

EFFECTIVENESS OF A NUTRITIONAL EDUCATION INTERVENTION ON  
INCREASING FRUIT AND VEGETABLE CONSUMPTION IN ADULTS  
WITH TYPE 2 DIABETES

by

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A DNP Project Submitted to the Faculty of the

COLLEGE OF NURSING

In Partial Fulfillment of the Requirements

For the Degree of

DOCTOR OF NURSING PRACTICE


In the Graduate College

THE UNIVERSITY OF ARIZONA

2018

THE UNIVERSITY OF ARIZONA  
GRADUATE COLLEGE

As members of the DNP Project Committee, we certify that we have read the DNP project prepared by *Daniela Torres*, titled *Effectiveness of a Nutritional Education Intervention on Increasing Fruit and Vegetable Consumption in Adults with Type 2 Diabetes* and recommend that it be accepted as fulfilling the DNP project requirement for the Degree of Doctor of Nursing Practice.

  
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Final approval and acceptance of this DNP project is contingent upon the candidate's submission of the final copies of the DNP project to the Graduate College.

I hereby certify that I have read this DNP project prepared under my direction and recommend that it be accepted as fulfilling the DNP project requirement.

  
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### ACKNOWLEDGMENTS

I would like to thank my project chair and advisor Dr. Kristie Flamm for her kindness and guidance in helping me throughout the steps of this project. I am also grateful for the contributed support and knowledge of my committee, Dr. Angela Brown and Dr. Patricia Mackey. Lastly, I would like to thank the staff and patients at Green Valley Family Practice for helping make this project possible.

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## ABSTRACT

**Background:** The prevalence Type 2 Diabetes Mellitus (T2DM) has been increasing significantly in the United States over the past decade, and it is more important than ever for primary care providers, including family nurse practitioners, to provide effective diabetes self-management education (DSME) at the point of care. One of the most important aspects of diabetes management is the practice of a healthy diet, high in fruit and vegetable consumption. The Health Belief Model (HBM), which purports that a change in human behavior can be stimulated through the modifications of certain variables, was utilized as the theoretical framework for this Doctor of Nursing Practice (DNP) Project.

**Objective:** The purpose of this DNP Project is to increase fruit and vegetable consumption in adult patients with T2DM who visit a family practice clinic in Green Valley, AZ, through an educational intervention based on the theoretical framework of the Health Belief Model (HBM).

**Design:** One-group pre-test/post-test quality improvement project

**Setting:** Green Valley Family Practice between September 3, 2018 and October 26, 2018. to evaluate the effectiveness of a focused nutritional education intervention on increasing fruit and vegetable consumption in patients with T2DM at a family practice in Green Valley, Arizona.

**Participants:** 18 adult patients aged 40 and older with T2DM visiting the clinic for diabetes follow up visits during the first four weeks of the study period

**Measurements:** Participants were surveyed with food frequency questionnaire (FFQ) questions drawn from the Behavioral Risk Factor Surveillance System (BRFSSQ) Questionnaire, four Likert scale type questions written by the project leader based on Health Belief Model variables,

and one question written by the project leader regarding perceived improvement in blood sugar control, which was only measured in the post-survey.

**Results:** Of the 21 original participants, 18 were retained for the follow-up survey and included in the final results. Four weeks following the intervention, average daily vegetable consumption increased by 50.7% increase and fruit consumption by 44.2%. There were also increases in HBM variables of perceived benefits and self-efficacy, and a decrease in perceived barriers. There was also an increase in the average perceived blood sugar control among participants four weeks following the intervention.

**Conclusion:** The educational intervention was effective in increasing fruit and vegetable consumption in adults with T2DM and can be feasibly replicated in similar family practice clinics that see this patient population. While it remains critical for FNPs to recommend structured diabetes self-management education to all patients with T2DM, it is also effective to provide brief patient-centered nutritional education during primary care visits to help empower patients into improving diabetes control.

## INTRODUCTION

As of 2015, an estimated 30.3 million people in the United States (U.S.), or 9.4% of the population, had Type 2 diabetes (Centers for Disease Control and Prevention, 2017a). Although *diabetes mellitus* is a highly manageable disease, if left uncontrolled, it can lead to serious complications including cardiovascular disease, renal disease, neuropathy, blindness, and death (World Health Organization, 2018). Therefore, it is essential for primary care providers to support patients in their efforts to improve their diabetes management, prevent complications, and enhance long-term quality of life. A major cornerstone of diabetes management is a healthy diet, such as increasing fruit and vegetable consumption, which is known to be associated with multiple anti-diabetic properties and improved long-term glycemic control (Carter et al., 2010; Cooper et al., 2015; Mahoney & Loprinzi, 2014). While national health policy increasingly recommends mostly plant-based diets, including the American Diabetes Association (ADA), Healthy People 2020, and the MyPlate campaign, fruit and vegetable intake remains low (Vitolins, 2009; Petersons, 2015). The Centers for Disease Control and Prevention (CDC) cite that the U.S. population consumes less than a cup of fruit and less than a cup and a half of vegetables daily; existing research indicates that such values are similar in those with Type 2 Diabetes as well, despite this population's increased risk for health complications associated with poor diet (CDC, 2017b; Burch et al., 2018; Petersons, 2015). In addition, the literature shows that low-income populations have even lower fruit and vegetable consumption (FVC), with some studies citing as little as half the average FVC as those individuals with the highest income, due to increased barriers such as affordability and access to fruits and vegetables as well as reduced access to health education and resources, among others (Bihan et al., 2011).

## **Background Knowledge**

Patients with diabetes frequently cite that major barriers to following nutritional recommendations include lack of daily flexibility, proposed meal plans that are not reflective of their food preferences, and the struggle of changing lifestyle habits (Ponzo et al., 2017). These barriers are amplified in low-income populations or those in ethnic minority groups, such as Hispanic populations (Ponzo et al., 2017; Gucciardi et al., 2013). Diabetes self-management education (DSME) incorporates behavioral and psychosocial elements to help provide individuals with both the education and empowerment to successfully improve their day-to-day control over the disease (American Association of Diabetes Educators, 2010). While there is much research available to support the recommendation of DSME to all patients with diabetes, there is less understanding of the effectiveness of specific interventions on influencing health behaviors that affect diabetes management outcomes (Gucciardi et al., 2013).

In terms of increasing fruit and vegetable consumption, nutritional interventions that are tailored to address patient food preferences are more effective in improving short-term and likely long-term dietary practices (Pem & Jeewon, 2015). Additionally, studies show that Hispanic populations, who are at greater risk for uncontrolled diabetes and associated complications, benefit from diabetes education that includes a psychosocial component (i.e., motivational interviewing or empowerment) with as much as an 80% difference in diet outcomes (Gucciardi et al., 2013). For these reasons, a successful primary care nutritional intervention for increasing fruit and vegetable intake among patients with Type 2 diabetes (including a large proportion of Hispanic patients) should involve culturally sensitive education and personalized goal-setting that addresses individual health beliefs, barriers, and self-efficacy.

### **Local Problem**

In Arizona, 12.5% of the adult population has Type 2 diabetes mellitus (T2DM) and an estimated \$6.4 billion is spent on diabetes and prediabetes management and complications in the state annually (ADA, 2014). Pima County, AZ, reports a slightly higher rate of diabetes than Arizona as whole, and a community needs assessment found diabetes to be the fourth highest on the prioritization of local health issues (Coyle, Gall, & Tippens, 2015). The assessment also found that over a quarter of respondents were eating fruits and vegetables once a week, at most (Coyle et al., 2015). Barriers to diabetes management in Pima County include limited education, health literacy, and socioeconomic factors (Coyle et al., 2015). According to the United States Census Bureau (2016), the poverty rate in Pima County is 18.2%, which is higher than national and state averages (United States Census Bureau, 2016). Additionally, multiple key informants cited that nutritional recommendations did not account for their cultural food preferences (Coyle et al., 2015). Given this information, it is crucial for local providers to inquire about patients' dietary preferences in order to administer effective nutritional interventions and enhance patient health outcomes.

### **Purpose**

The purpose of this DNP project is to increase fruit and vegetable intake among adult patients, age 18 and older, with Type 2 diabetes who visit a family practice in Green Valley, AZ, through providing culturally sensitive, healthy nutrition information and education. This health benefit can be achieved by family nurse practitioners through increased education and attention to patient health beliefs and barriers influencing their fruit and vegetable consumption.

While all patients with T2DM should be recommended DSME and a dietitian consult, the incorporation of a focused nutrition educational intervention on increasing fruit and vegetable consumption can enhance patient care and lead to improved diabetes management (Weinstein et al., 2013). For many patients with diabetes, their primary care visit may be the only healthcare they receive and it is thus important for family nurse practitioners to provide some form of nutrition education, such as providing education and advice on FVC. Unlike structured diets, increasing FVC can be incorporated into patients' diets without radically changing their lifestyles, and is thus a feasible way to improve overall health and diabetes outcomes. FVC educational interventions will be more effective if they are culturally sensitive and address personal variables that influence patient behavior, such as health beliefs or barriers, especially in diverse populations (Baranowski, 2011; Gucciardi et al., 2013).

Stakeholders in improving fruit and vegetable intake among patients with T2DM in a Green Valley clinic include clinic primary care providers, including family nurse practitioners, diabetes educators, dietitians, and patients. T2DM is a multi-faceted disease, which requires a comprehensive approach to management, and thus the more stakeholders who are involved in developing, implementing, and evaluating the nutritional intervention, the more effective it will be on long-term patient and community outcomes.

### **Study Question**

Is a focused nutrition educational intervention on fruit and vegetable consumption (FVC) effective in increasing FVC in adult patients, age 18 and older, with Type 2 diabetes mellitus (T2DM) at a family practice in Green Valley four weeks following the intervention?

## **FRAMEWORK AND SYNTHESIS OF EVIDENCE**

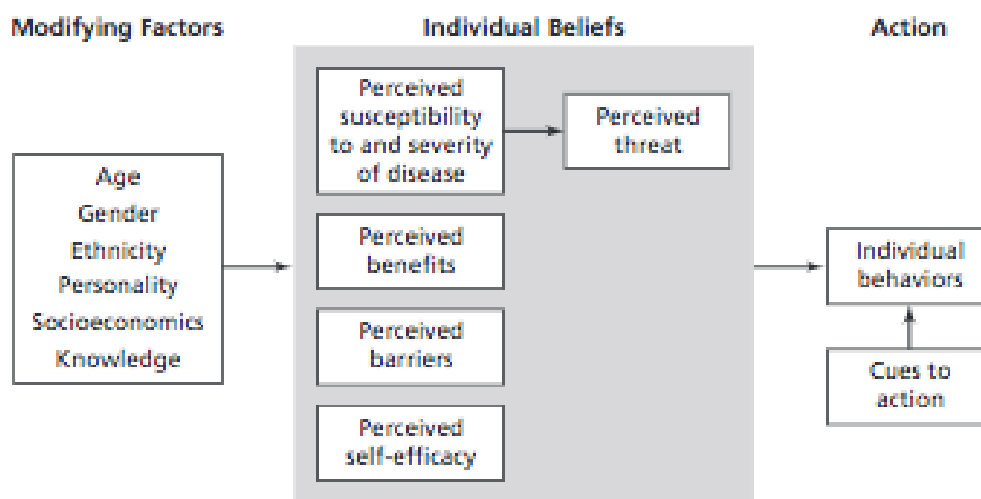
### **Theoretical Framework**

The health belief model (HBM) is one of the most widely used theoretical frameworks to target a desired health behavior change at the individual level (Green & Murphy, 2014). This model has been used to assess and evaluate diabetes management for over 20 years, as a means of improving diabetes management programs on both the national and local scales (Jalilian et al., 2014). Additionally, multiple trials have successfully implemented HBM-based educational interventions to improve diabetes management in targeted patient populations as well as fruit and vegetable consumption in at-risk populations (Jalilian et al., 2014; Sharifirad et al., 2009; Wagner et al., 2016). The HBM theorizes that the following variables affect whether or not an individual adopts a specific health behavior: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. The model, as developed in the 1950s, originally included only four variables, with “self-efficacy” and “cues to action” added later in the 1980s due to emerging research supporting the significance of self-efficacy to decision-making and behavior change (Champion & Skinner, 2008).

### **Concepts**

The HBM constructs serve as variables that influence an individual’s likelihood to adopt a health behavior (Green & Murphy, 2014). Perceived susceptibility refers to a person’s sense of the threat of developing a health condition or complications of a condition, while perceived severity is a person’s understanding of the seriousness of the condition and its complications (Champion & Skinner, 2008; Green & Murphy, 2014). Perceived benefits refer to the understood positive effects of adopting a health behavior, while perceived barriers are the understood

negative effects, or obstacles, that need to be overcome to adopt a health behavior (Green & Murphy, 2014). Cues to action may include internal or external factors motivating a person to adopt the health behavior, such as health information from a provider or friend (Green & Murphy, 2014). Self-efficacy, the newest component of the HBM, refers to a person's confidence that he or she can successfully adopt the health behavior (Green & Murphy, 2014).



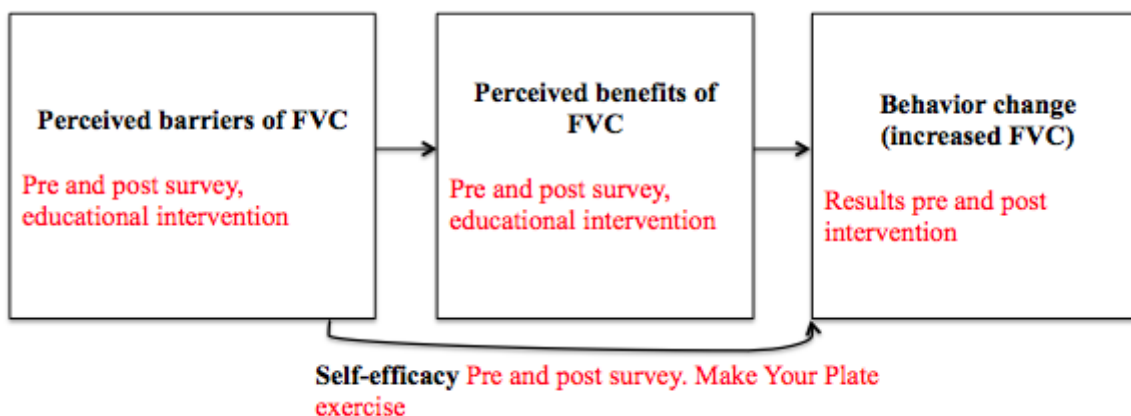
*Derived from Champion & Skinner (2008).*

**FIGURE 1.** Health belief model schematic.

Champion and Skinner (2008) explain that various modifying factors, such as age, gender, socioeconomics, etc., affect individual beliefs, which include the HBM constructs of perceived susceptibility, severity, benefits, barriers, and self-efficacy. These beliefs along with the sixth construct, cues to action, then influence an individual's likelihood to adopt a certain health behavior (Champion & Skinner, 2008). Utilizing this model, an individual with diabetes is more likely to adopt a health behavior, such as fruit and vegetable consumption, if: 1) they believe they are at increased risk for diabetes complications; 2) that the diabetes complications are severe; 3) that there are high benefits of fruit and vegetable consumption for diabetes



management; 4) that there are limited barriers to fruit and vegetable consumption; and 5) when there is a cue to action for adopting the behavior, such as in the form of nutritional education (Champion & Skinner, 2008). Self-efficacy would be represented by the individual's confidence in his or her ability to successfully increase fruit and vegetable consumption (Champion & Skinner, 2008). Several interpretations of the HBM view the net relationship of perceived benefits and barriers as a separate component influencing health behavior, as a person will often weigh out pros and cons when deciding whether or not to change their lifestyle (Mohebi et al., 2013; Green & Murphy, 2014). Focusing on mediating relationships between variables has been shown to lead to more effective interventions, and thus this project focused on the relationship between barriers, benefits, and self-efficacy (Jones et al., 2015).



*Derived from Jones et al, (2015).*

**FIGURE 2.** Focused health belief model schematic applied to DNP project

Participants were asked to fill out a questionnaire that incorporates three of the HBM constructs (perceived benefits, perceived barriers, and self-efficacy), which they completed both prior to and following the nutritional education intervention to help evaluate the effectiveness of the intervention on health beliefs. The nutritional education intervention itself served as a “cue to

action” to help improve fruit and vegetable consumption in patients with diabetes. Educational material addressed benefits (i.e., “Eating fruits and vegetables directly contributes to improved glycemic control and reduces risk of diabetes complications...”) and barriers (i.e., “Here are some ways to improve your access to fruits and vegetables and incorporate them into meals...”). Additionally, fresh fruits and vegetables from the Bountiful Baskets program were provided to each participant along with information on the program itself, in an attempt to assist participants in overcoming the barriers of affordability and access (Bountiful Baskets Food Co-op, 2018). Self-efficacy was encouraged through a “Make Your Plate” exercise modeled after the ADA’s interactive tool.

### **Synthesis of Evidence**

Nutritional therapy and structured diabetes programs such as Diabetes Self-Management Education (DSME) have long been recommended by the American Diabetes Association for their effectiveness in helping patients manage their diabetes and improve quality of life (Evert et al., 2013). Nutritional therapy, along with DSME, is recommended for all patients with diabetes (Evert et al., 2013). However, studies have shown that these resources are severely underutilized, with some studies citing as little as 9.1% utilization, and many patients with diabetes are not receiving any nutritional information (Evert et al., 2013). While it is important to recommend these therapies, it is also necessary for primary care providers to provide at least some basic nutritional education, as it may be the only information the patients receive. Nutritional interventions focusing on a particular health behavior, such as FVC, can be effective in improving patient dietary behaviors and diabetes management (Imai et al., 2011; Wagner et al., 2014). Research shows that FVC is associated with improved glycemic control and reduced risk

of complications, such as cardiovascular disease and diabetic retinopathy (Lamb et al., 2017; Mahoney & Loprinzi, 2014).

Literature searches on PubMed and CINAHL were conducted to evaluate existing research on nutritional education interventions involving fruit and vegetable consumption in patients with Type 2 diabetes. On PubMed, the following MESH search terms were used: “vegetables,” “fruit,” “diabetes mellitus,” and “nutrition therapy,” “diet,” OR “education.” Additional inclusion criteria included a publication date between 2011 and 2018. This search yielded 121 results. Nine articles were retained, with only one that specifically utilized an FVC educational intervention in diabetes patients. I conducted a CINAHL search with the same search terms published between 2011 and 2018, which yielded 150 results, two of which were relevant and not included in the PubMed search. Due to the limited total yield, I broadened the breadth of my search to include “fruits,” “vegetables,” “education” and “adults,” which yielded 89 results on PubMed and 71 on CINAHL, seven of which were relevant, collectively. I also carried out a focused search on PubMed with the search terms “Health Belief Model,” “diabetes,” and “education” in the past five years that yielded 19 results, two of which were relevant. After reviewing the collective yield, 20 articles were retained (Table 1).

TABLE 1. Literature search tables.

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Bayat, F., Shojaeezadeh, D., Baikpour, M., Heshmat, R., Baikpour, M., & Hosseini, M. (2013). The effects of education based on extended health belief model in type 2 diabetic patients: a randomized controlled trial. <i>Journal of Diabetes and Metabolic Disorders</i> , 12(1), 45. doi:10.1186/2251-6581-12-45	<p><b>Key Variables:</b> perceived susceptibility, perceived severity, perceived benefits, self-efficacy, and perceived barriers</p> <p><b>Hypothesis:</b> An extended HBM-based diabetes education program will have a positive effect on HBM constructs.</p> <p><b>Research Question:</b> Does an extended HBM-based diabetes educational program have a positive effect on HBM constructs?</p>	Health belief model	Randomized controlled trial	<p><b>Sample:</b> 120 patients with T2DM were randomly selected and assigned to intervention (n=60) and control (n=60) groups.</p> <p><b>Setting:</b> Hospitals of Tehran University of Medical Sciences</p>	<p><b>Data Collection:</b> Participants completed structured questionnaire using a five-point Likert scale prior to and 3 and 6 months following intervention.</p> <p><b>Data Analysis:</b> Analysis was accomplished through SPSS (17.0) and STATA (11.0) with independent T-test, Chi-square, Fisher's exact test, analysis of covariance and Generalized Estimating Equation</p>	This program resulted in a significant increase in extended health model belief constructs of perceived susceptibility, benefits, and self-efficacy, and a reduction in barriers both at 3 months and 6 months following intervention.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Bihan, H., Me'jean, C., Castetbon, K., Faure, H., Ducros, V., Sedeaud, A., Galan, P., ...Herberg, S. (2012). Impact of fruit and vegetable vouchers and dietary advice on fruit and vegetable intake in a low-income population. <i>European Journal of Clinical Nutrition</i> , 66, 369-375. doi:10.1038/ejcn.2011.173	<p><b>Key Variables:</b> FVC, vitamin levels</p> <p><b>Hypothesis:</b> A brief dietary advice intervention with the provision of a fruit and vegetable (FV) voucher compared to dietary advice alone will be more effective in increasing FVC in a low-income population.</p> <p><b>Research Question:</b> Is a brief dietary advice intervention with the provision of a FV voucher provision compared to dietary advice alone more effective in increasing FVC in a low-income population?</p>	N/A	Randomized controlled trial	<p><b>Sample:</b> 302 low-income adults 18–60 years old were randomly assigned to dietary advice and FV voucher group (n= 150) and advice alone group (n= 152).</p> <p><b>Setting:</b> Heath center affiliated with the French National Insurance System (Social Security)</p>	<p><b>Data Collection:</b> FVC was measured with short questionnaire (previously used in a French deprived population) for daily or weekly frequency of FVC, at baseline and 3 months post interventions. Socioeconomic status was measured through self-administered questionnaire at baseline and 3 months. Anthropometric measures and BP were collected at these visits, along with vitamin levels. A questionnaire was used to describe daily or weekly frequency of FVC.</p> <p><b>Data Analysis:</b> Data was analyzed through descriptive statistics, multiple linear regression and logistic regression to evaluate the impact on FVC.</p>	Between baseline and 3-month post intervention follow-up, mean FV consumption increased significantly in both the advice alone group ( $0.62 \pm 1.29$ times/day, $P1/40.0004$ ) and advice with FV voucher groups ( $0.74 \pm 1.90$ , $P1/40.002$ ), with no significant difference between groups. However, mean FV intake was higher in the advice with FV voucher group, and there was also a significantly lower number of “low consumers” of FV (less than one serving a day) in the FV voucher group. There was no significant change in vitamin levels in either group.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Block, G., Azar, K. M., Romanelli, R. J., Block, T. J., Palaniappan, L. P., Dolginsky, M. & Block, C. H. (2016). Improving diet, activity, and wellness in adults at risk of diabetes: a randomized controlled trial. <i>Nutrition &amp; Diabetes</i> , 6(9), e231	<p><b>Key Variables:</b> diet variables (FVC, refined carbohydrates, trans and saturated fats), physical activity level, wellness variables (self-rated health, self-efficacy, fatigue), weight, A1C, and fasting glucose</p> <p><b>Hypothesis:</b> An individualized goal-setting intervention compared to usual care will be more effective in improving diet, activity, and wellness markers in adults with prediabetes.</p> <p><b>Research Question:</b> Is an individualized goal-setting intervention compared to usual care more effective in improving diet, activity, and wellness markers in adults with prediabetes?</p>	N/A	Randomized controlled trial	<p><b>Sample:</b> Patients with confirmed pre-diabetes (n=339) were randomly assigned to either intervention (n =163) or control group (n =176). Mean age was 55 (s.d. 8.9) years, body mass index was 31 (s.d. 4.4) kg m<sup>-2</sup></p> <p><b>Setting:</b> Palo Alto Medical Foundation</p>	<p><b>Data Collection:</b> Dietary habits and level of exercise was assessed through five summary questions on their eating habits and one question on physical activity based on Block questionnaire, administered at baseline, 3 months and 6 months post-intervention. Health Perception was measured through brief questionnaire rating self-rated health status, self-efficacy for changing diet, etc.</p> <p><b>Data Analysis:</b> Differences between treatment groups at baseline were compared through <math>\chi^2</math>-tests for categorical variables and <i>t</i>-tests for continuous variables. Differences in group outcomes were assessed with linear regression.</p>	The intervention group had a significant increase in FVC by 3.71 (95% confidence interval (CI) 2.73, 4.70) times per week (effect size 0.62), and a decrease in refined carbohydrates by 3.77 (95% CI 3.10, 4.44), which were both significantly ( <i>P</i> <0.001) higher than the control group. There were also significantly higher increases in physical activity level, self-rated health, dietary self-efficacy, and a decrease in fatigue. There were significant decreases in A1c, fasting glucose, and weight.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Burch, E., Ball, L., Somerville, M., & Williams, L. T. (2018). Dietary intake by food group of individuals with type 2 diabetes mellitus: A systematic review. <i>Diabetes Research and Clinical Practice</i> , 137, 160-172. doi:10.1016/j.diabres.2017.12.016	<b>Research Purpose:</b> To synthesize literature assessing dietary intake of individuals with T2DM in comparison to national and international dietary guidelines.	N/A	Systematic review	11 studies were included	Four electronic databases (MEDLINE, EMBASE, CINAHL and Web of Sciences) were searched using the following inclusive criteria: adults (18 years old and over), T2DM diagnosis, published in a peer-reviewed journal, full English text, and published between 1990 and 2017. The selected studies were all published between 2009 and 2017 and included cross-sectional studies. Studies were assessed using the Mixed Methods Appraisal Tool (MMAT).	Individuals with type 2 diabetes do not consume sufficient fruit, vegetables, dairy, and grain intake as per current national and international recommendation.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
El Bilbeisi, A. H., Hosseini, S., & Djafarian, K. (2017). Association of dietary patterns with diabetes complications among type 2 diabetes patients in Gaza Strip, Palestine: a cross sectional study. <i>Journal of Health, Population and Nutrition</i> , 36(1), 1-11. doi:10.1186/s41043-017-0115-z	<b><u>Research Purpose:</u></b> Evaluate the influence of dietary pattern on risk for diabetes complications in individuals with Type 2 Diabetes Mellitus.	N/A	Observational cross-sectional study	<b><u>Sample:</u></b> 1200 patients selected via clustered randomized sampling, diagnosed with type 2 diabetes mellitus, of both genders, aged 20 to 64 years (n=1200).  <b><u>Setting:</u></b> primary healthcare centers in the Gaza Strip, Palestine	<b><u>Data Collection:</u></b> Dietary patterns were measured using a validated semi-quantitative FFQ. Demographics and medical history were obtained through an interview-based questionnaire.  <b><u>Data Analysis:</u></b> Statistical analysis was performed using SPSS version 20	Factor analysis resulted in the identification of two major dietary patterns: “Asian-like” pattern and “sweet-soft drinks-snacks” pattern. After adjusting for confounding variables, patients with the highest intake of fruits, vegetables, whole grains, potatoes, beans, and legumes) had lower odds for DM complications, including hypertension, renal dysfunction, cardiac issues, neuropathy, and neurological problems.



TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Hegde, S. V., Adhikari, P., Nandini, M., & D'Souza, V. (2013). Effect of daily supplementation of fruits on oxidative stress indices and glycaemic status in type 2 diabetes mellitus. <i>Complementary Therapies in Clinical Practice</i> , 19, 97-100. doi:10.1016/j.ctcp.2012.12.002	<p><b>Key Variables:</b> fasting plasma glucose, post prandial plasma glucose, HbA1c, BMI, waist circumference, waist-to-hip ratio, blood pressure, malondialdehyde, glutathione, Vitamin C, Vitamin E, superoxide dismutase</p> <p><b>Hypothesis:</b> Consumption of 2 low-calorie fruits a day for 3 months in patients with T2DM will result in improvements in oxidative stress, anthropometry, blood pressure and glycemic control.</p> <p><b>Research Question:</b> Does the consumption of two low-calorie fruits a day for 3 months improve oxidative stress, anthropometry, blood pressure and glycemic control in individuals with T2DM?</p>	N/A	Case controlled trial	<p><b>Sample:</b> 123 T2DM patients between ages 40-75 years recruited from clinic. Stratified sampling used to separate participants into diet intervention group (n=60) and control group (n=63).</p> <p><b>Setting:</b> Outpatient diabetes clinic at Kasturba Medical College Hospital (KMCH) in Mangalore</p>	<p><b>Data Collection:</b> Participants kept daily diet diary that included daily intake of fruit. Medical-history questionnaire and physical examination (including BMI, waist circumference, waist-to-hip ratio and blood pressure) completed before and after intervention. Plasma glucose concentration, HbA1c, glutathione, Vitamin C, Vitamin E, superoxide dismutase, and malondialdehyde obtained through laboratory blood tests.</p> <p><b>Data Analysis:</b> Data analyzed with SPSS software (version 11.0). Paired 't' test used to compare variables from baseline to follow-up. Manne-Whitney U test used to compare differences between groups in parameters.</p>	There was a significant reduction in malondialdehyde, plasma glucose, HbA1c, and an increase in antioxidants (vitamin C and reduced glutathione) in the intervention group versus control group after three months. There were no significant differences in waist circumference, waist-to-hip ratio, blood pressure, vitamin E and superoxide dismutase.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Imai, S., Mikuko, M., Hasegawa, G., Fukui, M., Obayashi, H., Ozasa, N., & Kajiyama, S. (2011). A simple meal plan of 'eating vegetables before carbohydrate' was more effective for achieving glycemic control than an exchange-based meal plan in Japanese patients with type 2 diabetes. <i>Asian Pacific Journal of Clinical Nutrition</i> , 20(2), 161-168.	<p><b>Key Variables:</b> HbA1c, BMI, SBP, DBP, HDL, LDL, green vegetable consumption, other vegetable consumption, fruit consumption, fats and sweet, fiber, vitamin A, vitamin K, folic acid.</p> <p><b>Hypothesis:</b> A simple educational intervention on eating vegetables before carbohydrates (VBC) is more effective than the traditional exchange-based meal plan (EXB) on long-term glycemic control in patients with T2DM.</p> <p><b>Study Question:</b> Is a simple educational intervention on eating vegetables before carbohydrates (VBC) more effective than a traditional exchange-based meal plan (EXB) on long-term glycemic control in patients with T2DM?</p>	N/A	Randomized controlled trial	<p><b>Sample:</b> 101 patients with diabetes were randomized into two groups: simple meal plan of eating vegetables before carbohydrate (VBC group, n=69) and traditional exchange-based meal plan (EXB group, n=32).</p> <p><b>Setting:</b> Kajiyama Clinic in Kyoto, which is specialized for diabetes treatment</p>	<p><b>Data Collection:</b> Participants filled out food diaries that included vegetable consumption. They also completed the Dutch Eating Behaviour Questionnaire (DEBQ) to assess for eating behaviors such as emotional eating and bingeing. Laboratory data, body weight and BMI measurements were collected every month for two years.</p> <p><b>Data Analysis:</b> The data was analyzed through SPSS 15.0 for Windows (SPSS Inc, Chicago, IL, USA). Student's <i>t</i>-tests were used to compare results from the two groups and paired <i>t</i>-tests were used to assess within-group changes. Repeated-measures ANOVA was used to assess comparisons over time at baseline, 12-month, and 24-month follow-ups. Spearman's correlation coefficients were calculated to assess the association between dietary intake and HbA1c, BMI, and lipid panel values.</p>	<p>The VBC group had significantly lower average HbA1C levels compared to the EXB group at 6, 9, 12 and 24 months after intervention (<math>p &lt; 0.001</math>). There were no significant differences in BMI, diastolic blood pressure nor lipid levels between groups.</p>

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Jalilian, F., Motlagh, F. Z., Solhi, M., & Gharibnavaz, H. (2014). Effectiveness of self-management promotion educational program among diabetic patients based on health belief model. <i>Journal of Education and Health Promotion</i> , 3(14). doi:10.4103/2277-9531.127580	<p><b>Key Variables:</b> perceived severity, susceptibility, benefit, barrier, self-efficacy, and self-management</p> <p><b>Hypothesis:</b> An HBM-based diabetes self-management education program will have a positive effect on participants' perceived severity, susceptibility, benefit, barrier, self-efficacy, and self-management.</p> <p><b>Research Question:</b> Does an HBM-based diabetes self-management education program have a positive effect on HBM constructs?</p>	Health belief model	Longitudinal randomized pre- and post-test control group design	<p><b>Sample:</b> 88 patients with type 2 diabetes attending Iranian Diabetes Association seminars were randomly selected and assigned to intervention (n=44) and control (n=44) groups.</p> <p><b>Setting:</b> rural health centers in Gachsaran, Iran</p>	<p><b>Data Collection:</b> 58-item structured questionnaire including HBM constructs and diabetes management questions completed by participants before and after intervention.</p> <p><b>Data Analysis:</b> Analyses conducted with SPSS-16. Chi-squared and <i>t</i>-tests used to compare constructs between groups.</p>	There were significant improvements in perceived susceptibility, severity, benefit and self-efficacy among intervention group. Additionally, perceived barriers to self-management were decreased in the intervention group.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Ko, L. K., Rodriguez, E., Yoon, J., Ravindran, R., & Copeland, W. K. (2016). A brief community-based nutrition education intervention combined with food baskets can increase fruit and vegetable consumption among low-income Latinos. <i>Journal of Nutrition Education and Behavior</i> , 48(9), 609-617. doi:10.1016/j.jneb.2016.06.010	<p><b>Key Variables:</b> knowledge, perceived barriers, self-efficacy, food outcomes, and FVC</p> <p><b>Hypothesis:</b> A brief SCT-based nutritional education intervention combined with fresh produce baskets will be effective in increasing FVC in low-income Latinos.</p> <p><b>Research Question:</b> Is a brief social cognitive theory (SCT) based nutritional education intervention combined with fresh produce baskets effective in increasing FVC in low-income Latinos?</p>	Social cognitive theory	Mixed methods pre-post interventional study	<p><b>Sample:</b> Participants (n=40) were recruited through convenience sampling (flyers), had a mean age of 37.8 +/- 10 years and were mostly female, uninsured, obese or overweight, and low-income.</p> <p><b>Setting:</b> Seattle Metropolitan area from September 2012 to July 2013.</p>	<p><b>Data Collection:</b> Pre-intervention telephone baseline survey assessing knowledge, perceived barriers, self-efficacy, food outcomes, and FVC, and the same post-intervention telephone survey 9 weeks later. SCT variables (knowledge, perceived variables, self-efficacy, etc.) were measured through Likert-type scale questions. FVC measured through a 36-item Block Food Frequency questionnaire before and after intervention.</p> <p><b>Data Analysis:</b> Descriptive statistics (means and percentages) were used to compare baseline data pre and post intervention. McNemar's exact test was used to compare the difference in proportions of categorical variables, and a paired t-test for continuous variables.</p>	There was a significant increase in vegetable consumption after intervention, as well as an increase in fruit consumption, although not significant. There were also significant increases in level of knowledge and self-efficacy before and after the intervention. Perceived barriers were relatively low at baseline and thus did not result in significant decrease post intervention.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Kreausukon, P., Gellert, P., Lippke, S., & Schwarze, R. (2012). Planning and self-efficacy can increase fruit and vegetable consumption: a randomized controlled trial. <i>Journal of Behavioral Medicine</i> , 35(4), 443-451. doi:10.1007/s10865-011-9373-1	<p><b>Key Variables:</b> FVC, intention to consume more F &amp; V, planning to consume more F &amp; V, and dietary self-efficacy</p> <p><b>Hypothesis:</b> A HAPA-based intervention will be more effective than a health education-based intervention on increasing FVC in college students.</p> <p><b>Research Question:</b> Is a HAPA-based intervention more effective than a health education-based intervention on increasing FVC in college students?</p>	Health Action Process Approach (HAPA)	Randomized controlled trial	<p><b>Sample:</b> Undergraduate students enrolled in General Psychology course; students randomly assigned to self-efficacy group (n = 61) or a health education control group (n = 60). Mean age of 20.1 years (SD = 1.4) in intervention group and 20.3 years (SD = 1.2) in control group.</p> <p><b>Setting:</b> Chiang Mai University, Thailand</p>	<p><b>Data Collection:</b> FVC was assessed before the intervention, 1 week afterwards, and at 6-week follow up through two survey questions inquiring about average daily FVC, separately. Intention, planning and self-efficacy were measured with survey questions based on Likert.</p> <p><b>Data Analysis:</b> SPSS software with repeated measures analyses of variance were used to assess changes in FVC, intention, planning, and self-efficacy as dependent variables. Mediating effects were calculated using multiple mediation analyses on SPSS.</p>	There were significantly superior increases in FVC, intention, planning, and self-efficacy in the HAPA-based intervention group than the control group, although all participants benefited.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Lamb, M. J. E., Griffin, S. J., Sharp, S. J., & Cooper, A. J. M. (2017). Fruit and vegetable intake and cardiovascular risk factors in people with newly diagnosed type 2 diabetes. <i>European Journal of Clinical Nutrition</i> , 71(1), 115-121. doi:10.1038/ejcn.2016.180	<p><b>Key Variables:</b> HbA1c, clustered cardiometabolic risk (CCMR) scores, plasma vitamin C, Fruit and Vegetable quantity</p> <p><b>Hypothesis:</b> Fruit and vegetable consumption will be associated with lower cardiometabolic risk factors in patients with diabetes.</p> <p><b>Study Question:</b> Is fruit and vegetable consumption associated with lower cardiometabolic risk factors in patients with diabetes?</p>	N/A	Longitudinal observational study of a RCT	<p><b>Sample:</b> 867 patients newly diagnosed with T2DM</p> <p><b>Setting:</b> 49 general practice clinics in the East of England, UK</p>	<p><b>Data Collection:</b> Lab values and anthropometric measures were retrieved from baseline, 1 year and 5-year health assessment visits. Plasma vitamin C was measured with a Fluoroskan Ascent FL fluorometer, and used along with a 130-item food frequency questionnaire (FFQ) to measure FVC.</p> <p><b>Data Analysis:</b> Linear mixed models were used to determine associations between each quantity of F&amp;V intake with CVD risk and other variables.</p>	Even modest increases in fruit and vegetable consumption are associated with significant improvements in cardiovascular disease risk factors, including waist circumference, HbA1c and HDL-cholesterol. While fruit and vegetable intake increase one-year post diabetes diagnosis, it decreased by 5 years post diagnosis.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Lhakhang, P., Godinho, C., Knoll, N., & Schwarzer, R. (2014). A brief intervention increases fruit and vegetable intake: a comparison of two intervention sequences. <i>Appetite</i> , 82, 103-110. doi:10.1016/j.appet.2014.07.014	<p><b>Key Variables:</b> FVC, dietary self-efficacy, dietary intention, dietary planning</p> <p><b>Hypothesis:</b> An intervention consisting of a motivational component followed by self-regulation will be more effective at increasing FVC in college students than an intervention comprising of same components, but in the opposite order.</p> <p><b>Research Question:</b> Is an intervention comprising of a motivational component followed by a self-regulation component more effective at increasing FVC in college students than an intervention comprising of same components, but in the opposite order?</p>	Health Action Process Approach (HAPA)	Randomized controlled trial	<p><b>Sample:</b> University students with mean age 20.7 were recruited via convenience sampling and assigned to two groups: motivational followed by a self-regulatory intervention (n=112), and a second group n=112), which received the same interventions in the opposite order. Follow-up assessments were done after 17 days.</p> <p><b>Setting:</b> University student residence in New Delhi, India</p>	<p><b>Data Collection:</b> FVC was measured pre-interventions and at 17 days follow-up through two survey questions on daily FVC, individually. Dietary self-efficacy, dietary planning, and intention were measured with survey questions based on Likert-type scale.</p> <p><b>Data Analysis:</b> SPSS with repeated measures analyses of variance (ANOVA) were used to measure FVC, intention, and dietary self-efficacy as dependent variables.</p>	Both intervention sequences resulted in significant increases in FVC and self-efficacy. However, the improvement was due to the self-regulatory component, as opposed to the motivational one. Self-efficacy was also shown to mediate participants' behavior and was directly associated with increased FVC.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Lyles, C. R., Wolf, M. S., Schillinger, D., Davis, T. C., DeWalt, D., Dahlke, A. R., Curtis, L., & Seligman, H. K. (2013). Food insecurity in relation to changes in HbA1c, self-efficacy, and fruit/vegetable intake during a diabetes educational intervention. <i>Diabetes Care</i> , 36(6), 1448-1453. doi:10.2337/dc12-1961	<b>Phenomenon:</b> Food insecurity in relation to self-efficacy, fruit and vegetable consumption, and HbA1c in patients with diabetes mellitus	N/A	Secondary observational longitudinal analysis	<b>Sample:</b> 665 low-income patients with diabetes mellitus who were enrolled in diabetes self-management educational intervention  <b>Setting:</b> The Missouri Health Literacy and Diabetes Communication Initiative conducted in low-income primary care clinics	<b>Data Collection:</b> Participants completed six-item scale (short-form of the Food Security Survey Module) to determine food security. HbA <sub>1c</sub> was obtained from patient EMRs. Self-reported surveys were used to evaluate fruit and vegetable intake. Diabetes self-efficacy was measured using an 8-item scale.  <b>Data Analysis:</b> $\chi^2$ tests and two-sided <i>t</i> tests were used to assess the relationship between food insecurity and outcomes. Linear regression models to further assess relationships.	Participants who were food insecure had significantly higher mean HbA <sub>1c</sub> values (8.4% vs. 8.0%), lower self-efficacy, and lower fruit and vegetable intake than those who were food secure.



TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Mahoney, S. E. & Loprinzi, P. D. (2014). Influence of flavonoid-rich fruit and vegetable intake on diabetic retinopathy and diabetes-related biomarkers. <i>Journal of Diabetes and Its Complications</i> , 28, 767-771. doi:10.1016/j.jdiacomp.2014.06.011	<p><b>Hypothesis:</b> Increased consumption of flavonoid-rich fruits and vegetables will have an inverse relationship with diabetes-related biomarkers and diabetic retinopathy (DR).</p> <p><b>Research Question:</b> What is the relationship between dietary flavonoid-rich fruit and vegetable consumption and diabetes-related biomarkers and DR?</p>	N/A	Cross-sectional study	<b>Sample:</b> 381 participants with diabetes from the NHANES 2003–2006 were analyzed.	<p><b>Data Collection:</b> Data from 381 participants with diabetes from the 2003–2006 National Health and Nutrition Examination Survey (NHANES) were analyzed. Lab values attained through blood samples. DR was assessed through a retinal imaging exam. A food frequency questionnaire was used to measure flavonoid-rich FVC.</p> <p><b>Data Analysis:</b> Statistical analyses were performed with STATA. Multivariable linear regression analysis used to examine association of flavonoid rich FV with DM biomarkers.</p>	Higher flavonoid-rich fruit and vegetable consumption was associated with lower levels of CRP ( $\beta = -0.005$ ), HgbA1C ( $\beta = -0.005$ ) and glucose ( $\beta = -0.59$ ), as well as a reduction of odds for diabetic retinopathy of 30%.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Shabibi, P., Zavareh, M., Sayehmiri, K., Qorbani, M., Safari, O., Rastegarimehr, B., & Mansourian, M. (2017). Effect of educational intervention based on the Health Belief Model on promoting self-care behaviors of type-2 diabetes patients. <i>Electronic Physician</i> , 9(12), 5960-5968. doi:10.19082/5960	<p><b>Key Variables:</b> perceived susceptibility, severity, perceived benefits and barriers, self-efficacy, and self-care</p> <p><b>Hypothesis:</b> An HBM-based educational intervention will be effective in improving self-care behaviors in patients with T2DM</p> <p><b>Research Question:</b> Is an HBM-based educational intervention effective in improving self-care behaviors in patients with T2DM?</p>	Health Belief Model	Quasi experimental pre-test/post-test interventional design	<p><b>Sample:</b> 70 patients with Type 2 diabetes aged 30 to 60 years old (n=70) were selected via random sampling.</p> <p><b>Setting:</b> Three randomly selected health centers in Ilam, western Iran</p>	<p><b>Data Collection:</b> HBM variables were measured via a research-made questionnaire with 5 item Likert-type scale questions at pre-intervention and at 2 weeks follow up. Self-care was measured using the Summary of Diabetes Self-Care Activities (SDSCA) questionnaire containing 10 questions, at pre-intervention and two weeks follow up.</p> <p><b>Data Analysis:</b> Data were analyzed using descriptive statistics (absolute frequency distribution and analyzed statistics) as well as SPSS 20, using independent samples t-test, paired samples t-test, and univariate and multivariate regressions with a p&lt;0.05.</p>	Two weeks post intervention, the mean score of all HBM constructs and the self-care behaviors significantly increased (p<0.001).

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Tanaka, S., Yoshimura, Y., Kawasaki, R., Kamada, C., Tanaka, S., Horikawa, C., Ohashi, Sone, H. (2013). Fruit intake and incident diabetic retinopathy with type 2 diabetes. <i>Epidemiology</i> , 24(2), 204-211. doi:10.1097/EDE.0b013e318281725e	<b><u>Research Purpose:</u></b> To investigate the association between fruit intake along with related nutrients, and the incidence of diabetic retinopathy (DR) in individuals with type 2 diabetes.	N/A	Cohort study	<b><u>Sample:</u></b> This study is a part of the Japan Diabetes Complications Study, a larger randomized trial; 978 participants (n=978) were selected based on response to survey and lack of DR or major ocular disease.  <b><u>Setting:</u></b> Outpatient clinics in 59 university and general hospitals in Japan that specialize in diabetes care	<b><u>Data Collection:</u></b> Laboratory measurements were assessed yearly over a period of 8 years, and DR was determined by ophthalmologists at annual ocular exam for the study duration. Fruit consumption, along with other dietary components, were assessed through a FFQ  <b><u>Data Analysis:</u></b> Probability of DR for 8 years was estimated through the Kaplan-Meier method using Cox regression with the standard multivariate method to adjust for confounding variables.	Fruit intake was inversely associated with DR; incidence of DR according to fruit intake quartiles was 83 (Q1), 74, 69, and 59 (Q4). Compared to fruit and vegetable intake together, fruit intake alone was more directly associated with reduced risk for DR.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Thomson, C. A. & Ravia, J. (2011). A systematic review of behavioral interventions to promote intake of fruit and vegetables. <i>Journal of the American Dietetic Association</i> , 111(10), 1523-1535. doi:10.1016/j.jada.2011.07.013	<b><u>Research Purpose:</u></b> To synthesize evidence that identifies the effectiveness of behavior-based intervention trials designed to increase fruit and vegetable intake	N/A	Systematic review	36 studies	<b><u>Data Collection:</u></b> A systematic review of MEDLINE PubMed and PsycINFO databases (2005–2010) conducted with the following inclusive criteria: human, English, clinical trial, or randomized controlled trial, published between 2005 and 2010. Studies included only RCTs with 30+ participants or descriptive pre-post, single-group interventions with 80+ participants.  <b><u>Data Analysis:</u></b> Data abstraction was completed in triplicate, with review for data on sample characteristics, study design and applied measurement instruments of FVC and measurement time points.	Studies averaged an increase of +1.13 servings per day in adults and +0.39 servings per day children. Interventions that focused on a population with a chronic condition were more effective. Authors recommend combining behavioral interventions with other approaches to improve effectiveness of interventions in reaching FVC goals.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Wagner, M. G., Rhee, Y., Honrath, K., Salafia, E., & Terbizan, D. (2016). Nutrition education effective in increasing fruit and vegetable consumption among overweight and obese adults. <i>Appetite</i> , 100, 94-101. doi:10.1016/j.appet.2016.02.002	<p><b>Key Variables:</b> Fruit servings (pre- and post-intervention) and vegetable servings (pre- and post-)</p> <p><b>Hypothesis:</b> Nutrition education with the provision of fruits and vegetables will have a greater effect on increasing fruit and vegetable consumption in overweight and obese adults than nutrition education alone or control group.</p> <p><b>Research Question:</b> Does a nutrition education intervention with and without the provision of fruits and vegetables affect fruit and vegetable consumption.</p>	Health Belief Model	Randomized controlled trial	<p><b>Sample:</b> 67 male and female adults with a BMI of 25 kg/m<sup>2</sup> or greater were recruited and randomly assigned to the control group (n=11), nutrition education group (n= 29) and nutrition education with provision of fruit and vegetables (n= 27).</p> <p><b>Setting:</b> Two communities in North Dakota</p>	<p><b>Data Collection:</b> Participants completed three-day food records semi-quantitative food frequency questionnaires before and after intervention.</p> <p><b>Data Analysis:</b> Statistical analyses performed with PASW version 18.0 (SPSS Inc., Chicago, IL). Chi square analyses used to assess differences in demographics, and paired sample t-tests to assess significant differences in the consumption of fruit and vegetable categories between groups.</p>	There were significant increases in the frequency of fruit and vegetable consumption following the intervention in both the nutrition group and the nutrition with fruit and vegetable group. There was no significant difference in the control group.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Weinstein, E., Galindo, R. J., Fried, M., Rucker, L., & Davis, N. J. (2014). Impact of a focused nutrition educational intervention coupled with improved access to fresh produce on purchasing behavior and consumption of fruits and vegetables in overweight patients with diabetes mellitus. <i>The Diabetes Educator</i> , 40(1), 100-106. doi:10.1177/0145721713508823	<p><b>Key Variables:</b> HbA1c, total cholesterol, LDL, HDL, triglycerides, systolic and diastolic blood pressure</p> <p><b>Hypothesis:</b> An educational intervention on FVC with small monetary incentive will improve FVC and diabetes control in overweight patients with T2DM</p> <p><b>Research Question:</b> Does FVC education intervention with the distribution of coupons redeemable at farmers markets positively impact FVC along with diabetes management parameters in overweight patients with T2DM?</p>	N/A	Randomized controlled trial	<p><b>Sample:</b> 78 participants with T2DM were randomized to nutrition education group (n=45) and control group (n=34).</p> <p><b>Setting:</b> Jacobi Medical Center in the Bronx, New York</p>	<p><b>Data Collection:</b> Participants completed questionnaires assessing demographics, FVC, and farmers market purchasing pre- and post- intervention. Clinical parameters were attained through chart review.</p> <p><b>Data Analysis:</b> Unpaired t-tests or Mann-Whitney U test compared baseline variables between groups. Chi- square tests were used to compare categorical variables. Two-way ANOVA was used to control for baseline differences between groups.</p>	A nutrition education intervention on fruit and vegetable consumption combined with a farmer's market coupon incentive resulted in an increased fruit and vegetable purchase and consumption. Additionally, there were decreases in BMI and HbA1C in the intervention group.

TABLE 1. – *Continued*

Author / Article	Qual: Concepts or Phenomena Quan: Key Variables Hypothesis Research Question	Theoretical Framework	Design	Sample (n)	Data Collection (Instruments/Tools)	Findings
Yokoyama, Y., Barnard, N. D., Levin, S. M., & Watanabe, M. (2014). Vegetarian diets and glycemic control in diabetes: a systematic review and meta-analysis. <i>Cardiovascular Diagnosis and Therapy</i> , 4(5), 373-382. doi:10.3978/j.issn.2223-3652.2014.10.04.	<b><u>Research Purpose:</u></b> To evaluate the effect of vegetarian diets on HbA1c and fasting blood glucose levels in individuals with diabetes.	N/A	Systematic review	6 controlled trials	<b><u>Data Collection:</u></b> Researchers searched Medline, Web of Science, EMBASE, and Cochrane Central Register of Controlled Trials for articles through December 9, 2013, with the following inclusion criteria: (1) age over 20 years, (2) vegetarian diet as intervention, (3) mean difference in HbA1c and/or fasting blood glucose used as outcomes, and (4) controlled trials, duration lasting at least 4 weeks.  <b><u>Data Analysis:</u></b> Researchers calculated the mean differences in HbA1c and fasting blood glucose levels in all three studies between vegetarian and non-vegetarian diets. Sensitivity analysis was used to assess the individual study versus combined effect.	Vegetarian diets were associated with a significant decrease in HbA1c [-0.39 percentage point; 95% confidence interval (CI), -0.62 to -0.15; P=0.001; I(2)=3.0; P for heterogeneity =0.389], and a non-significant decrease in FBG (-0.36 mmol/L; 95% CI, -1.04 to 0.32; P=0.301; I(2)=0; P for heterogeneity =0.710), in comparison to other non-vegetarian diets.

## **Fruit and Vegetable Consumption and Diabetes Outcomes**

Multiple studies support the association between increased fruit and vegetable consumption and improved glycemic control in patients both at risk for and currently diagnosed with Type 2 diabetes. A large study conducted by Block et al (2016) found that an individually tailored wellness education, which included dietary education on importance of fruits and vegetables had a significantly higher increase in FVC, among other dietary factors, as well as a significant decrease in HbA1c and fasting glucose, compared to usual care. Mahoney and Loprinzi (2014) found increased intake of flavonoid-rich fruit and vegetables to be associated with reduced biomarkers of diabetic severity, improved HbA1c, and reduced risk of diabetic retinopathy. In a large cohort study, Tanaka et al. (2013) found that increased fruit consumption, when isolated from vegetable consumption, was associated with lower risk for diabetic retinopathy most likely due to its associated increase in antioxidant levels. Lamb et al. (2017) found that modest increases in FVC were associated with significant improvements in cardiovascular disease risk factors and HbA1c in patients with Type 2 diabetes. In their systematic review, Yokoyama et al. (2014) found that vegetarian diets, which were higher in fruit and vegetable consumption than non-vegetarian diets, were associated with reductions in HbA1c and fasting blood glucose in patients with Type 2 Diabetes. El Bilbeisi, Hosseini, and Djafarian (2017) found that participants with dietary patterns with higher levels of fruits, vegetables, and other plant-based food sources, had lower odds of diabetes complications, including cardiac issues, renal dysfunction, extremity complications, diabetic retinopathy and other neuropathies. In their randomized controlled trial, Imai et al. (2011) found that educating participants on eating a vegetable before a different carbohydrate resulted in increased vegetable



consumption as well as significantly improved HbA1c compared to a general educational intervention on dietary exchange. Hegde et al. (2013) found that consuming at least two low-calorie fruits a day was associated with a significant improvement in HbA1c and antioxidant levels compared to controls three months following the intervention. Despite the known benefits of fruits and vegetables, patients with diabetes are not consuming a sufficient intake of fruits and vegetables as per the national recommendations (Burch et al, 2018).

### **Fruit and Vegetable Consumption Educational Interventions in Diabetes Patients**

Weinstein et al.'s (2013) study implemented a nutritional education intervention modeled after DSME, which focused on addressing the benefits and barriers of fruit and vegetable consumption for participants with diabetes. The study involved hour-long group education sessions, which included a discussion of benefits and barriers to FVC, a Create Your Plate exercise modeled after the ADA's initiative, and a small monetary incentive to be used to purchase fresh fruits and vegetables at a local farmers' market (Weinstein et al., 2013). The intervention resulted in increased FVC, as well as significant decreases in BMI and HbA1c in the intervention group one month following the education sessions (Weinstein et al., 2013). An educational intervention on consuming two low-calorie fruits a day was associated with improved glycemic control (Hegde et al., 2013). Imai et al. (2011) found that a simple nutritional intervention educating diabetic patients on eating a vegetable before a carbohydrate was more effective than traditional exchange-based recommendations on improving HbA1c.

### **Diabetes Educational Interventions and Health Behavior**

Multiple studies have used the Health Belief Model to successfully design and implement diabetes educational interventions. Bayat et al. (2013) found that an educational program

applying the extended HBM to diabetes significantly increased perceived susceptibility, severity, benefits, and self-efficacy, while reducing perceived barriers both at three months and six months following intervention. Jalilian et al. (2014) and Shabibi et al. (2017) conducted similar quasi-experimental, pretest/posttest studies involving a HBM-based diabetes management educational intervention and achieved significant improvement in the HBM variables and reduction in perceived barriers, at two months post intervention. An observational analysis of a large diabetes educational intervention found that food insecurity was a major barrier to fruit and vegetable consumption, and food insecurity is also associated with reduced glycemic control and self-efficacy (Lyles et al., 2013). It is important for diabetes nutritional education efforts to address this barrier in order to help improve the effectiveness of interventions.

### **Fruit and Vegetable Consumption Educational Interventions in the General Population**

Thomson and Ravia's (2011) systematic review of behavioral FVC interventions found that the 36 studies selected averaged an increase of 1.13 servings of fruits and vegetables per day in adults. The authors recommended combining educational interventions with other forms of interventions (i.e., theory based), as well as focusing on specific populations with chronic illnesses (Thomson & Ravia, 2011). Wagner et al.'s (2016) study implemented an HBM-based nutritional education intervention in overweight and obese adults and included the provision of fresh fruits and vegetables, and found a significant increase in FVC following the 10-week intervention. Ko et al. (2016) implemented a brief social cognitive theory (SCT) based FVC nutritional education intervention focused on addressing barriers in a low-income Latino population, combined with the provision of a fresh food basket, to successfully increase FVC, as well as self-efficacy and knowledge. Bihan et al. (2012) and Weinstein et al. (2013) used

incentives in the form of fruit and vegetable vouchers to increase the effectiveness of nutritional education interventions in improving FVC in low-income populations. Kreausukon et al. (2012) and Lhakhang et al. (2014) conducted similar RCTs, which implemented brief theory-based FVC educational interventions in college students and found that the interventions significantly increased FVC, intention, planning, and self-efficacy.

### **Strengths**

Cumulative strengths of the studies included the effectiveness of nutritional education interventions on short-term fruit and vegetable consumption and glycemic control, the number of randomized controlled trials and systematic reviews, and the relative feasibility of the interventions. Several large studies also highlighted the benefits of fruit and vegetable intake for patients with diabetes, including the reduction of risk of diabetes complications. Additionally, several of the studies included in this review utilized the Health Belief Model (HBM), or similar behavioral theory-based models, to design their nutritional education interventions.

### **Limitations**

Limitations included the lack of studies specific to this project's clinical question, and the short-term nature of many of the studies. Additionally, the majority of studies relied on questionnaires and food diaries to determine FVC, which allow for patient bias.

### **Literature Gaps**

Only one study was found that used a nutritional education intervention focusing on fruit and vegetable consumption in patients with Type 2 diabetes. This significant gap in research indicates the need for future research on interventions for increasing FVC in this vulnerable patient population, which this DNP project sought to address.

## **METHODS**

### **Design**

This DNP quality improvement project used a one-group pre-test/post-test design to evaluate the effectiveness of a focused nutritional education intervention on increasing fruit and vegetable consumption in patients with T2DM at a family practice in Green Valley, AZ. This project utilized convenience sampling, or selection from a readily available group of participants, based on upcoming appointments (Kelvin & Plichta, 2013). The study design was appropriate for this project as it allowed the project leader to collect baseline data on participants' knowledge and practice of FVC, and then assess the effectiveness of the intervention four weeks following implementation. Prior to starting this project, the project leader gained approval from the Institutional Review Board (IRB) to ensure that appropriate measures were taken to minimize risk and protect participants' health information (Polit & Beck, 2012).

### **Setting**

The setting of this project was a family practice located in Green Valley, Arizona in Pima County. This clinic sees many patients with diabetes from diverse backgrounds and has a large Hispanic population. Additionally, parts of Green Valley and surrounding areas are considered by the United States Department of Agriculture (USDA) to be "low income and low access" or "food deserts," which contributes to barriers in healthy eating in this population and increases the need for a fruit and vegetable intervention that addresses barriers such as access and cost (2017b). Site approval was obtained from the clinic site director following IRB approval. A written letter of approval is in Appendix A. Providers and clinic staff were also informed of the study three months in advance and educated on the study aims of improving fruit and vegetable

consumption in diabetes patients and associated research supporting improvement in glycemic control. The diabetes educator, who leads educational sessions at the clinic once a month, was also informed of the study and asked to assist in the preparation of educational materials for diabetic patients on appropriate fruit and vegetable consumption. The educational intervention was incorporated into diabetes follow-up visits. The majority of patients with diabetes have regular follow-up visits at the clinic, about every three months, and thus participants were recruited based on scheduled visits during the study period. The project leader checked the schedule for upcoming diabetes follow-up visits a few days in advance, and medical assistants at the front desk were then informed of eligible participants at the start of the clinical day. Medical assistants assisted in offering patients the study disclaimer at appointment check-in (Appendix B & C). If patients agreed to participate, they were given the pre-survey to fill out while they waited to be seen (Appendix D & E). Key stakeholders in this project's implementation included the family nurse practitioner, other staff, patients, and the diabetes educator. Resources included the patient incentives offered in the form of a bag of fresh fruits and vegetables. In the original plan, fruits and vegetables were to be purchased from the Bountiful Baskets Co-op (2018), which offers 60 pounds of fresh produce for \$10. However, due to unforeseen variability in the number of participants seen per day, this method was deemed unfeasible after the first week of implementation. Variabilities were due in part to the concurrent implementation of another similar project, as well as appointment cancellations. For the last three weeks of implementation, produce was purchased from a local grocery store and patients were informed about the Bountiful Baskets program to investigate on their own if they were interested.

## **Participants**

Study participants were obtained through convenience sampling, which involves selecting from a readily accessible population, in this case, based on upcoming diabetes follow-up visits at GVFP during the duration of the four-week implementation period (Kelvin & Plichta, 2013). Inclusion criteria for this study were: (a) adults 18 years or older; (b) diagnosis of Type 2 *diabetes mellitus*; (c) English or Spanish speaking; and (d) primary reason for visit is diabetes follow-up. Exclusion criteria were: (a) participants younger than 18 years of age; (b) diagnoses of pre-diabetes or Type I diabetes; (c) not English or Spanish speaking; (d) participants with cognitive impairment or dementia; and (e) primary reason for visit entails something other than diabetes follow-up. Both English and Spanish-speaking participants were included in this study, as the project leader and most of clinic staff speak both English and Spanish, and the study could thus include a more representative sample of the population that visits GVFP. Additionally, because the educational intervention took place during patient visits, it was important for the chief complaint to be diabetes follow-up rather than other acute health concerns. A goal of 20 to 30 participants was set to meet purpose of this project.

## **Intervention**

The educational intervention took place at the start of the patient visit and lasted 15 minutes or less, depending on participant engagement and questions. The intervention focused on fruit and vegetable consumption in the context of a healthy balanced diet and T2DM, and included components from the HBM, including benefits, barriers, and self-efficacy. The first educational component addressed barriers to FVC that the participant may have identified in their pre-survey. Resources included a USDA (2017a) handout on affordable fruit and vegetable

shopping (Appendix J & K) drawn from the USDA (2017c) recommendations. These materials were offered in both English and Spanish. The second component of this intervention summarized the benefits of FVC, both in general and specific to T2DM, based on the key points from the research provided in the literature review (Appendix L & M). Lastly, participants were educated on the My Plate recommendations along with appropriate serving sizes of fruits and both starchy and non-starchy vegetables (Appendix N, O, & P). Participants were shown a nine-inch paper plate, as recommended by My Plate, and asked to describe a possible meal, similar to the ADA's (2016) Create Your Plate activity. These components were inspired by the Weinstein et al. (2014) study that utilized a similar a three-part educational intervention to successfully increase FVC in patients with T2DM. Education was provided both verbally and in written format, in either English or Spanish, and at a fifth-grade reading level.

### **Data Collection**

Baseline data, including age, gender, primary language, length of time of diabetes diagnosis, and most recent HbA1c was retrieved from a participant demographic survey, which can be found in Appendix F and G. Data regarding current fruit and vegetable intake was collected through a pre- and post-survey adapted from the 2017 Behavioral Risk Factor Surveillance System (BRFSSQ) Questionnaire and is included in Appendix H and I. The wording of the questions was adjusted by the project leader to allow for a fifth-grade reading level. The survey asks about the frequency of consumption of fruit juice, fruits, potatoes, and vegetables not counting potatoes, either in servings per day, per week, or per month, depending on frequency. For those participants who reported consuming less than one serving a day (either servings per week or per month), servings per day would be calculated as number of servings

divided by number of days. For example, one serving a week would be calculated as ‘1’ divided by ‘7’ (days in a week) or 0.14 servings a day. Three servings a month would be calculated as ‘3’ divided by ‘30’ (days in a month) or 0.1 servings a day. No participants selected “less than one serving a month”, but if they had, this would have been measured as zero servings per day.

Additionally, participants filled out a brief four-question survey to assess the following Health Belief Model constructs: perceived barriers, perceived benefits, and self-efficacy. These questions are based on the concept that focusing on mediating relationships between the HBM variables allows for more effective interventions (Jones et al., 2015). The questions regarding perceived barriers and self-efficacy are drawn from an HBM-based study that assessed these variables (Tavassoli et al., 2013). The questions utilized the Likert scale to rank participants perceptions of the benefits of fruits and vegetables (two separate questions) to diabetes control, barriers in increasing FVC, and self-efficacy for increasing FVC, with a score of ‘1’ being *strongly disagree*, ‘2’ *disagree*, ‘3’ *neutral*, ‘4’ *agree*, and ‘5’ *strongly agree*. For perceived barriers, there was also an open-ended question allowing participants to list any specific barriers they faced in increasing FVC. During the educational session, participant surveys were reviewed face-to-face to provide focused education based on their perception of the benefits, barriers, and self-efficacy for increasing FVC. At the end of the intervention, participants were asked how they would like to be contacted for the post-survey, whether by phone call from the project leader or by mail. Several participants said they had follow-up visits scheduled in one month and preferred to receive their post-surveys in person at the time of their follow-up visit. In either case, the patients’ preferences (including phone number or address, if indicated) were recorded on their surveys along with their first names. The post-surveys were identical to the pre-surveys,



except for an additional question regarding the patient's perception of any improvement in blood sugar control. Participant responses to the survey questions were recorded in an Excel spreadsheet in an encrypted computer in a locked room, which no one had access to besides the DNP student project leader. Once the study was completed, all participant information was destroyed. Additionally, the final results of the study will be disseminated to the clinic providers, nurses and axillary staff during the monthly staff meeting along with a copy of the educational materials in both English and Spanish, to be copied and disseminated as desired.

### **Data Analysis**

Descriptive statistics in the form of average means were used to evaluate changes in fruit and vegetable consumption in participants at baseline and four weeks following the intervention, based on survey results (Kelvin & Plichta, 2013). The BRFSSQ asks participants to select a number for the quantity of fruit juice, fruits, potatoes, and vegetables besides potatoes, either by day, week, month, or less, depending on how frequently the participant consumes the food item. Participants were asked to respond to the same food frequency questionnaire four weeks following the intervention through a phone call or mail. Those participants who had follow-up visits scheduled for four weeks out received the follow-up survey in person. The mean average quantities of the fruit and vegetable servings regularly consumed were compared from baseline to four weeks post intervention, to check for percent change in average consumption following the educational intervention. Similarly, the calculated average mean score on the Likert scale for each of the Health Belief Model questions was compared from baseline to four weeks post intervention to assess for percent change in health beliefs.

### **Ethical Considerations**

The three most relevant ethical principles to research on human subjects are beneficence, justice, and respect for persons. This study adhered to these principles and ensured that the participants were treated in an ethical, fair, and safe manner.

#### **Beneficence**

Beneficence is the ethical principle that involves “doing good” or benefitting the welfare of participants (Polit & Beck, 2012). The educational intervention itself addressed overcoming barriers to FVC, in an attempt to improve self-efficacy for participants and helping them meet their needs in improving this health behavior. By offering this intervention in both English and Spanish, the project leader addressed the language barrier that is common in this population, and thus improved the accessibility of the intervention for participants, which also increased the chance of participants obtaining a positive outcome. It is important for researchers working with human subjects to consider how to maximize benefits and minimize harms of their project, including potential psychological harm. This was accomplished through a patient-centered educational approach that engaged participants to identify personal barriers and means of overcoming them to improve FVC and improve diabetes control (Polit & Beck, 2012).

#### **Justice**

Justice is the ethical principle that involves the participant’s right to equal treatment and privacy and freedom from discrimination (Polit & Beck, 2012). Participants in this project were treated fairly and equally regardless of personal attributes or engagement in the intervention. For example, participants could choose to skip any question on the survey and were not be penalized for doing so. Approval was obtained from the IRB to further ensure that ethical criteria were met

and participants' health information was protected as per the HIPAA Privacy Rule (Polit & Beck, 2012). Participant information collected during this study was kept anonymous and protected in an encrypted computer that only the project leader had access to. Participant first names and phone numbers or addresses, if included, were used to match pre-surveys with post-surveys. This information, along with the rest of the data collected, was destroyed once the project was completed.

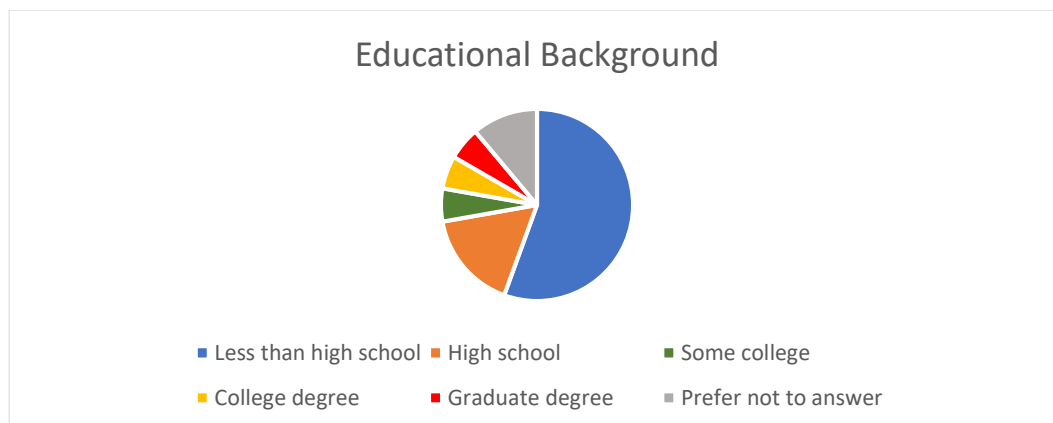
### **Respect for Persons**

Respect for persons involves ensuring participants can exercise full autonomy (Polit & Beck, 2012). This means that participants should have the choice of whether or not to participate in a quality improvement study and the extent of their participation (Polit & Beck, 2012). In this DNP project, participants could choose whether or not to take part when they signed in for their appointments, and thus had full autonomy in electing to participate with reduced influence by the project leader. Additionally, potential participants could choose to skip questions on the survey they did not feel comfortable answering and could withdraw from the study at any time without penalty. The participant disclaimer was provided in both English and Spanish (Appendix B & C) to ensure all participants' understanding of the project's aims, their rights as participants, the extent of their participation, and their right to drop out of the study. Participant demographic questionnaires (Appendix F & G) and pre- and post-surveys (Appendix H & I), as well as all educational materials (Appendix J to P) were also provided in both English and Spanish to ensure participant understanding.

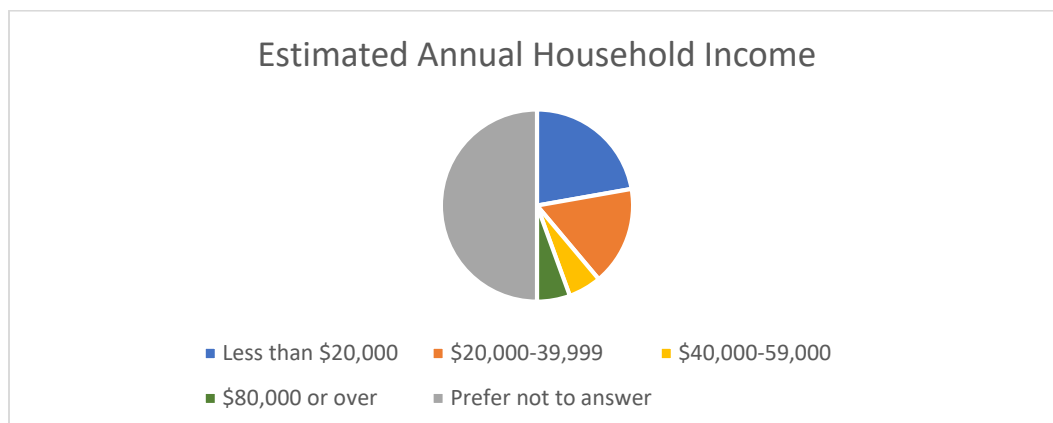
## **RESULTS**

### **Description of the Sample**

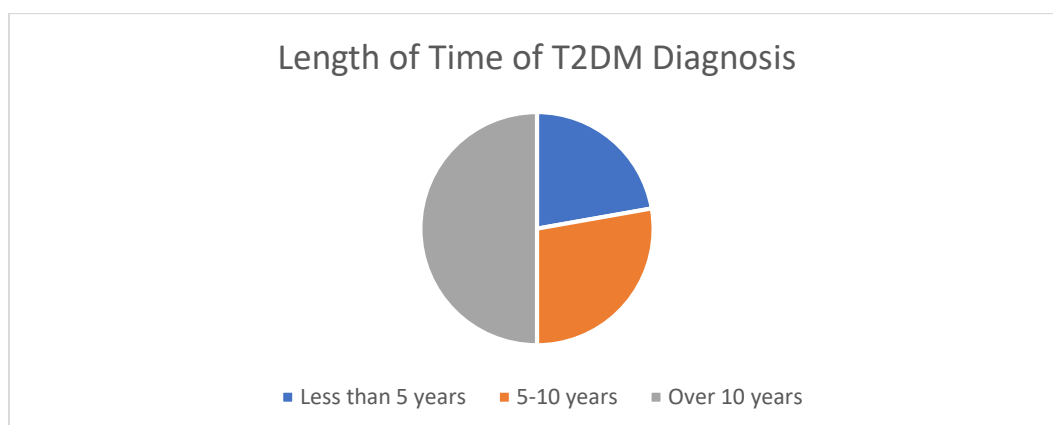
The pre-survey and intervention were completed for 21 participants, of whom 18 responded to the post-survey, for an overall response rate of 85.7%. Data was analyzed using complete case analysis, in which only those participants for whom both pre and post surveys were collected were included (Kelvin & Plichta, 2013). The participants were fairly evenly distributed regarding sex, with 55.6% male and 44.4% female. In terms of age, 77.8% fell in the 40 to 64 group, and the remaining 22.2% were 65 or older. The convenience sampling did not include any participants younger than 40, thus the actual population addressed in the project was adults aged 40 or older. Participants were also primarily Spanish-speaking, with 11 participants responding as primarily Spanish-speaking, five English-speaking, and two were bilingual in English and Spanish. Over half of the participants, who responded to the question, had less than high school education, and 11% chose not to reveal their educational background. Half of the participants chose not to reveal their annual household income. Of those that did, the majority fell in the less than \$20,000 or \$20,000 to \$39,000 categories. Half of the participants reported a duration of diabetes diagnosis of over ten years, 28% reported 5 to 10 years, and 22% less than five years. There was a wide variation in reported HbA1Cs ranging from less than 7% to 10 to 11%. The charts below (Figure 3 to 6) illustrate the rest of the demographic characteristics of the sample.



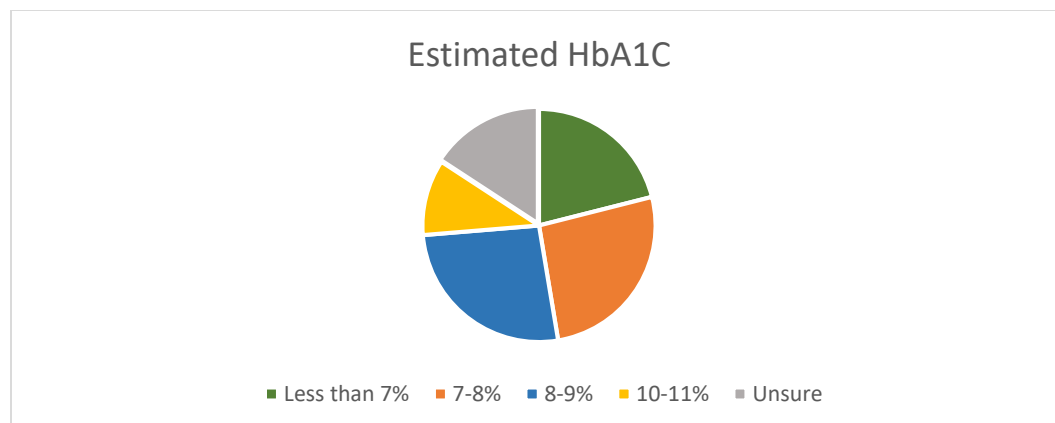
**FIGURE 3.** Educational background.



**FIGURE 4.** Estimated annual household income.



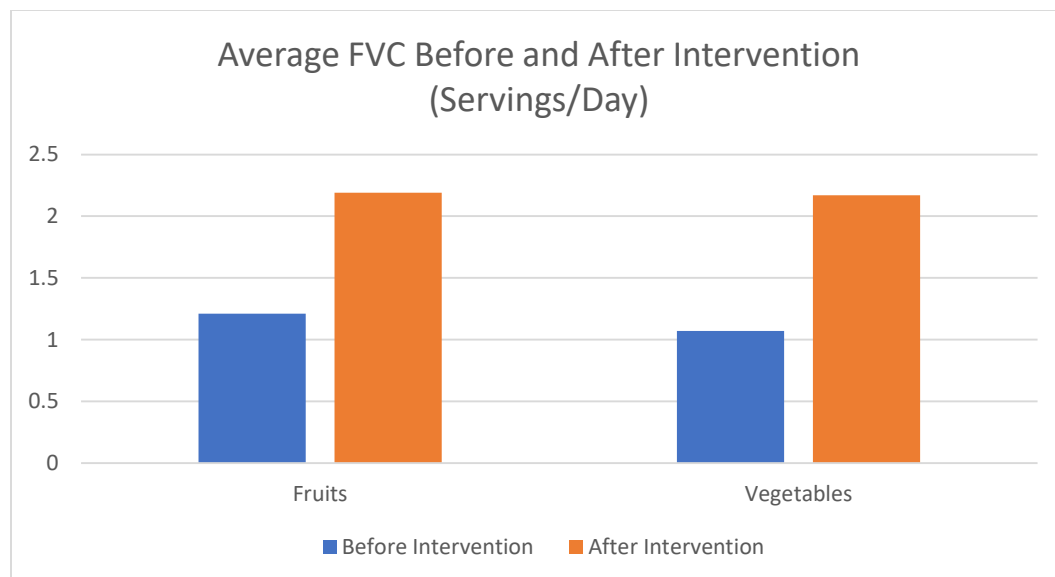
**FIGURE 5.** Length of time of T2DM diagnosis.



*FIGURE 6.* Estimated HbA1C.

### **Findings Related to the Research Questions**

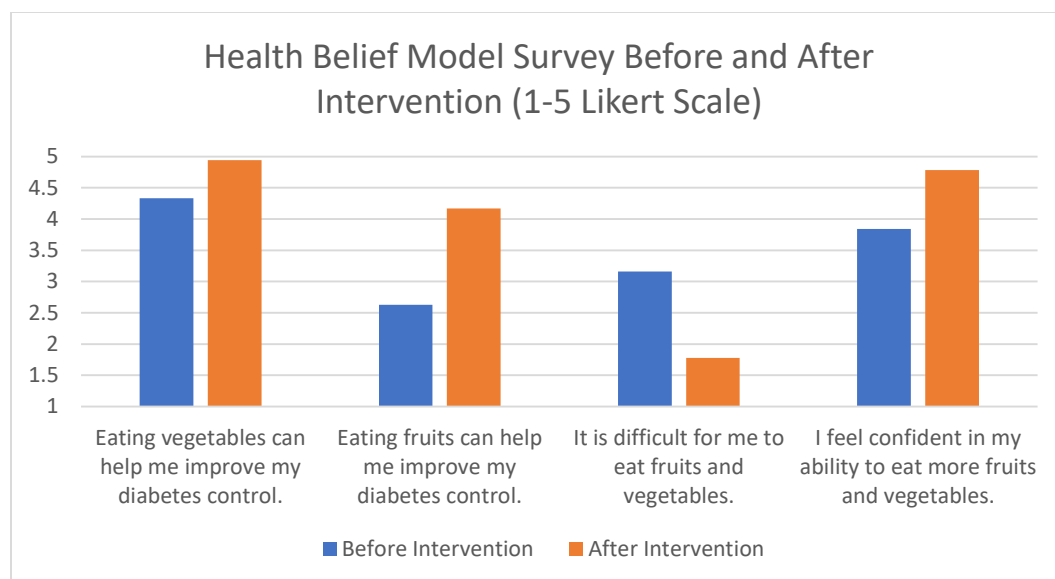
The average reported vegetable consumption of the sample increased from a baseline of 1.07 daily servings to 2.17 servings four weeks following the intervention, or a 50.7% increase. Average fruit consumption increased by 44.2%, from 1.21 servings daily to 2.17 servings daily. Baseline fruit juice consumption decreased slightly from 0.22 servings daily, or about two portions a week, to 0.16, or about one a week. Baseline potato consumption decreased from 0.33 servings daily to 0.22 servings after the intervention. On the post-survey question, “I feel my blood sugar control has improved after taking part in this project”, there was an average score of 4.62 (out of 5) on the Likert scale, reflecting an overall improvement in glucose control based on patients’ reported blood sugar readings at home. Of the 18 participants, 12 reported an improvement, one participant reported a ‘3’ (neutral or unchanged), and five participants said they were unsure or did not check blood sugars regularly. The results for pre- and post-fruit and vegetable consumption are presented in Figure 7 below.



*FIGURE 7.* Average fruit and vegetable consumption (FVC) results.

### **Findings Related to Health Belief Model**

Among the Health Belief Model questions, the perceived benefits of vegetables to diabetes control increased from 4.33 to 4.94 on the Likert scale, a slight increase of 12.3%, as there was already a high level of agreement with the benefits of vegetables at baseline. There was a greater increase observed in the perceived benefits of fruits to diabetes control, which increased from 2.63 to 4.17, or by 36.9%. This illustrates the commonly held belief among patients that fruits are detrimental to diabetes control, which was altered following the brief educational intervention. Perceived barriers to fruit and vegetable consumption decreased from 3.16 to 1.78 or by 43.7%. Reported self-efficacy in increasing FVC was already high at baseline at 3.84, and increased to 4.78 after the intervention, or by 19.7%. The results for Health Belief Model variables before and after the intervention are presented in Figure 8 below.



*FIGURE 8.* Health belief model survey results.

## DISCUSSION

### Summary

This brief educational intervention on the benefits of fruits and vegetables to diabetes control was effective in increasing fruit and vegetable consumption, as well as perceived benefits of fruits and vegetables, and decreased perceived barriers among participants. Average vegetable consumption increased by 50.7% and average fruit consumption increased by 44.2%. Additionally, the response on average perceived improvement in blood sugar control based on participants' blood readings at home was 4.62 on the Likert scale, which reflected an overall improvement. The perceived benefits of vegetables to diabetes control increased slightly by 12.3%, and perceived benefits of fruits increased by 36.9%. Perceived barriers to fruit and vegetable consumption decreased by 43.7% and reported self-efficacy in increasing FVC increased by 19.7%. All participants in this project were aged 40 or older, which is reflective of the general population with T2DM diagnoses. Additionally, the majority of participants were



low-income as well as primarily Spanish-speaking, which suggests that this project would be effective in similar populations. There was a wide variation in reported HbA1Cs among the participants, which indicates that the intervention could be helpful in a diverse population including individuals with both controlled and uncontrolled diabetes.

## **Results in Context**

### **Relationship of Results to Framework**

The Health Belief Model (HBM) was an effective framework for modeling an educational intervention on increasing the behavior of fruit and vegetable consumption in this patient population. Isolating the relationships between perceived benefits, perceived barriers and self-efficacy allowed for a more focused educational intervention, which increased perceived benefits and decreased perceived barriers of FVC. This approach modulated an overall increase in self-efficacy among the group four weeks following the intervention. This increase in self-efficacy occurred alongside an increase in fruit and vegetable consumption, which was the human behavior targeted by this theory-based quality improvement intervention.

### **Relationship of Results to Evidence**

There is little available literature specifically on fruit and vegetable educational interventions in patients with T2DM, although many studies have shown the effectiveness of HBM-based interventions at improving health behaviors in this patient population (Bayat et al., 2013; Jalilian et al., 2014; Shabibi et al., 2017). Use of the HBM has also been effective for implementing successful fruit and vegetable consumption educational interventions in obese patients, who are at risk for T2DM (Wagner et al., 2016). Thomson and Ravia's (2011) systematic review of behavioral FVC interventions found that the most effective studies involved

combining educational interventions with other forms of interventions (i.e. theory based, chronic disease-focused). This DNP project utilized a combined educational and theoretical intervention to target a specific behavior in those with T2DM, thus allowing for a more focused and intervention. Weinstein et al.'s (2013) study, which implemented a successful nutritional FVC educational intervention in underserved adults with T2DM served as the model for designing this DNP Project and its methodology. Literature also supported the effectiveness of theory-based educational interventions in increasing FVC in Latino populations, as well those that utilized patient-centered culturally sensitive interventions (Ko et al., 2016; Gucciardi et al., 2013). This project included many Latino participants, and language and cultural barriers were addressed, further increasing the project's effectiveness.

### **Study Strengths**

Study strengths include the overall effectiveness of the educational intervention at meeting the project's purpose of increasing fruit and vegetable consumption in adult patients with T2DM through an educational HBM-based intervention. Additionally, the project was theory-based and utilized the Health Belief Model, which has been shown to be effective in multiple similar studies, and likely contributed to the success of this project. This intervention took place one-on-one during individual patient visits and incorporated cultural sensitivity and other ethical considerations, thus increasing the patient-centeredness of the project. This intervention can be feasibly replicated in other primary care practices that see patients with T2DM. This quality improvement project had a low cost of about \$10 per participant, including costs of printing and the fresh fruit and vegetable incentive. These costs would be lower if the

intervention was performed by the clinic, rather than the individual project leader, due to reduced costs of printing at the clinic.

### **Study Limitations**

One of the main limitations of this project was the small sample size of 18 participants. Originally, the goal was to recruit 20 to 30 participants, in an attempt to retain at least 20. However, there was another DNP project occurring at the same site during the project period, which involved a nutritional education intervention on the Mediterranean diet in patients with T2DM. This made it more difficult to recruit participants, as there was one less day per week available for the intervention than originally planned. Four participants of this project actually participated in both of the DNP projects. However, two of those participants failed to respond to the post survey, thus leaving two participants in the final sample whose results may have been influenced by their participation in two similar educational interventions. Another limitation was the use of self-report for the food frequency questionnaire, participants' most recent A1C values, and their perceived improvement in blood sugar control questions, which may diminish the validity of the results. Participants may have been reporting high numbers of fruit and vegetable consumption at post-survey in order to please the student project leader. In future projects with longer study periods, a HbA1C could be collected before and three months following the educational intervention to strengthen the internal validity and obtain a more accurate measure of any improvement in blood sugar control.

### **Future Implications**

This DNP project's results will be disseminated at a clinic staff meeting at the end of November, during which multiple primary care providers as well as the diabetes educator will be

present. Educational materials utilized in this project will be given to the project site to copy and disseminate as desired among patients. It is the project leader's viewpoint that this intervention could be feasibly replicated at other family practice sites, in which case objective values could be used to measure improvements in fruit and vegetable consumption and blood sugar control. Additionally, providing the fresh fruits and vegetables to participants serves as a low-cost and effective incentive, while also increasing access to affordable fruits and vegetables through information provided on local resources like the Bountiful Baskets program. While it is important for family nurse practitioners to refer patients with Type 2 Diabetes to diabetes educators and dietitians to obtain the most focused interventions, patients may not always be able to utilize these resources for various reasons including out of pocket cost for diabetic educators and dietitians, difficulty with transportation to sites with these services, and language and cultural barriers. It is thus important to provide patient-centered nutritional education in the primary care sector to increase patients' access to a diabetes self-management education, which will help them improve their diabetes control, prevent complications of the disease, and lead to improved quality of life.

### **Conclusion**

The results of this project show that brief nutritional education on fruits and vegetables can be effective at improving patient's fruit and vegetable consumption short-term as well as enhancing their understanding of the benefits of both fruits and vegetables to diabetes control, improving perceived self-efficacy, reducing perceived barriers, and potentially improving blood sugar control short-term. Future research using a larger sample size and data collection during a

longer study period, as well as objective measures of glucose control and fruit and vegetable consumption could allow for a more effective evaluation of the intervention and diabetes control.

APPENDIX A:  
SITE AUTHORIZATION FORM



## Arizona Medical Services, P.C.

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June 4, 2018

University of Arizona Institutional Review Board  
c/o Office of Human Subjects  
1618 E Helen St  
Tucson, AZ 85721

Please note that Daniela Torres, UA Doctor of Nursing Practice student, has the permission of Green Valley Family Practice to implement a quality improvement project at our clinic for her project entitled, "Effectiveness of a Nutritional Education Intervention on Increasing Fruit and Vegetable Consumption in Adults with Type 2 Diabetes" contingent upon receipt of IRB approval, which will be attached to this document.

Ms. Torres plans to implement an educational intervention for clinic patients with Type 2 Diabetes. She will recruit patients based on upcoming follow-up visits at the clinic. Participants will receive a disclaimer before electing to take part in the project, including information regarding what their participation entails and their rights as participants in a research study. Ms. Torres's project implementation should be completed by October 2018.

Ms. Torres will present the results of her intervention to the clinic providers once the project is complete at a staff meeting.

Signed,

John M. Wadleigh, DO  
Physician Team Lead

APPENDIX B:

PARTICIPANT DISCLAIMER FORM – PRE-INTERVENTION (ENGLISH)



### **Participant Disclaimer Form**

The reason for this project is to educate on the benefits of eating fruits and vegetables for patients with diabetes and increase participants' intake of fruits and vegetables. This project will include a brief educational session, lasting approximately 10 minutes or less.

If you choose to take part in this project, you will be asked to fill out a brief survey about your intake of fruits and vegetables. It will take approximately 5 minutes to fill out this survey. There are no risks involved with this project and you will have the choice to take home one fresh fruit and a vegetable if you choose to take part in this project. In four weeks, you will receive a phone call (or letter in the mail, if you prefer) from the project leader and be asked the same survey questions.

You may skip any question on the survey you do not wish to answer, and you may step out of the project at any time. Refusing to participate in the study or dropping out of the study will have no affect on your medical care. Your information will be kept private and destroyed once the project is complete.

For questions about the project, you may email or call Daniela Torres, RN at [dtorres1@email.arizona.edu](mailto:dtorres1@email.arizona.edu)  
(818) 519-1660

APPENDIX C:

PARTICIPANT DISCLAIMER FORM – PRE-INTERVENTION (SPANISH)

### **Autorización de Participación**

La razón para este proyecto es educar sobre los beneficios de comer frutas y verduras para pacientes con diabetes y como incorporar a las frutas y verduras en su dieta. Este proyecto va incluir una sesión educativa de diez minutos o menos.

Si elijes participar en este proyecto, le vamos a pedir que llene un cuestionario que incluye preguntas demográficas y también sobre las frutas y verduras. Este cuestionario le va a tomar aproximadamente cinco minutos para completar. No hay riesgos al participar en este estudio, y los que participen podrán llevar una fruta y verdura a casa. En cuatro semanas, le vamos a llamar por telefono (o letra por correo, si usted prefiere) y preguntarle las mismas preguntas del cuestionario.

Se puede omitir cualquiera pregunta en el cuestionario y se puede discontinuar participación en cualquier momento. Si usted elige no participar o dejar al estudio, esto no afectará su atención médica. Su información personal se mantendrá privada y será desechada al terminar el proyecto.

Si tiene preguntas, puede mandar un correo o llamar a Daniela Torres, RN  
[dtorres1@email.arizona.edu](mailto:dtorres1@email.arizona.edu)  
(818) 519-1660

APPENDIX D:

PARTICIPANT DISCLAIMER FORM – POST-INTERVENTION (ENGLISH)

### **Participant Disclaimer Form – Post-Survey**

Four weeks ago, you took part in a project on fruit vegetable consumption in patients with diabetes. The reason for this project was to educate on the benefits of eating fruits and vegetables for patients with diabetes and increase participants' intake of fruits and vegetables. In order to assess the project's effectiveness, we are asking you to please complete a follow-up survey.

Most of the questions on this survey will look familiar to you. You are being asked the same questions to compare the results before and after taking part in the educational session. It will take approximately 5 minutes to fill out this survey.

There is an additional question on how you feel your blood sugar control has changed over the past few weeks, if at all. We are asking you if your fasting blood sugars that you take in the morning before breakfast have improved. If you do not know whether or not your blood sugars have improved, you can choose to skip this question. You may skip any question on the survey you do not wish to answer. Refusing to participate in this survey or dropping out of the study will have no effect on your medical care. Your information will be kept private and destroyed once the project is complete.

For questions about the project, you may email or call Daniela Torres, RN at [dtorres1@email.arizona.edu](mailto:dtorres1@email.arizona.edu)  
(818) 519-1660

APPENDIX E:

PARTICIPANT DISCLAIMER FORM – POST-INTERVENTION (SPANISH)

### **Autorización de Participación – Cuestionario Posterior**

Hace cuatro semanas, usted participó en un proyecto sobre el consumo de frutas y verduras en pacientes con diabetes. La razón para este proyecto fue educar sobre los beneficios de comer frutas y verduras para pacientes con diabetes y como incorporar a las frutas y verduras en su dieta. Le pedimos que complete una encuesta para evaluar la efectividad del proyecto.

La mayoría de estas preguntas van a parecer familiares. Le estamos haciendo las mismas preguntas para comparar los resultados antes y después de participar en esta sesión educativa. Este cuestionario le va a tomar aproximadamente cinco minutos para completar.

Hay una nueva pregunta sobre el control de su nivel de azúcar en la sangre durante las Últimas cuatro semanas y como ha cambiado. Le estamos preguntando si ha mejorado su nivel de azúcar por las mañanas antes de desayunar. Si no sabe si ha cambiado su azúcar, se puede omitir esta pregunta. Se puede omitir cualquiera pregunta en el cuestionario. Si usted elige no participar en este cuestionario o dejar al estudio, esto no afectará su atención médica. Su información personal se mantendrá privada y será desechada al terminar el proyecto.

Si tiene preguntas, puede mandar un correo o llamar a Daniela Torres, RN  
[dtorres1@email.arizona.edu](mailto:dtorres1@email.arizona.edu)  
(818) 519-1660

APPENDIX F:  
PARTICIPANT DEMOGRAPHIC SURVEY (ENGLISH)



## Participant Demographic Survey

What is your gender?

☐ Male ☐ Female ☐ Other

What is your age?

☐ 18-25

☐ 26-39

☐ 40-65

☐ Over 65 years

What is your primary language spoken at home:

☐ English ☐ Spanish ☐ Both

What is the highest level of education you have completed?

☐ Some high school

☐ High school diploma or G.E.D.

☐ Some education beyond high school but no degree

☐ College degree

☐ Some graduate school but no degree

☐ Advanced degree (i.e. M.S. or Ph. D.)

What is your annual household income?

☐ Less than \$20,000

☐ \$20,000-\$39,999

☐ \$40,000-\$59,999

☐ \$60,000-\$80,000

☐ \$80,000 or above

☐ Prefer not to answer

How long have you been diagnosed with Type 2 diabetes?

☐ Less than 5 years

☐ 5 to 10 years

☐ More than 10 years

What was your most recent HbA1c?

☐ Less than 7% ☐ 7-8% ☐ 8-9% ☐ 9-10% ☐ 10-11% ☐ Over 11% ☐ Unsure

APPENDIX G:  
PARTICIPANT DEMOGRAPHIC SURVEY (SPANISH)

## Cuestionario Demográfico de Participantes

¿Cuál es su sexo?

☐ Hombre ☐ Mujer ☐ Otro

¿Cuál es su edad?

☐ 18-24

☐ 25-34

☐ 35-44

☐ 45-54

☐ 55-64

☐ 65-74

☐ 75 o mayor

¿Cuál es su idioma principal en casa?

☐ Inglés ☐ Español

¿Cuál es el nivel educativo mas alto que ha cumplido?

☐ Preparatoria Parcialmente

☐ Bachillerato

☐ Algún tiempo en licenciatura

☐ Licenciatura

☐ Algún tiempo en Posgrado

☐ Posgrado (i.e. M.S. or Ph. D.)

¿Cual es su ingreso anual familiar?

☐ Menos de \$25,000

☐ \$20,000-\$39,999

☐ \$40,000-\$59,999

☐ \$60,000-\$80,000

☐ Más de \$80,000

☐ Prefiero no responder

¿Por cuantos años ha tenido el diagnosis de diabetes?

☐ Menos de 5 años

☐ 5 a 10 años

☐ Más de 10 años

¿Cuál fue su HbA1c más reciente?

☐ Menos de 7% ☐ 7-8% ☐ 8-9% ☐ 9-10% ☐ 10-11% ☐ Más de 11% ☐ No se

APPENDIX H:  
PARTICIPANT PRE- AND POST-SURVEY (ENGLISH)

Fruit and Vegetable Module (BRFSS)  
Fruits and Vegetables Pre-survey

These questions are about the foods you usually eat or drink. Please tell me how often you eat or drink each one, for example, twice a week, three times a month, and so forth. Remember, I am only interested in the foods you eat. Include all foods you eat, both at home and away from home.

1. How often do you drink fruit juices?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

2. Not counting juice, how often do you eat fruit?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

3. How often do you eat potatoes not including French fries, fried potatoes, or potato chips?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

4. Not counting potatoes, how many servings of vegetables do you usually eat? (Example: A serving of vegetables at both lunch and dinner would be two servings.)

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

These questions aim to measure how easy or difficult it is for you to eat fruits and vegetables. Please tell me how much you agree with or disagree with the following statements, on a scale of 1-5, with “1” meaning you strongly disagree and “5” meaning you strongly agree.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	1	2	3	4	5
Eating vegetables can help me improve my diabetes control.					
Eating fruits can help me improve my diabetes control.					
It is difficult for me to eat fruits and vegetables.  Please list any specific barriers you face (i.e. cost, time): _____ _____ _____.					
I feel confident in my ability to eat more fruits and vegetables.					

How would you prefer to complete your post-survey?

☐ Telephone call

Phone number: \_\_\_\_\_

☐ Mail

Address: \_\_\_\_\_

Fruit and Vegetable Module (BRFSS)  
Fruits and Vegetables Post-survey

These questions are about the foods you usually eat or drink. Please tell me how often you eat or drink each one, for example, twice a week, three times a month, and so forth. Remember, I am only interested in the foods you eat. Include all foods you eat, both at home and away from home.

1. How often do you drink fruit juices?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

2. Not counting juice, how often do you eat fruit?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

3. How often do you eat potatoes not including French fries, fried potatoes, or potato chips?

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

4. Not counting potatoes, how many servings of vegetables do you usually eat? (Example: A serving of vegetables at both lunch and dinner would be two servings.)

- ☐ Per day
- ☐ Never
- ☐ Per week
- ☐ Don't know/Not sure
- ☐ Per month
- ☐ Less than once a month

These questions aim to measure how easy or difficult it is for you to eat fruits and vegetables. Please tell me how much you agree with or disagree with the following statements, on a scale of 1-5, with “1” meaning you strongly disagree and “5” meaning you strongly agree.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
	1	2	3	4	5
Eating vegetables can help me improve my diabetes control.					
Eating fruits can help me improve my diabetes control.					
It is difficult for me to eat fruits and vegetables.  Please list any specific barriers you face (i.e. cost, time): _____ _____ _____.					
I feel confident in my ability to eat more fruits and vegetables.					
I feel my blood sugar control has improved after taking part in this project.					



APPENDIX I:  
PARTICIPANT PRE- AND POST-SURVEY (SPANISH)

Frutas y Verduras (BRFSS)  
Frutas y Verduras Cuestionario Inicial

Por favor piense en los alimentos que comió o bebió, incluidas comidas y refrigerios, durante el último mes, es decir, en los últimos 30 días. Si un encuestado indica que consume un alimento todos los días, ingrese el número de veces por día. Si el encuestado indica que consume un alimento menos de una vez por día, ingrese las veces por semana o por mes.

1. ¿Con qué frecuencia bebió jugo? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

2. Sin contar los jugos, ¿con qué frecuencia come frutas? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

3. ¿Con qué frecuencia comió usted algún tipo de papa o camote (batata), como papas al horno, hervidas, en puré o en ensalada? (no incluyen las papas fritas)

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

4. Sin incluir las papas, ¿con qué frecuencia comió verduras? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

Estas preguntas tratan de averiguar que tan facil o dificil es para ti comer frutas y verduras.. Por favor dime que tanto estas de acuerdo o desacuerdo con los siguientes declaraciones en escala de 1-5, “1” significando que estas completamente de acuerdo, y “5” completamente desacuerdo.

	Muy de acuerdo 1	De acuerdo 2	Neutral 3	En des- acuerdo 4	Muy en des- acuerdo 5
Comiendo verduras me puede ayudar a controlar mi diabetes.					
Comiendo frutas me puede ayudar a controlar mi diabetes.					
Se me hace dificil comer frutas y verduras.  Por favor, escribe ciertos barreras que enfrentas (por ejemplo, gasto o tiempo): _____ _____ _____.					
Me siento seguro en mi habilidad de comer frutas y verduras.					

¿Como prefiere hacer el cuestionario posterior?

☐ Llamada de teléfono

☐ Correro

Numero: \_\_\_\_\_ Dirección: \_\_\_\_\_

Frutas y Verduras (BRFSS)  
Frutas y Verduras Cuestionario Posterior

Por favor piense en los alimentos que comió o bebió, incluidas comidas y refrigerios, durante el último mes, es decir, en los últimos 30 días. Si un encuestado indica que consume un alimento todos los días, ingrese el número de veces por día. Si el encuestado indica que consume un alimento menos de una vez por día, ingrese las veces por semana o por mes.

1. ¿Con qué frecuencia bebió jugo? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

2. Sin contar los jugos, ¿con qué frecuencia come frutas? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

3. ¿Con qué frecuencia comió usted algún tipo de papa o camote (batata), como papas al horno, hervidas, en puré o en ensalada? (no incluyen las papas fritas)

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

4. Sin incluir las papas, ¿con qué frecuencia comió verduras? ¿Me puede decir la cantidad de veces por día, por semana o por mes?

- ☐ Cada día
- ☐ Nunca
- ☐ Cada semana
- ☐ No se
- ☐ Cada mes
- ☐ Menos de una vez al mes

Estas preguntas tratan de averiguar que tan facil o dificil es para ti comer frutas y verduras.. Por favor dime que tanto estas de acuerdo o desacuerdo con los siguientes declaraciones en escala de 1-5, “1” significando que estas completamente de acuerdo, y “5” completamente desacuerdo.

	Muy de acuerdo  1	De acuerdo  2	Neutral  3	En des- acuerdo  4	Muy en des- acuerdo  5
Comiendo verduras me puede ayudar a controlar mi diabetes.					
Comiendo frutas me puede ayudar a controlar mi diabetes.					
Se me hace dificil comer frutas y verduras.  Por favor, escribe ciertos barreras que enfrentas (por ejemplo, gasto o tiempo): _____ _____.					
Me siento seguro en mi habilidad de comer frutas y verduras.					
Me siento que mi azucar a sido mejor controlado después de participar en este proyecto					

APPENDIX J:  
FRUIT AND VEGETABLE SHOPPING HAND-OUT (ENGLISH)

## 10 Tips: Smart Shopping for Veggies and Fruits

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- 1. Shop in season**  
Use fresh vegetables and fruits that are in season. They are easy to get, have more flavor, and are usually cheaper. Your local farmer's market is a great source.
- 2. Why pay full price?**  
Check the local ads, online, and at the store for sales and coupons that will cut food costs. You can often get more for less at larger grocery stores.
- 3. Stick to your list**  
Plan out your meals ahead of time and make a grocery list. You will save money by buying only what you need. Save your food budget for vegetables and fruits.
- 4. Try canned or frozen**  
Canned and frozen fruits and vegetables may be cheaper than fresh. For canned items, choose fruit without added sugar and vegetables with "low sodium" or "no salt added" on the label.
- 5. Buy small amounts often**  
Some fresh vegetables and fruits don't last long. Buy small amounts more often to make sure you can eat the foods without throwing any away.
- 6. Buy in bulk when items are on sale**  
For fresh vegetables or fruits you use often, a large size bag is the better buy. You can buy canned or frozen produce in large amounts when they're on sale.
- 7. Store brands = savings**  
Choose the store brands when possible. You will get the same or similar item for a cheaper price. If your grocery store has a membership card, sign up for even more savings.
- 8. Keep it simple**  
Buy vegetables and fruits in their simplest form. Pre-cut and pre-washed foods are easy, but often cost much more than their basic forms.
- 9. Plant your own**  
Start a garden — in the yard or a pot on the deck. Good choices for beginners are herbs, cucumbers, peppers, or tomatoes.
- 10. Plan and cook smart**  
Prepare and freeze vegetable soups, stews, or other meals. This saves time and money. Add leftover vegetables to casseroles or blend them to make soup.

Source:  
<https://www.choosemyplate.gov/ten-tips-smart-shopping>

APPENDIX K:  
FRUIT AND VEGETABLE SHOPPING HAND-OUT (SPANISH)



## 10 Consejos: La Buena Compra de Vegetales y Frutas

1. **Celebre la temporada**  
Use frutas y vegetales frescos de temporada. Son fáciles de obtener, saben mejor y, por lo general, cuestan menos. Su mercado local es una fuente excelente.
2. **No vale la pena pagar el precio completo**  
Busque en el periódico local, en internet y en las tiendas los cupones de descuento y ofertas que pueden reducir el costo de los alimentos. A menudo, puede comprar más por menos en supermercados.
3. **Mantenga una lista de compras**  
Planifique sus comidas por adelantado y haga una lista de compras. Ahorrará dinero al comprar sólo lo que necesita. Tendrá más dinero disponible en su presupuesto para comprar vegetales y frutas.
4. **Pruebe productos enlatados o congelados**  
Los artículos enlatados y congelados pueden ser menos costosos que los frescos. En el caso de artículos enlatados, elija frutas sin azúcar extra y vegetales con etiquetas que indican "bajo en sodio" o "sin sal adicional" ("low in sodium").
5. **Compre cantidades pequeñas frecuentemente**  
Algunos vegetales y frutas frescas no duran mucho. Compre cantidades pequeñas con mayor frecuencia para garantizar que pueda comerlos y no se echen a perder.
6. **Compre a granel cuando los artículos estén en venta especial**  
En el caso de los vegetales y las frutas que usa con frecuencia, las bolsas más grandes son más baratas. Las frutas y vegetales enlatados y congelados duran más y se pueden comprar en cantidades grandes.
7. **Las marcas de las tiendas= ahorros para usted**  
Si es posible elija comprar las marcas de las tiendas. Obtendrá un producto idéntico o similar a un precio módico. Si su supermercado tiene una tarjeta de descuento para miembros, inscribese.
8. **Mantenga las cosas simples**  
Compre los vegetales y las frutas en sus formas más simples. Los alimentos pre cortados, pre lavados, y procesados son convenientes pero a menudo cuestan mucho más.
9. **Cultive un jardín**  
Cultive alimentos frescos, económicos y sabrosos, en el huerto, jardín, o en el balcón. Para los principiantes, las hierbas, los pepinos, pimientos o tomates son buenas opciones.
10. **Planifique y cocine de manera astuta**  
Prepare de antemano y congele sopas, guisos u otros platos con vegetales. Eso le ahorrará tiempo y dinero. Agregue restos de vegetales a cazuelas, o mézclelos para hacer sopa.

Fuente: <https://www.choosemyplate.gov/ten-tips-smart-shopping>

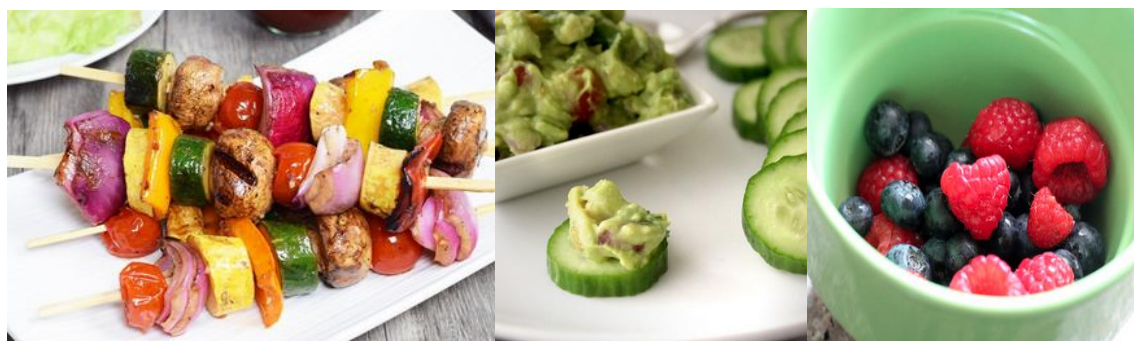
APPENDIX L:  
FRUIT AND VEGETABLE EDUCATIONAL HAND-OUT (ENGLISH)

## Benefits of Fruits and Vegetables

- High in vitamins, minerals, antioxidants, and fiber
- Fiber helps improve control of blood sugar
- Lower risk of heart disease, cancers, and controlling blood pressure
- Help lower risk of diabetes complications
- Recommended by the American Diabetes Association (ADA) and other national health organizations
- They are delicious!

## How to eat more fruits and vegetables?

- Plan meals around vegetables. Eat your veggies first!
- Pre-cut vegetables and keep in fridge or freezer for quick meals, snacks, or toppings
- Add cooked vegetables to tomato sauce—when buying tomato sauce, check that there's no added sugar
- Try roasting or grilling your vegetables
- Season vegetables to your liking, such as with olive oil, black pepper, or garlic
- Lettuce wrap tacos instead of tortillas
- Eat vegetables instead of chips with hummus, guacamole, or light ranch dressing
- Eat fruit as a snack or instead of dessert



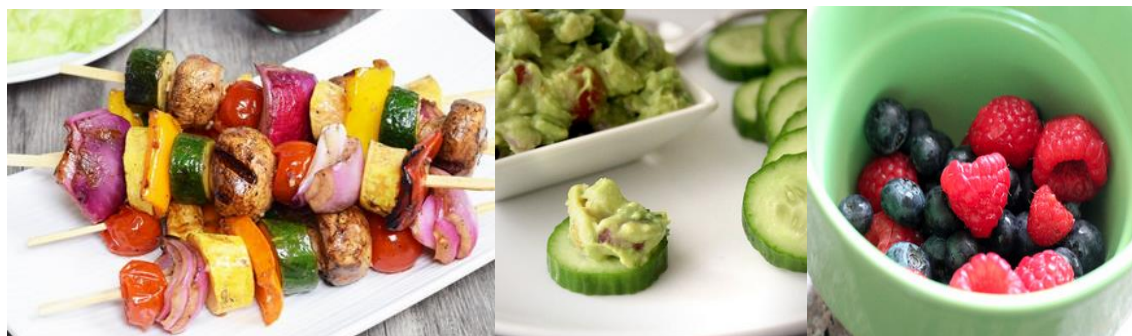
APPENDIX M:  
FRUIT AND VEGETABLE EDUCATIONAL HAND-OUT (SPANISH)

## Beneficios de frutas y vegetales

- Ricas en vitaminas, minerales, antioxidantes y fibra
- Bajan el riesgo de enfermedad cardíaca, cánceres y control de la presión arterial
- Ayudan a mejorar el control del azúcar
- Ayudan a reducir el riesgo de complicaciones de la diabetes
- Recomendado por la American Diabetes Association (ADA) y otras organizaciones nacionales
- ¡Son deliciosas!

## ¿Como puedo comer mas frutas y vegetales?

- Planee comidas alrededor de vegetales. ¡Coma sus verduras primero!
- Corte las verduras y guárdelas en el refrigerador o congelador
- Agregue verduras cocidas a la salsa de tomate. Cuando compre salsa, verifique que no haya azúcar añadida
- Asar las verduras en manera saludable
- Sazone los vegetales a su gusto, como con aceite de oliva, pimienta negra o ajo
- Tacos envueltos en lechuga en lugar de tortillas
- Coma verduras en lugar de totopos con hummus, guacamole o ranch “light”
- Coma fruta como aperitivo o en lugar de postre



APPENDIX N:  
FRUIT AND VEGETABLE SERVING SIZES (ENGLISH)

## Serving Sizes

**Non-starchy vegetables-** Only 5 grams of carbohydrate in a *1/2 cup cooked or 1 cup raw* serving

- Chilies, nopales, carrots, jalapenos, cabbage, eggplant, cauliflower, broccoli, jicama, tomatoes, spinach, peppers, mushrooms, beets

**Starchy vegetables-** Usually *1/2 cup* cooked and has 15 grams of carbohydrate

- Corn, Parsnips, green peas, sweet potato (3 oz. cooked or 1/2 cup mashed), white potato (3 oz. cooked or 1/2 cup mashed), winter squash, such as butternut or acorn (*1 cup* cooked)

**Beans/legumes-** Count as a serving of starch and a serving of protein, a single serving is *1/2 cup* cooked and has 15 grams carbohydrate; if buying canned, rinse first to rid of excess sodium

- Beans (black, garbanzo, kidney, lima, pinto, white), lentils, black-eye peas, refried beans

**Fruits-** The following represent one serving of fruit, with about 15 grams of carbohydrate. If canned, make sure there is no added sugar

- Apple, unpeeled (1 small, 4 oz)
- Apricots (4 fresh, 1/2 cup canned in water or juice)
- Banana (1 extra-small, about 4 inches long)
- Blueberries (3/4 cup)
- Cantaloupe (1 cup diced)
- Cherries (12 fresh, 1/2 cup canned in water)
- Grapefruit (1/2 large)
- Grapes (17 small)
- Guava (2 small)
- Orange (1 medium)
- Peaches (1 medium, 1/2 cup canned in water or juice)
- Pears (1/2 large, 1/2 cup canned in water or juice)
- Pineapple (3/4 fresh, 1/2 cup canned)
- Raspberries (1 cup)
- Strawberries 1 1/4 cup whole fresh)
- Watermelon (1 1/4 cups diced)

APPENDIX O:  
FRUIT AND VEGETABLE SERVING SIZES (SPANISH)



## ¿Que cuenta como porción?

**Non-starchy vegetables/Vegetales sin almidón** - Solo 5 gramos de carbohidrato en a *1/2 taza cocida o 1 taza raw* cruda

- chiles, nopales, zanahorias, jalapenos, repollo, berenjena, coliflor, brocoli, jicama, tomates, espinaca, chile campana, setas, betabel

**Starchy vegetables/Vegetales con almidón** - Usualmente *1/2 taza cocida* tiene 15 gramos de carbohidrato

- maíz, chirivías, guisantes verdes, batata (3 oz. cocida o 1/2 taza puré), papa (3 oz. cocida o 1/2 taza puré), calabaza (*1 taza cocida*)

**Beans or legumes/Frijoles o Legumbres-** Cuente como una porción de almidón y una porción de proteína, una porción es *1/2 taza cocida* y tiene 15 gramos de carbohidrato. Si compra en lata, es importante enjuagarlas con mucha agua primero para eliminar el exceso de sodio

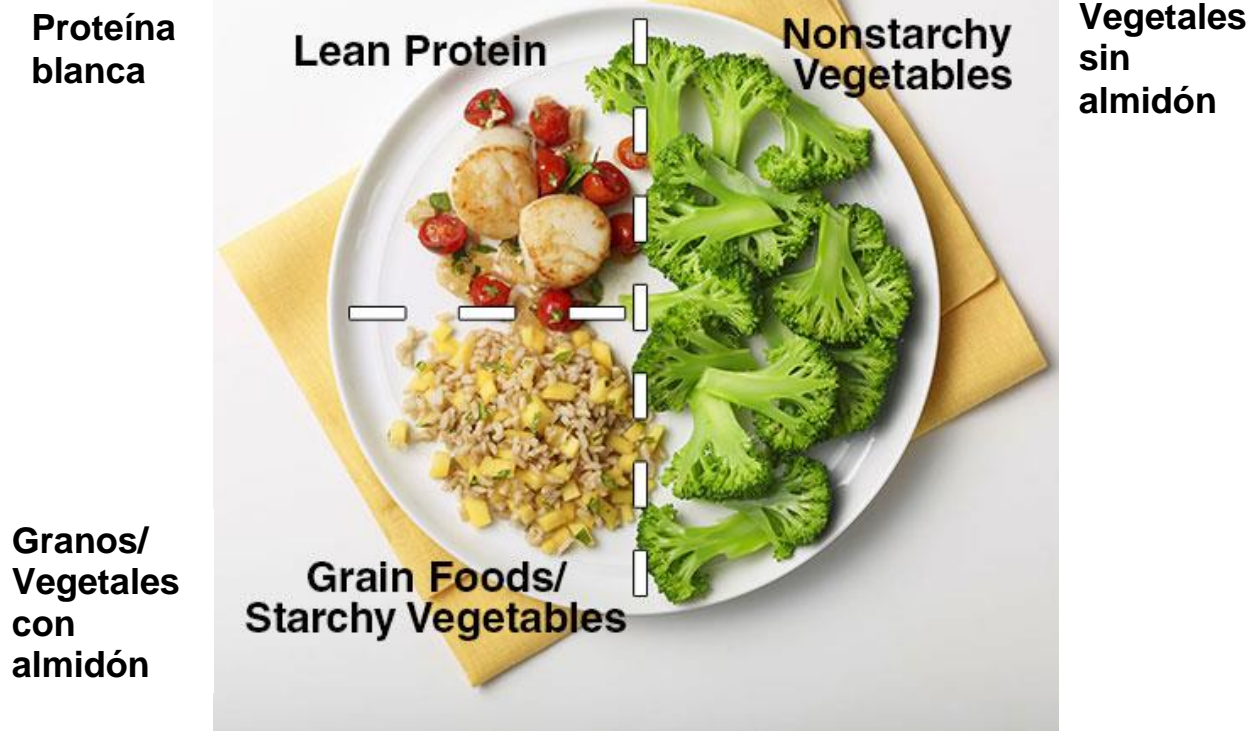
- Frijoles negros, garbanzo, habas, frijoles pintos, alubias blancas, lentejas, guisantes negros, frijoles refritos

**Frutas-** Los siguientes representan una porción de fruta, con aproximadamente 15 gramos de carbohidratos. Si la fruta está enlatada, asegúrese de que no haya azúcar añadida

- Manzana (1 pequeña, 4 oz)
- Albaricoques (4 frescas, 1/2 taza de enlatadas)
- Banana (1 pequeña, 1/2 grande)
- Arándanos (3/4 taza)
- Cantalupo (1 taza)
- Cerezas (12 frescas, 1/2 taza de enlatadas)
- Pomelo (1/2 grande)
- Uvas (17 pequeñas)
- Guava (2 pequeña)
- Naranja (1 mediana)
- Melocotones (1 mediana, 1/2 taza de frutas enlatadas)
- Peras (1/2 grande, 1/2 taza de frutas enlatadas)
- Piña (3/4 frescas, 1/2 taza de frutas enlatadas)
- Frambuesas (1 taza)
- Fresas 1 1/4 cup frescas)
- Sandía (1 1/4 taza)

APPENDIX P:  
MY PLATE FORM (ENGLISH AND SPANISH)

## My Plate Method



***Serving of fruit on the side if your meal plan allows, or separately as a snack***

***Porción de fruta al lado si su plan de comida lo permite o separada como merienda***

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