2015

Differentiating Demographic Factors in Latino Patients with Type 2 Diabetes

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Walden University
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Abstract

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MS, University of New Hampshire, 1998

BS, University of New Hampshire, 1992

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

Walden University

August 2015

Abstract

The American Diabetes Association (ADA) data suggest that Latinos share a greater burden of disease than do non-Latino Whites with type 2 diabetes. As a result of poor glycemic control, Latinos also suffer consequences such as blindness, kidney disease, and limb amputation more often than do other ethnic groups. The purpose of this study was to compare demographic factors of Latinos with well-controlled type 2 diabetes, as measured by a HgbA1c of 7 or less (n = 118) to Latinos not well controlled (n = 105). This cross sectional study used a secondary data set with a sample selected from the population of an urban, federally-qualified health center. The sample included all who were diabetic and Latino. Demographic factors examined included distance to a supermarket and gym, age, gender, language, employment status, health insurance status, number in family, and role in family. Using Chi square analysis, each demographic factor was cross-tabulated with the HgbA1c, the proxy for control, to determine which, if any, factors were associated with poor disease control. The results of the analyses showed no correlation between the demographic factors examined and poor control of diabetes. Although no positive associations were determined, this study provided information that was lacking in the literature. It provided data indicating that these demographic factors do not seem to affect diabetic control. This information was not previously found in the literature. Using the social epidemiological model, suggestions for interventions were made, such as incorporating family and social factors into individualized diabetes care plans, to improve diabetes care. Implementing the suggestions could possibly minimize the burden of illness among Latino diabetics and reduce this health disparity for Latinos.

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Acknowledgments

Completing a dissertation requires a lot of work and substantial commitment. However, these are required by others beyond the student. Without the support and encouragement of family and friends, adult students find it very challenging to balance work, family, and school. I want to thank my wonderful husband who has supported me and always had my back. I would also like to thank my son who had the foresight to go to college and get a job working in Information Technology. He has been my own personal IT department throughout this journey. I could not have done this without either one of them.

I would also like to thank Dr. Diana Naser, my Chair. She has been amazing. She has gotten feedback to me so quickly that it made it much easier to make progress. I would also like to thank Dr. Nicolette Alexander, my other committee member, for sticking with me through the long process.

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Chapter 1: Introduction to the Study

Type 2 diabetes is a disease characterized by elevated blood glucose levels caused by either insufficient insulin produced by the pancreas or the body's inability to use the insulin produced efficiently (American Diabetes Association [ADA], 2013). Common symptoms of diabetes include frequent urination, frequent thirst, hunger, fatigue, blurry vision, and slow healing of cuts and bruises (ADA, 2013). Diabetes is a chronic disease that is increasingly prevalent in the United States. In particular, Latinos have been identified as being at especially high risk. In one study, the age-adjusted prevalence of diabetes in the Latino population was estimated to be over twice that of white, non-Latino Americans (Rivera-Adams, 2003). Further, the estimated 2.5 million Latinos affected by diabetes have worse glycemic control, a higher rate of complications, and a greater risk of mortality than white, non-Latino Americans (Cabellero & Tenzer, 2007). Compared to white, non-Latino Americans, Latinos with diabetes were more likely to develop diabetic retinopathy, diabetes-related kidney disease, and limb amputation due to vascular disease, all consequences of poor glycemic control (Cabellero & Tenzer, 2007). Therefore the topic of interest for this research was the role of demographic factors on glycemic control of Latinos with type 2 diabetes.

Demographic data were gathered from the electronic health record (EHR) of one Federally-Qualified Health Center (FQHC). By comparing the demographics of Latinos with well-controlled diabetes and Latinos with poorly controlled diabetes, any differences were identified. This information could be used to identify Latinos at elevated risk for poor glycemic control, allowing interventions to be developed at personal, agency, and

community levels to reduce this health disparity with the opportunity to produce positive social change. For example, the results could be used to encourage offering permits for farmers' markets in areas of town where Latinos make up a significant percentage of the population. Or, placement of better lighting could be supported to encourage walking.

A brief review of the literature is presented in this chapter describing a gap in knowledge; this research was designed to provide information to address that gap. The problem statement will be discussed, stating the research question and providing support for the relevance and timeliness of the problem. The purpose of the study will identify the intent of the study and describe the variables in the study. The research question, along with both the null and alternative hypotheses, will be presented followed by a description of the theoretical framework. A brief overview of the study design and methodology is provided as well as a discussion of the significance of the study. Finally, assumptions and limitations of the study will be discussed.

Background

Diabetes is a significant public health problem with over 23 million people affected nationally, and is the seventh leading cause of death in the United States (Center for Disease Control [CDC], 2013a). In addition, it is estimated that another 7 million individuals in the United States are diabetic but are undiagnosed (CDC, 2012). Diabetes and the consequences of poor glycemic control lowers life expectancy by up to 15 years, and increases the risk of heart disease by up to four times the average (CDC, 2012). Diabetes is also the leading cause of preventable blindness, kidney failure, and lower limb amputation (CDC, 2012).

The prevalence of diabetes continues to increase both nationally and internationally; people are developing type 2 diabetes at younger ages (CDC, 2012). This may be associated with the increase in obesity, a known risk factor for developing diabetes (CDC, 2012). The increased rate of diabetes leads to a number of concerns such as the increased likelihood of developing diabetes-related complications. There is also the possibility of the number and complexity of patients with type 2 diabetes overloading health care system resources. As such, Healthy People 2020 (2014) identified a need for change in the delivery of care at all levels for those with or at risk for diabetes. This includes primary and secondary prevention, which involves monitoring, prevention, and early recognition activities. Healthy People 2020 (2014) also recommended tertiary prevention activities including access to adequate care.

The prevalence of diabetes is not equal across all populations (National Diabetes Fact Sheet, 2011). The age-adjusted prevalence of diabetes in American adults over 20 years of age is 7.1% for non-Latino whites and 11.8% for Latinos (National Diabetes Fact Sheet, 2011). Further, if Mexicans and Puerto Ricans are separated out from the group of Latinos, the prevalence for Mexican Latinos is 13.3% and for Puerto Rican Latinos 13.8% (National Diabetes Fact Sheet, 2011). This research took place in New Hampshire where most Latinos are of Mexican, Puerto Rican, or Caribbean Island descent; the risk of developing diabetes in this group is 66% higher than non-Latino whites (Behavioral Risk Factor Surveillance System [BRFSS], 2010).

Healthy People 2020 (2014) revealed a level of concern by providing a list of diabetes-specific objectives. There are 16 objectives and several subordinate objectives

specific for diabetes. The first objective states, “Reduce the annual number of new cases of diagnosed diabetes in the population” (Healthy People 2020, 2014, para 3). Additional objectives relate to managing the disease through adequate quality health care as well as self-management activities such as weight loss through increased activity and better diet. The intent of the subordinate objectives is to decrease diabetes-related complications (CDC, 2013a).

The goal of this study was to identify those Latinos at increased risk for poor glycemic control due to inadequate self-management, a topic about which there is little information. There has been research into the connections between obesity and diabetes, obesity and poor diet, obesity and inadequate exercise, and diabetes along with poor diet and exercise. However, no study seeking to identify, from an epidemiological perspective, which Latinos with diabetes are at risk for poor control has been located in the literature.

Problem Statement

The problem investigated by this study involves the potential impact of demographic factors on the glycemic control of Latinos with type 2 diabetes. The research topic of interest was: what are demographic factors that differentiate Latino patients with well-controlled type 2 diabetes (defined as a hemoglobin A1c of seven or less) from Latino patients with type 2 diabetes that is not well controlled?

The importance of diabetes as a significant public health concern is well established, given that the prevalence of diabetes in the United States has tripled since 1980 (BRFSS, 2010). The prevalence of diabetes among Latinos makes diabetes a

particular public health concern for that population. There were 25.8 million diabetics in the United States, of which 18.8 million were diagnosed and 7 million were undiagnosed (National Diabetes Fact Sheet, 2011). Another 79 million people could be called *prediabetic*, meaning they are at high risk of developing diabetes. Individuals fall into the prediabetic category when their HgbA1c is above normal but not quite high enough to be labeled as diabetes (National Diabetes Fact Sheet, 2011). In 2013, the number of diabetics in the United States had increased to 23.6 million, with another 6 million undiagnosed, and 57 million at high risk (CDC, 2013a). Minority populations make up 25% of adult diabetics in the United States; Latinos constitute a significant number of those minorities with Mexican-American and Puerto Rican Latinos having two times the likelihood of developing diabetes of non-Latino whites (CDC, 2013a). Although these two groups do not include all Latino diabetics, these two groups are important for this study, because the research took place in New Hampshire (NH). The majority of Latinos living in New Hampshire are either Mexican-American or Puerto Rican immigrants (BRFSS, 2010).

In addition to the human cost of diabetes, the financial costs are high. The costs associated with diabetes in 2007 were $174 billion, including the medical costs, disability, and early death (CDC, 2013a). By 2012, that total had risen to $245 billion (CDC, 2013a). The average yearly cost of caring for someone with diabetes in 2011 was 2.3 times the cost of caring for a nondiabetic of the same age (National Diabetes Fact Sheet, 2011). As a result of these trends and numbers, the CDC has identified diabetes as

"an immense and complex public health challenge" (Healthy People 2020, 2014, Diabetes Goals, para. 3).

As a result of improvements in disease surveillance, there is information available supporting the importance of diabetes as a public health concern. In addition, there is a fair amount of information related to diabetes and obesity, the importance of self-management in preventing complications, and health disparities related to diabetes affecting Latinos. This is addressed in Chapter 2: Review of the Literature. However, there is a scarcity of literature available addressing diabetes and self-management at a very personal level, such as where a diabetic lives or how large their family is. This is the gap in the literature that this research was intended to address.

Purpose of the Study

The research was a quantitative cross-sectional study intended to determine if there were any associations between demographic factors and glycemic control among the Latino diabetic patients of an urban health center. Using Chi-Square analysis, the variables associated with demographics were tested against the hemoglobin A1c (HgbA1c), which was used to determine glycemic control according to the recommendations of the ADA (NLM, 2012).

Variables

The independent variables for this study were: (a) being of Latino ethnicity, and (b) a diagnosis of type 2 diabetes. The dependent or outcome variable was glycemic control measured using the HgbA1c. If the HgbA1c was seven or less, the diabetes was considered controlled but if the HgbA1c was over seven, it was considered not controlled

based on the recommendation of the ADA for maintaining glycemic control and reducing diabetic complications (ADA, 2013). The covariables included: location of the home in relation to a supermarket or gym, gender, insurance status, employment status, languages spoken, age, number in the household, and role in food preparation.

Research Question and Hypotheses

The topic of interest for this research study was the demographic factors that differentiate Latino patients with well-controlled type 2 diabetes (defined as a hemoglobin A1c of seven or less) from Latino patients with type 2 diabetes that is not well controlled. The research questions were

Research Question 1: Is there a relationship between distance to nearest supermarket/gym and glycemic control?

Variable: Distance to supermarket

$H1_0$: There is no relationship between glycemic control and distance to the nearest supermarket.

$H1_A$: There is a relationship between glycemic control and distance to the nearest supermarket

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and independent variable *distance to supermarket*, for an α of 0.05. For this variable, *gym* was also added because the only supermarket is in the same strip mall as the only gym, which is Work Out World. This suggested that patients would be at the same distance from the gym as the supermarket.

Research Question 2: Is there a relationship between gender and glycemic control?

Variable: Gender

$H2_0$: There is no relationship between gender and glycemic control.

$H2_A$: There is a relationship between gender and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "gender", for an α of 0.05.

Research Question 3: Is there a relationship between insurance status and glycemic control?

Variable: Insurance status

$H3_0$: There is no relationship between having health insurance and glycemic control.

$H3_A$: There is a relationship between having health insurance and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable *insurance status*, for an α of 0.05.

Research Question 4: Is there a relationship between employment status and glycemic control.?

Variable: Employment status

$H4_0$: There is no relationship between employment and glycemic control.

$H4_A$: There is a relationship between employment and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable *employment*, for an α of 0.05.

Research Question 5: Is there a relationship between language and glycemic control?

Variable: Language

$H5_0$: There is no relationship between language concordance with the provider and glycemic control.

$H5_A$: There is a relationship between language concordance with the provider and glycemic control.

Statistical Analysis: Chi-square analysis was performed on the dependent variable HgbA1c and the independent variable *language concordance*, for an α of 0.05.

Research Question 6: Is there a relationship between age and glycemic control?

Variable: Age

$H6_0$: There is no relationship between age and glycemic control.

$H6_A$: There is a relationship between age and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable *age*, for an α of 0.05.

Research Question 7: Is there a relationship between number in household and glycemic control?

Variable: Number in household

$H7_0$: There is no relationship between household size and glycemic control.

$H7_A$: There is a relationship between the household size and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable *number in household*, for an α of 0.05.

Research Question 8: Is there a relationship between role in food preparation and glycemic control?

Variable: Role in food preparation

$H8_0$: There is no relationship between the role in food preparation and glycemic control.

$H8_A$: There is a relationship between the role in food preparation and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable *age*, for an α of 0.05.

Theoretical Foundation

The theoretical framework for the study was the social ecological model (SEM), a systems theory often used in public health research because it emphasizes the interdependence between people and their environments; a person's demographic data provides a description of their environment (Lounsbury & Mitchell, 2009; Stokols, 1996). The SEM is applicable across multiple disciplines, such as biology, sociology, and behavioral sciences. It can also be used in multiple research methodologies (Stokols, 1996). In using the SEM, individuals are considered as both influencing and being influenced by their environment (Lounsbury & Mitchell, 2009).

Although the SEM is discussed in more detail in Chapter 2, a major strength of this framework and the most significant reason it was chosen for this study, is that it can

be used to develop multi-level approaches to health problems (CDC, 2011). Physically, this model (Figure 1) is displayed as semicircular with the individual at the center. The next band represents interpersonal relationships, such as between the individual and family, friends, or healthcare providers. Outside that is an organizational level including healthcare systems, local health departments, and insurance programs. This is followed by a community level, which might include churches, community action groups, or methods of communicating within the community. The final level is the policy level, which would include ways to facilitate change through regulation at local, state, and federal levels (CDC, 2011). The variables for the research included several of these levels. For example, the *language* variable may have ramifications at the community level if it was found that not speaking English was associated with poor glycemic control. A recommendation to include Spanish interpretation for local media might be made as a result.

Figure 1. Sociological Ecological Model as used by the CDC (CDC, 2011). No copyright restrictions noted by the CDC.

There were a number of other theories or conceptual frameworks that were considered before the SEM was chosen. Dorothea Orem's self care theory was considered as was Leininger's transcultural nursing theory. Jean Watson's theory of human caring and Imogene King's theory of goal attainment were also considered. However, the SEM was chosen because it reaches beyond medicine and nursing and into the public health realm.

Nature of the Study

The study was a quantitative cross-sectional design. The cross-sectional design is useful when data is to be collected at a single point in time as in this study (Polit & Hungler, 1995). This type of design is used for describing the relationships between variables at the time of data collection, which is what was planned for this research. Other strengths of this design include practicality, ease of management, and being relatively economical (Polit & Hungler, 1995; Rudestam & Newton, 2007).

The main independent variables for the proposed study were Latino ethnicity (by self-description) and the presence of type 2 diabetes (by professional diagnosis). The dependent variable was glycemic control measured categorically as either seven or below, or over seven. The other independent variables were either categorical or ordinal. The categorical variables included gender, insured status, employment status, language, and role in food preparation. The ordinal variables included location of home in relation to supermarket, age, and number in household.

The data were obtained by querying the electronic health record (EHR) of a Federally Qualified Health Center (FQHC) on a single day. The sample included all Latino diabetics who were active patients of the FQHC on the day the query was made. The data were entered into SPSS, version 21 and used to run Chi-Square analyses to determine which, if any, demographic variables were associated with poor glycemic control.

Definitions

Type 2 diabetes: A metabolic disorder in which glucose, needed by all cells for energy, is not used correctly**.** This can be caused by insufficient insulin being produced by the pancreas or by inefficient usage of insulin by the cells, or both (American Diabetes Association, 2013).

Latino: A person who was born in or lives in South America, Central America, or Mexico or a person in the U.S. whose family is originally from South America, Central America, or Mexico, or someone who self-identifies as Latino (Latino, 2014).

HgbA1c: A measure of glycemic control and a lab test that shows average blood sugar levels over the previous three months. This is the definitive test used for both screening for and monitoring of diabetes (American Diabetes Association, 2013; National Library of Medicine, 2012).

Culture: Integrated behavior patterns that may include language, thoughts, communication patterns, customs, beliefs, values, and institutions of racial, ethnic, religious, or social groups.

Acculturation: The process of immigrants becoming immersed in and accepting of the attitudes, beliefs, behaviors, and customs of a new culture, usually the dominant one (Perez-Escamilla & Putnik, 2007).

Self-management: Taking responsibility for one's own behavior and well-being (Oxford, University on-line dictionary, 2014).

Health literacy: The ability of an individual to obtain, communicate, process, and understand basic health information and to use the information to make appropriate health decisions (CDC, 2011a).

Assumptions

The data for this study were obtained from the FQHC's EHR. This included relevant personal information including gender, age, address, family size and composition, insurance status, employment status, and languages spoken. This information is continuously updated when patients come in for care. Financial data are obtained every 6 months to determine the amount patients will pay for visits if they have no insurance as there is a sliding fee structure. As the data were obtained at a single point in time, it was assumed that the current data was accurate. While it would be possible to verify the information, it would necessitate knowing the patients' names and the researcher believed anonymity was a strength of the study.

Scope and Delimitations

The specific aspects of the research problem that were addressed in the study were designed to focus on demographic factors that could impact a person's ability to follow self-management recommendations made by the primary care provider. For

example *distance from supermarket* was one of the covariables. It has been shown that not being within walking distance of a supermarket decreases the ability of an individual to buy nutritious foods as advised, and individuals are more likely to buy food at neighborhood bodegas or fast food restaurants (Frank et al., 2009). Another example was the variable *role in food preparation*. A woman who is the primary shopper and cook for the family may have more control over what she eats than if she were in a more subordinate role.

The sample for this study came from the active patient list of a FQHC. Although Latinos comprise the largest group of minorities within the FQHC, they are by far not the only group. There are many Brazilians, Africans, and Asians. These other ethnic groups were not included, which in no way means that diabetes is not a problem for these groups. However, including other cultures would have been overwhelming as the variables selected were specific for Latinos. To include other cultural groups would entail developing variables specific to each group, making the study cumbersome.

Limitations

The most important limitation of the proposed study is also one of its strengths. The sample for the proposed study comes from one FQHC and includes a rather homogeneous group. Although the research questions apply to the group being studied, this makes the generalizability of the results limited. Another limitation is related to the fact that the data comes from a single point in time. It is possible that at another time, the results of the query could be different, perhaps significantly. For example, it was winter at the time of data collection, It is possible that the results would be different in the

summer, when it is easier to get outside for exercise and there are more fresh fruits and vegetables available. Another possible limitation related to running the query in winter was that a number of the Latinos served by the FQHC return to their countries of origin in the winter, especially older people who may no longer be working. They may return for extended periods to visit relatives or to avoid the cold New England winters. It is impossible to know how many patients' records were lacking data because they had not been to the clinic for care in the recommended every three month pattern.

Significance

There is a relative lack of information linking glycemic control to demographic factors. This research provided some data to fill in the gaps as well as some information as to how to provide assistance to the Latinos who were studied. Depending on the results of the research, the results may be used to support community changes to help Latinos with diabetes improve glycemic control. The information, while not specifically gathered from other ethnic and racial groups, may provide some direction for all groups who experience health disparities.

Latinos suffer a disproportionate burden of illness related to diabetes. It was hoped that by developing interventions to address the identified factors, this health disparity would diminish. It is recognized that not all factors may lend themselves to intervention; however, simply being aware of their existence will serve to alert the attending provider to the possibility of an inability to comply with recommendations. In addition to patient and health care provider interventions, establishing a clear link between social factors such as lack of insurance and poor glycemic control would be

helpful in encouraging change by policy makers and stakeholders in the community. Examples could include working with grocery stores to improve labeling to allow shoppers to identify appropriate foods and to encourage the use of labeling using the Spanish language and pictures for those who do not speak English or may not be literate in their own language. Another example may be to better publicize farmer's markets located throughout the city.

Summary

The research was intended to provide information regarding what, if any, demographic factors may influence the glycemic control of Latinos with type 2 diabetes in the sample selected. This chapter has provided a brief overview of the research and the potential for the outcome of the research to support positive social change. The chapter has been an introduction to the study and has included information about the study topic and the public health relevance of the topic. The research variables and the research question have been presented; in addition, the theoretical framework and an initial description of the methodology are included. Finally, the chapter concluded with a description of the anticipated significance and benefits of the research.

In Chapter 2, a review of the literature was provided beginning with a discussion of the SEM including why it was appropriate for the study. The literature related to the key variables, beginning with the epidemiology of diabetes, was reviewed. The impact of diabetes on Latinos was discussed, including cultural considerations that led to selection of the study variables. This was followed by a discussion of the literature related to

lifestyle and self-management among Latinos with diabetes followed by barriers to self-management.

Chapter 2: Literature Review

Introduction

Diabetes mellitus (DM) is a chronic and often lifelong disease that results in higher than normal levels of sugar in the blood due to defects in the body's ability to make and/or use insulin (American Diabetes Association, 2013). There is a current epidemic of diabetes, in part because of the current obesity problem, as obesity is a major risk factor for developing diabetes (ADA, 2013; Neal, Carlson, Jenkins, & Magwood, 2006). Due to the connection between obesity and diabetes, it is impossible to discuss diabetes without considering obesity as well. Obesity and diabetes have become global health priorities due to escalating prevalence (Boehmer, Hoehner, Ramirez, & Brownson, 2007). As with diabetes, obesity has multiple etiologies that include complex interactions between genetics, metabolism, behavior, and the environment (Boehmer et al., 2007). The SEM suggests that the physical and social environments impact obesity by promoting inactivity and overeating at a population level, known to be characteristic of developed countries (Boehmer et al., 2007). Despite being reflections of a developed country, diabetes and obesity are markers for inequalities in health and health care (Candib, 2007).

The purpose of this research was to identify which, if any, demographic factors can be used to predict poor glycemic control among Latinos with type 2 diabetes. If any demographic factors were identified, the information would then be used to develop interventions designed to prevent or delay the long term consequences of diabetes. For example, if it was shown that there is a correlation between a lack of places for safe

outdoor exercise, determined by the home address, this information could be shared with the city budget committee to perhaps encourage placement of sidewalks or improved lighting in the identified areas. Or perhaps it could be used to encourage the development of an exercise center in an abandoned building in the area.

In this chapter, a number of different factors related to the problem of diabetes among Latinos were reviewed, beginning with a description of the literature search strategy, and followed by the theoretical framework of the study. A discussion of the epidemiology of diabetes among Latinos follows, in which the impact of the disease was discussed, along with a review of Latino beliefs and cultural issues related to diabetes. A review of barriers to diabetes self-management, including acculturation, financial factors, and cultural barriers was addressed, and the chapter ends with a discussion of environmental and provider-related barriers to diabetes self-management.

Literature Search Strategy

The literature review performed was completed using multiple databases, including CINAHL, Google Scholar, Academic Search Complete, MEDLINE, EBSCO, and ProQuest Dissertation. This search was completed using the Walden University Library, the Medical Library at Southern New Hampshire Medical Center, and the Rivier University library.

Key terms and combinations were formulated so as to gather literature from a wide range of disciplines, including medicine, nursing, nutrition, public health, and health promotion. Specific terms included: diabetes and Latinos, diabetes and health disparities, diabetes and obesity, diabetes and self-management, glycemic control and Latinos,

barriers to health care, cultural competence and diabetes, patient/provider language concordance and the SEM.

The literature search included mainly the years 2005 to present; however, there were a few earlier studies which were either of historical significance or were one of a very few available articles on specific topics. An example is Stokol's 1996 guidelines for applying the SEM to public health issues, a landmark publication and very much in use today (Stokols, 1996). Another would be the study of differences in diets among ethnically diverse neighborhoods (Diaz-Roux et al., 1999). Additionally, Kemp and Rasbridge (2004) is a very commonly used handbook, as is the pocket guide by Lipson, Dibble, and Minarik (2000) for clinicians at all levels when dealing with culturally or ethnically diverse populations.

Theoretical Foundation

The theoretical framework for this research was the SEM, a systems theory that emphasizes interdependence between people and their environments (Stokols, 1996). It is alternatively referred to as the social ecological theory and social ecological framework in addition to SEM. For clarity, I will use SEM throughout this study. Social Ecological Model is an interdisciplinary model used extensively in public health and epidemiology. Researchers using this model have examined contributions from the social and behavioral sciences as they impact individual health behavior. The SEM has also been found to be useful for a number of research methodologies, including epidemiological analysis (Stokols, 1996). Rather than focusing simply on biology and environment, researchers may use this model to consider environment as having multiple layers, including social,

physical, and cultural. Within the SEM, individuals are viewed as both influencing and being influenced by their environments (Lounsbury & Mitchell, 2009).

Another factor that makes SEM appropriate for this study is that researchers can apply the model components to help identify what factors are, and are not, within the scope of control of individuals, families or groups, and communities. This information may then be used by clinicians and policy makers to develop interventions at the most appropriate level by understanding which social factors enable or constrain undesirable behavior, or promote or discourage desired behaviors (Blanchard et al., 2005; Lounsbury & Mitchell, 2009). An example of this use of the SEM was found in a study by Blanchard et al. (2005). They used the SEM to try to clearly establish a link between physical inactivity and weight. Whittemore et al. (2004), in one of the first studies in which the SEM was used to study diabetes, inactivity, and weight gain, used the SEM to determine how challenges to both prevention and self-management of type 2 diabetes may be overcome by developing interventions at various levels in the environment.

Originally presented by Lewin (1936) in his cornerstone work *Principles of Topological Psychology*, an equation was developed to represent his model of the SEM: $B = f(P/E)$, where B is behavior and that is the result of the f (function) of the interaction between the person (P) and environment (E) (Lounsbury & Mitchell, 2009). Starting with this equation, this model has been used by the Centers for Disease Control and Prevention [CDC] in developing multilevel approaches to specific health problems. A rainbow shaped figure of bands is used to visually represent the equation, with the very center being the individual. The outer levels include an interpersonal level, (including

health care providers, family, friends), an organizational level (including health care systems, local health departments, insurance programs), a community level (media as sources of communication, community activist groups, churches) and, finally, a policy level (facilitating behavior change through regulation at local, state, and federal levels) (CDC, 2011).

With a few assumptions, the SEM can be applied to problems related to health behavior. It assumes that a single cause of the health problem of interest is not likely, and that the problem of interest is likely to be affected by combinations of factors at one or more level of influence (Lounsbury & Mitchell, 2009). Other parameters include the presumption that socioenvironmental factors as well as biological processes affect individual behavior, and that, over time, even small changes in one or more key factor may produce a significant impact on the problem of interest (Lounsbury & Mitchell, 2009; Whittemore et al., 2004).

For the purposes of the theory ecology is defined as a dynamic way of viewing the complexity of the ecosystem, and involves a number of key principles (Lounsbury & Mitchell, 2009). The first principle is interdependence, which specifies that a change in one piece of the whole system will affect the other components (Lounsbury & Mitchell, 2009). As an example, increasing the hours of operation of a health center may be the result of a policy change at the systems level (more money to pay more providers). Another principle is cycling of resources. This involves finances, goods, and services, and refers to the movement of resources in and out of the ecosystem (Lounsbury & Mitchell, 2009). Adaptation refers to how a community or individual uses and reallocates

resources in response to a change in the ecosystem (Lounsbury & Mitchell, 2009). For example, a large influx of uninsured people, either new residents or those who have lost jobs, would require a shifting of resources (money) to the health center as a response. Finally, succession is the long-term movement of people or populations into and out of the community. This is often the result of previous adaptation (Lounsbury & Mitchell, 2009).

The SEM has been used extensively in public health research because it examines public health issues in a system-oriented manner, evaluating structure and process interactions within the community over time (Lounsbury & Mitchell, 2009). Application of the SEM may be either one directional or multidirectional and may be used simultaneously across disciplines. The SEM is supported by several organizations that seek to understand health problems from a systems viewpoint, including the CDC, the National Institute of Health (NIH), and the Office of Behavior and Social Science Research (OBSSR) (Lounsbury & Mitchell, 2009; Whittemore et al., 2004).

There are a number of examples of how the SEM has been used in research for some of the same factors considered for this research. Blanchard et al. (2005) reported on a study of environmental factors promoting obesity. They considered the physical environment of the neighborhood, including the presence or absence of parks, sidewalks, and walking trails. They also considered locations, distributions, and quality of recreational facilities, the presence or absence of community clubs, and the influence of churches (Blanchard et al., 2005).

Whittemore et al. (2004) used the SEM to examine the interaction between diabetes and obesity, with the knowledge that 80% of those with type 2 diabetes are also obese. The authors used the SEM to examine ways to expand and enhance diabetes prevention and management programs. They identified personal, interpersonal, institutional, community, and public policy strategies to enhance disease self-management and glycemic control (Whittemore et al., 2004). At a personal level, Whittemore et al. (2004) considered items like genetics, negative health behaviors, and ability to change. At an interpersonal level, the authors addressed relationships with family, friends, neighbors, and colleagues. Institutional considerations included such items as health promotion programs in work, school, or faith-based organizations. Community assessments as well as community health-related campaigns were reviewed; public policy was reviewed at a local, state, and national level (Whittemore et al., 2004). They also stressed the ability of the SEM to coordinate linkages between levels.

Richards, Riner, and Sands (2008) provided another example of the SEM being used to address public health issues, in this case to develop and promote physical and weight management programs. The SEM was used to study these issues at multiple levels and, in conjunction with a community assessment, to develop multilevel interventions to promote physical activity. The results were then used to develop personal, interpersonal, organizational, and community policy interventions as well as ways to link these (Richards et al., 2008). The strength of the SEM model lies in its applicability across many disciplines and at different levels. Examples are easily found that support the use of

the SEM for health management studies, and was therefore the model was a valid choice as the guiding framework for this study.

The demographic factors examined in this research addressed issues applicable to several levels of the SEM, including linkages between them. The variables in this research were related to intrapersonal factors, interpersonal factors, institutional factors, and community factors. Carson, Reynolds, Fonseca, and Muntner (2010) found that the demographic profiles of those individuals with controlled diabetes differed from those not well controlled. This suggests that the place a person lives, a personal factor, has an effect on control. Where a person lives is affected by community level factors such as presence of sidewalks, adequate lighting, and accessibility to health care. Further, in their study about the unmet needs of Latinos with diabetes, Cusi and Ocampo (2011) found that targeting environmental factors that affect diabetes control (community level factors) is the most cost-effective way to prevent complications caused by poor control (personal factor).

Review of the Literature Related to Key Variables

Epidemiology of Diabetes

As of 2010, 25.8 million Americans had diabetes or 11.3% of the population (Haas et al., 2013). Of this 25.8 million, 18.8 have been diagnosed, with 7 million undiagnosed (Haas et al., 2013). In addition, another 79 million would be classified as having prediabetes (Haas et al., 2013; National Diabetes Fact Sheet, 2011). The age-adjusted prevalence in American adults over age 20 is 7.1% for non-Latino whites and 11.8 % for Latinos National Diabetes Fact Sheet, 2011). In addition, separating out

Mexican and Puerto Rican Latinos reveals an even higher prevalence with 13.8% for Puerto Ricans and 13.3% for Mexicans (National Diabetes Fact Sheet, 2011).

The majority of the literature addressed *Hispanics* or *Latinos* as one group; however, there are significant differences within the group. Latinos from South and Central America as well as those from Cuba actually have a lower rate of diabetes than non-Latino whites (Campos, 2007). Mexican-Americans, Puerto Ricans, and those from the Caribbean Islands have the highest rates (Campos, 2007). The age and sex-adjusted rates of all cause and cardiovascular mortality is significantly higher among Mexican-Americans with diabetes than for non-Latino whites (Campos, 2007). In New Hampshire, where most Latinos are from Mexico, the Caribbean, and Puerto Rico, the risk for a Latino person to develop diabetes is 66% higher than non-Latino whites (BRFSS, 2010).

According to the most recent BRFSS trends in data, the number diagnosed with diabetes has tripled in the United States since 1980, rising from 5.6 million in 1980 to almost 21 million by 2010 (CDC, 2012). In addition, many with diabetes do not know they have it, so these numbers are presumed to be low. Further, diabetes is not a problem only in the U.S. The most recent World Health Organization (WHO) data reveals that in 2012, 347 million worldwide were diagnosed with diabetes (WHO, 2013). The number of deaths from diabetes is expected to increase by 50% in the next 10 years (WHO, 2013).

Further examination of BRFSS data shows that New Hampshire has approximately 77 thousand people with diabetes (BRFSS, 2010). When asked if they had ever been told they had diabetes, 7.9% of New Hampshire residents responded positively,

with an additional 2.2% responding that they had been told they are prediabetic (BRFSS, 2010). In addition to diabetes, many people are identified as prediabetic, meaning they have impaired glucose tolerance or impaired fasting glucose. These are often present five years or more before the development of type 2 diabetes (CDC, 2010).

Medical costs for those with diabetes in the United States in 2012 totaled $245 billion, with $176 billion in direct medical care costs (National Diabetes Fact Sheet, 2011). The remaining $69 billion was the cost of reduced productivity. The average medical cost for a person with diabetes was 2.3 times higher than for someone without diabetes (National Diabetes Fact Sheet, 2011). These costs have gone up since the last accounting in 2006, but diabetes remains one of the most expensive diseases in terms of health care costs.

The American Diabetes Association, the most widely recognized source for diabetes information, has made specific recommendations regarding the care of those with diabetes. For example, all those with diabetes should have a yearly dilated eye exam, sensation on the bottom of their feet should be checked at least yearly; and the HgbA1c should be checked at least twice a year (ADA, 2013). A chronic disease in its own right, diabetes can also be the cause of other chronic diseases, such as kidney disease and cardiovascular disease. It is well supported that controlling diabetes is important for preventing complications (Lee, Liu, & Sales, 2006; Nam et al., 2011). Recommendations for the care and self-management of those with diabetes include keeping a HgbA1c of 7% or less, the level at which it is believed that the risk of diabetes complications diminishes (ADA, 2013). Early and intensive blood sugar control has been shown to reduce

microvascular damage, which in turn decreases the likelihood of end organ damage (ADA, 2013; Campos, 2007; Lee et al., 2006; Nam et al., 2011). First level therapy involves meal planning and dietary management, and increased exercise (ADA, 2013). Next is stepwise introduction of oral anti-diabetic agents. Individuals with diabetes may be on one or several medications as there are a number of different classes of medications that target the problem from different angles. Despite all the different options for oral medications, insulin is often eventually needed and is considered the most effective treatment. Studies have shown that Latinos are 1.5 times more likely to resist treatment at any level than non-Latinos (Barrera, Toobert, Stryker, & Osuna, 2012; Campos, 2007; Coronado, Thompson, Tejeda, Godina, & Chen, 2007), despite the fact that few diseases have outcomes as dependent on patient adherence to treatment recommendations and self-management as diabetes. The remainder of this literature review considers the relationships between Latinos and the various aspects of diabetes care, along with disparities associated with them.

Impact of Diabetes on Latinos

There has been a substantial amount of research done regarding health disparities in diabetes among Latinos. Latinos have been shown to have higher prevalence, more complications, and worse outcomes than non-Latino whites, and their quality of care has been shown to be inferior (Mainous, Diaz, & Geesey, 2008). It has been predicted that one half of Latino children born today will be diagnosed with diabetes in their lifetimes (Sullivan, Hicks, Salazar, & Robinson, 2010). Another prediction states that 20% of all Latinos will have diabetes by 2031 (Lopez-Class & Jurkowski, 2010). Latinos are 1.7

times more likely than non-Latino whites to be treated for end-stage renal disease, a common consequence of poorly controlled diabetes (Office of Minority Health, 2010). Additionally, Latinos are 1.5 times more likely to die from the disease (Office of Minority Health 2010). This supports the premise that Latinos do not receive the same quality of care as non-Latino whites. Even in regards to the most basic of primary care of diabetes, Latinos do not receive the same quality of care. In 2010, 61% of non-Latino whites received a flu vaccine as opposed to 45% for Latinos. This is not necessarily to imply that poorer care is delivered because they are Latino; rather it is often related to lack of compliance, often due to lack of understanding. Latinos have a higher incidence of complications from diabetes than non-Latino whites (ADA, 2013). This could be due to a combination of problems. One problem is a difference in medical management. Those without insurance and low salaries may not be on the best medications. There may be a lack of a regular provider. Going to the Emergency Department for primary care is not the best idea. People with diabetes need regularly scheduled visits with their provider along with the recommended lab work (ADA, 2013; Coronado et al., 2007). In addition, it may be more difficult to get to recommended referrals, particularly to an ophthalmologist, to monitor for diabetic retinopathy. Telling a person with diabetes that diabetes is the most common preventable cause of blindness (ADA, 2013) is not helpful if they need to balance that need with putting food on the table. Inadequate access to care may also be due to a shortage of providers, lack of transportation, inconvenient hours, or cultural barriers such as language. Regardless of the reason for lack of access, the result is poor quality of care, or even no care at all. The care received may not be lacking at any

given point in time, but a dearth of care extrapolated over the course of the illness amounts to the same results, complications. Complications associated with inadequate access to care include end-stage renal disease, diabetic retinopathy and blindness, neuropathy and lower extremity amputation (ADA, 2013; Lee, Liu, & Sales, 2006).

Management Sciences for Health (n.d.) stated that diabetes was a challenge and further supported the importance of diabetes in Latinos. This is due to increased prevalence in the population, a high incidence of risk factors in Latinos (such as obesity and improper nutrition practices), a higher risk of diabetes complications, and the growth in the numbers of Latinos in the U.S. (Office of Minority Health, 2012).

There have been a number of compounding issues identified among Latinos with diabetes. Latinos have a higher prevalence of obesity, which often leads to diabetes. They are more likely to be uninsured or underinsured, leading to a lack of regular medical care (Gonzalez, Vega, Rodriguez, Tarraf, & Scribney, 2009; Neal, Magwood, Jenkins, & Hossler, 2006a). Being a woman and Latina is another potential compounding issue. Women of Latina heritage in the United States have more than twice the prevalence of diabetes of non-Latina white women and have more complications. Latina women who are obese, are then at a much greater risk of developing diabetes (Barrera et al., 2012; Neal et al., 2006a).

There are a number of likely reasons for differences in blood sugar control. To begin, Latinos are the most likely of the minority groups to have no insurance and to have financial barriers to medication acquisition and use (Fernandez et al., 2010). They must then find a community health center with a sliding fee scale and they must be able to

apply to the various drug companies for free or discounted meds. Nearly all drug companies have these programs but they are difficult to access if language is an issue. Since Latinos are the most likely minority group to lack proficiency in English, many not even being literate in their own language, it is easy to understand why they may be "non-compliant" with their medications. They are also often unable to understand written instructions, even if written in their native language (Fernandez et al., 2010; Gonzalez et al., 2009). In this research, the variables of income, insurance coverage, and language spoken will be considered as potential indicators of poor glycemic control.

Poor glycemic control is not just a lack of medical management (Lee et al., 2006). Studies have shown that Latinos are less likely to be involved in self-management activities than other groups. In one case-control study, it was found that Latinos were less likely to self-manage their diabetes with diet and exercise and had fewer eye exams (Lee et al., 2006). The conclusion was that Latinos engage in fewer self-management activities. Another study (Gonzalez et al., 2009) examined racial and ethnic differences in health care use and costs for adults with diabetes. Lee et al. (2006) used the Medical Expenditure Panel survey, which included a nationally representative sample of non-institutionalized civilians in the US. The findings supported a significant difference between ethnic groups. Latinos tended to be younger, fewer were married, had the lowest educational level, had lower income, and only 80% had insurance (non-Latino whites were 97% insured). In a similar study, Lopez-Class and Jurkowski (2010) found that of the 80% who were insured, Latinos were far more likely to have Medicaid than private insurance (Lee et al., 2006; Lopez-Class & Jurkowski, 2010). Latinos were also found to

have the most eye problems, because they were the least likely to get annual dilated eye exams. Nam et al. (2011) found similar results. They concluded that poor glycemic control was the result of failure in self-management by patients, along with inadequate intervention strategies by providers.

Another study of racial and ethnic differences between Latinos and non-Latinos was completed using the population of East Harlem in New York City (Horowitz, Colson, Hebert, & Lancaster, 2004). East Harlem is 90% Latino and/or African American, and only 6% white. This was compared to the Upper East Side of New York York City and separated at 96th Street. In East Harlem, one third of adults and one half of children lived in poverty at the time of the study (Horowitz, et al., 2004). Statistics from a more recent survey indicate that the poverty rate is even higher, with 43.3% of East Harlem residents living at or below poverty level, including nearly 60% of children living at or below poverty level (Areavibes, 2013). East Harlem also had the highest rate of obesity and the highest all-cause death rate in New York City (Horowitz et al., 2004). The prevalence of diabetes among those in East Harlem was two times that of those in the Upper East Side. Among the individuals with diabetes in East Harlem, the rate of diabetes-related amputations was five times the rate in New York City as a whole. Finally, the authors found that 40% of those responding did not follow dietary recommendations because of financial limitations (Horowitz et al., 2004). Although ten years old, this study indicated that there are differences in the outcomes of diabetes between these two groups. More recent statistics from the New York Department of Health (2012) indicated that this health disparity remains a concern. Mortality caused by

diabetes was 12.4 per 100,000 for Latinos, and 12.4 per 100,000 for non-Latino whites. Hospitalizations caused by diabetes occurred at a rate of 272.5 per 10,000 for Latinos and 163.1 per 10,000 for non-Latino whites. Finally, the rate of complications per 10,000 residents was 2.4 for non-Latino whites and 6.1 for Latinos (New York State, Department of Health, 2012). Factors related to community characteristics, including location related to area for safe physical activity and distance from supermarkets will be evaluated in this research.

Activity and exercise is another area where racial and ethnic variations occur. Exercise is an important component of the self-care of diabetics. Bull et al. (2006) and Lopez-Class and Jurkowski (2010) performed studies using the SEM to evaluate the relationship between physical activity and community level supports among low income Latinos. Both Bull et al. (2006) and Lopez-Class and Jurkowski (2010) found that Latinos had much lower levels of activity as well as higher levels of documented nutritional deficiencies. Over 80% of those in the study did not meet the current guidelines for physical activity (Bull, Eakin, Reeves, & Riley, 2006; Lopez-Class & Jurkowski, 2010). Frank et al. (2009) also found a connection between community design, physical activity, and obesity across ethnic and racial groups. Community factors such as prevalence of fast food outlets and few supermarkets led to poor food choices. The importance of assessing how variables affecting exercise are related to the area in which patients with diabetes live and comparing the areas with the HgbA1c was evident after examining these studies.

Cultural Considerations for Latinos with Diabetes

Acculturation. Acculturation is an aspect of individual Latino's lives that may impact diabetes. Acculturation refers to the process of immigrants becoming immersed in and accepting of the attitudes, beliefs, behaviors, and customs of a new culture, usually the dominant one (Perez-Escamilla & Putnik, 2007). Some factors associated with acculturation include birthplace, language used, and the number of years in the U.S. As a Latino becomes part of the new society, there are a number of options, the first being assimilation, or being part of the *melting pot*. In this case, Latinos give up much of their culture and enter the Euro-American mainstream (Perez-Escamilla & Putnik, 2007). Another option is to become bicultural and integrated. In this case, the Latino becomes part of the mainstream but retains their heritage. A third option is to maintain the Latino heritage and culture, becoming separated and segregated. Finally, the Latino can accept the loss of their heritage but refuse integration, making them marginalized or invisible (Perez-Escamilla & Putnik, 2007). For illustrative purposes, this is an oversimplification of a very complex concept. For example, acculturation may move in the opposite direction, such as when someone who is not Latino marries into a Latino family. Also, it is often not a linear process, nor is it unidirectional. For example, acculturation may vary in different settings for the same person. Someone who works with non-Latinos on a daily basis may feel quite comfortable with the adopted culture at work, and yet, still choose to attend an all-Spanish church. And if additional stress is added, such as when someone is ill, there may be some regression in comfort with non-Latinos (Perez-

Escamilla & Putnik, 2007). These are considerations that need to be taken into account when developing a plan of care for a Latino with diabetes. Although an important consideration, there was not a specific variable related to acculturation in the study. Acculturation, a complex and complicated construct, is beyond the scope of this study. It is discussed here only because it in some way affects all Latinos and their perceptions of their lives.

Latino beliefs about diabetes. There are a number of theories about the relationship between personal health beliefs and the impact on illness. Rizzo-Parse's (1992) theory of human becoming is often used because it examines the impacts of lived experiences on health; the health belief model is often used when researching patient compliance and preventative health practice; and, Lazarus' stress and coping model purports that a person's perception of health and illness (both mental and physical) are related to how they evaluate and cope with the stress of illness (Polit & Hungler, 1995). Although the different theories used in health research may focus on different facets of health and illness, the importance of personally held beliefs is universally recognized as important (McKean-Skaff, Mullan, Fisher, & Chesla, 2003). Nam et al. (2011) also identified cultural issues and acculturation as the source of potential barriers to self-management in their study. In fact, even among low-income Latinos, it was found that personal and cultural barriers were of more importance than financial ones (Nam et al, 2011) .

In one study, a contextual model was utilized to examine the association between feelings of control and health, incorporating a sociocultural context (McKean-Skaff et al.,

2003). This model was tested using a sample of Latino Americans with type 2 diabetes and comparing them to European Americans with type 2 diabetes. The findings showed that beliefs influence behavior. Specifically, the study found that if people believe their actions will have a positive influence on outcomes, they are more likely to engage in those behaviors. Another concept addressed in this study was that of "fatalism". This concept was presented as a reason for not following recommendations. Some Latinos stated that they had a belief that diabetes was simply their 'fate', where others believed that they had a total lack of control and did not believe that they could positively impact their future by following medical recommendations. Both groups were found to be less active in their approach to disease management (Kemp & Rasbridge, 2004; McKean-Skaff et al., 2003). This older study (McKean-Skaff et al., 2003) was groundbreaking at the time and has been supported going forward. Nam et al. (2011) performed a study to identify barriers to effective self-management. Their findings also support the idea that patients' attitudes and beliefs about diabetes affect self-management. Haas et al. (2013), in their discussion of the National Standards for diabetes care, point out that Standard number seven actually states that there must be an assessment of cultural and health beliefs regarding diabetes self-management.

According to Kemp and Rasbridge (2004), Latinos as sick persons prefer to stay in bed and take a dependent or passive role. When dealing with chronic illness, again, there is a reluctance to take control. Differing views on the cause of illness and perceptions of disease tend to lead to a lack of understanding of self-care and the importance of implementing recommendations (Spenser et al., 2006). Understanding this

potential pre-existing barrier for Latinos with diabetes is an important part of providing culturally appropriate care. Gallant, Spitze, and Grove (2010) compared four ethnic groups and their responses to self-management recommendations for chronic illness. They stated that Latinos' cultural views about chronic illness may conflict with recommendations for self-management which expects there to be some personal responsibility for illness self-care.

Latinos believe that diabetes is a serious illness. According to Hatcher and Whittemore (2007), Latinos generally do believe that there are biomedical causes of diabetes, including heredity. There is also a tendency to believe in folk or traditional causes. *Susto* is a commonly believed cause of diabetes. This is a strong emotion caused by fright or surprise, usually caused by a negative startling event. Some Latinos will actually describe when and where they became diabetic, which is perceived as a sudden event, rather than a gradual one. Most Latinos believe in an integration of both biomedical and folk causes, however. In addition, there may be religious beliefs (God's will), as well as the previously mentioned belief in fate (Gallant et al., 2010; Hatcher & Whittemore, 2007; Kemp & Rasbridge, 2004). Providers need to understand that any or all of these may be part of how a Latino patient understands diabetes. Providers tend to emphasize the pathophysiology of diabetes and its effects on the body. However, the literature supports having an understanding of Latinos' unique ethnic beliefs and customs, including food patterns and practices, health care practices, and social and cultural practices (Campos, 2007; Gallant, 2010; Hatcher & Whittemore, 2007; Kemp & Rasbridge, 2004).

Latinos emphasize the social domain including the effects of diabetes on their lives (Hatcher & Whittemore, 2007). Latinos with diabetes indicated that diabetes affected how they feel as well as their perception of how others feel about them They see their role in society as having changed due to being diabetic, and that they feel not normal (Hatcher & Whittemore, 2007; Kemp & Rasbridge, 2004). This caused a change in their social lives and their interactions with others. The role of the family is also important, and a supportive family was seen as a major strength. However, Latino diabetics often perceived that their role within the family had changed after their diagnosis. They sometimes noted a sort of role reversal with their children, which they did not like.

The prescribed diet is often perceived by Latinos as difficult to follow, as there is a lack of traditional Latino foods. This can be especially problematic at holidays and family gatherings (Hatcher & Whittemore, 2007). Other barriers to following the prescribed diet identified by this study included catering to family taste preferences, the high cost of buying healthy foods, lack of knowledge of how to cook healthy foods, being bored with the diet, or being left feeling hungry after eating according to the prescribed diet (Hatcher & Whittemore, 2007). Nam et al. (2011) further stated that barriers to diet adherence includes the idea that family wants and desires are paramount; and *catering* to an individual's treatment plan is perceived as self-indulgent. Recommendations by Kemp and Rasbridge (2004) also include consideration of these cultural issues when developing a diabetes education program for Latinos.

Another area where Latino beliefs may impact self-management involves the use of insulin. Most Latinos, like most non-Latinos, are more receptive of using oral medications than they are of injecting themselves. Although many people with diabetes can start with oral medications, most people eventually end up using insulin at some point. Latinos perceive this as a harbinger of death in many cases (Campos, 2007; Hatcher & Whittemore, 2007). In research supported by the Institute of Medicine, Campos (2007) found that most Latinos were resistant to starting insulin and were 1.5 times more likely to resist starting and adhering to treatment than non-Latino whites (Campos, 2007). Although more of a problem with Latinos, starting insulin is often met with resistance. Despite insulin being the best treatment for diabetes, it is often started later in the disease at a time where complications may have begun to be noticeable. By starting insulin late in the disease, after the onset of complications, insulin use becomes temporally associated with complications and may be misunderstood as the cause of rather than a consequence of advancement of the disease. An illustration of this, in one survey, used to make suggestions to improve diabetes education programs, 43% of those questioned believed that treatment with insulin caused blindness (Caballero et al., 2004). Nam et al. (2011) also noted cultural responses to insulin use. Among Latinos it was found that needing to change to insulin could be perceived as a personal failure and considered to be punishment for poor self-management. They also found, as others before them had, that insulin use was perceived by many to worsen the disease, rather than help, and to cause severe complications (Nam et al., 2011). Beliefs about diabetes, then, must be a component of a culturally competent diabetes self-management program.

Culture and culturally competent care are by themselves complicated concepts with much research addressing these concepts. The concepts are discussed only in so far as they may affect the demographic factors being studied, specifically roles in the family and language. Culture was not specifically addressed in this research, nor is it intended to be discussed in great detail in this literature review.

Lifestyle and self-care for Latinos with diabetes. Knowing the importance of the role of the patient in diabetes treatment, Rygg et al. (2010) postulated that self-management depends upon how well diabetes and its care is understood. One result from this study was the feeling that too much time was spent on what providers felt was important, at the expense of those topics deemed important by patients. In other results from this same study and one completed by Carlson et al. (2006), participants identified problems with the teaching received including experiencing practical problems and feeling insecure due to insufficient information, contradictory information, and lack of contact with others with diabetes (Carlson et al., 2006; Rygg et al., 2010). Haas et al. (2013) also indicated that lack of knowledge was a barrier; Gallant et al. (2010), indicated that Latinos' knowledge levels tended to be lower than other ethnic groups in regards to self-management of chronic disease in general. Specific areas from these studies addressed included diet, medication, social settings, and life style changes (Carlson et al., 2006; Gallant et al., 2010; Haas et al., 2013; Rygg et al., 2010).

Regarding diet, study participants (Rygg et al., 2010) went on to identify specific issues they felt needed to be addressed in teaching. These included managing a strict diet, and including planning/preparing family meals. They also felt it was hard to get enough

food for an average blue-collar day at work. Those who worked night shifts also had concerns about getting enough but not too much food. Stabilizing blood sugars and having diarrhea from medications was also mentioned. Finally, there were social issues such as how to change traditional recipes to pass on to children, how to say 'no' to unsuitable foods, and responding to apologies offered by those who do not have diabetes (Carlson et al., 2006; Rygg et al., 2010).

There were also gender specific issues suggested. Cultural expectations about gender roles presented problems for both genders. Men tended to be dependent on women to do the cooking and shopping as well as food preparation; females must be educated and committed as well as the male diabetics. Conversely, women tended to place their needs subordinate to those of the family; so women, too, are in need of support within the family (Gallant et al., 2010).

Study participants (Gallant et al., 2012) also identified issues specific to the medical care received. Most patients felt they had insufficient time with their provider to get their questions answered. Others needed further direction on getting accurate information, especially regarding Internet sites. Others wanted to be connected with someone to walk with. Finally, a majority wanted the opportunity to discuss and share their experiences (Rygg et al., 2010). The research examined the impact of some of these factors on blood sugar control, specifically related to location relative to supermarkets and exercise facilities.

Racial and Ethnic Approaches to Community Health 2010 (REACH) was a CDC initiative designed to eliminate disparities in health status among minorities in specific

areas, including diabetes (Spenser et al., 2006). A study supported by this initiative was used to identify additional lifestyle-related barriers identified by the participants. These included culturally inappropriate treatment plans, language barriers, patient/provider communication difficulties, and inadequate access to care (Spenser et al., 2006). Chen, Youdelman, and Brooks (2007) mentioned some of these same results, specifically the need for language congruency with providers. Nam et al. (2011) also mentioned language congruence between providers and patients, in addition to access to care; Cusi and Ocampo (2011) mentioned a need for language services and access to care. Ali et al. (2011) found a need for access to care; they used multivariate logistic regression and found that 22.4% of those without a usual source of care were poorly controlled versus 11.2% with a usual source (Ali et al., 2011).

Aware that minority patients are less likely to use preventive services or engage in self-management behaviors for diabetes (Gallant et al., 2010), Russell et al. (2010) used focus groups that made suggestions as to what would make following medical recommendations easier. The results indicated a need for more basic information. There were also requests for more group learning, more pamphlets in their language, and exercise groups. The most significant finding was the need to get more input from low-income populations (Russell et al., 2010). This was another common finding (Nam et al., 2011; Shiroma and Lee, 2010). The original recommendations for development of self-management programs were from a 1996 meta-analysis. Of the 33 studies included in the analysis, the majority used men and whites. Only five studies included women; only two included minorities. Another analysis was completed in 2008, and several studies

included in this had minorities in the sample; however only seven of the 30 studies included more that 10% minorities (Shiroma & Lee, 2010). Lack of information, communication issues, and availability of group support were identified among several studies, as illustrated (Carlson et al., 2006; Chen et al., 2007; Russell et al., 2010; Rygg et al., 2010; Spenser et al., 2006). Campos (2007), in an integrative review, further discussed the role of information acquisition and language in self-management. Latino patients often encounter providers who do not speak their language or, at least, not well, and Latinos often do not speak English well (Campos, 2007). They may also be illiterate even in their native language. This limits the exchange of information in both directions and prohibits gathering culturally relevant information. The result is miscommunication including misunderstanding the provider's instructions. This then leads to poor adherence, missed appointments, and poor patient satisfaction (Campos, 2007).

Lopez-Class and Jurkowski (2010) performed an integrative review that also identified some important lifestyle and culture–related issues. First, they identified that Latinos disproportionately experience poverty and limited access to health care. Low incomes, lack of education, and acculturation were also identified as problems with performing self-management. These results support previously addressed studies (Barrera et al., 2012; Campos, 2007; Carlson et al., 2006; Fernandez et al., 2010; Neal et al., 2006a). Latinos were also found to be less physically active than other races and ethnic groups, largely due to neighborhood characteristics (Lopez-Class & Jurkowski, 2010). These included lack of access to green spaces in poorer neighborhoods, as well as lack of exercise facilities and well lighted sidewalks. The single, most often cited problem within

the literature, however, was a lack of adequate research into social and demographic factors that are suspected of playing a larger role (Lopez-Class & Jurkowski, 2010). Frank et al. (2009) stated that few studies have assessed the effects of demographic factors and lifestyle on glycemic effect. They also found that demographic and lifestyle factors account for up to 2.1% of HgbA1c variance. Haas et al. (2013) indicated a continuing need for assessment of how lifestyle and demographic factors affect glycemic control.

A meta-analysis by Glanz, Sallis, Saelens, and Frank (2005) further supported the idea that self-management is influenced by social and cultural factors. They found that the home environment had the most complex and dynamic impact on food choices. The primary food shopper and preparer had particular influence over the choices made. This is usually a female and may or may not be the oldest female in the home, taking into account the frequency of multiple generations living in the same home. If this person is the one with diabetes, she may either use her control to make appropriate choices; or she may be too strongly influenced by the preferences of her family to do so (Glanz et al., 2005). Another conclusion derived from this analysis was that recommending eating less and getting more activity does not do enough to address the impact of the complex social environment on behavior. Bull et al. (2006) presented the results of a study examining the effects of different level supports for increasing activity and encouraging healthy eating among low-income Latinos. They found that Latinos self-reported higher fat consumption than non-Hispanic whites. They also found that as acculturation increases, nutritional deficiencies increased. This research took into account a number of these

factors, including family make-up, determining if the one with diabetes is the one controlling the food purchasing and cooking, language, and language compatibility with the provider.

Nam et al. (2011) found that financial resources also affected how well Latinos manage their diabetes, as did Haas et al. (2013). Many low-income Latinos are uninsured or underinsured. Ali et al. (2012) found that 28.5% of Latino diabetics without insurance were poorly controlled, whereas only 7.2% of those with private insurance were. Gallant et al. (2010) found that economic challenges and lack of insurance were barriers for Latinos with any chronic illness. Financial factors of income and insurance coverage will be considered in the proposed research.

Importance of culturally competent health care for Latinos with diabetes.

The importance of cultural competence has been a frequent and important topic in health care in recent years. There are a number of manuals available to guide healthcare professionals as they interact with patients of cultures differing from their own (Kemp & Rasbridge, 2004; Lipson, Dibble, & Minarik, 2000). These are very helpful and can address questions such as whether to shake hands, make eye contact, or how large personal space needs to be. However, with a complex chronic disease like diabetes, a much more in depth understanding of the lived experience is needed to deliver culturally competent care. Lopez-Class and Jurkowski (2010) recommended considering all of the cultural components of a Latino's life in order to provide excellent health care. These may include family-centered decision making, acculturation, traditions, and place of origin. Place of origin is relevant because there is a tendency to consider Latinos as one

homogeneous group when there are more differences between Latino groups than there are similarities. McKean-Staff et al. (2003) began with the health belief model when they developed a contextual model to explain the connection between sense of control and health management behaviors. They stated that ethnicity creates a sociocultural context for health and control. They further stated that the difference in prevalence in some ethnic groups (such as Latinos), and the course of the disease for that group, is a result of the lived experience. They concluded that providers should consider this in developing culturally competent health care for Latinos with diabetes (McKean-Staff et al., 2003). Fisher et al. (2005) presented an ecological approach to self-management that stated diabetes self-management must be grounded within the context of sociocultural and environmental influences. Using theories about personal models of illness, Fisher et al. (2005) attempted to define best practices aimed at having health education begin with the individual patient's perspective and that of their culture. These practices may include individual concepts of health and illness, the role of medication, the role of self in managing illness, and views of fate versus control. The views of the provider were presented as just that - the view of western medicine. Views were not presented as "right" but rather as one way to consider while trying to have the best quality of life with diabetes (Fisher et al., 2005). They recommended understanding individual perspectives related to culture as a key component of individualization. For fully competent care for culturally distinct groups, Fisher et al. (2005) recommended a comprehensive program addressing resources and supports for self-management. This begins with a comprehensive individualized assessment, which would then be used in collaborative

goal setting. In support of achieving those goals, skills enhancement must occur. This may occur one-on-one, in groups, or any other method with which the patient is comfortable. This is followed by follow-up and on-going support. Providing information regarding access to resources in daily life and ensuring access to continuity of quality clinical care was the final recommendation (Fisher et al., 2005). Haas et al. (2013) advised individualization in developing curricula for patients with diabetes. Radhakrishnan (2011) reviewed many interventions for management of chronic disease and advised tailored interventions be developed based on an individual's unique characteristics relative to the outcome of interest, accompanied by individualized assessment. Gallant et al. (2010) in their assessment of chronic care self-management stated that differences in self-care behavior among Latinos are at least partly due to a program that does not do enough to incorporate cultural values.

The importance of culturally competent care for all patients, regardless of ethnicity or race is a recognized quality indicator for health care. The literature certainly supports this, although there may be some disagreement as to how best to achieve this. Amaro and de la Torre (2002), for example, have suggested that more research is needed especially on Latinas. Women in general have had less research addressing their health, but this is especially true of Latinas. Research into intergenerational patterns in gender roles is also needed. Other topics that needed to be addressed included family patterns, social support, and socialization and how all of these affect the health of Latina women (Amaro & de la Torre, 2002). It was not the intention to conduct research on culture and culturally competent care but rather to include those cultural factors that are related to

demographic factors, such as role in the family, size of the family, and language spoken. This was gathered using data on family size and composition available through the EHR.

Barriers to Self-Management

Diabetes has been discussed as an illness that requires self-management. The most important outcome examined when considering control is the HgbA1c. All the medications and self-management activities are intended to keep the HgbA1c under control, which means it should be less than seven (ADA, 2013). Improved outcomes and decreased incidence of end-organ damage are desired results for self-management. By keeping the HgbA1c under 7, providers know that average blood sugars have been low enough to prevent end-organ damage. Self-management is among the most important ways of achieving glycemic control. It is also known that not everyone achieves these desired outcomes. There are a number of barriers to self-management, but they all affect a patients' ability or willingness to follow recommendations for appropriate diet and exercise routines, two areas that are particularly vulnerable to cultural influences (Mainous, Diaz, & Geezy, 2008). This research collected data that identified potential barriers to achieving diet and activity recommendations.

Acculturation. The role of acculturation is an important aspect of barrier assessment due to its tendency to negatively influence lifestyle choices. A number of studies have been completed assessing the role of acculturation as a barrier to self-care. For example, Sussner et al. (2009) found acculturation to be a barrier to getting genetic testing for breast cancer among Africans. Findings by Benbenek and Garick (2012) identified acculturation as a barrier to getting Somali teenage girls to eat calcium and

vitamin D rich foods. Bolstad and Bungum in their 2013 study of Latinos in Southern Nevada associated acculturation with a decrease in the intake of fruits and vegetables. As another example, a study by Johnson-Kozlow (2010) linked acculturation as a barrier to colorectal screening among Mexicans in California. In general, acculturation leads to less than optimal choices, including increased smoking, increased fat intake, and decreased fruit and vegetable intake (Mainous et al., 2008). However, in this same study it was also found that Latinos with diabetes who are more acculturated also showed some benefits. While less acculturated Latinos had a better diet, more acculturated Latinos had better access to medical care and a better socioeconomic status. Other conclusions from this study were that Latinos with diabetes suffered stress related to which traditional behaviors to retain and which new behaviors to adopt in service of self-management (Mainous et al., 2008). Another conclusion was that there was a dearth of research in this area and that the relevance of demographics was not sufficiently examined. Rosal et al. (2005) and Rosal et al. (2011) also addressed the issue of acculturation in their qualitative study. The authors found an association between increased knowledge about diabetes leading to better control among more acculturated individuals. This study attempted to fill in the gaps, specifically regarding demographics that affect lifestyle such as location related to exercise facilities and supermarkets.

Poverty/Economics. Another barrier to adequate self-management activities identified was the role of economics, specifically the level of poverty among Latino diabetics. McKean-Staff et al. (2003) found that poverty prohibited Latinos from seeking health care despite feeling that health care was valuable. The researchers found that

poverty interfered with the ability of Latinos to buy recommended medications, purchase blood glucose monitoring supplies, shop for high quality foods such as fresh fruits and vegetables, or have a convenient resource for getting regular exercise, all components of self-management for diabetes (McKean-Staff et al., 2003).

Access to health care is an important aspect of diabetes care and is directly related to economic status. Many Latinos are employed in low paying positions that either do not supply insurance or the cost of insurance uses a significant part of their salary, making the cost prohibitive (Rosal et al., 2005). This makes lower socioeconomic status an indicator for less access to care. However, even controlling for this, Latinos are less likely to have the recommended screening tests, such as HgbA1c and foot exams, and are less likely to monitor their glucose at home (Rosal et al., 2011). This study, conducted by Rosal et al. (2011), was qualitative in nature and involved interviewing Latinos about perceived barriers. Using the results of this initial study Rosal et al. (2011) completed a clinical trial comparing two groups of low-income Latino diabetics served by a community health center. The treatment group was engaged in a culturally tailored self-management program, where the control group had routine care. The treatment group had an improved HgbA1c level, indicating improvement in glycemic control. As secondary endpoints, the treatment group also had better diets, better activity levels, and improved physiological factors such as blood pressure and weight (Rosal et al., 2011).

Neal et al. (2006) also addressed the role of economic barriers to diabetes care in Latinos. The chronic care model was used for this study and the researchers tracked quality indicators such as HgbA1c over four years to determine if and how disparities

among races and ethnic groups improved. Their results indicated that there was a need to improve access to care and decrease economic barriers to self-care. Further, Neal et al. discussed the Institute of Medicine's paper "Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care" which states that socioeconomic status (SES) influenced access to care as well as the quality of that care. The IOM report also stated that a lower SES negatively impacted levels of social support and availability of resources (Neal et al., 2006). The authors then went on to state that lower SES is itself a marker for other factors such as lower educational achievement, lower health literacy and poorer patient/provider communication, all of which may lead to decreased ability to engage in successful self-management. Lower SES was also found to negatively impact the ability of diabetics to comply with treatment recommendations including purchasing testing supplies, meds, and recommended food sources (Neal et al., 2006).

Fernandez et al. (2010), in a cross-sectional, observational study, also supported the importance of ongoing interaction between patients with diabetes and a consistent health care provider and the medical system in general. Fernandez et al. (2010) and Spenser et al. (2006) both used data from the CDC (Neal, et al., 2006). This is the CDC's initiative designed to eliminate disparities in the health status of minorities in specific, key health areas, of which diabetes is one. The results of Spenser et al. were used to conclude that Latinos have less frequent and poorer quality health care, even when controlled for access and income (Spenser et al., 2006). Carlson et al. (2006), also used the surveys designed for REACH 2010, and addressed another topic related to economics, access to a computer in the home. In this study, it was found that 80% of all

Americans have researched a health topic on the Internet. However, many Latinos do not have a home computer, or the disposable income to have an Internet service provider. This was found to be another barrier to self-management, even when controlled for age, education, and income (Carlson et al., 2006). The results of these studies (Carlson et al., 2006; Spenser et al., 2006) were used by the individual researchers to provide support for the importance of economics; while not all of these variables (i.e. presence of a working computer in the home) were included, items such as income, insurance status, and family size were.

Campos (2007) also made a number of points related to economic factors. He found that Latinos were 1.5 times more likely to be unable to comply with therapy than other ethnic groups. Further, 60% of Latinos with diabetes earn less than 20 thousand dollars yearly versus only 28% of non-Latino whites with diabetes (Campos, 2007). In this review, Campos identified several studies that identify prohibitive costs as the reason for poor compliance. Patients were found to decrease doses and frequency of medications, including insulin, in order to make them last longer. This research considered several factors related to finances, including employment status, insurance status, and family size. These data are available through the EHR and can be queried making it possible to identify associations between them and glycemic control.

Going beyond personal economic factors, Lopez-Class and Jurkowski (2010), in their analysis, reported a dearth of research addressing the ecological framework considering the impact of factors at other than personal levels (such as community level) on self-management. They stated that fewer Latinos have health insurance than any other

racial or ethnic group, with 63% of employed Latinos being insured. At a higher ecological level, they found that towns with a greater than 50% Latino population had a higher provider to patient ratio. The low number of available providers led to decreased access to care (Lopez-Class & Jurkowski, 2010). Fortmann, Gallo, and Philis-Tsimikas (2011) in their study, also believed that more research into multi-level influences on health outcomes was needed. Chiu and Wray (2010) and Frank et al. (2009) both determined that social, cultural, and demographic factors need to be further researched at multiple levels. This research included variables related to community level factors related to self-management such as proximity to supermarkets, access to public transportation, and safety of the area of residence for outside activity.

Culture. Sullivan et al. (2010) identified a number of potential cultural barriers, such as language. Although health care organizations are required to use some sort of interpretation service, this can still be a problem. If using a telephone interpretation service (such as AT&T's Language Line), patients may feel awkward or uncomfortable; in addition, using a telephone for interpretation misses the unspoken components of communication such as facial expression and body language. Professional interpreters are a superior option, but may still miss unspoken communication, especially if from a different subculture than the patient (Sullivan et al., 2010). Another barrier Sullivan et al. (2010) identified was the desire to give a correct answer. Patients may perceive the desired answer and give it, regardless of if it is true, leaving the provider with a missed opportunity to identify problems. For example, the patient may lie about taking their medications correctly because they do not want to disappoint the provider. A third

potential barrier identified by Sullivan et al. (2010), was the inability of many Latinos to read, even in their own language. This may make it difficult for patients to follow instructions on medication labels or to know where and when to go for a referral appointment (such as to an ophthalmologist). Ockene et al. (2012) examined the results of a community-based intervention in which participants were randomly assigned to two groups. The test group was one that was involved in a lifestyle intervention while the control group received *usual care*. This study also found that illiteracy in their native language was a barrier, as was lack of English speaking ability. The study sample of Ockene et al.(2012) revealed that 49% were able to speak English, and 30% were illiterate in Spanish. This research considered the variable of language spoken.

Neal et al. (2006) addressed diabetes from a public health perspective, using the Chronic Care Model. They, too, identified lack of health literacy as a barrier to self-management. Health literacy includes both lack of understanding English, as well as lack of literacy in the native tongue. Fernandez et al. (2010) completed a cross-sectional observational study examining whether or not limited English proficiency was associated with poor glycemic control. Their conclusion was that limited English was a risk factor for poor glycemic control. Cheng, Chen, and Cunningham (2007) in their cross-sectional study of Latino households, also found that speaking Spanish at home was a risk for poor glycemic control. Campos (2007) found the lack of English literacy to be a barrier to self-management as well as being associated with not having a routine place for health care, not having health insurance, and having a lower level of education. He also found that lack of health literacy was strongly associated with lack of English proficiency,

reinforcing the previous few study results (Campos, 2007). Rosal et al. (2005) also supported the findings addressing the issue of health literacy. They found that patients must accept that their 'behavior' has a major impact on their glucose control. Behavior referred to diet, physical activity, glucose monitoring, and medication adherence. The lack of educational materials for those with low literacy was found to be a major barrier. Campos' meta-analysis indicated Latinos lacking health literacy had associated poorer glycemic control, poorer outcomes, and a higher likelihood of complications (Campos, 2007). Another conclusion by Campos (2007) was that Latinos rely on family and friends for their information, so failure to include them in educational activities can lead to contradictory information being given to the patient by health care providers and friends. Language, then, is very important, as it is the basis of communication, both oral and written, as is addressed by the topic of health literacy. The importance of health literacy underscores the need for using culturally appropriate material in teaching Latinos with diabetes. This research gathered data around this topic, including primary language, and English proficiency, but did not address specifically the topic of health literacy. There is no shortage of research on this topic and it is not specifically a demographic factor, therefore its inclusion as a variable was not appropriate for this research.

Healthcare providers. Language is relevant as a provider-related barrier. Miscommunication due to language discordance has been identified as a major component of healthcare disparity for those with limited English speaking capacity (Chen, Youdelman, & Brooks, 2007). In interpreting the 1964 Civil Rights Act, the Supreme Court identified discrimination based on language as equal to that based on

nation of origin, and further, that any organization receiving federal financial assistance may not discriminate based on language (Chen et al., 2007). "Federal financial assistance" is relevant to healthcare organizations because this would include sources such as Medicaid, Medicare, and other healthcare related federal program funding and would apply to the majority of healthcare organizations. In addition, any organization or individual receiving money from the Department of Health and Human Services is subject to oversight by the Office of Civil Rights, which has the right to withhold funds due to noncompliance (Chen et al., 2007). In 2000, President Clinton issued Executive Order 13166 *Improving access to services for persons with limited English proficiency*, which further strengthened existing laws (Chen et al., 2007). Once a healthcare provider or institution has accepted money from any federal program, they have an absolute legal responsibility to provide language access for all patients (Chen et al., 2007).

Neal et al. (2006), in their study of diabetes outcomes, found that impaired patient/provider communication was a barrier to achieving outcomes, even when care was equal. Impaired communication led to decreased ability for self-management in the studied population (Neal et al., 2006). Fernandez et al. (2010) specifically examined the effects of patient/provider language discordance. In their cross-sectional, observational study with a sample size of almost 7000 participants, they found that having concordance between patient and provider led to better glycemic control for a significant percentage. After attempting to control for other cultural factors, their conclusions were: (a) limited English proficiency should be considered a risk factor for poor glycemic control, and (b) limited English proficiency contributes to ethnic health disparities and is an independent

predictor of poor diabetes management (Fernandez et al., 2010). Lopez-Class and Jurkowski (2010) found in their meta-analysis that linguistic concordance, as part of provider cultural competence, was a positive predictor of active self-management on the part of Latinos with diabetes. Lack of English proficiency was also identified as a barrier to healthcare delivery; and impaired provider/patient communication led to poorer quality of care and worse treatment outcomes.

Studies by Fernandez et al. (2010) and Lopez-Class and Jurkowski, (2010) were used to examine the effects of concordance or discordance between English speaking providers and Latinos with diabetes. Less has been done to examine the results of providers who speak Spanish. Rosal et al. (2005) found that Spanish speaking providers working with Spanish speaking patients led to the same positive impact on outcomes found with Latinos with English speaking proficiency. However, they also stated that there is a dearth of research addressing this, largely due to a shortage of bilingual providers. One later work, by Nam et al. (2011), did identify language discordance as one of the clinician-related barriers to diabetes self-management. Another study by Rosal et al. (2011) also determined that language discordance was a provider related barrier to self-care. The research had a variable for the primary care provider's language capacity. For example, one of the primary care providers whose patients will be in the data set speaks several languages fluently, including Spanish. One of the queries made was to determine the effect of language concordance on his patients with diabetes.

Another barrier related to providers involves access to care, largely due to a shortage of primary care providers. Having a usual source of health care is associated

with higher use of preventive services, and better compliance with self-care recommendations among those with diabetes (Gonzalez et al., 2009). It was also found to be associated with more awareness and better knowledge of specific diabetes related information. It was estimated that between one third and two thirds of Latinos have no usual source of health care. Cheng et al. (2007) also identified lack of a usual source of care as a barrier to effective self-management, as did Campos (2007). Although certainly relevant, the current study had no study related factors regarding having a usual source of healthcare; the assumption was that if patients are being see at the health center, they have a regular source of health care, as no one is turned away due to inability to pay.

Provider factors at an institutional level have also been identified (Lopez-Class & Jurkowski, 2010). Clinic locations and lack of transportation may be a barrier, with suggestions that more than thirty minutes travel time is too much. Travel is often on foot or using public transportation. Another factor identified was clinic hours. Many working Latinos have jobs that do not allow then to take time off for healthcare appointments, assuming they can afford to financially (Lopez-Class & Jurkowski, 2010). Later in the day and weekend hours have been suggested to improve access. The provision of childcare services has also been suggested as a way to surmount barriers, as Latinas often have children at home and must bring them to their appointments. Wait time between calling for an appointment and actually having one was also identified as a barrier, which is directly related to the shortage of available providers (Fisher et al., 2005; Lopez-Class & Jurkowski, 2010). Study variables addressing these issues included comparison of home addresses to the clinic address, verifying access on foot or by mass transit. Issues

specifically related to the clinic (i.e. hours) were not included as variables in this research as there was no way to access that information using the EHR. In order to gather that information, the entire study would need to be redesigned to acquire data specifically from the patients themselves. This would also lead to a loss of anonymity. This does not mean to suggest these data are not important, rather that they were not appropriate for this study design.

Obesogenic environment. The cornerstone of diabetes care is self-management on the part of the patient. They are uniquely responsible for following diet and physical activity recommendations by the provider (ADA, 2013; Haas et al., 2013). However, in a meta-analysis supported by the Institute of Medicine and the Robert Wood Johnson Foundation, it was concluded that self-management is dependent on the environment surrounding the individual (Fisher et al., 2005). Access to healthy foods was identified as a key environmental resource for self-management, as was access to a place for physical activity. The World Health Association refers to environments that do not provide these resources as obesogenic (Candib, 2007).

Obesity is a complex topic that should be viewed through a cultural lens. Even now, many believe that obesity is desirable and sexually attractive (Candib, 2007). Historically, only the wealthy could afford to be overweight, so obesity was seen as connoting power, wealth, prestige, and high social standing. In developing countries, a fat baby is a healthy baby. Conversely, thinness was associated with poverty and poor health, weight loss often being associated with dying. Although in some cases, this is still true, the World Health Organization has recognized obesity as a global epidemic and

described the “Obesogenic environment” which promotes obesity by supporting inactivity and over-eating at a population level as a characteristic of developed countries (Boehmer et al., 2007).

Food availability and obesity. There are multiple factors that may be related to obesity, beginning at the beginning: in utero. When subjected to an adverse intrauterine environment, the calorie-deprived fetus responds by developing the ability to hoard calories leading to a relative tissue resistance to insulin, low birth weight, and childhood fat deposition; the result is adults with insulin resistance starting very early, and eventually developing type 2 diabetes (Candib, 2007). The scenario above is of particular importance in developing countries, which may often be the countries of origin for U.S. immigrants.

Another factor present from birth is referred to as the *thrifty genotype*, which allows for the conservation of calories by laying down abdominal fat. This genetic factor is an advantage in times of famine, but may also lead to insulin resistance and diabetes (Candib, 2007; Cusi & Ocampo, 2011). Genetics also interact with the social environment, which has recently seen a paradigm shift in nutrition: poverty was previously associated with low calorie intake, but this has changed in many areas. With the easy access to inexpensive, high calorie, and high fat foods, poverty is now associated with high calorie intake (Candib, 2007). Even the school lunch program is often full of high fat, high carbohydrate food (Candib, 2007)

Latinos were found to be at high risk for problems with obesity and its sequelae, such as hypertension and diabetes (Galvez et al., 2007). In addition, the consumption of

fruits and vegetables were found by Lopez-Class and Jurkowski (2010) to be occurring 40% less often among Latinos than non-Latino whites. Lopez-Class and Jurkowski (2010) also identified a number of reasons for poor diet, the most common reasons being cost and lack of access. Supermarkets' abandoning inner cities were found to be a community level barrier to the access of nutritional food at a reasonable cost. In many cases supermarkets have left the inner city due to changes in cost of property and development as well as changes in population demographics. High property values were associated with greater access to food stores; poor neighborhoods were associated with more stores by number, but they were smaller, with limited products and higher prices (Lopez-Class & Jurkowski, 2010).

Horowitz et al. (2004) in their previously discussed landmark study examined barriers to buying healthy foods in East Harlem, NY. In East Harlem, one third of adults and one half of children live in poverty (Horowitz et al., 2004). Residents of East Harlem also have the highest prevalence of obesity in New York City, along with the highest all-cause death rate in New York City. Prevalence of diabetes in East Harlem is twice that in New York City in general, and among those with diabetes, mortality and the rate of hospitalization is twice that of New York City as a whole (Horowitz et al., 2004). Amputation due to diabetes occurs five times more frequently than in New York City as a whole (Horowitz, et al., 2004). In this survey, results indicated that diet recommendations are not followed due to financial constraints. More recent statistics support the findings of this important study (New York State, Department of Health, 2012) regarding the impact of poverty on the residents of East Harlem. In their survey,

Horowitz et al. (2004) specifically asked about purchasing those foods recommended by clinicians that are relatively affordable, and considered culturally acceptable. They were also foods that are easily identified on store shelves without any teaching. These included diet soda, 1% or fat free milk, high fiber, low carbohydrate bread, fresh fruits, and fresh green vegetables or tomatoes. Surveyors documented the presence of these foods as well as the lowest available prices (Horowitz et al., 2004).

East Harlem had more stores but fewer large ones, with neighborhood bodegas having only one to three cash registers per store (Horowitz et al., 2004). Prices were higher in the small stores. In addition, only 18% of the stores in East Harlem carried all five items versus 58% of the stores in the Upper East Side (Horowitz et al., 2004) When asked why they shopped in these smaller stores, respondents indicated that convenience was the most important factor, even more important than taste, quality and cost. They also felt more comfortable in familiar neighborhood stores, and were also given *informal* credit when needed (Horowitz et al., 2004). Moore and Diez-Roux (2006) found similar results using existing data from census tracts to identify neighborhood characteristics of food stores. Low-income neighborhoods had four times as many grocery stores as the wealthiest but only half as many supermarkets. In a landmark study by Diez-Roux et al. (1999) the influence of neighborhood characteristics on dietary patterns was examined independent of individual level variables. In this prospective study with a sample size of over 13 thousand adults, participants who live in poorer communities ate fewer fruits and vegetables and more meats than those living in more affluent neighborhoods (Diez-Roux et al., 1999). These results were also supported in a study by Zenk et al. (2005), which

concluded that inadequate access to healthy foods resulted in a disparity in accessibility by Latinos and other ethnic minorities. Moore et al. (2008) found that in their study group, over 31% did not have a supermarket within a mile and yet those in more affluent communities did 95% of their shopping at a supermarket. Participants that did not have a supermarket near their home were up to 46% less likely to have a healthy diet than those living in areas of highest supermarket density. Finally, among participants who reported living where availability of healthy foods was lowest were up to 35% less likely to have a healthy diet (Moore et al., 2008).

Jago et al. (2007), in a study examining neighborhood characteristics of diet, studied the food intake of hundreds of Boy Scouts, boys from all walks of life and ethnic groups. The results were interpreted to indicate that living farther from a small food store or fast food restaurant was associated with increased fruit and vegetable consumption as well as low fat dairy products. The closer participants lived to fast food outlets, the worse the diet. Another study of food environments (Glanz et al., 2005) found that fast food restaurants were more prevalent in minority neighborhoods, and supermarkets less prevalent. Another outcome from this study was that, although the home is the most important influence on food, it is affected by the availability of foods at selected outlets. The primary food shopper and preparer had particular influence on the diet of the whole household. Usually a female, this person must be able to get to a food outlet, which is a potential barrier to accessing a supermarket. Further, if she has diabetes, she may have some control over what she buys and eats, but also must give the same food to her family, who may not be supportive, another potential barrier (Glanz et al., 2005). Ford and

Dzewaltowski (2008) provided more support for these conclusions in their observational study using both individual and neighborhood level data. Based on a sample size of over 7000, they found that adults living in low socioeconomic neighborhoods have a higher body mass index (BMI) and that is related to neighborhoods having more small grocery stores. Frank et al. (2009) also supported the importance of community/neighborhood characteristics to healthy food choices. Study variables that were included in this research included what food outlets (fast food, bodegas, and supermarkets) are within a one-mile radius of the home address.

Activity. Latinos engage in significantly less physical activity (Bull et al., 2006; Cleghorn et al., 2008; Flynn et al., 2013; Frank et al., 2009; Gallant et al., 2010). It was also found Latinos identified themselves as 30% less active than non-Latino whites (Cleghorn et al., 2008). This is supported by the results of Lopez-Class and Jurkowski (2010) as well as Flynn et al. (2013) and Gallant et al. (2010). Latinos engage in less than the recommended amount of physical activity, with 80% getting less than the current recommended guidelines. Much of the reason behind this has been associated with neighborhood characteristics, factors included in examining the *obesogenic environment*. In Boehmer et al. (2007) the *obesogenic environment* was studied with a focus on recreational facilities, land use, and aesthetics. Their findings indicated a causal relationship between reduced numbers of sidewalks and increased incidence of obesity. They also learned that increased mixed land use and improved aesthetics in neighborhood environments led to decreased obesity on a population level (Boehmer et al., 2007; Wang et al., 2006). Findings by Katz, Metfin, and Barr (2012) indicated that ease of use,

including the ability to safely exercise near one's home is paramount in keeping those with diabetes engaged in self-management. This was further supported by Flynn et al.; they stated that the ease or lack of ease instituting and maintaining lifestyle changes, including exercise, presented a significant barrier to self-management and was contributed to by the *obesogenicenvironmen*t.

Lopez-Class and Jurkowski (2010) found that well-lighted sidewalks and exercise areas led to increased physical activity, and that there was a correlation between lower property values and decreased access to green spaces and exercise facilities (Lopez-Class & Jurkowski, 2010). They concluded that lack of social support, public transportation, and safe sidewalks were barriers to effective self-management. Fisher et al. (2005) also identified a lack of safe, attractive places for exercise as a community level barrier to self-management. Finally, Glanz et al. (2005) identified activity friendly communities as part of a healthy nutrition environment. Study variables in the current research related to activity included home address compared to the availability of a work out area..

Overview of the Literature

There were a variety of studies that were explored for this literature review. There were a number of integrative reviews and meta-analyses (Cusi & Ocampo, 2011; Ford & Dzewaltowski, 2008; Gallant et al., 2010; Glanz et al., 2005; Hatcher & Whittemore, 2007; Lopez-Class & Jurkowski, 2010; Nam et al., 2011; Perez-Escamilla & Putnik, 2007; Shiroma & Lee, 2010). Other study designs included clinical trials (Barrera et al., 2012; Bull et al., 2006; Rosal et al., 2009; Rosal et al., 2011) and case-control studies (Katz et al., 2012; Ockene, et al., 2012). There were a number of qualitative studies as

well, which is common when studying health related topics, especially early in the process of researching a specific issue (Cleghorn et al., 2008; Flynn et al., 2013; Russell et al., 2010; Rygg et al., 2010; Sullivan et al., 2010). Neal et al. (2006a) performed a retrospective study as did Carson (2010) and Egede et al. (2011). There were a number of observational studies as well (Jago et al., 2007; Mainous et al., 2007; Wang et al., 2006). The majority of studies were cross-sectional (Ali et al., 2012; Blanchard, et al., 2005; Boehmer et al., 2007; Cheng et al., 2007; Diez-Roux et al., 1999; Fernandez et al., 2010; Galvez et al., 2007;. Gonzalez et al., 2009; Mainous et al., 2008; Moore & Diez-Roux, 2006; Richards et al., 2008; Vukshich-Oster et al., 2006 ; Zenk et al., 2005). Also a form of observational study, cross-sectional designs are more specific in that they use groups of people who differ on the variable(s) being studied but are similar in other areas (Polit & Hungler, 1995). For example, in McKean-Skaff's et al. (2003) cross-sectional study, the variable of interest is being Hispanic and the variable in which the sample is the same is having diabetes. This research was a cross-sectional design with the variable of interest being the HgbA1c and the sample being the same in that they are all Latino.

There were a variety of sampling strategies as well. Several studies used secondary data sets including those from National Health and Nutrition Examination Survey (NHANES) (Ali et al., 2012; Carson et al., 2010; Cusi & Ocampo, 2011; Mainous et al., 2007; Mainous et al., 2008). Other secondary data were obtained from electronic health records and billing records that had the codes of interest (Barrera et al., 2012; Bull et al., 2006; Chiu & Wray, 2010; Fernandez, et al., 2010; Lee et al., 2006; McKean-Skaff, et al, 2003; Moore et al., 2008; Neal et al., 2006; Neal et al., 2006a; Vukshich-Oster et

al., 2006). Telephone surveys (Boehmer et al., 2007; Gonzalez, et al., 2009) were also used. Another source for the samples was in reusing data from other surveys such as the Multi-Ethnic Study of Atherosclerosis (MESA) (Diez-Roux et al., 1999; Frank et al., 2009; Moore & Diez-Roux, 2006). A number of studies solicited their samples from community health centers (Cleghorn et al., 2010; Egede, et al., 2011; Flynn et al., 2013; Katz, et al., 2012; Merriam et al., 2009; Ockene et al., 2012; Rosal et al., 2005; Rosal et al., 2009; Rosal et al., 2011; Russel et al., 2010), as was the case for this research.

Sample sizes varied greatly depending on the nature of the study. The majority had a few hundred participants (Barrera, et al., 2012; Bull et al., 2006; Cleghorn et al., 2008; Jago et al., 2007; Mainous et al., 2008; McKean-Skaff et al., 2003; Neal, 2006; Ockene, et al., 2012; Richards et al., 2008; Zenk, et al., 2005). The largest samples were over 1000. Boehmer et al. (2007) had 1032; Wang et al. (2006) had 7595 in their sample. Vukshich-Oster et al. (2006) had a sample size of 6035, and Diez-Roux et al. had over 13,000.

There were a number of statistics carried out on the data. The overwhelming majority, however used some type of regression analysis, either multiple regression, logistic regression, or unspecified and identified simply as “regression models”. This research also had a cross-sectional design and used a secondary data set from the electronic medical records, as with a number of the discussed studies. Chi-Square analysis was used instead of regression as the variables are dichotomous and the sample size 223.

After examining the literature, it is clear that a better understanding of the barriers to self-management in Latinos with diabetes is indicated. Egede et al. (2011) stated that the social and demographic determinants of poor adherence to medical recommendations need to be better understood. They also support the use of the HgbA1c as the outcome variable to determine adequacy of glycemic control. Nam et al. (2011) identified such demographic and social factors as food, diet, and lifestyle as barriers to adequate self-management. In addition, Nam et al. (2011) recommended achieving a more complete understanding of not only barriers but how they are each related to one another. For example, how is the place of residence related to dietary choices or exercise? Chiu and Wray (2010) found that demographic factors account for a significant part of HgbA1c variance, possibly up to 21%. Cusi and Ocampo (2011) also supported these statements indicating that socioeconomic and cultural factors had the greatest influence on diabetes self-management. While there appears to be agreement regarding a need for greater understanding of social barriers to glycemic control and their interactions, this understanding has not been forthcoming. The goal of this research was to begin to address the issue of social barriers to self-management.

Conclusion

The literature supports the importance of diabetes in Latinos as a significant public health problem. It is also known that self-management is an important piece of optimum care of the patient with diabetes. Self-management refers to daily blood sugar monitoring, following a nutrition plan, getting regular exercise, and seeing a provider regularly for guidance with other recommendations such as foot checks and eye exams.

Following these recommendations has been shown to decrease diabetes-associated health risks, decrease incidence and length of hospitalizations, and reduce diabetes-related costs (Lopez-Class & Jurkowski, 2010). Lack of self-management has been implicated as an important reason for the higher rate of diabetes complications in Latinos with diabetes (Coronado et al., 2007).

A number of barriers have been identified including language discordance and poverty. These challenges also contribute to making Latinos with diabetes an understudied population (Rosal et al., 2009). Poverty, though a recognized barrier, has a number of associated factors including lack of insurance, lack of a regular source of health care, and persistent exposure to an environment that supports poor food choices and inadequate exercise (Ford & Dzewaltowski, 2008; Zenk et al., 2005).

There were some clearly identified areas where research is lacking. Literature identifying community and institutional level barriers was one such area (Bull et al., 2006; Glanz et al., 2005; Lopez-Class & Jurkowski, 2010; Zenk et al., 2005). At a more fundamental level, research on Latinos with diabetes was lacking. Areas lacking were barriers for Latinos, Latino self-management of diabetes, living conditions for Latinos, and health care delivery access for Latinos (Bull et al., 2006; Lopez-Class & Jurkowski, 2010; Mainous et al., 2007; Zen et al., 2005).

Little has been done examining demographic data from Latinos with diabetes. This research attempted to correlate inadequate diabetic control with demographic data such as English proficiency, age, insurance status, address (as it relates to access to health care, supermarkets, public transportation), and income. The results provided information

that could be used at both an individual and community level. By being able to identify those patients whose demographics indicate high risk for poor glycemic control, health care providers can intervene early, before complications become evident. At a community level, the information could be used to support increased funding for neighborhood improvements or enticing supermarkets to low-income areas.

The research used secondary data entered into SPSS, version 21 to perform Chi-Square analyses to determine which, if any, demographic factors correlate to poor glycemic control. The plan for data acquisition and management is presented in Chapter 3. In addition, the methodology used, as well as the justification for it is also presented.

Diabetes is a major health problem in the US, with fewer than 63% at or below a HgbA1c of seven percent (Katz et al., 2012), with Latinos twice as likely to be uncontrolled as whites (Ali et al., 2012). Among the Healthy People 2020 objectives is one that requires a ten percent reduction in the proportion of Americans with diabetes with a HgbA1c over nine percent (Ali et al., 2012), a level at which control is considered to be poor. The literature has clearly supported the importance of identifying barriers to self-management, and the need to identify them at various levels. As stated by Cusi and Ocampo (2011), socioeconomic and cultural barriers have the greatest influence and several of these barriers have been shown to increase the difficulty of both incorporating and sustaining lifestyle changes (Flynn et al., 2013). Ali et al. (2012) have stated that in the future, evaluations of personal, provider, and system factors should be included and used to develop policies and interventions to support diabetes self-management in Latino diabetics. This research aimed to partially fill these gaps.

Chapter 3: Methods

Introduction

The purpose of this study was to determine which, if any, demographic factors are associated with poor glycemic control among Latinos with diabetes. In this chapter, a description of the research design and methodology is presented. In addition to the research design, the setting of the study, as well as the acquisition of the sample is described. A discussion of the instruments used for the study and data collection will follow. Finally, there is a description of the statistical analyses to be conducted, threats to validity, and ethical considerations.

Research Design and Rationale

The topic of interest for this study is what the demographic factors are that differentiate Latino patients with well-controlled type 2 diabetes (defined as a hemoglobin A1c of seven or less) from Latino patients with type 2 diabetes that is not well controlled?

For this study, a quantitative cross-sectional design was used to examine the association between the selected demographic factors and glycemic control as measured by HgbA1c. Cross-sectional designs cannot be used to assess causal relationships; however, since establishing a causal relationship between demographic factors and glycemic control was not the intent of this study, using a cross-sectional design does not present any immediate concerns (Creswell, 2014).

A cross-sectional design allows for gathering of data from large samples (Creswell, 2014). For this study, a query was made of the electronic health record (EHR)

of a federally qualified health center (FQHC) to identify all the patients with known diabetes. The total number of patients approaches 5,000 (S. Pardus, personal communication, Feb. 14, 2013) of which only those with diabetes who are Latino were selected.

For this study, the independent variables were the presence of a diagnosis of type 2 diabetes and Latino ethnicity. The dependent variable was glycemic control. The covariates included all of the demographic factors collected, including income, insurance status, family size, status in the family, language spoken, home address, sex, and age. Age was used as a proxy of time, so there was no need to control for time.

Setting and Sample

Population

The population involved in this study consisted of all of the patients at the local FQHC. The population is located in a small city of approximately 85,000 people. This city is one of the original "mill towns" from the industrial revolution and has a long history in manufacturing (History of Nashua, 2013; Nashua Historical Society, 2013). In more recent years, economic support has been found in high tech and defense contractors. Originally, the city was mostly white, non-Hispanic, English or French speaking (due to many immigrants from Montreal, Canada) and very homogeneous (History of Nashua, 2013; Nashua Historical Society, 2013). In recent years, the French population has aged and passed on for the most part and immigrants from other countries began to arrive (History of Nashua, 2013; Nashua Historical Society, 2013). At this time, the population is still largely white, but there are many Latino and African groups living in the city.

Another factor the city is known for is that it is a settlement area for refugees. This makes the population largely urban, and increasingly heterogeneous, multi-ethnic, and multi-cultural (DHHS, 2013).

Sampling Procedure

The sample was selected from the FQHC's population (patient list) at a single point in time, the morning of the first Monday of the month, with the following specifications:

- Must be age 18 or older
- Must have type 2 diabetes
- Must be Latino

Sample

All who met the above criteria were included in the study. The total sample for the study was expected to be between 200 and 300 based on the total population of the FQHC and the prevalence of diabetes among those who are patients. In addition, the total number of patients with diabetes is measured monthly when the reports are generated as described below. This has yielded a nonprobability sample which is appropriate for providing the largest sample possible from the available population.

Sample Size and Power Analysis

Power was determined using G*Power. An α of 0.05 was used. The α is used to represent the probability of making a type I error, or rejecting the null hypothesis, when in fact, it is true (Munroe, 2005; Taylor, 2014). An α of 0.05 is commonly used (Munro, 2005; Taylor, 2014); however, if a researcher were concerned with increasing the

significance level and decreasing the chance of a type I error, this could be decreased to 0.01, meaning that there is only one chance in 100 that a "significant" result could have occurred by chance; with 0.05 there is a five in 100 chance (Munroe, 2005). The most commonly used α's are 0.1, 0.05, and 0.01; the smaller the α, the less likely it is that the null hypothesis is incorrectly rejected (Taylor, 2014). In medicine and nursing sciences, it is considered more appropriate to have a false positive than a false negative. For example, if using an α of .1 to test for a disease, there may be some false positives. Further testing would need to occur to determine who truly has the disease and who the false positives were. Other than some anxiety, no harm is done. If an α of 0.01 were used, there would be fewer false positives, but also some true positives may be missed. In this case a person who has been tested for a disease has a false sense of security and does not receive treatment. The potential for harm, then, is hypothetically greater (Taylor, 2014).

Using a lower α is not necessarily the answer either, as the lower the α, the higher the risk of Type II error, or failure to reject the null hypothesis when it was false (Markman, 1999; Munro, 2005). Most of the studies examined used 0.05 because using the higher 0.01 decreases the power of the study and makes it difficult to arrive at a significant result due to type II error (Markman, 1999; Munroe, 2005). Type II error risk may be decreased by increasing the sample size or decreasing the significance level as mentioned earlier. For each study the researcher must balance the risk of Type I and Type II errors, but there is consensus that 0.05 is a good compromise between the two issues, and as such, has largely been adopted in scientific research (Markman, 1999: Munro, 2005; Taylor, 2014).

Effect size describes the strength of the relationship among the variables. In medical research, generally speaking, the variables are only moderately correlated (Polit & Hungler, 1995). In the absence of prior knowledge or reasons to expect a strong relationship, at least moderate effect sizes should be anticipated, and larger sample sizes are less risky. Polit and Hungler (1995) along with Ferguson (2009) advised that the researcher must estimate the effect size using the available evidence. In the absence of a pilot study, the researcher must rely on other published studies about the topic. Again, generally speaking, most nursing and medical studies use moderate effect sizes. Based on this information, a moderate effect size was chosen for this study.

Power is described as the ability of a research design to determine relationships that exist among or between variables (Polit & Hungler, 1995) and the likelihood of avoiding a type II error, or of rejecting the null hypothesis (Munro, 2005). An 80% power level was defined as "adequate" (Creswell, 2014; Munroe, 2005); however, most of the studies examined, from the literature, used 95% power. To be consistent with the findings from the literature a 95% power level was selected. Power analysis is the procedure used to estimate the likelihood of committing a Type II error; it is also used, as it is here, to determine needed sample size (Polit & Hungler, 1995). The same authors opined that not using power analysis has led to a problem with non-significant findings being reported in the nursing literature, and they suggested that researchers using small effect sizes in their studies are part of the cause. The results of the power analysis for this study, using a moderate effect size, an α of .05 and power of .95, indicates a sample size of 220 is needed. This sample was sufficient (G*Power, 2013).

χ² tests - Goodness-of-fit tests: Contingency tables

Analysis:	A priori: Compute required sample size		
Input:	Effect size w	=	0.3
	α err prob	=	0.05
	Power (1-β err prob)	=	0.95
	Df	=	5
Output:	Noncentrality parameter λ	=	19.800000
	Critical χ²	=	11.070498
	Total sample size	=	220
	Actual power	=	0.950216

Instrumentation and Materials

The data was a secondary data set obtained from the EHR of the FQHC. The name of the program is Centricity, an EHR owned by General Electric. Originally called Logician, this is a widely used EHR and management software system. The advantage to this is that both aspects of the system, EHR and practice management, share a single database. For the purposes of this study, this enabled cross referencing between the clinical information and the demographic information (HealthCo, 2013).

Certified by the Certification Commission of Healthcare Technology, Centricity is a popular choice among healthcare systems as they struggle to meet recent requirements for EHRs such as Meaningful Use as part of the Medical Home model (HealthCo, 2013). The widespread use of this system is an advantage to this study. For example, a provider may order lab work on an outpatient basis, the results of which would be populated to the flow sheet in the EHR. The clinician is then able to track, for example, the HgbA1c of a diabetic patient. But if a patient is admitted to the hospital and the HgbA1c is performed during that admission, because they use the same system, the results will still populate to the outpatient EHR. Otherwise, this would require manual examination of the internal

hospital record, locating the data, and manually entering it. This system is also compatible with ICD-9 and ICD-10 codes. This makes it easy to query the system (HealthCo, 2013).

Data Collection Process

A query was made for self-identified Latino patients with the code for type 2 diabetes along with the accompanying demographic and laboratory data which will yield a list of all Latino type 2 diabetics, their most recent A1c, and their demographic information. This study used data from a secondary data set that is available through the EHR at the clinic where this researcher works. Each month a similar report is generated for providers to see how they are doing as compared to national standards. For this study, the reports were combined, so the report will include the Latino diabetic patients of all providers at the health center. There is no IRB at the FQHC, but the study plans were presented to the Board of Directors who did not feel this report was out of the ordinary use of the EHR. They agreed to sign a Data Use Agreement as required by Walden University.

These reports are generated each month by the Diabetes Education Nurse and reviewed with each provider, of which this researcher is one. The Diabetes Education Nurse also ran the report for this study, making two changes. First, it included all Latino patients with ICD- 9 codes for type 2 diabetes, regardless of primary provider; second, it did not include any names or other identifying information. The collected data was organized on an Excel spreadsheet. The data was then entered into SPSS, version 21.

Variables

The independent variables were type 2 diabetes and Latino ethnicity. Everyone in the sample had type 2 diabetes and was self-identified as Latino. The dependent variable was the HgbA1c, a proxy for "control". The independent variables included location of the person's home, which was measured as an ordinal variable reflecting the distance of their home from the one supermarket in the city. In the same strip mall as the supermarket is the one workout place, Work Out World (WOW) so the distance from the supermarket and the gym were assumed to be the same. Age was also an ordinal variable. The other co-variables were categorical. The co-variable of insurance was measured as "Yes" or "No". Employment was also measured as "Yes" or "No". Sex was identified as "M" or "F". Language spoken was recorded as "English" or "No English". Number of household members was ordinal; and role in food preparation/purchasing was measured categorically, either 'primary' or 'secondary'.

Table 1

Summary of Study Variables

Variable Title	Description	Type of Variable	Measure
HgbA1c	Measurement of glycemic control	Categorical; dependent	1=<=7 2= >7
Distance from Home to Supermarket or Gym	Distance	Categorical	1=within ½ mile 2=> ½ mile to <1 mile 3=>1 mile to <3 miles 4= > 3 miles
Gender	Gender	Categorical	1= male 2= female
Insured	Having health insurance	Categorical	1=Yes 2=No
Employment	Currently working	Categorical	1=Yes 2=No
Language	Language concordance with provider	Categorical	1=Yes 2=No
Age	Age	Ordinal	1= 18-30 2=31-45 3=46-64 4=>64
Number in Household	Number in household	Ordinal	1=<4 2=4-7 3=>7
Role in Food Preparation	Main Shopper and food preparer	Categorical	1=Yes 2=No

Data Analysis Plan

Although there is only one overarching research question, there were a number of other questions that the research design was intended to examine. These were associated with the independent variables. The independent variables selected were the result of an exhaustive literature review and the life experiences on the part of the researcher. The research topic of interest was what the demographic factors are that differentiate Latino patients with well-controlled type 2 diabetes (defined as a hemoglobin A1c of less than 7) from Latino patients with type 2 diabetes that is not well controlled? The data was analyzed using SPSS, version 21.

It was hypothesized that there were demographic differences between the controlled and the uncontrolled groups. The null hypothesis was that there were no differences between the groups. In order to arrive at an answer to this research question, additional hypotheses were considered which yield information in support of the research questions.

The research questions are as follows:

Research Question 1: Is there a relationship between distance to nearest supermarket and glycemic control?

Variable: Distance to supermarket/gym

$H1_0$: There is no relationship between glycemic control and distance to the nearest supermarket.

$H1_A$: There is a relationship between glycemic control and distance to the nearest supermarket

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and independent variable "distance to supermarket", for an α of 0.05.

Research Question 2: Is there a relationship between gender and glycemic control?

Variable: Gender

$H2_0$: There is no relationship between gender and glycemic control.

$H2_A$: There is a relationship between gender and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "gender", for an α of 0.05.

Research Question 3: Is there a relationship between insurance status and glycemic control?

Variable: Insurance status

$H3_0$: There is no relationship between having health insurance and glycemic control.

$H3_A$: There is a relationship between having health insurance and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "Insurance status", for an α of 0.05.

Research Question 4: Is there a relationship between employment status and glycemic control?

Variable: Employment status

$H4_0$: There is no relationship between employment and glycemic control.

$H4_A$: There is a relationship between employment and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "employment", for an α of 0.05.

Research Question 5: Is there a relationship between language and glycemic control?

Variable: Language

$H5_0$: There is no relationship between language concordance with the provider and glycemic control.

$H5_A$: There is a relationship between language concordance with the provider and glycemic control.

Statistical Analysis: Chi-square analysis was performed on the dependent variable HgbA1c and the independent variable "language concordance", for an α of 0.05.

Research Question 6: Is there a relationship between age and glycemic control?

Variable: Age

$H6_0$: There is no relationship between age and glycemic control.

$H6_A$: There is a relationship between age and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "age", for an αof 0.05.

Research Question 7: Is there a relationship between number in household and glycemic control?

Variable: Number in household

$H7_0$: There is no relationship between household size and glycemic control.

$H7_A$: There is a relationship between the household size and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "number in household", for an α of 0.05.

Research Question 8: Is there a relationship between role in food preparation and glycemic control?

Variable: Role in food preparation

$H8_0$: There is no relationship between the role in food preparation and glycemic control.

$H8_A$: There is a relationship between the role in food preparation and glycemic control.

Statistical Analysis: Chi-Square analysis was performed on the dependent variable HgbA1c and the independent variable "age", for an α of 0.05. The results are presented in a table in chapter four.

Threats to Validity

There are potential internal threats to validity. For example, demographics do change. While each time a patient is seen at the clinic, their demographics are required to be reviewed, it is possible that this is not done occasionally. It is also possible that a patient may give false information (such as those who are undocumented immigrants). The main threats, then, are related to missing data, data that is not up-to-date, or false data. The researcher assumed the data are correct and truthful as there was little that could be done to address this threat. Regarding missing data, the researcher only included

individuals with complete data in the study. In chapter four, the researcher specifies how many patients could not be included due to incomplete data.

Ethical Considerations

This proposal was submitted to the Walden University Institutional Review Board prior to collection of the data. Access to data was using a secondary data set from the FQHC. A report, by provider, is run each month on all patients with diabetes. For this report, there was also a single list including the diabetic patients of all the providers. Since a secondary data set was used, there was no recruitment of subjects, nor any direct involvement with any person by the researcher. Further, no identifying data was included in the data set, except for address. Given the denseness of the population where the majority of the patients live, it would be exceedingly difficult to identify a patient by their address alone. The data was anonymized prior to running the report by deleting the columns for name and date of birth. The raw data will be kept by the researcher and shared only, as needed, with those involved with oversight of the study. The raw data has been kept locked in the researcher's file cabinet to which no one else has a key. It will be kept for a period of five years as required. The computer in which the data is stored is password protected and only used by the researcher.

The FQHC has no IRB. In order to receive "permission" to collect the data, the medical director at FQHC was contacted. The medical director presented the study proposal to the FQHC Board of Directors who felt this was *ordinary* use of the EHR and that no special permission was required. Per the requirements of Walden University, a Data Use Agreement was established between the FQHC and the researcher. In addition,

a letter of cooperation as a research partner was created between the FQHC and the researcher.

Summary

Using a well-recognized and certified EHR, a data set was obtained and the raw data entered into SPSS, version 21. A secondary data set was used, preventing any possible negative effects on individuals. Chi-Square analyses were applied to the independent variables. The data were interpreted in order to determine which demographic factors are significantly associated with poor glycemic control among Latinos with diabetes. The results are presented in chapter four.

Chapter 4: Results

Introduction

The purpose of this quantitative cross sectional study was to determine which, if any, demographic factors are associated with poor glycemic control among Latinos with diabetes. The research questions and their hypotheses were:

Research Question 1: Is there a relationship between distance to nearest supermarket and glycemic control?

$H1_0$: There is no relationship between glycemic control and distance to the nearest supermarket.

$H1_A$: There is a relationship between glycemic control and distance to the nearest supermarket

Research Question 2: Is there a relationship between gender and glycemic control?

$H2_0$: There is no relationship between gender and glycemic control.

$H2_A$: There is a relationship between gender and glycemic control.

Research Question 3: Is there a relationship between insurance status and glycemic control?

$H3_0$: There is no relationship between having health insurance and glycemic control.

$H3_A$: There is a relationship between having health insurance and glycemic control.

Research Question 4: Is there a relationship between employment status and glycemic control?

$H4_A$: There is no relationship between employment and glycemic control.

$H4_A$: There is a relationship between employment and glycemic control.

Research Question 5: Is there a relationship between language and glycemic control?

$H5_A$: There is no relationship between language concordance with the provider and glycemic control.

$H5_A$: There is a relationship between language concordance with the provider and glycemic control.

Research Question 6: Is there a relationship between age and glycemic control?

$H6_0$: There is no relationship between age and glycemic control.

$H6_A$: There is a relationship between age and glycemic control.

Research Question 7: Is there a relationship between number in household and glycemic control?

$H7_0$: There is no relationship between household size and glycemic control.

$H7_A$: There is a relationship between the household size and glycemic control.

Research Question 8: Is there a relationship between role in food preparation and glycemic control?

$H8_0$: There is no relationship between the role in food preparation and glycemic control.

$H8_A$: There is a relationship between the role in food preparation and glycemic control.

This chapter describes the data collection process and reports the descriptive characteristics of the sample. It also reports the results obtained, including the statistical findings. These include the exact statistics and probability values. In addition, a post hoc Bonferroni analysis of the results is provided as needed. Finally, the chapter is summarized and chapter 5 introduced.

Data Collection

The data used was a secondary dataset collected on March 9, 2015. The data set included all diabetics under the care by providers at a federally qualified health center and listed all diabetes care quality indicators. It included all diabetics, which numbered 1487 in total. Of those, the patients identified as "Latino" were selected for the study, as the inclusion criteria were (a) being diabetic, and (b) being Latino (self-identified). There were no discrepancies in the data collection from the plan put forth in Chapter 3.

Baseline Descriptive and Demographic Characteristics of the Sample

The sample was comprised of the Latino diabetics of a federally qualified health center. The center is located in an urban area with a population of about 85,000. The city has a large number of immigrants and refugees, with the largest group being Latino.

The sample included people who were insured, employed, and English speaking as well as those who are none of those as long as they were Latino. They came from large

and small families with households as small as one to multigenerational households of up to nine people. These individuals lived throughout the city that is served by a mass transit system in the form of city buses. They were of varying ages, although all were 18 or older, and there was a mixture of males and females in the sample.

Representativeness

The sample of Latino diabetics is the population of interest. The sample represents about 15% of the diabetics of the health center. Any conclusions from the study would not be generalizable to the entire population of diabetics nor would it be generalizable to the entire panel of patients (diabetic and not) of the health center, which includes children and obstetrical patients.

Results

Descriptive Statistics

Distance from supermarket and gym. The final analytical sample for this study was *N*=223. The variable distance from the supermarket was used to apply to both the supermarket and the gym for simplification, and was divided into four groups by how far from a supermarket study participants lived. Thirty (*n*=30) individuals lived less than a half a mile away; ninety-one (*n*=91) individuals lived between ½ mile and less than a mile. The third group consisted of 85 (*n*=85) individuals who lived between a mile and three miles away; the final group lived more than three miles away and included seventeen (*n*=17) individuals.

Gender. The sample consisted of 98 (*n*=98) men and 125 (*n*=125) women, of whom 127 (*n*=127) were insured and 96 (*n*=96) were not.

Employment. The variable "employed" was nearly evenly divided with 111 ((*n*=111) employed and 112 (*n*=112) not employed.

Language. The sample consisted of 90 (*n*=90) individuals who spoke the same language as their primary care provider; 133 (n=133) did not.

Age. Age was also divided into four groups. Eleven 11 *(n*=11) individuals were between 18 and 30; 43 (*n*=43) were between 31 and 45. Group three consisted of 127 (*n*=127) individuals between 46 and 64, and 42 (*n*=42) were age 65 or older.

Number in household. The variable "number in household" was divided into three groups. There were 55 (*n*=55) individuals who lived in households of one to three; there were 131 (*n*=131) who lived in households of four to six; and 37 (*n*=37)lived in households of seven or more.

Role in managing food. The "role in managing food" variable showed that 94 (*n*=94) individuals from the sample did have control in managing food and 129 (*n*=129) did not.

Glycemic control. Finally, for the variable "control" 118 (*n*=118) of the sample were considered to be in good control of their diabetes and 105 (*n*=105) were not.

Chi-Square analysis was conducted comparing the "Control" variable which referred to diabetic control as measured by the HgbA1c, cross tabulated by the variables of distance from a supermarket, gender, insurance status, employment status, language congruency with provider, age, number in household, and role in food preparation. An α value of $<.05$ was used to indicate statistical significance between variables.

Statistical Assumptions

Chi-Square analysis has four assumptions. The first is that the data must be frequency data, meaning that it is a count of the actual number of those in the sample that are in the condition being analyzed, such as "insured" or "male". This criterion was met. The second assumption is that there must be an adequate sample size. The power analysis revealed that a sample of 220 was needed. This study has a sample size of 223, meeting the criteria. The third assumption is that all measures are independent of each other, meaning that the categories are mutually exclusive. For example, a subject cannot be both insured and uninsured. And the fourth assumption is that the categories are logically derived to ensure that the analysis is meaningful (Munro, 2005).

Statistical Analysis and Findings

Research question number 1: Is there a relationship between distance to nearest supermarket and glycemic control?

> This analysis examined the distance from individuals' homes to the nearest supermarket. It was divided into four categories: (a) one-half mile or less away; (b) one-half to one mile away; (c) greater than 1 mile but less than three miles; and (d) greater than three miles. Of the $N = 223$ patients in the sample, the majority fell into categories two or three, 91 (41%) and 85 (38%) respectively. Thirty (13%) people lived one-half mile or less away and 17 (8%) lived greater than three miles away. Results for the analysis are presented in Table 2.

Table 2

Cross-tabulation: Control by Distance

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.777[a]	3	.032
Likelihood Ratio	8.887	3	.031
Linear-by-Linear Association	7.018	1	.008
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.00.

The probability value was .032, which is greater than .01, but less than .05, indicating it falls within the "significant" range. However, because this study is making a number of paired comparisons, in order to prevent a type 1 error, a Bonferroni correction was undertaken. The significance level chosen for the Chi-squares was .05. Multiplying this by the number of variables (8) gives us the significance level for the Bonferroni correction (.00625). The results of the Bonferroni analysis are presented in Table 3.

Table 3
Bonferroni Correction: Control by Distance

(I) Distance	(J) Distance	Mean Difference (I-J)	Std. Error	Sig.	99.375% Confidence Interval	
					Lower Bound	Upper Bound
	2.00	.01538	.10393	1.000	-.3300	.3608
1.00	3.00	-.14118	.10484	1.000	-.4896	.2073
	4.00	-.30588	.14987	.255	-.8040	.1922
	1.00	-.01538	.10393	1.000	-.3608	.3300
2.00	3.00	-.15656	.07447	.220	-.4041	.0909
	4.00	-.32127	.13044	.087	-.7548	.1123
	1.00	.14118	.10484	1.000	-.2073	.4896
3.00	2.00	.15656	.07447	.220	-.0909	.4041
	4.00	-.16471	.13116	1.000	-.6006	.2712
	1.00	.30588	.14987	.255	-.1922	.8040
4.00	2.00	.32127	.13044	.087	-.1123	.7548
	3.00	.16471	.13116	1.000	-.2712	.6006

$H1_0$: There is no relationship between glycemic control and distance to the nearest supermarket.

$H1_A$: There is a relationship between glycemic control and distance to the nearest supermarket

Despite the rejection of the null hypothesis supported by the Chi-square, the Bonferroni correction indicates that a type 1 error was made and that, in fact, the null hypothesis could not be rejected.

Research question number 2: Is there a relationship between gender and glycemic control?

This Chi-Square analysis compared men (98 or 44%) to women (125 or 56%) and their level of control. Of the total sample, 53% were well controlled; 47% were not well controlled. Separated by gender, the men were 54% well controlled and 46 % poorly controlled. For the women, 52% were well controlled and 48% poorly controlled. Results are presented in Table 4.

Table 4

Cross-tabulation: Control by Gender

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.096[a]	1	.757		
Continuity Correction[b]	.030	1	.862		
Likelihood Ratio	.096	1	.757		
Fisher's Exact Test				.788	.431
Linear-by-Linear Association	.095	1	.758		
N of Valid Cases	223				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 46.14.

b. Computed only for a 2x2 table

$H2_0$: There is no relationship between gender and glycemic control.

$H2_A$: There is a relationship between gender and glycemic control.

In reviewing the results of the Chi-Square analysis, the relationship between gender and glycemic control is not statistically significant. The probability was .757, which is greater than .05. The null hypothesis cannot be rejected making the results statistically insignificant.

Research question number 3: Is there a relationship between having health insurance and glycemic control?

This analysis examined the relationship, if any, between having well controlled diabetes and having health insurance. The majority of the sample (127 or 57%) did not have insurance. Of those with insurance, 46% were controlled and 54% were not. For those without insurance, 40% were controlled and 60% were not. Results are presented in Table 5.

Table 5

Cross-tabulation: Control by Insurance Status

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.753[a]	1	.386		
Continuity Correction[b]	.536	1	.464		
Likelihood Ratio	.754	1	.385		
Fisher's Exact Test				.418	.232
Linear-by-Linear Association	.749	1	.387		
N of Valid Cases	223				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 45.20.

b. Computed only for a 2x2 table

$H3_0$: There is no relationship between having health insurance and glycemic control.

$H3_A$: There is a relationship between having health insurance and glycemic control.

The results of this Chi-Square analysis were not statistically significant. The probability value was .386, which is greater than .05, indicating that the null hypothesis cannot be rejected.

Research question number 4: Is there a relationship between employment status and glycemic control?

This analysis compared employed and unemployed patients and their levels of control. Nearly one-half the sample was employed (111 versus 112). For those employed, 52% were well controlled and 48% were not. Of those not employed the results were 53% versus 47%. Results are presented in Table 6.

Table 6

Cross-tabulation: Control by Employed

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.039[a]	1	.844		
Continuity Correction[b]	.004	1	.950		
Likelihood Ratio	.039	1	.844		
Fisher's Exact Test				.894	.475
Linear-by-Linear Association	.039	1	.844		
N of Valid Cases	223				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 52.26.

b. Computed only for a 2x2 table

$H4_0$: There is no relationship between employment and glycemic control.

$H4_A$: There is a relationship between employment and glycemic control.

The Chi-square analysis showed a probability value for this analysis as .844, again greater than .05. The results are statistically insignificant. The null hypothesis cannot be rejected.

Research question number 5: Is there a relationship between language and glycemic control?

This analysis looked at whether or not control was affected by concordance of language spoken between the patient and the provider. One of the providers is multi-lingual, so despite the sample being entirely Latino, 40% spoke the same language as their provider. Of those who were well-controlled, 59% spoke the same language as the provider, and 41% did not. Of those who did not speak the same language as their provider, 49% were controlled, and 51% were not. Results are presented in Table 7.

Table 7

Cross-tabulation: Control by Language

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.162[a]	1	.141		
Continuity Correction[b]	1.778	1	.182		
Likelihood Ratio	2.169	1	.141		
Fisher's Exact Test				.172	.091
Linear-by-Linear Association	2.152	1	.142		
N of Valid Cases	223				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 42.38.

b. Computed only for a 2x2 table

$H5_0$: There is no relationship between language concordance with the provider and glycemic control.

$H5_A$: There is a relationship between language concordance with the provider and glycemic control.

The Chi-square analysis yielded a probability of .141, greater, than .05. This did not allow for rejection of the null hypothesis.

Research question number 6: Is there a relationship between age and glycemic control?

This analysis compared the ages of those who are well controlled and not well controlled. The age groups were divided into four categories: (a) age 18-30, (b) age 31-45 (c) age 46-64, and (d) age 65 and older. The youngest group was 27% controlled versus 73% uncontrolled, which was the biggest difference among the groups. It was also the smallest group (11 or 5%). The second group had a size of 43 (19%) of which 51% were controlled and 49% were not. There were 127 (57%) in the third group and 54% were controlled, with 46% not well controlled. The final group had 42 (19%) members and 60% were well controlled, leaving 40% not well controlled. Results are presented in Table 8.

Table 8

Cross-tabulation: Control by Age

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.712[a]	3	.294
Likelihood Ratio	3.795	3	.284
Linear-by-Linear Association	2.654	1	.103
N of Valid Cases	223		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.18.

$H6_0$: There is no relationship between age and glycemic control.

$H6_A$: There is a relationship between age and glycemic control.

The result of the Chi-Square analysis showed a probability of .294. The null hypothesis could not be rejected and the results were deemed statistically insignificant.

Research question number 7: Is there a relationship between number in household and glycemic control?

This analysis was designed to determine if there was any connection between a diabetic's glycemic control and the number of people in their household. This variable was divided into categories with (a) having fewer than four in the home, (b) having four to six members of the household, and (c) having seven or more in the home. The smallest households included a number of single people who lived alone, although most were small families such as a mother with one or two children or a couple with one child. Those in this group were controlled (45%) or uncontrolled (55%). The second group was the largest group with a total of 132 members. The controlled patients represented 55% of the group and the uncontrolled, 45%. The final group was the smallest and consisted of large families, multi-generational families, or large groups of friends sharing expenses. This group also had 55% controlled and 45% uncontrolled. Results are presented in Table 9.

Table 9

Cross-tabulation: Control by Number in Household

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.632[a]	2	.442
Likelihood Ratio	1.630	2	.443
Linear-by-Linear Association	1.142	1	.285
N of Valid Cases	223		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.95.

$H7_0$: There is no relationship between household size and glycemic control.

$H7_A$: There is a relationship between the household size and glycemic control The Chi-Square analysis yielded a result of .442 for the probability. The null hypothesis cannot be rejected and the results are considered to be statistically insignificant.

Research question number 8: Is there a relationship between role in food preparation and glycemic control?

This analysis addressed the issue of control over food choices. The question asked whether the patient was the one in the home who was responsible for purchasing and cooking the food. It was presumed that the person in that role would have more control over his or her own diet then a person in a more subordinate role in the home. Of those who were "in control", 52% were well controlled and 48% were not. Of those who were not "in control", 53% were well controlled and 47% were not. Results are presented in Table 10.

Table 10

Cross-tabulation: Control by Role

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.040[a]	1	.841		
Continuity Correction[b]	.004	1	.948		
Likelihood Ratio	.040	1	.841		
Fisher's Exact Test				.892	.474
Linear-by-Linear Association	.040	1	.841		
N of Valid Cases	223				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 44.26.

b. Computed only for a 2x2 table

$H8_0$: There is no relationship between the role in food preparation and glycemic control.

$H8_A$: There is a relationship between the role in food preparation and glycemic control.

Chi-square analysis showed a probability of .474. The null hypothesis could not be rejected. The probability value for this analysis was .841. Greater than .05, it was also statistically insignificant.

Summary

The purpose of this quantitative cross sectional study was to determine which, if any, demographic factors are associated with poor glycemic control among Latinos with diabetes. After conducting numerous Chi-Square analyses, none of the variables yielded results that could reject the null hypothesis. Chapter 5 will provide further interpretation of the findings and address the limitations of the study. Recommendations for how the study could be improved will be discussed along with the implications for social change.

Chapter 5: Discussion

Introduction

This quantitative cross sectional study was conducted in an effort to fill a gap in the literature about Latinos with diabetes specific to the relationship between diabetic control and demographic factors of individuals. It has been established that Latinos suffer a greater burden of disease with a higher incidence of disease as well as more serious complications. This study collected data related to the demographics to determine if any correlation between glycemic control and demographic factors existed. The demographic factors examined were distance from home to supermarket or gym, gender, insurance status, employment status, language concordance with provider, age, household size, and role in the family related to food. The results of comparing eight different demographic factors against glycemic control indicated that these factors were not associated with control or lack of control. The null hypothesis could not be rejected when comparing any of the variables with glycemic control.

Interpretation of the Findings

A review of the literature indicated that little research had been done examining the impact of specific demographic factors on individuals with diabetes. No information was found that examined the specific demographic factors that the current study used. In that respect, the current study has contributed to addressing the identified gap in the literature and extending knowledge related to diabetes in the Latino population. Initially one study variable, distance to supermarket, was thought to be significant in relationship to glycemic control because the Chi-square analysis indicated a probability less than 0.05.

However, after further statistical analysis to correct for numerous paired comparisons was conducted, the result was deemed statistically insignificant.

Study findings related to Review of the Literature.

The results of this study can neither support nor refute the previous literature because of a lack of statistical significance in the findings. There were no similar studies to compare the findings to either. However, consideration of the variables in this study is still important. Hatcher and Whittemore (2007) as well as Kemp and Rasbridge (2004) felt that consideration of individual social domains was of great importance. They were particularly concerned about the role in the family, a lack of traditional food choices, and the sense that Latino diabetics do not feel "normal". Nam et al. (2011) stated that family wants and desires are of paramount importance as did Haas et al (2013). Rygg et al. (2010) addressed the issue of self-management being related to a good understanding of diabetes. Carlson et al. (2006) also found that lack of information led to a lack of security in self-care. Haas et al. stated that teaching needed to address diet, medications, and social settings while discussing life style changes. Roles in the family were also found to be important; men who did not live alone were fed by their spouses and were dependent on their knowledge of a diabetic diet, rather than their own. On the other hand with the man perceived as the head of the home, they needed to be allowed to control their own diets. All of these ideas were presented as items that should be discussed in groups. Latinos are a very social population and several of the studies support group discussion and education as a way to address diet, and lifestyle changes (Gallant et al., 2010; Haas et al., 2013; Rygg et al., 2010). Chen, Youdelman, and Brooks (2007), Nam et al. (2011),

and Cusi and Ocampo (2011) all addressed the issue of language congruence with their provider as a potential barrier to self-care. The need to "please" the provider was suggested by Sullivan et al. (2010) as another potential barrier involving the provider. Patients will sometimes give the answers they expect the provider is looking for rather than the truth, leaving the provider unable to determine why the patient is not at the target HgbA1c. This study included variables that addressed many of these topics.

In spite of the fact that none of the analyses related to demographic factors and glycemic control were found to be statistically significant, the results of the study are still important. By addressing some of the same issues as previous works, more information has been gleaned. Shiroma and Lee (2010), Lopez-Class and Jurkowski (2010) and Frank et al.(2009) all noted that a dearth of research involving minorities is a problem. They also stated that research around social and demographic factors was particularly lacking. As such, this study has added to the existing knowledge.

The results can still be used to support changes at the individual level, the interpersonal level, the organizational level, and the community level, all levels of the Social Ecological Model upon which this study was based. Suggestions as to how these could be implemented will be discussed below under "Implications".

Limitations of the Study

There were several limitations to this study. To begin, the study variables were limited to those that could be queried through the EHR of the health center. It is possible that there are other demographic factors that were not addressed. In addition, the demographic factors selected were the result of personal experience and consideration by

the researcher. In providing care for these Latino diabetics, the researcher considered ways to explain why certain diabetics were not well controlled. This led to the selection of some of the demographic factors, which were based on largely anecdotal information. For example, "age" or "gender" would certainly be considered in any examination of demographics. But the role of a Latino diabetic in purchasing and preparing food came solely from the researcher's work with Latino diabetics. This is not a variable that would commonly be used in examining demographics. This may be either a strength or a weakness, depending on one's viewpoint, but this researcher believed it deserved mention.

Another limitation of the study was the statistic chosen. While certainly appropriate for comparison of two categorical factors, the Chi-square statistic does not consider *how* things differ. For example, the outcome variable was diabetes control, as measured by the HgbA1c. If seven or under, the diabetic control is good. If greater than seven, it is not. Although this is true, this does not consider how out of control a diabetic may be. A HgbA1c of 7.2 is certainly not as bad as a HgbA1c of 14, yet they were considered the same for this study. The study would have been stronger if a regression statistic had been applied after the Chi-square analyses, or if the HgbA1c had been broken into groups such as the age variable was.

A great amount of thought went into how to divide the categories of distance to supermarket, age groups, and number in the household. In the category of "number in household", there are far more in the second group (4-6) than in the less than four group or the seven or more group. These categories would have been better divided by (a) one

to two members, (b) three to five members (c) six to seven members, and (d) over seven members. In the first group would be single member homes as well as couples without children or whose children are grown. The second and third groups could be single or two parent families with multiple children while the fourth group would most likely be multigenerational families. It was this fourth group the researcher anticipated being significant, however, the way the category was divided did not really access the intended data, leaving the question unanswered. The size of the second group led the researcher to believe that the intergroup differences may be significant but they were not.

Another demographic category that may not have given the data desired was the "role in food". In this category, the researcher anticipated that not being in charge of food purchasing and preparation would increase the risk of poor control. However, this category would have been better if only females had been included. There were a number of men who lived alone and so were in charge of their food. This may have produced misleading data.

The "age group" category may also have had a weakness. The first group in this category was "age 18-30". This was a very small group, which was expected. The potential problem with this group is that because of the ages, the members may have been pregnant and/or been type 1 diabetics. This study was to examine type 2 diabetics, not type 1 or gestational diabetics. Without losing confidentiality, it is not possible to determine how many, if any of this group this applied to.

Finally, the sample size was smaller than anticipated. The power analysis indicated that a sample of 220 was required for this study. The actual sample was 223,

just over the number required. Although it met the needed number, a larger sample would have been preferred. As stated by both Polit and Hungler, (1995) and Munro (2005) it is generally best to have the largest sample possible. When considering why the discrepancy between the actual number and the expected number, another potential weakness came to the forefront. The query to the EHR was made using ICD-9 diagnosis codes. There was only one queried for type 2 diabetes which was 250.00. However, 250.00 is not the only code used for the diagnosis of diabetes. There are other variations of this code depending on whether the patient had complications. Under the circumstances someone with a diagnosis code of 250.02 (diabetes with eye complication), would have been missed and not captured by the query. Also, not all providers are as careful in updating patient problem lists as they should be. There may be diabetics who do not have diabetes on their problem list. They would also be missed, thus not included in the study. Again, without loss of confidentiality, this could not be determined.

Recommendations

This study should be replicated on a larger scale. Obtaining a large sample of Latino diabetics from all the primary care providers in the city would provide a much larger sample. It would also avoid any possible contamination from the milieu of the FQHC. It would also be more likely to include Latinos from more places, as the FQHC, as previously mentioned has mostly Latinos from Mexico, Puerto Rico and the Caribbean Islands. As stated, some of variable groupings should be reevaluated and a regression statistic for at least some of the variables would have been helpful. Finally, including all

underserved populations in the sample would improve generalizability. It is known that many ethnic minorities have a greater burden of disease than white Americans. A study choosing variables that are applicable across all ethnic minorities (such as insurance status, employment status, and language concordance) would make it more generalizable. Positive results would also be of stronger value when being put forth as supporting policy change.

Implications

It is clearly established in the literature that Latinos suffer from the consequences of poor diabetic control more than non-Latinos; the unanswered question is *why.* Simply considering demographic factors in delivering care will improve communication between the patient and the provider; this could lead to enhanced quality and satisfaction and is in keeping with the Healthy People 2020 goals. Further, even without specific positive results, incorporating ways to address and discuss factors such as role in food preparation or number in household would improve the cultural strength of diabetic education programs as they give a better picture of who the patient is. For providers, the practice implications include gathering as much information about the patient and their family as possible. They should then utilize this information with ancillary professionals such as the dietitian, the embedded nurse for diabetes, and the diabetic nurse educator. Another option would be to develop a case management system for diabetes including case reviews with other providers to maximize services. At a family level, changes could include inviting a close friend or family member to attend diabetic education, providing support within the family unit for engaging in self-care activities. The organization can

support social change by examining ways to reduce health disparities and considering the role of the family unit and lifestyle factors as potential barriers to health care. As a society, the city needs to take a role in reducing health disparities by increasing the safety of lower income neighborhoods and encouraging farmer's markets within walking distance of these neighborhoods.

Conclusion

The fact that Latinos are more likely to suffer the consequences of poorly controlled diabetes, such as blindness, kidney disease, and limb amputation, indicates that Latinos do not control their diabetes as well as other ethnic groups. This study tested how certain demographic variables of Latino diabetics are related to glycemic control as measured by the HgbA1c. The results of this study did not identify a specific demographic factor that is associated with poor glycemic control, at least among the variables examined. However, this does not mean that there is no demographic variable that could be associated with poor control. The results of this study are useful in that demographic factors that do not appear to affect control have been identified, adding to the body of knowledge regarding this issue. This study builds on a foundation for exploring factors associated with poor glycemic control in Latinos but further study of other potential factors affecting glycemic control in Latinos is still needed.

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