THE MEDIATING ROLE OF DIETARY PATTERNS ON THE RELATION BETWEEN ACCULTURATION, PSYCHOSOCIAL FACTORS, AND CARDIOVASCULAR DISEASE RISK FACTORS IN THE U.S. - MEXICO BORDER

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Dedication

To my family, who provided support and motivated me to achieve this career goal. It is dedicated to my parents, who taught me the importance of achieving dreams, to my Mother for showing me the path that nurtures the spirit and my Father for showing me the path that nourishes the mind. Thank you for your commitment and loving care. To my brother and sister for their unconditional support; my brother Alex because his example taught me to be strong and build my character, my Sister Gaby for making me smile even in the most difficult times, because her example and advice gave me the strength to continue when I wanted to quit. To my lovely husband Charles because he accepted the challenge of supporting me to pursue this dream and has not given up. Thank you, because despite difficult times, you have given me your support, not only financial but most importantly, moral. Thank you, for your company, support, and dedication because it has been instrumental in achieving this dream.

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BY

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DISSERTATION

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Abstract

Chronic diseases affect both, developed and developing countries around the world. In the U.S., cardiovascular diseases (CVD) are the leading cause of death for all groups including Hispanics (Heron, 2009). Hispanics are disproportionally affected by CVD and experience risk factors at higher rates than non-Hispanic whites (Swenson, 2002). Although CVD are among the most expensive and widespread health problems, they are among the most preventable. Evidence shows that diet plays a very important role in the development of chronic diseases; current dietary changes are partially responsible for the increasing epidemic of chronic diseases worldwide. It is well established that the consumption of a healthy diet can help prevent and control morbidity and mortality (Diet, nutrition and the prevention of chronic diseases.2003).

The study of dietary patterns is a useful method to assess dietary intake focusing on the total intake (Kerver, 2003). Dietary patterns reflect the complexity of the diet providing a more practical way for researchers to evaluate the associations between diet and health outcomes and to evaluate health effects of current dietary guidelines. In addition, the public can better understand and implement research results from the dietary pattern studies.

The overall aim of this study is to examine dietary patterns, psychosocial factors, and dietary heart-healthy behaviors as mediators of CVD risk factors among Hispanics adults participating in the H.E.A.R.T. study. Two studies are proposed. Specific aim for Study 1 was to identify and characterize dietary patterns using factor analysis and to examine its associations with demographic characteristics and CVD risk factors. Specific aim for Study 2 was to examine the associations between acculturation, psychosocial factors with dietary patterns and CVD risk factors among Hispanic adults.

Five dietary patterns were identified by factor analysis; the Western, Prudent, Mexican, Juice, and Sweets. The Western pattern was predominantly consumed by younger adults, males, and by participant born in the U. S. The Prudent pattern was predominantly consumed by older adults, females, and participants being born in Mexico. The Prudent pattern was negatively and significantly associated with reduced CVD risk Index, whereas the Western was positively and significantly associated with waist circumference only. The Juice pattern was the only pattern to be negatively and significantly associated with most CVD risk factors. Results from the mediational analysis showed that only the Prudent and Juice patterns mediated the association between gender, age, and education with two CVD risk factors, BMI and CVD risk Index.

Acculturation levels were positively associated with consumption of the Western pattern and lower consumption of the Mexican pattern. Significant indirect effects indicate that the Prudent pattern has a mediating role between acculturation and CVD risk index. Lastly, four SEM models were tested to identify the effects of several psychosocial factors on two CVD risk factors, obesity and CVD risk Index. Results showed that the Prudent pattern was the only significant mediator in the association between psychosocial factors and CVD risk Index. In addition, lower perceived barriers to eat healthy were the strongest predictor of increased consumption of Prudent pattern, followed by higher self-efficacy and higher perceived benefits. Self-efficacy, followed by perceived barriers predicted the Western pattern. Moreover, perceived barriers were the only factor to have a direct effect on both, obesity and CVD risk Index. In conclusion, the models had an acceptable fit of the data in describing factors associated with CVD risk factors among Hispanics in El Paso, TX. Overall, high homogeneity of the study sample may have limited the strength of many relationships, particularly those between dietary patterns and cardiovascular risk factors.

H.E.A.R.T. Study Abstract

Background: A multilevel ecological approach (*individual/group/community/policy*) has been undertaken to address cardiovascular diseases (CVD) among low-income Hispanics in El Paso Texas through a community based participatory research entitled Health Education and Assessment Research Team (H.E.A.R.T) Project. This research study utilizes Community Health Workers (CHWs) with two purposes: 1) implement the program to at risk participants for CVD, and 2) to explore integration of CHWs in the workforce. H.E.A.R.T. is a partnership of academic (The University of Texas at El Paso, University of Texas Houston School of Public Health, El Paso Community College), government (City of El Paso Parks and Recreation), and community based organizations (YWCA El Paso del Norte Region and Centro San Vicente Clinic) working in collaboration to reduce risks of CVD in Hispanics living in the Mission Valley of El Paso (*community level*).

Methods: A 16-week CHW-led intervention comprises a menu of lifestyle and environmental activities offered to participants. Activities such as Su Corazon Su Vida, *charlas* (support groups), aerobics classes are conducted at the YWCA. Latin dance classes, family sports, and walking groups are conducted at city parks. Demographic, anthropometric, and behavioral measures were taken. Integration of CHWs at partner locations was conducted. Consultations with community leaders were performed using a CBPR approach.

Results to Date: A total of 745 adult Hispanics (*individual/group level*) have participated in the H.E.A.R.T. project. A Community Health Academy and Leadership Council has been developed and has established a policy agenda that promotes integration of CHWs into the local and state workforce. In addition and as a result of this project, the "Paso del Norte CHW/Promotora Workforce Coalition" has been formed. The three Coalition's strategic directions for CHW

workforce advancement include: policy and publicity, training and *capacitation*, and research and evaluation (*policy level)*.

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Introduction

A growing epidemic of chronic diseases is affecting both developed and developing countries around the world. Cardiovascular diseases, in particular, cause around 30% of all deaths in the world (WHO, 2008; Rosamond, 2008). For Hispanics living in the U.S., the leading causes of death are also heart diseases (CDC; Heron, 2009). Moreover, Hispanics are disproportionally affected by cardiovascular disease risk factors and experience them at higher rates than non-Hispanic whites (Swenson, 2002). For example, hypertension, overweight, obesity, and diabetes are increasing at alarming rates in this population (American Heart Association, 2008).

Evidence shows that diet plays an important role in the development of cardiovascular diseases; therefore, special emphasis should be placed on the dietary component of an overall *lifestyle modification strategy* (AHA, 2000) to help reduce morbidity and mortality. Recent studies recommend that people should not only focus on eating specific foods or nutrients to improve health, but that general population should adopt an overall healthier dietary pattern (AHA, 2000) consisting of increased consumption of fruits and vegetables, whole grains, lean meat and poultry, fat-free or low-fat dairy products, beans, peas, and nuts and seeds (USDA, 2010).

The recommendation for people to focus on a healthier dietary pattern, as described above, instead of increasing or eliminating specific nutrients, such as increasing dietary fiber only, has arisen from current studies that use the dietary pattern approach. Several authors have evaluated the use of the dietary pattern over the single nutrient approach because the overall dietary pattern might be easier to interpret by the public and therefore better translated into a healthier diet (Slattery, 1998; Newby, 2004; Hu, 2002; Hoffman, 2004). In addition, the study of

dietary patterns provides a more practical way to evaluate the associations between diet and health outcomes, as wells as the evaluation of the health effects to current dietary guidelines (Hu, 2002; Fung, 2001; Ashima, 2004; Hu, 2008; Kerver, 2003; Iqbal, 2008; Artinian, 2004; Nettleton, 2009).

As mentioned before, previous research studies have identified that diet plays an important role in the development of cardiovascular diseases. Although many have analyzed the relationship between diet and cardiovascular diseases, fewer have examined multivariate associations among dietary patterns, demographic characteristics, acculturation, and psychosocial factors and how they relate to disease risk. Therefore, the proposed studies will investigate the direct and indirect effects of dietary patterns and psychosocial factors as mediators in the development of cardiovascular disease risk factors. Understanding dietary intake patterns among Hispanics living in the U.S- Mexico border and identifying whether they mediate the occurrence of cardiovascular disease risk factors will sharpen interventions aimed at improving dietary patterns, thereby preventing diet-related chronic diseases and ultimately improving quality of life.

Therefore, this study will examine dietary patterns, psychosocial factors, and dietary heart-healthy behaviors as mediators for cardiovascular disease risk factors among Hispanic adults participating in a large cardiovascular disease risk factor intervention study (i.e., the H.E.A.R.T. study). Two specific studies are proposed as part of this dissertation. Study 1 will identify and characterize dietary patterns among Hispanic participants of the H.E.A.R.T. study using exploratory factor analysis and will identify direct and indirect association between demographic characteristic and dietary patterns as mediators of cardiovascular disease risk factors. Study 2 will identify the direct and indirect associations between demographic

characteristics, acculturation, psychosocial factors and dietary patterns among Hispanics adults participating in the H.E.A.R.T. study.

Background of the Study

Cardiovascular Diseases Overview

Cardiovascular diseases refer to a group of diseases that comprise heart disease, stroke, and congestive heart failure. In order to understand the role of dietary intake on cardiovascular disease is important to understand the pathogenesis of heart diseases. The pathological process responsible for coronary heart disease and stoke is called atherosclerosis. This chronic condition begins in childhood and continues to progress during adulthood. Atherosclerosis is caused by the build-up of fibrous-fatty plaques on the walls of the arteries. As we age, the fibrous plaques experience a variety of changes that can led to serious complications such as ulceration of the connective tissue and thrombosis. These pathological processes are responsible for obstruction of the blood flow in the arteries. Fibrous plaques and its consequent lesions located in the coronary artery leads to coronary heart disease, the most common clinical manifestation of atherosclerosis. However, if the fibrous plaques and lesions are located in a cerebral artery it will lead to restriction of blood flow to the brain and possibly stroke (Committee on Diet and Health, National Research Council, 1989).

In the early 1910s, experimental studies conducted in animals demonstrated that *dietary cholesterol* was responsible for higher serum cholesterol and development of atherosclerosis. Later on, studies found that *dietary saturated fats* elevate serum LDL cholesterol and induce atherosclerosis (Anitschkow, 1967). In addition to dietary cholesterol and fats, additional risk factors associated with atherosclerosis include overweight and obesity, physical inactivity, smoking, diabetes, and hypertension (Committee on Diet and Health, National Research Council, 1989). These risks factors are described in greater detail in the sentences below.

Prevalence and Costs of Cardiovascular Diseases

Overall, cardiovascular diseases are among the most widespread and expensive health problems in the Unites States. Similar to the trends seen worldwide, cardiovascular diseases are the leading causes of death in the United States with estimates showing them responsible for more than one third of all deaths in the Nation. Diseases of the heart are more than just a health problem; the disease and its underlying causes have major financial consequences for the individuals and the governments. In the United States, during 2010, the total cost of cardiovascular diseases was estimated to be $444 billion and one of every six dollars spent on health care was used to treat cardiovascular diseases. As the population ages, the economic burden of the disease will increase (Heidenreich, 2011).

Estimates show that more than 2200 American die each day of cardiovascular disease (Roger et al., 2012). Among the cardiovascular diseases, heart disease is the number one cause of death, accounting for over 33% of all deaths (1 of every 3 deaths) in 2010. In the same year, heart disease claimed 47,250 lives in Texas alone (Texas Department of Health, 2010). Stroke is the number 4 cause of death accounting for one of every eight deaths in the U.S. (Roger et al., 2012).

Hispanic Disparities in Cardiovascular Disease

The term Hispanic or Latino can be used interchangeably to define a person of "Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" (Office of Management and Budget). In 2010, approximately 50.5 million Hispanics were living in the United States, representing 16.3% of the U.S. total population. By 2050, estimates indicate that Hispanics will represent 30% of the U.S. population, reaching 132.8 million. Texas is the fourth state with the largest Hispanic population (38%) in the U.S.

Coronary heart disease and stroke are also the leading causes of death among Hispanics (CDC; Heron, 2009). Moreover, the incidence of cardiovascular disease risk factors including overweight, obesity, and diabetes affects Hispanic at higher rates than non-Hispanic whites (Rosamond, 2008). For example, in 2007, the diabetes death rate for Hispanics was 1.5 times higher than for non-Hispanics whites. Also, data from the NHANES from 2007-2008 indicates that the prevalence of obesity among Mexican American Men increased from 24% to 36% compared to 22% to 32% for non-Hispanic whites. Similarly, Mexican American women are more likely to be obese than non-Hispanic white women; the prevalence of obesity among Mexican American women was 45% compared to 33% non-Hispanic white women (Ogden, 2012).

Along with the higher prevalence of diabetes and obesity, physical inactivity is another existing risk factor in Hispanics. Sedentary lifestyles are more common among Hispanics than among white adults. Indeed, approximately 36% of Hispanics reported being physically inactive during leisure time, compared with 18% for the general population (Liao et al., 2004). Coupled with the high prevalence of cardiovascular disease risk factors, Hispanics are less likely to have access to health care services. For example, only 37% of Hispanics under the age of 65 had private health insurance compared to 73% of non-Hispanic whites. Limited access to regular health care services makes Hispanics less aware of other risk factors for cardiovascular diseases such as high blood pressure or high blood cholesterol (Perez-Stable, 1994). Overall, Hispanic adults have poverty rates twice as high as non-Hispanic whites do, and living in poverty is related to poorer health conditions, being uninsured, and mortality at younger age (CDC/NCHS, 2011).

Cardiovascular Disease Risk Factors

As noted above, several factors increase the risk for cardiovascular diseases; some factors are non-modifiable, whereas others are modifiable. Non-modifiable, risk factors include things such as age, gender, and heredity. Modifiable risk factors, in contrast, include high blood pressure, high cholesterol, smoking, physical inactivity, overweight/obesity, and diabetes. Indeed, the Canadian Heart and Stroke Foundation identified nine modifiable risk factors including those above plus alcohol abuse, malnutrition, and blood glucose (Heart and Stroke Foundation, 2005).

Numerous investigations have studied the effects of modifiable risk factors on cardiovascular diseases. Overall, the evidence shows that cardiovascular diseases can be prevented by lifestyle changes (Yusuf, 2004; Heart and Stroke Foundation, 2005). Of these risk factors, obesity, high blood pressure, and diabetes belong to the WHO's top 10 list of global health problems. These risk factors are described in detail below. In addition, because the emphasis of this project is on dietary patterns, the relationship of each to diet is explicitly noted.

Overweight and Obesity

The World Health Organization defines overweight and obesity as "an abnormal or excessive fat accumulation that might impair health" (WHO, 2000). Obesity is a complex disorder caused by genetic and environmental factors that affect the balance of energy consumption and energy expenditure (Buttar, 2005). The Body Mass Index, obtained by dividing the weight in kilograms by the height in meters squared (i.e., kg/m^2), is a widely used weight-for-height index to classify overweight and obesity in adults. A BMI ≥ 25 is defined as overweight and a BMI ≥ 30 is defined as obesity (WHO, 2000).

Worldwide, the prevalence of obesity has increased among people of all ages and socioeconomic groups in both developing and developed countries. The World Health Organization (WHO) has described this problem as an "escalating global epidemic" (WHO, 2000). Currently, there are 2-3 times more overweight people in the world than there were two decades ago (Speiser et al., 2005). Overweight and obesity are the fifth risk for global deaths and 23% of the burden of heart diseases can be attributable to overweight and obesity (Buttar, 2005).

Overweight and obesity place people at greater risk for heart disease, high blood pressure, and diabetes among other diseases. Excess body weight is associated with higher rates of morbidity and mortality and reduced life quality (National Lung, National Task force). A BMI greater than 35 significantly increases the risk of death (Flegal, 2005). For the period between 1988-1994 and 2007-2010 the percentage of adults overweight but not obese (BMI 25-29.9) remained steady, but the percentage of adults with obesity (i.e., BMI ≥30) increased for both men and women (CDC/NCHS, 2011). In addition, the prevalence of obesity is higher among women with lower educational attainment. Reports from the 2009-2010 National Health and Nutrition Examination Survey (NHANES) indicate that the age-adjusted prevalence of obesity is 36% for adults 20 years and older. For Hispanics, the age-adjusted prevalence of obesity is 39%, higher than the nation's age-adjusted prevalence; within the Hispanics group, Mexican-Americans have an age-adjusted obesity prevalence of 40% (Flegal, 2012).

As noted above, energy imbalance is most proximal cause of the overweight and obesity epidemic. The imbalance between the calories eaten and the calories used is mainly influenced by changes in dietary patterns, that include higher intake of energy-dense foods, high in fat, salt, and sugars but low in vitamins and minerals, and changes in the environment and society that promote sedentary lifestyles.

Current guidelines to improve diet and lifestyle are a critical strategy to reduce the risk for cardiovascular diseases in the general population. The American Heart Association recommends that individuals should focus on eating a healthier dietary pattern, identifying the caloric needs to achieve and maintain a healthy weight, and engaging in physical activity to reduce the overweight and obesity epidemic (Buttar, 2005; Lichtenstein, 2006).

High Blood Pressure

High blood pressure belongs to the modifiable category of risk factors for cardiovascular disease. The blood pumped by the heart produces pressure against the walls of the arteries and this force is measured as systolic and diastolic pressure. Systolic pressure reflects the pressure of the arterial pulse (when the heart contracts and pumps blood to the arteries) whereas diastolic pressure reflects the drop in pressure between heartbeats (when the heart refills with blood and ventricles relax). A normal or healthy blood pressure is a systolic BP <120mm Hg and a diastolic BP <80 mm Hg. Hypertension is defined as systolic BP ≥ 140mm Hg or diastolic BP ≥90 mm Hg or being on antihypertensive medication (NHANES, NCHS).

Blood pressures higher than these numbers are considered a serious condition that position people at higher risk for cardiovascular diseases (NHLBI, 2004). In the United States 76.4 million people 20 years and older—or one out of three adults—have high blood pressure. From 2005-2008, high blood pressure was present in more than two thirds of the people who had a heart attack for the first time (69%), had their first stroke (77%), or had congestive heart failure (74%). It is projected that by 2030 there will be a 9.9% increase in the prevalence of high blood pressure from 2010, or an additional 27 million people with hypertension. Hypertension is also an expensive disorder with a total direct cost of over $47 billion in 2008 (NHLBI, 2004).

The prevalence of hypertension among Hispanics is around 28% for both genders, a number that is only slightly higher than non-Hispanic Whites (25%), but lower than African-American (47%). Regardless of the differences in prevalence rates, a recent report by C. Ayala et al., (2005) found that of 21% of Hispanic adults who self-reported having high blood pressure, only 45% reported currently taking medication for high blood pressure compared to 53% of non-Hispanic whites and 53% African-American (C. Ayala et al., 2005). Like obesity, high blood pressure is determined by genetics and environmental factors. Of the environmental factor affecting blood pressure–diet, physical inactivity, and psychosocial factors–the diet has a predominant role in the development of high blood pressure. For example, multiple modifiable dietary factors affecting blood pressure include moderation of sodium intake, induced weight loss, moderated alcohol consumption, increased potassium intake, and the consumption of an overall healthier diet (Appel, 2006; Buttar et al., 2005).

Diabetes

Diabetes is a chronic health condition where the body does not produce enough insulin or cells in the body cannot use the insulin available. Insulin is a hormone secreted by the pancreas and it helps the movement of glucose from the blood into the cells. When the glucose cannot enter the cells, because the insulin is deficient, it cannot be metabolized increasing in the blood and affecting different systems in the body, including the cardiovascular system. Diabetes increases the risk of several cardiovascular problems. For example, people with diabetes have 2 to 4 times higher risk for stroke and the death rate from heart disease is also 2 to 4 times higher risk for people with diabetes (CDC, 2011; ADA, 2011).

In the United States, there are 25.6 million adults 20 years or older diagnosed with diabetes and there were approximately 1.9 million new cases in 2010. Diabetes contributed to