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Movimiento Saludable "MOVS" Project: Impact On Fruit And Vegetable Intake Using Reflectance Spectroscopy And Relationship With Behavioral Theory Predictors

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by

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Abstract

Background. *Movimiento Saludable* (MOVS), a component of *Ciudadanos Comprometidos con la Paz* (CCOMPAZ) in Ciudad Juarez, MX is an after-school lifestyle program that was implemented at five schools during 2016 – 2017. The purpose of the MOVS program is to prevent chronic diseases such as obesity and diabetes in children. The MOVS curriculum includes two components: a) physical conditioning through dance, body expression, and free play, and b) nutrition education and healthy meals to increase fruit and vegetable (F/V) intake. The Paso del Norte Institute for Healthy Living (IHL) at UTEP collected the data to conduct an evaluation of the program.

Aims & Objectives. The objective of this study was to conduct a secondary data analysis to assess a relationship between F/V intake and self-efficacy, outcome expectations, and social norms related to F/V intake in children who participated in the MOVS program**.** The specific aims of this study were to: 1) determine if the MOVS program changes F/V intake, 2) test if specific behavioral theory predictors correlate with F/V intake, and 3) determine which behavioral theory predictors influence F/V intake the most.

The hypotheses are based on relationships between F/V intake and behavioral predictors at baseline and the relationships between *changes* in F/V intake (from baseline to follow-up) and *changes* in behavioral predictors Baseline: **H1a.** F/V self-efficacy correlates with F/V intake; **H2a.** Outcome expectations for F/V correlate with F/V intake; **H3a.**
Social Norms for F/V intake correlate with F/V intake. Change from baseline to follow-up: **H1b.** Change in F/V self-efficacy correlates with change in F/V intake; **H2b**. Change in outcome expectations for F/V correlate with change in F/V intake; **H3b.** change in social

norms for F/V intake correlate with change in F/V intake; **H4b.** Children participating in the MOVS program will increase F/V intake.

Methods. A total of 296 students were enrolled in the MOVS program (5-15 y). The dataset for this secondary data analysis included 185 children at baseline and 75 at follow-up. The variables selected from the parent dataset for analysis were: reflectance spectroscopy score, a biomarker of F/V intake, as well as self-efficacy, social norms, and outcome expectations for F/V (self-reported survey). Paired sample t-tests were used to analyze differences in pre-post assessment for F/V intake. Pearson correlations were run to determine the relationship between behavioral theory predictors and F/V intake at baseline and with change from baseline to follow-up. A linear regression using variable selection method was used to determine which behavioral theory predictor (self-efficacy, outcome expectations, social norms) is most influential in F/V intake.

Results: F/V intake increased from baseline to follow-up (mean ± SD: 98.9±19.0 vs. 104.7±22.6, t=2.2, df 74, p=0.03; H4b). There were no significant correlations for any of the relationships tested at baseline: F/V intake at baseline was not correlated with self-efficacy (H1a), outcome expectations (H2a), or social norms (H3a) at baseline. There was a negative correlation between change in outcome expectations for F/V with change in F/V intake for children ≥12 years old (r=-0.487, *p-value*= 0.02). There was a positive correlation between change in social norms for F/V intake with change in F/V intake (r=0.270, *p-value*= 0.02). There was no correlation between change in F/V self-efficacy with change in F/V intake. The most influential predictor in changing F/V intake was social norms (*Coef*= 17.626, *Sdt. Error*= 9.191, t=1.918, *Pr(>|t|)* = 0.064)

Conclusion: Results indicate a moderate impact of MOVS on F/V intake and some indication that the behavioral theory predictor of social norms can influence F/V intake. Social norms and outcome expectations may contribute to an overall context that promotes certain eating behaviors and can change F/V intake.

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Chapter 1: Introduction

The United Nations International Children's Emergency Fund (UNICEF) defines childhood as the time for children to be in school and at play, to grow strong and confident with the love and encouragement of their family and an extended community of caring adults. It is a precious time in which children should live free from fear, safe from violence and protected from abuse and exploitation. Childhood means much more than just the space between birth and the attainment of adulthood. It refers to the state and condition of a child's life, to the quality of those years (UNICEF, 2019).

Ciudadanos Comprometidos con La Paz (CCOMPAZ) is a non-profit, civil organization established in 1996 in Ciudad Juarez, Mexico. The mission of CCOMPAZ is a commitment to "generating, maintaining and supporting programs to create a culture of peace" for children of Ciudad Juarez, Mexico.

The program Movimiento Saludable "MOVS," an initiative from CCOMPAZ, consists of a lifestyle intervention that has been implemented to improve health in this population. The main objectives of the program are to: 1) improve the physical condition of its participants through dance, body expression and free play, 2) increase the consumption of weekly consumption of fruits and vegetables (F/V) of children at five schools during the school year (August 2016 - June 2017); and 3) increase the knowledge of parents and participants in relation to nutritious foods ant its health benefits. These objectives were developed and implemented with the purpose of achieving one goal: prevent chronic diseases such as obesity and hypertension in children by improving their physical condition and by increasing their daily F/V intake. These objectives are in alignment with the Paso del Norte Health Foundation Healthy Eating and Active Living (HEAL) strategic plan. The

objectives of the HEAL strategic plan are to: 1) increase F/V intake, 2) improve portion control, 3) increase physical activity, 4) decrease sedentary behavior, and 5) create an environment that promotes healthy eating and active living without bias against obesity.

Chapter 2: Background and Significance

1. Child Health

The Children's Health, the Nation's Wealth: "Assessing and Improving Child Health," report provided a new definition of children's health. Children's health is defined as: "the extent to which individual children or groups of children are able or enable to develop and realize their potential, satisfy their needs, and develop the capacities that allow them to interact successfully with their biological, physical, and social environments" (Children's Health, The Nation's Wealth, 2004). The World Health Organization defines health as 'a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (Grad, 2002).

2. Physical Health

Physical health as opposed to mental or emotional health, is the overall physical condition of a living organism at a given time. It is the soundness of the body, freedom from disease or abnormality, and the condition of optimal well-being (Kurtus, 2017). Physical wellness encourage people to care for their bodies through physical activity, proper nutrition, and a strong mind (Physical Wellness, 2019.)

2.1. Obesity

Obesity is an energy balance disorder that leads to an inability of the body to regulate energy storage (in the form of adipose tissue) in a healthy range. The solution could involve changing a combination of energy intake and energy expenditure to achieve balance (Hill, Wyatt, & Peters, 2012). The Nutrition and Health Committee for Planning and Guidance, a subdivision of the USDA Human Nutrition Coordinating Committee and the Nutrition Multistate Regional Committees formed in 2008, recommend using the body mass index

[BMI = weight (kg) / height^2 (m)] as the parameter that best defines childhood obesity. Obesity is defined as a BMI equal to or above the 95th percentile for children and adolescents of the same age and sex. On the other hand, overweight is defined as a BMI equal to 85th percentile and below 95th percentile for children and teens of the same age and sex (CDC, 2018).

Childhood obesity is associated with a higher rate of premature death and disability in adulthood. Overweight and children with obesity are more likely to keep obesity into thru adulthood. Children with obesity and adolescents suffer from both short-term and long-term health consequences (WHO, 2019). Childhood obesity is an increasingly important predictor of adult obesity, regardless of whether the parents have obesity. Parental obesity more than doubles the risk of adult obesity among both children with or without obesity under 10 years of age (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997).

2.2. Physical Activity

Physical Activity (PA) is defined as any movement produced by skeletal muscles that result in energy expenditure. PA in daily life can be categorized into occupational, sports, conditioning, household, or other practices (Pinto, 2018). Extensive evidence shows an inverse relationship between physical activity and mortality and the development of chronic disease (McKinney et al. 2016). Social support from friends and family members and role models can enhance participation in youth's PA. Individuals who engage in regular PA are more likely to have higher self-esteem, optimism, and happiness than those who are physically inactive. There is also strong evidence that regular PA can help reduce, prevent, and treat some common mental health disorders including anxiety, depression, and stress among youth (Cekin, 2015).

2.3. Diet and Nutrition

Eating a healthy, well-balanced diet is important for everyone especially for a growing child. A balanced diet consists of eating a wide variety of nutritious foods from all different food groups. As a general guide, children should eat a variety of F/V, whole grains, beans and lentils, lean meat and fish, nuts, and seeds. By eating a healthy diet, children are more likely to get all the essential vitamins, minerals, and other nutrients that the body needs for healthy growth and development (U.S. Department of Agriculture and HHS, 2016).

Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity (WHO, 2019).

Household income is a major economic factor that impacts food availability, food choices thus affecting nutritional status of individuals. Low income families ate less fruits, vegetables, milk, meat, poultry, and fish than high-income families by self-reported dietary data collected through interviews and 24-hour recall method (Bowman, 2007).

The Dietary Guidelines for Americans (DGA) provides evidence-based nutrition information and advice for people ages two and older to help Americans make healthy choices about food and beverages in their daily lives. The DGA recommendations are: to focus on variety, nutrient-dense foods (include a variety of vegetables, fruits, grains, oils, protein foods and fat-free or low-fat dairy), limit calories from added sugars and saturated fats (for total fat are ≤35% total energy from total fat and saturated fat <10% of total energy from saturated fat), reduce sodium intake (U.S. Department of Agriculture and HHS. 2015-2020, Dietary Guidelines for Americans, 2019).

"El Plato del Buen Comer" (healthy plate) is a food guide from the Official Mexican Standard for the promotion and education for health related to food. This guide establishes criteria for nutritional advice in Mexico. The graphic representation of "El Plato del Buen

Comer" is aimed at providing the population with practical food options that are based in scientific evidence, to have a balanced meal and is flexible for individual needs and provides many possibilities. It facilitates the identification of the three food groups (vegetables and fruits, cereals and tubers, legumes and proteins of animal origin), the combination and variety of food, the selection of daily menus with the three food groups and the contribution of energy and nutrients for proper nutrition. Based on these guidelines, a diet must be complete; that is, that includes at least one element of each food group in each breakfast, lunch and dinner; it must also be balanced, which means that nutrients keep proportions to each other by integrating foods from the three food groups each time one sits at the table. To meet the nutritional needs of each person according to age, sex, height, physical activity or physiological state, the guide states that food should be sufficient (Centro de Investigacion de Alimentacion y Desarollo, 2016).

3. Obesity Prevalence

3.1. Obesity Prevalence in United States

In United States, the prevalence of children and adolescents affected by obesity has more than tripled since 1970. Data from 2015-2016 shows that nearly 1 in 5 school age children and young people (6 to 19 years) in United States has obesity (Centers for Disease Control and Prevention, 2018).

Nationwide, 39.6% of adults have obesity. Obesity in the United States is particularly prevalent among Hispanics and among African Americans. In the state of Texas, 34.8% of the adult population has obesity. Texas was ranking 7th nationwide in relation to adult obesity in 2016 (National Obesity Monitor, 2016). The prevalence of obesity among adults in 2017 in El Paso Country was about 34.9% (Behavioral Risk Factors Surveillance

System, 2017; Texas Health Data, 2017; Centers for Disease Control and Prevention, 2017). According to the National Health and Nutrition Survey, 2012, 68.1% of men and 69.2 % women over 20 years of age in the state of Chihuahua, Mexico have obesity or overweight (ENSANUT, 2012).

According to the National Survey of Children's Health in 2017 – 18, 4.8 million children aged 10 to 17 had obesity in the United States from which 25.8% were Hispanic. Texas has a 14.9% obesity rate and ranks among the states in the 19th position. According to the National Survey of Health and Nutrition, 2012, 11.4% of children under 5 years of age, in the state of Chihuahua, Mexico suffer from obesity or overweight, 30% of children from 5 to 11 years old, and 31.4% adolescents 12 to 19 years of age (ENSANUT, 2012).

3.2. Physical Activity Prevalence in United States

Physical activity fosters normal growth and development and can make people feel functioning, sleep better, and reduce risk of many chronic diseases. Approximately 80% of adults and adolescents in the United States are inactive (Piercy et al, 2018) Just over half of adults nationally, 51.7%, meet the national Physical Activity Guidelines for aerobic activity (Physical Inactivity in the United States, 2018)

According to the most recent Behavioral Risk Factor Surveillance System (BRFSS) data, Texas had a 32.2% of inactivity among adults and it ranked as the 5th state with more inactivity among the U.S. In that particular survey, adults who are physically inactive are those who did not engage in physical activity or exercise during the previous 30 days other than for their regular job. In El Paso County, 25.4% of the population of adults don't participate in any physical activities or exercises in the past month, other than their regular job (Behavioral Risk Factors Surveillance System, 2017; Texas Health Data, 2017).

According to the National Survey of Health and Nutrition, 2012, 13.1% of the inhabitants in the state of Chihuahua, Mexico are inactive, 11.1% are moderately active, that is, they perform the minimum of physical activity recommended by the WHO, and 75.6% are active (ENSANUT, 2012).

According to the Youth Risk Behavior Surveillance System approximately 76% American children and youth are not getting enough daily physical activity (Youth Risk Behavior Surveillance System; YRBSS, 2017). Approximately 24% of children 6 to 17 years of age participate in 60 minutes of physical activity every day (NSCH, 2016). The United States Report Card on Physical Activity for Children and Youth indicates that 42.9 % of children are active and have physical activity more than 5 days a week (Youth Risk Behavior Surveillance System; YRBSS, 2017). On the other hand, the National Health and Nutrition Survey reported that in 2012, in the state of Chihuahua, Mexico, 19.2% of adolescents between 15 and 18 years of age were inactive, 18% were moderately active and 62.8% were active in terms of daily physical activity. In this same survey, 57.5% of children between 10 and 14 years of age reported not have performed any competitive physical activity in the last 12 months (ENSANUT, 2012).

4. Health Status and Socioecological Factors

Health is influenced by many factors, including individual, interpersonal, and environmental. The Socioecological model considers the complex interplay between individual, relationship, community and societal factors. Living conditions and neighborhood conditions are factors that have an effect on health. Exposure to an unsafe neighborhood has been associated with more health risks among children in the U.S. (Singh et al. 2008). In line with health behavior theories, many personal, social, and contextual

variables influence health such as individual factors, which include material circumstances like having adequate resources for a childcare. Interpersonal factors, such as the presence of social ties, family roles and responsibilities, and social norms, are likely to be powerful correlates of health behaviors and may vary by factors reflecting cultural differences (race/ethnicity, acculturation). Neighborhood and community factors include access to a safe place for PA. Prior research has shown that compared to higher-income, lower-income neighborhoods are less likely to have access to health-promoting services. Additionally, larger societal forces, such as racial discrimination may also shape health behaviors and outcomes. Overall, all of these are factors influence the health of a child (Mcneill, Stoddard, Bennett, Wolin, & Sorensen,.2012; Forcano, Mata, Torre, & Verdejo-Garcia, 2018).

For children living in poverty, social determinants of health include child maltreatment, childcare and education, family financial support, physical environment, family social support, intimate partner violence, maternal depression and family mental illness, household substance abuse, firearm exposure, and parental health literacy. Children, particularly those living in poverty, exposed to Adverse Childhood Experience (ACEs) are susceptible to toxic stress and a variety of child and adult health problems, including developmental delay, asthma, and heart disease (Chung et al. 2016).

5. Factors Influencing F/V Intake

Despite the growing body of research that provides evidence of the health benefits of a diet that is high in F/V, most Americans eat much less than the recommended amounts of this food group (Robinson, 2008). Leaders from the American Heart Association, American Cancer Society, United States Department of Agriculture, and the World Health

Organization recommend increasing F/V intake for all ages to promote health**.** Depending on age and gender, it is recommended to consume approximately two and a half cups of F/V daily (US Department of Health and Human Services, Dietary Guidelines for Americans, 2015). Several factors influence F/V intake in children, including social support; peer normative beliefs; modeling by parents, teachers, and peers; food environment; and exposure and repeated opportunities to try new foods (Gold, Larson, Tucker, & Strang, 2017).

5.1. Social Support

The transition from adolescence to adulthood is a critical period for developing habits that impact health and risk for disease later in life (Wengreen, Nix, & Madden, 2017). Social norms and societal modeling and expectations contribute to an overall context that promotes certain eating behaviors. However, when making specific dietary and lifestyle choices such as PA, reactions from close friends and family—positive or negative—also exert a profound influence. Social support from friends and family in the form of offering encouragement, establishing connection, providing accountability, and modeling or sharing a target behavior has been shown to help improve adherence for a wide variety of health behaviors, including taking medication, eating less fat, and exercising more (Karlsen, 2016). In a cross-sectional statewide study using a validated self-administered questionnaire assessing obesity-related behaviors, it was found that for every 1-point increase in parental support (range, 0–12), adolescents had 1.19 times higher odds of consuming ≥1 fruits or vegetables per day ($P < .001$). Additionally, for every 1-point increase in peer support, adolescents had 1.14 times higher odds of consuming ≥1 fruits and

vegetables per day ($P < .001$), thus concluding that parental/peer support is associated with positive changes in healthier eating (Haidar, 2019).

5.2. Peer Normative Beliefs; modeling by parents, teachers and peers

Normative beliefs refer to beliefs of an individual that are accepted by specific people or groups and dictate whether behaving in a particular fashion is appropriate. Normative beliefs affect subjective norms, attitudes and behavioral intentions (Fang, Ng, Wang, & Hsu, 2017). Youth learns what is expected from them from their parents, teachers and peers. These influences is what builds their normative beliefs and are especially important when addressing behavior in youth (Hamlin, 2010). It has been shown repeatedly that people adjust their intake to that of others; i.e. people eat more when their eating companion eats more and they eat less when their eating companion eats less (Goldman, 1991). In that particular study, team leaders were instructed to eat six bite-sized foods or to eat 16 bite-sized foods. Participants who were eating together with the team leaders were affected by the eating behavior of the team leaders. Another study had similar findings; when leaders were instructed to eat four chocolate candies the participants ate on average two chocolate candies, as opposed when the leaders were instructed to eat 25 chocolate candies, participants ate an average of 10 chocolate candies (Hermans et al, 2008).

5.3. Food Environment and Exposure to Repeated Opportunities to Try New Food

Increasing F/V exposure at a younger age at school or at home may facilitate more positive preferences for F/V. Because many students consume at least one-third of their total food intake from school meals, schools represent an opportunity to introduce more F/V and increase its intake. School interventions to increase F/V consumption focused on

repeating taste exposures and modeling healthy behaviors. Classroom nutrition education yields positive changes in knowledge, attitudes, preference, self-efficacy, and even slight increases in F/V intake. School interventions to increase F/V consumption focused on repeating taste exposures and modeling healthy behaviors (Masis, Johnson, Mccaffrey, & Chapman-Novakofski, 2017). The study by Masis et al. (2017) investigated if the students participating in a F/V program would increase their preferences. They were given snacks during times of the day that do not include lunch time. The results indicated significantly higher preferences for F/V. One of the conclusions of that study indicated positive results due to the exposure to a variety of F/V that the children had in their school environment.

When curricular strategies are coupled with environmental strategies such as participation in a F/V snack program, increasing availability of F/V at meal times, and providing F/V taste testing, the intake of F/V increases significantly (Gold, Larson, Tucker, & Strang, 2017).

Chapter 3: Research Objective

The objective of this thesis project was to conduct a secondary data analysis of the data collected by Paso del Norte Institute for Healthy living (IHL) to assess the relationship between F/V intake and self-efficacy, outcome expectations, and social norms in children who participated in the MOVS program.

The specific aims of this thesis project were to:

1. Determine if the MOVS program changes F/V intake.
2. Test if specific behavioral theory predictors correlate with F/V intake.
3. Determine which behavioral theory predictors influence F/V intake the most.

Chapter 4: Research questions and Hypotheses

a. Baseline

1. Does F/V self-efficacy relate to F/V intake?

   H1a. F/V self-efficacy at baseline correlates with F/V intake scores at baseline.

2. Do outcome expectations for F/V relate to F/V intake?

   H2a. Outcome expectations for F/V at baseline correlate with F/V intake scores at baseline.

3. Do Social norms for F/V relate to F/V intake?

   H3a. Social norms for F/V intake at baseline correlate with F/V intake scores at baseline.

b. Follow-up

a. Does F/V self-efficacy relate to F/V intake?

   H1b. Change in F/V self-efficacy correlates with change in F/V intake scores.

b. Do outcome expectations for F/V relate to F/V intake?

   H2b. Change in outcome expectations for F/V correlate with change in F/V intake scores.

c. Do Social norms for F/V relate to F/V intake?

   H3b. Change in social norms for F/V intake correlate with change in F/V intake scores.

d. Does the intervention increase F/V intake?

   H4b. Children participating in the CCOMPAZ MOVS Nutrition program will increase F/V intake.

e. Which construct is more influential in changing F/V intake: self-efficacy, outcome expectations, or social norms?

Chapter 5: Materials and Methods

a. Overview of the Original Study

The purpose of the study was to conduct an evaluation for the Paso del Norte Institute for Healthy Living (IHL) by assessing process and outcome measures for the Movimiento Saludable project, or MOVS, a lifestyle intervention conducted by CCOMPAZ. The goals of the original study were: 1. to conduct formative and summative evaluation of the MOVS program, 2. to measure immediate outcomes of the MOVS program, particularly in relation to child nutrition (change in F/V intake) and to child physical activity and fitness, and 3. to assess the projected impact of the HEAL program based on its immediate outcomes. CCOMPAZ serves a population located south east of Cd. Juarez (Colonia Fray Garcia de San and Colonia Parajes de San Juan), to the west of the city (Colonia Obrera), and in the central part of the city (Colonia Infonavit Tecnológico). The need to create a program focused on health and nutrition was based on a two-year assessment conducted by CCOMPAZ. Results from the assessment indicated that 47% of children ate junk food more than seven times a week, 39% ate fruits only 4-7 times a week, 21% had obesity, and 15% were underweight for their age and height. The goals of the MOVS program were to: 1) improve the physical condition of participants through dance, body expression, and free play; 2) increase the consumption of F/V through weekly feeding of children and youth; 3) increase the knowledge in parents and participants of the MOVS program in relation to the health benefits of nutritious food through a comprehensive training system.

The after-school program intervention was composed of culturally- and family-appropriate, environmentally-friendly nutrition and fitness programming conducted by a team of professionals and community leaders that wanted to get involved. The intervention

consisted of indoor and outdoor physical activities such as dancing and free play that sometimes involve the whole family. The intervention was conducted by 4 PA teachers. The section dedicated to healthy cooking and portion control demonstrations for parents was carried out by a professional nutritionist that worked 20 hours a week in the program. The intervention also provided healthy meals that were balanced in calories and macronutrients and that were formulated by the nutritionist every month. The meals were prepared by 4 cooks that were trained and supervised by the same nutritionist.

The expected outcomes for participating in the program included increased nutrition knowledge and attitude changes, increased F/V intake, and increased amounts of PA. The overall evaluation plan was designed to measure the process and outcomes of the CCOMPAZ MOVS program. Assessments were conducted twice: during the first semester (baseline) and at the end of the school year (follow-up).

b. Population

This study focused on the population used for the IHL data collection. Children age between 5 and 15 years at baseline and 6-15 at follow-up old from 5 Schools from Cd. Juarez, Chihuahua, Mexico. These schools are located in different areas of the city and the study targets vulnerable populations.

c. Study Design

This study included 5 schools that are located in different areas of Cd. Juarez, Chihuahua, Mexico. The schools were selected with the intention of targeting the most unsecured areas of the city and where the personnel of the schools were willing to participate in the program. Data were collected from children at baseline (September 2016)

and follow-up (July 2017) during the 2016-2017 school year. There was no control group. This study was approved by the Institutional Review Board (UTEP IRB-017 #800991-1).

d. Data Collection

Parents of participants were provided with a parental consent form (English and Spanish), describing the process of data collection. There was no penalty for choosing not to participate in the evaluation, and participants could withdraw from the evaluation at any time without penalty or questioning. Participants in the study over the age of seven years received an assent form in English and Spanish. The inclusion criteria included participants who took part in the CCOMPAZ MOVS program.

Data collected included demographics, body composition, F/V intake (by reflectance spectroscopy), surveys (self-efficacy, outcome expectations, and social norms related to F/V intake and physical activity), and program satisfaction.

e. Sample Size

The number of students enrolled in the MOVS program by CCOMPAZ was a total of 296 students. The student enrollment in the program by school is a follows: school #1: 60 students; school #2: 40 students, school #3:71 students, school #4: 88 students, and school #5: 37 students. A total of 190 students completed the consent/assent process (Table 1).

f. Overview of the Thesis Project

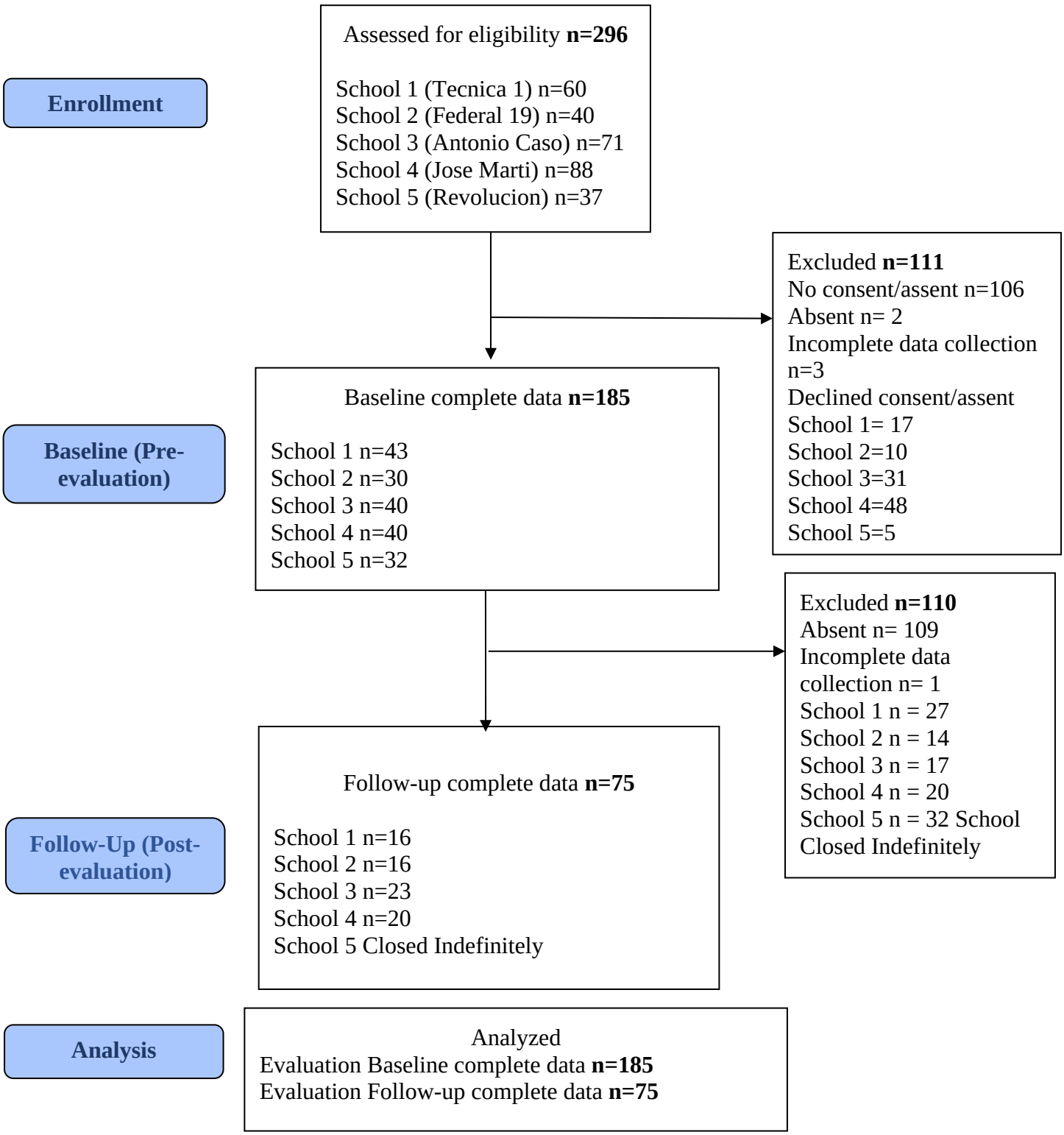
The objectives of this thesis project were to conduct a secondary data analysis using data collected as part of the original study described above, to determine if there was a change in F/V intake and to assess the relationship between F/V intake and self-efficacy, outcome expectations, and social norms in children participating in the MOVS program. The specific aims of this thesis project were to evaluate: 1) if the intervention had an effect

in F/V intake, 2) if specific behavioral theory predictors correlate with F/V intake, and 3) which behavioral theory predictors influence F/V intake the most. The data analyzed for this project were F/V intake (measured using reflectance spectroscopy) and surveys (self-efficacy, outcome expectations, and social norms related to F/V intake).

g. Sample Size

Of the 190 students who consented/assented to participate in the original study, 185 were present and completed data collection at baseline (Table 1); completed data at follow up was available from 75 students.

Table 1. MOVS Evaluation Project Consort Flow Diagram



h. Measures

I. Reflectance Spectroscopy (VEGGIE METER®)

Dietary assessment is inherently difficult and involves additional complications in children. Self-report methods are subject to bias and measurement error due to problems with reporting, portion size estimation, and inaccurate recall (Gold, Larson, Tucker, & Strang, 2017). Change in F/V intake was assessed using reflectance spectroscopy (VEGGIE METER®) to measure changes in carotenoids. Carotenoids is used as a biomarker of total F/V intake. Carotenoids are nutrients found in F/V such as beta-carotene in carrots or lutein in spinach or kale. The human body cannot synthesize carotenoids, therefore the only source of carotenoids for humans is through their diet. Because carotenoids are not found in significant concentrations in other foods, but are widely distributed in F/V, they are considered to be the best biomarker for F/V intake (Scherr et al., 2017). The reflectance spectroscopy was conducted indoors and away from direct sunlight. The instrument uses white light LEDs at the surface of the skin, and the illuminated surface area is about 3mm in diameter

i. Survey

I. Norms Survey for Children

The study entitled *Gimme 5 Fruits and Vegetables for Fun and Health* by Baranowski, et al. (2002) developed a questionnaire which targeted the behavior that could affect the increase of F/V consumption in children from 9-11 years old. The questionnaire measures family and social norms as factors that influence an individual at the interpersonal level. The survey include questions designed to capture shifts in a social network's expectation of

its member's behavior. The author thought that small changes at levels such as this could result in large changes in group behavior (Baranowski et al., 2000).

For the purpose of this study, the survey assessing norms by Baranoski et al. (2002) was adapted. Instead of referring to serving as the portion size, it was changed to cups for better understanding and clearer data provided by the children. The adapted version of this survey has not been validated with the new wording. For the purpose of the data analysis an average score for each student should be generated from their answers to each question. Higher average scores represent better results. For example, answering a question gives 4 points getting the average of the total questions of the survey (4 questions) should provide an average score of 4 for each participant, being 4 the highest score possible for this survey (Appendix 1).

II. Outcome Expectations Survey for children

The outcome expectations survey targets the behavior in relationship with the increase of F/V consumption for children. This survey was developed in the same research study by Baranowski, et al. (2002). The survey was developed to measure what individuals perceive will happen if they eat F/V.

The first set of questions were adapted from a survey developed by Reynolds et al. (2002) for 4th graders in the *Testing mediating variables in a school-based nutrition intervention program* research study. The original 12-item scale was reduced to 9 items to be more consistent with the nutrition education delivered by the Supplemental Nutrition Assistance Program Education (SNAP-Ed) contractors and USDA guidelines. For example, the question, "fruits and vegetables will keep me from getting cancer" was deleted. Also,

the original survey included a question that read: “eating F/V will keep me from getting cavities.” In Reynolds et al. (2002) original study, the questions were validated. Data were collected over a three-year period from students; the data were collected at the end of their 3rd grade and at the beginning of 5th grade (Appendix 2).

As part of the outcome expectations evaluation, an additional survey was added for children 11 years or younger, this survey was drawn from the instrument provided by Baranowski and colleagues. The survey is available at the Compendium of Surveys for F/V Consumption and Physical Activity by the California Department of Public Health 2010-2011. This survey had a smaller scale and was intended to be simple for younger kids (Appendix 3) (The Network for a Healthy California, California Department of Public Health, 2011).

III. Self-Efficacy Survey for children

The self-efficacy survey targets the behavior in relationship with F/V consumption in children. This survey follows measures in different areas of self-efficacy. The first section looks at self-efficacy in relationship to asking for and preparing F/V. The second section of the survey looks at self-efficacy for eating more F/V at different meals and snacks. The third section included questions about self-efficacy and about shopping for F/V (Reynolds K, Yaroch A, et al. 2002). A total of 8 questions were asked with a scale of 1-3, with 1 being the lowest score and 3 the highest, and a possible average of 3 (Appendix 4).

All the data gathered from the surveys were collected using Ipads that were provided by the IHL to children for self-input.

Table 2. Survey details

Survey	Age (years)	# Questions	Scale
Outcome expectations	5 to 11	6	1 to 3
Outcome expectations	12 to 16	9	1 to 5
Social Norms *	5 to 16	4	1 to 4
Self-efficacy	5 to 16	8	1 to 3

*Indicates the survey was reverse code for the purpose of the analysis.

j. Statistical Analysis

For the statistical analysis, R version 3.6.1 software was use. At baseline there was a total of 185 participants whose data was completed. The database included demographic data from participants as well as data gathered from the using the3 different surveys described above: Outcome expectations, social norms, and self-efficacy (Table 2).

Compared to the data collected at baseline, data collected at follow-up included completed data from 75 participants. This attrition was due to absences, missed consents and assent forms, and the indefinitely closure of one of the schools.

Descriptive statistics were used to summarize the data, such as means, frequencies, and standard deviation. The variables in this thesis project included: F/V intake scores, behavioral theory predictors (self-efficacy, outcomes expectations, and social norms), age, sex, and school. All variables were assessed for normality using symmetry, skewness, and kurtosis. The dependent variables were: social norms, self-efficacy and outcome expectations scores. Independent variables included age, sex and school.

H1a. F/V self-efficacy at baseline correlates with F/V intake scores at baseline.

Pearson's correlations were used to determine if there was a relationship between F/V self-efficacy and F/V intake at baseline (n=185, ages 5-14 years, 5 schools).

H2a. Outcome expectations for F/V at baseline correlate with F/V intake scores at baseline.

Pearson's correlations were used to determine if there was a relationship between F/V outcome expectations and F/V intake at baseline (ages 5-11 years [n = 127], 12-14 years [n = 58], 5 schools).

H3a. Social norms for F/V intake at baseline correlate with F/V intake scores at baseline.

Pearson's correlations were used to determine if there was a relationship between F/V social norms and F/V intake at baseline (n=185, ages 5-14 years, 5 schools)

H1b. Change in F/V self-efficacy correlates with change in F/V intake scores.

Pearson's correlations were used to determine the relationship in change between F/V self-efficacy and F/V intake. (n=75, ages 6-15, 4 schools)

H2b. Change in outcome expectations for F/V correlate with change in F/V intake scores.

Pearson's correlations were used to determine the relationship in change between F/V outcome expectations and F/V intake. (n=75, ages 6-15, 4 schools)

H3b. Change in social norms for F/V intake correlate with change in F/V intake scores.

Pearson's correlations were used to determine the relationship in change between F/V social norms and F/V intake. (n=75, ages 6-15, 4 schools)

H4b. Children participating in the CCOMPAZ MOVS Nutrition program will increase F/V intake.

Paired t-test was used to determine the mean differences between baseline and follow-up F/V intake scores. (n=75, ages 6-15, 4 schools)

Chapter 6: Results

Descriptive Statistics. The demographic information from students at baseline (n=185) and at follow-up (n=75) is shown in Table 3. At baseline 92% of participants reported being Hispanic or Latino, 82% were born in Mexico, 64% were enrolled in elementary school and 26% were in middle school, and there were more females than males (54% vs 46%). The characteristics of participants at follow-up were very similar to those at baseline. 95% reported being Hispanic or Latino, 80% were born in Mexico and there were more females than males (55% vs 46%). The age of participants ranged from 5 to 15 years (mean= 10 years) (Table 4). As shown in Table 5, F/V intake score differences were less than 1 for all theory behavioral predictors.

F/V intake scores increased from baseline to follow-up (98.9 ± 19.0, 104.7± 22.6, *p-value*= 0.03) (Table 4). There was no correlation between behavioral theory predictors and outcomes expectations for children younger than 12 years, social norms and self-efficacy at baseline

There was a negative correlation between outcome expectations for F/V intake at baseline for children´s age ≥12 years (r = -0.487, *p-value* = 0.022).

There was no correlation between behavioral theory predictors and outcome expectations for both age ranges, and self-efficacy at follow-up. There was a significant positive correlation between change in social norms for F/V intake with change in F/V intake scores (r = 0.270, *p-value* = 0.024) The most influential construct in changing F/V intake was social norms (*Coef* = 17.626, *Sdt. Error* = 9.191, t =1.918, *Pr(>|t|)* = 0.064). According to the analyses conducted with data at baseline, the following hypotheses were accepted and rejected:

Rejected Hypothesis

H1a. F/V self-efficacy at baseline correlates with F/V intake scores at baseline.

H3a. Social norms for F/V intake at baseline correlate with F/V intake scores at baseline.

intake scores.

H1b. Change in F/V self-efficacy correlates with change in F/V intake scores.

H2b. Change in outcome expectations for F/V correlate with change in F/V

Accepted Hypothesis

H2a. Outcome expectations for F/V at baseline correlate with F/V intake scores at baseline.

H3b. Change in social norms for F/V intake correlate with change in F/V intake scores.

H4b. Children participating in the CCOMPAZ MOVS Nutrition program will increase F/V intake.

Table 3. Summary of Demographics and Subject Information for and follow-up evaluations of intervention

		BASELINE				FOLLOW-UP			
		Frequency (N=185)	**Percentage** (%)	**Freq (Age<12)** (N=127)	**Freq (Age>=12)** (N=58)	**Frequency** (N=75)	**Percentage** (%)	**Freq (Age<12** (N=50)	**Freq (Age>=12)** (N=25)
Gender	Female	99	54%	69	30	41	55%	28	13
	Male	86	46%	58	28	34	45%	22	12
School Type	Elementary	119	64%	117	2	49	65%	48	1
	Middle	49	26%	3	46	20	27%	1	19
	High School	2	1%	1	1				
	Technical School	8	4%	0	8	5	7%	0	5
	Junior Col/Comm Col	1	1%	1	0				
	NA	6	3%	5	1	1	1%	1	0
School Code	Antonio Caso	41	22%	37	4	23	31%	21	2
	Revolucion	29	16%	29	0				
	Jose Marti	36	19%	34	2	20	27%	20	0
	Federal No.19	21	11%	6	15	11	15%	3	8
	Tecnica 1	43	23%	6	37	16	21%	1	15
	NA	15	8%	15	0	5	7%	5	0
Ethnicity	Hispanic or Latino	171	92%	116	55	71	95%	47	24
	Black or African	3	2%	2	1	2	3%	2	0
	White or Caucasian	3	2%	2	1	1	1%	0	1
	Other	5	3%	4	1	1	1%	1	0
	NA	3	2%	3	0				
Birth Country	US	27	15%	17	10	14	19%	8	6
	Mexico	151	82%	104	47	60	80%	41	19
	Other Country	6	3%	5	1	1	1%	1	0
	NA	1	1%	1	0				

Table 4. Survey and Reflectance Spectroscopy Data for all Participants and Participants at Baseline and Follow-up

BASELINE ALL PARTICIPANTS			BASEINE COMPLETERS			FOLLOW-UP COMPLETERS		
	Mean	**Range**		**Mean**	**Range**		**Mean**	**Range**
Age	10.0	(5-14)	**Age**	10.03	(6-15)	**Age**	10.31	(6-15)
Outocme expectations (N=127)	2.7	(1-3)	**Outocme expectations (N=127)**	2.7	(2.4-5)	**Outocme expectations (N=127)**	2.47	(0.167-3)
Outome expectations 12 (N=58)	3.9	(1-5)	**Outome expectations** 12 (N=58)	4.06	(2.3-5)	**Outome expectations** 12 (N=58)	3.57	(0.111-5)
Social norms	3.3	(2-4)	**Social norms**	3.2	(2.3-4)	**Social norms**	3.29	(2.5-4)
Self-efficacy	2.4	(1.375-3)	**Self-efficacy**	2.3	(1.3-3)	**Self-efficacy**	2.33	(0.5-3)
F/V intake	100.0	(29.1-154.4)	**F/V intake**	98.9	(55.4-154.4)	**F/V intake**	104.73	(35.9-154.4)

Table 5. Survey and Reflectance Spectroscopy Score Differences

	Mean	**Range**
Outcome expectations difference	-0.2	(-2.6 - 1)
Outocme expectation 12 difference	-0.5	(-3.8 - 1)
Social norms difference	0.0	(-1 - 1.1)
Self-efficacy difference	0.0	(-2.1 - 1.3)
F/V intake difference	5.8	(-81.4 - 57.3)

Chapter 7: Discussion

The recommendations of the American Heart Association, American Cancer Society, United States Department of Agriculture, and the World Health Organization are to increase F/V intake to improve overall health. The purpose of this secondary analysis study was to evaluate whether a behavioral theory predictor can result in increasing F/V intake. Past studies have shown that predictors such as social norms, outcome expectations and self-efficacy are correlated with changes in health behaviors (Fang, Ng, Wang, & Hsu, 2017). It is proven that these predictors have affected behavior in different populations around the United States. However, the population with which this study was conducted was different from what the literature has been reported. The study was conducted with a Hispanic vulnerable population in Mexico.

A reliable way to analyze the change in F/V intake is by assessing carotenoids, a biomarker of F/V intake, using reflectance spectroscopy. The results of the analysis carried out in this study showed a small increase in the carotenoid levels of the children evaluated (as intended by CCOMPAZ). However, the change may also have been influenced by other factors foreign to the intervention. Whigham et. al. (2015) notes that the change in carotenoid levels in a community-based program could be affected by measuring carotenoid levels using the reflectance spectroscopy, creating motivational or competitive effects among program participants (Whigham, L. D., & Redelfs, A. H. 2015).

Past studies have found a relationship between social norms and the change in health behaviors in different populations. The results of this study are agree with the theory; change in social norms was correlated with change in F/V intake. Studies have demonstrated that what foods and the amount of food children and adults eat is influenced

by their perceptions of eating habits of others. People look to others as a guide for how much to eat, and the presence of other people in eating situations can influence food selections, especially in children, who are developing their criteria (Higgs, Liu, Collins, & Thomas, 2019). Hamlin (2010) state that children's attitudes are built and influenced by their peers, parents, and teachers (Hamlin, 2010). Thus, it can be inferred that this positive correlation was due to the gain in knowledge and change in norms from the children's parents and peers. In another study, Donnelly & Springer (2015) stated that the Hispanic population reports lower support; since child more social support positively influences energy-balance behaviors, focusing on social support in Hispanic children could have important benefits.

According to the literature there are mixed findings on outcome expectations when focusing on nutrition. A study of African American and Caucasian students ages 11-15 years (n=674) showed a positive correlation with outcome expectations and F/V intake (Granner & Evans, 2012). However, a study in the southwestern United States found high outcome expectations to not affect F/V intake (Anderson, Winett, & Wojcik, 2007). These contradictory studies suggest that positive outcome expectations may not affect intake the same way in every population. The results of this secondary data analysis contradict the claims of Luszcynska, Gibbons, Piko, & Tekozel (2004) that outcome expectations have positive effects in relationship with nutritious behavior.

Other researches have tried to explain the unexpected results of the negative correlation between change in outcome expectations and change in F/V intake. In a study (n= 4231) where the concentrations of carotenoid levels were measured, children age 12-16 (n=1639) had a lower median score, compared to other children 6 -11 years old (Ford, Gillespie, Ballew, Sowell, & Mannino, 2002). One potential explanation for this that has

been suggested is focusing on this age range as a group and their characteristics. The middle teenage group are known for their rebellious attitudes. Young people have rebelled because they want to separate themselves from their parents so that they can develop their own personal identities (Pickhardth, 2009). The transition from adolescence to adulthood is a critical period for developing habits that impact health (Wengreen, Nix, & Madden, 2017). More attention and probably different ways of intervening on health behavior in adolescents should be taking into account. Based on the literature family-based interventions have been linked to positive outcomes in adolescence (Robinson, Power & Allan, 2011) Also, another study noted that standardized family-based interventions are the most effective way of preventing or treating adolescent risk health behaviors, like substance abuse or eating disorders (Kumpfer, 2016).

Even though the literature shows that self-efficacy is correlated with behavior change and F/V intake, we did not find a correlation among CCOMPAZ youth. It has been shown that self-efficacy is usually the best predictor of behavior change compared to other behavioral theory predictors (Hagler et al., 2007; Schunk & Miller, 2002; Dishman et al., 2007). For example, in an intervention study of adults (n = 665,18- 89 years), the predictors of: social support, self-efficacy, outcome expectations, and self-regulation, self-efficacy was found to account for 52% of the change in F/V intake (Anderson, Winett, Wojcik, & Williams, 2010). Also, Bandura noted that self-efficacy may arguably be one of the most important aspects of behavior change because a person's belief in their ability influences choices, effort expended, and how long the person perseveres in the behavior (Bandura, 1991).

Considering possible alternative explanations to our results, the literature also shows that behavior is influenced by many socioecological factors. Living conditions and

race/ethnicity may also shape behaviors and outcomes (Mcneill, Stoddard, Bennett, Wolin, & Sorensen, 2012; Forcano, Mata, Torre, & Verdejo-Garcia, 2018). A study that included low-income participants (n=290, 40% Hispanic) showed an association with F/V intake and social support (Dulin et al., 2018). This could potentially show that within Hispanic or low-income populations there are more significant correlation with predictors other than self-efficacy.

School-based educational strategies can raise children's awareness and knowledge about health-related topics (Townsend et al. 2011). The moderate impact that the MOVS program had on F/V intake could be attributed to the fact that this was done on a school setting. School setting has been proven to be a useful way of motivating a large number of children and adolescents in relation with healthy lifestyles (Gold, Larson, Tucker, & Strang, 2017).

An intervention in Mexico where almost 100% of the population is Hispanic, it is important to customized appropriate interventions that could be effective for them. Appropriate intervention methods that target behavior change, would require preliminary research of both a quantitative and a qualitative aspect. Baranowski et al, (2000) examined why nutrition education interventions have not been as effective as desired, stating that effective programs for children can and should be designed, implemented, and evaluated according to the community where the intervention is being implemented and based on relevant theory. Incorporating community-based frameworks, in which communities have an active role and participate in highlighting and addressing the issues that matter to them, may increase the efficacy of school-based intervention programs to reduce obesity-related outcomes among Hispanic children according to Andrade, Lotton, & Andrade (2018).

The effectiveness or or lack of nutritional interventions depends on many factors, including nature, duration, and the strength of the interventions and the level of adherence to the design of to the implementation in the interventions (Desroches et al., 2010). However, results of the effectiveness of educational interventions may also depend on the appropriateness, validity, and reliability of the measures used to make the assessment. (Mohajan, 2017). A curriculum evaluation was conducted after the data collection of the original study, and more adjustments had to be done, to make the curriculum more effective. This intervention was based on the effectiveness that these behavioral theory predictors have had in different populations with different characteristics in comparison with Hispanic living in Mexico and low-income.

Limitations of this study include that there was no control group. Study personnel did not have access to a suitable control group (students of a similar socio-demographic background who were not participating in the program). Another limitation was the relatively small sample size. Due to closure of a school and attrition on participation to the program, the follow-up sample size was reduced to a third of the sample size at baseline. More studies that include a control groups, large samples size, and more adherence to the evaluation, need to be conducted in the other side of the border, especially in cities like El Paso, same that is known as a twin city with Cd. Juarez, Mexico. A strength of this study was the use of a valid biomarker to objectively assess F/V intake in children, given that self-report of dietary intake is not a reliable measure. Another strength of this intervention was that it was applied on a real community setting, measuring change in a non-laboratory setting is hard but can be more meaningful in application.

Chapter 8: Conclusion

Children need supportive families and the proper community environment to have a good quality of life. *Movimiento Saludable* (MOVS), a component of *Ciudadanos Comprometidos con la Paz* (CCOMPAZ) in Ciudad Juarez, MX is an after-school lifestyle program which goal is to improve children's health by increasing F/V intake, increase physical condition and increase knowledge in health of parents and their children.

The results of this study indicate that the MOVS program had a moderate impact on the increase of F/V intake of children after participating in the intervention that included physical activities, nutrition education and cooking demonstrations.

This study aimed at finding relationships of F/V intake with predictors in behavior change. It was found that social norms is a predictor that has a relationship with the change in F/V intake low-income Hispanic children who participated in the study. The continuation of MOVS program or the implementation of future lifestyle interventions could focus on social norms since it was found that this approach improves F/V intake in children. These results provide the basis for future larger scale interventions testing the use of social norm-based interventions to promote increase in F/V among Hispanic children in Mexico.

More research addressing other factors is needed to fill the gaps for effective health behavior change interventions on this or similar populations in Mexico and in other Latin American populations.

The results of this study indicate that an after-school program is a viable approach that could be implemented at other schools where more children and their parents could modify behavior to increase F/V intake as a result of participating in a social norm-based intervention.

To our knowledge this is the first intervention of this type that is conducted in Ciudad Juarez, Mexico. Conducting this type of study in El Paso, Texas, the twin city for Ciudad, Juarez represents an opportunity for researchers to compare results that could aim to develop policies that adopt after school programs focused on increasing F/V intake of children.

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Appendix 1

Norms Survey for Children

Social Norms (Baranowski, et al.)

What do others think of eating fruits and vegetables?	(Please check ☑ your answer)			
	A very good thing	A good thing	Not important	I don't know
1. Most people in my family think that eating 1½ -2 cups of fruit or juice each day is…	4 ❑	3 ❑	2 ❑	1 ❑
2. Most people in my family think that eating 1½ - 3 cups of vegetables each day is…	4 ❑	3 ❑	2 ❑	1 ❑
3. Most kids my age think that eating 1½ -2 cups of fruit or juice each day is…	4 ❑	3 ❑	2 ❑	1 ❑
4. Most kids my age think that eating 1½ - 3 cups of vegetables each day is…	4 ❑	3 ❑	2 ❑	1 ❑

Appendix 2

Outcome Expectations for Children

Outcome Expectations for Eating FVs (Baranowski, et al.)

FRUITS AND VEGETABLES (IF I EAT)	Please choose your answer.				
If I eat fruits and vegetables every day…	I disagree very much	I disagree a little	I am not sure	I agree a little	I agree very much
1. I will become stronger	A	B	C	D	E
2. my friends will start eating them too	A	B	C	D	E
3. I will have stronger eyes	A	B	C	D	E
4. I will have a nicer smile	A	B	C	D	E
5. I will be healthier	A	B	C	D	E
6. I will think better in class	A	B	C	D	E
7. it may help keep me from getting fat	A	B	C	D	E
8. I will have more energy	A	B	C	D	E
9. my family will be proud of me	A	B	C	D	E

Appendix 3

Outcome Expectations for Children

	Disagree	Not Sure	Agree
1. I will have more energy for playing (sports, recess or after school) if I eat fruits and vegetables.	O	O	O
2. I will get sick more often if I don't eat fruits and vegetables.	O	O	O
3. Eating fruits and vegetables will help me grow.	O	O	O
4. I will have healthier skin if I eat fruits and vegetables.	O	O	O
5. If I eat fruits and vegetables, I will have stronger eyes.	O	O	O
6. If I eat fruits or vegetables at breakfast, I will be able to think better in class.	O	O	O
7. Eating fruits and vegetables may help keep me from getting cavities.	O	O	O

Appendix 4

Self-efficacy survey for children

Self-Efficacy Survey – Eating, Asking, Preparing FVs (Reynolds, et al.)

	Please check ☑your answer				
How sure are you that you can:	**I disagree very much**	**I disagree a little**	**I am not sure**	**I agree a little**	**I agree very much**
1. write my favorite fruit or vegetable on the family's shopping list	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
2. ask someone in my family to buy my favorite fruit or vegetable	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
3. go shopping with my family for my favorite fruit or vegetable	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
4. pick out my favorite fruit or vegetable at the store and put it in the shopping basket	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
5. ask someone in my family to make my favorite vegetable dish for dinner	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
6. ask someone in my family to serve my favorite fruit at dinner	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
7. ask someone in my family to have fruits and fruit juices out where I can reach them	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑
8. ask someone in my family to have vegetables cut up out where I can reach them	1 ❑	2 ❑	3 ❑	4 ❑	5 ❑

Curriculm Vita

Karen Marleen Juarez has an education background in Nutrition from the Universidad Autonoma de Chihuahua (UACH). Karen has exposure to healthcare in the clinical setting and experience with preventive health in the community setting, for her work at the Children's Hospital and the University Central Hospital of Chihuahua. Now she is pursuing her master's degree in Public Health (MPH), she has focused on research in healthy eating and active living among Hispanic community along the border region. She is currently working as a preparedness assistant at The City of El Paso Department of Public Health in the Emergency Preparedness program. Where she has been assisting in public health emergency exercises and training, developing of creative material for training and outreach purposes and, worked in translating and transcribing documents in English and Spanish.

Under the direction and mentorship of Angela Mora. Karen is an active member a current Vice-President of Students for Public Health (SPH), a graduate organization in the MPH program. Upon completion of her MPH, Karen will continue her work at The City of El Paso Department of Public Health, where she will use her education and experience to prevent health problems in the community.