Spring 5-2019

EVALUATING RELIGIOSITY ACROSS THE LIFESPAN AND FATALISTIC BELIEFS AMONG PATIENTS OF A CHRONIC CARE MANAGEMENT INTERVENTION PROGRAM WITH TYPE 2 DIABETES

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PROGRAM WITH TYPE 2 DIABETES

by

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DEDICATION

To my parents and husband

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MPH, Baylor University, 2013
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Presented to the Faculty of The University of Texas

School of Public Health

in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS
SCHOOL OF PUBLIC HEALTH
Houston, Texas
May, 2019

Acknowledgements

I would like to thank the *Salud y Vida* program team for making data collection for this dissertation possible. A big thanks to Belinda Garza, Rachel Avila, Carolina Alejandro-Ruiz, Elvia Garcia, and Yolanda Gonzalez for implementing the survey instrument for the present study in to their workday while enrolling participants in the *Salud y Vida* program. I especially want to thank Pablo Sanchez, Maria Zolezzi, and Julie Gomez for their incredible support in facilitating the data cleaning process. Lastly, I would like to thank my dissertation committee for their invaluable guidance and mentorship.

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The overall goal of the present study was to assess the effect of fatalistic beliefs and lifetime religiosity on glycemic control and blood sugar monitoring behavior among Mexican-American participants of a chronic care management intervention program of the Rio Grande Valley. In order to achieve these aims, a mixed methods prospective longitudinal study design was utilized among approximately 500 participants of the *Salud y Vida* program. Qualitatively, a phenomenological approach was used to analyze semi-structured interview data assessing fatalism and religiosity and type 2 diabetes management among 15 participants stratified by engagement in the *Salud y Vida* program. Fatalistic beliefs and religiosity were assessed quantitatively using the Diabetes Fatalism Scale and a subscale of the National Comorbidity Study-Replication.

When assessing these belief systems in relation to Type 2 Diabetes management qualitatively, fatalism and religiosity appeared to play a complex role with long-term participants seeing a connection between both fatalism and religiosity and diabetes management and these participants feeling discussions of these beliefs with a medical professional would be beneficial.

The association between fatalistic beliefs and lifetime religiosity with HbA1c and blood glucose monitoring behavior was assessed at baseline. This association was explored utilizing linear and logistic multi-regression methods. Linear regressions models revealed that higher levels of diabetes fatalism and emotional distress related to diabetes management were associated with higher HbA1c values. However, logistic regression models did not show diabetes fatalism and religiosity to be significantly associated with blood glucose monitoring behaviors.

The mediation of fatalism and lifetime religiosity on the effect of the *Salud y Vida* program was measured via change in HbA1c after three-month follow-up; however, none of the factors assessing fatalism or religiosity met the requirements of a mediating variable. Nonetheless, logistic regression models were utilized to assess the effect of the *Salud y Vida* program on HbA1c at three-month follow-up while controlling for fatalistic beliefs and lifetime religiosity. Frequency of *Salud y Vida* engagement significantly increased the odds of a participant decreasing their HbA1c at three-month follow-up. Fatalistic beliefs and lifetime religiosity did not have a statistically significant association with change in HbA1c at follow-up.

Table of Contents

List of Tables

List of Figures

List of Appendices

Literature Review

United States Hispanic Population

The Office of Management and Budget defines a Hispanic/Latino individual as "a person of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish culture or origin, regardless of race" (Registrar, 1997). Latino/a is a broader term referring to individuals with Latin American origin or ancestry who do not speak Spanish, such as individuals from Brazil (Passel & Taylor, 2009). Thus, Mexican-Americans are a sub-population of both Hispanics and Latinos. Nevertheless, although there is great diversity among these cultures there are also many similarities among Hispanic and Latino cultures such as religious beliefs, family values, cultural celebrations, and food (Center, P.H., 2007; Smith, 2000; Winchester, 2000; Sanjur, 1994). The present literature review includes studies and reviews conducted among various Hispanic subgroups with a focus on studies incorporating an entirely or predominantly Mexican-American population. As of July, 2013 the United States Hispanic population has been estimated at 54 million, which comprises approximately 17% of the total U.S. population making the Hispanic population the nation's largest ethnic/racial minority. The Hispanic population is expected to grow to an estimated 128.8 million by 2060, which would comprise 31% of our nation's projected population. Mexicans (64%) are the largest Hispanic subgroup with Puerto Ricans (9.4%) being the second largest (CDC, 2015). As of 2010 the U.S. Hispanic population is the largest Hispanic population in the world coming second only to Mexico who has an estimated Hispanic population of 120 million. The largest U.S. Hispanic populations are found in California, Florida, and Texas who house 55% of the total U.S. Hispanic population (U.S. Census Bureau, 2014). U.S. Census Bureau estimates of 2010 found that Hispanics made up

38.6% of the 26 million individuals living in Texas (U.S. Census Bureau, 2015).   Texas population projections for 2020 show that the Hispanic population is projected to rise to nearly 13 million and comprise 42.5% of the total Texas population (Texas Department of State Health Services, 2014). .

Hispanic Health Disparity

Despite its immense size the U.S. Hispanic population is laden with health disparities due in a large part to the many economical, educational, and lingual disadvantages this population faces. U.S. Census Data of 2012 showed that the average Hispanic/Latino household income was $40,417 while the average household income of non-Hispanic whites was $56,565. Poverty levels were also higher among Hispanics when compared to non-Hispanic whites (25.4% vs. 11%, respectively). Moreover, a lower proportion of Hispanics had obtained a high school diploma when compared to non-Hispanic whites (64% vs. 92%, respectively). Similarly, only 13.8% of Hispanics had obtained a bachelor's degree or higher in comparison to 32.5% of non-Hispanic whites. Data further revealed that 4. (Office of Minority Health, 2015). Being recruited by the U.S. for agricultural and menial labor within the 20th century, the Hispanic population has grown vastly in size and has acculturated into American culture. However, during this time this ethnic group, like many other racial/ethnic groups in the U.S., struggled against social barriers, such as racism, prejudice, and stereotypes. Their health landscape from that time to now is a reflection of these economic and political difficulties (Byrd & Clayton, 2003).

Hispanics have the highest rates of uninsured individuals with nearly a third lacking health insurance (Kaiser Family Foundation, 2013). Affordable Care Act expansions have made strides in reducing the proportion of uninsured Hispanic Americans, but have not remediated the problem. In 2011, 15.5 million nonelderly Hispanic Americans were uninsured including 12.5

million adults and 3 million children. Approximately 40% of uninsured Hispanics had a household income below poverty level and 23% had an income below half of the federal poverty levels. Although Medicaid helps fill gaps in insurance coverage among this population, Hispanics are still more than twice as likely as non-Hispanic whites to be uninsured (32% vs. 13%, respectively; Kaiser Family Foundation, 2013).

Since the implementation of the Affordable Care Act 2.6 million Hispanic/Latino individuals (aged between 18 and 64 years old) have gained health insurance coverage. Since October, 2013 there has been a 7.7% drop in the Hispanic uninsured rate. However, that still leaves nearly a fourth of the U.S. Hispanic population without health insurance (United States Department of Health and Human Services, 2014). Data from the 2012-2014 National Health Interview Survey (NHIS) was used to look at absolute disparity in insurance coverage, defined as the gap in percent uninsured between non-Hispanic whites and Hispanics, and the relative disparity, defined as the ratio of the percent uninsured for Hispanics to that of non-Hispanic whites (McMorrow, Lorg, Kenney & Anderson, 2015). Between 2013 and 2014 the absolute disparity in insurance coverage narrowed by 4.2%, but the relative disparity increased. When looking at differences among states implementing Medicaid expansion the absolute disparity declined in both expansion and non-expansion states; however, again relative disparities increased for Hispanics in expansion states. Within expansion states in 2014 Hispanics were still 3.2 times more likely to be uninsured compared to non-Hispanic whites whereas they were only 2.7 time more likely in 2013 (McMorrow et al., 2015).

Type 2 Diabetes among Hispanic Population

In conjunction with high rates of uninsured individuals Hispanics have higher rates of certain diseases and illnesses (Centers for Disease Control, 2015). One such disease is type 2

diabetes with the rate among Hispanics (11.8%) coming second only to that of African-Americans (12.6%). Among Hispanic subgroups 7.6% of Cubans, 7.6% of Central and South Americans, 13.3% of Mexican-Americans, and 13.8% of Puerto Ricans have diagnosed diabetes. When comparing rates of diagnosed diabetes among this population against the rates of non-Hispanic white adults, rates are 66% higher among Hispanics. Among Hispanic subgroups the rates of type 2 diabetes are 87% higher among Mexican-Americans and 94% higher for Puerto Ricans when compared to non-Hispanic whites (Centers for Disease Control, 2011).

Despite the high prevalence of type 2 diabetes, there are many unmet needs in the treatment and control of the disease among this population. Although racial/ethnic differences in the prevalence of type 2 diabetes have a genetic basis this does not fully explain the disparate rates of type 2 diabetes among this population and, socioeconomic and cultural factors play a large role in the management of the disease (Cusi & Ocampo, 2011). Rates of diabetes-related complications and unmet care in regards to diabetes management are higher among Hispanics. For example, the rate of hospital admissions for lower extremity amputations were two times higher among Hispanics when compared to non-Hispanic whites. Only 59.7% of Hispanics with type 2 diabetes reported a retinal eye examination compared to 65.5% of non-Hispanic whites. Moreover, 69.4% of non-Hispanic whites with type 2 diabetes received a foot examination compared to 65.3% of Hispanics with type 2 diabetes (Office of Minority Health, 2015).

Survey data from the Third National Health and Nutrition and Examination Survey (1988-1994) showed that lack of blood glucose self-monitoring was more common among Mexican-American men and women (67.8% and 62.9%, respectively) compared to non-Hispanic white men and women (53.1% and 56.9%, respectively). Similarly, poor glycemic control, defined as a HbA1c above 8%, was more common among Mexican-American men (45%) when

7

compared to other racial/ethnic gender groups (35-38%; Harris et al., 1999). Results of the National Health and Nutrition Examination Survey from 2007-2010 showed similar trends. The age and sex standardized proportion of non-Hispanic whites with type 2 diabetes and HbA1c values below 7.0% was 52.9% compared with only 47.3% of Hispanics. Rates were even lower among Mexican-Americans (43.5%). When looking at blood pressure control among this population 53.2% of non-Hispanic whites had a blood pressure reading below 130/80 compared to only 47.2% of Hispanics; however, rates were slightly higher among Mexican-Americans (48.7%; Casagrande, Fradkin, Saydah, Rust, & Cowie, 2013). Similarly a retrospective analysis of the 2012 U.S. National Health and Wellness Survey showed that Hispanics (24.4%) had the lowest prevalence of controlled HbA1c ($<7.0\%$) compared to non-Hispanic whites (38.0%) and other racial/ethnic groups (26.1%-43.0%); however, Hispanics were more likely to have no diabetes related complications compared to non-Hispanic whites (77.4% vs. 72.9%; Lopez, Bailey, Rupnow, & Annunziata, 2014).

A review of records from 2008-2010 of an outpatient health care organization serving approximately 800,000 active patients in northern California showed that proteinuric diabetes kidney disease (DKD) was more common among Hispanics (32.5%) than among non-Hispanic whites (24.8%; Bhalla et al., 2013). Similar results were found in vision complications using the National Health and Nutrition Examination Survey data (2005-2008) that showed a slight difference in diabetic retinopathy compared to rates among Mexican-Americans (31.7%) aged 40 years and older with type 2 diabetes and rates among non-Hispanic whites (31.2%). Moreover, Mexican-Americans were 3.63 more likely to have vision-threatening diabetic retinopathy than non-Hispanic whites (Zhang et al., 2010).

Factors Inhibiting Proper Glycemic Control among Hispanics with type 2 Diabetes

A systematic review of studies examining factors inhibiting diabetes management from both the patient and physician perspectives found that factors playing a role for patients included 1) difficulty adhering to a medication regimen, 2) negative attitudes and beliefs towards type 2 diabetes or its treatment, 3) incorrect or insufficient knowledge of type 2 diabetes, 4) cultural beliefs, 5) language barriers, 6) financial resources, 7) presence of co-morbidities, and 8) lack of social support (Nam, Chesla, Stotts, Kroon & Janson, 2011). More specifically, adherence to type 2 diabetes self-management regimens was found to be strongly influenced by financial resources, and beliefs and attitudes. While knowledge was seen to be a contributing factor, improving knowledge alone was not linked to better health outcomes if other barriers were present. Health care provider factors included their own attitudes and beliefs towards type 2 diabetes and its treatment, patient-provider interaction, and flaws in the health care system preventing physicians from spending an extensive amount of time with each patient (Nam et al., 2011).

A cross-sectional study of patients with type 2 diabetes found similar results in that a lack of adherence to type 2 diabetes management regimens increased the odds of poor glycemic control by 2.98. The study as well found that a longer duration with type 2 diabetes increased odds by 1.99 (Khattab, Khader, Al-Khawaldeh & Ajlouni, 2010). Other additional patient-level factors included barriers to effective insulin treatment such as fear of hypoglycemia, fear of weight gain as a result of transitioning to insulin treatment, and unwillingness to accommodate an inflexible insulin injection schedule (Ross, Tildesley & Ashkenas, 2011).

Differences across varying racial/ethnic groups exist regarding barriers to type 2 diabetes management as well (Cusi & Ocampo, 2011; Chlebowy, Hood & LaJoie, 2010; Sarkar et al.,

2010). Among Hispanics specifically, some of the largest barriers include language, cost of medications, and access to health care or other goods and services to help improve glycemic control (Cusi & Ocampo, 2011). Latinos with limited English proficiency (LEP) who have a language discordant physician are more likely to have an HbA1c level above 9% than LEP Latinos who have a language concordant physician (27.8% versus 16.1%, respectively). After controlling for potential confounders LEP Latinos with a language discordant physician were 1.76 times more likely to have poor glycemic control than English speaking Latinos (Fernandez et al., 2010). Fortmann and colleagues (2010) found that the effect of social support contributing to proper self-care behavior provided by family, friends, community, and the surrounding environment on glycemic control was mediated by depression and personal adaptive self-management behaviors among a sample of 208 low-income Latinos in San Diego County. This raises attention to the fact that diabetes self-management involves many factors, is best looked at in a socioecological manner, and that glycemic control is not only improved through the provision of resources but is as well determined by knowledge and self-efficacy of the individual (Fortmann, Gallo, & Phillis-Tsimikas, 2011).

Religiosity among the Hispanic population

Another factor that has been shown to play a role in diabetes management is religiosity, which is a central part of the Hispanic culture (Hunt, Arar & Akana, 2000; Taylor, Lopez, Martinez & Velasco, 2012). A national survey of 1,220 Hispanic adults conducted in 2011 by the Pew Hispanic Center found that 83% of Hispanics claimed a religious affiliation with the most prevalent denomination being Catholicism (62%) and the second being Protestant (19%). When compared to the general public Hispanics were slightly more likely to identify with a religious affiliation (83% vs. 80%), and much more likely to be Catholic (62% vs. 23%);

however, they were far less likely to be Protestant (19% vs. 50%). When assessing attendance in religious services the report found that 43% reported attending once a week, 33% attended monthly or yearly, and only 22% reported rarely or never attending religious services. Moreover, 61% of the sample rated religion as "very important" in their lives, and only 13% stated religion was "not too important" or "not at all important" (Taylor et al., 2012).

Estimates of Hispanic religious affiliation, namely Catholic affiliation, vary greatly across studies; however, estimates consistently are over 50% and some as high as even 90% (Perl et al., 2006). Another national survey assessing religiosity including nearly 3,000 adult Hispanics in 2001 found that 57% identified as Roman Catholic and only 13% reported no religion. This was a decrease from the survey's 1990 estimates including 4,900 adult Hispanic respondents in which 66% identified as Catholic and 6% reported no religion (Keyser, Kosmin & Mayer, 2001). A review of 12 national surveys examining religious affiliation among Hispanics from 1990-2005 estimated that 70% of Hispanics identified as Roman Catholic, 20% as Protestant, and only 8% identifying with no religion (Perl et al., 2006).

The most recent estimate provided by the Pew Research Center showed that there has been a change in the religious landscape among Hispanics in the U.S. with 55% currently identifying as Roman Catholic while 77% claimed they were raised Catholic. Opposite is seen among Hispanic Protestants with 14% being raised Protestant and 22% now identifying as such. Nevertheless, regardless of the religious makeup of the sample identifying with a religious belief system, the estimated percentage of Hispanics identifying with no religion is consistently below a fifth (Cooperman, Lopez, Funk, Martinez & Ritchey, 2014).

Religiosity and Positive Health Behaviors among Hispanics

Religion is an important, integral part of Hispanic culture that affects many dimensions of health and may be an influential determinant of adherence to positive health behaviors (Mann, Mannan, Quinones, Palmer & Torres, 2010; Skinner, Correa, Skinner & Bailey, 2001; Kane & Williams, 2000; Ransford, Carrillo & Rivera, 2010; Arredondo, Elder, Ayala, Campbell & Baquero, 2005). Religion may promote a healthier lifestyle through its prescriptions of behaviors that may prevent or inhibit disease and illness and through its proscriptions of behaviors that may harm the body or hinder any type of health treatment. Examples of such behaviors include vegetarianism prescribed by some Hindu and Buddhist sects or the proscription of the consumption of alcohol among Judaism. Moreover, religion may positively affect health through social support systems found within a religious entity and by helping to develop a healthier attitude when handling daily struggles. Conversely, religiosity may as well promote health behaviors that are detrimental to health, or advise against positive behaviors to the extent that medical services are denied. This denial of services may be done as a faith in divine healing or it may be due to a provision of health services within their religious faith such as the provision of blood transfusions among Jehovah's Witnesses (Levin, 2011). In looking at the following behaviors positively linked with religiosity among Hispanics, although they may not be directly linked with type 2 diabetes, these behaviors, especially those relating to physical activity and nutrition, may be precursors to or may help prevent type 2 diabetes (Hu et al., 2003; Klein et al., 2004). Examples of factors increasing type 2 diabetes risk identified in prior research include psychological stress, smoking, sleep loss, and high alcohol consumption (Leynen et al., 2003; Bodenmann, Ghali, Faris & Cornuz, 2007; Chaput et al., 2009; Cullmann, Hilding & Ostenson, 2012).

When looking at the promotion of positive health behaviors, religion has been noted as an influential determinant among Hispanic women (Arrerondo et al., 2010; Magana & Clark, 1995; Skinner et al., 2001; Rojas, 1996; Higgins, 1999). Church attendance among Latinas has been noted to be positively associated with positive nutritional and physical activity behavior (Arredondo et al., 2010). In the same light Hispanic women who exhibit higher levels of religiosity are more likely to follow positive health behaviors that may result in better health outcomes and a better infancy for their offspring. Positive behaviors resulting from religiosity may include lower likelihood of smoking, better nutritional choices, and higher rates of breastfeeding (Magaña & Clark, 1995). Religion has as well been shown to help Hispanic women deal with issues encountered on account of poverty and as an aid in maintaining general well-being in light of daily stress (Rojas 1996; Higgins, 1999). Among a sample of Mexican-American women common beliefs found were that health is achieved through the balance of physical, emotional, social, and spiritual needs (Mendelson, 2002). This holistic view of health may be a strength when approaching health promotion among this population as it provides the opportunity to approach health from multiple areas of wellness (Musgrave et al., 2002).

In light of the strong influence religiosity has been shown to have on health behaviors, this construct may have important implications for understanding Hispanic health behavior. For example, Hispanics identifying with a religious affiliation are less likely to binge drink or smoke when compared to those that identify with no religion (Garcia, Ellison, Sunil & Hill, 2013; Ford, 2006). Religiosity has as well been noted to be associated with a higher frequency of engagement in physical activity and higher perceived self-rated overall health (Merrill, Steffen & Hunter, 2012). Thus, spirituality and religious traditions could be used to strengthen health promotion efforts among this population (Musgrave, Allen & Allen, 2002). The incorporation of

13

spiritual elements of health with such interventions is important when catering to a Mexican-American population (Musgrave et al., 2002).

There have been some studies, however, that have found minimal or negative effects of religiosity on health among Hispanic populations (Franzini et al., 2002; Mann et al., 2010). Franzini and colleagues (2002) conducted 2,144 face-to-face interviews to examine the effect of religiosity on health of which 78.9% of the respondents were Hispanic (Franzini et al., 2002). Within this study both attendance at religious services and spirituality (measured through frequency of prayer, value placed on spiritual beliefs, and value placed on spirituality in existential beliefs) were negatively associated with self-perceived health (Franzini et al., 2002).

Religiosity and T2D among Hispanics

A review of studies examining Hispanic adult's beliefs about type 2 diabetes found that beliefs concerning the etiology of type 2 diabetes varied from biomedical to cultural to religious etiologies. Among Mexican Americans belief in a cultural etiology was more common as across various studies the concept of susto, a belief that a strong emotional response to an event brought about diabetes, was the most prevalent cultural etiology. The most common religious etiologies identified were fatalistic beliefs that diabetes was God's will or a punishment from God (Hatcher & Whittemore, 2007; Adams, 2003; Jezewski & Poss, 2002).

Beyond serving as a sense of understanding of the disease, religiosity has been identified as a coping mechanism and almost as a form of treatment through a qualitative study among a sample of 43 Mexican-American patients with type 2 diabetes. A belief in God and prayer was perceived to indirectly help with diabetes by reducing stress and anxiety linked with the disease. A belief in God was as well perceived to have a direct impact, but this belief did not inhibit pursuit of medical treatment. Beliefs regarding type 2 diabetes management were addressed by

14

asking patients their own experience with managing the disease, and their use and beliefs

concerning alternative medicine treatments such as prayer, herbs, and folk healers (Hunt, Arar &

Akana, 2000).

Religion was noted as an important part of diabetes management in a cross-sectional

quantitative study among 104 Hispanics with type 2 diabetes. When asked how they developed

diabetes 78% perceived it as God's will and 28% believed it was a punishment from God. When

asked about their diabetes management 55% sought help from their priest to control their

diabetes and 81% sought help from God. Moreover, 6% of participants stated that they turned to

God before a doctor when facing diabetic problems. Researchers developed the instrument used

within this study as a review of the literature at the time failed to yield a scale to assess the

importance of religion and folk medicine among patients with type 2 diabetes. After pre-testing

the 22-item scale, the instrument was found to be reliable (r=.82), and content validity of each of

the items was deemed to be significant by a panel of experts (Zaldivar & Smolowitz, 1994).

Prayer was noted to be a particularly strong consolation for Hispanic migrant farm

workers with type 2 diabetes in a qualitative study among 29 individuals. Two open-ended

questions with multiple probes were addressed including whether they though religion impacted

their health and the use of prayer in relation to their personal health. Participants reported

incorporating prayer into their daily lives, using religious paraphernalia while praying, praying

for their families and their own health, and reciting prayers specifically for their diabetes

(Bergland, Heuer & Lausch, 2007).

There have been studies finding no relationship between religious salience and positive

diabetes-related behaviors. Data from the Mexican Health and Aging Survey (2001-2003),

which surveys a nationally representative sample of Mexicans in Mexico above the age of 50,

found that although religious salience, measured by the value placed on religion by the participant, was significantly associated with 60% higher odds of blood pressure screening and 35% higher odds of cholesterol screening, it was not significantly associated with diabetes screening. The difference in odds of diabetic screening behavior was only significant when comparing those who felt religion was very important and those who did not feel it was important at all. Religiosity was addressed with two questions in this study addressing religious salience and religious service attendance. Researchers did not address the reliability and validity of these items (Benjamins, 2007).

Fatalism

A concept related to religiosity is fatalism, which is the belief that every event and circumstance is predetermined and an individual is powerless in altering the progression of these events or circumstances (Taylor, 1962). Fatalism includes the concepts of luck, fate, and destiny. Linked with these concepts is a range of religious ideas with beliefs in a deity who exercises control over all human life (Davison, Frankel & Smith, 1992).

Fatalism is as well-known as the concept of locus of control introduced by Rotter, which posits that although reinforcement, rewards, and gratification are central in developing skills and behaviors, the acquirement of these behaviors is contingent on the manner in which the individual perceived this reward or reinforcement. Specifically, the degree to which the individual believes that the particular award is dependent on their own actions or actions is outside of their control. If the behavior and the resultant reward is not perceived to have a cause and effect relationship, but rather a result of luck, fate, or chance then these behaviors will never be adopted (Rotter, 1966).

16

The concept of fatalism has been discussed more widely in the field of cancer research (Powe & Finnie, 2003). Philosophical underpinnings of cancer fatalism identified by Powe and Johnson (1995) include angst, which is losing sight of the meaning of life amidst life struggles, and nihilism, which is the daily struggle of living with despair, or feeling meaninglessness or hopeless. Straughan and Seow (1998) as well contributed to the literature concerning cancer fatalism; although their definition of the concept is very akin to that proposed by Powe and Johnson, they incorporate the idea of spirituality and the concept of an external locus of control (Straughan & Seow, 1998).

Fatalistic Beliefs and Health Behavior among Hispanics

Similar to religiosity, fatalistic beliefs are associated with health behaviors directly and indirectly related to type 2 diabetes. One such example is the relationship between depression and type 2 diabetes. A meta-analysis looking at studies conducted between 1950-2007 examining incident type 2 diabetes and depression found a statistically significant 60% increased risk in type 2 diabetes (95% CI: 1.37-1.88; Mezuk et al., 2008). One such study looking at depression, fatalistic beliefs, and religiosity was a cross-sectional study among a bi-ethnic sample finding fatalism to be positively associated with depression; however, results were varied when looking at gender and racial differences among joint effects of fatalism and religiosity. Mexican-American males with high levels of fatalism and high levels of religiosity yielded the highest levels of depression. No statistically significant joint effects of fatalism and religiosity were noted among Mexican-American females (Neff & Hoppe, 1993). Other studies examining fatalistic beliefs and depression among Hispanics in comparison to non-Hispanic whites had conflicting results in that both did not find Hispanic populations to have higher levels of fatalistic

17

beliefs nor did they find fatalistic beliefs to be significantly associated with depression (Skolarus et al., 2012; Joiner et al., 2001).

Socioeconomic status has been found to be associated with fatalistic beliefs with lower socioeconomic status individuals exhibiting higher fatalistic beliefs and more negative health behaviors in relation to psychological distress (Guzman et al., 2005), and cardio-metabolic dysfunction (De los Monteros & Gallo, 2013). Fatalistic beliefs are negatively related to social and psychological well being but positively associated with general well being among Hispanics. In relation to a patient's perception of health care worker control over their personal health, fatalism was found to be positively associated with a more positive outlook on this control (Roncancio et al., 2011).

Fatalism and Type 2 Diabetes

Fatalism has not been extensively studied in the realm of type 2 diabetes behavior among Hispanic populations; however, the limited research that has been conducted has found an association between diabetes fatalism and glycemic control and other diabetes management behaviors among various ethnic/racial populations (Egede & Ellis, 2009; Walker et al., 2012; Egede & Bonadonna, 2003; Choi, Kang & Lee, 2014; Feldman & Steptoe, 2003). The diabetes fatalism scale developed by Egede and Ellis examines emotional distress (despair), religious and spiritual coping (hopelessness), and perceived self-efficacy (powerlessness), three constructs associated with the concept of diabetes fatalism. The scale was validated among a non-Hispanic white and non-Hispanic Black population with type 2 diabetes. Scale scores were significantly correlated with self-management, self-management understanding, glycemic control, and quality of life measures (Egede & Ellis, 2009). The scale was developed based on focus group results conducted among African-Americans with type 2 diabetes. Study findings were that most

participants felt powerless in the control of their disease; individuals who had faced the disease the longest, had friends or family members with diabetes, had diabetes complications, and had poor social support were more fatalistic; participants felt their survival of the disease is God's will; and individuals with negative coping styles appeared to be more fatalistic and exhibit negative self-management behaviors (Egede & Bonadonna, 2003). Other studies implementing the diabetes fatalism scale have had varied results in regards to fatalistic beliefs and self-management behaviors (Walker et al., 2012; Choi et al., 2014). Walker and colleagues (2012) examined diabetes fatalism among a predominantly African-American population and found that diabetes fatalism was significantly associated with poorer medication adherence, self-care, diabetes knowledge, exercise, diet, and blood sugar testing. Non-significant associations were found with poor diabetic foot care (Walker et al., 2012). Choi and others (2014) utilized the scale among a Korean sample with type 2 diabetes to assess fatalistic beliefs among patients with and without diabetic foot. The perceived self-efficacy subscale of the instrument yielded a significant positive association with smoking, poor dietary habits, and drinking. However, no significant associations were found with exercise or foot care behaviors (Choi, Kang, & Lee, 2014).

Other scales developed looking at fatalistic beliefs and diabetes self-management include the Diabetes Locus of Control Scale (DLC) and a scale developed by Schwab and colleagues (1994) tailored for Mexican-Americans that incorporated multiple cultural beliefs and was based on the Health Belief Model (Peyrot & Rubin, 1994; Schwab, Meyer & Merrell, 1994). The scale developed by Schwab and others (1994) was not proven to be valid or reliable tool. The DLC was comprised of two subscales being internal locus of control and belief in a powerful other. Autonomy measured through the internal DLC was significantly associated with positive

diabetes control while self-blame was associated with poor control. Conflicting findings were found among various measures of powerful other DLC and self-care management behaviors (Peyrot & Rubin, 1994). Studies using the DLC found varied results when exploring locus of control as a predictor of diabetes self-care (Tillotson & Smith, 1996; Kneckt, Syrjälä & Knuuttila, 1999; Stenström, Wikby, Andersson & Rydén, 1998). One such study looked at the effect of diabetes locus of control on adherence to a weight management program for patients with type 2 diabetes. Researchers found that diabetes locus of control had only a modest effect on adherence and results were not as expected in that high internal locus of control was associated with negative self-care behaviors (Tillotson & Smith, 1996). Another such study looked at both diabetes and dental locus of control and diabetes self-care but only the dental locus of control was significantly associated with better dental care while the diabetes locus of control was not associated with better self-management or glycemic control (Kneckt et al., 1999). However, Stenstrom and others (1998) found the DLC to have adequate psychometric properties among a Swedish sample with insulin-dependent diabetes and found that individuals exhibiting a higher internal locus of control had better metabolic control and HbA1c levels than their low internal/high external locus of control counterparts (Stenström et al., 1998). More recent studies using this scale have looked at the effect of group care versus traditional one-to-one diabetic care on the prevalence of fatalistic beliefs (Trento et al., 2006; Trento et al., 2008). These studies were conducted among both patients with type1 diabetes and type 2 diabetes, and found that patients with type 1 diabetes had higher levels of fatalistic beliefs and less trust in others. Nevertheless, both patients with type 1 and type 2 diabetes who received group care exhibited a higher internal locus of control and lower fatalistic beliefs (Trento et al., 2006; Trento et al., 2008).

Public Health Significance

The proposed study aims to explore the association between religiosity across the lifespan and fatalistic beliefs and diabetes self-management among patients with type 2 diabetes of a chronic care management program in the Rio Grande Valley. The proposed study could help identify determinants of diabetes self-management to build upon current research and can help further identify manners in which health interventions may be culturally tailored for Mexican-American border populations. Past research has shown that Hispanics are highly religious (Pearl et al., 2006) and that religion can be utilized to reinforce health promotion efforts among this population (Musgrave et al., 2002). Moreover, diabetic fatalism has as well been identified as a determinant of diabetes self-management behavior and glycemic control (Egede & Bonadonna, 2003). The proposed study could contribute to the current type 2 diabetes literature in understanding the role of these two distinct, yet intertwined concepts, in the context of Hispanic diabetes self-management.

The current study will build upon findings of the previously mentioned reviews of diabetes fatalism and religiosity in the context of type 2 diabetes management by examining the effect of an intervention incorporating features that have been proven to increase diabetes management. Moreover, the proposed study will examine the effects of religiosity and fatalism longitudinally, which has not been done previously when exploring this relationship among this and other ethnic sub-groups (Zaldivar & Smolowittz, 1994; Bergland et al., 2007; Benjamins, 2007; Egede & Ellis, 2009; Walker et al., 2012; Choi et al., 2014; Feldman & Steptoe, 2003). In the realm of religiosity and type 2 diabetes this relationship has been explored previously with a focus on exploring belief systems and how these beliefs shape and determine chronic disease management behaviors (Hunt et al., 2000; Zaldivar & Smolowitz, Benjamins, 2007); however,

21

the proposed study will explore both these beliefs systems through qualitative work and it will explore the effect of these beliefs on disease outcomes through HbA1c results. When exploring diabetes fatalism past studies have examined this relationship cross-sectionally and they have not been conducted among a Hispanic sample (Egede & Ellis, 2010; Choi et al., 2014). Qualitative studies exploring the concept of religiosity in the context of type 2 diabetes have been conducted among a Hispanic sample, but this has not been done to explore the concept of religious fatalism and its relation to chronic management behavior (Hatcher et al., 2007; Adams, 2003; Jezewski et al., 2002).

Specific Aims

The overall goal of the proposed study is to assess the effect of fatalistic beliefs and religiosity across the lifespan on diabetes self-care behavior and glycemic control. The overall goal will be achieved by pursuing the following aims:

Study Aim #1: To understand the role religiosity and fatalistic beliefs play in diabetes care management among newly enrolled, current, and newly completed participants of a chronic care management program. In order to achieve this aim a minimum of six semi-structured interviews will be conducted with Mexican-American participants of the *Salud y Vida* program aged between 18 and 80 years old. The qualitative study will address their current religious beliefs, their perceived connection of religion and health, and the manners, if any, that they incorporate their religious beliefs in their daily self-management behavior. The same qualitative interviews will address current fatalistic beliefs, perceptions of how fatalistic beliefs can promote or hinder positive health behaviors, and fatalistic beliefs in the context of type 2 diabetes management, specifically.

22

Study Aim #2: To determine the relationship between fatalistic beliefs and religiosity across the lifespan and type 2 diabetes management as measured by HbA1c status while taking into consideration covariates such as gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, physical activity, nutrition, and medication adherence. This aim will be achieved by administering a questionnaire assessing diabetes fatalism and religiosity during the *Salud y Vida* enrollment process to interested participants. It is hypothesized that participants exhibiting a high level of religiosity and a low level of fatalism will exhibit more positive self-care behavior relative to individuals with low religiosity and high fatalism.

Study Aim #3: To determine the mediation, if any, of fatalistic beliefs and religiosity across the lifespan, on the effects of a chronic care management program on HbA1c score changes between baseline and three month follow-up while taking into consideration covariates such as gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, *Salud y Vida* class attendance, physical activity, nutrition, and medication adherence. This aim will be achieved by conducting a mediation analysis utilizing fatalism and religiosity data collected at baseline, and diabetes management behavior and HbA1c results collected at baseline and three months follow-up. Similarly, it is postulated that those who show a high level of religiosity and low fatalism will show a greater increase in positive self-care behavior and glycemic control while those who show high levels of fatalism and low religiosity will exhibit a smaller increase in positive self-care behavior and glycemic control.

Methods

Study Setting

Research examining the prevalence of diabetes and pre-diabetes in the Rio Grande Valley has shown that this chronic disease is highly prevalent among this population (Fisher-Hoch, Vatcheva, Rahbar, & McCormick, 2015). Baseline results of 2,856 individuals recruited to the Cameron County Hispanic Cohort (CCHC) between 2004 and 2014 found that 27.6% of the population had diabetes with 40% being previously undiagnosed. Additionally, 31.6% were found to have pre-diabetes. Predisposing factors of diabetes found among this population included lower education, lower income, older age, and a higher likelihood of obesity. Those who were found to have diabetes reported on average two years less of education, and on average $5,570 less in annual household income when compared to those without diabetes (Fisher-Hoch et al., 2015).

Results of the CHCC (2008-2011) as well showed that this population fared worse when compared to national Behavioral Risk Factor Surveillance Survey (BRFSS) respondents (2009) in regards to engagement in preventative health behaviors (Reininger et al., 2015). Statistically significant differences were found when comparing fruit and vegetable consumption and physical activity guidelines with a lower proportion of CHCC respondents meeting physical activity guidelines (33% vs. 44%; p-value <.0001) and a lower proportion meeting fruit and vegetable guidelines (14.8% vs. 21.93%; p-value <.0001). Similar trends were observed when comparing CHCC respondents with BRFSS Hispanic respondents by gender. A significantly lower proportion of CHCC respondents met fruit and vegetable guidelines among both males (11.4% vs. 18.71%; p-value=.0256) and females (11.4% vs. 25.16%; p-value=.0256). P-values

were adjusted for age, education, employment, language and insurance status (Reininger et al., 2015).

Cameron County is nearly 90% (88.7%) Hispanic and is one of the poorest counties in the U.S. with the average household income being $33,179, which is roughly only 60% of the average household income earned by non-Hispanic whites ($56,565) and is below the national Hispanic average household income ($40,417). Moreover, 34.8% live below the poverty level, which again is worse than national Hispanic estimates (25.4%) and far worse than estimates of non-Hispanic whites (11%; Office of Minority Health, 2015; United States Census, 2015).

Given the high prevalence of diabetes, negative health behavior, and economic disadvantages of this population, health interventions aimed at improving health behaviors geared to diabetes self-management should be implemented. An example of such a program is the *Salud y Vida* program of the Rio Grande Valley. The *Salud y Vida* program is a an intervention aimed at Hispanics living within the Rio Grande Valley that utilizes a culturally appropriate approach, provides individual check-ups, individualized feedback, incorporates an educational approach, and provides both a short and long follow-up time. The program is a bilingual adaption of the Wagner Chronic Care Model, which stresses effective self-management support, providing patient-oriented community resources, improving not only knowledge but self-efficacy, productive interactions with physicians and others equipped with skills to provide self-management support, and regular interactions between patient and caregiver (Wagner et al., 2001). The Rio Grande Valley *Salud y Vida* program partners with a number of hospitals, primary care entities, health care providers, universities, health information management organizations, and outreach organizations within the valley. Beyond the University of Texas School of Public Health, Health Science Center at Houston, Brownsville Regional Campus other

partnering institutions include the University of Texas Health Center San Antonio, Valley Baptist Health System, South Texas Health System, Proyecto Juan Diego, Migrant Health Promotion, Su Clinica Familiar, Brownsville Community Health Center, Rio Grande Valley Information Exchange, Tropical Texas Behavioral Health, and the Rio Grande State Center. The purpose of the *Salud y Vida* program is to provide patients with type 2 diabetes with the education and support needed to improve their diabetes management behavior. The program consists of three phases that each participant goes through being Transition Care, Chronic Disease Management, and Follow-up Monitoring. Enrollment into the program occurs within the Transition Care phase, and is the phase in which participants will be approached for participation in the proposed study. The enrollment process generally occurs in a location that is most convenient for the participant and can vary from the house setting to clinics, hospitals, or outreach locations. Regardless of the location, enrollment must occur face-to-face. Activities that occur during the enrollment process in addition to the proposed study's questionnaire administration include an introduction to the program, facilitation of questions on part of the participant, completion of forms required by the program to begin the intervention program, and scheduling of a primary care provider appointment, if necessary.

Study Design

The proposed study will employ a mixed-methods longitudinal study design. A stratified subsample by level of completion of the program (newly enrolled, current, and newly completed) of *Salud y Vida* participants will be recruited to participate in the qualitative portion of the proposed study. For the quantitative portion of the study a convenience sample of newly recruited participants of *Salud y Vida* will be asked to participate. Interested participants will be consented and those consenting to participate will have the questionnaire administered during the

enrollment process. The questionnaire must be completed prior to commencement of intervention elements, such as diabetes self-management class (DSME) classes or health worker visits, as health education efforts aimed to increase self-efficacy regarding diabetes care may result in a subsequent decrease of fatalistic beliefs.

During the consent process participants will be asked for permission to access their HbA1c results, anthropometric data, and diabetes care management behavior collected through survey questions assessing physical activity, nutrition, and medication adherence behavior collected as a part of the enrollment process for *Salud y Vida*. Additionally participants will be followed longitudinally to assess changes in their HbA1c results and diabetes care management behavior at their *Salud y Vida* three-month follow-up.

Study Subjects

Inclusion criteria for *Salud y Vida* participants are that they must be over 18 years of age, have uncontrolled diabetes (HbA1c over 8.0%), and reside within the Regional Healthcare Partnership region 5, which includes Starr, Hidalgo, Willacy, and Cameron counties. Exclusion criteria for participants are that they have a history of violent behavior toward others, history of substance abuse, are a dialysis patient, a cancer patient, have open chronic wounds, have untreated bipolar or personality disorders, or are currently pregnant.

Study Aim #1:

Participants recruited to assess aim #1 of the proposed study will be a stratified sample. Stratification will be conducted on the participant's progress in completion of the *Salud y Vida* program. An equally representative sample of participants who are newly enrolled, are currently engaged in the program, and who are long-term participants of the program will be recruited so as to gather insight from participants at every stage of the program. Newly enrolled participants

27

will be individuals who have been an active participant of the program for 45 days or less or have not completed their first in-home promotora visit or who have not attended their first DSME class even though they are beyond 45 days of enrollment. Currently enrolled participants are those who have been active in the program data system and who are between 46 – 352 days receiving services in the program. Long-term participants will be those who are considered active in the program data system and who is receiving program services for 353 days or greater.. This will as well be done to ensure that if the intervention has an effect on fatalistic beliefs or religiosity that thoughts and beliefs of these factors are gained from individuals who have not completed any portion of the intervention to compare with individuals that have participated in program components.

Study Aim #2:

As stated previously, subjects being recruited to complete the questionnaire for the proposed study will be newly recruited participants of the *Salud y Vida* program. Study subjects recruited to complete the quantitative portion of the study will be a convenience sample of newly enrolled participants. Although biases may result from a convenience sample, the findings of this study will help elucidate factors affecting glucose management improvements from an intervention aimed at type 2 diabetes management among a Hispanic population with uncontrolled HbA1c levels specifically. Participants of the program are enrolled in a five-session Diabetes Self-Management class, and are followed-up with by a promotora (community health worker) every three months for a year to provide a check-up on their progress in HbA1c improvement.

Study Aim #3

Participants that have been recruited for the previous study aim will as well be utilized to examine the third study aim. As part of the *Salud y Vida* program participants are visited by their assigned Community Health Worker (CHW) who follow-ups with participant and checks their HbA1c level, and assesses their current physical activity and nutrition health behavior. Data obtained from participants who successfully complete their three month follow-up will be utilized.

Sample Size Calculation and/or Study Power

Study Aim #1. **To understand the role religiosity and fatalistic beliefs play in diabetes care management among newly enrolled, current, and newly completed participants of a chronic care management program.**

In order to test study aim #1, the required sample size will be a minimum of six individuals with the maximum of participants being determined by when saturation is met. Because each individual will only be interviewed once and because a phenomenological approach will be used, it can be expected that the sample will reach saturation after 25-30 interviews (Morse, 2000). It has been debated in the literature as to what the appropriate sample size should be for a phenomenological approached qualitative study with Creswell (1998) suggesting between 5-25 interviews and Morse (2000) suggesting that at least six interviews be conducted. Because the research aim posed by the proposed study intends to examine the role of fatalism and religiosity within diabetes self-care among a Hispanic population and not among all individuals with type 2 diabetes in general, the needed sample size may be on the lower end to ensure that saturation is indeed met (Charmaz, 2006). Mason (2010) conducted a review of doctoral level qualitative studies and found that of those utilizing a phenomenological approach

(57 studies) all had conducted at least six interviews and 68% fell within the range of interviews suggested by Creswell (Mason, 2010).

Study Aim #2. To determine the relationship between fatalistic beliefs and religiosity across the lifespan and type 2 diabetes management as measured by HbA1c status while taking into consideration covariates such as gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, physical activity, nutrition, and medication adherence.

In order to test study aim #2 the required sample size will be 355. This sample size was calculated assuming a standard deviation of 1.68, and an effect size of .5 at the .05 significance level with 80% power (Weinstock et al., 2011). This sample size will be required to conduct a cross-sectional analysis of the effect of fatalistic beliefs and religiosity across the lifespan, on physical activity and nutritional self-care behaviors while taking into consideration potential confounders. Religiosity across the lifespan is measured using two questions assessing current religious salience and religious salience as a child. These measures are assessed on a four point unipolar Likert scale. Responses on the two items are utilized to obtain a change score, which is categorized as "no change", "slight positive change", "slight negative change", "moderate positive change", "moderate negative change", significant positive change" and "significant negative change". Slight changes are defined as a one point change, moderate changes as a three point change, and significant changes as a three point change.

Table 1: Sample Size Calculations

	Alpha = 0.01			Alpha= 0.05		
Power	.80	.85	.90	.80	.85	.90
Sample Size	528	591	672	355	407	475

Study Aim #3. To determine the mediation, if any, of fatalistic beliefs and religiosity across the lifespan, on the effects of a chronic care management program on HbA1c score changes between baseline and three month follow-up while taking into consideration covariates such as gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, Salud y Vida class attendance, physical activity, nutrition, and medication adherence.

In order to test study aim #3 the required sample size will be 358 patients (N=179 per group). Again, this sample size assumes a standard deviation of 1.68 with a 0.05 two-sided significance level. The sample size estimates will be calculated to detect a 0.5 difference in HbA1c between groups with at least 80% power (Weinstock et al., 2011). In order to evaluate the mediation of fatalistic beliefs and religiosity across the lifespan on HbA1c measures, with 358 study participants, we would have 80% power to detect minimal mediator effect size of 0.16 standard deviations in linear regression model with a 0.05 two-sided significance level (Vittinghoff, Sen & McCulloch, 2009). For example, with a standard deviation of 12.5, it is assumed that mediator effect at 3 month follow-up will be 2 (i.e., 0.16 times 12.5).

Data Collection

As stated previously, participants will be recruited from the *Salud y Vida* program who are referred to the program from partnering hospitals, clinics, indigent care corporations, or community referrals. An analytic model utilizing hospital utilization data and medical costs incurred is used to determine if the individual is deemed in need of chronic care management services. After the participant has been deemed eligible they will be approached for participation

in the proposed study during the *Salud y Vida* enrollment process. This process is carried out by a transition specialist, and occurs in a face-to-face manner.

In order to obtain consent for the proposed study, the study will be discussed in detail with the participant to explain the purpose of the study, the topics addressed within the questionnaire, what is required of the individual for participation in the study, and any foreseeable risks and benefits as a result of participation. If the individual is interested they will be asked to sign the informed consent form (Appendix A). By signing this form consent will be given to complete the study questionnaire (Appendix C), and access to their self-care management behavior data and HbA1c results at baseline and three-month post.

Measures

Study Aim #1

The first study aim is to understand the role religiosity and fatalistic beliefs play in diabetes care management among participants of a chronic care management program. In order to achieve this aim semi-structured interview questions will be conducted among a stratified sample of participants of the *Salud y Vida* program. Interview questions to be addressed are included within Appendix B. Questions that were used as a framework for the development of the proposed questionnaire (Diabetes Fatalism Scale) were adapted from a similar study conducting a qualitative analysis among African-American individuals with type 2 diabetes to explore the effect of fatalistic beliefs on managing diabetes to fit the current study's study aims and methodology (Egede & Bonadonna, 2003). Questions utilized within Egede's and Bonadonna's work were developed based on the ISAS paradigm, a Sociological theory, which posits that an individual chooses to engage in certain behaviors in response to symbols and that these behaviors are contingent on the audience and the situation. This qualitative study sampled

clinic patients for participation in focus groups to assess the participant's perception on the meaning of diabetes, the illness experience, the manner in which the participant coped with the illness, and their religious and spiritual beliefs. Responses that were generated during this qualitative study were utilized to develop the questionnaire that will be used for the quantitative portion of this study (Egede & Bonadonna, 2003).

Another such qualitative study whose results were used to help frame the proposed questions was a qualitative study that conducted in-depth unstructured interviews among Iranian patients with type 2 diabetes to explore religiosity and the empowerment process (Abdoli et al., 2011). Barriers to empowerment that were found among this sample were sustained stress, negative views concerning diabetes, faulty healthcare systems, poverty, and illiteracy. Factors that were found to be both a hindrance and a facilitator to empowerment among this population were religiosity, faith, the acknowledgment of medical doctors as holy men, diabetes fatalism, and regard towards their body as the temple of God (Abdoli et al., 2011).

Fatalism was explored qualitatively among a Hispanic population in the context of cancer fatalism in relation to cancer screening by performing semi-structured focus groups among 67 Hispanic Catholics in Massachusetts (Leyva et al., 2014). Focus group questions addressed among this sample touched upon general thoughts concerning cancer, cancer etiology, cancer prevention, cancer screening, cancer treatment, cancer curability and survivability, Catholicism and general health, divine healing, role of the Catholic Church in health, and interest in learning more about risk reduction of cancer. Among this sample fatalistic beliefs were referenced but majority of the participants believed in God's granting of free will as a more determining factor in an individual's health. Moreover, religious beliefs were found to be supportive of cancer screening behavior. Although participants believed that God has a role in determining a person's

health, they still believed that a person's health behaviors also played a role in cancer outcomes (Leyva et al., 2014). Similar qualitative studies exploring the role of fatalism and religiosity in cancer screening and cancer outcomes have been conducted (Florez et al., 2009; Puschel et al., 2009; Goldman & Risica, 2004); however, beyond the fact that these studies qualitatively assessed cancer fatalism they were conducted among other Hispanic sub-groups and not among a Mexican-American sample.

Nevertheless, findings and focus group questions were reviewed to develop the proposed study's interview questions. Questions touch upon the participant's personal religious beliefs, their religiosity across the lifespan, their perception of the effect of religiosity and fatalistic beliefs on glucose management, use of religious practices for type 2 diabetes management, and the appropriateness of discussing such topics in the context of diabetes management.

Study Aims #2 & #3

The second and third aim of the study will build off measures found in the *Salud y Vida* program. Measures are obtained at multiple time points and taken by trained staff in the language of choice for the participant.

Table 2: Measured Constructs and Selected Measures

Construct	Selected Measure	Type of Variable	Measurement Properties	Time of Assessment
Religiosity across the lifespan	National Comorbidity Study-Replication (NCS-R)	Independent (Aim #2) Mediator (Aim #3)	Not provided	Enrollment
Diabetes fatalism	Diabetes Fatalism Scale	Independent (Aim #2) Mediator (Aim #3)	Internal consistency: α= 0.804 (non-Hispanic White and	Enrollment

			African American population)	
Glycemic Control	HbA1c- TRUE Result	Dependent (Aim #2-3)	Validity: R^2 = .932 (when comparing at home A1CNow SELFCHECK HbA1c test kit conducted by a health professional with scores obtained from laboratory tests; Chang et al., 2010)	Enrollment and promotora (Community Health Worker) home visit
Medication Adherence	Morisky Medication Adherence Scale	Covariate (Aim #2-3)	Sensitivity and specificity for classifying between low versus medium/high adherence were 93% and 53% respectively when assessed in an outpatient setting among patients with hypertension (Morisky et al., 2008)	Enrollment and among participants whose HbA1c increases by 1.5% or more at check-up
Physical Activity Behavior	International Physical Activity Questionnaire-Short Form	Covariate (Aim #2-3)	Validity: When finding the correlation of the IPAQ-SF with accelerometer data within a meta-analysis the range was ρ = 0.09 to 0.39 (Lee at al.,	First and quarterly promotora home visit

			2001). Reliability: Spearman correlation coefficients range from .66-.88 among American samples when tested across three study visits internationally (Booth et al., 2003).	
Nutrition Behavior	Two-Item Dietary Questionnaire	Covariate (Aim #2-3)	Low sensitivity (24-36%) and high specificity (76-83%; Cappucio et al., 2003)	First and quarterly promotora home visit
Sociodemographics	*Salud y Vida* Enrollment Questionnaire	Covariate (Aim #2-3)	Not provided	Enrollment
Comorbidities	*Salud y Vida* Enrollment Questionnaire	Covariate (Aim #2-3)	Not provided	Enrollment
Acculturation	The Bidimensional Acculturation Scale for Hispanics	Covariate (Aim #2-3)	High internal consistency (α=.90) and high validity coefficients (.45-.88)	Enrollment
Salud y Vida Class Attendance	Diabetes Self-Management Education (DSME) Class Attendance Sheet	Covariate (Aim #2-3)	Not provided	At each DSME class
Health Literacy	Three-item Health Literacy Scale	Covariate (Aim #2-3)	Sensitivity (.79-.93); Specificity (.98-.99)	Enrollment

The questionnaires implemented within the *Salud y Vida* program for data collection exclusively relating toproposed study in conjunction with other existing measures are a combination of the 12 item Diabetes Fatalism Scale developed by Egede and Ellis (2010) and questions addressing religiosity across the lifespan taken from the National Comorbidity Study-Replication (NCS-R). The selected items on religiosity were administered between 2001 and 2003 to assess a variety of psychiatric and substance abuse conditions through the World Health Organization Composite International Diagnostic Interview (WHO-CIDI) instrument (Moscati & Mezuk, 2014).

The Diabetes Fatalism Scale was originally assessed in conjunction with HbA1c, cholesterol, health-related quality of life using the Medical Outcomes SF-12, diabetes knowledge using the 23-item Diabetes Knowledge Test, and depression using the Center for Epidemiological Studies Depression Scale by its developers (Egede & Ellis, 2010). Exploratory and Confirmatory Factor Analysis was conducted to assess the appropriateness of the Diabetes Fatalism Scale. The scale assesses three factors being emotional distress, religious and spiritual coping, and perceived self-efficacy. The items are answered on a Likert scale ranging from 6 ("Strongly agree") to 1 ("Strongly disagree"). Scores pertaining to religious and spiritual coping and perceived self-efficacy are reverse scored. All items are summed so that a higher scale score represents a higher level of diabetes fatalism. The scale was found to have high internal consistency (α= 0.804). The scale was as well seen to be significantly correlated with HbA1c scores (r=0.20, p=0.004). Furthermore, in a univariate regression model the scale score was found to be significantly associated with mean HbA1c (beta=0.20, p=0.004) and explained 4% of the variance in HbA1c. Sample utilized for this study was middle-aged (mean age=57.0 yrs),

women (71.8%), African-American (61.1%) and White (38.9%), and their average HbA1c value was 8.0 (SD=1.9) (Egede & Ellis, 2010).

Other studies to utilize this scale include work by Walker and others (2013) among a predominantly African-American (83.2%) sample. Items measured in conjunction with the Diabetes Fatalism Scale were the Diabetes Knowledge Questionnaire, the 11-item Summary of Diabetes Self-Care Activities, and depressive symptoms as measured by the Patient Health Questionnaire. Among this sample the scale was found to be significantly associated with medication adherence behavior (β=0.029) and diabetes self-care behaviors of diet (β=-0.063), exercise (β=-0.055), and blood sugar testing (β=-0.055). Glucose management was not measured among this sample (Walker et al., 2010).

Another such study was conducted by Choi and others (2014) among a Korean sample to assess the diet, self-care, and diabetes fatalism among patients with type 2 diabetes with and without diabetic foot. A Cronbach's α of 0.614 and .869 was found in patients with and without diabetic foot, respectively, when conducting an item analysis of the Diabetes Fatalism Scale. Of the scale the perceived self-efficacy subscale was found to be positively significantly associated with smoking (r=0.350, p<0.01), bad dietary habits (r=0.295, p<0.05), and drinking (r=0.257, p<0.05). Its negative associations with exercise and foot care did not reach significance (Choi et al., 2014).

The religiosity items of the National Comorbidity Study-Replication were utilized to explore the relationship between religiosity across the lifespan, and the use and misuse of illicit drugs among a non-Hispanic White sample (72.8%; Moscati et al., 2014). This study examined data from the National Comorbidity Survey-Replication (NCS-R), which is a nationally representative survey of American adults between 2001 and 2003 that collects data on a range of

psychiatric and substance abuse disorders using the World Health Organization Composite International Diagnostic Interview (WHO-CIDI) instrument. Participants who reporting to part two of the NCS-R survey in which religiosity and substance abuse/dependence (N=6,203) measures were collected were used for the study. Religiosity items measured both current and childhood religious salience on a 4 point scale ranging from 1 ("Very important") and 4 ("Very Unimportant"). Change scores were calculated by subtracting religiosity in adulthood from religiosity in childhood and categorized as "no change", "slight change"(denoting a one-point difference), "moderate change" (denoting a two-point difference), and a "significant change"(denoting a three-point difference). Positive and negative changes were looked at separately to allow two types of changes to be analyzed. Other measures collected included religious preference categorized as "Protestant", "Catholic", Other religious preference" and "No preference" (including Agnostic, Atheist, and those reporting no religious preference/no religion), and religious participation measured through the frequency of church attendance categorized as "More than once per week", "About once per week", "One to three times a month", Less than, once a month", and "Never". Among this sample both declines and increases in religiosity across the life course resulted in an increased likelihood of all substance abuse and abuse/dependence outcomes. The current study did not assess the validity or reliability of the scale items (Moscati et al., 2014).

Kessler and others (2004) describe the design and field procedures of the NCS-R. The second part of the survey in which the religiosity items are included takes on average 109.4 minutes to complete and is only completed among a subset of the sample with an oversampling of those with clinically significant psychopathology. However, again the validity and reliability

of the sub-scale is not provided (Kessler et al., 2014). To the authors' knowledge no other study has utilized this scale to date to analyze findings of the NCS-R or with another sample.

For the purpose of the proposed study, a skip logic has been implemented within the questionnaire including both scales so as to limit the number of questions addressing religiosity for participants who identify themselves as "not a believer; atheist; or agnostic". Additionally, for the purpose of the proposed study the response category of religious participation was divided into two distinct categories being those with "No preference" in that they attend, belong to, or prescribe to belief systems of churches of multiple denominations, and those who are "Not a believer, atheist, or agnostic". This classification will be addressed within the first question of the questionnaire when asking the participant to indicate their religious preference. Any questions addressing attendance at religious services, value placed on religion in daily life, and religious fatalism will not be asked of this sub-sample. The only exception will be the question addressing value placed on religion when the individual was growing up to capture changes in an individual's religious preference across the lifespan.

Study Questionnaire Validation

To the knowledge of the present researcher the validity or the reliability of the NCS-R subscale assessing religiosity across the lifespan has not been provided in prior publications making use of the sub-scale of the scale. In order to determine the validity and reliability of the instrument a sub-set (n=30) of the proposed sample size will have an additional instrument assessing religiosity the instrument re-administered in order to assess the reliability of the instrument. Only questions pertaining to this sub-scale will be re-administered. Questionnaire will be administered a second time within a one year period following initial administration.

The Duke University Religion Index (DUREL) will be administered to the subset of the proposed sample population. The DUREL has been translated in over ten languages, including Spanish, and has been utilized in over 100 scientific studies. The DUREL, similar to the subscale of the NCS-R, measures both intrinsic and extrinsic religiosity. Extrinsic religiosity is measured via two items relating to attendance at organizational religious activity (church or other religious meetings), and attendance at non-organizational religious activity (private religious activities such as prayer, meditation, or bible study). Both are measured on a five-point unipolar Likert scale ranging from "more than once per month" to "never". Intrinsic religiosity is measured via three items measured on a five-point bipolar Likert scale ranging from "definitely true of me" to "definitely not true of me". Items assessed include whether they feel that they experience the presence of the Divine, whether they feel their religious beliefs are behind their whole approach to life, and whether they try to carry their religion into all other dealings in their life. The DUREL has been found to be reliable and valid. Reliability of the DUREL has been found to be high (intra-class correlation coefficient= 0.91), and convergent validity measures have has well been found to show high validity (r's = 0.71-0.86).   (Koenig and Bussing, 2010).

Data Analysis

Study Aim #1

Qualitative interviews will be audio recorded and transcribed. Additionally, notes taken during the interview process will be utilized to fill in any missing information that is needed and missed from the audio recording. A phenomenological approach will be used to analyze the transcribed text using Atlas. Because this method of analysis will be used a focus will be placed on the experiential understanding of the phenomenon by the participant. In order to do this audio recording and transcriptions will be reviewed multiple times to understand the interview as a

whole rather than focusing on certain areas of the interview in an effort to answer or support preconceived ideas on behalf of the researcher. Once general meanings of the data have been ascertained, interviews will be coded to by relevant research questions that are addressed within the interview guide (Appendix B). Codes will then be re-categorized as needed to remove redundancies (Hycner, 1985). Saturation will be determined and kept record of by the number of codes formulated, code revisions, and code frequency after analysis of each interview (Guest, Bruce & Johnson, 2006). Saturation will be defined in the context of the research study, and an explanation of how it was determined will be given (Bowen, 2008). Moreover, a semi-structured interview process will be employed to allow for elaboration on points of interest brought about by the respondent, but at the same time providing the same structure of key questions to respondents to ensure that saturation is met. Furthermore, participants will be recruited from a homogenous sample being Hispanic individuals with type 2 diabetes of the Rio Grande Valley participating in a chronic disease intervention program, which further facilitates saturation (Romney, Weller & Batchelder, 1986).

Study Aim #2

Questionnaire data will be entered or exported using Excel, and will be analyzed using STATA version 14. Survey data pertaining to the proposed study's scale addressing fatalism and religiosity across the lifespan will be entered by the present researcher into Excel while all other linked data will be exported from the data management system utilized by *Salud y Vida*, Wellcentive. Study questionnaires do not contain identifying information, but do contain the participant's Wellcentive ID that will be used to identify and export data from the data system. Wellcentive data is entered at the time of enrollment and follow-up by the data collector. Data that will be identified and exported from the Wellcentive system includes sociodemographic

data, health behavior (physical activity and nutrition) measures, medication adherence, and HbA1c measures. Data cleaning and analysis will be conducted by the present researcher to ensure that there are no duplicate entries and to ensure that missing data is appropriately coded.

Bivariate analysis will be conducted to look at differences among groups by religiosity and fatalistic belief levels using Chi-squared tests, Student's t-tests, ANOVA, and their nonparametric counterparts when necessary. In order to assess the association between religiosity and fatalistic beliefs with glycemic control at baseline a linear regression model will be fit. Possible confounders, such as gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, physical activity behavior, nutrition behavior, and medication adherence will be adjusted for and possible interactions will be evaluated when developing the final multivariable model. Potential confounding variables will be assessed by their statistical significance in the logistic regression model, and only significant variables will be retained to compute an adjusted odds ratio (Pourhoseingholi et al., 2012). In the same manner, effect modification will be assessed using stratification and significance of interaction variables in the final multivariable model (Agresti & Kateri, 2011).

Study Aim #3

In order to evaluate the mediation, if any, of fatalistic beliefs and religiosity on self-care glycemic control after participation in a chronic care management program mediation analysis using structural equation modeling will be performed using Mplus. This method of analysis will be utilized as it is more appropriate than utilizing multivariate methods in that structural equation modeling provides information on model fit of the entire model including the hypothesized mediating variable and all confounding variables (Warner, 2008). A path diagram showing the relationship between endogenous and exogenous variables will be developed to assess the

association. The endogenous variable for the proposed analysis will be glucose management as measured through the participant's HbA1c level (variable Y). The exogenous variable will be level of participation in the *Salud y Vida* program as measured by class attendance in the Diabetes Self-Management (DSME) classes (variable X). Figure 1 is a proposed path diagram including one mediator (M), which in this case could be fatalistic beliefs or religiosity across the lifespan, and one confounder (Z), which could include gender, age, education, acculturation, comorbidities, blood pressure, BMI, waist/hip circumference, physical activity behavior, nutrition behavior, and medication adherence. As mentioned previously, multivariate methods and structural equation modeling will be utilized to determine if mediation and/or confounding is present (Li, Bienias & Bennett, 2007).

Figure 1: Structural Equation Model
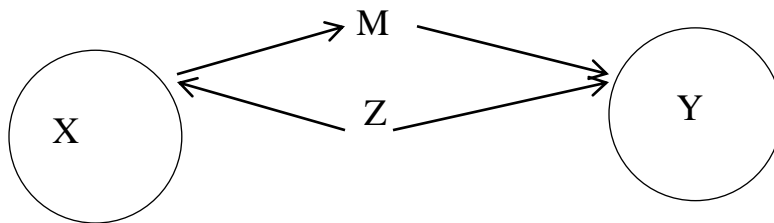
Human Subjects, Animal Subjects, or Safety Considerations

The proposed study was approved by the Institutional Review Board of the University of Texas School of Public Health, Health Science Houston. Study methods do not pose any major risks or dangers beyond what a normal physician visit would present. No sensitive information will be asked of the participant within the study's questionnaire. All but one question addressing religious beliefs has been removed for those indicating that they are non-believers, atheists, or agnostic to be respectful of all belief systems. Participants will be allowed to cease participation

44

with no penalty or cessation of services provided through *Salud y Vida* at any time. No incentive will be offered for participation in the proposed study. All study materials will be de-identified and study data will be linked through a participant identification number. Signed informed consent forms will be kept in a locked filing cabinet to which only the principal investigator and the study staff have access. If any participant chooses to terminate their participation in the proposed study, their informed consent form and questionnaire will be shredded. No identifying information will be kept within electronic study data files. Again the participant's identification number will be used to track the participant's relevant data. All data files will be kept on a password protected site to which only the principal investigator and study staff will have access.

Title of Journal Article (Exploration of fatalism and religiosity by gender and varying levels of engagement among Mexican-American adults of a Type 2 diabetes management program)

Name of Journal Article Proposed for Article Submission (The Diabetes Educator)

Fatalism, Religiosity and Type 2 Diabetes

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ABSTRACT

Purpose. The purpose of the study is to describe the roles religiosity and fatalistic beliefs play in diabetes care management among newly enrolled, currently enrolled, and long-term Mexican-American participants in a Type 2 diabetes chronic care management program.

Methods. In 2017, study participants (n=15) completed a semi-structured interview in their preferred language (English or Spanish). Sample was stratified by the amount of time an individual had been an enrolled participant of the *Salud y Vida* program : newly, currently, and long-term enrolled participants. Individual interviews assessed participant's religious beliefs, beliefs concerning the cause of diabetes, perception of relationship of religiosity and fatalistic beliefs with Type 2 diabetes management, and the appropriateness of discussing such topics with a health professional. Interview responses were analyzed using ATLAS.ti 8.

Results. Themes identified included: perceived autonomy over diabetes prognosis; motivators for self-care; discussions of personal beliefs in the healthcare setting; and the church's role in diabetes management.

Conclusions. Among this sample, religiosity and religious fatalism played a complex role in coping with and managing diabetes. Long-term enrolled and male participants expressed beliefs of divine control over health, and a connection between religiosity and health behavior. Long-term enrolled participants felt religious and fatalistic beliefs may be suitable and beneficial to discuss within the context of the healthcare setting.

Over one in ten (11.8%) of Hispanics in the United States are estimated to have Type 2 diabetes[1]. Estimates among Mexican-Americans range from 13.3% to 18.1%, compared to 7.1% of non-Hispanic whites[2]. Although Hispanics have a higher prevalence of Type 2 diabetes, they as well have the highest rates of uninsured adults (32%) when compared to other racial and ethnic groups[3]. Moreover, Hispanic patients with Type 2 diabetes have the lowest prevalence of meeting American Diabetes Association standards for blood glucose management (HbA1c ≤7.0%) when compared to non-Hispanic whites (24.4% vs. 38.0%)[4]. A variety of factors have been found to play a role in Type 2 diabetes management among this population, including socioeconomic factors, health literacy, physician-patient relationships, and personal factors and beliefs[5,6].

Fatalism, which may play a role in diabetes management, is the belief that every event and circumstance is predetermined and an individual is powerless in altering the progression of these events[7-9]. Fatalism includes the concepts of luck, fate, and destiny. Fatalism is strongly related to the concept of locus of control introduced by Rotter, which posits that although reinforcement, rewards, and gratification are central in developing skills and behaviors, the acquirement of these behaviors is contingent on the manner in which the individual perceived this reward. If an individual does not perceive a behavior and the resultant reward to have a cause and effect relationship, but rather perceives the outcome as a result of luck, fate, or chance, then these behaviors will likely not be adopted[10]. Qualitative studies assessing fatalistic beliefs and their effect on health behaviors among Hispanic adults have had varied results[8,9]. One such study found fatalistic beliefs to be a barrier to adopting positive self-care behaviors, namely dietary behaviors among Hispanic men, while another did not find fatalism to be a barrier to diabetes self-management[8,9].

Religiosity is related to fatalism, but is a distinct construct. Religiosity is the belief in a diety who exercises control over all human life[11]. In past years, researchers have described religiosity broadly including an individual's religious beliefs, relationships within the church, and devout practices. However, recent definitions of religiosity have focused on religious practices, and do not account for the element of spirituality or the interplay between religion and fatalism[12]. Religion is a central part of Hispanic culture with 55% of Hispanics identifying as Roman Catholic, 22% identifying as Protestant, and only 18% identifying as non-believers[13]. Religion plays a complex role in an individual's life and may promote a healthier lifestyle through its prescriptions of healthy behaviors and proscriptions of unhealthy behaviors. Moreover, religion may positively affect health through social support systems found within a religious institution and by helping to develop a healthier attitude when handling daily struggles[14].

Religious engagement can affect health in direct and indirect manners. Examples of an indirect effect include religiosity serving as a coping mechanism in Type 2 diabetes management. A qualitative study among 43 Mexican-Americans with Type 2 diabetes found that a belief in God indirectly helped by lowering stress and anxiety[15]. Similarly, among Hispanic migrant workers with Type 2 diabetes, prayer was used as a source of comfort by incorporating prayer into their daily lives, using religious paraphernalia while praying, praying for their families and their own health, and reciting prayers specifically for their diabetes[16]. Religiosity has as well been seen to play a direct role in disease management among a sample of 104 Hispanics with 55% seeking help from their priest to control their diabetes; however, only 6% of participants stated that they turned to God before a doctor when facing diabetic problems[17].

Nevertheless, given the impact that fatalism and religiosity have in determining health outcomes and disease management behaviors, in both indirect and direct manners, among Hispanic populations, the present study aims to describe the roles both of these beliefs play in diabetes care management among newly, currently, and long-term enrolled Mexican-American participants of a Type 2 diabetes chronic care management program. Previous studies qualitatively assessing the effects of fatalistic beliefs on diabetes management have had inconsistent results. Those assessing the effect of religiosity have explored this relationship separately of fatalism.

METHODS

Participant Selection

The study population includes participants enrolled in the chronic care management program for patients with Type 2 diabetes, *Salud y Vida*. The program is ongoing, has been operating in South Texas since 2012, and offered an opportunity to explore the relationship between fatalism, religiosity, and Type 2 diabetes management. *Salud y Vida* is a program, which includes Diabetes Self-Management Education (DSME) classes, and quarterly, home visits from a community health worker (*promotora*). Inclusion criteria for participants of the *Salud y Vida* program include being over 18 years of age, having uncontrolled diabetes (HbA1c over 8.0%), and residing within the Regional Healthcare Partnership region 5. Exclusion criteria include having a history of violent behavior, history of substance abuse, currently receiving dialysis, currently a cancer patient, having open chronic wounds, having untreated bipolar or personality disorders, or are currently pregnant.

To understand the manner in which fatalism and religiosity play a role in facilitating or hindering diabetes self-care accounting for *Salud y Vida* program completion, the participant

sample was stratified by newly, currently, and long-term enrolled participants. Newly enrolled is defined as having been an active participant in the program for 45 days or less, or not having had a first *promotora* home visit, or not having attended the Diabetes Self-Management Education (DSME) class. Currently enrolled participants are those who have been active in the program for 46-352 days. Long-term enrolled participants are those enrolled and still receiving program services for 353 days or more. Stratification method was employed to allow for the observation of the effect of *Salud y Vida* intervention elements, if any, on fatalistic beliefs or religiosity among participants of varying program completion levels.

Study Measures

Qualitative methods were utilized and semi-structured interviews were conducted with each participant in their preferred language (English or Spanish)[18-20]. Questions addressed participants' personal religious beliefs; lifetime religiosity; perceived effect of religiosity and fatalistic beliefs on diabetes management; diabetes etiology; use of religious and folk practices for Type 2 diabetes management; and appropriateness of discussing such topics with health care practitioners. Interview questions can be found in Table 1. Egede's work exploring fatalism among an African-American population was used as a framework to develop the interview guide[18]. A qualitative study implementing in-depth interviews with Iranian patients with Type 2 diabetes looking at religiosity and the empowerment process and semi-structured focus group questions utilized with a Hispanic population in the context of cancer fatalism were also utilized to inform the development of this guide[19,20]. Questions were tailored to a Hispanic population to ensure they were at the appropriate literacy level, and addressed culturally relevant elements of religiosity and fatalism within Hispanic culture, such as folk medicine beliefs and practices. The present study was reviewed and approved by the XXXXXXXXXX XX XXXXX XXXXXX

51

XXXXXXX XXXXXX XX XXXXXXX, XXXXXX XX XXXXXX XXXXXX Institutional Review Board.

Data Analysis

A single, trained interviewer who was bilingual (English/Spanish) conducted one-on-one interviews. Each interview was audio-recorded and transcribed. Spanish language interviews were translated for the purpose of dissemination of results. Transcriptions were analyzed using Atlas.ti 8, and coded by themes using a phenomenological approach. Excerpts were selected from transcripts to elaborate on identified themes. Codes and excerpts underwent additional review by a secondary reviewer to ensure appropriateness in describing themes, and to reach a consensus in generating one list of themes. Occurrences of themes by level of engagement and gender were observed. Authors noted the count of the occurrence of identified themes by engagement levels and gender. Disproportionality in the occurrence of themes was determined if a difference by at least two respondents expressing the belief was noted between groups.

RESULTS

Interviews were conducted with 15 individuals between May to June, 2017. An equal number of respondents represented each level of engagement (5 newly, 5 currently, and 5 long-term enrolled). Average length of interviews was 24 minutes 59 seconds (range:13 mins 10secs to 42mins 12 secs). Sample was primarily female (73.3%), Spanish-speaking (66.7%), and average age was 51.7 years old. Demographics by level of engagement can be found on Table 2. Major themes related to fatalism and religiosity and disease management included: (1) perceived autonomy over diabetes prognosis, (2) motivators for self-care, (3) discussions of personal beliefs in the healthcare setting; and (4) the role of the church in diabetes management. A

complete list of themes, sub-themes, and their occurrence by gender and level of engagement can be found in Table 3. Figure 1 shows the network view of themes and sub-themes.

Perceived Autonomy over Diabetes Prognosis

Participants expressed a complex understanding of the interplay between human and divine will in the determination of diabetes and resultant complications. Differing understandings of fate varied between attributing a person's health to human will, divine will, or a combination of the two. A variation of these beliefs presented by participants was the belief that one's health is dependent on the level of intensity of their religious faith, and others expressed uncertainty in identifying who or what decides a person's fate. Female newly and long-term enrolled participants expressed an exclusive human autonomy over health while none of the currently enrolled or male participants expressed this belief.

Both genders and all engagement levels (newly, currently and long-term enrolled) expressed feeling their diabetes prognosis was divine will. One female, current participant shared, *"With diabetes we can make all the healthy changes but if our destiny is to die of diabetes then we will die of diabetes."* This Type of perception can make an individual feel powerless when managing their illness, and may result in poorer self-care behaviors. Another female, currently enrolled participant stated, "*God has given me life, and he will take it when he wants…That is my belief, and my faith in God*". Although this participant showed resolve and peace in her faith, these beliefs can hinder an individual from seeking to adopt healthy behaviors.

In the same manner, both genders and all engagement levels expressed a joint locus of control of health between man and God. "*I do think God has a play in someone's destiny. But there [are] still things we can do to change our destiny. If we make changes in our life to help our health then we can change our destiny.*" All participants expressing this belief felt that

53

although their fate was the will of a higher power, their own will as well played a role in their health management. Moreover, participants with a viewpoint of a joint locus of control seemed to be able to mitigate feelings of anxiety about self-management, and seemed to be optimistic about their disease management.

A variation of these perspectives of divine control and joint locus of control is the belief that one's fate is determined by one's commitment to God, level of faith, piety, or righteousness. This belief was only shared by male and female newly enrolled participants. One female, newly enrolled participant shared, "*If we believe in God, we will have good health. Also, if we do good, then we will have everything.*" Although this participant expressed optimism in the notion that God rewards devout faith and good behavior, beliefs such as this can translate into a person feeling religious guilt or accepting diabetes complications as divine punishment. These beliefs can place the focus on a person's faith rather than on their self-care behaviors when thinking about their health. Beliefs similar to these arose when exploring Type 2 diabetes etiology with one individual who blamed the development of Type 2 diabetes among his siblings as a punishment for their sins, but understood his own diabetes development as a result of negative dietary behavior as he was a devout Catholic.

On the other hand, both female and male newly and currently enrolled participants shared uncertainty in fully understanding the existence or determination of fate. No long-term enrolled participants shared this belief. A currently enrolled, female participant shared: "*At times I believe in fate and at times I don't. I feel I am just really at the wrong place at the wrong time. I feel it may be coincidence.*" However, those expressing uncertainty all noted a combination of human and divine will. This same female, currently enrolled participant later stated, "*I think God*

is responsible for our destiny. I think we can change our future though, because future is a bit different… I think".

When looking at differences by levels of engagement and gender, a larger proportion of long-term enrolled participants attributed health outcomes to a higher power with three of the five sharing that belief versus only one newly enrolled and one currently enrolled participant. All of the men in the current sample identified God or a combination of God and humans in control of their health, rather than attributing health to human will only.

Motivators for Self-Care

Identified motivators for self-care included religious messages, prayer, and internal motivation. Female and male participants at all engagement levels expressed that their religious engagement helped support positive health behaviors through scriptures that proscribed caring for one's physical health. One male, long-term enrolled participant shared: "*I mean the reason I am taking care of myself is because I have a love for my heavenly father. It is because I take care of myself that I can go out and do his will.*" Participants expressing this belief viewed their diabetes management positively, and in accordance with their faith.

Again, male and female participants at all engagement levels expressed that prayer was a coping mechanism and a source of support when overcoming barriers to engaging in positive health behaviors. A female, currently enrolled participant said, "*We just pray for his help to get better. Sometimes [prayer] does not heal the body, but it heals the mind*". Participants mainly mentioned prayer and their relationship with God as a form of inspiration to engage in healthy self-care behaviors. This same participant later shared that having courage and support makes managing her diabetes "*not so bad*". Although participants identified prayer a resource in their

diabetes management, none of the participants stated that they would use prayer in lieu of medical care.

Although participants of both genders and all levels of engagement expressed a connection between religiosity and health behaviors, all but one long-term enrolled participant and all but one male respondent shared this belief. Moreover, participants who expressed beliefs in some kind of divine control over their health identified religious messages or prayer to be positive influencers in their motivation for self-care.

However, there were male and female participants at all engagement levels who saw no connection with religiosity and health behaviors, but rather drew from secularly driven, self-motivation to engage in positive health behavior. A female, long-term enrolled participant shared: "*Religion does not affect my Type 2 management at all. I don't drink or smoke, but it is not because of my religion. I would still not do it even if I didn't go to church. I have not heard any religious messages about health either.*" Participants who did not use prayer for health reasons did not express negative viewpoints of the church nor did they identify barriers to self-care that differed from participants who drew motivation from their religiosity. In the same light, none of the participants expressed that any religious messages or time spent in prayer were contraindicative or a barrier to self-care. There was no disproportionately noted in the occurrence of the belief that there was no connection between religiosity and health behaviors across groups.

Barriers to Discussing Personal Beliefs in the Healthcare Setting

Barriers to discussing fatalistic and/or religious beliefs with physicians noted by participants were differences in religious beliefs, lack of time during a medical consultation, lack of comfort in discussing such beliefs in that setting, and lack of knowledge on the subject on behalf of the physician. Male and female newly and currently enrolled participants expressed

differences in religious beliefs as a barrier. A male, newly enrolled participant described

discussing religious beliefs with a physician of a different religion comparable to the same level

of discomfort as discussing politics with someone of the opposing party. "*I don't think I would*

ask a doctor on that part. He could bear a different religion than I have. It's like with different

politics in democrat or republican." This sentiment could reflect a perception of lack of cultural

competence on behalf of the physician. One newly enrolled female participant shared a sentiment

reflecting that perception and the barrier of insufficient time for these discussions during their

physician visit.

"*I don't think the doctor should ask about that stuff [religiosity]. The nurse should be the*

one to ask. The nurse should explain things to the patients. The nurse will give us a

correct answer. She is there with the doctor and she can ask the doctor for information

that will help us. The doctors are always in a hurry and sometimes we don't even

understand them." (Female, newly enrolled participant).

Participants of both genders and all engagement levels felt that physicians did not have

knowledge in the subjects of religion and spirituality.

"*They don't have expertise. He is there to help me out physically… not as much*

emotionally or tell me about different religions and things like that. That comes from

someone else like a clergy person, or priest, or others that are involved in that."

(Male, newly enrolled participant).

Participants sharing these viewpoints all referenced their doctors as males, and mentioned

a distinct disconnect between their physician and their personal beliefs. None of the participants

spoke of their physician in a negative way; however, feelings of disconnect such as this may be

due to participants not having experienced a physician inquire about their personal beliefs in this context.

There were patients, however, of both genders and all engagement levels that felt it would be beneficial to discuss religious or fatalistic beliefs with health practitioners. One female, currently enrolled participant stated, "*I wish more doctors would pray. I think it would put a lot of people at ease.*" Participants believing a medical consultation was an appropriate setting for these discussions appeared to want "more" of their consultations. A female, currently enrolled participant shared, "*I think it would be good to talk to a doctor about this stuff. It would make the approach feel more 'human', and it would be more beneficial. At times people feel inundated with problems concerning their disease…*" These participants may be feeling over-burdened by their self-management regimen, or may be worried about the prognosis of their disease.

When observing differences by gender and engagement level, none of the males or long-term enrolled participants cited lack of time as a barrier. Long-term enrolled participants as well did not reference differences in religious beliefs, or feelings of discomfort as barriers to these discussions. Individuals who expressed religious beliefs and practices playing a role in their understanding and management of diabetes felt discussing these beliefs with their physician would be beneficial. However, they felt that their physicians may not have the expertise needed to engage in these discussions.

Role of the Church in Diabetes Management

Male and female current and long-term enrolled participants expressed that church members were a source of emotional support in dealing with their diabetes. Currently enrolled female participants mentioned meeting groups that focused on mental or physical health that were a great resource in coping with their disease. "*So every Wednesday at 7 o'clock we have a*

group of friends…we have the rosary and then we get together like a therapy group…We discuss our problems. It is a therapy session for me." Only one female, long-term enrolled participant stated that her church had health resources and shared the ways in which their pastor addressed the importance of health during this lectures. "*At the church that I go to they do give classes on health and they do talk about health*. [The pastor] *gives sermons on health. He talks to us about how we need to take care of our health and eat a healthy diet to care for our illnesses and to prevent them.*"

None of the participants, noting any type of support or advice offered through the church, utilized these resources in lieu of medical care. Neither did any participant state that any information or advice given within the church setting was contradictory to the advice given to them by medical professionals. These resources were used as supplemental to their medical care, and seemed to either reinforce medical advice or were used as a coping agent.

Male and female newly and currently enrolled participants pointed to intercessory prayer by faith leaders and members of the congregation. A male, newly enrolled participant shared "*I am very fortunate that the pastors at my church…will go to your house and pray for you. When they have an alter call you can go and ask that you need strength or wisdom on your diabetes…*" Among this sample, those who engaged in intercessory prayer for others or were on the receiving end of intercessory prayer attributed emotional and social benefits to prayer.

On the other hand, one female, long-term enrolled participant and one male, newly enrolled participant did not feel that the church was the appropriate environment to discuss their diabetes care or management. The male participant shared, "*I think it just makes me uncomfortable because a church is [a] place to go in and praise God …I don't think people want to hear about your diabetic problem. In this region…there is so much diabetes that it is not even*

59

an interesting topic anymore." This individual spoke fondly of his church, and seemed to benefit from prayer by church leaders. However, this individual did not feel comfortable talking about his struggles with church members. Responses for this theme did not vary by gender; however, none of the newly enrolled participants felt that the church played a role in their self-management other than through intercessory prayer. As expected, again, those expressing beliefs in divine control over health and drawing motivation for self-care from religion as well drew support for their diabetes management from the church. Furthermore, even though those who drew support from their church felt it would be beneficial to discuss these beliefs with a physician, they felt more comfortable doing so with church clergy or members.

DISCUSSION

Study findings exhibit a complex interplay of religiosity and fatalistic beliefs in an individual's comprehension of their disease and the way they approach its management. Among this sample, long-term enrolled participants and males were more fatalistic and believed religious beliefs and practices played a role in their diabetes management. Previous research examining diabetes management among African-American and Hispanic populations have found perceived autonomy over disease outcomes to be a barrier for both men and women[21-23].

Beliefs in a divine will over health have been noted among non-Hispanic white and African-American populations; however, these fatalistic beliefs were associated with higher HbA1c values, and poorer diet, exercise, and blood sugar monitoring behaviors[24]. Similarly, among Jewish patients with Type 2 diabetes there was an association between diabetes fatalism and a higher HbA1c; however, this relationship disappeared after controlling for religiosity[25]. Seeing that long-term participants, who have remained in the program due to not lowering their HbA1c to a point where they can be discharged, expressed these viewpoints, it is important to

60

note the role these beliefs play in self-care and their connections to distress in managing the disease. On the other hand, feelings of either joint human and divine autonomy or exclusive human autonomy over one's self-management, such as were noted among participants in all engagement levels and genders, can result in better adherence to self-care behaviors[26].

Looking at motivators for self-care, the link between religiosity and health behaviors through the prescriptive and proscriptive nature of religious messages is noted in a variety of religions[14]. Participants sharing this viewpoint had a positive outlook on their self-care, which suggests that religious beliefs and teachings may be an important resource to overcome fatalistic beliefs. The use of prayer over health has been observed in previous research among Hispanic populations[16,27]. A national survey among American adults assessing prayer and spiritual practices, 49.5% of Hispanic adults reported the utilization of prayer for their personal health and the health of others[27]. A qualitative study among Hispanic farmworkers as well found prayer utilized for safety, comfort, and diabetes healing and management[16]. Findings of these studies and the present study suggest that religious beliefs and practices, namely prayer, may be an ancillary agent to addressing methods and strategies to improving blood glucose management among Hispanic populations.

Although participants listed barriers to discussing fatalistic and religious beliefs with their physicians, participants across all engagement levels and genders expressed a desire to openly discuss these beliefs in the context of their diabetes management. However, given that participants felt that physicians may not have the time or expertise to address these beliefs, it may be more suitable for these beliefs to be addressed by other health professionals, such as nurses or health educators. Moreover, it is important that in order for these discussions to be implemented that a strong interpersonal relationship be developed, and that providers approach

these discussions in a culturally sensitive manner. A focus group conducted with women coping with breast cancer found that discussions regarding religiosity were only appropriate in instances where this type of interpersonal relationship existed[28]. Participants expressing an unwillingness to take up time within their medical consultation to discuss these beliefs is similar to the findings of a cross-sectional study among out-patient medical clinics in that only 10% of the surveyed sample were willing to trade off time during their consultation to discuss religious beliefs[29] Nonetheless, discussions of these beliefs with a physician or other health professional are associated with higher patient satisfaction[30].

Participants' beliefs concerning the church's role in addressing Type 2 diabetes as well reflect a desire for interpersonal connections in the context of health, and exhibit the benefit of faith-based or faith-placed health interventions. Studies have shown that social and emotional support in the church setting may be protective of health and even more of a significant predictor of health than intrinsic religiosity[31,32]. More importantly, health messages delivered within the church setting may be the bridge needed for individuals needed to address their physical health as these messages are being delivered in a familiar setting by a trusted individual[33]. Studies assessing the effects and/or benefits of intercessory prayer have shown mixed results[34,35]. Nevertheless, intercessory prayer has been noted as a coping mechanism among minority populations[36,37].

Exploration of both religiosity and fatalism among participants is a strength of the present study. Although distinct, fatalism and religiosity are intertwined for some in their understanding of their health and wellness. Another strength of the current study is the representation of varying levels of engagement in the *Salud y Vida* program. This diverse representation allowed for the observation in differing themes by these groups. Limitations of the study are that all of the

participants had uncontrolled diabetes; thus, viewpoints of individuals who are effectively managing their diabetes are not reflected. Another limitation is that stratification did not account for the number of years an individual had Type 2 diabetes. Although gender differences were observed, stratification methods did not account for gender either.

IMPLICATIONS FOR DIABETES EDUCATORS

Study findings underscore a need to address fatalism and religiosity in discussions within intervention programs addressing diabetes self-management behaviors. Discussions of these beliefs in a more familiar setting, such as a diabetes management class, with a community health worker, or a nurse in the clinic setting may overcome barriers identified to discussing fatalism and religiosity with a physician. Campos[38] provides a variety of beliefs, such as *fatalismo*, that were noted among this sample and should be accounted and/or addressed when providing treatment for Hispanic patients with Type 2 diabetes. Other concepts listed are *personalismo*, which pertains to the need for a perceived warm, personal patient-provider relationship, and *respecto*, which refers to respect offered based on social standing, age, and/or gender. Although Campos discusses these concepts through the lens of a physician and patient relationship, findings of this study suggest a need to address these beliefs in alternative manners in the healthcare setting or with a member of the clergy[38].

Findings as well suggest a need for assessment of religious beliefs prior to consultation or treatment among this population. Lujan and Campbell[39] note the importance of assessing such beliefs to ensure practitioners provide holistic treatment and education. In assessing religious beliefs, it is also important to note one's own biases and beliefs to provide objective treatment. These assessments provide educators with the understanding to identify barriers to self-care

management behaviors and appropriate opportunities to refer to faith leaders in the patient's treatment if necessary[39].

Discussions surrounding fatalistic beliefs among this sample point to a generally positive outlook on self-agency in diabetes management. Additionally, many participants drew positive support from their church and religious teachings and practices for their self-care. Although fatalistic beliefs are negatively associated with social and psychological well-being among Hispanics, they are positively associated with general well-being in this population[40]. Seeing the complex understandings participants expressed of fate and its role in diabetes management, it is important to address these beliefs in diabetes education to increase patient self-efficacy in management care behaviors. While this study demonstrated new understanding in the manner in which fatalistic and religiosity beliefs may play a role in an individual's understanding and management of Type 2 diabetes, future research should explore this relationship while controlling for other demographic factors, such as health literacy levels, acculturation, and length of time coping with Type 2 diabetes.

Table 1: Interview Guide

Introduction
1. Please describe things that are important in your daily life. For example, this can include your family, work, your church, or a hobby.
Religiosity
2. Please describe any importance, if at all, that religion and/or your faith has in your daily life? Probe: In what ways do you engage in your religious beliefs in your daily life? For example, attending church, prayer, confessions, volunteering with your church, or any other church activity.
3. How has the role religion plays in your life changed from when you were a child to when you were an adult? If the role that religion played has changed please describe how it has changed. Probe: Describe differences in religious practices from when you were a child and now as an adult. For example, religious denomination, church attendance, prayer, confessions, or any other church activity. Probe: What prompted these changes? (if applicable).
4. For some people their religious beliefs could influence their choices about health, which could include what they eat, drink, or choosing to take certain medications. For other people it does not influence them at all. In what way, if at all, would you say that your religious beliefs influence your Type 2 diabetes management? Probe: Describe any religious messages or themes that encourage healthy lifestyles and any influence those messages have on your health choices.
Fatalism
5. Fate is described as the occurrence of events beyond a person's control, and is regarded as determined by a supernatural higher power, which may or may not include religious beliefs. Describe your beliefs in regard to fate. Describe your beliefs about fate in relation with Type 2 diabetes? Probe: Who or what is responsible for a person's fate? Is there anything someone can do to change their fate?
Type 2 Diabetes Etiology
6. Some people believe there are different ways that someone could get diabetes. Some beliefs include an intense fear known as "susto," a curse from someone else, a person's diet, or that it was inherited. I am very interested in these broad range of the beliefs. Please describe your beliefs as to how a person develops Type 2 diabetes. Describe your beliefs in regard to the role God plays in a person developing diabetes and the outcomes of the disease.
Diabetes Management Behaviors
7. Describe any religious practices (such as prayer) or cultural practices (such as herbal medicine, ointments, teas or pills) that you use as a method to help with your Type 2 diabetes management. Probe: Describe how you think prayer can or cannot help a person manage their diabetes.

8. Healthy behaviors as you know include taking your medication, eating healthy, checking your blood sugar every day, attending your doctor's visits, and engaging in physical activity. Describe the role your church leaders or fellow members of your church play in your diabetes management behavior? Probe: Is there something about the church environment that makes this comfortable or uncomfortable? Probe: Does your faith leader or other members of the church visit the sick to pray over them or offers words of support?
Religious Beliefs in the Health Setting
9. What benefit, if any, is there in discussing religious beliefs or practices with your doctor, nutritionist, nurse, or any other health professional? Are there negative things that can come from this discussion? Probe: What makes it comfortable or uncomfortable for you to talk about these things with your doctor?

Table 2: Demographics by Levels of Engagement

Demographic Factor	Newly Enrolled	Currently Enrolled	Long-Term Enrolled
Gender			
Male	2	0	2
Female	3	5	4
Language Preference	2	1	2
English Spanish	3	4	3
Average Age (years)	49.2	56.4	49.4

Table 3: Themes Related to the Role of Religiosity and Fatalism in Type 2 Diabetes Management

Theme/ Sub-Theme	Newly Enrolled	Currently Enrolled	Long-Term Enrolled	Male	Female
Perceived Autonomy over Diabetes Prognosis					
• **Human autonomy**	X		X		X
• **Divine Will**	X	X	X	X	X
• **Human and divine control**	X	X	X	X	X
• **Fate determined by faith in God**	X			X	X
• **Uncertainty in whom or what determines fate**	X	X		X	X
Motivators for Self-Care					
• **Religious messages**	X	X	X	X	X
• **Internal Motivation**	X	X	X	X	X
• **Prayer**	X	X	X	X	X
Discussions of personal beliefs in the healthcare setting					
• **Physician/Patient Difference in Religious Beliefs**	X	X		X	X
• **Physician Lack of time**	X	X			X
• **Uncomfortable for Patient**	X	X		X	X
• **Physician Lack of Knowledge in Religiosity/Spirituality**	X	X	X	X	X
• **Perceived Benefit**	X	X	X	X	X
Role of the church in diabetes management					
• **Emotional support**		X	X	X	X
• **Church health resources**			X		X
• **Prayer from clergy/church members**	X	X		X	X
• **Inappropriate environment**	X		X	X	X

Figure 1: Theme Network by Level of Engagement
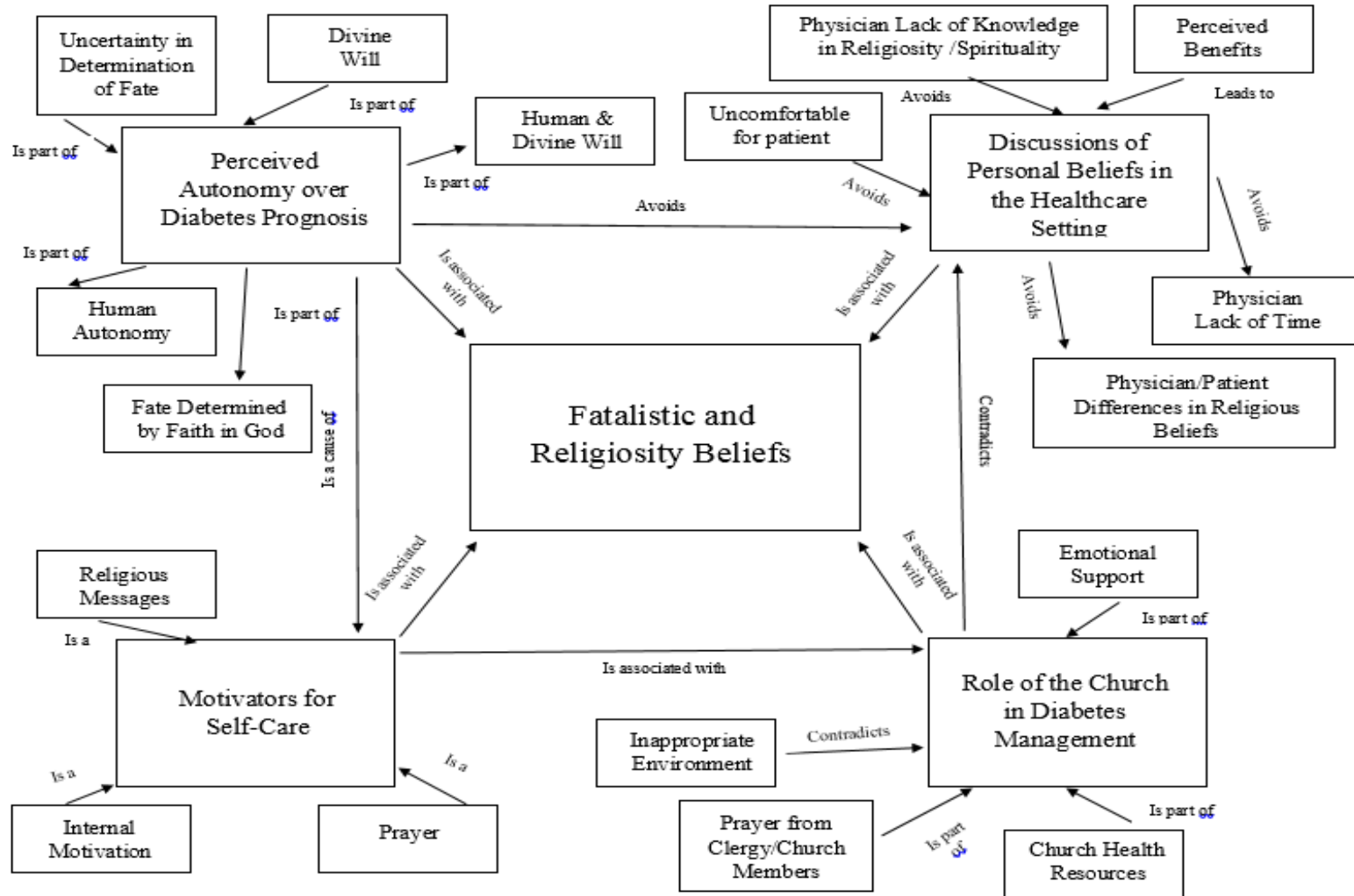
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Journal article (Fatalistic and Religiosity Beliefs Among a Mexican-American Sample of a Chronic Care Management Program for Patients with Type 2 Diabetes)

Name of Journal Proposed for Article Submission (Journal of General Internal Medicine)

Fatalism/Religiosity among Hispanic T2D Participants

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Article Word Count: 2613

Abstract Word Count: 227

ABSTRACT

Background: Rates of Type 2 diabetes disproportionately affect Mexican-American adults. Socioeconomic and cultural factors, including religiosity and fatalistic beliefs, play a role in diabetes management among this population.

Objective: To determine the relationship between fatalistic beliefs and lifetime religiosity with Type 2 diabetes management as measured by HbA1c and blood glucose monitoringbehavior. These relationships will be examined while taking into consideration covariates such as gender, age, education, comorbidities, blood pressure, BMI, and waist/hip circumference.

Design: Cross-sectional

Participants: Sample is comprised of adult Mexican-American participants who are enrolled in a chronic care management program, *Salud y Vida*, for individuals with uncontrolled Type 2 diabetes.

Main Measures: At baseline, enrolled program participants were administered the Diabetes Fatalism Scale and a sub-scale of the National Comorbidity Study-Replication (NCS-R) relating to lifetime religiosity

Key Results: Linear regressions models revealed that higher levels of diabetes fatalism and emotional distress were associated with poorer HbA1C control. However, logistic regression models did not show diabetes fatalism and religiosity to be significantly associated with blood glucose monitoring behaviors.

Conclusions: While the overall fatalism and emotional distress subscales were significantly associated with HbA1c values, the relationships were not clinically significant. Fatalism nor religiosity were seen to have a significant effect on blood glucose monitoring behavior. Further longitudinal research is needed to examine this relationship to observe changes in HbA1c and blood glucose monitoring behaviors in response to a chronic disease management program while controlling for fatalistic and religiosity beliefs.

INTRODUCTION

The United States (U.S.) Hispanic population comprises approximately 17% of the total U.S. population making it the nation's largest ethnic/racial minority[1]. Unfortunately, the U.S. Hispanic population is laden with health disparities due in part to economical, educational, and lingual disadvantages[2-6]. Hispanics have the highest rates of uninsured adults with nearly a third lacking health insurance when compared to non-Hispanic whites, and other racial/ethnic minorities[2]. In addition, Hispanics have higher rates of certain diseases and illnesses as compared to national averages[3]. One such disease is type 2 diabetes with the rate among Hispanics (11.8%) coming second only to that of African-Americans (12.6%). Among Hispanic subgroups, 7.6% of Cubans, 7.6% of Central and South Americans, 13.3% of Mexican-Americans, and 13.8% of Puerto Ricans have diagnosed type 2 diabetes[4]. When comparing rates of diagnosed diabetes among this population against the rates of non-Hispanic white adults, rates are 66% higher among Hispanics. Among Hispanic subgroups the rates of type 2 diabetes are 87% higher among Mexican-Americans and 94% higher for Puerto Ricans when compared to non-Hispanic whites[4].

Socioecological factors affecting type 2 diabetes management include patient-provider communication, education, personal factors, provider issues and support[7,8]. Among Hispanics socioeconomic and cultural factors play a role; some of the largest barriers include language, cost of medications, and access to health care and other goods[9]. Results of the National Health and Nutrition Examination Survey (2007-2010) showed that only 47.3% of Hispanics with type 2 diabetes achieved HbA1c values below the recommended cutpoint of 7.0%, compared to 52.9% of non-Hispanic whites. The rate was even lower among Mexican-Americans (43.5%)[10].

Religiosity, a central part of Hispanic culture, plays a role in diabetes management[11]. Estimates of Hispanic religiosity are consistently over 80%, with Catholicism being the most prevalent religious preference[12,13]. Data from the Mexican Health and Aging Study (2003) reveal that although a direct relationship between health and religiosity was not found, religiosity was associated with positive self-care and glycemic control behaviors among older Mexicans with diabetes[14]. Similarly, church attendance among Latinas has been noted to be positively associated with positive nutritional and physical activity behaviors[15].

Similar to religiosity, fatalism has been associated with behaviors directly and indirectly related with diabetes. A study looking at religiosity, fatalism and depression found that among Hispanic adults with type 2 diabetes there was an indirect relationship between increased depression and increased fatalism that was attributed to a direct relationship between diabetes distress and depression[16]. Among Mexican women, fatalistic beliefs have been found to be connected with cardiometabolic dysfunction after controlling for socioeconomic status[17]. Moreover, findings of the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study (2008-2011) found higher fatalism to be associated with an increased odds of hypertension. Study findings suggest the association of fatalism with hypertension may be due largely to its association with SES, acculturation, or related health conditions[18]. Fatalism and type 2 diabetes among Hispanics have not been studied extensively. However, among an African-American population, diabetes fatalism was associated with poorer medication adherence, self-care, diabetes knowledge, exercise habits, diet, and blood sugar testing[19].

In consideration of these findings, the present study aims to further explore the role fatalism and religiosity play among a South Texas Hispanic population with uncontrolled diabetes. Prior research noting a relationship between one or both of these constructs and

76

diabetes management behaviors is limited among Hispanic populations, or has found this relationship among other racial minority groups. The present study aims to determine the relationship between fatalistic beliefs and religiosity across the lifespan and type 2 diabetes management as measured by HbA1c status, and blood glucose monitoring behaviors. These relationships will be determined independently and while controlling for covariates such as gender, age, education, comorbidities, blood pressure, and BMI.

METHODS

Study Population

Study population is a convenience sample of newly enrolled participants of the *Salud y Vida* program, a chronic care management program. *Salud y Vida* utilizes a culturally appropriate approach to reach primarily low income, uninsured, Spanish language participants with an adaptation of the Wagner Chronic Care Model[20]. Partnering clinics refer potential participants to the *Salud y Vida* program. The purpose of the program is to provide patients with type 2 diabetes with the education and support needed to improve their diabetes management behaviors. The present study examines participants' baseline data collected during enrollment in the program. Inclusion criteria for participants include: over 18 years of age, have uncontrolled diabetes (HbA1c >8.0%), and reside within Regional Healthcare Partnership Region 5. Exclusion criteria include: history of violent behavior, history of substance abuse, dialysis patient, cancer patient, have open chronic wounds, untreated bipolar or personality disorders, or are pregnant. The study was approved by the XXXXXXXXXX XX XXXXX XXXXXX XXXXXXX XXXXXX XX XXXXXXX, XXXXXX XX XXXXXX XXXXXX Institutional Review Board.

Study Measures

Religiosity. Lifetime religiosity[21] was assessed using a subscale from the National Comorbidity Study-Replication (NCS-R). The NCS-R is a nationally representative survey of American adults between 2001 and 2003 that collected data on a range of psychiatric and substance abuse disorders using the World Health Organization Composite International Diagnostic Interview (WHO-CIDI) instrument. The NCS-R subscale is comprised of four items. Two items assessed religious salience during adulthood and childhood on a 4 point scale ranging from 1 ("Not at all important") to 4 ("Very Important"). For the present study, religious salience during childhood and adulthood were coded as dichotomous variables comparing those who expressed religion was "not at all important" or "unimportant" to those who expressed religion was "somewhat important" or "very important" at each respective life stage. A change score was calculated to determine what change, if any, there was in religious salience between childhood and adulthood. The change score was calculated by subtracting childhood religiosity from adulthood religiosity, and was categorized as an ordinal variable (e.g., no change, positive change, and negative change)[21].

Religious engagement was assessed by a single item, which was measured through the frequency of church attendance categorized as "More than once per week", "About once per week", "One to three times a month", Less than once a month", and "Never"[21]. Within the current analyses religious engagement was coded as a dichotomous variable comparing those who attended church at least once per week against those who attended less than once per week. Lastly, religious preference, was assessed and categorized as a dichotomous variable comparing "Protestant/Catholic" to "No preference" (including Agnostic, Atheist, and those reporting no religious preference/no religion).

Reliability and validity measures were not available for this subscale. Thus, for the purposes of this study, the scale was re-administered to 30 participants within three months of enrollment to determine the tool's reliability. The time interval was chosen to allow sufficient time to elapse between assessments such that participant responses at the second administration would not be affected by memory recall, but not too long after so that there was not a high potential for a change in the assessed construct[22]. Percent agreement per subscale item ranged from 60% to 93.3% demonstrating moderate to near perfect agreement; Spearman correlation coefficients range from .6307- .850 demonstrating moderate to high correlation.

Fatalism. The Diabetes Fatalism scale developed by Egede and others[23] was utilized to assess fatalism (scale score range: 12-72). The 12-item Diabetes Fatalism scale assesses Emotional Distress (5 items), Religious and Spiritual Coping (4 items), and Perceived Self-Efficacy (3 items). Scale items are measured on a unipolar, six-point Likert scale. Items relating to Religious and Spiritual Coping and Perceived Self-Efficacy are reverse-scored. A higher score on the Emotional Distress subscale would demonstrate a higher level of frustration and thus higher fatalism. A higher score on Religious and Spiritual Coping subscale would indicate decreased coping and thus higher fatalism. A higher score on the Perceived Self-Efficacy subscale would signify decreased self-efficacy and in turn higher fatalism. A higher score on the overall scale would as well denote a higher level of fatalism. Overall diabetes fatalism and diabetes fatalism sub-scale scores were treated as continuous variables in the present analysis. Among the current sample, the Diabetes Fatalism Scale was determined to have good reliability (Cronbach alpha = 0.790). The Emotional Distress (Cronbach alpha= 0.840), Perceived Self-Efficacy (Cronbach alpha= 0.801), and Religious and Spiritual Coping (Cronbach alpha= 0.807) subscales were found to have good reliability as well.

HbA1c and Blood Glucose Monitoring Behaviors. Glycemic control was assessed via Hemoglobin A1c measured at enrollment utilizing the TRUE Result ™ home test kit, and was analyzed as a continuous variable in the present analysis. Home-test Hemoglobin A1c kits have been found to be valid when utilized by both health care professionals (R^2=0.932) and patients themselves (R^2=0.925) when assessed by regression analyses to determine the correlation with these values and laboratory acquired values[24]. Blood glucose monitoring behavior was measured with a single item assessing frequency with which participants' measured their blood glucose daily. Blood glucose monitoring behavior was categorized as a dichotomous variable comparing those who tested their blood glucose levels at least once per day versus those who tested their blood glucose levels at a lesser frequency.

Statistical Methods

Descriptive statistics were computed to describe participant characteristics and frequencies of religiosity and fatalistic beliefs. Means and standard deviations were computed to describe continuous variables, while counts and percentages were computed for categorical variables. Spearman correlations explored the strength of the relationship between fatalistic beliefs and religiosity with HbA1c and blood glucose monitoring behaviors. Linear regression was used to model the unadjusted and adjusted relationships between diabetes fatalism and religiosity across the lifespan on HbA1c. The unadjusted and adjusted effects of diabetes fatalism and religiosity across the lifespan on blood sugar monitoring behavior were examined using logistic regression models. Adjusted models controlled for demographic factors and potential confounders including comorbidities, blood pressure, and BMI. All analyses were carried out using Stata v15.

RESULTS

Sample Characteristics. Participants (n=475) represented an under-served population with 68.1% of participants not having completed high school or a GED, and 92.9% not having health insurance. As stated previously, all participants had poor glycemic control (HbA1c=8.0 – 17.9), and 92.6% of participants were either overweight or obese. Most common comorbidities included high cholesterol (56.4%), high blood pressure (56.1%), neuropathy (25.0%), and retinopathy (24.5%). Participants demonstrated poor blood glucose monitoring behaviors with over three-fourths (76.1%) not checking their blood glucose at least once per day. Detailed participant characteristics can be found in Table 1.

Fatalistic Beliefs. Overall, participants reported a high level of Emotional Distress with diabetes; however, they also demonstrated a high level of Religious and Spiritual Coping and a moderate level of Perceived Self-Efficacy. The average Diabetes Fatalism score was 36.7 (SD=6.3), 88% reported a score between 27 and 45. The average Emotional Distress subscale score (range: 5-30) was 18.4 (SD=4.3) with 25.8% of participants expressing some level of agreement to all items on the subscale signifying frustration and distress relating to diabetes self-management. Conversely, 17.9% did not express agreement with any of the items of the subscale. The average Spiritual Coping subscale score (range: 4-24) was 17.1 (SD=3.4) with 62.2% of participants expressing some level of agreement with all subscale items signifying a presence of Religious and Spiritual Coping methods. The average Perceived Self-Efficacy subscale score (range: 3-18) was 13.6 (SD=2.5) with none of the participants expressing some level of agreement on all subscale items.

Lifetime Religiosity. Most participants (90%) reported a religious affiliation; 67.7% reported they were Catholic and 22.3% reported they were Protestant. Nearly two-fifths (39.9%) reported attending church at least once weekly. Participants did not report large changes in

religiosity between childhood and adulthood -- over three-fifths (65.6%) showed no change, 27.3% showed an increase in religiosity, and only 7.1% reported a decrease in religiosity between adulthood and childhood.

Tests of Correlation. Spearman's correlations are found in Tables 2 & 3. Overall Diabetes Fatalism (r=0.14; p < 0.010 and Emotional Distress (r=01.6, p< 0.01) were significantly associated with HbA1c. Diabetes fatalism nor any of the subscales were significantly associated with blood glucose monitoring behaviors. When assessing the relationship between religiosity and HbA1c and blood glucose monitoring behaviors, a significant association was found between church attendance and blood glucose monitoring (r=0.09, p<0.05). However, a significant association was not seen between religiosity and HbA1c. Religious salience as a child neared significance with HbA1c (p=0.10).

Linear Regression Model. Results from the linear regression model are found in Table 5. When conducting an unadjusted linear regression overall Diabetes Fatalism (β=0.03, 95% CI= 0.01-0.06, p-value≤0.05) and Emotional Distress (β=0.12, 95% CI=0.04-0.21, p-value≤0.05) had statistically significant positive associations with HbA1c at the .05 significance level. For every point increase in Diabetes Fatalism we can predict a 0.03 point increase in HbA1c. For every point increase in Emotional Distress we can predict a 0.12 increase in HbA1c. In addition, in the unadjusted models, Spiritual and Religious Coping (β=-0.15, 95% CI = -0.31, 0.02, p = 0.08) and religious salience as a child (β=-0.35, 95% CI = -0.76, 0.05, p = 0.08) both approached significance. The relationship between Spiritual and Religious Coping and HbA1c levels was inverse. Similarly, HbA1c levels were lower among those indicating that religion was not important during their childhood compared to those who indicated religion was very important.

However, when assessing the significance in the change in religiosity between childhood to adulthood, this association was not significant.

Sociodemographics (age, gender, and education), potential confounders (comorbidities, blood pressure, and BMI), fatalism and religiosity were controlled for in the adjusted models. Each adjusted model controlled for Diabetes Fatalism by including either the overall Diabetes Fatalism score or one of fatalism subscales. Adjusted Model 1 included the overall Diabetes Fatalism score, and the only association found to be statistically significant was Diabetes Fatalism (β= 0.04, 95% CI= 0.02, 0.07, p-value=<.01). Within Adjusted Model 2, only the Emotional Distress subscale (β=0.08, 95% CI= 0.04, 0.12, p-value=<0.001) was statistically significant. Adjusted model 3 did not find a statistically significant association between the Religious and Spiritual Coping subscale (β= -0.02, 95% CI= -0.07, 0.03, p-value=0.46) or religiosity and HbA1c (data not shown). Similarly, Adjusted model 4 did not find a statistically significant association with the Perceived Self-Efficacy subscale (β= -0.01, 95% CI= -0.08, 0.05, p-value=0.67) or religiosity (data not shown).

Logistic Regression Model. Results from the logistic regression model are found in Table 6. The unadjusted model did not show a statistically significant association between blood glucose monitoring behavior and any measures of fatalism or religiosity. The only association to near statistical significance was religious salience during adulthood (β=0.41, 95% CI= 0.14, 1.20, p-value=0.10). Within the adjusted model only overall Diabetes Fatalism and not the subscales were included. After adjusting for sociodemographics and potential confounders all associations remained insignificant.

DISCUSSION

Findings suggest that there is a significant association between fatalistic beliefs and HbA1c in that higher levels of Diabetes Fatalism were associated with poorer HbA1c control. However, religiosity did not prove to have a significant association with HbA1c. When assessing blood glucose monitoring behaviors, neither fatalistic beliefs nor religiosity had a significant association. Although most participants reported a religious affiliation and nearly two-fifths reported attending church at least once weekly, these beliefs were not significantly associated with either HbA1c or blood glucose monitoring behaviors when utilizing tests of correlation or multivariate regression methods. Although reliability analyses of the NCS-R lifetime religiosity subscale found the scale to have moderate to high correlation among participants of this sample, the subscale did not probe religiosity beliefs in the context of diabetes management directly as did the Diabetes Fatalism scale in relation to fatalistic beliefs and diabetes management. Potentially, if an instrument exploring religiosity in this manner were to be utilized with this population, similar associations might be observed as with Diabetes Fatalism and HbA1c.

Our findings suggest, however, that Diabetes Fatalism may be a significant predictor of poorer blood glucose management as measured by HbA1c, but this relationship may not be clinically significant[25]. Likewise, the Emotional Distress subscale was a significant predictor of poorer blood glucose management, but this relationship was as well not clinically significant. It is important to note, however, that the other two subscales did not result in a statically significant association with HbA1c. Further research should qualitatively explore this factor of Diabetes Fatalism in relation to blood glucose management among Hispanic populations to gain a better understanding of this relationship.

To our knowledge, the present study is the first study to utilize the Diabetes Fatalism Scale among a primarily Hispanic population. However, previous studies have found fatalistic beliefs to be associated with the development of cardiometabolic dysfunction and comorbidities related to type 2 diabetes among Hispanic adults[17, 18]. Moreover, Diabetes Fatalism has been found to be significantly associated with higher HbA1c and poorer self-care behaviors among African-American populations[19, 23].

The high prevalence of fatalistic beliefs found among the present sample is not unique to this population. Sample was comparable in their scores on the Diabetes Fatalism Scale to African-American populations for which the scale was first developed[23]. A distinctive feature of this population is their responses to the Perceived Self-Efficacy subscale. The subscale consisted of three questions and not one participant expressed any negative feelings of Perceived Self-Efficacy on any of the subscale items. Moreover, Diabetes Fatalism also has been noted to be have a significant association among African-American populations as well[19]. However, although previous studies have explored relationships between Diabetes Fatalism and self-care behaviors such as nutrition, physical activity, and foot care, they have not examined the relationship with blood glucose monitoring behaviors[19,26].

Study contributes to the literature surrounding Diabetes Fatalism among Hispanic populations, which has not been studied extensively to date. Prior research shows a link between religiosity and diabetes self-care behaviors[14-16]; however, the current study did not replicate this relationship when applying multivariate regression models and controlling for potential confounders. Although these other studies have found a positive relationship between religiosity, health behaviors, and resultant health outcomes, findings from the present study may be due to the fact that the entire sample had uncontrolled diabetes and 80.6% were uninsured. This lack of

diversity in the sample may not have allowed for the observation of the effect of religiosity on glycemic control or blood glucose monitoring. The nature in which religiosity was assessed in a broad manner and not in the context of diabetes management directly may have also contributed to the observation of null results. Nonetheless, there have been studies as well that have observed negative direct or indirect effects of religiosity on health[27-29]. Data from the 2001-2003 Mexican Health and Aging Survey showed that religious salience was not associated with diabetes screening[28], and religiosity was not seen to reduce stress among a sample of pregnant and post-partum Latinas[29].

Strengths of the current study are that both religiosity and fatalistic beliefs were assessed, which are distinct yet intertwined constructs posited to affect Type 2 diabetes management and health. Moreover, both religious salience and religious engagement were measured and the instrument used to measure religiosity accounted for change in religiosity over time. Another strength of the study is that the relationship of religiosity and fatalism was evaluated in relation to blood glucose management and blood glucose monitoring behavior. Limitations of the current study are that barriers to religious engagement were not assessed, such as transportation or familial opposition. These barriers may have been potential confounders in the relationship between religious engagement and diabetes management. Participant sample was a convenience sample presenting a threat of response bias, and did not allow for generalizability of results beyond the present study sample. Furthermore, all participants in the sample had a Hemoglobin A1c score indicating poor glycemic control and poor self-care behaviors. Nevertheless, the participant sample allowed for the evaluation of this relationship among a Hispanic, under-served population with uncontrolled Type 2 diabetes, specifically. Lastly, the present study was a cross-sectional study, and did not evaluate changes in blood glucose management or self-care

behaviors in relation to religiosity and fatalism. The present study design also does not allow for the establishment of causality among the observed factors.

Our research suggests the need to further evaluate this relationship among this population with the implementation of more rigorous study designs. Findings as well suggest the need for the development of instruments including diabetes specific measures of religiosity. The limitations of our sample suggest the need to explore the effects of diabetes fatalism and religiosity longitudinally. Moreover, findings suggest that other socioecological factors, such as education, income, and access to medications may have a more significant effect on HbA1c and blood glucose monitoring behaviors than fatalism and religiosity.

Table 1. Sample Characteristics (n=475)

Characteristic	N (%)
Age (years), mean (SD)	52.2 (10.93)
Ethnicity: Hispanic	99.2
Gender: female	66.7
Language: Spanish	72
Education[*]	
8th Grade or Less	50.1
Some High School	18
High School Graduate/GED	16.7
Some College	11.9
College Degree (BA/BS)	2.9
Insurance Status †	
Private	4.1
Government (Medicaid/Medicare)	12.3
Uninsured	80.6
DSME Class Total, mean (SD)	4.6 (4.1)
Hemoglobin A1c, mean (SD)	10.2 (1.7)
BMI[‡]	
Normal	7.4
Overweight	26.6
Obese	66
Blood Pressure: Normal[§]	29.4
Comorbidity	
0/1	32.1
2	23.3
3+	44.5
Blood Sugar Monitoring: Yes[‖]	23.9
Religious Preference: Catholic or Protestant	90
Church Attendance: ≥1x/week	39.9
Diabetes Fatalism (overall) , mean (SD)	36.7 (6.3)
Subscale 1: Emotional Distress, mean (SD)	18.4 (4.3)
Subscale 2: Religious & Spiritual Coping, mean (SD)	17.1 (3.4)
Subscale 3: Perceived Self-Efficacy, mean (SD)	13.6 (2.5)

[*]Data missing on 20 participants [†]Data missing on 11 participants
[‡]Data missing on 49 participants [§] Data missing on 75 participants
[‖] Data missing on 7 participants

Table 2. Correlations among Diabetes Fatalism and HbA1c, and Blood Sugar Monitoring Behaviors

Measure	r	P-value
Diabetes Fatalism (overall)		
HbA1c	0.14	<0.01
Blood Sugar Monitoring	-0.00	0.92
Subscale 1: Emotional Distress		
HbA1c	0.16	<0.0001
Blood Sugar Monitoring	0.01	0.8
Subscale 2: Religious and Spiritual Coping		
HbA1c	-0.05	0.29
Blood Sugar Monitoring	-0.01	0.76
Subscale 3: Perceived Self-Efficacy		
HbA1c	0.00	0.94
Blood Sugar Monitoring	-0.00	0.93

Table 3. Correlations among Religiosity, HbA1c, and Blood Sugar Monitoring Behaviors

Measure	r	P-value
Church Attendance		
HbA1c	-0.07	0.17
Blood Sugar Monitoring	0.09	<0.05
Religious Salience - Adult		
HbA1c	-0.03	0.51
Blood Sugar Monitoring	-0.03	0.54
Religious Salience- Child		
HbA1c	-0.08	0.1
Blood Sugar Monitoring	0.01	0.76
Change in Religiosity		
HbA1c	0.05	0.29
Blood Sugar Monitoring	-0.03	0.51

4. Linear Regression Model: Effect of Fatalistic and Religiosity Beliefs on HbA1c

	Unadjusted N=476			Adjusted Model #1[*] N=396			Adjusted Model #2* N=396		
	β	95% CI	P-value	β	95% CI	P-value	β	95% CI	P-value
Fatalism									
Diabetes Fatalism	0.03	0.01, 0.06	<.05	0.04	0.02, 0.07	.001	-	-	-
Subscale 1: Emotional Distress	0.12	0.04, 0.21	<.05	-	-	-	0.08	0.04, 0.12	<.001
Subscale 2: Spiritual and Religious Coping	-0.15	-0.31, 0.02	0.08	-	-	-	-	-	-
Subscale 3: Perceived Self-Efficacy	-0.58	-1.29, 0.13	0.11	-	-	-	-	-	-
Religiosity									
Religious Preference None/Atheist/Agnostic	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Catholic/Protestant	-0.22	-0.72, 0.28	0.38	-0.02	-0.56, 0.52	0.94	-0.08	-0.62, 0.46	0.77
Church Attendance Less than 1x/week	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
1x/week or more	-0.13	-0.44, 0.18	0.41	0.12	-0.23, 0.47	0.50	0.09	-0.25, 0.44	0.59
Religious Salience- Adult Not Important	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Important	-0.25	-1.14, 0.65	0.59	-0.10	-1.19, 0.98	0.85	-0.26	-1.33, 0.82	0.64
Religious Salience- Child Not Important	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Important	-0.35	-0.76, 0.05	0.08	-0.12	-0.73, 0.49	0.70	-0.12	-0.72, 0.49	0.71
Change in Religiosity Decrease	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
No Change	0.05	-0.56, 0.66	0.88	0.26	-0.50, 1.01	0.50	0.31	-0.44, 1.06	0.42
Increase	0.27	-0.38, 0.92	0.42	0.46	-0.45, 1.37	0.33	0.53	-0.37, 1.43	0.25
*Model adjusted for all other variables and age, gender, education, blood pressure, and BMI.									

5. Logistic Regression Models: Effect of Fatalistic and Religiosity Beliefs on Blood Glucose Monitoring

	Unadjusted N=476			Adjusted* N= 398		
	OR	95% CI	P-value	OR	95% CI	P-value
Fatalism						
Diabetes Fatalism	0.98	.95, 1.01	0.21	1.04	.99, 1.09	0.1
Subscale 1: Emotional Distress	0.98	.89, 1.09	0.75	-	-	-
Subscale 2: Spiritual and Religious Coping	1.07	.88, 1.30	0.49	-	-	-
Subscale 3: Perceived Self-Efficacy	1.2	.48, 3.02	0.7	-	-	-
Religiosity						
Religious Preference						
None/Atheist/Agnostic	Ref	Ref	Ref	Ref	Ref	Ref
Catholic/Protestant	1.41	.66, 3.00	0.38	1.32	.53, 3.27	0.55
Church Attendance						
Less than 1x/week	Ref	Ref	Ref	Ref	Ref	Ref
1x/week or more	1.07	.70, 1.65	0.74	0.99	.55, 1.78	0.97
Religious Salience- Adult						
Not Important	Ref	Ref	Ref	Ref	Ref	Ref
Important	0.41	.14, 1.20	0.1	0.73	.12, 4.48	0.73
Religious Salience- Child						
Not Important	Ref	Ref	Ref	Ref	Ref	Ref
Important	0.93	.54, 1.61	0.804	1.93	.72, 5.20	0.19
Change in Religiosity						
Decrease	Ref	Ref	Ref	Ref	Ref	Ref
No Change	0.71	.32, 1.55	0.39	0.56	.13, 2.36	0.43
Increase	0.82	.35, 1.89	0.64	0.78	.16, 3.86	0.76
*Model adjusted for all other variables and age, gender, education, blood pressure, and BMI.						

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Journal article (Evaluating the Effect of Fatalistic Beliefs and Lifetime Religiosity on Decreasing HbA1c Scores among Mexican-American Patients of a Type 2 Diabetes Chronic Care Management Program)

Name of Journal Proposed for Article Submission (General Hospital Psychiatry Journal)

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Mediation of fatalistic beliefs on the effects of a Chronic Care Management Program

Tables: 3

Figures: 0

Appendixes: 0

Article Word Count: 3,006

Abstract Word Count: 174

ABSTRACT

Objective: To determine the association between engagement in a chronic care management program and change in HbA1c score changes between baseline and three-month follow-up while controlling for fatalistic beliefs and lifetime religiosity.

Methods: Diabetes fatalism and lifetime religiosity were assessed at baseline for *Salud y Vida* program participants (n=348). HbA1c was assessed at baseline and three-month follow-up. Unadjusted and adjusted logistic regression models evaluated the association between *Salud y Vida* engagement, diabetes fatalism and lifetime religiosity and change in HbA1c at follow-up. Adjusted models adjusted for potential confounders including age, gender, preferred language and insurance status.

Results: Frequency of *Salud y Vida* engagement significantly increased the odds of a participant decreasing their HbA1c at three-month follow-up. Fatalistic beliefs and lifetime religiosity did not have a statistically significant association with change in HbA1c at follow-up.

Conclusion: Fatalism and religiosity did not play a significant role in change in HbA1c after engaging in a chronic care management program for three months. Further research should explore this relationship among a larger sample, and for a longer follow-up time.

Key words: fatalism, Type 2 diabetes, religiosity, Mexican-American

1. INTRODUCTION

An estimated 11.8% of Hispanics in the United States have Type 2 diabetes, and estimates among Mexican-Americans range from 13.3% to 18.1% compared to 7.1% of non-Hispanic whites[1,2]. Beyond these higher prevalence rates, Hispanics (24.4%) as well have the lowest prevalence of adequate blood glucose management (HbA1c < 7.0%) when compared to non-Hispanic whites (3.8.0%) and other racial/ethnic groups (26.1%-43.0%)[3]. Diabetes prevalence rates and lack of preventative health behaviors is even higher among Hispanics of South Texas[4]. Results of the Cameron County Hispanic Cohort (CCHC; n=2,856) collected between 2004 and 2014 found that 27.6% of the population had diabetes with 40% being previously undiagnosed. Additionally, 31.6% were found to have pre-diabetes[4]. Results of the CHCC from 2008-2011 showed that this population engaged in preventative health behaviors at a lower frequency when compared to national Behavioral Risk Factor Surveillance Survey (BRFSS) respondents (2009). Statistically significant lower proportions of CHCC respondents met physical activity guidelines (33% vs. 44%; p-value <.0001) and a lower proportion met fruit and vegetable guidelines (14.8% vs. 21.93%; p-value <.0001)[5].

Barriers to Type 2 diabetes management include race/ethnicity, sociocultural factors (language, folk medicine beliefs), marital status, religiosity, social support, economic factors, psychologic factors (including fatalism), the built environment, and availability of health education[6]. Nam and others identified similar factors and others such as medication adherence, negative outlook towards Type 2 diabetes prognosis and treatment, and presence of comorbidities[7]. Similarly, barriers to completing self-management programs or therapy include cultural, economic, and social factors as well as the built environment[8].

98

Fatalism has not been extensively studied in the context of Type 2 diabetes management among Hispanic populations; however, the limited research that has been conducted has found an association between diabetes fatalism and poorer glycemic control and negative diabetes management behaviors among various ethnic/racial populations[9-12]. Fatalism, an intricate construct, is often times understood or determined by an individual choosing to base their decisions on external of internal factors. However, fatalism is a much more complex balance of these beliefs that can have both a positive or negative effect on health[13]. Among a non-Hispanic white and black population, fatalism was significantly inversely correlated with self-care behaviors, diabetes knowledge, glycemic control, and perceived quality of life[9]. Walker and colleagues[10] examined diabetes fatalism among a predominantly African-American population and found that diabetes fatalism was significantly inversely associated with medication adherence, diabetes knowledge, exercise, diet, and blood glucose testing[10]. Among a Korean sample, perceived self-efficacy yielded a significant positive association with smoking, poor dietary habits, and drinking[12].

Religiosity is another social and cultural factor that plays a role in diabetes management and self-care among minority populations[14-16]. Among an African-American population with Type 2 diabetes, religion and spirituality demonstrated significant relations with higher HbA1c levels with age, income, education, body mass index, and diabetes medications held constant[14]. In a Malaysian sample, religiosity had a negative correlation with lower fasting glucose but no correlation was found with HbA1c[15]. Looking at determinants of self-care behavior, among a convenience sample of 104 Hispanic adults with Type 2 diabetes, when asked about their diabetes management 55% sought help from their priest to control their diabetes and 81% sought

help from God. Moreover, 6% of participants stated that they turned to God before a doctor when facing diabetic problems[16].

Seeing that fatalism and religiosity may play a role in diabetes management and the effects of interventions aimed at improving self-care behaviors, the present study aims to explore such a relationship among a Hispanic, underserved population with Type 2 diabetes. Research to date evaluating fatalism and religiosity in relation to Type 2 diabetes has not been conducted at length among Hispanic populations. Moreover, research on the effect of religiosity on diabetes management have resulted in mixed findings. In order to explore this gap in the literature, the purpose of the present study is to determine the association of fatalistic beliefs and lifetime religiosity on the effects of a chronic care management program as measured by HbA1c score changes between baseline and three-month follow-up. Analyses will account for potential confounding variables including age, gender, preferred language, and insurance status.

2. METHODS

2.1 Participants

Study sample was drawn from participants of *Salud y Vida*, a chronic care management program for individuals with Type 2 diabetes. *Salud y Vida* utilizes a culturally appropriate approach, and is a bilingual adaptation of the Wagner Chronic Care Model[17]. The *Salud y Vida* program is a an intervention aimed at Hispanics living within the Rio Grande Valley that incorporates an educational approach, provides individualized feedback, and employs both a short and long follow-up time. The program stresses effective self-management support, and provides patient-oriented community resources that focus on improving not only knowledge but self-efficacy. *Salud y Vida* provides productive interactions with physicians and others equipped with skills to provide self-management support, and works to facilitate regular interactions

between patient and caregiver[17]. The program consists of three phases: Transition Care, Chronic Disease Management, and Follow-up Monitoring. Enrollment into the *Salud y Vida* program occurs within the Transition Care phase, and is the phase in which participants were approached for participation in the proposed study. Participants participate in Diabetes Self-Management Education (DSME) classes, and quarterly home visits with a community health worker. During the Follow-up Monitoring phase participants continue participating in quarterly home visits.

The *Salud y Vida* enrollment process generally occurs in the participants' home clinic location although some participants are enrolled in outreach locations. Regardless of the location, *Salud y Vida* program enrollment occurred face-to-face. Activities that occur during the enrollment process, in addition to the proposed study's questionnaire administration, include an introduction to the program, facilitation of questions on behalf of the participant, completion of forms required by the program to begin the intervention program, and the scheduling of a primary care provider appointment, if necessary. Inclusion criteria for *Salud y Vida* participants are that they are over 18, have uncontrolled diabetes (HbA1c >8.0%), and reside within Regional Healthcare Partnership region 5 (Starr, Hidalgo, Willacy, & Cameron counties). Exclusion criteria are that they have a history of violent behavior, have a history of substance abuse, are a dialysis patient, are a cancer patient, have open chronic wounds, have untreated bipolar or personality disorders, or are pregnant. The present study includes a convenience sample of newly enrolled participants. Study was approved by the XXXXXXXXXXX XX XXXXX XXXXXX XXXXXXX XXXXXX XX XXXXXXX, XXXXXX XX XXXXXX XXXXXX Institutional Review Board.

2.2 Key Measures

Study measures are described in full in a previous study (citation). However, a description of key measures are described below.

2.2.1 Lifetime Religiosity

A Subscale of the National Comorbidity Study- Replication (NCS-R) was utilized to measure religiosity[18]. Religiosity items measured both current and childhood religious salience on a 4 point scale ranging from 1 ("Very important") and 4 ("Not at all important"). Change scores were calculated by subtracting religiosity in childhood from religiosity in adulthood. Change score were categorized as "no change", "positive change", and "negative change ". Other measures collected included religious preference and religious participation. Authors did not provide reliability and validity measures for the subscale, so for the purpose of this study the scale was re-administered to 30 participants within three months of enrollment to determine the tool's reliability. Percent agreement per item ranged from 60% to 93.3% demonstrating moderate to near perfect agreement; Spearman correlation coefficients ranged from .6307- .850 demonstrating moderate to high correlation. Religiosity was measured during the participant's *Salud y Vida* enrollment process.

2.2.2 Fatalism

Fatalism was assessed utilizing the 12 item Diabetes Fatalism Scale developed by Egede and others[9]. The scale measures three constructs of fatalism being Emotional Distress (5 items), Religious and Spiritual Coping (4 items), and Perceived Self-Ffficacy (3 items). Each item is measured on a unipolar 6 point Likert scale. Diabetes Fatalism scale scores range from 12 to 72 with higher scores denoting a higher level of diabetes fatalism. Items relating to Religious and Spiritual Coping and Perceived Self-Efficacy subscales are reverse-scored[9]. Among the current sample the Diabetes Fatalism scale (Cronbach alpha= 0.783) was determined to have acceptable

reliability. The Emotional Distress (Cronbach alpha= 0.820), Religious and Spiritual Coping (Cronbach alpha= 0.844) and Perceived Self-Efficacy (Cronbach alpha= 0.827) subscales were determined to have good reliability as well. The fatalism scale was assessed during the *Salud y Vida* enrollment process.

2.2.3 HbA1c

HbA1c was measured at baseline within the clinic setting by a registered nurse utilizing a TRUE Result ™ home test kit. Home test kits have proven to be valid when compared to laboratory results when utilized by both health care professionals ($R2=0.932$) and patients themselves ($R2=0.925$)[19]. HbA1c also was measured at the three-month community health worker home visit. Change in HbA1c between baseline and three-month follow-up was computed by subtracting the baseline HbA1c from the three-month follow-up HbA1c. A dichotomous variable was computed comparing those whose HbA1c score decreased between baseline and three-month follow-up versus those whose HbA1c score remained the same or increased between baseline and follow-up.

2.2.4 *Salud y Vida* Engagement

Salud y Vida engagement was classified as the number of times a participant received program services. Program services include the enrollment processes, quarterly community health worker home visits, and DSME classes. Each instance in which a participant received a program service was summed to compute a continuous variable.

2.3 Statistical Analyses

Descriptive statistics were computed to describe participant sample and frequencies of religiosity and fatalistic beliefs. Spearman correlations were utilized to assess the strength of the relationships between the change in HbA1c between baseline and follow-up, *Salud y Vida*

engagement, fatalistic beliefs, and lifetime religiosity. Unadjusted and adjusted logistic regression models were conducted to explore the association between change in HbA1c between baseline and follow-up and *Salud y Vida* engagement, fatalistic beliefs and lifetime religiosity. Adjusted models controlled for demographic factors and potential confounders including gender, age, preferred language (English or Spanish), and insurance status. All analyses were conducted using Stata v15.

3. RESULTS

3.1 Sample characteristics

Participants (n=348) were enrolled in the *Salud y Vida* program from March, 2015 to March, 2017. Majority of participants were Hispanic (99.4%), had not completed high school (69.1%), and were uninsured (74.5%). As per eligibility requirements of the *Salud y Vida* program, all participants had uncontrolled diabetes at baseline. There was a significant difference in the average HbA1c between baseline (M=10.1, SD=1.7) and three-month follow-up (M=8.8, SD=1.7); (t=12.88, p=<.001). Nearly four-fifths of participants (79.8%) improved their HbA1c score between baseline and follow-up, and 40% achieved a HbA1c at or below 8.0% at follow-up. Average change in HbA1c between the two points of assessments was -1.3%. Participant demographics are found on Table 1.

3.2 Fatalistic Beliefs

Participants exhibited a high level of Emotional Distress with diabetes; however, they also showed a high level of Religious and Spiritual Coping and Perceived Self-Efficacy. On the Emotional Distress subscale, 24.4% of participants expressed some level of agreement with all items in the scale signifying frustration and distress from diabetes. Conversely, 19.0% did not express agreement with any of the items. On the other hand, 63.2% of participants expressed

some level of agreement on all items of the Religious and Spiritual Coping signifying positive coping styles incorporating religiosity and spirituality. Although none of the participants expressed agreement on all items of the Self-Efficacy subscale, 60% expressed agreement on two of the three items. Diabetes Fatalism (overall) and fatalism subscale score ranges, means and averages are found on Table 1.

3.3 Lifetime Religiosity

Nearly all participants (88.8%) identified as either Protestant or Catholic, and only 11.2% identified as atheist, agnostic, or not having a religious preference. Moreover, two-fifths (40.8%) reported attending church at least once per week. Participants as well expressed high religious salience with 96.0% and 82.8% expressing religiosity was "important" or "very important" during adulthood and childhood, respectively. Change in religiosity from childhood to adulthood was quite stable with two-thirds reporting not experiencing a change in religious salience from childhood to adulthood. Participant religiosity can be found on Table 1.

3.4 Test of Correlation

There was a significant, positive association with *Salud y Vida* engagement (p-value $\leq$ 0.01) and a decrease in HbA1c at follow-up. No significant correlations were seen between change in HbA1c and fatalistic beliefs or lifetime religiosity. The only factors to approach significance were Perceived Self-Efficacy (p-value=0.20) and Religious Preference (p-value=0.12). Despite not having a significant correlation with a participant's change in HbA1c between baseline and three-month follow-up, all fatalism subscales had a positive correlation with participants decreasing their HbA1c scores at follow-up. However, participant's overall fatalism score had a negative correlation. Conversely, most religiosity factors, with the exception

of adult religious salience and change in religiosity between childhood and adulthood, had a

negative correlation. Correlation matrix can be found in Table 2.

3.5 Logistic Regression Analyses

Results from the logistic regression analyses are found in Table 3. Model #1 was an

unadjusted model evaluating the association between *Salud y Vida* engagement and change in

HbA1c at follow-up, which resulted in a statistically significant association (OR=1.11, 95% CI=

1.02-1.21, p-value≤0.05). For every additional *Salud y Vida* program service a participant

participated in, we can predict an 11% increase in the odds of that participant improving their

HbA1c score at follow-up. Model #2 adjusted for potential confounders, which included age,

gender, preferred language (English or Spanish), and insurance status. None of the potential

confounders had a significant association with the change in HbA1c at follow-up; however,

Salud y Vida engagement remained statistically significant (OR=1.13, 95% CI= 1.03-1.24, p-

value≤0.05).

No significant correlations were observed when evaluating the relationship between

fatalistic beliefs and lifetime religiosity; however, two of these factors neared significance. In

order to explore the association between these factors while controlling for potential

confounders, Model #3 and Model #4 further adjusted for Perceived Self-Efficacy and religious

preference, respectively. Model #3 did not find Perceived Self-Efficacy to be significantly

associated with the change in HbA1c at follow-up (OR=1.10, 95% CI= 0.99-1.23, p-value=0.09),

but again it approached significance. Similarly, Model #4 did not find a significant association

between religious preference and change in HbA1c at follow-up (OR=0.72, 95% CI= 0.51-1.03,

p-value=0.07), but the factor approached significance. Nonetheless, *Salud y Vida* engagement

remained statistically significant when controlling for these factors. Diabetes Fatalism and

lifetime religiosity were as well explored as potential mediators on the effect of *Salud y Vida* engagement on HbA1c at follow-up; however, none of the factors met necessary properties of a mediating variable.

4. DISCUSSION

Engagement in the *Salud y Vida* program was associated with a significant decrease in HbA1c at three-month follow-up. However, no association was found between fatalistic beliefs or lifetime religiosity and change in HbA1c at follow-up. Although participants presented moderate to high levels of Diabetes Fatalism, and nearly 90% identified as Protestant or Catholic, these beliefs did not play a significant role on participant's success in improving blood glucose management after participating in the program for three months. Likewise, none of the items assessing lifetime religiosity were a significant predictor of the change in HbA1c at follow-up.

Nonetheless, it is important to note that overall Diabetes Fatalism had a negative correlation with improved HbA1c at follow-up. Similarly, religious preference, church attendance, and religious salience during childhood all had negative correlations. Although these correlations were not significant, these factors should be noted when working with Hispanic participants with Type 2 diabetes. Also important to note is that after controlling for potential confounders, Perceived Self-Efficacy, and religious preference, the association between *Salud y Vida* engagement and change in HbA1c at follow-up remained significant. These results suggest that health education resources provided in a culturally sensitive manner, such as those provided via the *Salud y Vida* program, may be effective in overcoming potential influences of fatalistic and religiosity beliefs among this population.

As stated previously, negative or non-significant associations have been noted between religiosity and HbA1c among minority populations[14,15]. In the same manner, Diabetes Fatalism has been found to be significantly associated with higher HbA1c and poorer self-care behaviors[10-12]. Moreover, the prevalence of fatalistic beliefs among study participants is similar to that among the African-American population, the population for which the instrument was developed[9].

Strengths of the current study include the assessment of fatalism and religiosity, which are related but distinct socio-cultural factors that have been observed to play a role in Type 2 diabetes management. The NCS-R subscale assessed lifetime religiosity, allowing for the exploration of continued religious practices and beliefs across the lifespan. The present study assessed the effect of Diabetes Fatalism on HbA1c over time. Previous research exploring this relationship was conducted utilizing cross-sectional study designs[10-12]. To our knowledge, this is the first study exploring the effect on Diabetes Fatalism over time, and the first study to utilize the scale with a predominantly Hispanic population.

Although follow-up is a strength of the study, it also is a limitation in that these relationships were assessed after only a three-month period. Findings of the present study are not generalizable as participants were a convenience sample. Moreover, recruitment methods employed for the present study pose a threat of response bias among the sample. Another limitation is that other factors that may facilitate or hinder a participant's success or level of engagement in a chronic care management program were not explored, such as social support, transportation, financial troubles, and the built environment[8]. Lastly, all participants had uncontrolled diabetes at baseline, which did not allow for the observation of the effect of fatalistic beliefs and religiosity on HbA1c over time among participants who have demonstrated

adequate glycemic control. This lack of diversity in the sample and reduced variance may have reduced the power available to observe the true effects of these factors on HbA1c over time.

Our research suggests the need to further evaluate the relationship between program engagement and change in HbA1c while controlling for fatalistic beliefs and lifetime religiosity among this population over a longer follow-up time and with a larger sample. Future research should as well explore this relationship while controlling for sociocultural factors that may have a bigger effect on change in HbA1c over time. Furthermore, this relationship should be explored in relation to the change in blood glucose management behaviors, such as physical activity, nutrition, and glucose monitoring frequency at follow-up. Subsequent studies should employ stratification methods to sample a more diverse study population. Lastly, the relationship between Diabetes Fatalism and lifetime religiosity and change in HbA1c should be assessed qualitatively in order to gain a better understanding as to how these beliefs play a role in diabetes management, and potential manners in which to explore this potential relationship.

Tables and Figures

Table 1: Sample Characteristics (n=348)

Characteristic	% or Mean (SD)
Age (years), mean (SD)	52.5 (10.7)
Ethnicity: Hispanic	99.4
Gender: female	70.4
Language: Spanish	75.6
Education[*]	
8th Grade or Less	51.5
Some High School	17.6
High School Graduate/GED	15.8
Some College	11.2
College Degree (BA/BS)	3.9
Insurance Status †	
Private	3.5
Government (Medicaid/Medicare)	12.6
Uninsured	74.5
DSME Class Total, mean (SD)	7.3 (4.3)
Hemoglobin A1c, mean (SD)	
Baseline	10.2 (1.7)
Three-Month Follow-up	8.8 (1.7)
Religious Preference: Catholic or Protestant	90
Church Attendance: ≥1x/week	39.9
Adult Religious Salience- Very Important/Important	96.0
Child Religious Salience- Very Important/Important	82.8
Change in Religion	
Positive Change	27.3
No Change	66.7
Negative Change	6.0
Diabetes Fatalism (overall) , mean (SD)	36.7 (6.3)
Subscale 1: Emotional Distress, mean (SD)	18.4 (4.3)
Subscale 2: Religious & Spiritual Coping, mean (SD)	17.1 (3.4)
Subscale 3: Perceived Self-Efficacy, mean (SD)	13.6 (2.5)
[*]Data missing on 20 participants †Data missing on 11 participants	

Table 2: Correlations among *Salud y Vida* Engagement, Fatalistic Beliefs, Lifetime Religiosity and Change in HbA1c

Measure	r	P-value
Salud y Vida Engagement	0.14	<0.01
Diabetes Fatalism (overall)	-0.04	0.41
Subscale 1: Emotional Distress	0.04	0.48
Subscale 2: Religious and Spiritual Coping	0.07	0.26
Subscale 3: Perceived Self-Efficacy	0.06	0.20
Religious Preference	-0.08	0.12
Church Attendance	-0.02	0.65
Adult Religious Salience	0.04	0.43
Child Religious Salience	-0.04	0.45
Change in Religiosity	0.04	0.46

Table 3: Logistic Regression: Effect of *Salud y Vida* Engagement, Fatalism and Religiosity on HbA1c

	Model #1 N=346			Model #2 N=339			Model #3 N=339			Model #4 N=339		
	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value	OR	95% CI	P-value
Salud y Vida **Engagement**	1.11	1.02, 1.21	<0.05	1.13	1.03,1.24	<0.05	1.13	1.03,1.24	<0.05	1.13	1.03,1.24	<0.05
Gender: Female	-	-	-	1.09	0.61, 1.99	0.77	1.01	0.56, 1.84	0.97	1.08	0.60, 1.94	0.24
Age	-	-	-	0.98	0.95, 1.01	0.13	0.98	0.95, 1.01	0.15	0.98	0.95, 1.00	0.08
Language: Spanish	-	-	-	1.26	0.67, 2.34	0.47	1.29	0.69, 2.43	0.42	1.19	0.63, 2.24	0.59
Insurance: Insured	-	-	-	1.33	0.68, 2.59	0.41	1.35	0.69, 2.65	0.38	1.36	0.70, 2.67	0.37
Perceived Self-Efficacy	-	-	-	-	-	-	1.10	0.99, 1.23	0.09	-	-	-
Religious Preference: Protestant/Catholic	-	-	-	-	-	-	-	-	-	0.72	0.51, 1.03	0.07

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Conclusion

Qualitative findings suggest a need to address fatalism and religiosity beliefs within intervention programs addressing diabetes self-management. Discussions of these beliefs in a more familiar setting, such as a diabetes management class offered by the *Salud y Vida* program, may help overcome barriers identified to discussing fatalism and religiosity with medical professions in the clinic setting that were identified by participants. While religiosity beliefs pointed to positive effects on diabetes management, a better understanding of this relationship while controlling for other potential confounders and among a larger group is needed.

Baseline data showed a statistically significant association between diabetes fatalism and HbA1c. A statistically significant association was not noted in relation to blood glucose monitoring behavior. Religiosity did not have a significant association with either HbA1c or blood glucose monitoring behavior. These findings suggest that although diabetes fatalism appeared to be a significant predictor of glycemic control, it may not be clinically significant. Our research suggests the need to further evaluate this relationship utilizing more rigorous study designs, and the need for the development of instruments including diabetes specific measures of religiosity.

Salud y Vida program engagement was associated with a significant decrease in HbA1c at three-month follow-up; however, fatalistic beliefs nor lifetime religiosity had a significant association with HbA1c at follow-up. Although, these beliefs were not seen to be significant predictors of HbA1c at follow-up, perceived self-efficacy and religious preference did near significance. These findings suggest that this relationship should be explored utilizing a longer follow-up period, among a larger sample, and controlling for other factors that may be a larger role than fatalism and religiosity.

Strengths of the current study are that both fatalism and religiosity were assessed among study participants. Another strength was that these beliefs were assessed using both qualitative and quantitative methods. Moreover, association between these beliefs and glycemic control was assessed using cross-sectional and longitudinal study designs. When assessed qualitatively, study participants represented varying levels of engagement in the *Salud y Vida* program. Lastly, to our knowledge the present study is the first to explore the relationship between fatalistic beliefs and HbA1c over time and among a predominantly Hispanic sample. A limitation of the current study is that all participants had uncontrolled diabetes, which does not allow for the observation of the effect of these belief systems on Type 2 Diabetes management among participants who have managed to achieve target HbA1c values. Furthermore, because participants were also a convenience sample, these factors do not allow for the generalizability of study findings. Another limitation is that although the effect of fatalism and religiosity on HbA1c was assessed longitudinally, the follow-up time was only three months which may not have been enough time to observe this effect. Lastly, the present study did not observe the effect of these beliefs on blood glucose management behaviors such as physical activity and dietary choices.

Future research should explore these relationships using stricter stratification and/or participant selection methods. Future work should as well explore the effect of fatalism and religiosity on diabetes management behaviors as well as glycemic control beyond glucose monitoring behavior. Finally, future studies should employ longer follow-up times when assessing these relationships longitudinally.

Appendices

Appendix A

INFORMED CONSENT FORM TO TAKE PART IN RESEARCH
Evaluating Religiosity across the Lifespan and Fatalistic Beliefs among Patients of a Chronic Care Management Intervention Program with Type 2 Diabetes
HSC-SPH-15-0600

Invitation to Take Part

You are invited to take part in a research project called, Evaluating Religiosity across the Lifespan and Fatalistic Beliefs among Patients with Type 2 Diabetes of a Chronic Care Management Intervention Program, conducted by Dr. Belinda Reininger, of the University of Texas Health Science Center. For this research project, she will be called the Principal Investigator or PI.

Your decision to take part is voluntary. You may refuse to take part or choose to stop from taking part, at any time. A decision not to take part or to stop being a part of the research project will not change the services available to you from your physician, hospital, service agency, etc.

You may refuse to answer any questions, asked or written, on any forms. This research project has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston as HSC-SPH-13-0532.

Purpose

The purpose of this study is to determine the association between religiosity across the lifespan and fatalistic beliefs and Type 2 diabetes control. A secondary purpose is to determine the association between religiosity across the lifespan and fatalistic beliefs and Type 2 diabetes management behavior. A third purpose is to evaluate the mediation, if any, religiosity across the lifespan and fatalistic beliefs on changes in HbA1c levels for participants of a chronic care management intervention program. The study will be conducted among participants of the Salud y Vida program.

Procedures

If you agree to take part in this study you will be asked to complete a questionnaire asking questions about your religious preference, attendance of religious services, importance placed on religion currently and during your childhood, faith beliefs, and fatalistic beliefs. You will be

asked to give consent to include your HbA1c results at enrollment in the Salud y Vida program and at a three month follow up in the data analysis of this project.

Time Commitment

The total amount of time in which you will be asked to be a part of this study is only the amount of time it takes you to complete the questionnaire, approximately 10-15 minutes. HbA1c measures will be taken during your Salud y Vida enrollment and follow-up. You will be asked to complete the questionnaire during enrollment in the program.

Benefits

Your answers may help us gain a better understanding of whether religiosity across the lifespan and fatalistic beliefs affect Type 2 diabetes control and health management behaviors. These findings may help guide further health promotion efforts among Type 2 diabetes patients in the Rio Grande Valley.

Risk and/or Discomforts

Being a part of this study poses no major risks or dangers beyond that of a normal physician visit. All answers you give on this questionnaire will be kept private and secret. Only research project staff can access data. There is no penalty if you do not fill out a questionnaire. The questionnaire does not ask any sensitive questions, but you may skip any questions that make you feel uncomfortable. You may also choose to quit the project at any time. Any information given to us up to that time will be kept private and secret.

Alternatives

The only alternative is not to take part in this study.

Study Withdrawal

Your decision to take part is voluntary. You may decide to stop taking part in the study at any time. A decision not to take part or to stop being a part of the research project will not change the services available to you from your physician.

Costs, Reimbursement and Compensation

If you decide to take part in this research study, you will not have any additional costs. You will not be compensated for your participation in this study.

If you receive a bill that you believe is related to your taking part in this research study, please contact Dr. Belinda Reininger at 956- 755-0654, or research staff at 956-755-0673.

Confidentiality

You will not be personally identified in any reports or publications that may result from this study. Any personal information about you gathered during this study will remain confidential to every extent of the law. All questionnaires and information will be kept in a locked filing cabinet or password protected computers or websites. No identifying information will be kept with your answers. An ID number will be given to the data you turn in to make sure that your answers and lab results stay private and secret.

Questions

If you have questions at any time about this research study, please feel free to contact Dr. Belinda Reininger at 956- 755-0654 or research staff at 956-755-0673. You can contact the study team to discuss problems, voice concerns, obtain information, or offer input in addition to asking questions about the research.

SIGNATURES

Sign below only if you understand the information given to you about this research and you choose to take part. Make sure that any questions you may have are answered and that you understand the study. If you have any questions or concerns about your rights as a research subject, call the Committee for the Protection of Human Subjects at (713) 500-7943. You may also call the committee if you wish to discuss problems, concerns, or have any questions; to obtain information about the research; or to offer input about current or past participation in a research study. If you decide to take part in this research study, a copy of this signed consent form will be given to you.

_____   _____   _____

Printed Name of Subject   Signature of Subject   Date/Time

_____   _____   _____

Printed Name of   Signature of   Date/Time
Person Obtaining Consent   Person Obtaining Consent

This study (HSC-SPH-15-0600) has been reviewed by the Committee for the Protection of Human Subjects (CPHS) of the University of Texas Health Science Center at Houston. For any questions about research subject's rights, or to report a research-related injury, call the CPHS at (713) 500-7943.

120

Appendix B

1. Please describe any importance, if at all, that religion and/or your faith has in your daily life?
   Probe: Describe why you feel religion is or is not important?
   Probe: How often do you engage in religious practices such as prayer?
   Probe: How often do you attend church?

2. Describe the role religious beliefs have played when you were a child as you grew into adulthood? If the role that religion played has changed please describe how it has changed.
   Probe: Do you have the same religious preference that you had as a child?
   Probe: Do you attend church at the same frequency you did as a child?
   Probe: If your religiosity has changed, what prompted that change?

3. In what way, if at all, would you say that your religious beliefs influence your type 2 diabetes management?
   Probe: Are there certain health behaviors you do or do not do as a result of your beliefs?
   Probe: Are there any religious messages or themes that encourage healthy lifestyles?

4. Describe your beliefs in regard to fate and destiny in relation with type 2 diabetes?
   Probe: Is there a connection between the two? If so, how?

5. Describe your beliefs in regard to the role God plays in a person developing diabetes and the outcomes of the disease.

6. Describe any religious practices (such as prayer) or cultural practices (such as herbal medicine or teas) that you use as a method to help with your type 2 diabetes management.
   Probe: Do you engage regularly in prayer to help you manage your diabetes?
   Probe: Do you have others pray over you for your diabetes?

7. Describe the role your church leaders or fellow members of your church play in your diabetes management behavior?
   Probe: Do they encourage healthy/unhealthy behaviors?
   Probe: Do they provide tangible support such as cooking meals, or taking you to a doctor's appointment?

8. What is in your opinion in regard to talking about religious beliefs when discussing blood sugar control? In what environments do you think it is appropriate to discuss these beliefs?

9. What is in your opinion in regard to talking about beliefs in fate and destiny when discussing blood sugar control? In what environments do you think it is appropriate to discuss these beliefs

Appendix C

Cuestionario de Fatalismo/Religiosidad
Fatalism/Religiosity Questionnaire

Las preguntas siguientes preguntan sobre religión, fatalismo y cómo se siente sobre su propia salud. No tiene que contestar ninguna pregunta que le pueda hacer incómodo....*The following questions ask about religion, fatalism and how you feel about your own health. You do not have to answer any questions that may make you uncomfortable.*

1. ¿Cuál es su preferencia religiosa?.. *(What is your religious preference?)*
☐ **Evangélica/Protestante** *(Evangelical/Protestant)*; **Por favor, indique la denominación** *(Please indicate denominatio):*
_____
☐ **Católica** *(Catholic)*
☐ **Otra preferencia religiosa- judío, musulmán, etc.** *(Other religious preference- Jewish, Muslim. etc):*_____
☐ **Ninguna preferencia religiosa** *(No religious preference)*
☐ **No es un creyente; ateo; agnóstico** *(Not a believer; atheist; agnostic)* ➡ SI SELECCIONA ESTA RESPUESTA PASE A LA PREGUNTA 4... *IF YOU SELECT THIS ANSWER, SKIP TO QUESTION 4 AND CONTINUE.*

2. ¿Con qué frecuencia asiste usted a la iglesia u otras reuniones religiosas?... *(How often do you attend church or other religious meetings?)*
☐ **Nunca** *(Never)* ☐ **Una vez al año o menos** *(Once a year or less)* ☐ **Algunas veces al año** *(A few times a year)*
☐ **Una vez por semana** *(Once a week)* ☐ **Más de una vez a la semana** *(More than once per week)*

3. En general, que tan importante son las creencias religiosas o espirituales en su vida diaria?... *(In general, how important are religious or spiritual beliefs in your daily life?)*
☐ **Muy importante** *(Very important)* ☐ **Importante** *(Somewhat important)* ☐ **No muy importante** *(Not very important)*
☐ **Nada importante** *(Not at all important)*

4. ¿Qué tan importante era la religión en su vida cuando usted eras joven?... *(How important was religion in your life when you were growing up?)*
☐ **Muy importante** *(Very important)* ☐ **Importante** *(Somewhat important)* ☐ **No muy importante** *(Not very important)*
☐ **Nada importante** *(Not at all important)*

Participant ID Number_____   Location:_____   Date:_____

	Fuertemente en Desacuerdo (Strongly disagree)	Moderadamente en Desacuerdo (Moderately disagrees)	En Desacuerdo (Disagree)	De Acuerdo (Agree)	Moderadamente de acuerdo (Moderately agree)	Fuertemente de Acuerdo (Strongly agree)
5. Me molesto, cuando pienso en mi diabetes… (*I get upset when I think about my diabetes.*)						
6. Me siento deprimido(a), cuando pienso en mi diabetes… (*I feel down when I think about my diabetes.*)						
7. Me frustra, tener que vivir con diabetes… (*I get frustrated with having to live with diabetes.*)						
8. La diabetes es una enfermedad que hace mi vida más difícil… (*Diabetes is a disease that makes my life more difficult.*)						
9. Sufro mucho a causa de mi diabetes… (*Diabetes causes a lot of suffering for me.*)						
10. Creo ser capaz de controlar mi diabetes tal y como mi médico espera que lo haga… (*I believe I am able to control my diabetes the way my doctor expects.*)						
11. Si hago todo lo que mi medico dice, yo puedo prevenir las complicaciones de la diabetes, tales como ceguera, amputaciones, fallo renal, impotencia, etc… (*If I do everything my doctor tells me, I can prevent the complications of diabetes like blindness, amputations, kidney failure, impotence, etc.*)						

Participant ID Number_____   Location:_____   Date:_____

	Fuertemente en Desacuerdo (Strongly disagree)	Moderadamente en Desacuerdo (Moderately disagree)	En Desacuerdo (Disagree)	De Acuerdo (Agree)	Moderadamente de acuerdo (Moderately agree)	Fuertemente de Acuerdo (Strongly agree)
12. Yo creo que la diabetes es controlable... (*I believe that diabetes is controllable*)	☐	☐	☐	☐	☐	☐

NO CONTESTE SI NO ERES UN CREYENTE; ATEO; AGNÓSTICO... *DO NOT ANSWER QUESTIONS BELOW IF YOU ARE NOT A BELIEVER OR AGNOSTIC OR ATHEIST*

	Fuertemente en Desacuerdo (Strongly disagree)	Moderadamente en Desacuerdo (Moderately disagree)	En Desacuerdo (Disagree)	De Acuerdo (Agree)	Moderadamente de acuerdo (Moderately agree)	Fuertemente de Acuerdo (Strongly agree)
13. Confiar en Dios me ha ayudado a lidiar con mi diabetes... (*Trusting in God has helped me better deal with my diabetes.*)						
14. Creo que Dios no me manda más de lo que no puedo soportar... (*I believe God does not give more than I can bear.*)	☐	☐	☐	☐	☐	☐
15. Creo que Dios puede curar por completo mi diabetes... (*I believe God can completely cure my diabetes.*)	☐	☐	☐	☐	☐	☐
16. He rezado por mi diabetes así que ya no me preocupo más por eso... (*I have prayed about my diabetes, so I am not going to worry about it anymore.*)	☐	☐	☐	☐	☐	☐

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146

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