2013-01-01

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By

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THESIS

Presented to the Faculty of the Graduate School of

The University of Texas at El Paso

in Partial Fulfillment

of the Requirements

for the Degree of

MASTER OF PUBLIC HEALTH

Department of Public Health Sciences

THE UNIVERSITY OF TEXAS AT EL PASO

December 2013

Acknowledgements

I would like to greatly thank my thesis advisor Dr. Maria Duarte, for all of her hard work and dedication to making my Master of Public Health experience enlightening. I would also like to thank Dr. Maria Duarte for her commitment into helping the community improve their health through the H.E.A.R.T. project, where many lives have been touched. I would like to acknowledge Dr. Hector Balcazar for being part of my thesis committee and also for offering valuable insights during my thesis experience. Dr. Hector Balcazar's devotion to improving community health was also a very kind act, as he did so with the H.E.A.R.T. project. I also want to thank Dr. Rodrigo Armijos for being part of my thesis committee and for helping me understand the impact and significance of my thesis. I would also like to thank Dr. Ximena Burgos for the feedback provided during my thesis experience and to Dr. Julia Bader for her help with the statistical analyses and interpretation of my thesis results. I would like to thank the investigators in the H.E.A.R.T. project for giving me the opportunity of working as a Research Assistant and for making the data set of the intervention available for my thesis. The Community Health Workers' dedication and commitment to our community during the H.E.A.R.T project is also acknowledged. I thank them for all of their devoutness because without them the intervention wouldn't have been successful. Lastly, I would like to thank my mom and sister for always being there for me.

Abstract

Cardiovascular disease (CVD) has become a worldwide epidemic in the last decade and is the leading cause of death in the U.S. population, including Hispanics. The objective of this study was to conduct secondary data analyses to assess the impact of a lifestyle intervention on clinical and behavioral measures of Hispanic participants. A 16-week culturally appropriate lifestyle intervention was part of the Health Education and Assessment Research Team - H.E.A.R.T. Project, a community-based participatory research that is framed around the socio-ecological approach and employs Community Health Workers (CHW) to address cardiovascular risk factors among Hispanics living in El Paso, Texas. The project was undertaken by a partnership of academic institutions, government and community agencies. The intervention was named My Heart My Community (Mi Corazón, Mi Communidad - MiCMiC) and consisted of a menu of nutrition and physical activities that were implemented by CHW at partners' agencies.

A total of 754 adults' ages 44.6 $\pm$ 13.3 years were enrolled in the intervention, but this study only reports on 404 participants. Sociodemographics, clinical (height, weight, waist circumference and blood pressure) and behavioral (self-reported health screenings and lifestyle) information was gathered upon enrollment and four months after the intervention. Statistical analyses to assess intervention effects included descriptive statistics, a two-tailed paired t-test, Bowker's test and McNemar's test. CVD risk factors and CVD risk index (CVDRI), a composite of 11 risk factors for CVD was also analyzed.

Eighty-three percent of participants were female, and more than two-thirds reported an annual income below $25,000. Spanish was reported as the language of preference by 82.6% of participants, more than half reported being married and 45% had no health insurance.

Results showed significant pre-post differences for all clinical measures, except for systolic blood pressure. Screening behaviors for blood pressure, blood cholesterol, and diabetes were significantly higher after the intervention. In addition a significant increase was noted in the reported consumption of 5 or more fruits and vegetables a day and on engagement in physical activity 30 minutes 3 times a week. CVDRI was also significantly lower after the intervention.

Overall results from this study indicate that participants in the MiCMiC intervention decreased their risk of CVD demonstrated by a significant difference between pre-and-post testing clinical measures (BMI, waist circumference, diastolic blood pressure), improvement in self-reported health behaviors (screenings in blood pressure, blood cholesterol, & diabetes, fruit and vegetable consumption, and increased engagement in physical activity) and CVDRI. This lifestyle intervention implemented by CHW may be viewed as a model to reduce CVD risk factors among the Hispanic population.

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Introduction

Cardiovascular diseases (CVD) is a public health concern nationwide and around the world. CVD is a dysfunctional condition of the heart, arteries, and veins that supply oxygen to vital-sustaining areas of the body such as the brain, heart, and other vital organs. CVD includes coronary heart disease (CHD), stroke, hypertension, rheumatic fever, congenital heart defects, congestive heart failure, and peripheral vascular disease. CVD has been the leading cause of death in the United States since 1900, with the only exception in 1918 (Ford et. al, 2007; Kochanek et al., 2012). Government statistics from 2009 listed CVD as the number one cause of American mortality with 32.3% (787,931), followed by cancer, chronic lower respiratory disease, accidents, and Alzheimer's disease. CVD is also the leading cause of death among Hispanics (Go et al., 2013).

According to the 2012 Centers for Disease Control and Prevention (CDC) and National Center for Health Statistics (NCHS) report CVD takes the lives of more than 2,150 Americans each day, which averages to about 1 death every 40 seconds. In the National Heart Lung and Blood Institute (NHLBI) and NCHS statistics reports, heart related deaths that were attributable to CVD in 2009 include: 49% for Coronary Heart Disease (CHD), 16.4% for stroke, 7.8% for high blood pressure, 7.2% for heart failure, 3.4% for diseases of the arteries, and 16.2% for all others (NHLBI, 2012b). The two major causes of deaths attributable to CVD are CHD and stroke. Table 1 shows CVD deaths for different U.S. ethnicity or race by gender for the year 2009 showing that CVD deaths are more frequent among Hispanic or Latino females (29.6%) than in Hispanic or Latino males (27.4%) (Go et al., 2013).

Table 1. *CVD death rates reported in 2009 among American ethnic groups by gender*

Race or Ethnic Group	Men (%)	Women (%)
Asian/Pacific Islander	33.4	33.3
White	31.8	32.8
Black	31.7	34.2
Hispanic or Latino	27.4	29.6
American Indian/Alaska Natives	24.7	23.2

Source: Adapted information from the NCHS and NHLBI 2009 (Go et al., 2013)

As of 2011, the Hispanic population in the U.S. was reported to be about 52 million making of this the largest ethnic minority group in the nation (U.S. Census Bureau, 2012). It is projected that by 2050, there will be 132.8 million Hispanics, which would constitute 30% of the nation's population. Recent statistics show the breakdown of Hispanics in the U.S. with 63% of Mexican origin, 9.2% of Puerto Rican origin, 3.5% of Cuban origin, 3.3% of Salvadoran origin, 2.8% of Dominican origin, and the remainder of Central American, South American or other Hispanic/Latino origin (U.S. Census Bureau, 2012).

The prevalence of CVD among U.S. ethnic groups by gender including those for Hispanics of Mexican origin is shown in Table 2.

Table 2. *CVD prevalence reported in 2010 for adults' ages 20 years and older*

	Ethnic Group		
Gender	Non-Hispanic White	Non-Hispanic Black	Hispanics of Mexican Origin
Male	36.6%	44.4%	33.4%
Female	32.4%	48.9%	30.7%

Source: Go et al., 2013

Table 3 depicts different CVD conditions for U.S. ethnic groups Indicating that hypertension is the most frequent heart condition for all ethnic groups being highly prevalent among African Americans with similar rates among American Indians or Alaska Natives, Whites, and Hispanics or Latinos. Among all ethnic groups CHD is the second most diagnosed CVD condition. (Go et al., 2013).

Table 3. *CVD conditions reported in 2011 for U.S. ethnic groups*

	CVD Condition			
Race	Coronary Heart Disease	Heart Disease	Hypertension	Stroke
White	11.1%	6.3%	23.3%	2.3%
Black or African Americans	10.7%	6.9%	33.4%	4.5%
Hispanics or Latinos	8.6%	5.9%	22.2%	2.8%
Asians	7.4%	4.3%	18.7%	2.7%
American Indians or Alaska Natives	12.7%	7.2%	25.8%	4.6%
Native Hawaiians or Other Pacific Islanders	--	--	21.8%	--

Source: Adapted information from the NHIS, NCHS 2011 (Go et al., 2013)

The Texas Department of State Health Services reports that CVD-related deaths in Texas is ranked 20th in the nation at a rate of 247.1 per 100,000 population (CDC & NCHS, 2012). In Texas, the CVD mortality rate among different ethnic groups has been reported per 100,000 population as follows: African American, non-Hispanic at 314.3, White, non-Hispanic at 252.4, and Hispanics at 196.4 (TDSHS, 2012). According to the Behavioral Risk Factor Surveillance

Survey (BRFSS) in 2011the prevalence of CVD in El Paso, Texas revealed that there were: 66 cases of CHD or angina, 49 cases of heart attack, and 26 cases for stroke.

Recent research from CDC states that at least 200,000 deaths from heart disease and stroke can be prevented each year through the adoption of healthy habits, including quitting smoking, being more physically active, and eating less salt; other community changes that create healthier living spaces, include safe places to perform physical activity and smoke-free areas (CDC Vital Signs, 2013). About six out of ten of these preventable deaths could occur to people under age 65; while Hispanic men are twice as likely to die from a preventable heart disease and stroke than Hispanic women (CDC Vital Signs, 2013). Previous research has demonstrated that interventions aimed at improving health habits are key in the prevention of CVD (Farrell, 2009; Marins et al., 2007).

Due to the high prevalence of CVD nationwide and also among Hispanics there is a call for action from the government to overcome this condition through lifestyle interventions. Previous lifestyle interventions have successfully employed Community Health Workers to assist populations in adopting healthy behaviors aimed at preventing chronic diseases (Balcazar, Alvarado, Fulwood, Pedregon, & Cantu, 2009).

Community health workers (CHW) are lay workers and trusted community members who have acquired health promotion knowledge as they have the same ethnicity, geographical identity, and socioeconomical background as the clients or community members they serve (Allen et al., 2011). CHW are a great resource for community members as they provide health education and also serve as a liaison between underserved populations and access to healthcare resources (Allen et al., 2011). CHW aid community members in improving quality of care, satisfaction with care, increase access to care, reduce healthcare costs strengthen local economies

and families, and foster community capacity building (Allen et al., 2011). Lastly, and most importantly, CHW have been shown to be effective agents in supporting research as interviewers and interventionists (Allen et al., 2011).

The lifestyle intervention, a Well-Integrated Screening and Evaluation for Women Across the Nation (WISEWOMAN) program in California, also known as the Heart of the Family employed CHW (Farrell, 2009). The program implemented and evaluated the effectiveness of lifestyle interventions to improve nutrition and physical activity while reducing CVD risk. The program focused on underinsured and uninsured women ages 40-64 years old. CHW provided three face-to-face counseling sessions to the enhanced intervention group (EIG) with the use of the New Leaf: Choices for Healthy Living material, Spanish version *Vida Saludable, Corazón Contento* (VSCC). The New Leaf material includes a structured assessment instrument for nutritional and physical activity. Results from that study showed how low-income women can reduce CVD risk factors by identifying healthy and unhealthy dietary behaviors and by assessing different types and levels of physical activity.

The Heart of the Family project is a lifestyle intervention aimed at increasing awareness, treatment, and control of hypertension in Hispanic adults. Results of that project were compared to the NHANES group and showed that participants in the Heart of the Family project were more aware of their hypertensive condition and got more appropriate treatment than results from the NHANES group concluding that this type of intervention was able to improve the health of participants (Farrell, 2009).

In an effort to overcome the high prevalence of CVD among low income Hispanics in El Paso Texas, a culturally appropriate lifestyle intervention was planned as part of the Health Education Assessment and Research Team (H.E.A.R.T.) project. The H.E.A.R.T. project is a

community based participatory research that was framed around the socio-ecological approach (individual/group/community/policy) that employed Community Health Workers (CHW) to address cardiovascular risk factors among low income Hispanics living in El Paso, Texas. This project was undertaken by a consortium of academic, government and community based agencies. These included The University of Texas at El Paso (UTEP), the University of Texas, School of Public Health El Paso Regional Campus (UTSPH-El Paso), El Paso Community College (EPCC); community based organizations (CBOs) including Centro San Vicente (CSV), the Young Women's Christian Association (YWCA) El Paso del Norte Region, and City of El Paso Parks and Recreation. The H.E.A.R.T. project was funded by the National Institutes of Health (NIH) and the National Institutes for Minority Health and Health Disparities (NIMHD). The overall objective was to reduce risk factors for CVD among Hispanics from El Paso, Texas (Balcazar et al., 2012).

A culturally appropriate lifestyle intervention is defined as meeting each of the following characteristics that include: (1) an intervention that is based on the cultural values of a group, (2) the intervention consists of strategies that reflect the subjective culture (attitudes, expectancies, norms) of the group, and (3) the components of the strategies reflect the behavioral preferences and expectations of the group (Marin, 1993).

The purpose of employing CHW to implement the lifestyle intervention within the H.E.A.R.T. project was to influence participating individuals (individual level) and families (group level) to adopt healthy behaviors aimed at reducing CVD risk factors.

Overall the goal of this thesis project was to determine whether the large scale lifestyle intervention implemented by CHW was effective at reducing CVD risk factors among Hispanic participants.

1.1 Goals and Objectives

The goal of this thesis project, a secondary data analysis, was to assess the effectiveness of the lifestyle intervention on CVD risk factors of Hispanic participants (individual level/family domain) from El Paso, TX. The primary objective was to assess whether the intervention was effective at changing clinical measures and behavioral information related to CVD risk factors and CVDRI at baseline and four months after the intervention was completed.

1.2 Specific Aims and Hypotheses

1.2.1 Specific Aim 1

To determine whether the intervention had an impact between baseline and four months after the intervention on body mass index (BMI), waist circumference, blood pressure, and cardiovascular disease risk index (CVDRI) on Hispanic participants.

Hypothesis:

It is hypothesized that after participating in the intervention, low-income Hispanic adults will significantly decrease BMI, waist circumference, blood pressure, and CVDRI.

1.2.2 Specific Aim 2

To determine whether the intervention had an impact between baseline and four months after the intervention on screening behaviors to detect hypertension, high blood cholesterol, and diabetes on Hispanic participants.

Hypothesis:

It is hypothesized that after participating in the intervention, low-income Hispanic adults will significantly improve their screening behaviors to detect hypertension, high blood cholesterol, and diabetes.

1.2.3 Specific Aim 3

To determine whether the intervention had an impact between baseline and four months after the intervention on the consumption of five fruits and vegetables a day on Hispanic participants.

Hypothesis:

It is hypothesized that after participating in the intervention, Hispanic adults will significantly increase its consumption of five fruits and vegetables a day.

1.2.4 Specific Aim 4

To determine whether the intervention had an increased performance of physical activity of 30 minutes, three times a week on Hispanic participants.

Hypothesis:

It is hypothesized that after participating in the intervention, low-income Hispanics will significantly increase its engagement in performing physical activity.

Literature Review

Risk factors for CVD includes being overweight or obese, high waist circumference, high blood pressure or hypertension, high LDL cholesterol levels, diabetes, poor diet, lack of physical activity, smoking, and low health education/health literacy. Hispanics are especially susceptible for CVD due to the multiple risk factors that affect their health. For example, recent statistics indicate that Mexican American women have a higher prevalence of obesity and Mexican American men have higher LDL cholesterol levels than any other group in the U.S. (CDC, 2012c, Flegal, Carroll, Kit, & Ogden, 2012). In addition diabetes, a risk factor for CVD is highly prevalent among Mexican Americans (CDC, 2013c, 2013d). Among other ethnic groups, Hispanics were reported to having the lowest rate of physical activity (CDC, 2013). Lastly the lack of access to health care among Hispanics also represents an added risk factor for CVD (U.S. Census Bureau, 2012). Collectively all of these risk factors put Hispanics at a greater disadvantage for CVD. Cardiovascular diseases are often triggered by individual or by a cluster of factors that include: being overweight or obese, having a waist above normal parameters, having high blood pressure and cholesterol, diabetes, consuming a high calorie diet that is high in fat, low physical activity, smoking, and a poor health education.

2.1 Overweight and obesity

Obesity is described as a condition of excessive fat accumulation to the extent that health may be impaired (Bouchard, Blair, & Haskell, 2007). One method to determine obesity is by calculating body mass index (BMI). BMI is a calculation from a person's weight and height and an indicator of body fat for most people. BMI is reported in kg/m^2 and includes the following categories: Underweight (<18.5), Normal weight (18.5-24.9), Overweight (25-29.9), and Obesity (>30) (CDC, 2011). Overweight and obesity are the leading factors for premature mortality and a

risk factor for chronic disease (Bouchard, Blair, & Haskell, 2007). Obesity can lead to hypertension, dyslipidemia, Type 2 diabetes, sleep apnea, orthopedic complications, and fatty liver disease (Dietz, 1998).

According to the American Medical Association (AMA) recently, obesity has been considered a disease. The AMA (2013) delegates declared obesity as a disease which could influence changes in treatment, coverage, research and health policy. AMA delegates suggested that screening for obesity should be conducted at least annually in low-risk patients and more frequently on patients with multiple risk factors (AMA, 2013). The decision of the AMA to label obesity as a disease will help with the public's attention on the importance of obesity screening.

The number of U.S. adults' ages 20 years and older that are overweight and obese is alarming and it has been estimated at 69.2% (NCHS, 2013). This statistic shows that about two out of three Americans are overweight or obese. It is reported that adults ages 60 or older were more likely to be obese than young adults (CDC, 2012). There were about 41 million women and about 37 million men in the U.S. who were reported to be obese from 2009-2010 (CDC, 2012).

According to NHANES 2009-2010 age-adjusted obesity among different U.S. ethnic groups were as follows: non-Hispanic blacks at 49.5%, Mexican-Americans at 40.4%, all Hispanics at 39.1% and non-Hispanic whites at 34.3% (Flegal, Carroll, Kit, & Ogden, 2012). The same report indicates that obesity among non-Hispanic blacks and Mexican-American women were more prevalent for obesity, thus showing that Mexican-Americans have a higher incidence of obesity than all Hispanics combined (Flegal et al., 2012).

In 2011, Texas was ranked among one of 12 states listed with one of the highest obesity prevalence in the country with 30.4%, whereas the lowest prevalence was reported in the state of Colorado at 20.7% (BRFSS, 2011). Consequently, obesity is of great concern particularly in El

Paso, which has a population that is predominantly Hispanic. Based on the statistics from BRFSS, in 2010, El Paso has a 69.7% either overweight or obese rate among adults, compared to 65.7% in Texas, and 63.7% in the nation (BRFSS, 2010c). El Paso was recently ranked number seven among the top 25 obese cities in the U.S. (Vigneri & Millado, 2013). These statistics show the high level of obesity in El Paso.

A high BMI represents a risk for CVD. In a study conducted in Switzerland among 17,791 persons 16 years and older that relied on self-reported CVD events in a 10 year period it was concluded that compared to total cholesterol BMI was a better predictor of CVD risk (Faeh, Braun, & Bopp, 2012). That particular study suggested that lifestyle changes that include diet and physical activity promote weight loss or prevent weight gain may be more helpful toward improving health than a lipid lowering treatment (Faeh et al., 2012).

2.2 Waist Circumference

Waist measurement is a clinical measure being used to assess CVD risk. A waist circumference measured above $\geq$102 centimeters (cm) or about 40.16 inches for men and a $\geq$88 cm or about 34.65 inches for women could represent a risk to develop obesity-related conditions like type 2 diabetes, high blood cholesterol, high triglycerides, hypertension and coronary artery disease (CDC, 2011). Watching the waistline can be very beneficial to decrease obesity related conditions. The waist circumference of a person has been listed as a risk factor for Metabolic Syndrome, which raises the risk for CVD (Alberti et al., 2009). Table 4 lists the U.S. waist circumference in centimeters by race or ethnicity for both females and males according to the CDC/NCHS and the NHANES from 2007-2010 (Fryar, Gu, & Ogden, 2012).

Table 4. *Waist circumference mean in centimeters for U.S. male and female adults ages 20 and older by race or ethnicity*

	Mean	
Race or Ethnicity	Female	Male
Non-Hispanic white	94.90cm	102.43cm
Non-Hispanic black	100.90cm	98.88cm
Hispanic (Mexican-Americans Included)	96.53cm	100.93cm
Mexican-American	97.63cm	101.10cm

Source: Fryar, Gu & Ogden, 2012

Table 4 shows an average of waist circumference in cm for US adults by race or ethnicity and by gender being above the reference value of 88 centimeters. Non-Hispanic black women and Mexican-American women have the higher waist circumference, respectively at 100.90 cm and 97.63 cm. Also non-Hispanic white men have a waist circumference above the reference value (102 cm) with 102.43 cm, thus adding a risk factor for CVD in this population. Mexican-American men are second after Non-Hispanic white men with a waist circumference of 101.1 cm, thus below the reference value of 102 cm. Table 4 shows that all female U.S. adults no matter what race or ethnicity tend to struggle with the reference value of waist circumference. Table 4 also shows that Mexican-American women tend to struggle with a high waist circumference.

A study conducted in Finland tested whether abdominal obesity is a stronger predictor of CVD and type 2 diabetes than overall obesity. The research focused on middle age men from the city of Helsinki. The conclusion states that “waist circumference above 94 cm was more predictive in identifying middle-aged men having a high risk to develop type 2 diabetes or cardiovascular disease” (Siren, Eriksson, & Vanhanen, 2012).

Another study looked at the association between waist circumference and waist-to-hip ratio (WHR) to the risk of CVD events. The study conducted a meta-regression analysis and searched for prospective cohort studies and randomized clinical trials of CVD risk and abdominal obesity from several databases. A review article of 15 publications identified participants and 4,355 CVD events. The result showed that WHR and waist circumference are significantly associated with the risk of incident CVD events, as a 1 cm increase in waist circumference is associated with a 2% increase of CVD risk (De Koning, Merchant, Pogue, and Anand, 2007). The authors recommend that simple measures of abdominal obesity should be incorporated in CVD risk assessments.

2.3 Blood Pressure

Hypertension of high blood pressure has been associated with the development of CVD (Vasan et al., 2001). Blood pressure involves a systolic reading which is the pressure in the arteries when the heart beats or the heart muscle contracts, and a diastolic reading is the pressure in the arteries between heartbeats or when the heart muscle rests between beats and refills with blood (National Heart, Lung, and Blood Institute [NHLBI], 2013). A normal blood pressure reading refers to having a systolic pressure <120 mm Hg and a diastolic pressure <80 mm Hg (NHLBI, 2013). Table 5 shows the different categories of blood pressure and Table 6 shows recent statistics of Americans with Stage 1 hypertension and above.

Table 5. *American Heart Association's Blood Pressure Categories*

Blood Pressure Category	Systolic mm Hg		Diastolic mm Hg
Normal	less than 120	and	less than 80
Prehypertension	120-139	or	80-89
High Blood Pressure (Hypertension) Stage 1	140-159	or	90-99
High Blood Pressure (Hypertension) Stage 2	160 or higher	or	100 or higher
Hypertensive Crisis (Emergency care needed)	Higher than 180	or	Higher than 110

Source: AHA, 2013b

It is estimated that 67 million U.S. adults or 1 in 3 have hypertension of high blood pressure a risk factor for CVD (CDC Vital Signs, 2012). Table 6 shows blood pressure prevalence among different U.S. population groups.

Table 6. *Hypertension reported in 2010 for male and female adults ages 20 years and older by race or ethnicity*

Race or Ethnic Group	Men (%)	Women (%)	Both Genders
Non-Hispanic white	33.4%	30.7%	--
Non-Hispanic black	42.6%	47.0%	--
Mexican-American	30.1%	28.8%	--
Hispanic or Latino	--	--	22.2%
American Indian/Alaska Natives	--	--	25.8%
Asian	--	--	18.7%

Source: Go et al., 2013

As reflected in Table 6 Mexican-American men and women have a hypertension prevalence of 30.1% and 28.8% respectively. These figures are higher than the reported hypertension for all Hispanics or Latinos at 22.2%. This data shows that Mexican-Americans living in the El Paso region tend to have difficulty controlling their blood pressure as well.

A study conducted in the Framingham Heart Study looked at 6,859 participants to look at the association between blood-pressure category at baseline and the incidence of CVD at follow-up. The study found that a high-normal blood pressure is associated to having an increased danger of CVD. The result from that study proves that high blood pressure is a risk factor for CVD (Vasan et al., 2001).

Sodium is an element the body uses to control blood pressure and blood volume, as well as it is needed for proper muscle and nerves functioning. Sodium's dietary reference intake is 1,500 milligrams per day (Lloyd-Jones et al., 2010). A consumption of higher than the recommended sodium levels can lead to hypertension and to a serious buildup of fluid in persons resulting in congestive heart failure, cirrhosis, or kidney disease (Medline Plus, 2013). Overload of sodium in the body is a major factor in the pathogenesis of hypertension (Appel et al., 2011).

Some studies have examined people's behaviors in reference to controlling their blood pressure. For example, the following study examined actions taken by hypertensive adults living along the Texas-Mexico border region to control their blood pressure by either antihypertensive medication or lifestyle modifications (Ayala et al., 2012). The study used self-reported data from the 2007 Texas Behavioral Risk Factor Surveillance System (BRFSS). Results from that particular study show that those least likely to take any action to control their blood pressure were Spanish-speaking, uninsured, border county resident Hispanics. The study points out that

public health efforts should be taken to improve the control of hypertension among Hispanics living in Texas border counties.

2.4 Blood Cholesterol

Blood cholesterol is a substance carried in the blood by particles called lipoproteins, which can be low-density lipoprotein (LDL) or high density lipoproteins (HDL) (World Health Federation [WHF], 2013). High levels of LDL cholesterol can cause atherosclerosis, which can lead to heart attacks or ischemic strokes (WHF, 2013).

Increased LDL cholesterol has shown to be a main risk factor for cardiovascular diseases (CVD), especially coronary heart disease (CHD) and myocardial infarction (Reiner, 2012). About 71 million or 35% of American adults have high LDL, or bad cholesterol (CDC, 2012c).

When comparing people of different American ethnicities with a level of LDL cholesterol greater than 130 mg/dL, men of Mexican American origin have higher levels with 41.9% while Mexican American women have 31.6% (Table 7) (CDC, 2012c).

Table 7. *CDC's American ethnicities with high LDL cholesterol >130 mg/dL*

Race or Ethnic Group	Men (%)	Women (%)
Non-Hispanic Blacks	34.4	27.7
Mexican Americans	41.9	31.6
Non-Hispanic Whites	30.5	32.0
All	32.5	31.0

Source: CDC, 2012c

A study looking to clarify the inconsistencies of the role HDL has as a CVD protective factor was conducted. The study focused on seven pooled European prospective studies and the effect of HDL on CVD risk and coronary heart disease (CHD) mortality. The results showed the

multivariable analysis, one of the largest of its kind to date, a confirmed inverse, independent, strong and graded relationship between HDL and both CVD and CHD mortality (Cooney et al., 2009). The results show that greater levels of HDL will decrease the chances of CVD and CHD mortality.

2.5 Diabetes

Diabetes, a condition reflected by above normal blood glucose levels due to the lack of insulin production or improper utilization of glucose by muscle cells, liver and fat, is considered a risk factor for CVD. After time and uncontrolled, high blood glucose levels will damage blood vessels and nerves, which can lead to heart disease and stroke (NDIC, 2012).

People with diabetes are two to four times more likely to get a stroke, and are two to four times more likely to die from heart disease than those who do not have diabetes (CDC, 2011c). People with diabetes will likely have high rates of high blood pressure, lipid problems, and obesity (NIDDK, 2005).

Currently it is estimated that 20 million adults have physician-diagnosed diabetes, 8 million adults have undiagnosed diabetes, and about 87 million have pre-diabetes (Go et al., 2013). A 2011 report on diabetes prevalence among ethnicity or race shows the following figures: White at 5.9%, Black at 9.3%, Asian at 6.5%, all Hispanics at 9.2%, Puerto Ricans at 10.1%, Mexican/Mexican-American at 10.0%, and Cubans at 7.3%, the highest prevalence among Puerto Ricans and Mexican/Mexican-Americans (CDC, 2013c, 2013d). Due to the high prevalence of diabetes among the Mexican/Mexican-American group, the highest population living in El Paso, TX, there is also a great concern for this group to develop CVD.

People with diabetes require having access to health care. A study of U.S.-Mexico border residents with diabetes assessed whether these persons 1) experienced greater barriers to medical

care in the U.S. versus Mexico and 2) are more likely to seek care and medication in Mexico compared to border residents without diabetes (de Heer et al., 2013). The importance of access to health care for diabetic persons is equally important as having access to lifestyle programs that could diminish their risk of CVD.

2.6 Diet

The diet of a person plays an important role on the prevention or risk for CVD. A heart healthy diet is one that includes at least 4.5 cups of fruits and vegetables per day, at least two 3.5 oz. servings of fish per week, preferably oily fish, at least three 1-ounce servings of fiber-rich whole grains per day, it is limited in sugar-sweetened beverages and contains less than 1,500 milligrams of sodium a day. Out of these dietary components reducing sodium intake and increasing whole grains intake will help Americans prevent CVD (Go et al., 2013).

In addition, a diet rich in fruits and vegetables may help reduce chronic diseases including CVD. A CDC's Behavioral Risk Factor Surveillance System (BRFSS) survey conducted in 2011 shows that Americans eat an average of 1.1 fruits per day and 1.6 vegetables per day (CDC, 2013e). Nationwide the consumption of fruits and vegetables is below the typical recommended amounts of fruits and vegetables in the 1991 "5 A Day for Better Health" (Campbell et al., 2008). A more recent dietary guideline from the United States Department of Agriculture (USDA), Dietary Guidelines for Americans 2010 and "MyPlate" launched in 2011 recommends filling peoples' plate with half of fruits and vegetables (USDA & USDHHS, 2010; USDA, 2011).

The National Health and Nutrition Examination Survey Epidemiologic Follow-up study focused on fruit and vegetable intake and the risk of CVD in U.S. adults, ages 25 to 74 years old. The study found that when consuming $\geq$ 3 fruits and vegetables a day compared with less than 1

time per day, participants had a 27% lower CVD mortality (Bazzano, 2002). Therefore, that particular study showed an inverse association of fruit and vegetable intake and the risk of CVD.

The role that fruits and vegetables have on cardiovascular health can be attributed to its antioxidants content. Antioxidants are known to prevent or delay some types of cell damage (NIH, 2012). Antioxidants as stated by Agarwal et al. (2012) "provide a broad, upstream approach via reactive oxygen species (ROS)/ reactive nitrogen species (RNS) quenching or free radical chain breaking seem an appropriate therapeutic option based on epidemiologic, dietary, and *in vivo* animal model data." Different types of antioxidants include vitamins C and E, selenium, and carotenoids, such as beta-carotene, lycopene, lutein, and zeaxanthin (NIH, 2012).

Agarwal et al. (2012) also states that "short term dietary intervention trials suggest that diets rich in fruit and vegetable intake lead to improvements in coronary risk factors and reduce cardiovascular mortality." Enhancing consumption of fruits and vegetables in the Hispanic population might decrease CVD risk among all ethnic groups including Hispanics.

Besides adequate consumption of fruits and vegetables dietary fat also plays an important role in the prevention of CVD. As dietary fat is necessary for the human body to transport liposoluble vitamins and to regulate body temperature among other important functions, an excessive amount of total fat can also be harmful.

For example, saturated fat, a solid fat that is mainly from animal sources tends to raise total blood cholesterol as well as low-density lipoprotein (LDL) cholesterol levels (USDA & USDHHS, 2010). Diets high in saturated fat are associated with chronic disease, especially with coronary heart disease (CDC, 2010). Similarly a diet containing trans fatty acids, a type of fat that is mostly created during food processing through partial hydrogenation of unsaturated fats to increase life shelf of food products is equally damaging for heart health levels (USDA &

USDHHS, 2010). Polyunsaturated fats have more than one double-bond (unsaturated) carbon levels (USDA & USDHHS, 2010). The consumption of polyunsaturated fats has been associated with low blood cholesterol levels as well as lowering the risk of CVD risk levels (USDA & USDHHS, 2010). On the other hand polyunsaturated fats or those with more than one double bound including essential fats such as omega-6 and omega-3 play a role in the prevention of CVD as well as monounsaturated fats levels (USDA & USDHHS, 2010).

Research has shown that a decrease in saturated fats will lead to modest reductions in coronary heart disease (CHD) rates when replaced by polyunsaturated fats and monounsaturated fats (Willet, 2012).Willet (2012) states that much of the evidence shows that a replacement of red meat with alternative proteins sources like fish and nuts will reduce CHD risk, as well as a diet that includes fruits, vegetables and whole grains and low in refined starches, sugar-sweetened beverages, potatoes and salt. Research also shows that monounsaturated fat and polyunsaturated fat help improve insulin sensitivity and reduce diabetes risk (Riserus, Willet, & Hu, 2009).

According to Hooper (2011) when saturated fat is reduced but not the total dietary fat there is a small but potentially important reduction in the risk of cardiovascular events by 14%. If Hispanics in El Paso, Texas learn about the adverse effects of harmful fats and adopt a healthy diet the risk of CVD would be less prevalent.

2.7 Physical Activity

Physical activity is one of the most important habits a person can engage in. and is shown to prevent and manage CVD, hypertension, obesity, type 2 diabetes, and dyslipidemia (Warburton, Nicol, & Bredin, 2006). In spite of the many benefits involved with physical activity, many people fail to perform the recommended regimen of at least 150 minutes of

moderate-intensity aerobic activity (e.g. brisk walking) per week (U.S. Department of Health & Human Services, 2008).

Physical activity consists of any body movement produced by skeletal muscles that results in a substantial increase over resting energy expenditure; it consists of leisure-time physical activity, which includes exercise, sport, transportation, occupational work, and chores done in one's leisure time (Bouchard, Blair, & Haskell, 2007).

A physical activity report states that only about 20.6% of U.S. adults meet the federal guidelines (CDC, 2013). For example, only 18.4% of Hispanics, 21.2% of non-Hispanic blacks, and 20.7% of non-Hispanic whites meet the recommended physical activity levels, thus indicating that Hispanics are not getting the necessary physical activity required to prevent chronic diseases including CVD.

A longitudinal study of cardiovascular health in the Dallas Heart Study assessed physical activity participation and health perceptions among both genders in African Americans, Hispanics, and whites. The study indicated that when compared to non-Hispanic whites ethnic minorities participate less often in physical activity. Overall the lack of physical activity has been associated with higher cardiovascular deaths overall (Mathieu, 2012).

The levels of physical inactivity for El Paso Texas have been recorded thru the Selected Metropolitan/Micropolitan Area Risk Trends (SMART), a BRFSS survey providing regional and national statistics on the number of adults not engaging in leisure time exercise or physical activity in the past 30 days. The SMART results show that El Paso County has 28.5%, Texas 27.3%, and the U.S. 23.8% of respondents who do not engage in physical activity in the last 30 days (BRFSS, 2010b). This data shows that El Paso County has a lower number of residents conducting no leisure time exercise or physical activity in the past 30 days.

2.8 Smoking

Smoking has been listed as the leading preventable cause of disease and deaths in the U.S. (CDC, 2012d). Although smoking is a preventable, many Americans currently tend to smoke and suffer the consequences that this habit produces. Smoking and being exposed to cigarette smoke are major factors for coronary heart disease and stroke, increasing the risk for CVD significantly with brief exposure. Inhaled tobacco smoke quickly affects the blood chemistry and damages delicate cells that line blood vessels in the body. Delicate cells are important because it helps maintain proper blood flow, when damaged, the heart can be impaired and in a short time a person's heart rate and blood pressure can increase. The effects of smoking seem to lead to another cardiovascular risk factor like blood pressure. Several studies have shown that the prevalence of heart attacks is lower in locations where laws ban smoking in public places, and the risk for heart attack decreases greatly after one year the smoker quits entirely. The chance of stroke could decrease to the same level of nonsmokers after 2 to 5 years without smoking (USDHHS, 2010b).

It is estimated that about 43.8 million or 19.0% of American adults smoke cigarettes (CDC, 2012d). There is about 21.3% of men and 16.7% of women who are current smokers in the U.S. as reported by the National Health Interview Survey (NHIS) (Schiller, Lucas, & Peregoy, 2011). The CDC (2012d) lists the following statistics for smoking by race/ethnicity: 31.5% for American Indians/Alaska Natives, 20.6% for whites (non-Hispanic), 19.4 % for blacks (non-Hispanic), 12.9% for Hispanics, and 9.9% for Asians (non-Hispanic; excludes Native Hawaiians and Pacific Islanders).The statistics show that American Indians/Alaska Natives have the highest smoking prevalence, while Hispanics are fourth on the list. In the U.S. there are about 443,000 annual deaths that account for smoking (CDC, 2008). The breakdown of these deaths include

128,000 for lung cancer, 126,000 for ischemic heart disease, 92,900 chronic obstructive pulmonary disease, 44,000 other diagnoses, 15,900 for stroke, 35,300 for other cancers (CDC, 2008).

Smoking has been linked to higher cholesterol levels, coronary vasomotor reactivity, platelet aggregation, and a prothrombotic state all of these being risk factors for CVD (Prasad, Kabir, Dash, & Das, 2009). Cigarette smoking has been called by the Surgeon General "the leading preventable cause of disease and deaths in the United States." The statistics and the vulnerability that smoking will lead to CVD are great.

2.9 Health Education

In addition to the above mentioned risk factors for CVD the lack of health education is also considered another factor. A study conducted by Mosca et al. (2010) assessed awareness and barriers to prevent CVD risk in a nationally representative sample of women using a triennial survey. It was concluded that although the awareness of CVD among women has doubled since 1997, it continues to lag among racial or ethnic minorities. Recommendations from participating women included changes at the community level such as: access to healthy foods (91%), public recreation facilities (80%) and nutritional information in restaurants (79%) (Mosca et al., 2010). These strategies seem appropriate to decrease CVD risk.

2.10 Cardiovascular Disease Risk Index

The use of several health measures to obtain optimal cardiovascular health has been developed by the AHA to improve Americans health, just like the H.E.A.R.T. project used the cardiovascular disease risk index, a compilation of 11 risk factors for CVD. Data gathered during the implementation of the lifestyle intervention of the H.E.A.R.T. project included 11 indicators to conform the CVDRI:

1. Have you ever had your blood cholesterol checked? Yes or No
2. Have you ever been told by a doctor, nurse, or other health professionals that your blood cholesterol is high? Yes or No
3. Have you ever been screened for diabetes? Yes or No
4. Have you ever been told by a doctor that you have diabetes? In case you were a woman, was this only when you were pregnant? Yes or No
5. Have you taken part in a class to improve your health in the last 3-6 months? Yes or No
6. Do you exercise for at least 30 minutes 3 times per week? Yes or No
7. Do you eat at least five fruits and vegetables a day? Yes or No
8. Is your mean blood pressure, out of the 3 readings taken today, above the normal range? Yes or No
9. Is your waist circumference measurement taken today above normal range? Yes or No
10. Is your BMI, based on today's weight and height, above the normal range? Yes or No
11. Do you currently smoke cigarettes? Yes or No

The CVDRI has the purpose of identifying whether a person is at risk for CVD. After participants answered questions, the higher the number of affirmative questions answered, the higher the risk for CVD. For example, a value of 1 indicates a low CVD risk, while a value of 11 indicates a high CVD risk (Balcazar et al., 2010).

A study conducted in Brazil used different parameters to compile a CVDRI. These included: body mass index (BMI), waist-to-hip ratio, smoking, hypertension, sedentary lifestyle, and alcohol consumption. The study found that the prevalence of CVDRI was 42.2% among males and 65.4% among females. The highest risk indicator was sedentary lifestyle which was

68.2% for males and 72.2% for females followed by BMI and smoking (Marins et al., 2007). The study concluded that health interventions should be used to decrease the risk of CVD.

As part of the 2020 impact goals of the AHA, seven health measures are used to assess CVD health. The AHA's classification of cardiovascular health is: poor, intermediate or ideal. This classification is also known as *Life's Simple 7* (Lloyd-Jones et al., 2010):

- Body mass index less than 25 kg/m²;
- Blood pressure below 120/80 mm Hg;
- Total cholesterol of less than 200 mg/dL;
- Fasting blood glucose less than 100 mg/dL;
- Four to five of the key components of a healthy diet consistent with current American Heart Association guideline recommendations;
- Physical activity of at least 150 minutes (moderate intensity) or 75 minutes (vigorous intensity) each week;
- Never smoked or quit more than one year ago.

My Heart My Community - Lifestyle Intervention

My Heart My Community is a culturally appropriate intervention aimed at reducing CVD risk factors among low income Hispanics. Hispanic adults participated in the intervention that included a menu of nutrition and physical activities and that was implemented by CHW at partner agencies.

3.1 Protection of Research Participants

The study protocol was approved by the Institutional Review Board (IRB), which protects the rights and the welfare of the research subjects. A signed consent form was obtained from each participant.

3.2 Study Participants

Participants in the study were Hispanic adults from both genders, living in the zip codes 79907 or 79915, both areas located in lower valley community of El Paso. Table 8 shows the sociodemographic characteristics pertaining to the zip codes where the study was performed.

Table 8. *Sociodemographic profile of people living in target zip code areas of El Paso, Texas*

	79907	79915	El Paso
Total Population	55,132	40,057	820,790
Hispanic or Latino (%)	52,803 (95.8%)	38,024 (94.9%)	81.4%
Spanish Spoken at Home (%)	44,289 (87.6%)	33,195 (85.6%)	71%
Median Age	32.8	35.8	31.2
Median Household Income ($)	$29,347	$35,966	$36,015

Source: U.S. Census Bureau, 2010

As depicted in Table 8 the majority of people living in the two zip codes (79907 and 79915) are Hispanic or Latino, speak Spanish at home and are considered low income. Because the study aimed focused on reducing CVD risk in low income Hispanics, participants were recruited from these two target zip codes.

3.3 Theoretical Framework

The overall project incorporated a conceptual framework that uses the socioecological model (Balcazar et al., 2012). Viswanath, Orleans, Glanz, & Rimer (2008) states that the "…central conclusion of ecological models is that it usually takes the combination of both individual-level and environmental/policy-level interventions to achieve substantial changes in health behaviors." The H.E.A.R.T. project used this framework due to "…empirical evidence that supports using parks and recreation facilities to implement physical activity and nutrition programming." In the ecological model for this specific project, CHW are an important factor (Balcazar et al., 2012). The ecological framework targets five specific change agents: 1) Policy (e.g., policy makers), 2) Community (e.g., community members), 3) Organizational (e.g., YWCA, Parks and Recreation, Community Health Academy and Leadership Council (CHALC), UT-El Paso, UT-SPH, Centro San Vicente, El Paso Community College), 4) Interpersonal (e.g., Promotores, family, friends, social networks), and 5) Individual (e.g., participants in the lifestyle intervention). The ecological approach used community based organizations to implement physical and nutrition programming. The intervention uses the social cognitive theory that focuses on a multicomponent conceptual model showing the influence social ecology has on individual behavior (Balcazar et al., 2012).

3.4 Recruitment

Recruitment of participants was conducted by three CHW at health fairs, through newsletter distribution, mass mailing, radio and television announcements, going house to house, and at after school programs. Eligible participants were at least 18 years and older, not a current member of the YWCA, reside in the Lower Valley zip codes 79907 or 79915, and not having a heart condition that could worsen during the intervention. Participants were recruited in 5 cohorts of approximately 100 participants each.

3.5 Data Collection

Data from participants was collected at baseline and at 4 months after the intervention was completed. Data collection was conducted by CHW and research assistants at two points. Each participant attended an appointment at baseline and four months after the intervention was competed to provide sociodemographic information (age, sex, race, education, employment, spouse information, socioeconomic status, insurance coverage, and family size), anthropometric measures (height, weight, waist circumference and blood pressure). Participants also provided information through an interview conducted by CHW on self-reported health behaviors including screening for high blood pressure, high cholesterol, and diabetes; consumption of fruits and vegetables, and conducting physical activity, smoking, and health education. The interview answered a detailed questionnaire and lasted approximately one and a half hours. Data collected was entered in SPSS.

3.6 Intervention

A lifestyle intervention was planned around the topic of heart health and prevention of CVD risk factors. Your Heart Your Life (*Su Corazon Su Vida*) a CHW friendly curriculum from the National Heart, Lung and Blood Institute was chosen as one of the main educational

materials of the intervention. To upgrade the lifestyle intervention from the individual level (My Heart My Life) to the community and organizational level, the intervention was named (My Heart My Community) Mi Corazon Mi Comunidad (*MiCMiC).* MiCMiC is based on the Daniel Stokols approach and on the social cognitive theory that focuses on a multicomponent conceptual model showing the influence social ecology has on individual behavior (Balcazar et al., 2012). In addition, MiCMiC curriculum included methods identified by the CDC Task Force Community Preventive Services, including the utilization of 1) self-management education for adults with type 2 diabetes, 2) community-wide campaigns that encourage physical activity, 3) walking groups to offer social support, 4) individually tailored interventions 5) access to existing local exercise facilities, and 6) improving self-monitoring and goal-setting skills among participants (Balcazar et al., 2010, 2012). Su Corazón, Su Vida curriculum was taught to participants by CHW. The curriculum includes 10 sessions that verse around healthy lifestyle behaviors:

- Session 1 Are you at risk for heart disease?
- Session 2 Act in time to heart disease signs.
- Session 3 Take heart: Say yes to physical activity.
- Session 4 Help your heart: control your high blood pressure.
- Session 5 Be heart smart: Keep your cholesterol in check.
- Session 6 Keep your heart in mind: Aim for a healthy weight.
- Session 7 Protect your heart: Take good care of your Diabetes for life.
- Session 8 Make heart-healthy eating a family affair.
- Session 9 Eat in a heart-healthy way- even when money is tight.
- Session 10 Enjoy living smoke free.

Additional activities of the intervention included: coffee talks, heart-healthy cooking demonstrations, heart-healthy grocery shopping tours, Latin dance in the parks, family activities (e.g., playing soccer and swimming), and walking groups. A notebook “health passport” was used by participants to track their involvement in the activities of the intervention. Each participant was expected to comply with a minimum number of activities “minimum expectations.” Table 9 describes the minimum expectations required for participants in the intervention. Participants were compensated with incentives for their involvement in the intervention.

Table 9. *Minimum expectations of participants in the MiCMiC intervention*

Activity	Expectations per Month	Total Per Intervention (4 months)
Lifestyle-Nutrition Su Corazón, Su Vida	1 Session	4 Sessions
Environment-Nutrition Coffee Chats		
Heart healthy shopping grocery shopping tours	1 Session	4 Sessions
Heart healthy shopping Cooking Demonstrations		
Lifestyle and Environment-Exercise YWCA Aerobic Classes		
Family Soccer		
Latin dance aerobics in the park	4 Sessions	16 Sessions
Walking groups in the parks		
Swimming in the parks		
Free Choice (choose any activities from above)	1 Session	4 Sessions
TOTAL	7 Sessions	28 Sessions

Source: Balcazar et al., 2012.

Methods

The purpose of this study was to analyze secondary data from the MiCMiC intervention. This thesis project, a secondary data analysis of the H.E.A.R.T. project, focuses on the impact of the 16-week culturally appropriate lifestyle intervention (MiCMiC) implemented by CHW on CVD risk factors of Hispanic participants.

Variables analyzed included BMI, , waist circumference, blood pressure, screening behaviors for high blood pressure, high cholesterol, and diabetes; consumption of five fruits and vegetables a day, engagement in physical activity and CVD risk index (CVDRI), a composite score of 11 variables. The specific aim of this thesis project was to assess the effectiveness of the MiCMiC intervention conducted by CHW that addressed lifestyle and environmental factors around the individual level/family domain of the socioecological model. The main purpose was to determine whether the intervention had an effect on reducing CVD risk factors and CVDRI of participants in the intervention.

4.1 Study Design

A pre-post data design was conducted to assess changes on CVD risk factors and CVDRI between baseline and four months after the intervention was compelled. The first step was to identify key variables that could assist in testing the effectiveness of the intervention. This was achieved by carefully examining the data collected through clinical measures obtained through the interview. A dataset containing the variables of interest for the purpose of this thesis project is available from the investigators of the H.E.A.R.T. project. This data set included multiple variables that were gathered from a sample of 754 Hispanic adults who participated in the intervention.

4.2 Statistical Analysis

Data analysis was conducted using pre-post assessment for continuous and categorical variables. Statistical analysis included a two tailed paired t-test for continuous variables (BMI, waist circumference, blood pressure, and CVDRI).

As shown on Table 10, the categorical variables included self-reported questions on screening for high blood pressure, blood cholesterol, and diabetes.

Table 10. *Categorical variables for screening*

Type	Question	Categorical
Blood Pressure	Have you ever had your blood pressure checked?	No
		Yes, within the past year
		Yes, within the past 2 or more years
Blood Cholesterol	Have you ever had your blood cholesterol checked?	No
		Yes, within the past year
		Yes, within the past 2 or more years
Diabetes	Have you ever been screened for diabetes?	No
		Yes, within the past year
		Yes, within the past 2 or more years

Statistical significance was determined using Bowker's (3 x3) test with significance set at p value < .05.

In addition data analysis was conducted using pre-post assessment for self-reported questions on eating five fruits and vegetables a day and conducting physical activity (Table 11). Statistical significance was determined using McNemar's test (2 x2) with significance set at p value < .05.

Table 11. *Categorical variables for health behaviors*

Type	**Question**	**Categorical**
Fruits and Vegetables	Do you eat at least five fruits and vegetables a day?	Yes/No
Physical Activity	Do you exercise for at least 30 minutes 3 times per week?	Yes/No

Results

Enrollment and Retention

The MiCMiC intervention was conducted at YWCA Paso del Norte Region located at the Lower Valley of El Paso, Texas. The intervention had an initial enrollment of 754 participants of whom only 741 were available at baseline for clinical measures and to provide demographic information. Out of the initial enrollment only about 400 completed the 16-week intervention. Therefore the statistical analyses to assess the effectiveness of the intervention were based on those participants who returned four months after the intervention was completed.

Descriptive Analyses

Table 12 shows the demographic characteristics of participants. The mean age of the participants was 44 ± 13.3 years and the majority of the participants were female (83.5%). The household income for most participants (78%) was below $25,000 while in 2011 the U.S. national median household income was $50,502 (U.S. Census Bureau, 2012). Spanish was the language of preference for 82.6% of the participants and more than half (62.5%) were born in Mexico. In addition more than half reported being married or living together and had an average of 12 years of education. In addition almost half of the participants indicated not having health insurance.

Table 12. *Demographics characteristics of participants enrolled in the MiCMiC intervention*

	n = 741
Age, X±SD, years	44.6 ± 13.3
Gender	
Female, n (%)	619 (83.5)
Male	122 (16.5)
Income	
<$15,000	408 (55.4)
$15,000 - $25,000	166 (22.6)
>$25,000	162 (22.0)
Language Preference	
Spanish	612 (82.6)
English	129 (17.4)
Birthplace	
U.S.	278 (36.8)
Mexico	463 (62.5)
Marital Status	
Never Married	131 (17.7)
Married or Living Together	407 (55.1)
Separated/Divorced	161 (21.8)
Widow	40 (5.4)
Years of Education, X±SD, years	12 ± 3.6
No Health Insurance	353 (47.8)

Characteristics of Participants by Age and Gender

A comparison of participants by age and gender is depicted in Table 14. A tripartite for age break cut-off points was calculated for three categories: 18-40 years old, 40-60 years old, and 60 years and older. It was found that the majority of both females and males participating in this intervention were between the ages of 40-60 years old. As shown in Table 14 the income of participants for both genders and for all ages, was below $25,000 with a majority reporting an income under $15,000. In terms of language women reported Spanish as being their language of preference, compared to the majority of men who reported preferring to speak English more often than Spanish. Most participants were married or living together. As seen in Table 13 slightly over 25% of women and 30% men ages 40 – 60 years were married or living together.

Educational levels for both genders were somewhat different. The highest educational level for females was at 12.7 years for the 18-40 years age group, while the lowest educational level was 9.9 years for women 60 years and older. For males, the highest educational level was 12.9 years for the 40-60 age group, while the least educational level which was at 11.3 years for males 60 years and older. The majority of women (23.0%) in the 40-60 years age group as well as the majority (28.1%) of man in the 18-40 years age group did not have health insurance. Overall the majority of the participants were low-income Hispanic females.

Table 13. *Descriptive characteristics by gender of participants in the MiCMiC intervention*

	Females			Males		
		n =619			n =122	
Age, $\bar{X} \pm$ SD, years	18-40	40-60	>60	18-40	40-60	>60
Gender						
Female, n (%)	240 (38.8)	294 (47.5)	85 (13.7)			
Male				54 (44.3)	58 (47.5)	10 (8.2)
Income		n = 615			n=121	
<$15,000	148 (24.1)	112 (24.7)	52 (8.4)	31 (25.6)	22 (18.1)	3 (2.5)
$15,000 - $25,000	45 (7.3)	77 (12.6)	17 (2.8)	7 (5.8)	15 (12.4)	5 (4.2)
>$25,000	45 (7.3)	63 (10.3)	16 (2.6)	16 (13.2)	20 (16.5)	2 (1.6)
Language Preference		n=619			n=122	
Spanish	196 (31.7)	251 (40.5)	67 (10.8)	12 (9.8)	11 (9.0)	1 (0.8)
English	44 (7.1)	43 (6.9)	18 (2.9)	42 (34.4)	47 (38.5)	9 (7.4)
Marital Status		n=617			n=122	
Never Married	61 (9.9)	34 (5.5)	5 (0.8)	22 (18.0)	9 (7.4)	0 (0)
Married or Living Together	134 (21.7)	163 (26.4)	35 (5.7)	29 (23.8)	38 (31.1)	8 (6.6)
Separated/Divorced	41 (6.7)	83 (13.5)	22 (3.6)	3 (2.4)	11 (9.1)	1 (0.8)
Widow	2(0.3)	14 (2.3)	23 (3.7)	0 (0)	0 (0)	1 (0.8)
		n=617			n= 119	
Years of Education	12.7 $\pm$ 2.7	11.8 $\pm$ 3.9	9.9 $\pm$ 4.2	12.7 $\pm$ 3.0	12.9 $\pm$ 3.6	11.3 $\pm$ 5.0
		n=617			n=121	
No Health Insurance	136 (22.0)	142 (23.0)	18 (2.9)	34 (28.1)	20 (16.5)	3 (2.5)

Participant Baseline Risk Factors

Table 14 depicts CVD risk factors at baseline by genders and age groups. Body mass index (BMI) of most participants fell under the overweight and obese categories. Females and males ages 40 – 60 years had the highest percentage of obesity (27% for both genders) and abnormal waist circumference (37% for females vs. 47% for males). Most females (31%) and males (30%) ages 40 – 60 years had a normal systolic blood pressure while the diastolic levels also fall under the normal levels for most female participants. About 20% of males in the 18 – 40 year age group had the highest percentage of systolic blood pressure within the pre-hypertension levels, while for the diastolic blood pressure most were within the normal levels. Lastly, the CVD risk index is also shown by gender and age groups. Among females the highest percentages were found 5 – 7 CVD risk index for the 40 – 60 year age group. For males a cumulative CVD risk factor between 5 – 8 had the highest percentage among age groups 18-40 years.

Table 14. *Baseline cardiovascular disease risk factors among females and males by age group*

	Females			Males		
Age group (years)	18-40	40-60	>60	18-40	40-60	>60
BMI		n=613			n=120	
Normal (18.5 – 24.9)	53 (8.6)	32 (5.2)	6 (1.0)	13 (10.7)	4 (3.3)	1 (0.8)
Overweight (25 – 29.9)	70 (11.4)	96 (15.7)	27 (4.4)	14 (11.6)	20 (16.5)	2 (1.7)
Obese (>30)	112 (18.3)	165 (26.9)	52 (8.5)	27 (22.3)	33 (27.3)	7 (5.8)
Waist Circumference		n=615			n=122	
Female						
< 88 cm (34.65 in)	80 (13.0)	62 (10.1)	10 (1.6)			
> 88 cm (34.65 in)	158 (25.7)	230 (37.4)	75(12.2)			
Male						
<102 cm (40.16 in)				12 (9.8)	1 (0.8)	0 (0)
>102 cm (40.16 in)				42 (34.4)	57 (46.7)	10 (8.2)
Blood Pressure		n=614			n=122	
Normal						
Systolic, < 120 mm Hg	146 (23.8)	105 (17.1)	15 (2.4)	23 (18.9)	9 (7.4)	1 (0.8)
Diastolic, < 80 mm Hg	170 (27.7)	188 (30.6)	71(11.6)	37 (30.3)	23 (18.9)	7 (5.7)
Prehypertension						
Systolic, 120-139 mm Hg	79 (12.9)	128 (20.8)	31 (5.0)	25 (20.5)	31 (25.4)	3 (2.5)
Diastolic, Below 80-89 mm Hg	49 (8.0)	78 (12.7)	12 (2.0)	13 (10.7)	23 (18.9)	2 (1.6)
High Blood Pressure						
Systolic, > 140 mm Hg	11 (1.8)	60 (9.8)	39 (6.4)	6 (4.9)	18 (14.8)	6 (4.9)
Diastolic, >90 mm Hg	17 (2.8)	27 (4.4)	2 (0.3)	4 (3.3)	12 (9.8)	1 (0.8)
CVD Risk Index (11 items)		n=619			n=122	
0	1 (0.2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
1	1 (0.2)	3 (0.5)	0 (0)	0 (0)	0 (0)	0 (0)
2	11 (1.8)	7 (1.1)	3 (0.5)	1 (0.8)	0 (0)	0 (0)
3	33 (5.3)	19 (3.1)	3 (0.5)	6 (4.9)	2 (1.6)	2 (1.6)
4	37 (6.0)	38 (6.1)	7 (1.1)	6 (4.9)	8 (6.6)	2 (1.6)
5	48 (7.8)	61 (9.9)	18 (2.9)	8 (6.6)	7 (5.7)	0 (0)
6	48 (7.8)	68 (11.0)	24 (3.9)	15 (12.3)	20 (16.4)	4 (3.3)
7	32 (5.2)	58 (9.4)	18 (2.9)	12 (9.8)	11 (9.0)	2 (1.6)
8	23 (3.7)	31 (5.0)	9 (1.5)	4 (3.3)	10 (8.2)	0 (0)
9	5 (0.8)	7 (1.1)	1 (0.2)	2 (1.6)	0 (0)	0 (0)
10	1 (0.2)	2 (0.3)	2 (0.3)	0 (0)	0 (0)	0 (0)
11	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Specific Aim 1

Specific aim one investigates the impact of the MiCMiC intervention among low-income Hispanic adults on cardiovascular disease (CVD) risk factors including BMI, waist circumference, blood pressure, and cardiovascular disease risk index (CVDRI). Table 15 shows means and standard deviations of a two tailed paired t-test between pre- and post-intervention for these variables.

Body Mass Index

There was a significant difference between BMI pre-test (x = 31.5 kg/m^2, SD = 6.3) and post-test (x = 31.0 kg/m^2, SD = 6.2), t-test (402) = 6.40, SD = 1.30, p = .0001 (two-tailed) for participants in the MiCMiC intervention. Consequently, this result shows that many participants reduced their BMI and therefore reduced one risk factor for CVD.

Waist Circumference

There was a significant difference in waist circumference between pre-test (x = 38.9 inches, SD = 5.3) and post-test (x = 37.8 inches, SD = 5.4), t-test (401) = 10.18, SD = 2.12, p = .0001 (two-tailed) for people participating in the MiCMiC intervention. Furthermore, partaking in the MiCMiC intervention significantly decreased the waist circumference of many participants.

Blood Pressure

The mean systolic blood pressure of participants in the MiCMiC intervention was not significantly different when comparing mean values between pre-test (x = 127.2 mm Hg, SD = 18.8) and post-test (x = 126.3 mm Hg, SD = 16.8), t-test (403) = 1.35, SD = 13.15, p = .1762 (two-tailed). On the other hand the diastolic mean blood pressure at pre-test (x = 76.4 mm Hg, SD = 9.4) was significantly different than the mean diastolic blood pressure at post-test (x = 75.6

mm Hg, SD = 9.2), t-test (403) = 2.15, SD = 7.24, p = .0325 (two-tailed). Thus, having taken part in the MiCMiC intervention helped participants to improve their diastolic blood pressure.

Cardiovascular Disease Risk Index (CVDRI)

CVDRI is based on a composite of 11 risk factors. Information on individual CVD risk factors was gathered from the HEART project's survey. These risk factors included BMI, waist circumference, screening for blood pressure, cholesterol and diabetes, fruits and vegetable consumption, exercise, smoking, and health education. The main hypothesis posted for participants in the MiCMiC intervention is that the culturally appropriate intervention will reduce individual CVD risk factors as well as CVD risk index at post-test. As shown in Table 15 the mean difference in CVDRI between pre-test (x = 5.6 risk factors, SD = 1.7) and post-test (x = 3.8 risk factors, SD = 1.6), t-test (404) = 22.01, SD = 1.68, p = .0001 (two-tailed) was found significantly different. Participants' involvement in the MiCMiC intervention greatly decreased their CVD risk index.

Table 15. *Cardiovascular disease risk factors of participants in the MiCMiC intervention*

	Baseline		Pre-test		Post-test		
CVD Risk Factors	n	$\bar{X} \pm SD$	N	$\bar{X} \pm SD$	n	$\bar{X} \pm SD$	P value
BMI, kg/m^2	737	31.2 $\pm$ 6.4	403	31.5 $\pm$ 6.3	403	31.0 $\pm$ 6.2	<.0001*
Waist circumference, inches	737	38.9 $\pm$ 5.5	402	38.9 $\pm$ 5.3	402	37.9 $\pm$ 5.4	<.0001*
Blood Pressure	736		404		404		
Systolic, mm Hg		126.4 $\pm$ 18.1		127.2 $\pm$ 18.8		126.3 $\pm$ 16.8	0.1762
Diastolic, mm Hg		77.0 $\pm$ 14.9		76.41 $\pm$ 9.4		75.7 $\pm$ 9.2	<.05*
CVD Risk Index (11 items)	741	5.6 $\pm$ 1.7	405	5.6 $\pm$ 1.73	405	3.8 $\pm$ 1.6	<.0001*

p< .05, p< .0001 *significant difference

Table 16 shows the individual CVD risk index of participants upon enrollment (741) as well of those participants who completed the intervention (402-405). Frequency analysis was used to demonstrate the distribution of individual and cumulative risk factors upon enrollment pre-test and post-test. For the pre-test the greatest distribution of CVDRI was around six risk factors (24.44%), while for the post-test the greatest CVDRI distribution was 3 risk factors (25.68%). Overall there was a significant difference of CVDRI between pre- and post-test, indicating that the intervention was effective at reducing CVD risk index.

Table 16. *Distribution of CVD risk index*

CVDRI Frequency	Baseline n (%)	Pre-test n (%)	Post-test n (%)	p value <.05
	n = 741	n = 405	n = 405	
0	1 (0.13)	0(0)	3 (0.74)	
1	4 (0.54)	2(0.49)	29 (7.16)	
2	22 (2.97)	13 (3.21)	56 (13.83)	
3	65 (8.77)	35 (8.64)	104 (25.68)	
4	98 (13.23)	61 (15.06)	81 (20.00)	
5	142 (19.16)	70 (17.28)	71 (17.53)	0.0001*
6	179 (24.16)	99 (24.44)	37 (9.14)	
7	133 (17.95)	69 (17.04)	22 (5.43)	
8	77 (10.39)	42 (10.37)	2 (0.49)	
9	15 (2.02)	11 (2.72)	0 (0)	
10	5 (0.67)	0 (0)	0 (0)	
11	0 (0)	0 (0)	0 (0)	

$p < .0001$, * significant difference

Table 17 shows the difference between pre- and post-test in relation to CVD risk factors of 404 participants. The most common CVD risk factor prior to the intervention was the lack of health education for 89.6% of participants, followed by an abnormal BMI at 85.4%. The least common CVD risk factor reported prior to the intervention was diabetes with 15.8%. Most CVD risk factors decreased at post-test except for abnormal BMI at 85.1% and high blood pressure at 63.1%. Between all the CVD risk factors the lack of health classes had the biggest impact, as it

went from 89.6% to 2.5%, meaning that most of these participants attended the health classes from the MiCMiC intervention. The results show that lowering CVD risk factors helped decrease CVD prevalence among the participants.

Table 17. *CVD Risk factors from the CVDRI*

CVD Risk Factor	Pre-test n (%)	Post-test n (%)
	n = 404	n = 404
Blood Cholesterol Not Screened	149 (36.9)	122 (30.2)
High Blood Cholesterol	142 (35.1)	145 (35.9)
Diabetes Not Screened	136 (33.7)	107 (26.5)
Have Diabetes	64 (15.8)	61 (15.1)
High Blood Pressure	257 (63.6)	255 (63.1)
No 5 Fruits & Veg a Day	258 (63.9)	137 (33.9)
No Exercise 3times 30 min a week	228 (56.4)	58 (14.4)
Abnormal Waist Circumference	282 (69.8)	247 (61.1)
Abnormal BMI	345 (85.4)	344 (85.1)
Smoking	34 (8.4)	28 (6.9)
No Health Classes	362 (89.6)	10 (2.5)

Specific Aim 2

Specific aim two examines the impact of the MiCMiC intervention among low-income Hispanic adults on screening behaviors for blood pressure, cholesterol, and diabetes.

Participant Baseline Screening Behaviors by Age and Gender

A comparison by genders and age groups on screening behaviors are depicted in Table 18. Screening for blood pressure in the past year has been more frequent for the majority of female participants under the age group of 40-60 years with 41.1%. Amongst males in the 40-60 age group, blood pressure screening has occurred for the majority within the past year with 38%. As for blood cholesterol screening, most females (32.3%) in the age group 40-60 years were screened within the past year. Screening for blood cholesterol occurred for the majority of men

(30.3%) in the age group 40-60 years. A final screening behavior for diabetes is reported in Table 18. For this screening most of the females who were screened (34.1%) are from the 40-60 year age group, while for the males the same age group had the majority at 32.2%. Thus, for all screening behaviors among females and males the 40-60 age groups got the highest screening.

Table 18. *Self-reported screenings of participants in the MiCMiC intervention*

	Females n (%)			Males n (%)		
Age (years)	18-40	40-60	>60	18-40	40-60	>60
Blood Pressure Screening		n=618			n=121	
No	26 (4.2)	13 (2.1)	1 (0.2)	6 (5.0)	5 (4.1)	1 (0.8)
Yes, within past year	182 (29.4)	254 (41.1)	82 (13.3)	41 (33.9)	46 (38.0)	9 (7.4)
Yes, within past 2 years or more	30 (4.9)	26 (5.2)	2 (0.3)	7 (5.8)	5 (4.1)	0 (0)
Blood Cholesterol Screening		n=619			n=122	
No	65 (10.5)	32 (5.2)	1 (0.2)	20 (16.4)	9 (7.4)	0 (0)
Yes, within past year	105 (17.0)	200 (32.3)	76 (12.3)	22 (18.0)	37 (30.3)	9 (7.4)
Yes, within past 2 years or more	64 (10.3)	60 (9.7)	8 (1.3)	9 (7.4)	12 (9.8)	1 (0.8)
Diabetes Screening		n=614			n=121	
No	53 (8.6)	27 (4.4)	4 (0.6)	24 (19.8)	11 (9.1)	0 (0)
Yes, within past year	127 (20.5)	211 (34.1)	71 (11.5)	23 (19.0)	39 (32.2)	8 (6.6)
Yes, within past 2 years or more	52 (3.7)	54 (8.8)	6 (1.5)	6 (4.9)	7 (5.8)	2 (1.6)

Blood Pressure Screening

Table 19 shows the comparison of screening for blood pressure of participants' prior and post intervention. The question asked to the participants was: have you ever had you blood pressure checked? Participants were able to choose from the following three responses: no, yes, within the past year, and yes, within the past 2 years or more. The percentage of participants who reported conducting blood pressure screening within the past year increased from 84.7% to

93.8%, while those who did not get their blood pressure screened decreased from 5.9% to 3.0%. Results also showed a change in the proportion of participants who were screened for blood pressure within the past 2 years or more, from 9.4% to 3.2%. Furthermore, the percent change indicates that the MiCMiC intervention improved the participants' blood pressure screening behavior.

Table 19. *Self-reported screening for blood pressure of participants in the MiCMiC intervention, have you ever had you blood pressure checked?*

Response	Pre-test n (%)	Post-test n (%)
	n = 405	n = 405
No	24 (5.9)	12 (3.0)
Yes, within past year	343 (84.7)	380 (93.8)
Yes, within past 2 years or more	38 (9.4)	13 (3.2)

Results shown in Table 20 demonstrate how blood pressure screening among participants had a significant difference in the proportion of participants not getting screened to getting screened within the past year, $p < .0001$. Results depicted in Table 20 also show how blood pressure screening among participants had a significant difference in the proportion of participants getting screened within the past 2 or more years to within the past year after participating in the MiCMiC intervention, $p < .0001$.

Table 20. *Pre-post test results of screening for blood pressure of participants in the MiCMiC intervention using Bowker's test, have you ever had you blood pressure checked?*

	Post-test Blood Pressure screening n (%)		
Pre-test Blood Pressure screening n (%)	n = 12	n = 380	n = 13
Response	No	Yes, within the past year	Yes, within the past 2 or more years
No	3 (0.74)	19 (4.69)*	2 (0.49)
Yes, within the past year	9 (2.22)	326 (80.49)	8 (1.98)
Yes, within the past 2 or more years	0 (0)	35 (8.64)*	3 (0.74)

n = 405, p < .0001, * significant difference

Blood Cholesterol Screening

Table 21 shows changes among participants for self-reported screening for blood cholesterol. The question asked to the participants was: have you ever had you blood cholesterol checked? Participants were able to pick from the following responses: no, yes, within the past year, and yes, within the past 2 years or more. The proportion of participants who responded not having their blood cholesterol checked after the intervention decreased from 13.2% to 12.3%, while those who did get checked within the past year increased from 64.3% to 70.5%. After the intervention variations occurred among participants who were screened for blood cholesterol within the past 2 years or more, decreasing from 22.5% to 17.3%. More often participants in the MiCMiC intervention had their blood cholesterol screened than prior to engaging in the intervention.

Table 21. *Self-reported screening for blood cholesterol of participants in the MiCMiC intervention. have you ever had you blood cholesterol checked?*

Response	Pre-test n (%)	Post-test n (%)
	n =400	n = 400
No	53 (13.2)	49 (12.3)
Yes, within past year	257 (64.3)	282 (70.5)
Yes, within past 2 years or more	90 (22.5)	69 (17.3)

On Table 22 the blood cholesterol screening results among participants had a significant difference in the proportion of participants getting screened within the past 2 or more years to within the past year after participating in the MiCMiC intervention, $p < .05$.

Table 22. *Pre-post test results of screening for blood cholesterol of participants in the MiCMiC intervention using Bowker's test, have you ever had you blood cholesterol checked?*

	Post-test Blood Cholesterol screening n (%)		
Pre-test Blood Cholesterol screening n (%)	n = 49	n = 69	n = 282
Response	No	Yes, within the past year	Yes, within the past 2 or more years
No	23 (5.75)	15 (3.75)	15 (3.75)
Yes, within the past year	15 (2.22)	228 (57.00)	14 (3.50)
Yes, within the past 2 or more years	11 (2.75)	39 (9.75)*	40 (10)

n=400, $p < .05$, * significant difference

Diabetes Screening

Self-reported diabetes screening results are displayed in Table 23. The question asked to the participants was: have you ever been screened for diabetes? Participants were able to choose from the following three responses: no, yes, within the past year, and yes, within the past 2 years or more. The number of participants who did not get screened for diabetes after the MiCMiC intervention decreased from 14.0% to 10.3%, while those who did get screened for diabetes increased from 67.3% to 74.0%. Table 23 also shows changes in diabetes screening self-reported behavior among participants within the past 2 years or more decreasing from 18.8% to 15.8%. Therefore, these changes show the impact the MiCMiC Intervention had on improving the frequency of participants' diabetes screening.

Table 23. *Self-reported screening for diabetes of participants in the MiCMiC intervention, have you ever been screened for diabetes?*

Response	Pre-test n (%)	Post-test n (%)
	n = 400	n = 400
No	56 (14.0)	41 (10.3)
Yes, within past year	269 (67.3)	296 (74.0)
Yes, within past 2 years or more	75 (18.8)	63 (15.8)

Self-reported diabetes screening results as shown in Table 24, had a significant difference in the proportion of participants getting screened within the past 2 or more years to within the past year after participating in the MiCMiC intervention, $p < .05$.

Table 24. *Pre-post test results of screening for diabetes of participants in the MiCMiC intervention using Bowker's test, have you ever been screened for diabetes?*

	Post-test Diabetes screening n (%)		
Pre-test Diabetes screening n (%)	n = 41	n = 63	n = 296
Response	No	Yes, within the past year	Yes, within the past 2 or more years
No	13 (3.25)	26 (6.5)	17 (4.25)
Yes, within the past year	17 (4.25)	227 (56.75)	25 (6.25)
Yes, within the past 2 or more years	11 (2.75)	43 (10.75)*	21 (5.25)

n = 400, $p < .05$, *significant difference

Specific Aim 3

The third specific aim studies the effect of the MiCMiC intervention among low-income Hispanics on the consumption of five fruits and vegetables a day. Participants answered whether or not they consumed at least five fruits and vegetables a day. Table 25 depicts the consumption of five fruits and vegetables a day by gender and age group. The majority of females (30.0%) who were in the 40-60 year age group stated that they did not conduct this health behavior. Male

consumption of five fruits and vegetables was not completed for the majority (31.4%) of males under the 40-60 year age group. In conclusion, most participant, females and males among all age groups do not consume five fruits and vegetables a day.

Table 25. *Baseline self-reported fruit and vegetable consumption by gender and age, do you eat at least five fruits and vegetables a day?*

	Females n (%)			Males n (%)		
Age (years)	18-40	40-60 n=614	>60	18-40	40-60 n=121	>60
No	158 (25.7)	184 (30.0)	47 (7.7)	37 (30.6)	38 (31.4)	4 (3.3)
Yes	79 (12.9)	109 (17.8)	37 (6.0)	17 (14.0)	19 (15.7)	6 (5.0)

Table 26 shows improvement in consumption of five fruits and vegetables from 35.8% to 66.4% between pre-and post-test, while those who reported not eating five fruits and vegetables per day decreased from 64.2% to 33.6%. Furthermore, this result shows an impact of the MiCMiC intervention on the consumption of five fruits and vegetables a day.

Table 26. *Self-reported fruit & vegetable consumption results of participants in the MiCMiC intervention, do you eat at least five fruits and vegetables a day?*

Response	Pre-test n (%)	Post-test n (%)
	n = 405	n = 405
No	260 (64.2)	136 (33.6)
Yes	145 (35.8)	269 (66.4)

Table 27 describes the results from the analysis using McNemar's (2x2) test to show the impact of the MiCMiC intervention among participants' behavior of eating five fruits and vegetables a day. A significant difference was found for participants who changed their habit of

eating five fruits and vegetables a day from answering no to yes after participating in the intervention, $p < .0001$.

Table 27. *Pre-post test results of eating five fruits and vegetables a day of participants in the MiCMiC intervention using McNemar's test, do you eat at least five fruits and vegetables a day?*

	Post-test 5 fruits & vegetables a day, n (%)	
Pre-test 5 fruits & vegetables a day, n (%)	n = 136	n = 269
Response	No	Yes
No	111 (27.41)	149 (36.79)*
Yes	25 (6.17)*	120 (29.63)

n = 405, $p < .0001$, *significant difference

Specific Aim 4

The fourth specific aim studies the effect of the MiCMiC intervention on conducting 30 minutes of physical activity, three times a week. Participants answered whether or not they exercise for at least 30 minutes 3 times per week. Table 28 shows the amount of participants who exercise 30 minutes, three times a week. The majority of women ages 40-60 (29.5%) did not conduct this health behavior. For the majority of men ages 18-40 (28.9%) did not conduct this health behavior. In conclusion, among both genders most participants do not conduct exercise 30 minutes, three times a week.

Table 28. *Baseline self-reported exercise results by gender and age, do you exercise for at least 30 minutes 3 times per week?*

		Females n (%)			Males n (%)	
Age (years)	18-40	40-60	>60	18-40	40-60	>60
		n=613			n=121	
No	138 (22.5)	181 (29.5)	47 (7.7)	35 (28.9)	29 (24.0)	2 (1.7)
Yes	16.2 (16.2)	111 (18.1)	37 (6.0)	19 (15.7)	28 (23.1)	8 (6.6)

As seen on Table 29 physical activity increased from 43.3% to 85.6% after taking part in the intervention while those who reported not engaging in physical activities behavior changed from 56.7% to 14.4%. Therefore, participants taking part in the MiCMiC intervention greatly improved engagement in physical activity.

Table 29. *Self-reported physical activity results of participants in the MiCMiC intervention, do you exercise for at least 30 minutes 3 times per week?*

Response	Pre-test n (%)	Post-test n (%)
	n = 404	n = 404
No	229 (56.7)	58 (14.4)
Yes	175 (43.3)	346 (85.6)

McNemar's test was used to assess the impact the MiCMiC intervention had on participants' habit of conducting physical activity 30 minutes, three times a week. As shown in Table 30 there was a significant difference on physical activity conducted 30 minutes, three times per week after participating in the MiCMiC intervention, $p < .0001$.

Table 30. *Pre-post test results of conducting exercise of participants in the MiCMiC intervention using McNemar's test, do you exercise for at least 30 minutes 3 times per week?*

	Post-test exercise 30 min, 3 times per week n (%)	
Pre-test exercise 30 min, 3 times per week, n (%)	n = 58	n = 346
Response	No	Yes
No	44 (10.89)	185 (45.79)*
Yes	14 (3.47)*	161 (39.85)

n = 404, $p < .0001$, *significant difference

Discussion

Results from this study indicate that participating in an intervention implemented by CHW had an impact on the reduction of most CVD risk factors of participants. Previous lifestyle interventions implemented by CHW have demonstrated its effectiveness when changing health behaviors of participants. CHW have similar demographics as those taking part in lifestyle interventions (Allen et al., 2011). Being part of the community and having a similar background helped participants form a strong relationship with CHW which helps in building trust and in fostering a learning process that is conducive of adopting a healthier lifestyle. As seen in previous interventions the utilization of CHW is a very effective strategy in the adoption of healthier behaviors especially among low-income Hispanic populations (Balcazar, Alvarado, Fulwood, Pedregon, & Cantu, 2009; Farrell, 2009; & Staten, Scheu, Bronson, Pena, & Elenes, 2005).

A study conducted in the US-Mexico border using CHW on an intervention called *Salud para su Corazón*, was aimed at high-risk Hispanic communities to reduce health risk factors and to improve health behaviors (Balcazar et al., 2009). The results of that particular program showed successful results demonstrated by positive changes in biochemical indicators of participants including low-density lipoprotein cholesterol level, triglyceride level, waist circumference, diastolic blood pressure, weight, and glycated hemoglobin (HbA1c). Results from this study are consistent with similar studies and proves that the use of CHW is effective in interventions aimed at Hispanics and intended for this population to adopt healthier behaviors.

Another example of a successful intervention is the WISEWOMAN program in California (Heart of the Family). Lifestyle interventions were used among the enhanced intervention group (EIG) and compared to a usual care group (UCG). The EIG had counseling

sessions with CHW and had access to Spanish material on nutrition and physical activity. Results from that study showed that women in the EIG were more likely to improve health behaviors such as diet and physical activity than the UCG. The 10-year coronary heart disease (CHD) risk, which shows that those who have a low risk tend to live 10 years longer compared to those with a high risk, results show that EIG women improved in the 10-year CHD risk when compared to UCG (Farrell, 2009).

Pasos Adelante or "Steps Forward" is a primary prevention program from the National Heart Lung and Blood Institute (NHLBI) that focused on preventing diabetes, cardiovascular disease, and other chronic diseases in Hispanics. In this 12-week program, CHW led sessions that included topics on chronic disease prevention, nutrition, and physical activity. The results of the *Pasos Adelante* program indicate that significant pre-post results showed improvement in physical activity and a change of dietary patterns (Staten et al., 2005). An intervention like "Steps Forward", which incorporated CHW shows that this type of model can be beneficial among the Hispanic population.

Another study using CHW is called the Mexican-American Trial of Community Health workers (MATCH). This study focused on using MATCH as a blinded randomized controlled trial to analyze CHW efficacy in improving physiologic outcomes and self-management behaviors among Mexican-Americans with type 2 diabetes (Rothschild et al., 2012). That study only describes the design and baseline characteristics, but it is an example of how interventions with CHW can be implemented.

Participant awareness of community health resources greatly increased with their participation in MiCMiC intervention of the H.E.A.R.T. project. Not only were participants able to improve their health, but they learned which local health centers were available to continue

practicing their healthy behaviors. Overall results from this study showed a positive impact the intervention has made in a community of low income Hispanics living in El Paso, TX.

After participating in the MiCMiC intervention, clinical measures (BMI, waist circumference, diastolic blood pressure, CVDRI) and self-reported health behaviors (screenings in blood pressure, blood cholesterol, & diabetes, fruit and vegetable consumption, and physical activity) improved significantly. While Hispanics are one of the groups with higher obesity prevalence, this intervention helped decrease this health measure among participants. The American Medical Association's (AMA) description of obesity being a disease increases the awareness of the public and could lead to more interventions that addresses this issue (AMA, 2013). The NHANES 2009-2010 report states Mexican-American women tend to have higher obesity prevalence along with Black women. The results of this study revealed the intervention's impact on decreasing BMI among the participants.

This study proves that when having an effective intervention like MiCMiC blood pressure screening can be conducted more frequently to prevent hypertension or getting treated for hypertension. Not only was blood pressure screening increased, but the project was able to decrease the diastolic blood pressure among participants. Systolic blood pressure may have to be studied further in order to make it effective in the intervention as well.

A waist circumference above recommended levels represents a risk factor for obesity, diabetes, CVD, and other diseases (CDC, 2011). Females in general tend to have a higher than normal waist circumference that puts them at a higher risk for CVD risk factors as this is also the case for Mexican-American women. Significant differences were noticed among participants in this study when participating in a culturally based intervention.

CVD has been a very common disease affecting this nation. It has been the leading cause of death for almost a century (Ford et al., 2007; Kochanek et al., 2012). This study assessed whether this type of intervention would make a difference among participants in terms of CVD risk. The results are very revealing of participants' CVD risk significantly decreasing. In a time where Americans are struggling with this disease, the MiCMiC intervention offers a different approach to combat this epidemic.

High blood cholesterol represents a risk factor for CVD among Mexican-American men. This project helped participants increase screening behaviors for blood cholesterol. Not only were participants taught about screening but they also learned what type of diet was important in preventing CVD.

Diabetes is another important CVD risk factor that has become very prevalent among Mexican-Americans as they are one of the leading groups to have this condition. Awareness of getting screened was significantly increased, while diet was also part of the health education implemented among participants.

The latest statistics indicate that Americans only eating about 2.7 fruits and vegetables per day (CDC, 2013e). The self-reported results show that MiCMiC intervention participants were able to improve significantly in eating five fruits and vegetables a day. Especially among Hispanics this intervention proved valid in improving fruit and vegetable consumption.

Physical activity levels for Hispanics is among the lowest when compared to other ethnic groups in the U.S. Recent statistics show that Hispanics do not perform the minimum requirement of exercise per week (CDC, 2013). After participating in this intervention most participants reported a significant increase of this physical activity.

The amount of physical activity a person performs is also linked to cardiovascular disease. A longitudinal study of cardiovascular health in the Dallas Heart Study assessed physical activity participation and health perceptions with a questionnaire among African Americans, Hispanics, and white men and women. The study stated that ethnic minorities have less physical activity (PA) participation compared to non-Hispanic whites and a deficiency of PA was associated in higher cardiovascular deaths overall (Mathieu, 2012). Results also found that ethnic-specific factors contributed to the study's result on ethnic minorities' low physical activity. Perhaps these other ethnic-specific factors could be surpassed with a culturally based intervention like MiCMiC.

Another study utilized promotores de salud volunteers to promote physical activity by conducting free exercise classes in San Diego, California. The results show that after providing females with free exercise classes the intervention was effective in improving systolic blood pressure, waist circumference, fitness, hamstring flexibility. The study also points out that there were improvements in use of community resources, depressed mood and anhedonia. Conclusions from the study state that promotores can promote physical activity in the community and make meaningful changes in community members' health.

Strengths

One of the strengths of the study was the large sample size. The baseline had a sample of about 754, which then translated to about 400 when conducting pre-post tests. Having this larger sample helps with detection of significant difference which was strong enough. Another strength in this study is that it was able to have a large Hispanic group of participants, which was initially what the MiCMiC intervention had wanted. This Hispanic sample population also aids future programs' aim on decreasing CVD among this group.

The MiCMiC intervention had many health resources for participants, which was another reason this study was successful. This intervention provided great social support like CHW and new acquaintances, health education classes, and physical activity classes. This intervention was also very well structured to aid a low-income population. Multiple resources made available through the intervention filled with variety and excitement, translated into motivation for participants.

An additional strength of this study being successful is that activities had a very attainable schedule. Activities were conducted throughout the day to accommodate those participants that had different work schedules (day shift/night shift). Not only that, but activities were also offered on Saturdays where a majority of participants had time off. A culturally appropriate intervention that offers a menu of nutrition and physical activities implemented by CHW in a family friendly environment is of high relevance for the Hispanic population, the fastest growing minority group in the nation.

Participants' feelings on the MiCMiC intervention also demonstrate its impact. One participant stated, "I am very happy with the H.E.A.R.T. program which was sponsored by UTEP. In terms of my health I felt good, because I have diabetes and with all the scheduled activities I could participate in a number of them. The important thing was that they were having morning and evening activities, when it was not possible to attend in the morning, I would be able to in the afternoon. I always took the glucose test in the evening, when it was not possible in the morning I would change my schedule for the afternoon. I always took the glucose test and also after the exercises and I could see as my glucose levels decreased. I got very excited and my self-esteem rose, as well as my energy." This participant was very happy with the flexible

MiCMiC schedule of activities as well as the decrease in glucose levels, higher self-esteem, and energy.

Another participant also expressed their gratitude towards the intervention. This participant stated, “On the other hand, my family has benefited from the knowledge that HEART provides in their classes to improving healthy cooking and shopping for my family. My children are now looking at measures (servings) in every food they consume and count the calories so that they do not go beyond their consumption. My family avoids eating salt and excess sugar thanks to pamphlets that HEART gave me in their classes and who have informed my family from the risks to which we are exposed, if we do not have a proper diet.” This participant is very thankful because their family as well as the participant is able to eat healthier. The intervention also proves that it was not only effective among participants, but was as successful with family members.

Participants were also very happy with the CHW. One participant stated, “Getting to know the community health workers gave a great swing to my personal life in general issue of different aspects that I learned from them by their information and knowledge thank you for your support. Super thanks for all your help and collaboration to have answered all my questions about various topics.” Another participant stated, “The promotoras were all very professional, friendly, and well informed. They really inspired many of us that weren’t always up to attending.” These participants seemed to have been motivated by the CHW to not only participate but to improve their health.

Lastly, I think another strength of this study was my personal experience as a research assistant in the H.E.A.R.T. project. I was also able to observe how an intervention was conducted, which opened my eyes on the variety of activities participants were involved in. I was

also able to observe the motivation and happiness many participants were experiencing during and after the intervention because of their improved health. The use of the ecological model helped me understand that when many collaborators work together this could help the increase participant participation. For example, having collaboration among UTEP, University of Texas School of Public Health, YWCA, City of El Paso Parks and Recreation, Centro San Vicente, and the EPCC allowed the participants to have different health locations to partake in activities. This collaboration was successful because each organization did its part to make this intervention successful as observed in the significant differences.

I was also able to work along with and experience the use of CHW effect among participants. I observed that CHW having similar characteristics as participants is very important because there is a stronger relationship. The health knowledge CHW have is very beneficial because it is translated in Spanish and that is a factor that helps the Hispanic population. I understand as well that culture is another factor that plays into effect, especially among diet and physical activity. CHW being aware of the Mexican culture helps understand which unhealthy foods in the Mexican culture can be replaced with healthier ones. CHW knowledge on physical activity is also another factor to consider. CHW were able to lead physical activities that motivated participants to perform exercise more frequently

Limitations

The results showed that an intervention led by CHW was effective in decreasing risk factors for CVD; however one limiting factor in this investigation is that the majority of the participants were women (83.5%). Many reasons could have affected the low participation of men. First of all males in the Hispanic culture tend to be the provider of the family. Therefore, work schedules of males may be more time consuming on a daily basis compared to females.

Another reason is that men tend to have lower prevalence of obesity compared to women and may be viewed as not important to conduct.

CHW's gender could also be another reason there was a low participation of male participants involved. The intervention was led by three female CHW. Perhaps a male CHW/PS could have caught the attention of male participants due to a better understanding of what Mexican men's' perceptions on health are like.

Language could have also been a factor in low male participation. Based on male participant characteristics from the intervention, English is the preferred language. This may be due to the fact that most males are the financial provider for the family and they may require speaking English at their workplace. Perhaps because Spanish was the primary language in the intervention many men didn't participate, although handouts were also provided in English, as well as the CHW being bilingual.

Another limitation was that the attrition rates for the program. The retention rate for the intervention was about 56.1 %. As stated before there was an initial enrollment of 754 participants and about 400 completed the intervention and returned four weeks after to have their clinical measures taken and to answer the same questionnaire administered by the CHW at the beginning of the study. Some factors that could have played a role in low participation in the post evaluation may be attributed to multiple factors including work schedules, family obligations, or illnesses among other reasons. Having a higher number of participants in the analyses could have helped make the significant differences stronger.

Perhaps a reason for a low attrition rate may be due to immigration status. As stated before the study was conducted in a low-income Hispanic area. Immigration continues to affect the majority of Hispanics, many states have increased law enforcement efforts to decrease the

amount of undocumented persons. This in turn has made the Hispanic population fearful upon being apprehended and removed from this country, where many have families that depend on them. Thus, this may be a reason for many participants not returning back for attendance of activities and post-testing.

Another limitation was the instability some participants might have had. As mentioned before the location of the intervention focused on low-income Hispanics. Several participants had to move to a different location within or out of the city due to getting a new home. This change of home also meant that participants would have to drive further back to the YWCA, location where the testing was being conducted. The distance of location could also be a factor due to the high cost of car fuel that could have also decreased post-testing participation. Not all participants had cars so this could have also prevented many from coming back because their ride was not available or their car was inoperable.

There are some similarities between the participants who completed the intervention and those who dropped out. There were no significant differences in age, total years in the U.S., years of education, and gender distribution among those who completed the intervention and those who dropped out. There were some significant differences between these two groups, the majority that completed the intervention were married or living together like a married couple, born in Mexico, and Spanish was the preferred language. Perhaps to have a higher attrition rate a closer look at those who completed the intervention can be studied to use the same characteristics they had in future interventions.

The project not being a randomized control trial also was a limitation, since this is the gold standard for clinical trials. The use of a randomized control trial tests for efficacy and/or effectiveness for interventions. When comparing to another group, randomization helps

minimize allocation bias. Perhaps a reason for this not occurring was probably the increase in resources to conduct this test and the fact that the community wanted a program like MiCMiC available to all.

Conclusion

The implementation of the MiCMiC intervention by CHW resulted in positive changes of participants in terms of reduction of their CVD risk factors such as BMI, waist circumference, blood pressure in addition to their CVD risk index. The significant improvement of clinical measures, the adoption of health screenings and healthier behaviors of participants makes of the MiCMiC intervention an effective model that could be reproduced for other low income Hispanic communities around the U.S. The results of the intervention are encouraging and demonstrate that CHW are an important agent of change to improve heart health among low income Hispanics.

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Curriculum Vita

Julio Ramirez is originally from El Paso, Texas and was raised in Anthony, New Mexico. Julio is the son of Julio Sr. and Margarita Ramirez. Julio graduated from The University of Texas at El Paso (UTEP) with a BS in Kinesiology and minor in Health Promotion in 2010. In Fall of 2010, Julio was accepted in the Master of Public Health program at the Department of Public Health Sciences at UTEP. While attending graduate school Julio was awarded a Graduate Research Assistantship in the H.E.A.R.T. project, an NIH funded project since 2008 in where Julio gained invaluable professional experience.

Being part of the H.E.A.R.T. project has given Julio the opportunity to work with community health workers/promotores de salud, work closely with community members and agencies, and learn about cardiovascular diseases (CVD) affecting Hispanics. Julio's thesis studied the impact a CHW lead intervention (Mi Corazon, Mi Communidad) on CVD risk factors in Hispanics living in the Lower Valley of El Paso, Texas.