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FLORIDA INTERNATIONAL UNIVERSITY

Miami, Florida

THE EFFECTS OF A 12 WEEK NUTRITION AND PHYSICAL ACTIVITY INTERVENTION PROGRAM ON MEXICAN AMERICANS RESIDING IN THE LOWER RIO GRANDE VALLEY, TX

A dissertation submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

in PUBLIC HEALTH

by

Tania Rivera

2016

To: Dean Tómas Guilarte
Robert Stempel College of Public Health and Social Work

This dissertation, written by Tania Rivera entitled The Effects of a 12 Week Nutrition and Physical Activity Intervention Program on Mexican Americans Residing in the Lower Rio Grande Valley, TX, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this dissertation and recommend that it is approved.

_____
Susan Himburg

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Richard Palmer

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H. Virginia McCoy

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Elena Bastida, Major Professor

Date of Defense: June 20, 2016

The dissertation of Tania Rivera is approved.

_____
Dean Tómas Guilarte
Robert Stempel College of Public Health and Social Work

_____
Andrés Gil
Vice President for Research and Economic Development and Dean of the University Graduate School

Florida International University, 2016

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DEDICATION

This dissertation is dedicated to my parents for all of their support, not only with this dissertation, but also, throughout my entire life. Their guidance, confidence and belief in me have given me the ability to successfully accomplish this life goal. I feel truly blessed to have the greatest parents who have shaped the person that I have become. I have learned that perseverance is not always easy but the light at the end of this long tunnel is very bright and I am thankful.

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to have an elaborate support system of family and friends that have made this come true.

ABSTRACT OF THE DISSERTATION

THE EFFECTS OF A 12 WEEK NUTRITION AND PHYSICAL ACTIVITY INTERVENTION PROGRAM ON MEXICAN AMERICANS RESIDING IN THE LOWER RIO GRANDE VALLEY, TX

by

Tania Rivera

Florida International University, 2016

Miami, Florida

Elena Bastida, Major Professor

The obesity epidemic is a global health concern. In the United States alone, 68.5% of adults are categorized as overweight or obese; of these, 35.1% are considered obese. Obesity is a leading cause of morbidity and mortality from diabetes and cardiovascular disease, two diseases adversely affecting minority groups such as Mexican Americans. Yet, a modest 5% decrease in weight, through changes in diet and physical activity, can help control type 2 diabetes.

The current study extracted the dietary data and selected outcome variables from Beyond Sabor, a 12 week intervention conducted in the Lower Rio Grande Valley, Texas, a predominantly Mexican American disadvantaged community. Social Cognitive Theory, guided the design of this culturally tailored intervention. Community resources and natural helpers emerged through the utilization of community based participatory research methods. Study participants (n= 1,273) were recruited from local food bank sites and randomized into treatment and control groups. The treatment group received 12 weekly sessions focusing on healthier

eating habits, cooking methods, and physical activity. The control group received 6 nutrition education sessions on similar topics. The study measured changes in several food groups including consumption of soda, fruit juice, and fruit and vegetables. A repeated measures Analysis of Variance was employed to determine changes in treatment and control groups from baseline, post intervention and 40 week follow up. The results showed a significant decrease in soda ($F= 8.48$, $p< .001$) and fruit juice ($F= 3.12$, $p= .045$) consumption for both groups, with a particular decrease in soda for the treatment group. In addition, there was a significant increase in fruit ($F=15.32$, $p< .001$) and vegetable ($F=3.16$, $p= .04$) consumption in both groups. The outcome variables selected were weight, body mass index (BMI), and fasting plasma glucose (FPG). There were significant changes for all three variables over time. The intervention resulted in changes in dietary behaviors that ultimately led to changes in weight, BMI, and FPG. It is evident from the current study, that the use of community based helpers facilitated changes in food habits. This study serves as a prognosticator for future interventions.

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CHAPTER I

INTRODUCTION

Background

For several years, the Centers for Disease Control (CDC) has reported research trends indicating that 68.5% of adults over the age of 20 years are overweight (Body Mass Index [BMI] 25.0-29.9). Of the 33.9% reported overweight individuals, 35.1% fell within the obese category (BMI $\geq$30) and 6.4% extremely obese (BMI $\geq$40) (Frayar, Carroll, & Ogden, 2015; Ogden, Carroll, Kit, & Flegal, 2014). If the increase in obesity continues at the current linear time trend, it is predicted that 51% of the population will be obese by 2030, with an estimated $500 billion in associated medical costs (Trogon, Finkelstein, Feagan, & Cohen, 2011). National initiatives such as Healthy People 2020, are focusing on interventions for health promotion, guidelines for lifestyle changes, screening and metabolic parameters, and recommendations for local policy changes (United States Department of Health and Human Services, 2016).

Reports also indicate that, in overweight and obese adults, the higher the BMI, the higher the risk for morbidity and mortality from diabetes, cardiovascular disease, coronary heart disease, and hemorrhagic and ischemic stroke (Bauer, Briss, Goodman & Bowman, 2014). These risk factors are the same for both men and women. Of the health consequences associated with obesity, diabetes and cardiovascular disease are the two leading causes of morbidity and mortality in the United States for both men and women of all ethnicities, especially Hispanics. For Hispanics, obesity and physical inactivity were found to be among the most significant modifiable causes,

indicating that changes in lifestyle may be a preventative measure (Bauer et al., 2014; May, Freedman, Sherry, & Blanck, 2013; Pearson et al., 2013).

Health disparities, disproportionate rates of disease in a minority population, exist in Hispanics. Reasons for the high prevalence of health disparities are attributed to lower socioeconomic status (SES), lack of health care, insurance coverage, and acculturation (United States Department of Health and Human Services, 2011; Perez-Escamilla, 2011; Wallerstein & Duran, 2010). Notably, the incidence of diabetes in Hispanics, including Cubans, Puerto Ricans, and Mexican Americans is on the rise (CDC, 2015; Geiss et al., 2014; May et al., 2013). From 2007 to 2010, the incidence of diabetes in Mexican Americans alone rose from 4.7 to 11.2% in men and from 5.7 to 8.7% in women (Menkey, Rust, Fradkin, Cheng, & Cowie, 2014; Gregg et al., 2012; Zjhang, Wang, & Huang, 2009). Moreover, Mexican Americans and other minority ethnicities are more likely to die from diabetes complications than non-Hispanic whites (Cefalu & Golden, 2015). These increases have been attributed to the severe increases in obesity in Mexican Americans over the last decade (Menkey et al., 2014).

With such alarming statistics as stated above, the role of diet, exercise, and lifestyle factors in regards to obesity cannot be overstated. Obesity as a precursor to other chronic diseases has been widely studied. These studies have served as the basis for nutrition education, health promotion activities, and recommendations by several national agencies, including the CDC, National Institutes of Health, and National Heart, Lung, and Blood Institute (MacLean et al., 2015).

While ascribed demographic characteristics such as age, gender, and ethnicity that affect cardiovascular disease or diabetes are not open to modification, the above research indicates that a modification in weight yields substantial benefits. In those individuals who are at risk for type 2 diabetes, a weight loss (with or without medication) of 2-5% showed a reduction in fasting plasma glucose (FPG) and a lower glycosylated hemoglobin or A1c - a measure of glucose control over the previous three months (MacLean et al., 2015; American Diabetes Association, 2014). Studies also confirm that a lipid profile can be greatly affected by at least a 3 kilogram weight loss. The lipid profile consists of cholesterol and low density lipoproteins, among others. The low-density lipoproteins have a negative impact on plaque while high-density lipoprotein are heart healthy. A reduction in low-density lipoprotein and triglycerides and an increase in high-density lipoproteins is associated with weight loss.

There is further evidence confirming that a 5% weight loss in those individuals identified with type 2 diabetes is achieved through lifestyle interventions such as diet and exercise. These individuals experience a reduction in the need for lipid lowering medications (Jensen et al., 2014). In addition, the research indicates that modifications of diet such as lower carbohydrates, higher protein, and reduction of saturated fats will improve not only weight but also the risks for diabetes and cardiovascular disease. Recommendations for achieving the above outcomes include lifestyle changes with intervention programs that specifically address behavior modifications involving diet and increased physical activity. These recommendations

include “self-monitoring” of intake and inclusion of activity, such as walking, for at least 150 minutes per week (Jensen et al., 2014).

Statement of the Problem

Mexican Americans living in the United States have a disconcerting prevalence of obesity and diabetes (Powell-Wiley, Miller, Agyemang, Agurs-Collins, Reedy, 2014; Fisher-Hoch et al., 2010). The literature shows that 42% of women and 37% of men are obese, and due to the complications of obesity, the morbidity and mortality rates of this population will increase. The complications include diabetes and cardiovascular disease and the statistics are much higher than the national average. It is predicted that more than 50% of Mexican Americans will be diagnosed with diabetes (Aschner, 2016; Daviglius et al., 2012; Humes, Jones & Ramirez, 2010). Addressing this health disparity is important with this minority population. This study evaluated an intervention design, which included a focus on changing the eating behaviors of Mexican Americans, in an effort to reduce the prevalence of obesity in this population.

Using secondary data from the parent study, *Beyond Sabor* (A Border Embedded Health Intervention Program), the current study assessed the overall efficacy of a culturally based health and nutrition intervention program conducted on a sample of Mexican Americans residing in the Lower Rio Grande Valley in Texas. This research examined the overall effects of the intervention on weight, body mass index (BMI), and FPG values in the parent study sample. Changes in eating behaviors, such as water, soda, and fruit juice consumption as well as fruit and vegetable consumption from baseline to 12 week post intervention was reviewed.

The study examined the changes in weight, FPG, and BMI at the same intervals and the results showed whether food consumption changes were successful in reducing these values. The study's findings also looked at the same variables at 40 weeks after the intervention's inception to give insight into the participant's ability to sustain certain food behavior changes. This analysis determined the overall impact of the interventions of the *Beyond Sabor* project on its participants.

Given the high rates of obesity and diabetes in the Lower Rio Grande Valley, the study design used community based participatory research (CBPR) to better reach the community and establish community partners. This approach has been adopted in several types of studies and its popularity in interventions has grown exponentially over the last decade. CBPR strengthens the community by helping to build partnerships throughout the community and reciprocate the valuable information gained. The basic premise is that the community is involved in all phases of a research project from its inception, to execution and follow up. Some of the concepts in CBPR reflect a multidisciplinary approach to health promotion intervention that is focused on a target community. Ultimately, the entire community benefits by involvement in the research and the outcomes of health behavior change (Blumenthal & DiClemente, 2013). Most of the studies employing CBPR are conducted in underserved minority communities because the methodology not only involves but also enriches the community (Smith et al., 2014; Balcazar et al., 2013; Spencer et al., 2011; Balcazar, 2009). Researchers, including the investigative team of the parent study, will often use the individuals in the community to serve as natural helpers to disseminate the message of health and disease prevention. These natural helpers

emerge as leaders in their community and provide advice and social support (Israel, 1985). Throughout the literature, they are referred to as community health workers or *promotoras* and many studies confirm the efficacy of their value in bridging networks in the community (Nimmons, Beaudoin, & John, 2015; Brown & Harris, 2014). This study identified what factors, including which food behavioral changes, should be the focus of health promotion initiatives in the future. It contributes to the literature regarding the effectiveness and importance of CBPR when designing nutritional interventions for a target population.

CBPR is influenced by culture and it plays a pivotal role in the way an individual defines who they are, how they relate to others, and how the individual shapes values and beliefs. Culture also dictates what people eat and their dietary patterns and in what context they eat. For example, culture is expressed at family time gatherings or celebrations. The ingredients used in cooking, portion size, and traditional cooking methods are also dictated by heritage and culture. There is evidence to show that weight loss interventions that are not culturally tailored to Hispanics are generally unsuccessful mainly because they ignore the food preferences and lifestyle of this population (Lindberg, Stevens, & Halperin, 2013; Lindberg & Stevens, 2007; MacClancy, 1992). This study, with its attention to culture, serves as a model for intervention design and execution in underserved minority populations, such as those in the Lower Rio Grande Valley.

The *Beyond Sabor* program utilized social cognitive theory (SCT) as its theoretical framework. The study utilized a variety of constructs including reciprocal determinism and self-efficacy and provided the theoretical framework that guided the

examination of modifiable health behaviors described below and in subsequent chapters. The intervention was a multilevel cluster design with individual participants nested within clusters, which are the food pantry sites in the Lower Rio Grande Valley. The contributions of this study demonstrated the efficacy of the use of SCT as the theoretical framework and CBPR in its design to reach and improve the health biomarkers of individuals with diabetes in the Lower Rio Grande Valley and other similar populations throughout the Southwest. The design and implementation of the study can be applied to any predominantly disadvantaged Hispanic community with a high prevalence of diabetes.

Research Questions

Research Question #1**:** Did the 12 week community based intervention significantly improve the eating habits and/or food behaviors in a sample of Mexican American adults living in the Lower Rio Grande Valley in comparison to the control group? If there was an improvement, were those eating habits and/or food behaviors maintained at the 40 week post intervention follow up?

Hypothesis #1.1: Participants in the intervention group will have a significant increase of water and a decrease in fruit juices and sodas in comparison to the control group.

Hypothesis #1.2: Participants in the intervention group will have a significant increase in consumption of fruits in comparison to the control group.

Hypothesis #1.3: Participants in the intervention group will have a significant increase in consumption of vegetables in comparison to the control group.

Hypothesis #1.4: Participants in the intervention group will have a significant increase in consumption of salad in comparison to the control group.

Hypothesis #1.5: Participants in the intervention group will have a significant increase in consumption of corn tortillas in comparison to the control group.

Hypothesis #1.6: Participants in the intervention group will substitute cooking oil for lard more frequently in comparison to the control group.

Hypothesis #1.7: Participants in the intervention group will significantly reduce their frequency of eating out in comparison to the control group.

Research Question 2: Did the intervention group decrease their weight, BMI, and FPG when compared to the control group?

Hypothesis #2.1: Participants in the intervention group will have a significant decrease in weight in comparison to the control group.

Hypothesis #2.2: Participants in the intervention group will have a significant decrease in BMI in comparison to the control group.

Hypothesis #2.3: Participants in the intervention group will have a significant decrease in FPG in comparison to the control group.

In summary, the research questions have addressed the overall efficacy of the 12 week intervention in Mexican Americans in the Lower Rio Grande Valley. The variables selected for analysis were based on the nutrition topics covered during the sessions and reflect the overarching aims of the parent study. The following chapter will provide current literature on obesity and diabetes trends in the U.S. and in

Mexican Americans. The literature will also examine the health disparities that exist and interventions that were conducted in the Lower Rio Grande Valley.

CHAPTER II

LITERATURE REVIEW

This chapter provides the reader with current prevalence rates of obesity and diabetes, both for the general population and more specifically, Mexican Americans. It surveys research and background information focusing upon the recent dietary interventions in the U.S. and with Mexican Americans. The theory and constructs for the parent study are discussed in detail in order to provide the reader with the framework that was used in its design. The definition of community based participatory research (CBPR) will be introduced as it was used in this and other studies and is present in much of the literature that addresses minority communities.

Theory for Parent Study

The parent study, *Beyond Sabor* Intervention, used constructs from Bandura's social cognitive theory (SCT) which has been utilized with success in several community programs incorporating health education and changing dietary behaviors (Bandura, 1986, 1996, 2001; Glanz, Rimer, & Viswanath, 2015). It is important to note that this theory began in 1962 and has evolved significantly over the years adopting new constructs that define how people interact with their environment and identify behaviors, observe others, gain confidence to perform the target behavior, and continue to perform behaviors (Glanz et al., 2015). Self-efficacy is a key construct in this theory as it addresses the person's confidence in their ability to accomplish change.

Social Cognitive Theory promotes rewarding healthy behaviors and the empowerment of these behaviors through the use of a variety of social support

systems. The social support systems that are employed are unique to the target community and can be drawn from multiple sources such as personal and community support. The theory is based on personal as well as social determinants of health. The constructs that define SCT as it has emerged over the years and is currently being utilized are summarized below (Glanz et al., 2015).

Constructs

- Reciprocal Determinism: This construct refers to the constant interaction between the person and their experiences, the behavior of the person and how the environment affects the behavior. It is important to note that, if the environment, person, or behavior changes - they are all reassessed.
- Environment and Situations: The environment can be social or physical. The social environment may be a person's family, friends, and peers. Whereas, the physical environment may refer to the layout of the community or availability of safe places to exercise or to obtain healthy foods. A situation can be viewed as the mental view of the environment.
- Observational Learning: This effective method of learning is when a person observes not only the behavior but also, the rewards that are realized from performing the behavior.
- Behavioral Capability: This is the ability to perform a behavior, not just learning the behavior.
- Reinforcement: This is when a person is rewarded for performing the behavior, which in turn increases the probability that the desired behavior will be repeated.

- Outcome Expectations: This refers to the perceived outcomes of a behavior. They are learned from previous experience, observing or hearing about the expectations.
- Outcome Expectancies: This construct has more to do with the value that the person sees in the outcome of the behavior change.
- Self-Efficacy: This is the confidence that a person feels in performing the behavior. It can be better achieved by breaking down a behavior into smaller steps. Confidence is a large predictor of the intent to change a behavior and thus drives the success of an intervention.
- Self-Control of Performance: This construct is based on goal setting and measurement of performance.
- Managing Emotional Arousal: This construct defines the cognitive management of stress, fear, or anxiety of performing a behavior.

Use of Social Cognitive Theory

Due to the variety of constructs in the SCT and its applicability to several determinants of health, it has been widely used as a theory for intervention design. The theory has been used in studies to improve a variety of target health outcomes, such as AIDS awareness, cardiovascular disease, and weight management. This theory also lends itself well to numerous demographics, ethnicities and ages (Weiland et al., 2015; Smith et al., 2014; Cleveland & Stevens, 2012; Akers, Cornett, Savla, Davy, & Davy, 2012; Sharpe et al., 2010). Self-efficacy has been used in order to empower participants and bring confidence in their ability to achieve and maintain change (Bandura, 1998; Stokols, 1996).

Community Based Participatory Research

The basic premise of CBPR is that it addresses the connection between the individual, the environment and policy in addressing social determinants of health in order to reduce health disparities (Israel, Eng, Schulz, & Parker, 2005). All of these interact with each other. Therefore, the community members, partnerships, and organizations are all involved in the research process. This process includes making decisions on identifying problems, drawing upon community resources, study design, recruitment, implementation, and follow up. Israel et al. (2003) describes the principles of CBPR as:

- Acknowledging the community as a unit of identity and capacity building based on the resources in the community;
- Facilitating an equitable partnership in research that attends to social inequalities;
- Utilizing knowledge gained from an intervention to benefit both the community and the researcher;
- Creating a long-term solution for the community through intervention that ultimately leads to policy change.

Community Based Participatory Research is widely used in many studies as will be described later in the chapter. As part of the community partnership and networking is the emergence of natural helpers. Natural helpers are part of the entire network and serve as "caregivers" and provide support, such as social or emotional, to the members of the community. The natural helpers also engage the community to strengthen it through capacity building (Israel, 1985). The parent

study used natural helpers as part of its design and implementation. The current literature uses community health workers, or *promotoras* as the terminology. While similar, the classic concept of natural helpers differs in the selection process. These individuals are selected by word of mouth, faith organizations or as leaders in advisory boards (Israel, 1985). This will be evident in Chapter III as part of the study design.

Obesity

Overweight and obesity, as classified by BMI, are major health problems in the United States. Although statistics are highly variable by region and ethnicity, over 68.5% of individuals are classified as overweight or obese. Of those, 35.1% are classified as obese (Fryar et al., 2015; CDC, 2014; Ogden, Caroll et al., 2014; Frayer et al., 2014; Champion, Pierce, & Collins, 2014). The National Health, Lung and Blood Institute (2016), uses BMI as the standard for the classification of overweight and obese. The numbers are as follows: normal (18.5-24.9), overweight (25.0-29.9), obese (30.0-39.9) and extreme obese being over 40. Over the years, the prevalence of obesity has increased from 31.5 to 38% in women aged 60 and older (Ogden et al., 2014; Freedman, Sherry, & Blanck, 2013; Fryar, Caroll, Ogden, 2012).

Obesity and its related chronic diseases cost an annual 150-200 billion dollars in health care (Trogon et al., 2011). It is estimated that 10% of all dollars spent in the US on health care can be attributed to diabetes and its complications alone (American Diabetes Association, 2013). It has also been shown that socioeconomic status, such as income and educational levels, has a strong association with these obesity rates (Ogden, Lamb, Carroll, & Flegal, 2010). Cardiovascular disease, a complication of

diabetes, is known to be one of the leading causes of death in both men and women; however, in those individuals who have diabetes, lifestyle changes have a tremendous impact on the onset of cardiovascular disease ((National Center for Health Statistics, 2015; Staimez, Weber, & Gregg, 2014; World Health Organization, 2012; Hoyert, 2012).

As a result of these alarming statistics, numerous initiatives have been conducted to decrease the prevalence of obesity. The Surgeon General has issued a call for action to reduce these rates and create a healthier nation. In addition, he has issued expert recommendations that include increased physical activity, adopting a healthier diet, and behavior change (An, 2014; US Department of Health and Human Services, 2010). In addition to improvements in diet and exercise, there have been changes in policy that have been designed to help with these initiatives (Kass, Hecht, Paul, & Birnback, 2014).

While there has been a decrease in deaths related to cardiovascular disease and diabetes since 1997, the incidence of diabetes is still rising. The decrease in deaths has been attributed to increased quality of care, diabetes self-management, and medications (Gregg et al., 2012). However, due to the economic disadvantages at the Texas border, the decrease in these statistics are not applicable in this population. Issues in the health care system and policies, also contribute to the health disparities in this region (Homedes, 2012). The higher prevalence of diabetes in Mexican Americans is further described below.

Diabetes

In the general population, there has been a 33% increase in the prevalence of diabetes over the last 20 years. It is considered one of the most common chronic diseases with multiple complications that contribute to morbidity and mortality (Menke et al., 2014; Geiss et al., 2014; Gregg et al., 2012). The National Health and Nutrition Examination Survey was used to determine the prevalence of pre-diabetes and the results were a 27.4% increase, diagnosed as a fasting plasma glucose of 100-126 mg/dL, from 2002 to 2010 (Bullard et al., 2013). Although there has been an overall plateau in the prevalence of diabetes in recent years, there has been a significant increase in certain minorities, such as Hispanics and non-Hispanic blacks (Geiss et al., 2014).

Certain risk factors for diabetes are known to be modifiable. These include weight and healthier eating habits, such as decreasing caloric intake and the reduction of higher fat foods (Morales, Flores, Leng, Sportiche, Gallegos-Carrillo, & Salmeron, 2014; Acosta-Cazares & Escobedo-de la Pena, 2010). The non-modifiable risk factors are race and ethnicity. These and the physical environment, such as access to healthy foods and safe walking areas, play a key role in its prevalence (Pasala, Rao, & Sridhar, 2010). In those individuals with diabetes, several interventions have yielded positive outcomes such as weight loss, which in turn led to less need for medication, improved lipid levels and glycemic control (Staimez, Weber, & Gregg, 2014; Rejeski, Bertoni, Bray, Evans, & Gregg, 2012; Koivula, Tornberg, & Franks, 2013).

A broad based chronic disease self-management program for Spanish speaking older adults in South Florida resulted in improvements in some measures

related to self-efficacy and physical activity. The concept of self-efficacy was measured through eight health behaviors, such as managing disease, symptoms, emotions and communicating with the physician. The results showed that the participant's ability to manage symptoms through self-efficacy increased significantly (Melichor, Bastida, Albatineh, Page, & Palmer, 2013). This 6 week study showed that utilizing an evidence based program to increase self-efficacy and thereby increasing disease management, is beneficial.

Eating Behaviors

The development of the complications of diabetes are somewhat attributed to modifications of eating behaviors and an increase in physical activity. The complications of diabetes include all types of cardiovascular disease and higher rates of morbidity and mortality. Those that have better controlled diabetes, have more positive outcomes such as a decrease in morbidity and mortality and macrovascular complications. The ability to reduce complications, such as stroke and myocardial infarction, as a result of diabetes, are of particular interest to researchers and are described below (Staimez, Weber, & Gregg, 2014).

Beverage Consumption

Optimal hydration is achieved through adequate consumption of water. The Institute of Medicine (2004) recommends 1-1.5 liters for every 1000 kcals consumed commensurate with the level of physical activity. Other extenuating factors that affect water needs are environment, temperature, level of strenuous work, and current health status. To date, there is limited evidence on water consumption patterns for adults in the U.S. but as expected, older men and women were among the highest

group of individuals that did not meet the recommended amounts of water intake. Those who consume more water tend to consume less calories. Water consumption has been associated with improved health behaviors, less risk for chronic disease, and better dietary intake (Drewnowski, Rehm, & Constant, 2013; Stookey, 2010). It was found that Mexican-Americans consumed more bottled water than tap water when comparing them to non-Hispanic whites; the researchers attributed this to the possibility of non-sanitary water conditions (Drenowski et al., 2013).

Notwithstanding appropriate water intake, the Dietary Guidelines for Americans (2015) recommend decreasing the amount of added sugars from beverages in the total daily diet. It has been shown that added sugars constitute up to 11-14% of the American diet and that 12% of the adult diet is made up of sugar sweetened beverages, such as soda and juice (Ervin & Ogden, 2013; Bleich, Wang, & Wang, 2009). Data from the National Health and Nutrition Examination Survey suggests that an average of 171 kcals per day are consumed in sugar sweetened beverages alone, with male adolescents having the highest consumption of 292 kcals per day (Miller et al., 2013). Although trends in sugar sweetened beverage consumption has decreased nationally from 1999-2010, a large portion of the average diet continues to be from consumption of beverages such as soda, which have no nutritional value (White & Nicklas, 2016; Argarwal, Reider, Brooks, & Fulgoni, 2015; Stern, 2014; Hu, 2013; Kit, Fakhouri, Park, Nielsen, & Ogden, 2013). A meta-analysis of 88 studies confirmed that the consumption of soda is associated with increased daily caloric intakes and subsequent weight gain in both adults and children (Beck, Tschann, Butte, Penilla, & Greenspan, 2014; Vartanian, Schwartz, & Brownell,

2007). Sugar sweetened beverages also contain high fructose corn syrup, which is the most used sweetener in the U.S. and has been found to be associated with higher rates of obesity (White & Nicklas, 2016). This problem has also been attributed to the increase in beverage sizes over the years, such as "supersizing," which also includes food. Reducing the consumption of sugar sweetened beverages has proven to be successful in maintaining long term weight loss (Hu, 2013; Piernas & Popkin, 2011). Certain interventions such as taxation and preventing the purchase of these beverages with food stamps have been proposed (Kass, Hecht, Paul, & Birnback, 2014; Stern, Piernas, Barquera, Rivera, & Popkin, 2014).

Fruit and Vegetable Consumption

A diet high in fruits and vegetables has been extensively shown in the literature to prevent chronic diseases such as cardiovascular disease and cancer and may aid in weight loss. There are several beneficial phytochemicals in fruits and vegetables that work at the cellular level to eliminate free radicals which contribute to chronic diseases (Rabenberg, Mensink, Krause, Kamtsiuris, & Ziese, 2011). It has also been shown that the higher consumption of fruits and vegetable may increase satiety due to their soluble and insoluble fiber content, which may also help regulate overeating. This literature has been the basis of several interventions to increase fruit and vegetable consumption and addressing policy initiatives to increase access to these healthier foods (Rebello, Lui, Greenway, & Dhurandhar, 2013; Boeing et al., 2012; Key, 2011; Mente, Koning, Shannon, & Anand, 2009).

The 2015-2020 Dietary Guidelines of Americans recommends consumption of 2 cups of fruit and 2.5 cups of vegetables per day for the average person requiring

2000 kcals. The yearly Behavioral Risk Factor and Surveillance Survey (BRFSS) data has shown that in all states of the union there was an average of 32.5% of individuals consuming at least 2 fruits, and 26.3% consuming at least three vegetables per day. The BRFSS questionnaire does not specify serving sizes but rather amounts per day. These results in fruit and vegetable consumption were even lower in those who experienced higher poverty levels (Grimm, Foltz, Blanck, & Scanlon, 2012). A study compared fruit and vegetable consumption across Hispanic subgroups and found that Hispanic men and women ate more fruits and vegetables than non-Hispanic whites and non-Hispanic blacks (Colon-Ramos et al., 2009). While their consumption was greater, they still did not eat the optimal amounts.

Mexican Americans

Non-Hispanic blacks and Mexican Americans have higher rates of obesity than other ethnicities (Powell-Wiley, Miller, Agyemang, Agurs-Collins, Reedy, 2014; Fisher-Hoch et al., 2012; CDC, 2015). Mexican Americans are particularly at risk for obesity with recent literature stating that 42% of women and 37% of men are obese (Aschner, 2016; Daviglius et al., 2012). When examining the impact of complications of obesity, such as cardiovascular disease and diabetes, it is apparent that the morbidity and mortality rates for Mexican Americans are increasing (Daviglius et al., 2012). These statistics are much higher than the national rate. This is a clear indication that this population needs intervention - in particular, a culturally tailored intervention.

In Mexican Americans, the prevalence of diabetes over the last few decades has risen alarmingly. It is suspected that over 50% of Mexican Americans will have

diabetes after the age of 60 (Humes, Jones & Ramirez, 2010). These higher rates of diabetes are said to be due to a higher BMI, family history as well as economic and environmental factors. The prevalence over time increases more in men than in women (Menke, Rust, Fradkin, Cheng, Cowie, 2014; Reininger et al., 2010). Addressing the problem of diabetes in this population is important to public health. It will impact mortality rates, help resolve the disparities in minorities, and reduce health costs.

Factors Affecting Health

There is robust literature on the factors contributing to the prevalence of obesity, diabetes, and heart disease in Mexican Americans (Fisher-Hoch et al., 2012; Fisher-Hoch et al., 2010). Data show those that were less educated had increased rates of obesity. Other factors contributing to the high rates of obesity and diabetes were lack of health care access and financial inability to pay for health care due to lack of insurance. Of all the various ethnic groups in the US, individuals of Mexican descent are the least likely to have health insurance coverage. This affects their ability to purchase medications and keep current with doctor and dental visits (Su, Richardson, Wen, & Pagan, 2011; Bastida, Brown, & Pagan, 2008).

In addition to the lack of health insurance, there are other factors that contribute to the health disparities in ethnic populations such as Mexican Americans and non Hispanic blacks. One study examined the causes for this disparity among Mexican Americans and found that, not only are there socioeconomic status (SES) issues, such as income, education, and transportation, but also fear of diagnosis and embarrassment regarding medical issues (Reininger et al., 2014; Golden et al., 2012).

There is also a high rate of Mexican Americans that are not screened for pre diabetes and diabetes and therefore they do not know of the complications. This has been associated with lack of health care coverage (Keifer, Silverman, Young, & Nelson, 2014). It is evident that intervention is needed in order to increase preventative services in this population to help decrease the incidence of diabetes.

Physical activity is also a concern in this population. It has been shown that there is a difference in physical activity between U.S.-born Mexican Americans versus foreign-born Mexican Americans (living in US < 10 years); the latter of which is more likely to engage in "transportation activity" instead of leisure time physical activity (Murillo, Albrecht, Daviglus, & Kershaw, 2015). A study conducted by Griffin, Brecht, Takayanagi, Villegas, & Melendrez (2013), identified that women of Mexican descent engaged in small intervals of moderate physical activity instead of steady maintained activity and that culturally tailored interventions should be developed.

In addition to the burden of obesity on adults, there is a high rate of obesity in those between the ages of 2-19 with an even higher rate in Mexican Americans. There is an additional need for intervention for the adoption of healthy eating habits at a younger age because obesity begins during adolescence and there is a greater prevalence by ethnicity. Acculturation plays a role in modeling children's eating practices such as fast food consumption and increased portion sizes. (Kaiser et al., 2015; Champion, Pierce, & Collins, 2014; Piernas & Popkin, 2011; Gordon-Larsen, Adair, Nelson, & Popkin, 2004).

Lower Rio Grande Valley

According to the BRFSS statistics, one of the states with high rates of obesity is Texas with an obesity prevalence of 30.9% with an annual obesity related state expenditure of $10,262,000,000. This amount is third in the country - below California and New York. The fact that these medical expenses are so high further shows the need for intervention in this state (BRFSS, 2015; Trogon et al., 2011).

The Lower Rio Grande Valley is in the southern part of Texas and encompasses Cameron, Starr, Hidalgo and Willacy Counties with a reported 86%, 90%, 97%, and 86% rate of Hispanics residing in this area, respectively (U.S. Census Bureau, 2016). Rates of obesity and diabetes are highest in these Mexican border counties of Texas because of economic factors, lack of health care utilization, and lack of insurance. Obesity rates for Mexican Americans of high SES were found to be lower indicating that those at risk are economically disadvantaged. There is also evidence of undiagnosed diabetes in those of lower SES (Brown & Hannis, 2013; Golden et al., 2012).

Studies in the Lower Rio Grande Valley have used CBPR and community partners in their design to reach to those with diabetes or at risk for diabetes. These programs are designed to include lifestyle changes which include both nutrition behavior change and increasing physical activity. The natural helper model was effective in introducing and reinforcing the benefits of lifestyle changes, through social networks with the residents of the community. These studies in the Lower Rio Grande Valley showed improvements in weight, A1c, knowledge of diabetes, and self-efficacy (Sorkin et al., 2014; Ryabov & Richardson, 2011).

Research reveals a variety of influences upon health care access in those Mexicans living along this Texas border. Individuals of Mexican descent were more prone to having little to or no access to healthcare, which in turn adversely affected their health (Reininger et al., 2014; Mier et al., 2012). For the same reason, those who received diabetes education were less likely to require emergency services (Mier et al., 2012; CDC, 2010; Fisher-Hoch et al., 2010; Florez, Price, Campbell, Riba, & Parra, 2009). Consequently, interventions designed to address the obesity rates in rural areas are important to reduce health care costs and improve the health of this community. It is suggested that changes in policy in the Lower Rio Grande Valley may be needed in order to improve the health outcomes of this community (Mier et al., 2013; Ward, 2010).

Colonias and Community Partners

The Lower Rio Grande Valley is known for its *colonias* which are impoverished areas that are near the U.S. Mexico border and in which there is lack of access to basic environmental services such as affordable and sanitary housing, paved roadways, lighting and drainage (Federal Reserve Bank of Dallas, 2011; Ward, 2010). There are close to 400,000 inhabitants from around 1500 *colonias* in Texas - over 50% of which are located in Hidalgo County (Mier et al., 2012, Ward, 1999). Some estimates show that the population of the *colonias* is estimated to grow to 700,000 (Federal Reserve Bank of Dallas, 2011). These impoverished communities have been the basis of several intervention studies but more research needs to be conducted to address the health disparities in these communities.

In addition to the *colonias* as target communities, the use of *promotoras*, are found in several studies (Nimmons, Beaudoin, & John, 2015; Brown & Harris, 2014; Mier et al., 2012; Balcazar et al., 2010; Nichols, Berrios & Samar, 2005). The *promotoras*, or "promoters of health," are community health workers that provide a unique connection to the community because they are a trusted part of the community. The *promotoras* are popular in the Mexican-American literature and can be described as community representatives who advocate for the needs of the minority group (Griffin et al., 2015; Brown & Hanis, 2014; Nichols, Berrios, & Samar, 2005). These *promotora* led interventions have yielded positive outcomes in Hispanic women of all ages, including improvements in weight, dietary habits and physical activity (Griffin et al., 2015; Schwingel et al., 2015). They provide support to the community through networks, observed behaviors and addressing health literacy (Ryabov & Richardson, 2011). The *promotoras* utilize culturally tailored education techniques to deliver messages of health promotion to improve the health outcomes of the community. A study conducted in Hidalgo County by Millard et al., (2011) aimed at educating participants about a healthful diet and physical activity. It included a population of 900 *colonias* and used education in order to reduce the onset of diabetes. Their approach employed CPBR but utilized the transtheoretical model to capitalize on the participant's stage of change in a behavior. This study also used 4 *promotoras*, of which 3 were women and 1 man who took several field notes which were analyzed to yield positive results in intervention design and convenience such as childcare. Promotoras have been successfully used in community intervention programs such as cancer screening and prevention and Human papillomavirus

vaccination in young women (Vernon & Fernandez, 2016; Nimmons et al., 2015; Parra-Medina, Morales-Campos, Mojica, & Ramirez, 2015).

Eating Behavior Interventions

A health promotion intervention was conducted with Mexican Americans residing in the border of Texas and Mexico that employed CBPR to increase fruit and vegetable consumption and increase physical activity to 30 minutes on a regular basis. This study utilized a media campaign that helped to empower the participants to increase physical activity and choose healthier food items. It has been documented that media campaigns can help to address the health issues of culturally unique communities (Reininger et al., 2010; Ramirez et al., 1999; Ramirez, McAlister, Gallion, Ramirez, Garza, & Stamm, 1995). The aim of the study was to build self-efficacy through media sources. The construct of self-efficacy was described earlier. There, the researchers selected the SCT as the framework for the media campaign, which, is termed "behavioral journalism." This term and concept use people who have successfully changed negative behaviors in its promotional material and outreach to the target population (Reininger et al., 2010; McAlister, 1995). The study also used the Ecological Model to construct its interventions. The media campaign included news segments and newsletters in Spanish. Their results found that exposure to their campaign did increase physical activity but did not increase fruit and vegetable consumption (Reininger et al., 2010).

Another study conducted by Reininger et al., (2015), was done in a community along the U.S.-Mexico border. It was designed to increase fruit and vegetable consumption and physical activity in those individuals of Mexican descent.

The study reviewed community campaigns involving mass media to gain the attention of the population at risk. The basis of the study was a "Guide to Community Preventive Services" and outlined ideas for reaching the community such as through health fairs, screenings, as well as policy changes for positive health outcomes. This study utilized the ideas and foundation of the guide as part of their evidence based intervention and culturally informed strategies in order to further reach the community. The basis of their approach was from a Stanford Five City Evidence Based Study, which employed several media outlets in order to get the message across in underserved communities. The study was in place to increase physical activity and healthy eating patterns among residents of the Texas-Mexico border (Reininger et al., 2010). There, the researchers implemented a community campaign entitled "Tu Salud, Si Cuenta," which translated means "Your Health Matters." The study showed, along with other studies, that the way of reaching out to the community was through family (Ong, Phinney, & Dennis, 2006; Reininger et al., 2005). Their methodology included reaching out to the community via an advisory board that represented individuals that were involved in health organizations in the area. The board identified community needs and addressed them in their approach to the intervention; for example, the study used media, timing, and culturally relevant information. They recruited leaders to initiate walking groups and exercise classes. In addition, the health workers gave specific input into how best to reach the community with media outlets. Their evidence based participatory research approach proved to be effective in designing a campaign model. The theories that were used in this campaign were the SCT and transtheoretical model for change (Bandura, 1986;

Prochaska, DiClemente, & Norcross, 1992). The media messages included TV segments that focused on healthy messages that were adaptable to the population and community events and screenings to further the reinforcement of healthy messages. The intervention also included motivational interviewing exercises as well as access to local markets that provided healthier food options.

Diabetes Interventions

Culturally relevant interventions with diabetes along the U.S.-Mexico border have also been evaluated. In the Starr County Border Health Initiative, the main goal was to identify evaluation techniques for this population and determine what motivated this particular population to change (Brown & Hanis, 2014). The intervention involved education sessions - long weekly sessions followed by shorter bi-weekly sessions - that consisted of nutrition, physical activity, monitoring of blood glucose, medications, and addressing behavior changes. This intervention also included food demonstrations. The food demonstrations were tailored to food preparation methods and use of healthier ingredients while keeping with traditional Mexican food recipes. There were dietitians as part of the research team that helped with the education, modification of recipes and grocery store visits. Interestingly, this study used family members and/or supporters of the participants to assist with moral support between sessions. These supporters also had a relatively high prevalence of diabetes and received diabetes related supplies and information. This study also had reported strategies for recruitment and retention in this population. Of interest about the project were factors such as having personnel on the project that spoke Spanish, the offering of transportation to and from the study site, employing the use of

promotoras, having the opportunity to taste healthy Mexican foods, utilizing family members for support, and providing diabetes self-management tools (Brown & Hanis, 2014; Nichols, Berrios, & Samar, 2005). This study was able to achieve an over 1.7 percent reduction in A1c with measurements taken at 3, 6, and 12 months. They were able to contact other women in the community and provide encouragement and connections in providing support. Outcomes were positive and the participants perceived that there was a companionship in this relationship (Albarran, Heilmann, & Griffin, 2014).

Another diabetes prevention program was conducted on the U.S.-Mexico border where type 2 diabetes rates are exceedingly high (Millard et al., 2010). This particular study looked at participants belonging to *colonias* or individuals living in poverty and the outcome was to delay or prevent the onset of diabetes by decreasing overall BMI. The project was focused on education related to nutrition and physical activity. Similar to the current study, this intervention used CBPR to address the needs of this underserved community. This study also utilized the transtheoretical stage of change model (Prochaska & DiClemente, 1986). The study used the concepts of *promotores* and *colonias* as described earlier in this review and it appears often in the Mexican American literature. These particular *promotores* were trained and had done health research and projects in the *colonias* where they tailored their education to the culture of the city and its people. The study researched social networks in the area and looked for homes with "children in the yard" which was indicative of a solid relationship in the neighborhood. The investigators confronted the female of the home and requested their presence in a group. The resulting group

that was formed was considered a *colonia* as well as a "network." The weekly sessions consisted of topics such as physical activity, chronic diseases, managing disease and nutrition. In addition, the sessions were coupled with physical activity and pedometer readings. The program was only 8 weeks long with a small sample size (n= 91 at inception). It included pre and post assessment whereas the current study had pre-, 12 week, and 40 week follow up to assess the retention of the educational lessons. In this study, the participants had a 92% prevalence of above normal weight with 58% being in the obese category - higher than the estimates mentioned in the beginning of the review (Millard et al., 2010). This study utilized food demonstration to hone in on the concepts taught that day regarding healthy meal preparations. The researchers observed that this was very popular among the participants. This particular study showed a decrease in BMI of 0.19 in the intervention group despite the short duration of the study, which was significant. The researchers noted that the use of the *promotores* in the *colonias* were pivotal to this study (Millard et al., 2010).

In the Diabetes Among Latinos Best Practices Trial (DIALBEST), a CPBR approach was used in a community that had type 2 diabetes with A1C levels of $\geq$ 7% to provide counseling and education on topics such as nutrition, physical activity, compliance with medication, and medical monitoring as well as support for food access. Community health workers were trained on how to deliver culturally tailored messages with particular importance to health literacy. This study also used interactive activities such as onsite education regarding grocery shopping and reading food labels. The education sessions were delivered at home weekly for the first

month, then bi-weekly for the next 2 months and then monthly for duration of the 12 month study. Follow up assessments occurred 6 months post intervention and the overall attrition rate was about 30%. Their results showed a reduction of A1c and FPG in the intervention group with sustained effects at the post intervention follow up (Perez-Escamilla et al., 2015).

Summary

In summary, this literature review has given the reader an overview of the current trends in obesity, particularly in Hispanics. The literature review presents background on the health disparities of Mexican Americans and the prevalence of diabetes. It presents several intervention studies targeting this population along with their methods and results. The literature also shows the current studies using CBPR and its effectiveness in the communities, especially ones similar to the Lower Rio Grande Valley. The next chapter provides a detailed description of the methods used in the current and parent study.

CHAPTER III

METHODS

The purpose of this study was to examine the effects of a 12 week dietary intervention on a sample of disadvantaged Mexican Americans living in the Lower Rio Grande Valley in Texas. The intervention outcomes were analyzed 40 weeks post baseline in order to verify whether the knowledge and behaviors were retained. This chapter provides information on the intervention program's design and methods of analysis of the outcome variables: weight, body mass index (BMI), and fasting plasma glucose (FPG), as well as provide an abridged version of the intervention topics as they relate to the research questions and hypotheses presented in Chapter I.

Data Source

The *Beyond Sabor* data collected for this study was under the direction of Dr. Elena Bastida and her research team at the University of North Texas in the Lower Rio Grande Valley during the years 2009 through 2012. The research of the parent study was approved by the Department of Health Sciences, University of North Texas Institutional Review Board. The data collected by Dr. Bastida and her team was used to investigate the questions posited by the current study.

This unique study was geared towards changing the eating habits and physical activity patterns of members of the Lower Rio Grande Valley community through the use of social cognitive theory (SCT) - described above in Chapter II. Although the parent study contained several different sources and measures of outcome variables, only weight, BMI, and FPG were selected for this analysis.

The parent study's participants were randomized into two treatment groups. One received the *Beyond Sabor* program and the control group received the Healthy Living Program. The *Beyond Sabor* program employed a community based participatory research (CBPR) approach, which has been previously described in Chapter II.

Parent Study

The parent study, *Beyond Sabor*, was a 12 week intervention program that provided the participants with a variety of presentations on health and nutrition topics while simultaneously engaging in hands-on cooking demonstrations. Participants also engaged in group physical activities. The goals of the program were to: 1) reduce overweight and obesity or to maintain the person's status as measured by weight and BMI; 2) prevent those with pre diabetes from progressing to actual diabetes as determined by FPG and A1c; and 3) improve glucose control in those who had already been diagnosed with diabetes as determined by FPG. The laboratory testing for the project was conducted by the Valley Baptist Hospital outreach mobile laboratory unit. All participants were tested while fasting.

In addition to the laboratory tests, dietary data, described below, was obtained. This was done through participant self-reporting. To ensure accuracy, visual tools were utilized thereby allowing participants to select sizes of consumption. The parent study included questions on socioeconomic status (SES) and tools to evaluate self-efficacy. The current study analyzed the intake and self-reporting sections of the parent study for the purpose of providing a perspective on how healthy eating habits influenced the selected outcome variables.

Social Cognitive Theory

As described in Chapter II, the *Beyond Sabor* project addressed several constructs within the social cognitive theory (SCT). Among these are self-efficacy, reciprocal determinism, and reinforcements. Throughout the 12 week intervention phase, as well as during its follow up stage, these constructs were used not only as verbal teaching tools, but also hands-on experience. The participants were able to experience and learn how to create healthier meals. In addition, the participants had access to local food banks in their community where the recommended foods were made available. This access to the food banks was designed as part of the study in order to also change the environment. The project also provided post intervention reinforcements that allowed the participants to continue their learned healthy behaviors and to motivate each other through various incentives described below.

Community Based Participatory Research

The basic philosophy of CBPR is to achieve change by means of a researcher/ community nexus. The researcher strives to connect with the community and not only conduct research but also make changes in its population based upon the problems identified. In essence, CBPR strives to merge academia and the needs of a community in order to promote healthy lifestyles (Hacker, 2013). The initiative is to give back to the target community and bridge collaborative partnerships in order to sustain the change in healthy behaviors.

In conducting its CBPR, the parent study's research team first identified those individuals within the community that would serve as members of the advisory committee and that would inspire the community in the aims of the project. The

investigators met with this active and engaged group of individuals to discuss and gather information that eventually led to the development of a media campaign. This campaign was to decide the best and most efficient ways to reach the community, such as print, television, or other media outlets. Also, in concert with CBPR's philosophy, was the research team's goal to change the environment by promoting access to healthier food options and walking areas.

Instruments

The instruments used in the parent study were questionnaires with self-reported data and blood samples. The study included a dietitian that performed 24 hour recalls at the time of testing. During the recall, the dietitian inquired about the participant's intake the previous day beginning with their first meal. Rather than asking complete open ended questions, the investigators, in discussion with the advisory committee, developed a questionnaire that asked about food habits and consumption. This questionnaire obtained an inter-item reliability in pilot studies of a Cronbach alpha of .76. There were additional items added that reflected the traditional foods of the region. These food habits were purposefully targeted in the intervention. It specifically asked about the person's water, soda, fruit juice, salad, fruit, vegetable, taco, gordita, tostada, and enchilada intake. The questionnaire also addressed types of tortillas i.e., flour or corn, the use of lard or oil and eating out versus at home. The dietitian showed samples of serving sizes for beverages, fruits, vegetables, and salads and the participants would identify the exact size and/or quantity consumed. These visual aids included various plate sizes, containers, cup sizes (8, 8.5, 12, 16, 20, 32, and 40 fluid ounces), and tortilla samples. The visuals

also included sizes of the traditional Mexican foods: tacos, gorditas, tostadas, and enchiladas. The instrument contained additional intake questions such coffee, tea, chips and salsa, rice, and breakfast foods. Once the participant identified the size and amount of the servings consumed, the information was recorded on the questionnaire. These measurements of the traditional Mexican foods were then classified into amounts between "one to four" and an option of "other" where the participants could write in a numerical value.

In addition to amounts, the parent study examined cooking practices. This measurement was in the form of a question asking whether the participant cooked with oil, lard, or "other." The participants were also asked if they ate out the previous day and, if so, what they ate and where. This data, along with type of soda and fruit juice, were collected, but at the time not categorized for analysis. In other words, the participants were able to write in what type of cooking medium they used, where they ate, what type of soda and juice they drank but it is not included in the present study.

ADD RELIABILITY PARAGRAPH

Questions on self-efficacy assessed the confidence level of the participant in achieving healthy eating and physical activity behaviors. Although this study did not address self-efficacy, the model is the theory of the parent study and is described in Chapter II. The investigative team obtained an inter-rater reliability factor on their recall measurement and self-efficacy questions of 0.91. This reliability factor is useful for the development of tools used in a study and for determining that the scale is the appropriate one for measuring selected independent or dependent variables.

Participant Selection Method

The sampling frame consisted of 156 community sites, of which most were from the Lower Rio Grande Valley Food Bank Network. Of these, 32 were randomly selected for the study. It must be noted that the Food Bank Network includes 222 sites and supplies food to over 300,000 individuals. However, 72 of its client sites did not meet the inclusion criteria detailed below and were therefore excluded from randomization in the study. Other sites considered include the Texas Farm Workers Union, Senior Outreach Services, La Joya Center, and the Pharr Community Outreach Program but were not used in the study.

Six to eight sites were randomly selected from the 156 community sites in preparation for each 4 month cycle of the study. The sites were then randomized a second time into the treatment or control group. Each cycle consisted of 6 or 8 sites for a total of 32 sites at the end of the study. The samplings were non-replacement samples. Once the selected site was randomized to either the treatment or control group, it was not put back in the randomization pool for selection if they left the study. This was done to maintain the quality of the design and integrity of analysis.

Criteria for Selection of Participants

Given the CBPR approach, the community advisory group established the criteria for selection of participants in collaboration with the investigator.

The inclusion criteria for both the intervention and control groups were as follows:

- Men and women, 21-72 years of age of Mexican American origin, any generation.

- Subjects had to reside in a family context (married or living with a partner, or raising children (single parent, grandparent or guardian or other possible family arrangement).
- Participants had to be free from any medical condition that prohibited them from engaging in moderate physical activity or consuming a low fat, low carbohydrate, moderately high fiber diet.
- Participants had to be willing to commit to living in the study area for 12 months, with the exception of migration of agricultural workers for 3 months in the summer, if applicable.

The exclusion criteria for both the intervention and control groups were as follows:

- BMI >40 or in poor health, which was determined by a screening evaluation at baseline.
- Inability to attend the 12 week program.
- Did not live in a family context as described above.

Recruitment and Retention

A total of 1,273 subjects were recruited by the research team. Recruitment began four weeks prior to the start of the intervention for each cycle. Flyers were posted at the selected sites and nearby neighborhoods. The flyer indicated the dates when the research team would visit to discuss protocols as well as the study goals and objectives. The research team was available to answer any questions regarding the study and its protocols. The researchers were blinded during the recruitment process and at baseline. This means that they did not have knowledge as to which site was going to be in the treatment or control group. During the initial visit, the participants

were told that there were two study programs but were not made aware if they were part of the intervention or control group. Additional flyers were posted indicating the time and date for formal recruitment, which included enrollment and participant consent.

There were 35-45 participants recruited at each site. This amount accounted for an anticipated 30% attrition rate. However, the overall attrition rate for the entire study was less than 20% for the intervention group. Sites having a larger amount (>40) of study participants were divided into sub groups and analyzed separately but still considered as one site. This meant that, for those larger sites, two educational sessions were conducted the same day at two different times.

Once recruitment was completed, baseline data, such as weight, dietary habits, physical activity, SES, clinical measures (waist circumference and blood pressure), and blood work were collected. The enrolled participants were then randomized into either the *Beyond Sabor* intervention or Healthy Living control groups. The control groups and intervention groups were randomized by site, not participants within the site.

Intervention and control group participants attended an orientation session and then signed an additional consent form relevant to the selected group outlining the commitment to the 12 week program. This group engaged in informal discussions about the logistics of the program as well as the physical activity they would like to do during the meetings. Incentives such as child care, transportation, or gas cards were provided.

Likewise, an orientation meeting was conducted at the control sites to discuss their program. The control group attended an American Diabetes Association's health program called Healthy Living where, over a 12 week period, they received 6 lectures on healthy habits. This program was lecture only with no food sampling or interaction time. The topics, however, were the same ones covered in the intervention group program.

A measurement was conducted at 12 weeks after baseline measurements. There was a follow up at 38-40 weeks post baseline. In an effort to reduce attrition rates, the participants were contacted one day ahead of time by the intervention group staff and control group staff to remind them of their assessments. Both intervention and control group participants received gift cards at each assessment points as incentives.

Beyond Sabor Program Description

This unique, culturally relevant 12 week program targeted key health and nutrition issues identified in the literature as contributing to overweight, obesity, and diabetes. As detailed in Chapter II, SCT and its constructs were the framework for the study. The construct of reciprocal determinism is shown by how the individual and the environment interact to cause a behavior change. Self-efficacy is a cognitive behavior and includes confidence and ability to change a behavior and self-regulate said behavior (Bandura, 2004). These constructs are evident in the design of the weekly sessions. Each week the participants attended a 2 hour workshop that included a didactic presentation, a cooking demonstration, and physical activity. A presentation of the week's topic was done in the first 20 minutes and was reinforced

by a cooking demonstration of the recipes presented. The following 50 minutes was an interactive application where the participants had the opportunity to cook and taste the food, as well as to learn about recipe modifications. The primary objective of the hands-on cooking experience was to encourage participants to use the new cooking skills and recipe modifications at home. The last portion (60 minutes) of the meeting was devoted to physical activity and the participants chose walking.

It is important to note that a focus group pilot study was conducted prior to the inception of the parent study to collect ethnographic observations. The results of the focus group guided the format of the *Beyond Sabor* intervention and identified the natural helpers (described in Chapter II). The focus groups obtained cultural data, recipes of traditional foods from the population, and ideas on the best practices for disseminating messages about the *Beyond Sabor* intervention.

The description and key points of the learning activities for each of the 12 weeks of the *Beyond Sabor* intervention project follow.

Week 1: The Walking Club

- This presentation was a formal introduction to the program. The focus was on the importance of consistently practicing healthy behaviors to impact weight management and disease prevention. The participants were encouraged to create their own walking club so that reinforcement and encouragement could increase the likelihood of maintaining these behaviors throughout the remainder of the week.
- The participants were given a goal card where they could log in their physical activity each day, see their progress, and set new goals each week.

- A portion of the presentation focused on how to get started, including a list of items that they should bring with them during their walking sessions. There was also information on hydration, street safety, and personal protection.

Week 2: Diabetes: What You Need to Know

- This presentation gave a basic overview of pre diabetes, type 1, type 2 and gestational diabetes along with their symptoms.
- The participants were given examples of how much sugar is in different serving sizes of sodas as well as the caloric density. This interactive demonstration focused on measuring the sugar content in various soda products.
- The overarching message in this week's presentation was to drink more water.

Week 3: Diabetes Risk Factors and Complications

- This presentation gave a much more in depth look at diabetes including risk factors, long term complications of diabetes, and prevention strategies.
- There was information about pre diabetes with an emphasis on the importance of checking blood glucose levels regularly in order to prevent progression to diabetes.
- They learned to cook beans in a healthier way, which used more flavorful seasonings as well as fat substitutions.

Week 4: The Kidneys and Water, Essential for Life

- This presentation focused on how diabetes affects the functions of the kidney and the importance of maintaining healthy blood glucose levels in order to prevent kidney failure.

- The role of water in the body and signs of dehydration were discussed.

In order to encourage increased water consumption, the participants engaged in an activity where they made water flavored with fresh fruit.

Week 5: Cholesterol, a Silent Enemy

- This presentation gave an introduction to cholesterol including the consequences of high cholesterol and the risk factors.
- The presentation included strategies for lowering cholesterol through healthier lifestyle changes.
- The participants learned how to make a "skinny taco" which included the use of fresh ingredients, vegetable oil, and corn tortillas, as well as additional items available at the food bank.

Week 6: Blessed Calories

- This presentation provided the participants with the make up of macronutrients and their calorie value.
- This presentation included the value of whole grains and high fiber selections in their daily meals.
- The interactive session taught the participants the components of a "healthy sandwich" and how to make one using the ingredients at the food bank. In addition, choosing healthier side options (i.e. apples) at the food bank instead of chips was stressed.

Week 7: Fat

- This presentation focused on the digestive process and in particular fat. The session highlighted the differences between the “good fats” and “bad fats” as well as their impact on health.
- The concept of “normal weight” and how to calculate adequate ranges was introduced.
- The participants were taught how to make a traditional Mexican “caldo resposado” while removing excess fat during the cooking process.

Week 8: Reading Nutritional Labels

- This presentation introduced the nutrition facts label, its scientific basis, and its use in making sound nutrition choices.
- The participants learned how to read the label and understand the serving size and the components of the food product.
- The interactive presentation included preparing a chicken and apple salad and incorporated what they learned about portion size from the nutrition facts label.

Week 9: Portions

- This presentation taught the participants how to utilize measuring cups and spoon and food scales to visualize healthy portions and incorporate them into their day to day meals.
- The participants learned about continuing to use the nutrition facts label as a guide.

- The interactive presentation utilized portion control using pasta, which was readily available at the food bank. They learned to incorporate more vegetables and beans into their dish, while keeping portions under control.

Week 10: Sweeteners

- This presentation was based on many questions (over the course of the program) that the participants had been having about sweeteners.
- They learned about both natural and artificial sweeteners and the impact on health.
- The interactive presentation was one of the "natural helper's" recipe for papaya bread with sugar substituted with Splenda.

Week 11: Traditional Quesadilla goes Healthy

- This presentation reinforced a basic concept of *Beyond Sabor*, which was to not sacrifice flavor for health. It reminded the participants that they can create traditional Mexican food while retaining its flavor and roots.
- The participants were taught the benefits of incorporating corn tortillas into their cooking and using less flour tortillas. A lot of information on the breakdown and comparison of calories using corn versus flour tortillas was provided.
- The participants learned how to make a healthier quesadilla utilizing fresher ingredients and cooking techniques that they had learned throughout the program.

Week 12: Eating and Taking Out

- This culminating presentation offered the participants the option of eating in a restaurant or sharing a pizza from a take-out restaurant to show the research team the concepts and healthy habits they had learned during this intervention.
- The participants were able to apply the knowledge gained throughout the intervention to make healthier choices both at a restaurant and ordering food for home.
    - Several topics were reinforced, such as healthier selection of fat, reviewing the menu, and healthy ethnic choices during this interactive session.
    - During the option of ordering from home, several topics such as portion control and choosing a healthier pizza were discussed.
- This experience was also where the research team was able to have an "informal chat" with the participants and review all of the major concepts throughout the intervention. This was especially useful for the participants to be able to give their feedback to the team and reiterate all that they have learned. There was qualitative data collected here but not yet analyzed.

Current Study

The goal of the current study was to determine what factors, if any, had significant changes in the dependent variables, weight, body mass index (BMI), and fasting plasma glucose (FPG) of Mexican Americans in the Lower Rio Grande Valley. Towards that end, the current study extracted the dietary and dependent

variables from the data of the parent study, at T1, T2, and T3 (baseline, post and 40 week follow up) from all of the participants.

The dietary data of interest were described in the hypotheses in Chapter I and measured via quantities of food consumed the day before.

As mentioned before, several other measures such as physical activity, self-efficacy, as well as a variety of other SES variables were contained in the database but were not used in the current study including caloric analysis. The data were cleaned to ensure that correct numbers and/or dummy variables were available in each cell thereby securing viable data for analysis. Florida International University's Institutional Review Board approved the study.

Statistical Analysis

The descriptive analyses focused on the amounts of soda, juice, water, fruits and vegetables, salad, corn and flour tortillas that were consumed the previous day. In addition, the use of oil and lard for cooking at home and frequency of eating out was analyzed. These variables were selected consistent with the 12 weekly sessions and goals of the parent study which were to: 1) increase water, fruit, vegetable, salad, and corn tortilla consumption as well as decrease juice and soda consumption; 2) teach healthier cooking methods and recipe modifications; and 3) to control weight and manage or prevent diabetes.

As previously stated, estimates of serving sizes in ounces were obtained for reported beverages using visual representations of the typical serving sizes in the foods and beverages on the questionnaire. For example, the researcher had several visual samples of soda, water, and juice cups and plates of fruit, vegetable, and salad

so that the participant could identify the actual amount they ate the day before. Also, the intake data contained a variety of sizes of tortillas - both flour and corn - for identification. The serving size was then multiplied by the amount of servings for the analysis. The estimation of these measures allowed the researcher to perform a more rigorous statistical analysis resulting in a more accurate output for interpretation. The various sizes of the tortillas that were shown to the participants were converted into ounces using the USDA Food and Nutrient Database (2016). The descriptive statistics for the tacos, gorditas, tostadas, and enchiladas, were also analyzed.

Using IBM SPSS statistics 20, the study first analyzed the frequency of consumption of the below listed food variables from each of T1, T2 and T3 participants' assessments in the parent study. The use of T1, T2, and T3 were for the purpose of representing baseline, post intervention and 40 week follow up. The frequencies of each of the variables and a detailed description of the sample will be discussed in the beginning of Chapter IV. For the consumption of tacos, gorditas, tostadas, and enchiladas, only baseline frequencies, ranges, means, and standard deviations were reported because the current study is not measuring change in these foods over time. T-tests were conducted to compare the means and SD of the control and treatment groups at baseline for the outcome variables, weight, BMI, and FPG. To explore differences between treatment and control groups at baseline, chi-square tests were done for gender, BMI, and FPG. The categories for BMI and FPG were based on the standards listed below.

To test Research Question #1, a repeated measures ANOVA (Analysis of Variance) were conducted to determine the change in each of the food consumption

behaviors over T1, T2, and T3 in both the control and treatment groups. These analyses provide information on statistical significance, which were measured using a value of p=< .05. The repeated measures ANOVA allowed treatment and control groups to be compared and identified a difference between groups and a difference over time.

For purposes of analyses of beverage and tortilla consumption, the responses were divided into ounces so that the variable was not categorical but continuous. There were chi-square tests for the variable of "eating out" where the treatment and control groups were compared at T1, T2, and T3. The data was analyzed determining those participants who ate out at baseline (yes or no) and by whether they ate out at T2 and T3 (yes or no). This analysis was reported for both treatment and control groups to examine a significant difference at not only time intervals but between both groups.

Finally, to answer question #2, a repeated measures ANOVA was employed to examine change in weight, FPG, and BMI over T1, T2, and T3. Each hypothesis, weight, FPG, and BMI was examined individually to determine if there was a significant difference between the treatment and control groups at each time interval. The variables were tested to see if there was a significant difference between the treatment and control group -independent of time -which can examine the overall efficacy of the intervention in comparison to the control group. This analysis also compared the treatment and control group for both time and group interactions and determined if the groups significantly differed at time intervals and between groups.

Variables

The food variables examined in the current study are listed below. Each were measured in 8, 8.5, 12, 16, 20, 32, or 44 fluid ounces and the amounts of servings as reported by the participant based on the previous day's consumption. Eating out and whether oil or lard was used for cooking were categorical variables and analyzed as described above.

- Soda Consumption
- Juice Consumption
- Water Consumption
- Fruit Consumption
- Vegetable Consumption
- Salad Consumption
- Taco, Gordita, Tostada, Enchilada Consumption
- Eating Out
- Corn Tortilla Consumption
- Flour Tortilla Consumption
- Oil Used for Cooking
- Lard Used for Cooking

Other variables analyzed are listed below and all are reported as continuous. However, for analysis and reporting standardized categories for BMI were used: normal (18.5-24.9), overweight (25.0-29.9), and obese (30.0-39.9). For FPG, the categories were normal (<110 ml/dL), pre diabetes (110-125 ml/dL), and diabetes ($\geq$126 ml/dL).

- Weight (kilograms)

- Fasting Plasma Glucose (milliliters/deciliter)
- BMI

Additional Analysis

After the above variables were analyzed using chi-square, t-test, frequencies, and repeated measures ANOVA, several post hoc analyses were conducted to provide additional information. Chi square was used to determine if those that had significant decreases with regard to weight, BMI, and FPG, were on medication to control chronic diseases such as diabetes and cardiovascular disease. Analyses also compared those that took medication for lowering cholesterol and those who did not, and those who took insulin and those who did not. These analyses are presented in Chapter IV.

Summary

The sample utilized was from the Lower Rio Grande Valley and comprised primarily of Mexican Americans as described in Chapter II. The current study was designed to provide valuable information on the nutrition consumption trends of the selected intake variables, including beverages, fruits and vegetables, and salad consumption of this population. Additional variables such as eating out, traditional Mexican food consumption, use of lard for cooking, and type of tortillas consumed were also used to describe the food habits of this population.

The data analysis in Chapter IV provides information on the frequency of consumption and the changes in consumption over baseline (T1), post intervention (T2), and follow up (T3). The analysis methods were designed to determine if both

the treatment and control groups changed over time, if the groups changed independently, or if the groups changed over time and independently.

CHAPTER IV

RESULTS

The purpose of this study was to examine the effects of a 12 week dietary intervention on a sample of disadvantaged Mexican Americans living in the Lower Rio Grande Valley in Texas. The variables selected to indicate change in outcomes in the post intervention and follow up were: consumption of water, soda, fruit juice, fruit, vegetables and salad. as well as weight, body mass index (BMI), and fasting plasma glucose (FPG). Other variables analyzed were the use of oil, eating out behaviors and increases in substitution of corn tortillas. This chapter begins with descriptive statistics so that a baseline examination of the population is established. The hypotheses are then presented using a repeated measures Analysis of Variance (ANOVA) to determine significant changes within different times and/or with the control and treatment groups.

Descriptive Statistics

Study participants (n= 1,273) were 19.7% male and 80.3% female with a mean age of 45.39 (SD= 14.37) years. The level of education reported in years, was a mean of 8.62 (SD= 4.26). In addition, at baseline, the weight in kg was 78.92 (SD=

18) and BMI was 31.48 (SD= 6.7). The BMI categories for participants at baseline were 0.9% underweight, 13.3% normal, 30.9% overweight, and 54.9% obese. The average FPG for participants was 127.8 (SD= 51.14). Approximately 18% of participants were considered in the normal category for glucose; 52.9% had pre diabetes and 28.1% had diabetes. Standard categories for BMI were used: normal (18.5-24.9), overweight (25.0-29.9), and obese (30.0-39.9). For FPG, the standard categories used were: normal (<110 ml/dL), pre diabetes (110-126 ml/dL), and diabetes (>126 ml/dL).

Participants having desirable cholesterol levels were 56.3%; 20.8% had borderline levels and 22.6% had high cholesterol. Most participants were married (68.1%), and 3.9% were single. The remaining 18% reported being either separated, living with a partner, or widowed. (See Table 1)

Table 1

Summary of Variables of Interest at Baseline

	N	Range	Mean	SD
Age	1050	18-72	45.39	14.37
Education	1039	0-22	8.92	4.26
Weight (kg)	1049	40.6-173.8	78.92	17.99
Body Mass Index	1049	15.45-82.95	31.48	6.71
Fasting Plasma Glucose	1035	44-457	127.81	51.14

Participants' baseline eating habits are described in Tables 2 and 3 below. The mean fruit consumption was 2.98 ounces (SD= 4.89) and vegetable consumption

was 2.84 ounces (SD= 4.86) per day. The total salad consumption was 3.58 ounces (SD= 5.82) per day. The total soda consumption was 9.64 ounces (SD= 14.79), total juice consumption was 5.34 (SD= 11.6), and total water consumption was 66.79 ounces (SD= 53.9) per day. In addition, the total consumption of corn tortillas was 1.39 ounces (SD= 1.96) and flour tortilla consumption was 0.85 ounces (SD= 2.19) per day at baseline.

Table 2

Selected Intake Variables at Baseline

	N	Range	Mean	SD
Fruit (oz.)	1032	0-18	2.98	4.89
Vegetable (oz.)	1032	0-18	2.84	4.86
Salad (oz.)	1032	0-18	3.58	5.82
Juice (oz.)	1019	0-132	5.34	11.6
Soda (oz.)	1023	0-176	9.64	14.79
Water (oz.)	970	0-384	66.79	53.9
Corn Tortillas (oz.)	1030	0-20	1.39	1.96
Flour Tortillas (oz.)	984	0-20	0.85	2.19

At baseline, 94.2% of participants cooked with oil and only 1.4% used both oil and lard. In contrast to the 989 participants who reported cooking with oil, only 3 reported using lard which totaled 0.3% of the group. Only 16.9% of subjects reported eating out on the day prior to baseline assessment. Thirty five percent of participants reported not consuming any corn tortillas and 58.4% reported consuming 1-6 corn tortillas per day. Whereas, 75.4% reported not consuming flour tortillas and 22.8%

reported consuming 1-5 flour tortillas per day. Investigators were eager to examine the extent to which the group consumed traditional and highly caloric Mexican foods on a given day. Thus, 80% of participants reported not consuming tacos while 20% consumed at least 4 tacos per day. The average consumption of tacos per day was M= 0.54 (SD= 1.24). Similarly, 96.7% of participants reported not consuming any gorditas while 3.4% consumed at least 4 gorditas. The average consumption of gorditas per day was M= .06 (SD= .08). For tostada consumption, 94.4 % reported not consuming tostadas and 5.6% reported consuming at least 4 tostadas. The average consumption of tostadas per day was M= .13 (SD= .61). Finally, 98% did not consume enchiladas on the prior day and 2.3% reported consuming at least 4 enchiladas. The average consumption of enchiladas per day was M= .06 (SD= .45). (See Table 3)

Table 3

Selected Traditional Food Intake Values at Baseline

	N	Range	Mean	SD
Tacos	1031	0-5	0.54	1.24
Gorditas	1032	0-4	0.06	0.38
Tostadas	1031	0-5	0.13	0.61
Enchiladas	1031	0-5	0.06	0.45

Comparison of Treatment and Control Groups

Chi-square and t-tests were performed to examine differences in the treatment and control groups at baseline (Table 4). For age, the control and treatment groups did differ (t= 2.54, p= .01) with the treatment group being older. The gender of the groups did not differ (chi-square= 1.51, p= .25). Weight of the participants differed slightly (t= -2.00, p= .05) with the control group being higher. At baseline there was no difference in BMI category (chi-square= 6.91, p= .08). In looking at t-tests and chi-squares for differences between the groups at baseline with regard to BMI and FPG, the groups showed no differences (t= -.83, p= .41; t= -.05, p= .96; chi-square = 2.69, p= .26).

Table 4

Means and Standard Deviation of Treatment and Control Groups at Baseline

	Treatment Group Mean (SD)	Control Group Mean (SD)	*t*	P value
Age	46.53 (14.83)	44.28 (13.83)	2.54	0.01
Weight (kg)	77.79 (18.2)	80.01 (17.74)	-2.00	0.046
Body Mass Index	31.30 (6.68)	31.65 (6.73)	-0.83	0.41
Fasting Plasma	127.73 (48.65)	127.88 (53.48)	-0.05	0.96

Repeated Measures Analysis of Variance

Repeated measures ANOVA was used to determine differences between the control and intervention groups across time - baseline (T1), 12 week post intervention (T2), and 40 week follow-up for dietary outcome variables (T3). These times are reported in tables 6-13. All tests were computed using a significance of p= .05. The means and SDs are reported for T1, T2, and T3. The measures reported for water, soda, fruit juice, and fruit and vegetable consumption are in ounces.

Research Question 1: Did the 12 week community based intervention improve the eating habits and/or food behaviors in a sample of Mexican American adults living in the Lower Rio Grande valley in comparison to the control group? If there was an improvement, were those eating habits and/or food behaviors maintained at the 40 week post intervention follow up?

Hypothesis #1.1: Participants in the intervention group will have a significant increase of water and a decrease in fruit juices and sodas in comparison to the control group.

When looking at the control and treatment groups together, there was a significant time effect for ounces (oz.) of soda consumption ($F= 8.48$, $p< .001$) with a significant decrease in soda consumption between baseline and post intervention ($p= .002$), and baseline and follow up ($p< .001$) ($M= 8.64$ $SD= 12.94$, $M= 5.55$ $SD= 9.57$, $M= 6.38$ $SD= 9.78$; respectively). When comparing the treatment and control group irrespective of time, there was a significant group effect ($F= 9.28$, $p= .002$) with those in the treatment group reporting less soda consumption than those in the control group ($M= 6.05$, $SD= .44$ vs. $M= 8.23$, $SD= .57$). There was a significant group by time interaction effect ($F= 4.03$, $p= .02$) with those in the treatment group decreasing their consumption of soda more so than those in the control group. (See Table 5)

When looking at the control and treatment groups together, there was a significant time effect for ounces of juice consumption ($F= 3.12$, $p= .045$) with a significant decrease in juice consumption from post intervention to follow up ($p= .01$) ($M= 6.55$, $SD= 10.51$ vs. $M= 5.03$, $SD= 9.18$). When comparing the treatment and control group irrespective of time, there was not a significant group effect ($F= .022$, $p= .88$). Both groups had similar consumption: treatment group ($M= 5.83$, $SD= .38$) and control group ($M= 5.74$, $SD= .49$). There was not a significant group by time interaction effect ($F= .31$, $p= .74$) for juice consumption. (See Table 6)

When looking at the control and treatment groups together, there was not a significant time effect for ounces of water consumption ($F= .52$, $p= .59$) with a

similar consumption from baseline to follow up (M= 65.04, SD= 48.2 vs. M= 63.01, SD= 41.30). When comparing the treatment and control group irrespective of time, there was not a significant group effect (F= .07, p= .80). Both groups had similar consumption: treatment group (M= 64.39, SD= 2.06) and control group (M= 63.54, SD= 2.59). There was not a significant group by time interaction effect for water consumption (F= .91, p= .40). (See Table 7)

Table 5

Repeated Measures ANOVA Comparing Treatment and Control Groups on Soda Consumption

	Treatment Group (n=317) Mean (SD)			Control Group (n=187) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Soda Consumption (oz.)	8.30 (13.38)	4.05 (7.16)	5.78 (9.51)	9.20 (12.16)	8.08 (12.27)	7.40 (10.16)

Table 6

Repeated Measures ANOVA Comparing Treatment and Control Groups on Fruit Juice Consumption

	Treatment Group (n=319) Mean (SD)			Control Group (n=188) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Fruit Juice Consumption (oz.)	5.63 (11.01)	6.70 (9.97)	5.15 (8.87)	6.11 (11.35)	6.30 (11.37)	4.81 (9.70)

Table 7

Repeated Measures ANOVA Comparing Treatment and Control Groups on Water Consumption

	Treatment Group (n=262) Mean (SD)			Control Group (n=166) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Water Consumption (oz.)	65.22 (47.12)	63.13 (42.86)	64.82 (40.60)	64.75 (50.00)	65.73 (57.66)	60.14 (42.34)

Hypothesis #1.2: Participants in the intervention group will have a significant increase in consumption of fruits in comparison to the control group.

When looking at the control and treatment groups together, there was a significant time effect for ounces of fruit consumption ($F= 15.32$, $p< .001$) with a significant increase in fruit consumption between baseline and post intervention ($p= .002$), an increase between baseline and follow up ($p= .03$) and an increase between post-intervention and follow-up ($p< .001$) ($M= 2.96$ $SD= 4.81$, $M= 3.82$ $SD= 5.17$, $M= 4.48$ $SD= 4.90$, respectively). When comparing the treatment and control group irrespective of time, there was not a significant group effect ($F= 2.91$, $p= .09$) with those in both groups (treatment and control) reporting similar consumption ($M= 3.95$, $SD= .19$ vs. $M= 3.42$, $SD= .25$) There was no significant group by time interaction effect ($F= .02$, $p= .98$). (See Table 8)

Hypothesis #1.3: Participants in the intervention group will have a significant increase in consumption of vegetables in comparison to the control group.

When looking at the control and treatment groups together, there was a significant time effect for ounces of vegetable consumption ($F= 3.16$, $p= .04$) with a significant increase in vegetable consumption between baseline and post intervention ($p= .01$) ($M= 2.78$ $SD= 4.82$ vs. $M= 3.49$ $SD= 4.92$). When comparing the treatment and control group irrespective of time, there was not a significant group effect ($F= 3.63$, $p= .06$) with those in both groups (treatment and control) reporting similar consumption ($M=3.31$, $SD= .17$ vs. $M= 2.77$, $SD= .22$) There was not a significant group by time interaction effect ($F= .01$, $p= .99$). (See Table 9)

Table 8

Repeated Measures ANOVA Comparing Treatment and Control Groups on Fruit Consumption

	Treatment Group (n=323) Mean (SD)			Control Group (n=193) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Fruit Consumption (oz.)	3.16 (4.91)	3.99 (5.13)	4.70 (5.03)	2.63 (4.60)	3.52 (5.24)	4.11 (4.66)

Table 9

Repeated Measures ANOVA Comparing Treatment and Control Groups on Vegetable Consumption

	Treatment Group (n=331) Mean (SD)			Control Group (n=191) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Vegetable Consumption (oz.)	4.00 (6.02)	4.35 (5.70)	3.82 (5.41)	4.08 (6.10)	3.47 (5.43)	3.85 (5.27)

Hypothesis #1.4: Participants in the intervention group will have significant increase in consumption of salad in comparison to the control group.

When looking at the control and treatment groups together, there was not a significant time effect for salad consumption (F= .19, p= .82) with no significant changes in salad consumption between baseline, post intervention and follow up (M= 4.03 SD= 6.05, M= 4.03 SD= 5.62, M= 3.83 SD= 5.35). When comparing the treatment and control group irrespective of time, there was not a significant group effect (F= .54, p= .46) with those in the both groups (treatment and control) reporting similar consumption (M= 4.06, SD= .21 vs. M= 3.81, SD= .28) There was not a significant group by time interaction effect (F=1.36, p= .26). (See Table 10)

Hypothesis #1.5: Participants in the intervention group will have a significant increase in consumption of corn tortillas in comparison to the control group.

When looking at the control and treatment groups together, there was not a significant time effect for corn tortilla consumption (F= 1.74, p= .18) with no significant changes in corn tortilla consumption between baseline, post intervention and follow up (M= 1.28 SD= 1.99, M= 1.15 SD= 1.66, M= 1.34 SD= 1.81). When comparing the treatment and control groups irrespective of time, there was not a significant group effect (F= 3.13, p= .77) with those in both groups (treatment and control) reporting similar consumption (M= 1.34, SD= .07 vs. M= 1.17, SD= .10). There was not a significant group by time interaction effect (F= 1.33, p= .26). (See Table 11)

Table 10

Repeated Measures ANOVA Comparing Treatment and Control Groups on Salad Consumption

	Treatment Group (n=330) Mean (SD)			Control Group (n=191) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Salad Consumption (oz.)	4.00 (6.02)	4.35 (5.70)	3.82 (5.41)	4.08 (6.10)	3.47 (5.43)	3.82 (5.26)

Table 11

Repeated Measures ANOVA Comparing Treatment and Control Groups on Corn Tortilla Consumption

	Treatment Group (n=331) Mean (SD)			Control Group (n=189) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Corn Tortilla Consumption (oz.)	1.32 (2.18)	1.20 (1.67)	1.48 (1.85)	1.20 (1.58)	1.06 (1.65)	1.09 (1.71)

Hypothesis #1.6: Participants in the intervention group will substitute cooking oil for lard more frequently in comparison to the control group.

As described previously, most of the participants did not use lard when they cook. There was not enough data to conduct analyses for this hypothesis.

Hypothesis #1.7: Participants in the intervention group will significantly reduce their frequency of eating out in comparison to the control group.

Of the 74 people in the treatment group that ate out at baseline, 28 participants (37.84%) ate out at post intervention. Of the 318 participants in the treatment group who did not eat out at baseline, 53 (16.67%), did eat out at post intervention (chi-square= 16.41, p< .001). Of the 62 participants in the treatment group who ate out at baseline, 21 (33.87%), ate out at follow-up (chi-square= 14.40, p< .001). Of those 259 participants in the treatment group that did not eat out at baseline, 35 (13.51%) ate out at follow-up.

Of the 52 participants in the control group that ate out at baseline, 21 (40.38%) ate out at post intervention. Of the 283 participants in the control group who did not eat out at baseline, 43 (15.19%), did eat out at post intervention (chi-square= 18.04, p< .001). Of the 25 participants in the control group that ate out at baseline, 9 (36.00%) ate out at follow-up. Of the 147 participants in the control group who did not eat out at baseline, 29 (19.73%), did eat out at follow-up (chi-square= 3.29, p= .07).

Although some participants in the treatment group that did not report eating out at baseline reported eating out at post intervention and/or follow-up, there was a significant reduction in the proportion of those who ate out at post intervention and

follow-up. For the control group, although some subjects that did not report eating out at baseline, they reported eating out at post intervention. There was a significant reduction in the proportion of subjects who ate out at post intervention. There was no significant difference for the control group when comparing subjects at baseline and follow-up.

Research Question 2: Did the intervention group decrease their weight, BMI, and FPG when compared to the control group?

Hypothesis #2.1: Participants in the intervention group will have a significant decrease in weight in comparison to the control group.

There was a significant time effect for weight loss (F= 6.11, p= .002) with a significant decrease in weight (kilograms) from baseline to post intervention (p= .004) and post intervention to follow up (p= .03) (M= 78.79, SD= 18.48, M= 78.25, SD= 17.94, M= 78.69, SD= 18.17 respectively). When looking at the control and treatment groups together, irrespective of time, there was a significant group effect (F= 4.56, p= .03) with the treatment group weighing less than the control group (M= 77.36, SD= .972 vs. M= 80.91, SD= 1.35). There was not a significant group by time interaction effect (F= 2.05, p= .13). (See Table 12)

Hypothesis #2.2: Participants in the intervention group will have a significant decrease in BMI in comparison to the control group.

When looking at the control and treatment groups together, there was a significant time effect for BMI (F= 6.06, p= .003) with a decrease in BMI between baseline and post intervention (p= .003) but an increase in BMI between post-intervention and follow up (p= .03) (M= 31.47 SD= 6.60, M= 31.26 SD= 6.40, M=

31.44 SD= 6.51). When comparing the treatment and control group irrespective of time, there was not a significant group effect (F= 3.40, p= .66) with those in the both groups (treatment and control) having a similar BMI (M= 31.01, SD= .35 vs. M= 32.11, SD= .48, respectively) There was not a significant group by time interaction effect (F= 2.31, p= .10). (See Table 12)

Hypothesis #2.3: Participants in the intervention group will have a significant decrease in FPG in comparison to the control group.

When looking at the control and treatment groups together, there was a significant time effect for FPG (F= 11.46, p< .001) with a decrease between baseline and post assessment (p< .001), and a decrease between baseline and follow-up (p< .001) (M= 124.34 SD= 42.15, M= 121.00 SD= 37.72, M= 119.70 SD= 42.11, respectively). When comparing the treatment and control group irrespective of time, there was a significant group effect (F= 4.76, p= .03) with those in the treatment group having lower FPG levels (M= 118.84, SD= 2.19 vs. M= 126.88, SD= 2.96). There was not a significant group by time interaction effect (F= .70, p= .50). (See Table 12)

Table 12

Repeated Measures ANOVA Comparing Treatment and Control Groups on Outcome Variables

	Treatment Group (n=342) Mean (SD)			Control Group (n=178) Mean (SD)		
	Time 1	Time 2	Time 3	Time 1	Time 2	Time 3
Weight (kg)	77.69 (18.55)	76.94 (18.04)	77.44 (18.40)	80.89 (18.22)	80.76 (17.51)	81.07 (17.50)
BMI	31.14 (6.70)	30.84 (6.52)	31.05 (6.67)	32.09 (6.37)	32.05 (6.09)	32.18 (6.13)
FPG	121.09 (33.54)	118.40 (32.66)	117.02 (37.02)	130.30 (54.09)	125.74 (45.27)	124.60 (49.85)

Additional Analysis:

Additional analyses were conducted to determine if those participants who had a decrease in cholesterol and FPG were on medication to decrease these measures. These analyses were conducted after the initial analyses to understand the effect of the medication in addition to the intervention.

Of those who decreased their FPG (n= 344), 339 subjects had complete medication data. For those (n= 339), chi-square analysis was used to determine the proportion of participants in the control and intervention groups who were on insulin. There was a significant difference between the two groups, (chi-square= 4.45, p= .04) with those in the control group being more likely to be on insulin than those in the treatment group (13.64% vs. 6.76%). There were only 14 participants in the treatment group and 18 in the control group that reported taking insulin. It should be noted that most people with type 2 diabetes do not take insulin, but rather, oral medications.

Of those who decreased their cholesterol levels (n= 398), 389 had complete medication data. For those (n= 389), chi-square analysis was used to determine the proportion of participants in the control and intervention groups who were taking cholesterol medication. There was no significant difference between the two groups (chi-square= .19, p= .68) with those in the treatment group not likely to be taking cholesterol medication (16.43% vs. 14.83%).

Summary of Findings

This chapter examined the findings from the *Beyond Sabor* intervention and the changes in selected variables that were observed at baseline, post intervention and

40 week follow up. In summary, there were significant decreases in soda consumption, fruit juice consumption, weight, BMI, and FPG for participants in both the treatment and control groups across time. There were significant increases in fruit and vegetable consumption in both groups together across time. In addition, soda consumption decreased to a greater extent for those in the treatment group versus the control group. Lastly, there were significant group by time differences for those in the treatment group decreasing soda consumption more than those in the control group. The frequency for eating out was significantly reduced for those in the treatment groups. For the control group, the results were not significant. It should be noted that in both groups, the amount of participants that reported eating out the day before was small in relation to the sample size. These results will be further discussed and put into the context of the literature in the following chapter.

CHAPTER V

DISCUSSION

The purpose of this study was to examine the effects of a 12 week dietary intervention on a sample of disadvantaged Mexican Americans living in the Lower Rio Grande Valley in Texas.

This chapter provides the reader with current trends and findings in the literature and compares these findings to the research questions and hypotheses of the current study. This chapter has many themes that overlap, such as: lifestyle interventions, use of community based participatory research (CBPR), and social cognitive theory (SCT). The term "lifestyle interventions" in the current literature include both diet and physical activity. The outcome variables are consistent throughout the literature and are usually weight, BMI, FPG, A1c, and management of chronic diseases (Schwingel et al., 2015).

The parent study used SCT constructs of reciprocal determinism and self-efficacy as the theoretical framework, which addresses social and environmental factors for behavior change (Bandura, 2004). The study also employed CBPR in the development and execution of the study and, as part of that design, used *natural helpers* in disseminating the healthy messages to the participants. These *natural helpers* serve the role referenced in the literature as a community health worker. In other literature associated with Hispanic communities, the term *promotoras* is used (Millard et al., 2010; Balcazar, 2010; Nichols, Berrios & Samar, 2005). The *natural helpers* in *Beyond Sabor* emerged as group leaders and were part of the advisory committee discussed in Chapter IV. Studies have successfully used CBPR in

underserved communities, such as the Lower Rio Grande Valley, thus further providing the efficacy of this approach (Millard et al., 2013; Ryabov & Richardson, 2011). These interventions have been designed to target both healthier eating behaviors and increase physical activity through engagement and improvement in the target community (Reininger et al., 2014; Perez-Escamilla et al., 2014, Fawcett et al., 2013; Wilcox et al., 2013; Balcazar et al., 2010). The summary of this study further expands on the efficacy of the use of SCT as a theoretical framework and CBPR in the design of the study and its significant outcomes. The significance of the current study as it relates to the statement of the problem, how this study benefits health promotion in this community, and future research are discussed later in this chapter.

Research Questions and Hypothesis

Research Question #1: Did the 12 week community based intervention significantly improve the eating habits and/or food behaviors in a sample of Mexican American adults living in the Lower Rio Grande Valley in comparison to the control group? If there was an improvement, were those eating habits and/or food behaviors maintained at the 40 week post intervention follow up?

Hypothesis #1.1: Participants in the intervention group will have a significant increase of water and a decrease in fruit juices and sodas in comparison to the control group.

The current study found significant decreases in soda and fruit juice consumption, however there were no significant increases in water consumption in this sample. Three studies in Mexican Americans have been able to reduce sweetened beverage consumption and increase water consumption through a range of

mechanisms (Rodriguez-Ramirez, 2015; Bacardi, Perez-Morales, & Jimenez-Cruz, 2012; Bender, Nader, Kennedy, & Gahagan, 2013). Bender and colleagues (2013), and Bacardi and colleagues (2012) used community engagement and school intervention approaches among parents and children that resulted in reductions in soda and other sugary drinks, including modest reductions in 100% juice, along with significantly increased consumption of water. Other studies looked at substituting water for sugar sweetened beverages with the outcome variables being weight and triglycerides. Their findings included that water consumption did increase but there were no changes in metabolic parameters (Hernandez-Cordero & Popkin, 2015; Hernandez-Cordero et al., 2014). The current study finds that although water did not significantly increase, other outcome variables were found to be significant. Akers and colleagues found that an intervention approach directed at consuming 16 ounces of water, pre meal, three times per day was associated with benefits in weight change. Their findings were attributed to a self-monitoring, or self-regulation model, and significantly increased water consumption in the intervention group (Akers, Cornett, Savla, Davy, & Davy, 2012). Another approach that has shown some success is the delivery of water to homes in Mexico, along with nutrition education. This has shown increased water consumption and reduction in sweetened beverage consumption (Rodriguez-Ramirez, 2015). While this type of intervention may not be feasible in the U.S., it represents a potential approach. These studies suggest that intervening with culturally appropriate, community or school-based approaches might be most effective among Mexican American samples.

Hypothesis #1.2: Participants in the intervention group will have a significant increase in consumption of fruits in comparison to the control group.

Hypothesis #1.3: Participants in the intervention group will have a significant increase in consumption of vegetables in comparison to the control group.

Hypothesis #1.4: Participants in the intervention group will have a significant increase in consumption of salad in comparison to the control group.

The current study found that there were significant increases in fruit and vegetable consumption in both groups at baseline and post intervention. Both the treatment and control group changed the amounts of fruits and vegetables they consumed before and after the intervention. The changes in the control group may be attributed to the nutrition education sessions and access to the food bank. There were only 6 nutrition education sessions in the control group but the topics covered were similar to those in the treatment group. The Food Bank had provided access to local food pantries with fruits and vegetables to all participants; thus changing their environment and the ability to utilize these ingredients in meal planning and cooking.

Studies show increases in fruit and vegetable consumption in Hispanics by implementing lifestyle intervention programs that include both nutrition education and physical activity (Ayala et al., 2015; Ayala, Baquero, Laraia, Ji & Linnan, 2013; Grimm et al., 2012). The current study supported these results and used both nutrition education to teach the benefits of fruit and vegetable consumption; but also showed the participants how to incorporate them into meals by demonstration. Current interventions designed to increase fruit and vegetable consumption have focused on CBPR in most minority communities. The studies show that vehicles

such as churches, schools, grocery and corner stores are providing positive dietary changes (Ayala et al., 2015; Ayala, Baquero, Laraia, Ji & Linnan, 2013; Tussing-Humphreys, Thompson, Mayo, & Edmond, 2013; Quandt, Dupius, Fish & D'Agostino, 2013; Grimm et al., 2012). This CBPR approach has yielded improvements; therefore, changing the environment of the underserved community can change fruit and vegetable consumption due to the access to healthier foods. Much of the literature shows the significant outcomes of addressing the community in achieving positive results. Additional studies found similar outcomes in Hispanic children with access to vegetables through a federally funded program or through modifying school curriculums to teach healthier food choices and physical activity. The children showed increases in vegetable consumption and a decrease in soda, sugary snacks, and fast foods (Kasier et al., (2014), Bacardi-Gascon, Perez-Moralez, & Jimenez-Cruz, 2012).

In contrast, another study showed that higher intakes of fruit, but not vegetables, were associated with a lower risk of becoming overweight. This study had a limitation in its findings in that the women had a normal BMI at baseline (Raitianen et al., 2015). There are very few studies on fruit and vegetable interventions, in particular in underserved or high risk communities, where the participants had normal BMI levels at baseline. The current study did not have these normal BMI measures at baseline and therefore, the comparison between studies should not be made.

The current study did not find any significant findings with respect to salad consumption. After reviewing the literature, there is little to no data on interventions

including only salad. This is likely due to the fact that salad is associated with vegetable consumption and is not treated as a separate variable for analysis.

Hypothesis #1.5: Participants in the intervention group will have a significant increase in consumption of corn tortillas than those in the control group.

The current study did not find any significant results with the frequency of corn tortilla consumption. Over half of the study participants reported consuming corn tortillas at baseline. One of the goals of the sessions was to increase the use of corn versus flour tortillas in traditional Mexican dishes. At baseline, 80% reported not consuming flour tortillas. This may be the reason for insignificant results for this hypothesis. There is limited literature on consumption trends of corn tortillas alone. There is evidence to show negative metabolic responses in Mexican Americans that adopt more U.S. food items in their diet. The Mexican diet which includes beans, corn tortillas, vegetables, fruits, and soups is considered healthier (Santiago-Torres, 2016).

Hypothesis #1.6: Participants in the intervention group will substitute cooking oil for lard more frequently in comparison to the control group.

The current study did have enough data to analyze the differences between oil and lard for cooking due to the small amount of individuals who reported using lard to prepare foods. A qualitative focus group study collected data on the food preparation behaviors of 21 Mexican American mothers. They did report the use of lard in their cooking of traditional Mexican foods. The study did find several themes among the reported factors influencing food preparation such as social, cultural, self-

efficacy, and meal planning (Smith et al., 2015). These results of the use of lard cannot be compared to the current study due the difference in sample sizes.

The parent study used the construct of self-efficacy throughout the weekly lessons. It also included interactive healthy preparation methods, or healthy food substitutions for traditional Mexican foods. One of the sessions in the *Beyond Sabor* program specifically taught participants about the use of lard in traditional Mexican cooking. The reinforcement of learning to prepare culturally relevant foods in a healthier way may lead to sustainable changes in lower caloric consumption.

Hypothesis #1.7: Participants in the intervention group will significantly reduce their frequency of eating out in comparison to the control group.

Of those who did eat out at baseline, there was a significant change in the amount of participants who ate out at post intervention and follow-up. Only a small sample of those in the intervention group reported eating out at baseline (n=74), therefore, small changes may not have been seen in the statistical analysis. This could be attributed to the phrasing of the question in the parent study questionnaire, which asked about eating out habits the day before and did not reflect usual eating out patterns of the participants. The association of fast food consumption and increase in total caloric intake and weight status has been widely studied (Dunn, Sharkey, & Horel, 2011; Moore, Diez-Roux, Nettleton, Jacobs, Franco, 2009). The current study's findings support the literature of decreasing fast food consumption as a way of reducing calories. Interestingly, a study conducted in central Texas, Brazos Valley, utilized data from the Behavioral Risk Factor and Surveillance Survey to show the amount of fast food locations near the county for whites and non-whites.

Their data showed that non-whites, which includes blacks and Hispanics, have greater access to fast food restaurants and thereby higher rates of obesity (Dunn, Sharkey, & Horel, 2011). To further examine the eating out patterns of the current population, it may be more useful to ask about the number of times the individual ate out the previous week to better ascertain their pattern of dining outside the home, including locations.

Research Question 2: Did the intervention group decrease their weight, BMI, and FPG when compared to the control group?

Hypothesis #2.1: Participants in the intervention group will have a significant decrease in weight in comparison to the control group.

The current study found significant changes in weight in both groups from baseline to follow up, however, the treatment group had a greater decrease in weight. Several intervention studies show improvement in weight by modifying lifestyle such as eating habits and physical activity. Many of these studies were culturally tailored to Hispanics of varying ages and all were in lower income populations. In addition, the interventions were at least 4 months long with a follow up meeting to weigh the participants (Schwingel et al., 2015; Lindberg et al., 2014; Sorkin et al., 2014). The current study supports these findings. The design and content of the interventions are similar. Akers and colleagues (2012) found success with daily self-monitoring of intake and water consumption as a method of achieving long term weight loss. The findings presented earlier of increased fruit and vegetable consumption and decreased soda consumption can partially explain the positive outcomes in weight with the *Beyond Sabor* project.

Hypothesis #2.2: Participants in the intervention group will have a significant decrease in BMI in comparison to the control group.

The current study did not find significant changes in BMI in the comparison of intervention and control group; however, there were changes in BMI between baseline and post intervention in the intervention group and again at follow up. A study conducted in Hidalgo County by Millard and colleagues (2011) aimed at educating a population of 900 *colonias* about healthful diet and physical activity in order to reduce the onset of diabetes. Their approach employed CPBR but utilized the transtheoretical model to capitalize on the participant's stage of change in a behavior. Their intervention was comparable to the parent study and included topics relating to understanding chronic disease and its complications with nutrition education and taste testing. Similar to the current study, 92% of the participants were above normal BMI range but their results yielded a decrease in BMI of 0.19. It is important to note that the sample size of the current study is significantly larger.

Hypothesis #2.3: Participants in the intervention group will have a significant decrease in FPG in comparison to the control group.

There were significant changes in FPG in the treatment group that continued throughout the follow up period. These sustained benefits suggest that improvement in eating behaviors has an impact on FPG. If FPG levels are improved, this may prevent those with pre diabetes from developing diabetes (FPG $\geq$ 126).

The sessions in *Beyond Sabor* addressed awareness of diabetes, healthier cooking demonstrations and physical activity. This could account for the above stated change in FPG. Lifestyle change programs have also been shown to be effective in

preventing or managing diabetes. These programs included extensive nutrition education programs about healthy eating, healthy food preparation, and grocery shopping. The study's findings support the literature on the use of lifestyle changes and their effect on FPG and diabetes (Perez-Escamilla et al., 2015; Schwarz, Greaves, Thomas, & Davies, 2014; Yoon, Kwok, & Magkidis, 2013; Ryabov & Richardson, 2011).

In minority populations, similar findings have been addressed in the literature regarding diabetes management as seen by reduction of glucose and/or A1c The use of community partnerships, collaborations, and resources are being used with success (Perez-Escamilla et al., 2015; Peek, Ferguson, Bergeron, Maltby, & Chin; 2014). One study by Ryabov and Richardson (2011) was conducted in the Lower Rio Grande Valley and used community health workers that served as diabetes educators; they were trained on how to teach nutrition and glucose management to the group. Their results were a reduction in A1c and an increase in self-efficacy. The current study did not look at A1c but instead looked at glucose as a measure of improvement in diabetes control.

Implications

There were many significant changes in the food behaviors and measured clinical outcomes of this large population of Mexican Americans living in the Lower Rio Grande Valley. The current study's findings contribute to the literature in many ways due to the large randomized, cluster sample and length of follow up with participants. With a study of this sample size, the analysis is more accurate for interpretation. The selection of repeated measures ANOVA also gave insight into the

differences within time for the treatment and control group and differences between groups. These findings support much of the current literature and further show that the program was successful. The *Beyond Sabor* study was designed with social cognitive theory as its theoretical framework; therefore, the concepts of self-efficacy and reciprocal determinism were taught and reinforced throughout the 40 weeks. Other studies using social cognitive theory and its construct have resulted in weight loss and reduction of overweight in minority populations (Bender et al., 2013; Akers et al., 2012; Reininger et al., 2010). Exposing the participants to information about self-efficacy allowed them to have confidence that they could make and sustain food behavior change. Ryabov and Richardson (2011) also found improvements in diabetes control and weight through the use of self-efficacy.

The concept of CBPR has been widely used in the literature and in the parent study (Smith et al., 2014; Gittelsohn et al., 2013; Blumenthal & DiClemente, 2013; Balcazar et al., 2010). As previously discussed, this approach, not only strengthens the community, but improves the health of the community. This model has been extrapolated for use in several types of communities (Smith et al., 2014; Balcazar et al., 2013; Spencer et al., 2011 Balcazar, 2009). The Lower Rio Grande Valley has benefited from CBPR research and the use of community health workers in order to improve the health of the residents. Due to the high number of *colonias* in the Lower Rio Grande Valley, it is important to develop culturally relevant programs that meet the needs of the low income population so that the adoption of health promotion habits are sustained. These habits may also have a positive impact on the families of the participants. Within this study, the natural helpers that emerged from the

community served as the communication link with the participants. Their ability to build relationships in their own community and engage through a variety of venues by virtue of their connection are among the reasons for their success. This has proven to be invaluable in both the preparation and implementation of the study (Israel, 1985). They can relate to the culture, language and economic factors in the community and create a network of support (Perez-Escamilla et al., 2015; Shah, Kaselitz, & Heisler, 2013; Rothschild et al., 2013; Spencer et al., 2011).

The parent study provided weekly nutrition education on topics such as increasing water, fruit and vegetable consumption as well as awareness about diabetes and its complications. Interactive healthy cooking lessons provided the participants with ways to make traditional Mexican foods healthier through changes in cooking methods and lower fat food substitutions. Food demonstrations during the cooking lessons not only retained the culture but also allowed participants to interact with each other, cook, and taste healthy foods. The importance of physical activity was emphasized in the lessons by ending each session with an hour long walk. There are few large scale, randomized interventions in the Lower Rio Grande Valley that were conducted weekly and that included all three components described. A person's culture has a significant impact on their food choices, timing of foods, and is an important consideration when designing weight loss interventions in ethnic and minority populations. There has been considerable success in losing and maintaining weight loss when culture is considered and the intervention is sensitive to that culture. It has also been shown that "culturally sensitive" studies do not simply include translating materials into Spanish, but also considering the traditional foods, level of

acculturation, and other demographics (Schwingel et al., 2015; Lindberg et al., 2012; MacClancy, 1992). The findings presented show the efficacy of a culturally tailored intervention for food behavior change in Mexican Americans. The parent study included modification of traditional Mexican foods and incorporated them into the nutrition education and food demonstrations. In addition, the study took into consideration the work environment of the participants. The sessions were conducted in the morning and child care was provided.

It has been suggested that these positive outcomes in underserved communities will lead to changes in policy that address access to health care, healthy foods, and a safe physical environment. Prior studies that utilized positive models of health behavior change, with significant health outcomes were important in creating health policy changes in certain communities. For example, a classic framework RE-AIM, recognized the importance of reaching the community, establishing the impact of the intervention, the settings where delivery will occur, implementation of the intervention, and integration into policy (Mier et al., 2013; Jilcott, Ammerman & Sommers, 2007).

Limitations

One of the limitations to this study is the source sample. The sites were all from the Lower Rio Grande Valley Food Bank and while the sample size was very large, it may not completely represent all residents of the Lower Rio Grande Valley. The study looked at a specific population and cannot be extrapolated to the general population due to its unique culture and setting.

The questionnaire that was used asked participants about food consumption for only the 24 hour period prior to the assessment. This may not accurately reflect usual food consumption patterns and frequency of eating out. For example, if a participant had an assessment on a Monday, the recall would only include Sunday's consumption. This may not be a typical pattern throughout the week. There is also the possibility of recall bias for the consumption portion of the study. This is commonly seen in the literature and can be affected by age (Coughlin, 1990). The results for the variables, such as frequency of eating out, using lard for cooking, and using corn tortillas had very few responses of "yes" in compared to the sample size. Analysis of these variables was therefore limited.

Future Research

Although children and adolescents were not the focus of this study, it is worth exploring due to the potential influence that parent's eating habits, in particular mothers, have on their children (Sosa, McKlyer, Goodson, & Castillo, 2014). Recent findings show that 43.2% of children 6-11 years old are obese, many of whom are Hispanic or black (Ogden et al., 2014). This will likely contribute to the development of other chronic diseases. The consumption of sugar sweetened beverages, physical inactivity, and lack of a balanced diet have been found to be reasons for these high obesity rates (Hoelscher, 2015; Champion, Pierce, & Collins, 2014). It is proposed that educational programs target mothers' knowledge about healthy eating behaviors and the importance of positively influencing their children (Sosa et al., 2014).

A study done in the Lower Rio Grande Valley looked at the outcomes and benefits of teaching students about community gardening. The students increased,

not only their knowledge, but their consumption of fruits and vegetables. Some research has also suggested that implementation of community gardens is a way to increase fruit and vegetable consumption in Hispanic populations (Faver, 2014; Nolan, McFarland, Zajicek, & Waliczek, 2012). In children in the Rio Grande Valley, the community gardens had an additional effect on nutrition knowledge and snack choices. Not only did they bring the communities together, but they also improved the health of both adults and children. These gardens addressed changing the environment by providing more access to fruits and vegetables (Nolan et al., 2012).

The majority of added sugars are purchased at supermarkets, grocery stores, and fast food restaurants (Drewowski & Rehm, 2014). Although the current study did not analyze exactly where the beverages were purchased, it would be useful to analyze this in the future. These results bring up the suggestion of taxing these beverages in order to decrease consumption and lessen the contribution of empty calories to the diet. The results also support the USDA requiring the labeling of added sugars on the Nutrition Facts Panel to help individuals become aware of their beverage selections.

In summary, the results presented add to the emerging body of literature on the effective use of SCT and the constructs of self-efficacy, to teach and develop confidence in the ability to change health behaviors. SCT utilizes reciprocal determinism to teach the participant to interact with the environment to bring about change (Bandura, 2004). The concept of CBPR was positively used to design the study involving the community partners, which in this case, were the natural helpers.

This engaged the community and had a positive impact on the residents of the Lower Rio Grande Valley. A culturally tailored, lifestyle intervention program that includes modification of certain foods and eating behaviors is useful in changing and sustaining clinical measures. The change in weight and glucose will ultimately benefit the participants in preventing or controlling diabetes.

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APPENDIX

Location: **Date:**
_____

NAME: _____
ID_____

I want you to think about what you ate and drank yesterday and I will ask you some questions about it. Think about meals, but also think about snacks, place and time.

I'm going to begin by asking you questions about what kind of beverages you drank yesterday and their size. I have with me samples of various sizes that we will use to make it easier for you to decide your drink sizes.

Interviewer please display the various glasses by size, so that the participant may choose the size that comes closest to what they consumed yesterday.

Did you drink any water yesterday?
1. Yes
2. No

If yes, how many glasses? _____

Amount of Serving Size
1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer: Please display the various sizes and types provided: cans, bottles, regular glasses and super size glasses.

Did you drink any soda (soft drinks) yesterday?
1. Yes
2. No

If yes to above
1. Regular

2. Diet

Name of drink_____

How many glasses, cans or bottles of soda (soft drinks)? (estimate)_____

Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer, please display glasses and bottles as provided

1. Did you drink iced tea yesterday?
   1. Yes
   2. No

If yes to above

1. Sweetened
2. Unsweetened

How many iced tea servings?(estimate)_____

Amount of Serving Size

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

Interviewer: Please display the various cups and mugs provided for this component

Did you drink coffee yesterday?

1. Yes
2. No

If yes to above

1. Regular

2. Decaf

If yes, did you add
1. Cream or milk
2. Sugar

If yes, (to sugar), how many teaspoons or packets?
Interviewer, please display a teaspoon.
1. 1 tsp
2. 2 tsp
3. 1 packet
4. 2 packets
5. Other _____

26. If yes to packet, what kind of sugar
Interviewer, please display an average size packet.
1. Sweet n' Low (pink)
2. Equal (blue)
3. Splenda (yellow)
4. Reg. sugar (white)

27. If yes to cream (Please display sample sizes, as provided)
1. regular cream
2. light cream
3. no fat cream
4. regular powdered cream
5. l ight powdered cream
6. no fat powdered cream
7. Whole milk (4%)
8.. Low fat milk (2 or 1%)
9. Fat Free milk
10. Other _____

28. Did you drink any fruit juices yesterday? (Please display sample sizes as provided)
1. Yes
2. No

29. If yes, what kind _____

30. How many servings? (Estimate) _____

31. Amount of Serving Size
1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz

4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

32. Did you have any tortillas yesterday? (if no, go to # 40)
1. Yes
2. No

33. If yes, were they
1. Corn
2. Flour
3. Both

34. Tortillas use
1. Alone
2. Tacos
3. Gorditas
4. Tostadas
5. Enchiladas
6. Other _____

35. How many corn tortilla?
1. One
2. Two
3. Three
4. Four
5. Other _____

Interviewer: Please display sample sizes as provided

36. Size _____

37. How many flour tortillas?
1. One
2. Two
3. Three
4. Four
5. Other _____

38. Size _____

39. How many Tacos

1. One
2. Two
3. Three
4. Four
5. Other _____

40. Size _____

41. How many Gorditas
1. One
2. Two
3. Three
4. Four
5. Other _____

42. Size _____

43. How many Tostadas
1. One
2. Two
3. Three
4. Four
5. Other _____

44. Size _____

45. How many Enchiladas
1. One
2. Two
3. Three
4. Four
5. Other _____

46. Size _____

47. How many other (tortilla use)
1. One
2. Two
3. Three
4. Four
5. Other _____

48. Size _____

49. Did you have any chips and salsa yesterday?
1. Yes

2. No

50. If yes, (Please display sample sizes as provided)
1. Whole Serving
2. Half Serving
3. Other _____

51. Do you usually cook with?
1. Oil (Aceite)
2 Lard (Manteca)
3. Other _____

52. In general, can you give us an idea of how much oil or manteca do you use on an average day when cooking ?(If person does not cook, whoever cooks at home --Spouse, mother substitute for whoever cooks). Please display sample sizes as provided.
_____

53. Did you eat any Mexican rice (like Mexican our rice fried with tomato sauce yesterday)?
1. Yes
2. No

54. If yes, how many total servings (if they ate rice for lunch and dinner just record it as total) Display sample sizes as provided.
1. One
2.Two
3. Three
4. Four
5. Other _____

55. To your knowledge was the rice fried with
1. Oil (Aceite)
2. Lard (Manteca)
3. Other _____

56. Size _____ (Display as provided)

57. Have you ever tried just eating boiled white rice, like in the Chinese restaurants?
1. Yes
2. No

58. Did you eat a salad, vegetable or fresh fruit yesterday?

1. Yes
2. No

59. If yes,
1. Salad
2. Vegetables
3. Fresh fruit

60. Salad Size (Display samples as provided)
1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

61. Vegetable Serving (Display samples as provided)
1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

62. Now I want you to think of the whole of last week: Did you have any salads?
1. Yes
2. No

63. If yes, how many? _____

64. Size_____

65. Now I want you to think of the whole of last week again: Did you have any rice (Mexican rice)?
1. Yes
2. No

66. **If yes, how many times during the week did you Mexican rice?**
1. Every Day
2. Every Other day
3. One or two days a week
4. Other _____

67. Portion Size (If yes, display sample sizes)
1. Small (4 oz)
2. Medium (10 oz)
3. Large (18 oz)

68. Did you eat out yesterday?
1. Yes
2. No

69. If yes, where?

_____
_____
_____

70. What did you eat?

_____
_____
_____

71. Size, if applicable

1. Regular
2. Super Size
3. Other _____

72. Did you eat out at all last week?

1. Yes
2. No

73. If yes, where?

_____
_____
_____
_____

74. What did you eat?

_____
_____
_____
_____

Think of a regular week in your life, what do you usually have for breakfast? Mark as many as needed

75. Breakfast Tacos

1. papas con huevos
2. huevos, papas y chorizo
3. frijol y huevos
4. barbacoa
5. Other _____

76. Cereal

1. Oatmeal (avena)
2. Box Cereal

3. Made at home
4. Other _____

77. Milk
1. Whole
2. No fat
3. Low fat 1-2%
4. Other _____

78. Bread
1. White
2. Wheat
3. Pan Dulce
4. Donuts
5. Cinnamon rolls
6. Other _____

79. Drink
1. Coffee
2. Juice
3. Water
4. Other _____

80. Other foods
1. Bacon and Eggs
2. Sausage
3. Pancakes/French Toast
4. Other _____

Now, I'd like to ask you a few questions about how you felt during the last week. These questions are important because it allows us to better understand how your emotions and feelings may play a part in what and how you eat and ever in your physical activity

89. When you think about how you felt during the past week, would you say that you felt sad?
1. Never
2. Rarely
3., Sometimes
4. Frequently
5. Most of the Time

90. Did you ever feel that you could not get going during the past week?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

91. During the past week, did you not feel like eating?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

92. During the past week, did you feel depressed?

1. Never
2. Rarely
3. Sometimes
4. Frequently
5. Most of the Time

Nombre: _____ **ID:** _____

Piense en lo que comió y bebió ayer, incluyendo las comidas y antojitos y la hora y el sitio donde los consumió.

10. **Tomó agua ayer?**
    1. Si
    2. No
11. **Si, Cuantos Vasos ?** _____
12. **Capacidad del Vaso:**

1. 8 fl oz
    2. 8.5 fl oz
    3. 12 fl oz
    4. 16 fl oz
    5. 20 fl oz
    6. 32 fl oz
    7. 44 fl oz
    8. Other _____

13. **Tomó soda o coca?**
    1. Si
    2. No
14. **Si tomo soda, de cual?**
    1. Regular
    2. Dieta
15. **Nombre de refresco** _____
16. **Cuantos vasos o latas (estimado)** _____
17. **Capacidad del Vaso:**

1. 8 fl oz
    2. 8.5 fl oz
    3. 12 fl oz
    4. 16 fl oz
    5. 20 fl oz
    6. 32 fl oz
    7. 44 fl oz
    8. Other _____

18. **Tomó té helado ayer?**
    1. Si
    2. No
19. **Si,**

1. Endulzado

2. Sin endulzar

20. **Cuantos vasos se tomo? _____**

21. **Capacidad del Vaso:**

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

22. **Tomo café?**

1. Si
2. No

23. **Si, de cual**

1. Regular
2. Decaf

24. **Si, le agrego**

1. crema
2. azúcar

25. **Si, cantidad de crema y azúcar**

1. 1 cucharadita
2. 2 cucharaditas
3. 1 sobre
4. 2 sobres
5. Otra medida_____

26**. Si de sobre, que clase**

1. Sweet n' Low (rosado)
2. Equal (azul)
3. Splenda (amarillo)
4. azúcar regular (blanco)

27**. Si, crema:**

1. Leche regular
2. Leche descremada
3. Leche en polvo
4. Otra _____

28. **Tomó algún jugo de frutas?**

1. Si
2. No

29. **Si tomó, de qué clase _____**

30. **Cuantos vasos se tomo? _____**

31. **Capacidad de vaso?**

1. 8 fl oz
2. 8.5 fl oz
3. 12 fl oz
4. 16 fl oz
5. 20 fl oz
6. 32 fl oz
7. 44 fl oz
8. Other _____

32. **Comiste tortillas ayer? (if no, go to # 49)**

1. Si
2. No

33. **las tortillas eran de:**

1. masa
2. harina
3. de las dos

34. **Uso de la tortilla:**

1. Solas
2. Tacos
3. Gorditas
4. Tostadas
5. Enchiladas
6. Otra _____

35. **Cuantas tortillas de masa se comió?**

1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras

36**. Tamaño** _____

37 **Cuantas tortillas de harina se comió?**

1. Una
2. Dos
3. Tres
4. Cuatro
5. Otras

38. **Tamaño** _____

39. **Cuantos tacos?**

1. Una
2. Dos
3. Tres

4. Cuatro
5. Otras

40. **Tamaño _____**
41. **Cuantas gorditas?**
    1. Una
    2. Dos
    3. Tres
    4. Cuatro
    5. Otras
42. **Tamaño _____**
43. **Cuantas tostadas?**
    1. Una
    2. Dos
    3. Tres
    4. Cuatro
    5. Otras
44. **Tamaño _____**
45. **Cuantas enchiladas?**
    1. Una
    2. Dos
    3. Tres
    4. Cuatro
    5. Otras

46 **Tamaño _____**

47. **Cuantas tortillas si las uso para otra cosa?**
    1. Una
    2. Dos
    3. Tres
    4. Cuatro
    5. Otras

48. **Tamaño _____**

49 **Comió totopos (chips) con salsa?**
    1. Si
    2. No

50. **Si,**
    1. Porción completa

2. la mitad
3. otra _____

51. **Cocina con**

1. aceite
2. manteca

3. otra_____

52. **En general nos puede dar una idea de cuánta manteca o aceite usa en un día promedio? (Si la persona no cocina, obtenga la información de la persona que lo hace)**

_____
_

53. **Comió Arroz Mexicano, con salsa de tomate ayer ?**
    1. Si
    2. No

54**. Si, cuantas veces se sirvió (si comió arroz de comida y de cena apunta como total)**
    1. Una
    2. Dos
    3. Tres
    4. Cuatro
    5. Otras

55. **Sabe si el arroz lo prepararon en**
    1. Aceite
    2. Manteca
    3. Otra _____

56. **Tamaño de porción _____**

57. **Ha comido arroz blanco – como el de los restaurantes chinos?**
    1. Si
    2. No

58. **Comió ensalada, vegetales, fruta fresca ayer?**
    1. Si
    2. No

59. **Si, cual?**
    1. Salad
    2. Vegetales
    3. Fruta Fresca

60**. Tamaño de ensalada?**
    1. Pequeña (4 Oz)
    2. Mediana (10 Oz)
    3. Grande (18 Oz)

61. **Tamaño de porción de vegetales?**
    1. Pequeña (4 Oz)
    2. Mediana (10 Oz)
    3. Grande (18 Oz)

62. **Piense en la semana pasada: Comió ensaladas las semana pasada?**
    1. Si

2. No

63. **Si, cuantas? _____**

64. **Tamaño de porción _____**

65. **Piense en la semana pasada otra vez: Comió arroz?**

1. Si
2. No

66. **Si, cuantas veces?**

1. Cada día
2. días alternados
3. una o dos veces por semana
4. otras _____

67. **Tamaño de porción?**

1. Pequeña (4 Oz)
2. Mediana (10 Oz)
3. Grande (18 Oz)

68 **Comió en restaurante ayer?**

1. Si
2. No

69**. Si, en donde?**

_____
_____
_____

70. **Que comió?**

_____
_____
_____

71. **Que tamaño**

1. regular
2. Extra grande - super size de mcdonalds
3. Otro

72. **Comió en restaurante la semana pasada?**

1. Si
2. No

73. **Si, en donde?**

_____
_____
_____

74.**Que comió?**

_____
_____
_____

Piense en una semana normal en su vida, que toma para el desayuno? *Marque todos los que aplican* (circle all that apply)

75. **Tacos (de almuerzo)**
    1. Papas con huevo
    2. huevos, papas y chorizo
    3. frijol y huevos
    4. barbacoa
    5. otro ____

76. **Cereal**
    1. Avena
    2. Cereal de caja
    3. Hecho en casa
    4. Otro _____

77. **Leche**
    1. Regular
    2. Descremada
    3. 1-2%
    4. otra _____

78. **Pan**
    1. Blanco
    2. De trigo
    3. Pan dulce
    4. Donas
    5. Rolls de canela
    6. Otro _____

79. **Bebidas**
    1. Café
    2. Jugo
    3. Agua
    4. Otra

80**. Otra o algo mas**
    1. Huevo con tocino
    2. Salchicha
    3. Pancakes/French Toast
    4. Otra._____

Ahora le vamos a hacer algunas preguntas sobre como se sintio en general durante la semana pasada. Es important conocer como nuestros sentimientos y emociones nos pueden afectar la manera que comemos y cuanto comemos y tambien como nos puede afectar nuestros actividades fisicas.

Durante la semana pasada, se sintio triste?

1. Nunca
2. Rara vez
3. Algunas veces

4. Frecuentemente
5. Casi todo el tiempo

Durante la semana pasada, batallo para iniciar mis actividades?

1. Nunca
2. Rara vez
3. Algunas veces
4. Frecuentemente
5. Casi todo el tiempo

Durante la semana pasada, sintio ganas de comer?

1. Siempre
2. Casi todo el tiempo
3. Frecuentemente
4. Rara vez
5. Nunca

Durante la semana pasada, se sintio deprimido/a

1. Nunca
2. Rara vez
3. Algunas veces
4. Frecuentemente
5. Casi todo el tiempo

Beyond Sabor Project

Health Screening form for Beyond Sabor
to be completed by Rio Grande Regional Mobile Unite

ID #_____ Male Female (Circle one)

Ethnicity: _____ date of Birth: _____

Measurements:
Begin with blood pressure reading
Blood Pressure will be taken three times 10 minutes apart
Blood Pressure Reading (First take) Systolic _____Diastolic_____

Height: _____ Cm inches (Circle one)

Weight: _____ Kg pounds (Circle one)

Mid-Arm Circumference _____ Cm inches (Circle one)

Waist Circumference _____

Hip Circumference _____

Triceps Skinfold: _____ mm

Take second blood pressure reading:
Blood Pressure Reading (Second take) Systolic _____Diastolic_____

Health Information

Are you following any special diet? Yes No

If "Yes," what type? _____

Do you have any food allergies? Yes No

If yes, to what _____

On a daily basis, how often do you add salt to your food? _____

Have you been told by a physician that you have a serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
   If yes, what are you taking_____
   How often do you take this medication? _____
4. Are you taking any other medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____

Have you been told by a physician that you have another serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
   If yes, what are you taking_____
   How often do you take this medication? _____
4. Are you taking any other medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO

Have you been told by a physician that you have another serious health condition or a condition for which you need to take regular medication or watch your diet? Yes NO

1. If "Yes", what condition? _____
2. Are you taking any medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
3. Are you taking any other medication for the above condition? Yes NO
   If yes, what are you taking_____
   How often do you take this medication? _____

4. Are you taking any other medication for this condition? Yes NO
   What are you taking_____
   How often do you take this medication? _____
5. Are you taking any other medication for this condition? Yes NO

Are you taking any medications or vitamin/mineral supplements? Yes No

If "Yes", type and dosage? _____

How physically active are you? On a scale of 1-10 (10 being very active exercise everyday)
1 2 3 4 5 6 7 8 9 10 (circle one)

WOMEN ONLY (in reproductive age); Are you pregnant? Yes No
If "Yes", weeks of gestation: _____

Has your doctor ever told you that you cannot engage in any physical activity? Yes _____NO_____
Has he told you for example not to go upstairs or carry heavy loads or do anything that requires heavy movement? Yes _____NO_____

Regional staff name:_____ Date: _____

VITA

TANIA RIVERA

December 1999	Bachelor of Science, Food Science and Human Nutrition, emphasis in Dietetics and Nutrition University of Florida Gainesville, Florida
August 2001	Masters of Science, Dietetics and Nutrition Florida International University Miami, Florida
August 2000- April 2002	Dietetic Internship Florida International University Miami, Florida
August 2005-present	Assistant Clinical Professor Florida International University Miami, Florida
2006 – 2016	Doctoral Candidate in Public Health Florida International University Miami, Florida