I, Sarah J. St. Cyr, hereby submit this original work as part of the requirements for the degree of Master of Science in Nutrition.

It is entitled:
The Effects of Nutrition Education on Fruit and Vegetable Consumption in Food Pantry Clients

Student’s name: Sarah J. St. Cyr

This work and its defense approved by:

Committee chair: Seung-Yeon Lee, Ph.D.

Committee member: Melinda Butsch-Kovacic, Ph.D., M.P.H.
The Effects of Nutrition Education on Fruit and Vegetable Consumption in Food Pantry Clients

A thesis submitted to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

Department of Nutritional Sciences
College of Allied Health Sciences
by

Sarah St. Cyr

B.S., University of Cincinnati 2014
Cincinnati, OH

Committee Chair: Seung-Yeon Lee, Ph.D.
ABSTRACT

Background: Food pantry clients tend to be of low-socioeconomic status and are therefore at a greater risk for developing chronic diseases and having lower than average intakes of fruits and vegetables. Despite nutrition education interventions being effective at increasing the fruit and vegetable consumption of target populations, no studies have evaluated the effectiveness of a nutrition education program on increasing the fruit and vegetable intake in adult food pantry clients.

Objective: To evaluate the effectiveness of a nutrition education program on increasing the fruit and vegetable consumption in adult food pantry clients using mixed methods (survey and photovoice).

Methods: A quasi-experimental study was conducted with 21 adult food pantry clients in the intervention group, and 27 adult food pantry clients in the control group. Those in the intervention group attended a 4-week nutrition education program focused on fruit and vegetable consumption while those in the control group received no intervention. The effects of the intervention on the fruit and vegetable consumption and self-efficacy, outcome expectations, and self-regulation related to fruit and vegetable intake was assessed using a survey. In addition, photovoice was utilized to further evaluate the effectiveness of the nutrition education program in the intervention group only.

Results: After the nutrition education program, participants in the intervention group significantly (p=0.002) increased their whole fruit intake, while the control group did not. Major themes identified from photovoice included: dietary behavior change since attending the nutrition education classes, skills applied from the nutrition education classes to make healthy dietary behavior changes, and barriers and facilitators to the participants’ fruit and vegetable consumption.

Conclusions: The findings suggest that a 4-week nutrition education program was effective in eliciting positive dietary changes in food pantry clients. Photovoice was a feasible tool in evaluating the effect of nutrition education programming, particularly highlighting the broader impact of the classes on the individual participants.

Implications: Photovoice highlighted that the education was valued by program participants; therefore additional nutrition educations programs should be implemented in this population. To detect potential significant changes in participants’ vegetable intake, future studies should include a larger sample size. In order to include in-depth information on dietary patterns that can prevent chronic disease beyond fruit and vegetable intake, they should also be longer in duration. Further, they should include a follow-up to determine if changes to the participants’ diets are sustainable.
ACKNOWLEDGEMENTS

There are many individuals who have dedicated countless hours of their lives to assist with this project and without whom; this study would not have been possible. First and foremost, I would like to thank Dr. Seung-Yeon Lee. She guided and encouraged me during every step of this project and throughout graduate school. Her motivation in doing research is truly to better the lives of others, and I consider her my mentor. I would like to thank Dr. Melinda Butsch Kovacic for her willingness to provide her expertise in planning and implementing the photovoice segment and for serving on my thesis committee. To Linda Knight and Karen Kearney, I cannot thank you enough for everything you have done to make the nutrition education classes possible. I would like to thank Angela Bruzina and Madison Linek, who volunteered to help with the project and were a pleasure to work with. Additionally, I want to express my gratitude to the participants in this research study, especially those who took pictures and presented during the photovoice session. And last but not least, to Mom, Dad, Emily, and all of my wonderful family and friends, I thank you for your unwavering support. Without you, I most certainly would not have been able to complete this thesis or be where I am today!
# TABLE OF CONTENTS

List of Tables ................................................................................................................. vi
List of Figures ................................................................................................................... vii
Introduction ..................................................................................................................... 1
Literature Review .............................................................................................................. 4
Research Question and Hypotheses ............................................................................... 18
Methods ........................................................................................................................... 19
Results ............................................................................................................................. 33
Discussion ....................................................................................................................... 50
Conclusion and Implications ........................................................................................... 57
Bibliography .................................................................................................................... 59
LIST OF TABLES

Table 1. Photovoice Question Guide .................................................................23
Table 2. Summary of Nutrition Education Classes ............................................27
Table 3. Baseline Demographics ......................................................................34
Table 4. Average Daily Servings of Fruits, Fruit Juice, and Vegetables .............36
Table 5. Average Score for Self-Efficacy, Self-Regulation, and Outcome Expectations ..........37
LIST OF FIGURES

Figure 1. Number of Participants at Recruitment, Pre-Test, and Post-Test ......................20
Figure 2. Targeted Mediators to Improve Fruit and Vegetable Consumption ..................25
Figure 3. Mango from Participant’s Fridge ........................................................................39
Figure 4. Side Salad Ordered at a Pizza Restaurant ...........................................................41
Figure 5. Participant’s Take-Home Message: Drink More Water .......................................44
Figure 6. Fruit and Vegetable Smiley Face ........................................................................45
Figure 7. Photo of Participant’s Neighbor’s Garden.............................................................46
Figure 8. Photo of Blood Oranges Gone Bad.................................................................48
INTRODUCTION

Food pantry clients are individuals who utilize emergency food assistance programs. They tend to be low-income, less educated, and unemployed, and therefore are of low socioeconomic status (SES). Based on this, they are at greater risk for deadly chronic diseases including cardiovascular disease, obesity, type 2 diabetes and cancer. They are also at a greater risk for unhealthy eating behaviors, including low fruit and vegetable intake. As a dose dependent relationship has been observed between fruit and vegetable intake and a reduced risk for several chronic diseases, in the United States (US), public health officials have emphasized a specific focus on finding ways to increase the fruit and vegetable intake of low income populations.

Nutrition education programs have shown to be effective at changing the dietary habits of their participants. Because of this, the government funds two programs, the Supplemental Nutrition Assistance Program Education (SNAP-Ed) and the Expanded Food and Nutrition Education Program (EPNEP) that provide nutrition education to low-income adults. These programs are intended to cover a range of nutrition-related topics, however, fruit and vegetable intake is a major focus of both. In addition to these programs, a variety of nutrition education programs designed specifically to increase the fruit and vegetable intakes of low-income adults have been implemented. These programs have shown effectiveness at improving the fruit and vegetable consumption and related behaviors of their target populations.

Food pantry clients have previously expressed a need for programs to teach them how to make nutritious meals for less money, especially those including fruits and vegetables. Still, only one study published has described a nutrition education session delivered to low-income adults who frequently visit food pantries. This session focused on increasing its participants’ self-efficacy and nutritional knowledge related to fruits and vegetables, but the effect of the
intervention on their fruit and vegetable consumption was not measured.25

The Social Cognitive Theory (SCT) provides a framework for designing interventions that can assist participants in bridging the gap from intention to behavior change.26 This is because it enables the understanding of the factors that determine behavior as well as the mediators that allow for behavior change.26 Self-efficacy is at the center of the SCT and is defined as the confidence or beliefs a person has related to their ability to carry out a certain behavior.26 It is considered one of the biggest mediators for behavior change27 and the SCT has become the most widely used theory for designing nutrition education interventions.26 Other individual or personal mediators to behavior change described by this theory include outcome expectations, reinforcements or facilitators, impediments or barriers, goals and goal intentions. Behavioral mediators include the knowledge and skills a person needs to carry out a behavior, self-regulation, and goal setting.26

Community based participatory research (CBPR) has demonstrated effectiveness at addressing unique health needs in a variety of target populations.28-31 One method utilized in CBPR to gain insights into a community’s needs is by partnering with community members and organizations.32 Another method is through photovoice, which involves giving participants cameras, allowing them to document and discuss various aspects of their lives.33 Photovoice has been utilized in research to identify the nutrition education needs of target groups34 and was used in one study to evaluate the effects of a nutrition education program in teenagers (13-18 years),35 but to our knowledge, has not been used as a tool to evaluate the effectiveness of a nutrition education program in adults.

The purpose of this study was therefore to utilize aspects of CBPR and the SCT to design and implement a nutrition education program targeting food pantry clients in Cincinnati, Ohio.
Mixed methods (survey and photovoice) were used to evaluate the effects of the program on the participants’ fruit and vegetable consumption, and self-efficacy, self-regulation and outcome expectations related to eating fruits and vegetables.
LITERATURE REVIEW

Health Disparities in Low-Income Populations

Chronic diseases include conditions such as cardiovascular disease, cancer, diabetes and obesity.\(^3^6\) Although most cases are preventable, in 2012, nearly half of all adults in the United States (US) had been diagnosed with one or more chronic diseases.\(^3^7\) They are the leading causes of death in the US\(^3^8\) and burden society with their extreme health care costs.\(^3^9\) For example, cardiovascular disease causes one in every four deaths in the US\(^3^8\) and accounts for one in every six dollars spent on health care.\(^4^0\) More than one third of US adults are obese\(^3^8\) and the annual medical expenses for individuals with obesity are estimated to be around $1,400 per year higher than non-obese individuals.\(^4^1\) In 2015, an estimated 590,000 individuals will die from cancer and 1,700,000 cases will be newly diagnosed.\(^4^2\) Further, around nine percent of the population is estimated to be living with diabetes and in 2012 it was the seventh leading cause of death in the United States.\(^4^3\) Based on this, a major focus in health care research is analyzing the causes of chronic diseases and how they can be prevented.\(^1^8,1^9\)

Chronic Disease Prevalence and Socioeconomic Status

Socioeconomic status (SES) is a measure of a person’s education, occupation, and income.\(^7\) Studies have shown that adults of low SES have higher prevalence of several chronic diseases compared to those of high SES.\(^5,1^8,1^9,3^6\) These differences are known as health status disparities. For example, a study by Franks et al (2011) found that adults of low SES are 50 percent more likely to develop cardiovascular disease compared to adults of high SES.\(^4^4\) The Center for Disease Control (CDC) reports low income women are more likely to be obese than
high income women. Additionally, evaluation of data from a longitudinal study found that compared to those in the highest income bracket and with at least a college degree, those in the lowest income bracket and with less than a high school degree had a twofold risk of mortality from diabetes.

Factors that contribute to the increased prevalence of chronic diseases in low SES populations include their increased risk for unhealthy behaviors, poor diets, reduced access to healthcare, and poor quality of care. A report by Healthy People 2010 stated that such factors, which lead to health disparities, can be overcome by giving individuals to opportunities to gain the knowledge, motivation and opportunities they need to make informed decisions about their health. The National Prevention Strategy seeks to give individuals in at risk target populations these opportunities by promoting active living, tobacco free living, and healthy eating and preventing drug abuse and excessive alcohol intake.

**Disparities in Fruit and Vegetable Intake**

One specific problem area in the diets of low SES adults is their fruit and vegetable intake. The 2010 Dietary Guidelines for Americans (DGA) recommends adults with a 2,000 calorie per day diet consume 9 servings of fruits and vegetables per day (2 cups of fruit and 2 ½ cups of vegetables). The general guideline to achieve recommended intakes by the US Department of Agriculture (USDA) MyPlate is for Americans to make half the composition of their meals fruits and vegetables. However, most adults fall far below the recommended fruit and vegetable intakes. For example, in 2013, 37.7% of adults in the US reported consuming less than one serving of fruits and vegetables per day. In some states, this number was as high as 50%. 
Moreover, compared to individuals of higher SES, lower SES populations consume even less.\textsuperscript{11,49}

The differences in fruit and vegetable intake between individuals of high and low SES have been reported in several studies. In 2004, a report by the Centers for Disease Control (CDC) found that the average American consumed 1.03 cups of fruit and 1.58 cups of vegetables per day while in low-income populations, average intakes were 0.96 cups of fruit and 1.43 cups of vegetables per day.\textsuperscript{11} A study by Middaugh et al (2012) included 16, 213 participants and found that only 8\% met the recommended intakes of fruits and vegetables and those at 400\% of the U.S. poverty to income ratio (PIR) consumed significantly (P<0.001) more grams of fruits and vegetables per day than individuals of every other PIR. Those at ≥400\% the poverty threshold (PT) consumed an average 332 grams per day, compared to 289 grams per day in 300\%-399\% of the PT, 288 grams in 200\%-299\% PT, 269 grams in 100\%-199\% PT and 260 grams in those below the PT. These associations were no longer significant after controlling for education, which suggests that education was the mediating factors causing the differences.\textsuperscript{50} Another study by Dubowitz et al (2008) analyzed fruit and vegetable intake by in US neighborhoods by SES index level. The SES index was calculated based on: 1) the percentage of adults >25 y old with less than a high school education; 2) the percentage of unemployed males; 3) the percentage of households with income below the poverty line; 4) the percentage of households receiving public assistance; 5) the percentage of households with children that are headed by a female; and 6) median household income. The SES index in ranged from -7.72 to 1.99 and the standard deviation (SD) was 1. Based on this analysis, a 1-SD increase in neighborhood SES was associated with a 2 serving per week increase in fruit and vegetable intake.\textsuperscript{10}
Fruit and Vegetable Intake and Health

Fruits and vegetables have a variety of health benefits that influenced the recommendations for their consumption by the DGA. Most fruits and vegetables are low in calories and a good source of nutrients including: folate, magnesium, potassium, fiber, and vitamins A, C, and K. Although not cited by the DGA, they contain a wide-range of phytochemicals, which have been associated with positive health outcomes. In addition, high intakes of fruits and vegetables have been associated with the prevention of several chronic diseases.

A recent review by Boeing et al (2012) included epidemiological studies evaluating the effects of fruit and vegetable intake on chronic disease prevention. The review concluded that there is “convincing” evidence (at least two high quality studies showing consistent results) that high fruit and vegetable intake can reduce the risk of hypertension, coronary heart disease, and stroke and “probable” evidence (consistent relationship between intake and disease observed but with weakness in casual argument) that it can reduce the risk of cancer, and “possible” evidence (at least 3 studies with consistent results) that it can reduce the risk of weight gain. Further, there was “probable” evidence that fruit and vegetable intake is not associated with type 2 diabetes. This study was unable to identify the specific servings of fruits and vegetables needed to prevent these diseases.

In other epidemiological studies, the level of fruit and vegetable intake associated with disease prevention has been reported. An epidemiological cohort study by Crowe et al (2011) collected dietary data from over 300,000 men and women for an average of 8.4 years. After this time period, those who consumed an average of 640 grams (~8 servings) of fruits and vegetables a day had a 22% lower risk of fatal ischemic heart disease compared to those who consumed less than 240 grams (~3 servings) per day. Overall, for every 80 gram (on portion) increase in fruit
and vegetable consumption per day, a 4% reduction in fatal ischemic heart disease was observed. A cohort study reported by Bazzano et al (2003) studied 9,608 participants over 19 years and concluded that compared to individuals with fruit and vegetable intake of less than one serving per day, intake of three or more servings per day was associated with a 27% reduced risk for stroke, 42% lower stroke mortality, 24% lower ischemic heart mortality, 27% lower cardiovascular disease mortality and 15% reduced risk of all-cause mortality. Another study found that at the 12 year follow-up for the Nurses’ Health Study (which included a dietary intervention designed in part to increase the participants’ fruit and vegetable intake), women who increased their fruit and vegetable intake by 1.86 servings per day had a 25% reduced risk of becoming obese after adjusting for age compared to women who decreased their average daily servings of fruits and vegetable by around 1.27 servings per day.

Finally, in a review of studies examining the association between fruit and vegetable intake and various types of cancers, separate meta-analyses of case-control studies and cohort studies were done. In case-control studies evaluating the odds ratios (OR) for developing breast, lung, bladder, stomach, colon and rectum cancer with a daily 100 gram increase in fruit were (OR (95% CI)): 0.92 (0.84, 1.01), 0.83 (0.74, 0.94), 0.82 (0.70, 0.94), 0.69 (0.62, 0.77) and 0.93 (0.81, 0.99), respectively. In vegetables, the OR for developing breast, lung, bladder, stomach, colon and rectum cancer with a 100 gram daily increase were (OR (95% CI)): 0.86 (0.78, 0.94), 0.85 (0.77, 0.92), 0.90 (0.78, 1.03), 0.78 (0.71, 0.86), 0.87 (0.80, 0.95), respectively. A meta-analysis of cohort studies found the relative risk (RR) for developing breast, lung, bladder, stomach, colon and rectum cancer with a 100 gram daily increase in fruit were (RR (95% CI)): 0.99 (0.98, 1.00), 0.86 (0.78, 0.94), 0.80 (0.65, 0.99), 0.89 (0.65, 0.99) and 0.96 (0.90, 1.01), respectively. In vegetables the RR for developing breast, lung, bladder, stomach, colon and
rectum cancer with a 100 gram daily increase were (RR (95% CI)): 1.00 (0.97, 1.02), 0.92 (0.84, 1.07), 0.92 (0.75, 1.14), 0.89 (0.75, 1.05), 0.96 (0.90, 1.05), respectively.\textsuperscript{17}

Barriers to Fruit and Vegetable Consumption in Low-Income Populations

Based on the health benefits of fruits and vegetables, it is of public health concern to increase the fruit and vegetable consumption in all populations.\textsuperscript{18, 19} As adults of low SES consume even less fruits and vegetables than average, a great deal of research has been done to understand the barriers they face to getting adequate intake.\textsuperscript{19, 52} Additionally, research has examined the factors that facilitate fruit and vegetable intake in these populations.\textsuperscript{53, 54}

Both the individual and environmental factors associated with fruit and vegetable consumption among low-income adults have been investigated. Low income neighborhoods have been shown to have a lack of access to both quantity and quality of foods, and in particular, fresh fruits and vegetables.\textsuperscript{52} These areas are known as food deserts and they serve as a barrier to adequate fruit and vegetable intake because they limit accessibility.\textsuperscript{52} In the US, there are 23.5 million people living in areas where more than 40% of the population is at or below 200% of the poverty line and are more than a mile away from a grocery store.\textsuperscript{52} In 2.2% of US households, individuals live more than a mile away from a grocery store and do not have access to a vehicle.\textsuperscript{52} Another 3.2% live ½ a mile to a mile away from a grocery store and also do not have access to a vehicle. Without easy access to a grocery store, these adults often rely on smaller convenience stores in their neighborhoods for food.\textsuperscript{52} Research shows that convenience stores are more concentrated in low-income census tracts, more expensive than large grocery stores/supermarkets, and sell limited-no fresh fruits and vegetables.\textsuperscript{55, 56}
From focus groups and individual interviews with low income adults, individual barriers and facilitators to fruit and vegetable intake have been identified. Common barriers identified from these studies included: taste preferences, cost/finances, lack of transportation, lack of freshness of available fruits and vegetables, lack of time to cook and prepare fruits and vegetables and lack of self-efficacy to cook.\textsuperscript{53, 54, 57, 58} Some unique barriers identified from these studies were changing society norms on food \textsuperscript{57} and not having to worry about one’s weight.\textsuperscript{54, 54} Commonly identified facilitators included enjoying the flavor of fruits and vegetables, perceived positive health outcomes, having the resources to purchase fruits and vegetables, having the habit of including fruits and vegetables with meals and social support.\textsuperscript{24, 53, 54} A unique facilitator identified was trying to set a good example.\textsuperscript{54}

**Nutrition Education in Low Income Adults**

Nutrition education has become an important aspect of the nation’s efforts to improve the diets of low-income populations.\textsuperscript{19} Food Stamp Nutrition Education (FSNE) was first funded in 1992 and implemented in seven states with a total federal budget of around $660,000.\textsuperscript{59} It has since been renamed the Supplemental Nutrition Assistance Program Education (SNAP-Ed) and is provided by all 50 US states, the District of Columbia, and Virgin Island.\textsuperscript{59} In 2014, it had reached a federal budget of more than $400 million dollars.\textsuperscript{59} SNAP-Ed targets eligible SNAP recipients and low income adults and the purpose is to promote diets and physical activity levels that reflect the recommendations outlined by the USDA MyPlate and DGA.\textsuperscript{21} The delivery of SNAP-Ed changes based on the agency that provides it, however, the Food and Nutrition Service (FNS) encourages states to focus their SNAP-Ed efforts on several behavioral outcomes,
including getting participants to fill half their plates with fruits and vegetables. It also
recommends fruit and vegetable intake to be one of the evaluation areas of SNAP-Ed. In a
recent review (2013), SNAP-Ed provided to low-income elementary school children and seniors
was effective at significantly increasing children’s willingness to try a new kind of fruit and
seniors’ ability to add more fruits and vegetables to their meals and improve household
availability of fruits and vegetables.

The Expanded Food and Nutrition Education Program (EFNEP) is another government
funded initiative designed to provide nutrition education to low-income populations. EFNEP is
available in all fifty states, the District of Columbia, and six U.S. territories. This program
partners with SNAP-Ed but targets low income households with children, specifically.
Evaluation of EFNEP has shown that it can be effective at improving the diets of its participants,
specifically, increasing their fruit and vegetable intake by around 1.4 servings per day.

**Fruit and Vegetable Nutrition Education Interventions**

Aside from government funded nutrition education programs that have an emphasis on
fruit and vegetable intake, a variety of nutrition education interventions with the primary focus of
increasing fruit and vegetable intake of participants have been implemented in low-income
adults. The specific low income adult group targeted in these interventions varied and included
low-income young adults aged 18-24 years, urban African American women, Hispanics
living in rural areas, rural Appalachian couples, and ethnically mixed low-income populations
from inner city areas. The style of these interventions also ranged greatly. Commonly,
community nutrition education interventions were implemented. Additionally, in-person,
individual counseling was used. Other interventions were designed for the participants to engage in at their homes. These ranged from education provided through tailored CD-Roms, the Internet, or through the mail.

In a review including seven interventions designed to promote fruit and vegetable intake in low income and minority adults, the average change in fruit and vegetable intake was 0.97 servings per day.

**Social Cognitive Theory**

In attempt to increase the likelihood nutrition education interventions would elicit changes in participants’ dietary behavior, starting around the 1980’s, a priority was placed on developing interventions designed based on theoretical frameworks for human behavior. Examples of theories that have developed and/or utilized in nutrition education include: the health belief model, the theory of planned behavior, the trans-theoretical model, and the social cognitive theory (SCT).

The SCT has become the most widely used theory in designing nutrition education interventions. Reciprocal determination is described by this theory and is the way in which personal, behavioral and environmental factors work in a reciprocal manner that leads to health behaviors. It enables the understanding of the factors that determine behavior as well as the mediators that allow for behavior change.

There are a variety of mediators for behavior changed described by the SCT. Individual or personal factors include outcome expectations, self-efficacy, reinforcements or facilitators, impediments, and goals and goal intention. One of the most important mediators is self-efficacy,
which is defined as the confidence a person has related to carrying out a specific behavior. Outcome expectations are the expectations a person had about the outcomes related to a specific behavior. Reinforcements/facilitators are the results of a person’s behavior that increase or decrease the likelihood of that person taking action. Impediments or barriers are factors that prevent a person from taking action. Goals and goal intentions refer to intentions of behavior change that express value in that behavior change. Behavioral mediators of behavior change include behavioral capabilities such as the knowledge and skills, self-regulation/self-control and goal setting.

Several studies have evaluated these mediators in relation to fruit and vegetable intake, specifically. Cartwright (2003) examined socio-environmental, personal and behavioral factors in relation to the fruit and vegetable consumption in low-income urban African-American caregivers. From this study, self-efficacy was identified as the most important factor determining fruit and vegetable consumption. Another study by Anderson et al (2007) included adults in a health promotion study and evaluated how their self-efficacy, outcome expectations and self-regulation explained variances in their fruit and vegetable intake. After analysis, these mediators explained 59% of the variance observed in participants’ fruit and vegetable intake. Additionally, Stadler et al (2010) examined the effects of a one-meeting nutrition education intervention with information alone vs. information plus self-regulation techniques in a sample of 126 German females aged 30-50. In this study, the participants in the information plus self-regulation group consumed significantly more fruits and vegetables at four and 24 months after the intervention, compared to the intervention group.
Characteristics of Food Pantry Clients and their Nutrition Education Needs

Food pantries allow emergency access to food to those in need. They are provided by private or religious organizations and rely on public donations from external sources. There are two types of food pantries: traditional and choice. In traditional food pantries, individuals are provided a pre-portioned box or bag of food and in choice food pantries, individuals are allowed to decide what foods to take home.

Studies evaluating the characteristics of food pantry clients show that they tend to be low income and less educated. A study by Daponte et al (1998) found that when evaluating individuals who were all below 185% of the poverty level, compared to non-food pantry users those who used food pantries were more likely to have difficulty feeding their families, serve less nutritious foods, run out of money for food, and were less likely to have cars. Further, the median length of food pantry use was more than two years, which indicates use was more chronic rather than for emergency cases. In New York, food pantry clients from rural areas were more likely to be white females with children while those in urban areas were more likely to be older African Americans without children living in their homes. One of the interesting findings about the characteristics of food pantry clients is that despite the majority of them being eligible for food stamps, many of them do not use them. One study found that among food pantry clients, single parents (p<0.05) and clients who were more fluent in English (p<0.021) were more likely to receive food stamps and those who were homeless were less likely to receive food stamps (p<0.001).

Hosington et al (2002) conducted focus groups with 100 food pantry clients in nine different locations in Washington State. They found that food pantry clients had a variety of coping strategies to overcome food insecurity by using different stores, coupons, and sales to
obtain food for less money. Reducing expensive ingredients such as meat and increasing inexpensive filling foods such as pasta and potatoes was also common. Moreover, many families reported consuming more inexpensive convenience foods and less fruits and vegetable. Coping strategies to afford fruits and vegetables included sectioning off food stamps week by week and buying only canned fruits and vegetables because they are cheaper. When asked what their nutrition education interests were, participants were most concerned in learning about shopping and stretching food dollars in order. Other topics of interest included cooking and making tasty, low-cost meals, and learning about healthful foods and nutrition.

**Community Based Participatory Research**

Community based participatory research (CBPR) is an approach to research that has emerged within the past several decades. According to the National Institutes for Health, it is defined as: “an applied collaborative approach that enables community residents to more actively participate in the full spectrum of research (from conception – design – conduct – analysis – interpretation – conclusions – communication of results) with a goal of influencing change in community health, systems, programs or policies.” Through collaborating with communities, mistrust between researchers and community members can be reduced and sustainable interventions that are adapted to the unique needs of communities can be developed. According to Burdine et al (2010), the characteristics of CBPR are as follows: the foundation is built on strengths of the community; partnerships between academic and community members are facilitated and utilized in all research phases; social inequalities are attended to by power-sharing and empowering; co-learning is promoted between academic and
community members; efforts are balanced between research and actions that benefit all members of the research team; it is relevant based on local and public health problems; it recognizes and attends to determinants of health and disease; finally, it is cyclical, iterative, and committed to long-term sustainability.\textsuperscript{76}

CBPR has been utilized to understand the complexities of various chronic diseases such as hypertension, diabetes, and certain types of cancers.\textsuperscript{77} It has also been used to design and implement successful nutrition education interventions in a wide-range of populations.\textsuperscript{30, 31, 78} In this way, CBPR has demonstrated effectiveness at improving the health of different communities and has the long-term potential to reduce health disparities.

\textbf{Photovoice}

Photovoice is a method commonly used in CBPR.\textsuperscript{79} It involves providing community members and participants in research studies cameras to allow them to document different aspects of their lives.\textsuperscript{33} The images they capture and discussion of the images thereafter allows them to provide their unique insights, experience, and knowledge and provides them with the opportunity to serve as potential catalysts for change in their communities.\textsuperscript{33} Overall, the goals of photovoice are to allow individuals to document and discuss community strengths or concerns, promote discussion of community issues, and ultimately to reach policymakers.\textsuperscript{33}

Photovoice has been used in a wide range of health-related research studies. Examples of such studies include: providing a means for individuals with severe mental illness to express their nutrition education needs \textsuperscript{34} understanding the perceptions of weight related health in African Americans,\textsuperscript{80} and investigating the facilitators and barriers rural older women have in
terms of acquiring and preparing food. In addition, a study by Lardea et al (2011) used photovoice as a means to characterize the food security of eight food pantry clients in Iqaluit, Nunavut and explore the factors related to their daily food consumption. Another study by Thomas et al used photovoice as a method to evaluate the impact of a nutrition education program “Cook It Up!” in four teenagers aged 13-18 years. Photovoice allowed for identification of facilitators and barriers to applying the cooking skills learned in the classes to real-life scenarios.
Research Question

1. What were the effect of a nutrition education intervention on fruit and vegetable consumption and psychosocial factors, such as self-efficacy, self-regulation, and outcome expectations related to fruit and vegetable intake in adult food pantry clients?

Hypotheses

1. Fruit and vegetable consumption of food pantry clients in an intervention group will significantly (α< 0.05) increase after four weekly nutrition education classes compared to those in a control group.

2. Self-efficacy related to fruit and vegetable consumption of food pantry clients in an intervention group will significantly (α< 0.05) increase after four weekly nutrition education classes compared to those in a control group.

3. Outcome expectations related to fruit and vegetable consumption of food pantry clients in an intervention group will significantly (α< 0.05) increase after four weekly nutrition education classes compared to those in a control group.

4. Self-regulation related to fruit and vegetable consumption of food pantry clients in an intervention group will significantly (α< 0.05) increase after four weekly nutrition education classes compared to those in a control group.
METHODS

Study Design

A quasi-experimental design with non-randomization of participants was employed to evaluate the effects of a nutrition education intervention on fruit and vegetable consumption and mediators related to fruits and vegetables of adult food pantry clients. Those who were eligible, interested, and able to attend all four classes and photovoice session of the nutrition education program were assigned to the intervention group while those who were eligible but not able to attend/interested in attending the classes were assigned to the control group. The effects of the intervention were evaluated using mixed methods, a survey and photovoice.

Participants

Participants for the study were recruited from St. Vincent de Paul (SVdP), which is located in the West End of Cincinnati, Ohio. The population in the West End is 87.7% African American, 9.6% Caucasian, and 3% other races. The average annual household income is $12,800 and 48% of the population lives below the 100% federal poverty line. SVdP offers its clients a wide-range of resources including a free pharmacy, vouchers for clothing and furniture, and assistance with rent and utilities. Additionally, it provides a free choice food pantry that feeds over 800 families in the community each month.

The total number of participants recruited for the intervention group was 34 and the total number for the control group was 45. At baseline, 21 completed the pre-test in the intervention group and 27 in the control group. After the intervention, 18 completed the post-test in the intervention group and 24 completed the post-test in the control group. Therefore the retention
rate for the nutrition education class from baseline to post-test in the intervention group was around 87%. The majority (15/18) of the participants who completed the post-test attended all four nutrition education classes. Two completed three out of the four classes and one attended two out of four.

Figure 1. Number of Participants at Recruitment, Pre-Test, and Post-test
Procedures

Prior to recruitment, approval for the use of human subjects and written permission to use SVdP as the study site were obtained from the University of Institutional Review Board (IRB) and program director at SVdP, respectively. Recruitment began the second weekend of April 2015 and lasted around two weeks. Individuals were approached directly by research aides in the lobby of the food pantry. A recruitment script and screener were used to determine eligibility. Individuals were eligible for the study if they were: 18 years or older, able to read, write, and speak English, use the food pantry once a month, and available to attend all four of the nutrition education classes, as well as the photovoice session (intervention group only). After being deemed eligible, a participant could either sign up for the morning or afternoon nutrition classes (intervention group) or schedule a time to complete their survey (control group). Participants were reminded of the classes/surveys through phone and mail.

Prior to filling out the pre-test survey, all participants were consented for the study. They were all given a copy of the signed consent form. The control group completed their pre-test survey during the week of the first nutrition education class and those in the intervention group completed it before the start of the first class they attended. One participant in the intervention group did not show up for the first class and completed the pre-test before the second class. The surveys took around thirty minutes to complete and were self-administered to the participants unless they requested assistance from a research aide.

After completion of the pre-test, the intervention group proceeded to attend four weekly 90 minute nutrition education classes on Friday mornings/afternoons in May, 2015. At the first class, there were 12 participants in the morning session and 9 participants in the afternoon session. The control group scheduled a time to come back to SVdP to complete the post-test
around one month from the time they completed their pre-test. They were reminded of the post-test by phone and mail. The post-test was completed by the intervention group prior to the photovoice session the last Friday in May. The photovoice sessions were at the same time the classes were held and were 90 minutes in length. The control group completed the post-test during the time scheduled.

The photovoice session was held for the intervention group following the completion of their post-test surveys. Two weeks prior to the photovoice session, all members of the research team attended a photovoice training session led by the Co-Investigator who had previous experience using this methodology. At the fourth session, 18 participants received digital cameras and training on how to use the cameras. They were instructed to bring the cameras with them wherever they went during the following week and take as many photos as they wanted of things that related to what they learned in the classes. They were also encouraged specifically to take photos of facilitators and barriers to their fruit and vegetable consumption. They were instructed to select 2-3 of their favorite photos to present to the class the following week. They were told that they would explain why they took the photos and how their photos related to what was discussed in the nutrition classes. As an example, two members of the research team demonstrated a photovoice discussion on barriers and facilitators to physical activity.

When the participants arrived for the photovoice session on the fifth week, their photos were uploaded onto the Primary Investigator’s (PI) laptop. All eighteen participants who were given digital cameras came back for the photovoice session. One of these participants was not able to bring the camera back even though he took several photos. Hence, he discussed the photos he took without presenting them. Another participant lost his camera but took pictures on his cell phone, so he used these pictures to present to the class. The other participants returned
with their cameras and photos to share. Each participant chose around 2-3 photos to present to the class. Each participant stood up in front of the class while their photos were projected onto a large screen. They were then guided through a discussion led by the research assistant and the Co-I. When each participant was done discussing their photos, members of the audience were encouraged to make comments about the photos or ask questions. The sessions were audio-recorded and several members of the research team took notes on the discussion.

Table 1. Photovoice Discussion Question Guide

<table>
<thead>
<tr>
<th>Questions</th>
<th>Probes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  What do you SEE in this photograph?</td>
<td></td>
</tr>
<tr>
<td>2  What is really HAPPENING in this photograph?</td>
<td></td>
</tr>
<tr>
<td>3  How does this relate to what we’ve been discussing in the nutrition education class?</td>
<td>• What was the big take away from the nutrition education classes?</td>
</tr>
<tr>
<td>Probes</td>
<td>• If you share information you’ve learned in the classes with your friends/family members, what do you tell them you’ve learned?</td>
</tr>
<tr>
<td>4  For pictures of barriers: Why do you think these barriers still exist?</td>
<td>• Is there anything that still makes it difficult for you to eat fruits and vegetables?</td>
</tr>
<tr>
<td>5  For pictures of facilitators: What helps you to eat fruits and vegetables?</td>
<td></td>
</tr>
</tbody>
</table>

As an incentive for participation in the study, participants in the control group were given a $5 Kroger gift card for completing the pre-test survey and a $10 Kroger gift card for completing the post-test survey. Those in the intervention group were given a $5 Kroger gift card for attending the four nutrition education classes and a $15 Kroger gift card for attending the photovoice session. They were also allowed to keep the cameras used for photovoice. For transportation, each time a participant came to SVdP for study activities, they were provided two bus tokens.
**Nutrition Education Intervention**

**Program Goals**

The main goal of the program was to teach participants ways to overcome the barriers they face to fruit and vegetable consumption and to promote their intake with reinforcements/facilitators to fruit and vegetable consumption.

**Theoretical Framework: Social Cognitive Theory**

The intervention was designed based on the Social Cognitive Theory (SCT). The personal factors addressed were outcome expectations, self-efficacy, and goals intentions. The behavioral factors that were addressed were skills, self-regulation and goal setting. The relationship to these mediators to fruit and vegetable intake as well as how they were addressed in the nutrition education classes are outlined in Figure 2. The demonstrations, activities, souvenirs and handouts were used to enhance the participants’ self-efficacy, outcome expectations, knowledge, and skills related to fruit and vegetable intake. Goal setting sessions were held using the Specific, Measureable, Attainable, Realistic, and Timely (S.M.A.R.T) format. These sessions were designed to increase the participants’ self-regulation related to fruit and vegetable intake. After the intervention, the factors that promote (facilitators) or continue to impede (barriers) the participants in their fruits and vegetable consumption were explored through in photovoice session.
Development of Program

The program was developed through several phases and in a CBPR approach, several of these phases involved members of the community. Two 4-week pilot nutrition education programs were implemented in food pantry clients at SVdP in May and July of 2014. These occurred after an initial literature review and four, hour-long meetings with a community member from the West End/volunteer at SVdP and the Social Services Program manager at SVdP to develop the content. The classes focused on a wide-range of nutritional topics relevant to low-income populations. Based on the feedback from the participants in these classes and the length of the program, it was decided to narrow the scope of the classes.
An in-depth literature review was conducted, and from this, it was decided to narrow the scope of the nutrition education classes to increasing fruit and vegetable consumption. After the main objective of the program was determined, another four, hour-long meetings were held between the a community member from the West End of Cincinnati and the Social Services Program manager at SVdP. During these meetings, brainstorming sessions took place to develop the specific topics, learning objectives, activities and souvenirs for each week’s lesson. To develop an understanding of the budgeting habits of the population and the foods available provided at SVdP, a member of the research team also attended a financial education classes provided through SVdP, talked to the Food Pantry Coordinator, and walked through the food pantry to survey the foods available. After the lesson plans were completed by the PI and research aide, they were approved by the West End community member and Social Services Program manager.

**Program composition and content**

The four-week 90 minute-nutrition education classes were taught by a graduate student from the University of Cincinnati with a Bachelor of Science in Food and Nutrition with assistance from the SVdP volunteer who resides in the West End, two undergraduate students studying dietetics and the PI. Each class started with short educational PowerPoint presentation and proceeded into several interactive demonstrations and activities. At the start of the classes, the participants were given printouts with copies of the Power Points, informational handouts related to each week’s lesson and fruit and vegetable based recipes. Goal setting sessions were held at the end of weeks one and three using the Specific, Measureable, Attainable, Realistic, and
Timely (S.M.A.R.T) format. At the end of each lesson, in addition to the grocery gift card, small souvenirs were provided to the participants, which were related to that week’s lesson and designed to help them increase their fruit and vegetable intake. The specific topics, learning objectives, activities and souvenirs provided for each week’s classes are described in Table 2.

Table 2. Summary of Nutrition Education Classes

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Learning Objectives</th>
<th>Activities</th>
<th>Souvenir</th>
</tr>
</thead>
</table>
| 1    | Fruit and vegetables and disease prevention | • Identify three health benefits from eating fruits and vegetables  
• List nutrients that are rich in fruits and vegetables  
• Develop a S.M.A.R.T goal related to fruit and vegetable intake | • True or false game on fruits and vegetables and their health benefits  
• Taste testing with explanation of nutrients found in each fruit/vegetable  
• S.M.A.R.T. goal setting | Pack of five plastic Ziploc containers which were a cup in size |
| 2    | Fruits and vegetables and MyPlate | • List three ways to add fruits and vegetables to their plate  
• Identify the healthier of two canned/frozen fruit/vegetable options  
• Prepare a salad that follows the MyPlate guidelines | • Cooking demonstration using items commonly available from food pantry  
• Game on choosing the healthier of two frozen/canned fruits and vegetable options  
• MyPlate Activity comparing own dinner to MyPlate  
• Making a salad following the MyPlate guidelines using giving various items in food groups | Measuring cups and measuring spoons |
### Snacking and storing fruits and vegetables

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>• Cut and store a mango, pineapple, and bell pepper&lt;br&gt; • List three ways to include more fruits and vegetables into their snacks&lt;br&gt; • Set a S.M.A.R.T goal to increase fruit and vegetable intake via snacks</td>
<td>Cutting boards, two knifes, and a fruit and vegetable peeler</td>
</tr>
</tbody>
</table>

### Meal planning with fruits and vegetables

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>• Develop a meal plan including five servings of fruits and vegetables a day&lt;br&gt; • Write out a shopping list based on menu developed&lt;br&gt; • List three ways to save money on fruits and vegetables</td>
<td>Two reusable shopping bags</td>
</tr>
</tbody>
</table>

### Instruments

The surveys were composed of questions on demographics, self-efficacy, outcome expectations and self-regulation related to fruit and vegetable consumption. Pre-existing surveys that had already been tested for validity and reliability were used to assess self-efficacy, outcome expectations and self-regulation. The questionnaires were reviewed for appropriateness and readability by the community member from the West End and the Social Services Program Director from SVdP.

Demographics included questions on the participants’ age, gender, ethnicity, race, average monthly household income, household size, and education. Further, a section was included to assess whether the participants used any benefits from the Supplement Nutrition Assistance
Program, Women Infants and Children, Social Security, Ohio Works First, Medicaid, Medicare or the Children’s Health Insurance Program.

Scales to Measure Self-Efficacy of Eating Fruits and Vegetables was used to assess their self-efficacy related to fruit and vegetable intake. This scale include three subscales, such as self-efficacy of eating vegetables (7 items, Cronbach’s alpha= 0.80), eating fruit (6 items Cronbach’s alpha=0.85) and eating both fruits and vegetables (11 items Cronbach’s alpha=0.73). These questions were all measured on a five point Likert scale (1 –not at all confident, 5 – very confident). Examples of questions asked include: I am confident that I can eat fruits or vegetables when I am down or depressed, I can eat fruits and vegetables when the ones I like are unavailable, I can eat fruits and vegetable when I don’t have much money, I can eat vegetables on days when I am in a rush, I can eat fruit on days when I am in a rush. Permission from the author to use this survey was also obtained.

The Health Belief Survey was modified to include only questions related to the participants’ outcome expectations and self-regulation of eating fruits and vegetables. After modifications, the survey included 21 items on outcome expectations which were measured on a 5 point Likert scale point (1 – strongly disagree, 5 – strongly agree). Examples of questions related to outcome expectations include: if I eat more fruits and vegetables every day, I expect I will feel healthier and happier, if I eat more fruits and vegetables every day, I will be unhappy and irritable, if I eat more fruits and vegetables every day, and I will be less likely to get cancer or heart disease. Finally, there were 6 items on self-regulation which were based on a scale from 0-100. Examples of questions related to self-regulation include: how certain are you that you can eat at least 5 servings of fruits and vegetables every day, how certain are you that you can eat fruit for a snack, and how certain are you that you can have a side salad instead of
French fries when dining out.

Daily fruit and vegetable intake was assessed using the National Cancer Institute’s Fruit and Vegetable Screener By-Meal. This screener consisted of fourteen items that asked the participants about the typical amount and frequency of fruits and vegetables they consume. The questions were divided into: lettuce salad, non-fried white potatoes, fried potatoes, beans, tomato sauce, tomato soup, and all other vegetables in the morning, afternoon and evening, fruit juice, and all other fruit in the morning, afternoon and evening.

Data analysis

A research aide entered all of the survey data into SPSS (IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) and each survey was double-checked for accuracy. The data for one participant in the control group was excluded as he arrived too heavily intoxicated to complete his post-test survey.

The demographic questions were analyzed using descriptive statistics. To detect differences in ordinal variables between the intervention and control groups, Chi squared tests were used. For continuous variables, normality was first checked using the Shapiro-Wilk test. Any variables with a p value less than 0.05 was considered to be non-normally distributed. Independent t-tests were used for normally distributed variables and the Independent Mann Whitney U test was used for non-normally distributed variables.

The daily servings of fruit juice, fruit, and vegetables (not including French fries) were calculated by scoring the Fruit and Vegetable Screener By-Meal according to the directions on the Applied Research Cancer Control and Population Science page of the National Cancer Institute’s website. Using the directions, the reported frequency and amount of fruits and vegetables during the previous month were converted into a daily average. Changes in the
variables from baseline to post-test were calculated by subtracting the average post-test score from the average pre-test score. Outliers in fruit, fruit juice and vegetables were identified using box and whisker plots. Outliers including intakes that did not seem plausible were removed from the dataset for a separate analysis of the variables. For fruit juice intake, four outliers were identified and removed at baseline (12.5 servings per day, each) and 3 were identified and removed at the post-test (12.5, 10.0, 8.5 servings/day, respectively). For vegetable intake, three outliers were identified and removed at baseline (25.33, 18.53, 16.42 servings per day, respectively) and three were identified and removed at post-test (29.14, 14.36, and 11.56 servings per day, respectively). The normality of these variables was also checked using the Shapiro-Wilk test. For normally distributed variables, independent t-tests were used to examine the differences in the average pre-test score as well as the change from pre to post-test between the intervention and control groups. Paired t-tests were used to examine the differences from baseline to post-test within groups. For non-normally distributed variables, the Independent-Sample Mann-Whitney U test was used to analyze differences in the pre-test score as well as the change from pre to post-test between the intervention and control groups. The Related-Samples Wilcoxon Signed Ranked Test was used to examine the differences in the median score for the variables from baseline to post-test within each group.

For the questions related to self-efficacy, self-regulation and outcome expectations, an average score was generated by adding up the score for each question related to each mediator and dividing by the number of questions related to that mediator. The scores for the questions on outcome expectations were reversed when appropriate. Similarly to fruit, fruit juice and vegetable intakes, these variables were assessed for normality. Depending on whether the
variable was normally distributed; the appropriate statistical test was run to detect differences within and between groups before and after the intervention.

The digital audio files from the photovoice sessions were transcribed verbatim by a research assistant. The transcripts, photos, and reviewer notes from the photovoice were then analyzed by the research staff for codes. The transcripts were coded independently by three researchers and then codes were compared and discussed until a consensus was reached. Similar codes were categorized into one group, and overarching themes were identified and summarized.
RESULTS

Demographics

The demographic data for the participants is represented in Table 3. After analysis, there were no significant differences between the intervention and control group in demographic variables aside from the highest level of education completed. Participants in the control group had completed a higher degree of education \((p=0.014)\). The age range for the participants in the intervention group was 27-67 years and the age range for the control group was 37-87 years. The majority of participants in both groups were female, identified racially as black, had less than a high school diploma, and were unemployed.
Table 3. Baseline Demographics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Intervention Group (n=21)</th>
<th>Control Group (n=26)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) (Mean ± SD)</td>
<td>48.65 ±11.01</td>
<td>54 ± 9.72</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>47.6% (10)</td>
<td>38.5% (10)</td>
</tr>
<tr>
<td>Female</td>
<td>52.5% (11)</td>
<td>61.5% (16)</td>
</tr>
<tr>
<td>Marriage Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>4.8% (1)</td>
<td>19.2% (5)</td>
</tr>
<tr>
<td>Single, never married</td>
<td>76.2% (16)</td>
<td>46.2% (12)</td>
</tr>
<tr>
<td>Divorced</td>
<td>14.3% (3)</td>
<td>19.2% (5)</td>
</tr>
<tr>
<td>Living with a partner</td>
<td>4.8% (1)</td>
<td>3.8% (1)</td>
</tr>
<tr>
<td>Widowed/Widower</td>
<td>0% (0)</td>
<td>11.5% (3)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hispanic/Latino</td>
<td>95.2% (20)</td>
<td>92.3% (24)</td>
</tr>
<tr>
<td>Non-Hispanic/Latino</td>
<td>4.8% (1)</td>
<td>7.7% (2)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>14.3% (3)</td>
<td>7.7% (2)</td>
</tr>
<tr>
<td>Black</td>
<td>81.0% (17)</td>
<td>84.6% (22)</td>
</tr>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td>0</td>
<td>3.8% (1)</td>
</tr>
<tr>
<td>Other</td>
<td>4.8% (1)</td>
<td>3.8% (1)</td>
</tr>
<tr>
<td>Highest Education*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than high school</td>
<td>52.3% (11)</td>
<td>34.6% (9)</td>
</tr>
<tr>
<td>High school/GED</td>
<td>47.6% (10)</td>
<td>26.9% (7)</td>
</tr>
<tr>
<td>Some college</td>
<td>0</td>
<td>26.9% (7)</td>
</tr>
<tr>
<td>An associate’s degree</td>
<td>0</td>
<td>11.5% (3)</td>
</tr>
<tr>
<td>Monthly Household Income</td>
<td>$1312 ± 462.62</td>
<td>$786.62 ± 591.94</td>
</tr>
<tr>
<td>Household Size</td>
<td>2.05±1.47</td>
<td>2.35±1.88</td>
</tr>
<tr>
<td>Type of Benefits Received</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNAP</td>
<td>66.7% (14)</td>
<td>57.7% (15)</td>
</tr>
<tr>
<td>Medicare</td>
<td>4.8% (1)</td>
<td>15.4% (4)</td>
</tr>
<tr>
<td>Medicaid</td>
<td>71.4% (15)</td>
<td>57.7% (15)</td>
</tr>
<tr>
<td>SSI Retirement</td>
<td>0</td>
<td>15.4% (4)</td>
</tr>
<tr>
<td>SSD</td>
<td>7 (33.3%)</td>
<td>34.6% (9)</td>
</tr>
<tr>
<td>Ohio Works First</td>
<td>2 (9.5%)</td>
<td>11.5% (3)</td>
</tr>
<tr>
<td>CHIP</td>
<td>0</td>
<td>7.7% (2)</td>
</tr>
<tr>
<td>Currently Employed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19% (4)</td>
<td>26.9% (7)</td>
</tr>
<tr>
<td>No</td>
<td>81% (17)</td>
<td>34.6% (18)</td>
</tr>
</tbody>
</table>

*Difference in intervention and control group at p <0.05
Effect of the Nutrition Education Classes on Fruit and Vegetable Consumption

As shown in Table 4, at pre-test, the control group had a significantly higher consumption of total fruit (p=0.025) compared to the intervention group. At post-test, the fruit consumption of the intervention group was significantly higher compared to the pre-test (p=0.002), and the change in fruit intake was significantly greater in the intervention group compared to the control group (p=0.002). The changes in vegetable and fruit juice consumption between the two groups were not significantly different.
Table 4. Average Servings of Fruits, Fruit Juice, and Vegetables (Mean ± SD, Median, Range)

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Mean ± SD, Median, Range)</td>
<td>(Mean ± SD, Median, Range)</td>
<td>(Mean ± SD, Median, Range)</td>
</tr>
<tr>
<td>Total Fruit</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>0.55 ± 0.63, (0.17, 0.00-1.80)</td>
<td>1.01±0.96(^1), (0.85, 0.02-3.68)</td>
<td>0.56±0.94(^a), (0.38, -1.02-3.68)</td>
</tr>
<tr>
<td>Control</td>
<td>1.00 ± 0.83(^b), (0.85, 0.07-3.00)</td>
<td>0.68±0.52, (0.52, 0.10-1.89)</td>
<td>-0.32±0.96, (-0.10, -2.68-1.72)</td>
</tr>
<tr>
<td>Fruit juice</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>1.09 ± 2.08, (0.16, 0.00-7.5)</td>
<td>0.92±0.0.89, (0.53, 0.07-3.00)</td>
<td>-0.18±1.88, (0.19, -3.04-2.21)</td>
</tr>
<tr>
<td>Control group</td>
<td>1.40±2.06, (0.50, 0.00-8.13)</td>
<td>0.76±0.54, (0.54, 0.00-5.00)</td>
<td>-0.64 ±1.74, (0.00, -3.13-4.79)</td>
</tr>
<tr>
<td>Total vegetables(^2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>2.04 ± 1.50, (1.93, 0.14-5.06)</td>
<td>2.66±1.53, (2.04, 0.68-6.02)</td>
<td>0.61±1.64, (0.52, -1.08-5.24)</td>
</tr>
<tr>
<td>Control</td>
<td>2.59±3.03, (1.94, 0.18-14.68)</td>
<td>3.19±2.34, (2.14, 0.14-7.19)</td>
<td>0.59±3.58, (0.47, -9.97-6.60)</td>
</tr>
</tbody>
</table>

\(^a\) p<0.05, Difference between intervention and control groups at baseline,

\(^b\) p<0.01, Difference in intervention and control group

\(^1\) p<0.01, Difference in pre-test score

\(^2\) Total vegetables including lettuce salad, beans, potatoes (not fried), tomato sauce, and vegetable soup
Effect of the Nutrition Education on Self-Efficacy, Self-Regulation, and Outcome Expectations

As shown in Table 5, at baseline, the average scores for self-efficacy, and outcome expectations were close to 4 out of 5 in both groups and the average score for self-regulation was around 75 out of 100 in both groups. There were no significant differences in the score for any of the mediators between each group at baseline. Further, none of the changes in the SCT mediators between or within groups were significant from pre to post test.

Table 5. Average Score for Self-Efficacy, Self-Regulation, and Outcome Expectations (Mean ± SD)

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self-Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3.91±0.87</td>
<td>4.04±0.79</td>
<td>0.19±0.77</td>
</tr>
<tr>
<td>Control</td>
<td>4.01 ± 0.69</td>
<td>3.99±0.66</td>
<td>-0.17±0.60</td>
</tr>
<tr>
<td><strong>Outcome Expectations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>3.84±0.58</td>
<td>3.58±0.69</td>
<td>-0.18 ± 0.44</td>
</tr>
<tr>
<td>Control</td>
<td>3.98±0.49</td>
<td>3.77±0.54</td>
<td>-0.15±0.65</td>
</tr>
<tr>
<td><strong>Self-Regulation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>76.28±16.2</td>
<td>78.11±16.68</td>
<td>2.46±18.95</td>
</tr>
<tr>
<td>Control group</td>
<td>72.56±25.17</td>
<td>72.35±22.29</td>
<td>0.55±21.45</td>
</tr>
</tbody>
</table>
Evaluation Using Photovoice

Eleven themes were identified from the photovoice sessions: 1.) *Dietary changes made since attending the nutrition education classes*; 2.) *Goal intentions to make dietary changes since attending the nutrition education classes*; 3.) *Skills applied from the nutrition education classes to make dietary changes*; 4.) *Goal intentions to apply skills learned in the nutrition education classes to make dietary changes*; 5.) *Impact of the classes on the participants’ family and friends*; 6.) *The participants’ perceived take-home message from nutrition education classes*; 7.) *Appreciation for the nutrition education classes*; 8.) *Facilitators to eating fruits and vegetables*; 9.) *Barriers to eating fruits and vegetables*; 10.) *Health concerns related to chronic diseases*; and 11.) *Misconceptions about nutrition and health*.

Theme 1: Dietary changes made since attending the nutrition education classes

Throughout the photovoice presentations, the participants discussed changes they had made to their diet since attending the nutrition education classes. Several of the participants directly stated that they had started eating more fruits and vegetables. A number of participants also discussed changes they had made to their diets other than increasing their fruit and vegetable intake. These changes included drinking more water, eating less fried food and eating more whole grains.

“I’m just trying to eat more…fruits and vegetables from meats cause I’m trying to eat more fruits and vegetables”

“What I learned from this class, ya’ll, with the vegetables and I very seldom eat them but I eat more now the fruits and vegetables, you know, with my meal.”

“I started attending this class, make me start eating more fruits and vegetables and stuff start trying to eat more whole grains and stuff”
Theme 2: Goal intentions to make dietary changes since attending the nutrition education classes

While some participants discussed changes that they had already made to their diets since attending the nutrition education classes, others identified changes they were planning to make. These changes included plans to eat or try more fruits and vegetables. Further, participants identified other areas of their diet they were going to work on improving such as reducing their sodium and fried food intake.

“I’m gonna try to start eating healthier you know cause of my health conditions…. Maybe only I’ll still have fried food once or twice a week instead of every day.”

Figure 3. Mango from Participant’s Fridge
“It’s [mango] very healthy. I’ve learned since I’ve been in this it very healthy and um that was the first time that I tried it [in the class] and liked it so I’m going to start to make that a part of my regular…eating.”
Theme 3: Skills applied from the nutrition education classes to make dietary changes

Throughout the discussions, the participants described utilizing skills they learned in the classes to eat more fruits and vegetables. Examples of skills used or that they intend to use included: eating a greater variety of fruits and vegetables, eating fresh fruits and vegetables, reducing sodium intake from canned vegetables, eating canned fruit in 100% juice, adding fruits and vegetables to meals, shopping smart to save money on fruits and vegetables, and buying more fruits and vegetables at the grocery store so they are easily accessible at home.

“Since I’ve been in this program…. I go out and buy fruits, vegetables and stuff and the other time I walked by that isle”

“This class has really helped me tremendously cause ….even just cutting up the mango and the pineapple have helped me. There was a whole table full of pineapple and I was like I’m gonna get two of these ripe ones you know ….I got them and I cut them up…. I put some of it in the freezer in some of those containers you gave me”

“I’m opening up my eyes to new stuff I don’t eat”
Figure 4. Side Salad Ordered at a Pizza Restaurant
“I got me my pineapple and banana peppers calzone which I forgot to take the picture of and I also got a salad. I was like...let me just try a salad cause that’s all we’ve been talking about in the class is nutrition fruits and vegetables.”

While some of the participants utilized skills they learned in the classes to increase or improve their fruit and vegetable intake, others utilize the skills learned to make other healthy dietary changes such as eating less sodium and fat. Skills utilized to make healthy dietary changes other than increased fruit and vegetable intake included reading nutrition facts labels, baking instead of frying meat, and eating fried foods in moderation.

“I got... pretzel crisps from Findlay market..... cause them look better than me eating the chips with so much salt and fat in them ..... I looked on the back, I should’ve took a picture of that and compared it to the chips I had, the lays, I love them lays sour cream and onion and I compared the fat intake and the salt the sodium and the sodium is killing me with that.”

“This here [nutrition facts label] I got off the Internet but it didn't print very clearly. I was trying to see how many calories and...the nutritional content of it and...I was surprised to find out that like Kentucky fried chicken has got an awful lot of salt in it and like one
piece of the chicken breast gives you 50% of all the salt you need for the day. Yeah, and that's probably why I got high blood pressure. So anyway I’m, I’m reading labels”

Theme 4: Goal intentions to apply skills learned in the nutrition education classes to improve diet

Several of the participants stated that while they had not yet utilized the skills they learned in the nutrition education classes to eat more fruits and vegetables/improve their diets, they were planning to do so. Skills they were planning on utilizing included trying fruits and vegetables that they had not tried before and rinsing canned vegetables off before consumption to reduce sodium intake.

“The other thing I learned too is that canned goods have a lot of sodium in it and you get some of that sodium off by rinsing them off, which I learned here so that's something I plan to use a lot”

Theme 5: Impact of the nutrition education classes on the participants’ family and friends

Another major theme identified was the impact the nutrition education classes had on the participants’ family and friends. The participants described discussing the classes with many of their friends and family members and encouraging them to eat/drink healthier. They described dietary changes their family members had made as a result of their attendance in the classes including: eating more fruits and vegetables and drinking more water. They described other positive changes their family members had made such as putting away a snack bowl to limit their grandchildren’s access to it. A number of the participants said that after talking about the classes with their friends, they became interested in attending and wanted to find out how to sign up.

“This is what my daughter ate this morning, to herself [canned peaches].... It was her first time eating peaches....But it was just shocking to me that my child ate this [canned peaches] because she’s a picky eater”
“My mom…. she just started eating more vegetables with her food because she never ate vegetables.”

“[My family] wanted to know why I was taking the pictures and I…told them that we should eat more fruits and vegetables.”

Theme 6: The participants’ perceived take-home message from nutrition education classes

Another theme identified was the participants’ perceived take-home message from the nutrition education classes. When the participants were asked what the major take-home message of the classes was, they responded with a variety of answers. Many of them found the biggest take away to be fruit and vegetable intake while others felt the take-away was eating healthier and improving health in general. Simply because water was the only beverage served at every class, the biggest take-home message for one participant was to drink more water.

“I learned about taking care of your health, eating a lot of vegetables, eating the right type of food”

“Well the biggest thing I think I’ve learned is that it’s very important to eat very healthy and I’m going to try to take that with me and continue to eat healthy”
Figure 5. Participant’s Take-Home Message: Drink More Water
“What I learned in the nutrition class was to drink more water. You see me drinking that water…. I do not drink water but I been here so many weeks that's all they gave us was water. I ain’t have no other choice that they gave us water so that's what…. I learned”

Theme 7: Appreciation for the nutrition education classes

Throughout their discussion, many of the participants described that they were very appreciative of the nutrition education classes. They mentioned that they were thankful for the other participants, teachers, and knowledge that they learned. Aside from simply discussing how they had changed their eating habits, they described how their attitude toward the classes changed throughout and how the classes had motivated them to take better care of themselves. This appeared to improve their self-esteem.
“I appreciate this class. I appreciate you stopping cause I love St. Vincent de Paul cause they always got something beneficial for you. And I enjoy ya’ll. I enjoy all of ya’ll. All of ya’ll are great and I love classes its great I’m gonna miss it”

“I was over at my mother’s house and she was telling me….since you’ve been in that program, you must be doing real well. I said yes ,…..I like going there mom because this program gave me a new outlook on life.”

“You know what I learned in the class, I learned from all ya’ll the goods and bads the greatest thing that you guys showed it would’ve been lonely if I was but I learned so much through all ya’ll man and I want to just I want to clap”

“When I first started here, I have to be honest, when I first started here I was only coming for the gift card, ha!...and….after I came for like two or three sessions I really liked it because I learned about different things, you know. You all seem like you really care about you know the people who are coming here ”

Figure 6. Fruit and Vegetable Smiley Face
“ I feel like I’m doing something to make myself healthier, you know, cause before I would just eat whatever”
Theme 8: Facilitators to Eating Fruits and Vegetables

A variety of factors were identified as helping the participants consume more fruits and vegetables. These included taste preferences, social support, perceived positive health outcomes from eating fruits and vegetables, having the right mindset, and support from food pantries/community centers. Some unique facilitators identified included faith and family gatherings where fruits and vegetables are served.

“I took a picture of the vegetables and fruit, but then like they say - I go to pantries…I get an income once a month, so I go to the pantries to get my produce - my fruit and vegetables.”

“My boyfriend…He knows I don't like eating vegetables so he encourages me to eat more vegetables. He gets mad when I don’t have none on my plate so I have to eat them”

Figure 7. Photo of Participants’ Neighbor’s Garden
“So…when you plant a seed it will come up and… starts a harvest. It will take you about three weeks to a month. I’ve got to say I’m pretty excited about it, cause I was at city [link] a couple of years ago and we was in a garden class. And every Friday always come up with greens [broccoli…watermelon]…I mean everything with that we can… I didn’t
have to go to the grocery store! That is the best thing about planting your garden! It’s free. The greatest things in life are free, ya’ll.

Theme 9: Barriers to Eating Fruits and Vegetables

The participants identified a wide-variety of factors that made it difficult for them to eat fruits and vegetables. These included cost, taste preferences, lack of accessibility to fruits and vegetables of good quality, dental problems, lack of self-efficacy to cook and prepare fruits and vegetable and time. A unique factor that was identified included diabetes as a barrier to eating fruits.

“I can’t eat no oranges cause they tear me down. I’m a diabetic, take my sugar sky-high.”

“The store that we attend, it’s like a community store. It’s like a [community] store where they just sell more…of bread, snacks and stuff. They don’t sell…fruits and vegetables.”

“Well I can’t eat no apple cause I don’t have no dentures”
Figure 8. Photo of Blood Oranges Gone Bad

“Well when you on a budget you trying and you trying to eat healthy…and then your fruit go bad and being on a budget you can’t afford to buy no more so what do you do? Go up in the cabinet and get some chips”

Theme 10: Health Concerns Related to Chronic Diseases

One of the themes that emerged during the discussion was health concerns that the participants have related to chronic diseases. Several of them mentioned that they were concerned about their conditions such as diabetes, high blood pressure and cardiovascular disease. These concerns not only motivated them to want to eat more fruits and vegetables but improve other aspects of their diets including their sodium and fat intake. In addition to being concerned about their own health, several of them described concerns they have about the health and diets of their family members.

“I’m still gonna fry but and I know it ain’t healthy for me cause of my health conditions but I’m gonna try to start eating healthier you know cause of my health conditions.”
“I have high blood pressure and my doctors…..they get on me about when I go off the limit eating certain things”

Theme 11: Misconceptions about nutrition and health

Throughout the discussion, it was evident that some of the participants have misconceptions about nutrition and health. Several comments were made indicating that they had incorrect or misguided nutritional knowledge. These comments included statements about how the food industry poisons fruits and vegetables, the sugar in pop dissolves the insides of your body, inflammatory “things” cause cancer, sickness, and diabetes, and products that are fruit flavored count as fruit.

“I mean the doctors give us medication but that's basic just to try and contain it but your fruits and vegetables is what really cures everything”

“You don't know what people are doing. You always hear about on the news...... Ebola or whatever it is poison that they…..poisoning your fruits and vegetables”
DISCUSSION

Fruit and Vegetable Intake

Analysis of the survey data indicated that the nutrition education intervention was successful at significantly increasing the fruit consumption of the participants. The average change in the fruit intake was 0.56 servings per day in the intervention group compared to -0.32 servings per day in the control group. Analysis of the qualitative data from the photovoice session supported this finding. During the session, the participants described eating more fruits since attending the nutrition classes and utilizing the skills they learned in the class to do so. They also discussed increasing the variety in the fruit they eat. Enjoying the flavor of fruits was a major facilitator for increasing their consumption, and during the taste-testing sessions in class, the majority of the participants responded very well to the fruits tried.

The participants’ fruit juice intake was analyzed separately from their whole fruit intake. No significant changes in fruit juice intake within or between either of the groups were observed. Significant increases in fruit juice intake would not likely be observed from this intervention because the focus of the nutrition classes was on whole fruit. As fruit juice tends to be higher sugar and lower in fiber compared to whole fruit, the Dietary Guidelines for Americans recommends consuming fruit juice in moderation.\(^4\) Therefore fruit juice was mentioned briefly in the classes and it was recommended to strive to obtain daily fruit intake from whole fruits. In the photovoice session, fruit juice was also not commonly discussed.

Although the classes focused on both whole fruit and vegetable intake and provided opportunities to taste and prepare both, there were increases observed in the intervention groups’ average intake albeit these differences were not significant. There are several possible explanations as to why a significant change was not observed. One reason could be that the
participants were unclear about what constitutes a cup or serving of vegetables. Moreover, literacy in the population was assessed during screening by simply asking the participants if they could read, write and speak English and numeracy was not assessed. Some individuals who would be otherwise considered illiterate may have answered yes to the screening question. Further, some individuals may have high literacy but not numeracy, which would limit their ability to answer questions on frequency of consumption or servings sizes. Therefore low literacy or numeracy in the population is another possible contributor.

Aside from the logistics of the study, the qualitative data collected from the photovoice session provide a possible explanation as to why no significant changes in vegetable intake were observed. Although several participants stated that they had been eating more of both fruit and vegetables, more participants described increasing their fruit intake. Additionally, several participants mentioned that flavor was a barrier to vegetable intake while this was not described as a barrier to fruit intake. Several participants also described lack of cooking skills as a barrier to their fruit and vegetable consumption. As vegetables often involve more cooking and preparing compared to fruit, this could be another explanation. Additionally, during the classes, the participants responded negatively to some of the vegetables tasted. Several of them refused to try recipes including chick peas and others did not like the taste of kale chips.

Several previously reported studies involving nutrition education interventions in low-income populations found similar results; however, these studies included female participants only. One study by Devine et al (2005) evaluated Sisters in Health, a community-based nutrition education intervention targeting low-income women. In this study, women who attended six 90-minute nutrition education classes with an emphasis on fruits and vegetables increased their fruit and vegetable intake by 1.6 times per day compared to the control group (p=0.04) who increased
their intake by 0.8 times per day. When fruit, juice, and vegetable intake were analyzed separately, however, significant (p ≤ 0.05) increases were only observed in the intervention groups’ fruit and juice intake, compared to the control group. Another community-based intervention was reported by Shanker et al (2007) and targeted urban female residents of Washington DC public housing communities. After ten, weekly nutrition education classes they found no significant changes in the intervention groups’ fruit or vegetable intake, compared to the control group.61

Several community-based nutrition education interventions have, however, been effective at significantly increasing the vegetable intake of its participants. In a community based intervention reported by Wenrich et al (2012) targeting low-income rural Appalachian families, an intervention focused on cooking with vegetables was successful at significantly (p<0.05) increasing the vegetable intake of participants in the intervention group. However, the increase in the interventions groups’ intake of vegetables was not significant compared to the increase in the control group. Further, evaluation of the EFNEP curriculum, Eating Smart, Being Active (ESBA), a program designed for adults to reflect Dietary Guidelines for Americans 2005/2010 and typically delivered in group settings in a series of 8-12 classes found that the curriculum was effective at significantly (p<0.001) increasing both the fruit and vegetable intake of its participants from pre to post-test and compared to Non-ESBA curriculums.87

Self-efficacy, Self-regulation and Outcome Expectations

In the present study, no significant changes in the participants’ self-efficacy, self-regulation and outcome expectations were found. This finding was not surprising, however,
considering the participants’ high pre-test scores related to these mediators. The pre-test scores for self-efficacy and outcome expectations were close to 4 out of 5 in both groups and for self-regulation, were close to 75 out of 100. This indicates that at baseline, the majority of the participants felt confident in their ability to eat fruits and vegetables, even in difficult circumstances. This finding coordinates with what was reported by the participants both in their fruit and vegetable consumption and during the photovoice session. Even after adjusting for outliers, the participants in this study reported higher average fruit and vegetable intakes than what has been previously reported for low-income US adults.\textsuperscript{11} During the photovoice sessions, the participants also described self-efficacy to cook, grow and eat fruits and vegetables. They also described positive outcome expectations from eating fruits and vegetables, and goal intentions to increase their intake.

Although these mediators, and self-efficacy in particular, have been identified as important predictors to an individual’s fruit and vegetable intake, there is a lack of literature assessing how they are affected by nutrition education. The number of studies assessing these mediators related to fruit and vegetable intake in low-income populations is even more limited. A study reported by Bacahr (2013) investigated the effects of a one-class nutrition education intervention on the self-efficacy related to fruit and vegetable intake in 89 food pantry clients.\textsuperscript{25} The instrument used to assess self-efficacy, however, was different from the instrument used in the present study.\textsuperscript{25} In the study by Bacahr (2013), the nutrition education class was effective at significantly (\(p<0.05\)) improving participants’ self-efficacy scores from baseline to post-test, compared to a control group.\textsuperscript{25} Another study by Anderson et al (2001) evaluated the effects of an online nutrition education course in 277 US adults. Similar to what was found in the present study, the baseline scores for self-efficacy and health outcome-expectations related to fruit and
vegetable intake were high and the changes in scores for self-efficacy and outcome expectations after the intervention were not statistically significant. There have not been any comparable studies evaluating the effects of a nutrition education intervention on the self-regulation related to fruit and vegetable intake of its participants.

**Additional Findings from the Photovoice Sessions**

The data collected from the photovoice sessions not only helped to explain the quantitative results but provided rich qualitative data that went far beyond the scope of the questionnaires. The broader impact of the classes on the participants’ lives, barriers and facilitators to their fruit and vegetable intake, and greater insights to their nutrition education needs were identified.

From a dietary standpoint, the only variables assessed in this study were the participants’ fruit, fruit juice and vegetable intake, however, the photovoice sessions suggested that they made changes to their diet beyond these foods. These changes included reducing their sodium and fat intake. Their motivation for making these changes were health concerns related to chronic diseases. This indicates that the participants were not only concerned with increasing their fruit and vegetable consumption to achieve health benefits, but making other healthy dietary changes, as well.

Throughout the photovoice sessions, the moderator asked participants to discuss the main take-home message they got from the classes. It was interesting to find that although the classes were focused on fruit and vegetable consumption, the participants had a range of take-home messages. One of the most interesting reported take-home message was to drink more water.
The benefits of drinking water were never directly discussed in the classes; however, water was the only beverage available at each class. This indicates how powerful role modeling can be in terms of eliciting behavior change.

During the photovoice sessions, the participants identified a range of factors that serve as barriers or facilitators to their fruit and vegetable intake. Some of these had been previously reported by qualitative studies examining these factors in similar populations, while several were unique. Barriers identified that have been previously reported included cost/money, taste-preferences, lack of convenience, family gatherings and lack of self-efficacy to cook with and prepare fruits and vegetables. Diabetes was a unique barrier identified to eating fruit. Facilitators described by the participants that have been previously reported included flavor, health benefits, social support, and gardening. Facilitators identified that have not been previously reported included faith and family gatherings where fruits and vegetables are served.

**Strengths and Limitations**

This study had several strengths. In an attempt to make the program more relevant to the participants, principles from CBPR were utilized. The use of photovoice to evaluate the classes was unique compared to other studies and allowed for a more in-depth understanding of the impact of the nutrition education. Having feedback from a community member from the West End and staff member from SVdP allowed for insights that made the classes more relevant to the participants. Additionally, having the West End community member attend the classes may have improved the participants’ comfort level to take part in the program. This may have influenced
the relatively high retention rate in the program from pre to post-test, which was an additional strength.

There were several major limitations to this study. One of the biggest limitations was the non-random assignment of the intervention and control groups. The two groups were not comparable in terms of their education level and interest in nutrition education. Another limitation was the small sample size. The small sample size limits the effect size of the survey’s findings and limits the generalizability of the findings from the quantitative evaluation. Additionally, the survey questions used in the study had been validated in adult populations, but not low-income adult populations, specifically. Although the questions on the surveys were checked for readability and appropriateness from the West End community member and St. Vincent de Paul staff member, they are both literate individuals.
CONCLUSION AND IMPLICATIONS

In conclusion, the findings from this study suggest that a 4-week community-based nutrition education program focused on fruits and vegetables may significantly increase the fruit consumption in adult food pantry clients. Moreover, it may have additional benefits in their eating behavior and lives. These benefits include: improved self-esteem from engaging in an activity designed to better their health, improved dietary habits, learned skills that can help them overcome barriers they face to fruit and vegetable intake, and social support from the other participants in the classes.

Photovoice highlighted that the education was valued by program participants and therefore additional nutrition education programs should be implemented in this population. Several lessons from this study can be utilized to improve such programs. To help make the nutrition education classes more relevant to the fruits and vegetables available at the food pantry, a more long-term assessment of the trends in fruits and vegetables available at the pantries should be done. To detect potential significant changes in the participants’ vegetables intake, studies should include a larger sample size. A long-term follow-up period should also be included to determine if the effect of the classes on the participants’ fruit consumption is sustainable. Finally, the classes may be more relevant to this population if the topics include fruits and vegetables as well as other nutrients related to the prevention of chronic diseases. Increasing the length of program would allow for more nutrition topics to be covered in detail.

Dissemination of the study findings is a critical aspect of CBPR. As a next step and follow-up to this project, the results will be summarized into a newsletter and distributed. This will be accomplished by circulating the newsletters in the lobby of SVdP. Additionally, environmental barriers identified through the photovoice session may be shared with key
stakeholders in the community. This could start a dialogue related to eliciting changes in the community such as: increasing the accessibility of fresh fruits and vegetables, increasing the supply of fresh fruits and vegetables at food pantries, developing grocery stores in the community that sell high quality fresh fruits and vegetables and establishing sustainable and effective nutrition education interventions.
BIBLIOGRAPHY


25. Bachar D. *Effects of a fruit and vegetable nutrition education class on self-efficacy and nutrition knowledge in minority participants of a school-based food pantry*. ProQuest, UMI Dissertations Publishing; 2013.


47. United States Department of Agriculture. Choose MyPlate. How many vegetables are needed daily or weekly?. 2012.


