Spring 5-17-2018

The Impact of Depressive Symptoms on Cognitive Decline and Risk for Dementia

Katheryn Conde

University of San Francisco, kconde@usfca.edu

THE IMPACT OF DEPRESSIVE SYMPTOMS ON COGNITIVE DECLINE AND

RISK FOR DEMENTIA

A Clinical Dissertation Presented to

The University of San Francisco

School of Nursing and Health Professions

Department of Integrated Healthcare

PsyD Program in Clinical Psychology

In Partial Fulfillment of the Requirements for the Degree

Doctor of Psychology

by

Katheryn Conde, MS

July 2018

This dissertation, written under the direction of the candidate's dissertation committee and approved by members of the committee, has been presented to and accepted by the faculty of the PsyD Program in Clinical Psychology in partial fulfillment of the requirements for the degree of Doctor of Psychology. The content and research methodologies presented in this work represent the work of the candidate alone.

Candidate Signature

Katheryn Conde

Candidate

July 27, 2018

Date

Dissertation Committee Signatures

Chairperson: David A. Martinez, Ph.D.

July 27, 2018

Date

William Bosl, Ph. D.

7/27/18

Date

Konjit Page, Ph.D.

July 27, 2018

Date

Administrator Signatures

PsyD Program Director

08/01/18

Date

Dean, School of Nursing and Health Professions

08/01/18

Date

Acknowledgement

Katheryn Conde, MS

July 2018

San Francisco, CA.

Dedication

I dedicate this work to my family who have offered me unconditional love and support through my educational journey. Mami, Papi, Letty, Vincent, Tita, and Alex, I love you all and feel very blessed to have you in my life -this one is for you!

Katheryn Conde, MS

July 2018

San Francisco, CA.

Table of Contents

Abstract

As of 2011, the life expectancy for Latinos in the U.S. was 81.6 years, which is higher compared to non-Hispanic Blacks (75.3 years), non-Hispanic Whites (79 years), and Hispanic Black populations (74.9 years; Arias, 2011; Arias, 2015). Latinos have higher age specific prevalence of dementia, which is higher than African Americans and non-Hispanic Whites (Gurland et al., 1999). Latinos experience Alzheimers disease symptoms 6.8 years earlier, with the average onset of 67.6 years which is younger than non-Hispanic Whites (73.1 years; Clark et al., 2005). Furthermore, older Latinos tend to experience depression at a rate of 13% and 35% with the prevalence reported among Mexicans in the United States being between 4% and 28% (Hernandez, Prohaska, Wang, & Sarkisian, 2013; Kwag, Jang, & Chiriboga, 2012). The data from this study are longitudinal and drawn from the Sacramento Area Latino Study on Aging (SALSA; Haan et al., 2003). Structural equation modeling (SEM) was used to examine whether the association between depressive symptoms and cognitive decline was mediated by risk for dementia. A correlational analyses was used to examine the association between depression, risk for dementia, cognitive functioning, years of education, and income level. The mediation models indicated that those with moderate to severe levels of depression are at an increased risk for dementia compared to those with subclinical levels of depression. Our findings also revealed that participants with higher depressive scores had fewer years of education and lower income. Those who died over the course of the study reported higher depression scores at time 2. Participants born in Mexico also reported higher depressive scores. Participants who had a higher education level, income and cognitive functioning had a lower risk for dementia. Participants born in the U.S. had greater levels of cognitive functioning, than those who were born in Mexico.

Chapter I

Introduction

Statement of the Problem

As of 2017, people of Latino origin represent the nation's largest ethnic minority, making up 18.1% of the US population (U.S. Census Bureau, 2017). As of 2011, the life expectancy for Latinos in the U.S. was 81.6 years, which is higher compared to non-Hispanic Blacks (75.3 years), non-Hispanic Whites (79 years), and Hispanic Black populations (74.9 years; Arias, 2011; Arias, 2015). By 2050, researchers project that Latinos will make up 18.4 percent (15.4 million) of the US population aged 65 years and older, compared to 7.3 percent (3.1 million) in 2012 (Ortman, Velkoff & Hogan, 2014).

With a growing fraction of Latinos in the geriatric population, age-related health issues are quickly becoming an increasingly pressing concern within this population. Latinos have higher age-specific prevalence of dementia, which is higher than African Americans and non-Hispanic Whites (Gurland et al.,1999). Additionally, compared to non-Hispanic Whites, Latinos experience Alzheimer's disease symptoms 6.8 years earlier, with the average onset of 67.6 years old (Clark et al., 2005). It is important to identify specific risk factors for dementia among Latino older adults because the higher prevalence of dementia among this population compared to other racial/ethnic groups, and because they are living longer and experiencing cognitive symptoms earlier.

Furthermore, there are few studies exploring this issue among Latino adults aged 65 and older, which is not surprising given that many studies fail to include ethnic minorities in their sample (Moreno-John et al., 2004). Although there is no current systemic review of only older

Latinos adults in health research, Aragones and colleagues (2013) conducted a systematic review of the representation of Latino populations in research. They found that from 2000 to 2011 only 131 articles have been published that included a keyword related to the Hispanic/Latino population. Of those studies, 73 (56%) reported "Hispanic" or "Latino" as the only description provided. Merely 35 articles (27%) stated the participants' country of origin, 38 (29%) reported language, and only 3 studies (2%) reported the race of Latino participants (Aragones, Hayes, Chen, González, & Gany, 2013). Although an article identifies a Latino population, we know there are many within group differences within the Latino population. Therefore, when conducting research, identifying a particular Latino subgroup would make the study more generalizable to the particular group that is identified in the study. Furthermore, while research has increased it's focus on older adults, Latino older adults still remain underrepresented in research and underserved clinically (Alvarez, Rengifo, Emrani, & Gallagher-Thompson, 2014). The present study focused on elderly Mexicans and Mexican Americans to address the gaps in literature and to better understand and serve our elderly Latino community in a culturally sensitive way.

Purpose

This study explored the impact of depressive symptoms on cognitive functioning and risk for dementia among elderly Mexican and Mexican Americans in Northern California. It consisted of a secondary data analysis of the Sacramento Area Latino Study on Aging (SALSA). The SALSA study is a longitudinal study designed to assess the prevalence of dementia in older Latino adults. Latino older adults tend to experience depression at a rate of 13%- 35% with the prevalence reported among Mexicans in the United States between 4% and 28% (Hernandez, Prohaska, Wang, & Sarkisian, 2013; Kwag, Jang, & Chiriboga, 2012). This study examined the

impact of depressive symptoms on cognitive functioning and risk for dementia among Latino older adults. Depressive symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CES-D). Two outcomes were explored: risk for dementia and cognitive function. Additionally, the role of country of nativity, income level and education were also explored. It was hypothesized that Latino older adults who have moderate to severe levels of depression will be at a higher risk for dementia and lower levels of cognitive functioning compared to those with mild to subclinical levels of depressive symptoms. It was also hypothesized that lower income and education would be linked to greater cognitive decline and risk for dementia.

Chapter II

Review of Literature

Depression in the United States

Major depression is one of the most common mental disorders among individuals in the United States. Major depression in some individuals can result in severe impairments that interfere with or can limit one's ability to carry out major life activities (National Institute of Mental Health, 2016). As of 2016, an estimated 16.2 million (6.7%) adults in the United States had at least one major depressive episode. With 10.3 million (4.3%) U.S. adults aged 18 or older having had at least one major depressive episode with severe impairment (National Institute of Mental Health, 2016). In 2009 it was reported that depression affects more than 6.5 million Americans aged 65 or older (National Alliance on Metal Illness, 2009). Depression among older adults is a significant and fast growing global public health issue (Üstün, Ayuso-Mateos, Chatterji, Mathers, & Murray, 2004). Depression is not a normal part of again and it is often associated with impaired function, increased medical morbidity and mortality, and dementia (Steffens et al., 2006).

Depression in older adults has become an increasingly prevalent health problem (Ho, 2007). It is projected that by the year 2030, more than 15 million (20%) of older adults, age 65 years or older, will have a diagnosable mental health disorder (Jeste et al., 1999; Karel, Gatz, & Smyer, 2012). Although there are effective treatments for depression, many older adults who can benefit from these services are unable to or choose not to initiate treatment, or prematurely discontinue the services (Corrigan, 2004; Rüsch, Angermeyer, & Corrigan, 2005; Sirey et al., 2001). Barriers to accessing treatment are major contributors to underutilization of mental health services among older adults with depression (Barrett, Chua, Crits-Christoph, Gibbons, & Thomp-

son, 2008; Kessler et al., 2001; van Beljouw et al., 2010). Barriers leading to the underutilization of mental health services among older adults include believing that they do not have a need for the services, having financial limitations (Kessler et al., 2001; van Beljouw et al., 2010), difficulties accessing treatment clinics, and not being able to have immediate contact with a mental health professional (Barrett et al., 2008). Given the large number of older adults affected by depression, additional emphasis should be placed on this population to ensure their mental health needs are being met.

Older Adults in the Unites States

As of 2017, adults aged 65 and older make up 15.6% of the United States population (U.S. Census Bureau, 2017). The U.S. Census Bureau has projected that in less than 2 decades, older adults will outnumber children in the United States for the first time. By the year 2035, it is expected that the older adult population (aged 65 years and older) in the United States will reach 78 million, while the population of children under 18 years old will be 76.4 million. It is projected that by 2060, nearly one in four Americans will be 65 years and older, with the number of adults aged 85 years-plus tripling (U.S. Census Bureau, 2018). As of 2011, the life expectancy for Latinos in the U.S. was 81.6 years, which is higher compared to non-Hispanic Blacks, non-Hispanic Whites and Hispanic Black populations (Arias, 2011; Arias, 2015). By 2050, researchers project that Latinos will make up 18.4 percent (15.4 million) of the US population aged 65 years and older, compared to 7.3 percent (3.1 million) in 2012 (Ortman, Velkoff & Hogan, 2014).

Depression among the Latino Population

There is a dearth of literature on Latino older adults as mental health studies often fail to include ethnic minorities in their sample (Moreno-John et al., 2004). According to the U.S. Department of Health and Human Services (1999) there have been very few studies addressing depression among Latino older adults. This is concerning given that 80% of older general adult population have at least one chronic health condition which puts them at increased risk for depression (Centers for Disease Control and Prevention, 2015). Depression has been shown to be a significant risk factor for cognitive decline in older adults (Bhalla et al., 2006; Butters et al., 2004) in which those with depression have a two-fold risk for dementia including Alzheimer's and vascular dementia (Diniz et al., 2013). The number of depressive episodes experienced in one's lifetime is positively associated with risk for dementia and with accelerated progression of dementia among Latino older adults (Lu et al., 2009). In light of these findings, few interventions exist that are tailored for Latino older adults that address depression and cognitive decline (Gallagher, Kiss, Lanctot, & Herrmann, 2016).

When comparing rates of depression in other racial groups, non-Hispanic Asian adults had the lowest prevalence of depression (3.1%) compared with Hispanic (8.2%), non-Hispanic white (7.9%), and non-Hispanic black (9.2%) adults (Brody, Pratt, & Hughes, 2018). Between 13% and 35% of Latinos experience severe depressive symptoms in their older adulthood. For Mexican Americans in the United States, the prevalence rate is between 4% and 28% (Hernandez, Prohaska, Wang, & Sarkisian, 2013). Latinos are under-treated for mental health in general, but they are particularly under-treated for depression (Dwight-Johnson & Lagomasino, 2007). Less than one in 11 Latinos with a mental disorder seeks mental health treatment. Furthermore,

less than 5% of Latino immigrants with mental disorders used services from mental health spe-

cialists (U.S. Department of Health and Human Services, 2001a). A study by Klap, Unroe, and

Unützer (2003) reported that less than 50% of older adults with depression followed through

with a referral for mental health, and only 8% saw a mental health professional. Untreated de-

pression is known to have emotional and biological consequences, such as hippocampal volume

loss (Sheline, Gado, & Kraemer, 2003). The results of untreated depression highlight the need to

address this issue with Latino older adults. There are many factors that contribute to the lack of

mental healthcare utilization among Latinos. Language barriers as a result of shortage of bilin-

gual and bicultural mental health professionals often results in miscommunication and misinter-

pretations (Schwarzbaum, 2004). Furthermore, the number of Spanish- speaking providers re-

mains insufficient to meet the needs of Latinos, especially monolingual immigrants (Barrio et al.,

2008; Falicov, 2009). Socioeconomic status (SES), which has the potential to affect access to in-

surance is a barrier given that in 2013, the poverty rate for older Latinos was 20.4% (Administra-

tion on Aging, 2010). Other cultural factors such as social stigma, distance to providers, sched-

uling difficulties due to lack of providers or limited work schedules, transportation concerns,

high deductibles, co-pays, and psychiatric symptoms limit access to mental health care

(Langheim, 2014).

Prevalence of Cognitive Impairment & Dementia

In the United States, more than 16 million people aged 18 and over are living with cogni-

tive impairment (Centers for Disease Control and Prevention, 2011). Understanding the factors

that are related to cognitive functioning is important. Research suggests that depressive symp-

toms, country of nativity, SES, and educational attainment play a role in the cognitive function-

ing of older adults (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011; Bhalla et al., 2006; Butters et al., 2004; Hill, Angel, Balistreri, & Herrera, 2012; Xu et al., 2015).

Country of Nativity and Socioeconomic Status

As of 2013, an estimated 34.6 million Latinos of Mexican origin resided in the United States, 11.5 million of which are foreign born (Pew Hispanic Center, 2015). A phenomenon known as "the healthy immigrant effect", refers to the notion that many immigrants, upon arrival in the U.S., live in relatively disadvantaged neighborhoods and are less likely to have health insurance, yet despite this, their health is more favorable than their U.S. born counterparts (Hamilton, 2015). The factors contributing to this effect lead immigrants to be healthier than their native born counterparts, despite being of the same ethnicity (Hill, Angel, Balistreri, & Herrera, 2012). Research has speculated on various reasons for this phenomenon, such as the healthy selection effect, meaning the migration process requires good health and those with good health are the ones that make it to the U.S. An immigration pattern, dubbed the salmon bias, has hypothesized that immigrants in poor health return to their countries of origin to die (Cunningham, Ruben, & Narayan, 2008). Literature also suggests the healthy lifestyle hypothesis, in that immigrants tend to generally lead healthier lifestyles and have fewer health risks related to drinking and smoking (Cunningham, Ruben, & Narayan, 2008; Franzini, Ribble, & Keddie, 2001; Jasso et al., 2004; Lopez-Gonzalez et al., 2005). The healthy immigrant effect not only has an impact on physical health, but extends further to cognitive functioning, including orientation, attention, memory, language, and reasoning (Hill, Angel, Balistreri, & Herrera, 2012). Research has found that nativity and migration are related to differences in lifetime socioeconomic status trajectories. Fur-

thermore, both early and midlife socioeconomic status have been shown to have individual effects on cognitive aging (Haan, Al-Hazzouri, & Aiello, 2011).

Research with older Mexican Americans has found that individuals with greater lifetime socioeconomic advantage experienced fewer declines on a test of global cognitive function and a short-term verbal memory test (Haan, Al-Hazzouri, & Aiello, 2011). For instance, a one unit decrease in cumulative socioeconomic position (SEP; Parental educational level and occupation, food deprivation while growing up, childhood sibling mortality, participant's educational attainment and lifetime occupation) advantage across the life course was associated with a 16% increase in decline of cognitive functioning, but yet not meeting criteria for dementia (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011). Individuals with a continuously high SES position have been found to have a lower risk for dementia (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011).

Upward and downward status mobility is also affected by nativity. Upward mobility is referred to a raise from a lower to upper social class, while downward mobility is the inverse of this. A study by Haan, Al-Hazzouri and Aiello (2011) classified generations since migration from Mexico into 0, 1, 2, and 3, with all born in United States being labeled as generation 0; generation 1 as only grandparent born in the US; generation 2 as parent and grandparent born in the US; and generation 3 as self, and parents and grandparents born in the US. More downward mobility is seen in generation 0 (22%) and generation 3 (23%) when compared to generation 1 (12%) and generation 2 (13.5%) and more upward mobility is experienced in generation 1 and 2 than in generation 0 and 3 (Haan, Al-Hazzouri, & Aiello, 2011). This shows that lifetime SES trajectory is impacted by number of generations born in Mexico. Research has also found that older adults

with higher levels of socioeconomic status have the ability use strategies to compensate for the adverse effects of aging in memory tasks that require the conscious recollection of the context in which an event took place (Czernochowski, Fabiani, & Friedman, 2008).

In 2013, the poverty rate for Latinos age 65 years and older was 20.4%, which is double the 10.2% rate for all older Americans (Administration on Aging, 2010). When comparing household income containing families headed by Hispanics age 65 and older, the median income in 2013 was $44, 228 per year, compared to $54,184 for non-Hispanic Whites. When looking at yearly personal income, older Hispanic men earn $15,240 and older Hispanic women earn $11,255. This is less than the earnings of older non-Hispanic individuals, with older men earning $29,854 and women earning $17,366 annually (Administration on Aging, 2010). Contributing factors for poverty among Hispanics include age, gender, educational attainment, family compo-sition, and fertility (Aponte 1991; Garcia 2011; Lopez 2013; Siordia and Leyser-Whalen 2014). Research has also found that immigration status accounts for a large portion of the poverty gap between Hispanics and non-Hispanic Whites (Orrenius & Zavodny, 2013). Limited English lan-guage proficiency has also been found to be a contributing factor of poverty among Hispanics (Sullivan & Ziegert, 2008). Other factors such as access to health care, healthy nutrition, occupa-tional attainment, and education have also been associated with SES (Czernochowski, Fabiani, & Friedman, 2008).

The Role of Education

Educational attainment has been found to be an influential factor in relation to cognitive performance (brain capacity and cognitive reserve). Those with higher education in general show delays in the onset of cognitive decline and show improvement in cognitive performance in older

adulthood compared to those with lower levels of education (Bennett, Arnold, Valenzuela, Brayne, & Schneider, 2014). Lower education has been associated with lower baseline Modified Mini-Mental State (3MS) scores, which is used to screen for dementia (Farias, Mungas, Hinton, & Haan, 2011). Additionally, for every year spent in higher education there is a 7% reduction in risk for dementia (Xu et al., 2015).

Latinos of Mexican descent and Cuban Americans have lower levels of education than their US-born counterparts (Everett, Rogers, Hummer, & Krueger, 2011). Latino older adults in the United States have a lower level of educational attainment than the general population (Administration on Aging, 2010) in that only 46% of Latino older adults have completed high school compared to 77% of the general older adult population. Furthermore, individuals with higher education are more likely to be associated with a higher standard of living, socioeconomic status, and more likely to participate regularly in mentally stimulating activities, all of which are protective factors against cognitive impairment (Xu et al., 2015). Research has found a negative association between educational attainment and risk for dementia among Latinos (Haan et al., 2003). Thus, education has been found to mitigate cognitive decline in advanced age (Springer, McIntosh, Wincer & Grady, 2005). Given that Latinos have been found to have lower education and education has an impact on cognitive functioning, it is important to explore the role of education among the participants in the present study.

Additional Factors Impacting Cognitive Functioning

Activities of Daily Living (ADLs) and Independent Activities of Daily Living (IADLs) are representative of an individual's ability to function independently and perform certain physical and cognitive abilities. Basic and instrumental ADLs are a strong predictor to future cognitive

decline (Rajan, Hebert, Scherr, de Leon, & Evans, 2013). Lifestyle choices such as physical exercise and engaging in mentally challenging activities may preserved performance in advanced age (Colcombe, Kramer, Ericsson & Scalf, 2005; Wilson, Bennett, Gilley, Beckett, Barnes & Evans,2000).

In addition to the factors listed above, social aspects have also been linked to impacting cognitive functioning. Social networks, such as friends and family, appear to reduce the onset of Alzheimer's (Bennett, Arnold, Valenzuela, Brayne, & Schneider, 2014)". In fact, the risk of dementia itself was also found to be less common in those adults who more regularly participated in leisurely activities (Scarmeas, Levy, Tang, Manly, & Stern, 2001). Meanwhile, those of the older population who reportedly had less social interaction and/or social support have been found to have earlier onset of cognitive decline (Bassuk et al., 1999; Dickinson, Potter, Hybels, Mc-Quoid,& Steffens, 2011; Seeman et al., 2001; Holtzman et al., 2004). These studies suggest that decreased social networks and social disengagement are predictive risk factor for cognitive decline in the geriatric population.

Acculturation is another factor that is related to cognitive function among older Latino adults. Acculturation refers to the process by which Latinos in the U.S. acquire aspects of the dominant U.S. culture (Cabassa, 2003; Schwartz, Unger, Zamboanga, & Szapocznik, 2010). Research by Loong (2017) revealed that the level of acculturation was strongly associated with cognitive function. Loong (2017) found that higher global cognitive score were significantly correlated language preference, media and ethnic social relations. Therefore, when exploring cognitive functioning, acculturation should also be taken into account.

Research has found that religious involvement and spirituality may serve as a protective factor as it is associated with improved recovery from illness, greater longevity, better coping skills, and a better health-related quality of life (Mueller, Plevak & Rummans, 2001; Levine and Targ, 2002). People who have religious involvement often use religious beliefs and behaviors when facing situations in which they have little control, and use religious beliefs and behaviors to cope with a feeling of helplessness, to give meaning and order to the experience and a sense of control over it (Holland et al., 1999). Individuals diagnosed with Alzheimer's with high degrees of religious belief and religious participation show slower cognitive and behavioral declines compared to those with lower degrees of religious involvement (Coin et al., 2010). Certain aspects of religious involvement, such as sermons, prayer, scriptural reading, singing, and philosophical discussions, may directly or indirectly protect against cognitive decline by enhancing positive psychological feelings such as optimism and happiness (Hill and Pargament, 2003).

Summary

Depression in the geriatric Latino population is phenomenon of great concern given the impacts it can have on a person's quality of life. There is a dearth of literature on Latino older adults as mental health studies often fail to include ethnic minorities in their sample (Moreno-John et al., 2004). There is a huge need for culturally appropriate services and interventions for this population (Alvarez, Rengifo, Emrani, & Gallagher-Thompson, 2014). Additionally, research suggests that depressive symptoms, country of nativity, SES, and educational attainment play a role on the cognitive functioning of older adults (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011; Bhalla et al., 2006; Butters et al., 2004; Hill, Angel, Balistreri, & Her-

rera, 2012; Xu et al., 2015). This highlights the importance for examining alternative factors that may play a role in cognitive functioning.

This study explored the role of depressive symptoms on cognitive functioning and risk for dementia among elderly Latinos. It was hypothesized that individuals with greater depressive symptoms will be at greater risk for dementia and a decline in cognitive functioning. It was hypothesized that Latino older adults who have moderate to severe levels of depression will be at higher risk for dementia and lower levels of cognitive functioning compared to those with mild to subclinical levels of depressive symptoms. It was also hypothesized that lower income and education would be linked to greater cognitive decline and risk for dementia.

Chapter III

Methodology

The secondary data analysis examined depressive symptoms as a predictor of cognitive functioning and risk for dementia among Latino older adults. The data are longitudinal, drawn from the Sacramento Area Latino Study on Aging (SALSA). The SALSA study was funded by the National Institute on Aging (NIA Grants AG 12975, AG 10129, and AG10220), with the goal of exploring the prevalence and distribution of dementia by etiology and evaluate the contribution of type 2 diabetes Mellitus, stroke, and apolipoprotein E (ApoE) genotype in older Mexican Americans (Haan et al., 2003).

Population

The SALSA study comprised 1,789 community-dwelling Mexican Americans who were aged 60-101 years at baseline in 1989-1999. The participants for the larger study were recruited using the 1990 census tracts and were contacted via mail, phone, and door-to-door interviews. The SALSA eligibility criteria included: (1) self-identifying as being of Hispanic or Latino ancestry (parents or grandparents), (2) were aged 60 or older, and (3) their primary language was, English, Spanish, or both. There was a maximum of six follow-ups conducted every 12 to 15 months. During each follow-up interview, clinical and cognitive assessments were collected via home visits. In order to obtain updates on medications, health events, and some sociodemographic risk factors, such as income, semiannual phone calls were made to each participant. The study's population and methods have been described in detail elsewhere (Haan et al., 2003).

The SALSA study was approved by the Institutional Review Board at the University of Michigan, the University of California, San Francisco, and the University of California, Davis.

Instruments

Changes in cognitive function over time were assessed using two instruments: the Modified Mini Mental State Examination (3MS; Teng and Chui,1987) and the Spanish English Verbal Learning Test (SEVLT; González, Mungas & Haan, 2002). These instruments were administered yearly and semi-yearly. Depressive symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CES-D; Lewinsohn, Seeley, Roberts, & Allen, 1997). The CES-D was also administered yearly and semi-yearly. The cut off score of 16 was used to identify participants that were at risk for clinical depression and those that were not.

Modified Mini-Mental State Examination -3MS. The Modified Mini-Mental State (MMMS, or 3MS) was used to measure risk for dementia. It's a brief assessment that measures a person's concentration, attention, orientation to time and place, short-term and long-term memory, language ability, abstract thinking, constructional praxis, and list-generating fluency. The test is composed of 15 questions and the scores from the 3MS range from 0 to 100, with a cut point of 77 (Teng & Chui, 1987). The cut off score of 77 was used to dichotomize the variable between participants that are at risk for dementia

The 3MS has a reliability of .92 and it appears to offer increased validity over the Mini-mental state examination (MMSE; Teng and Chui,1987). In comparison to other neuropsychological tests, the 3MS had a 0.61 correlation with the Boston Naming Test, 0.81 with the Controlled Word Association Test, 0.62 with the Logical Memory test, and 0.44 with the Functional Independence Measure (Grace et al.,1995). Teng, Chui and Gong (1990) reported a range of sensitivity and specificity results for the 3MS for individuals with different educational levels. A specificity of 0.95 was found for both individuals with 7 to 12 years of education and individuals

with13 or more years of education. A sensitivity of 0.94 was reported for individuals with 7 to 12

years of education and a sensitivity of 0.91 for those with 13 or more years of education.

Spanish English Verbal Learning Test (SEVLT). The SEVLT was used to measure

cognitive impairment and consists of a list of 15 items composed of five categories. In total,

there are five exemplars of vegetables, four drinks, three kitchen utensils, two reading materials,

and one fruit. The administrator reads word at a rate of one (1) word per second and there are

five learning trials with an immediate recall following each trial. After the five trials, there is an

interference trial where a separate 15-word list is presented and participants are asked to repeat.

A delayed free-recall for the first list of words follows the inference list (González, Mungas &

Haan, 2002). Greater word recall is associated with better cognitive functioning.

The SEVLT is available in both English and Spanish and used to assess verbal learning

and memory. The SEVLT measures are equally sensitive to identifying dementia in both Spanish

and English (González , Mungas & Haan, 2002). Folstein, Folstein, & McHugh (1975) found the

SEVLT to be sensitive to cognitive impairment. The SEVLT has been used in previous studies

that have used the SALSA data, as well as in independent studies with English and Spanish

speakers, and it has been shown to be sensitive to clinically relevant cognitive change as well as

to magnetic resonance imaging (MRI) measures of brain structure (Carmichael et al., 2012;

Farias et al., 2012; Mungas et al., 2010; Mungas, Reed, Farias, & Decarli, 2009). Psychometric

properties for SEVLT were not available.

Center for Epidemiological Studies Depression Scale (CES-D). The CES-D is a

screening measure developed to assess current depressive symptoms related to clinical depres-

sion in adolescents and adults. It is composed of 20 items and uses a 4-point ordinal scale: Rarely

or none of the time (less than 1 day); Some or a little of the time (1-2 days); Occasionally or a

moderate amount of the time (3-4 days); Most or all of the time (5-7 days). Scores range from 0

to 60 points, a score of 16 is indicative of "significant" or "mild" depressive symptoms, while a

higher score indicates greater symptoms (Lewinsohn, Seeley, Roberts, & Allen, 1997).

Studies have indicated that the internal consistency is excellent for the CES-D (*Cron-*

bach's α = 0.88-0.91). Test-retest reliability has also been found to be excellent (*ICC* = 0.87).

This instrument has poor to excellent test-retest reliability for the individual items

(*ICC*=0.11-0.73; Miller et al. 2008). The CES-D was found to have convergent validity (*r* = .91)

and divergent validity (*r* =.89; Miller et al. 2008). The CES-D also had both good sensitivity =

0.95 and specificity = 0.29 (Radloff, 1977).

Data Analysis. We explored the impact of depressive symptoms on risk for dementia and

cognitive decline. We conducted correlational analyses to examine the association between de-

pression, risk for dementia, cognitive functioning, years of education, and income level. Addi-

tionally, chi-square analyses were conducted to examine the relationship between mortality and

nativity. We also tested the association between depression, risk for dementia, and cognitive

functioning with mortality and nativity. Structural equation modeling (SEM) was used to exam-

ine whether the association between depressive symptoms and cognitive decline was mediated

by risk for dementia. These analyses allowed us to test the indirect association of depression with

cognitive decline via dementia status. To test these associations, our mediation model included a

path analysis model, illustrated conceptually in Figure 1. Depression at time 1 was used as a pre-

dictor of dementia status at time 4, which was in turn used to predict change in cognition from

time 1 to time 6. Country of nativity, income level, education, gender, and age have been shown

to be related to depression, cognitive functioning of older adults (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011; Bhalla et al., 2006; Butters et al., 2004; Hill, Angel, Balistreri, & Herrera, 2012; Xu et al., 2015). These variables were included as endogenous variables in the model to ensure that they did not account for the associations of interest.

We conducted the analyses using a bootstrapping approach (N = 1000). All SEM models used probit regression with a theta parameterization in MPLUS to account for dichotomous predictors (e.g. dementia), mediators and the primary estimator was weighted root mean square residual (WRMR). This estimator does not produce fit statistics (e.g. CFI, RMSEA) and are not reported as a result. Dementia was dichotomized using the MMMS cut off score of 77 or greater to indicate risk of dementia. Full Information Maximum Likelihood (FIML) method was used to estimate for missing data. FIML does not replace missing values, but estimates model parameters that are most likely to give the data that is available for analysis. Standardized values were reported and calculated using the formula $\beta = b/\text{SD}(y)$ for dichotomous variables.

Chapter IV

Results

Descriptive Statistics

As can be seen in Table 1, the sample (N = 1,790) consisted of 41.6% male and 58.4%

female. A total of 42.8% had a gross monthly income of $1,000, 20% $1,000 - $1,499, 11.1%

$1,500-$1,999, 9.1% $2,000-$2,499, and 13.8% $2,500 or more. A total of 54.2% of the sample

were born in the U.S. and 45.2% were born in Mexico. The mean years of education was 7.24

(SD = 5.34). The mean age was 70.6 years (SD = 7.11). Lastly, there were 464 deaths during the

course of the study.

Primary Results

Correlation among the variables in this study are presented in Table 2 and chi-square be-

tween nativity and mortality are presented in Table 3. Results revealed a significant negative as-

sociation between depression scores and educational attainment (r = -.228) and household in-

come (r = -.264 p's < .01). Spearman correlation revealed a positive association between depres-

sion scores at T2 and mortality during the course of the study (r = .099) and nativity (r = .141 p's

< .001). This means that those who died over the course of the study and were born in Mexico

had higher depression scores than those who did not die or were born in the U.S. There was a

positive association between risk for dementia (higher scores = lower risk) and years of educa-

tion (r = .254), income (r = .200), and cognitive functioning (higher scores = better cognitive

functioning; r = .566, p's < .01). Risk for dementia was negatively associated with deaths (r = -.

113, p < .05) and country of nativity (r = -.166, p < .01). This means that those who did not die

over the course of the study and were born in the U.S. had greater risk for dementia than those

who did die or were born in Mexico. Education was positively correlated with income ($r = .200$)

and cognitive functioning ($r = .290$, $p's < .001$). Spearman correlation revealed a negative associ-

ation between years of education and death ($r = -.113$) and country of nativity ($r = -.471$, $p's < .001$). This means that those who did not die over the course of the study and were born in the

U.S. had higher levels of education than those who died or were born in Mexico. Income was

positively correlated with cognitive functioning ($r = .223$) and mortality ($r = .122$, $p's < .001$) and

negatively associated with country of nativity ($r = -.348$, $p < .001$). This means that those who

died over the course of the study and were born in the U.S. had greater income levels than those

who did not die or were born in Mexico. Country of nativity was negatively correlated with cog-

nitive functioning ($r = -.117$, $p < .001$). This means that those who were born in the U.S. had

greater levels of cognitive functioning, than those who were born in Mexico.

As can be seen in Table 4 and Figure 2, the mediation models revealed that risk for de-

mentia significantly partially-mediated the relationship between depression and cognitive func-

tioning. There was a significant relationship between depression and risk for dementia. Depres-

sion at T2 was a significant predictor of risk for dementia at T5, $B = 0.023$, $\beta = 0.181$, $p < 0.001$. In addition, we found that the relationship between risk for dementia and cognitive func-

tioning was significant. This means that as risk for dementia at T5 increased by one point, there

was a 0.67 decrease in the numbers of words correctly recalled on the delayed recall task from

T2 to T7, $\beta = -0.26$, $p < 0.05$, 0.015. Depression also directly predicted cognitive functioning at

T1-T6, $B = -0.02$, $\beta = -0.05$, $p < 0.05$, 0.024. Country of nativity, income level, education, gen-

der and age were included as endogenous variables to control for their effect on our independent

variable (cognitive functioning) and mediating variable (risk for dementia) (Table 4) and the

findings remained the same.

Additionally, income was significant independent predictor of cognitive functioning, such that as income decreased by one point, cognitive functioning decreased by 0.24 points, $\beta =$ -0.12, $p < 0.05$. Age, education, country of nativity, and gender were not significant independent predictors of cognitive functioning, $p's > 0.5$. However, age was a significant independent predictor of risk for dementia, such that as age increased by one year, risk for dementia increased by 0.06 points, $\beta = 0.01$, $p < 0.001$. Education was also a significant independent predictor of risk for dementia, such that as education level increased by one year, risk for dementia decreased by 0.03 points, $\beta = -0.06$, $p < 0.01$. Country of nativity significantly predicted risk for dementia status, such that individuals born in Mexico had a 0.25 increased risk for dementia compared to those who were born in U.S., $\beta = 0.11$, $p < 0.05$. Income and gender were not significant independent predictors of risk for dementia, $p's > 0.5$.

Alternative Models

We examined additional mediation analyses that included the covariates of interest (country of nativity, income level, education, gender, and age) to shed some light on, additional context to the main results reported above.

Country of Nativity. We also conducted the primary mediation analyses comparing those born in the US versus those born in Mexico (N = 883) and other Latin American regions (N = 54). The results were largely replicated, with some small changes to point estimates. The results of people born in other Latin American countries was not significantly different from those born in Mexico and were, therefore, combined for the analysis.

Mortality. When excluding those who had died over the course of the study (N = 101), the results for the main effects were largely the same in terms of effect size and were all in the same direction as the main model. One difference, however, was in the indirect effect, which was also in the same direction and had the same effect size, but was no longer significant *(p > .05)*. Meaning that depression, risk for dementia and cognitive functioning was no longer significant. This is likely due to the decrease in sample size.

Chapter V

Discussion

Summary of Findings

The main purpose of the study was to explore the impact of depressive symptoms on cognitive function and risk for dementia among elderly Mexicans and Mexican Americans in Northern California. Additional variables including income level, years of education, and country of nativity were also explored. A thorough understanding of the nature of the relationship among these variables is important as it could inform areas that could address efforts to aide the prevention of cognitive decline and risk for dementia among this underserved population.

Our results supported our hypothesis that Latino older adults with moderate to severe levels of depression would be at higher risk for dementia and have lower levels of cognitive functioning compared to those with mild to subclinical levels of depressive symptoms. It was also hypothesized that lower income and education would be linked to greater cognitive decline and risk for dementia. Our findings revealed participants with higher depressive scores had fewer years of education and lower income. Those who died over the course of the study reported higher depression scores at T2. Participants born in Mexico also reported higher depressive scores. This could be due to acculturative stress in response to immigration which manifests by uncertainty, anxiety, and depression (Berry, 1997). Participants who had a higher education level, income and cognitive functioning had lower risk for dementia. Participants born in the U.S. had greater levels of cognitive functioning, than those who were born in Mexico. The overall pattern of our results is consistent with previous studies which suggest that depressive symptoms, country of nativity, SES, and educational attainment play a role on the cognitive functioning of older

adults (Al Hazzouri, Haan, Kalbfleisch, Galea, Lisabeth, & Aiello, 2011; Bhalla et al., 2006; But-

ters et al., 2004; Hill, Angel, Balistreri, & Herrera, 2012; Xu et al., 2015).

When looking at mortality, participants who did not die over the course of the study and

were born in the U.S. had greater risk for dementia than those who did die or were born in Mexi-

co. Participants who did not die over the course of the study and were born in the U.S. had higher

levels of education than those who did die or were born in Mexico. Participants who died over

the course of the study and were born in the U.S. had greater income levels than those who did

not die or were born in Mexico. The healthy lifestyle hypothesis, may account for this as immi-

grants tend to generally lead healthier lifestyles and have fewer health risks related to drinking

and smoking (Cunningham, Ruben, & Narayan, 2008; Franzini, Ribble, & Keddie, 2001; Jasso et

al., 2004; Lopez-Gonzalez et al., 2005). This pattern is also consistent with research findings that

suggest nativity and migration are related to differences in lifetime socioeconomic status trajec-

tories. Furthermore, both early and midlife socioeconomic status have been shown to have indi-

vidual effects on cognitive aging (Haan, Al-Hazzouri, & Aiello, 2011). Research with older Mex-

ican Americans has found that individuals with greater lifetime socioeconomic advantage experi-

enced fewer declines on a test of global cognitive function and a short-term verbal memory test

(Haan, Al-Hazzouri, & Aiello, 2011).

The mediation models indicated that those with moderate to severe levels of depression

are at increased risk for dementia than those with subclinical levels of depression. This is con-

sistent with literature that indicate depression has been shown to be a significant risk factor for

cognitive decline in older adults (Bhalla et al., 2006; Butters et al., 2004) in which those with

depression have a two-fold risk for dementia including Alzheimer's and vascular dementia (Di-

niz et al., 2013). In addition, we found that the relationship between risk for dementia and change in cognition was significant; such that as risk for dementia increased there was decrease in the numbers of words correctly recalled on the delayed recall task at different time periods. In other words, those with higher risk for dementia declined in their cognitive functioning more so than those with lower risk for dementia. These results are consistent with prior studies that have demonstrated that depression is a significant risk factor for cognitive decline in older adults (Bhalla et al., 2006; Butters et al., 2004). Research has also found that the number of depressive episodes experienced in one's lifetime is positively associated with risk for dementia and with accelerated progression of dementia among Latino older adults (Lu et al., 2009). Our results extend these prior findings among a diverse sample that includes older adults of Mexican descent. The results from this study are particularly important, because of the large number of Latino older adults and the higher prevalence of dementia among this population. Compared to non-Hispanic Whites, Latinos have higher age specific prevalence of dementia, which is higher than African Americans and non-Hispanic Whites (Gurland et al.,1999). Additionally, given that Latinos are living longer, and experiencing cognitive symptoms earlier, it is important to understand key variables that are related to the risk for dementia in the elderly Latino population.

Limitations of the Study

Certain limitations were present during this study, one included not being able to explore religiosity given the lack in variability of religiosity among these participants. Given that research has found that cognitive and behavioral decline, appears to progress more slowly in individuals with religious involvement (Coin et al., 2010), it would be important to explore if religiosity impacts depressive symptoms and has an effect on cognitive functioning or risk for de-

mentia. In this study, we were unable to explore activities of daily living and acculturation, which have been shown to be associated with cognitive functioning, because these variables were only collected at baseline (Loong, 2017; Rajan, Hebert, Scherr, de Leon, & Evans, 2013). Given that this is a secondary data analysis there was lack of control over the data collected. It is important for future research to consider additional contributing factors such as; the impact of health conditions, activities of daily living, acculturation and religiosity as they have shown to have an impact on cognitive functioning (Haan et al., 2003; Loong, 2017; Rajan, Hebert, Scherr, de Leon, & Evans, 2013). Inclusion of additional variables could provide additional psychosocial information regarding longitudinal change in cognition and risk for dementia. Additionally, given that this study focused primarily on Latinos of Mexican descent, it may not be generalizable to other Latino groups given the heterogeneity of the population. This study focused primarily on older Latino adults of Mexican descent, future longitudinal studies would also benefit from exploring the impact of depressive symptoms on cognitive decline with a larger sample of Latino subgroups.

Implications and Future Directions

Findings from this study have important clinical implications for future studies on depression, cognitive decline and dementia. These results also have the ability to expand beyond research implication, as it has the potential to impact policy and education training changes. Given that the current study indicated that depressive symptoms predicts cognitive decline and risk for dementia, it calls for the need to identify and properly treat depressive symptoms as a way to help mitigate the risk for dementia and cognitive decline among Latino older adults.

Depression is a highly treatable psychological disorder; however, Latinos are underserved when it comes to mental health care. Research has shown that Latinos are less likely to seek services for psychological distress than other cultural groups (U.S. Department of Health and Human Services, 2001b). Lagomasino and colleagues (2005) found that Latinos are more likely to seek services from primary care providers, even when symptoms may be psychological in nature. The findings of this study clearly show that depression is a significant risk factor for dementia and cognitive decline for this population. Therefore, expanding the efforts to increase our ability to screen for depression among this underserved population is imperative. This calls the need for the integration of behavioral health services within the primary care settings and the importance for policymakers to acknowledge this need.

It is important to consider factors that may lead to not detecting depression or misdiagnosing it among Latinos. Research has shown that Latino immigrants may not attribute their somatic complaints and psychological distress as symptoms of depression, but rather may attribute the somatic symptoms to stress (Escobar & Vega, 2000; Lackey, 2008; Lewis-Fernandez, Das, Alfonso, Weissman, & Olfson 2005). Future studies should consider ways to account for somatic symptoms when looking at depression among Latinos. Providers should also consider assessing for somatic symptoms in their Latino patients to ensure they are not missing an individual who is depressed. This can also be addressed through incorporating culturally informative classes that address how symptoms may manifest different in particular cultures.

Given that this study showed the impact that depression can have on cognitive decline and risk for dementia, it is important for an individual with depression to receive adequate treatment for it. Research has shown that Cognitive Behavioral Therapy (CBT), Interpersonal psy-

chotherapy (IPT), behavioral activation, and problem-solving therapy are effective treatments for depression among Latinos/Hispanics (Cabassa and Hansen, 2007; Collado et al., 2016). Rosselló et al. (2008) researched a Puerto Rican sample and found that emphasizing cultural values such as *familismo* in CBT and IPT were effective in reducing depressive symptoms.

Furthermore, with Latinos living longer, it is important to also focus on quality of life as an integral part of interventions tailored for this population. As of 2011, the life expectancy for Latinos in the U.S. was 81.6 years, which is higher compared to non-Hispanic Blacks (75.3 years), non-Hispanic Whites (79 years), and Hispanic black populations (74.9 years; Arias, 2011; Arias, 2015). Focusing on the importance of addressing depression in older adults has the potential to improve quality of life. Engaging in moderate exercise has been proven to reduce the risk of cognitive decline and depressive symptoms. A study by Lincoln and colleagues (2011) found that several exercise resistance training reduces depressive symptoms in older Puerto Rican adults.

Conclusion

Depression in the geriatric Latino population is phenomenon of great concern given the impacts it can have on a person's quality of life. There is a dearth of literature on Latino older adults as mental health studies often fail to include ethnic minorities in their sample (Moreno-John et al., 2004). There is a huge need for culturally appropriate services and interventions for this population (Alvarez, Rengifo, Emrani, & Gallagher-Thompson, 2014). This study found that participants with moderate to severe levels of depression are at increased risk for dementia than those with subclinical levels of depression. Our findings also revealed participants with higher depressive scores had fewer years of education and lower income. Those who died over the

course of the study reported higher depression scores at time 2. Participants born in Mexico also reported higher depressive scores. Participants who had a higher education level, income and cognitive functioning had lower risk for dementia. Participants born in the U.S. had greater levels of cognitive functioning, than those who were born in Mexico. Findings from this study have important clinical implications for future studies on depression, cognitive decline and dementia. This study calls for the need to identify and properly treat depressive symptoms as a way to help mitigate the risk for dementia and cognitive decline among Latino older adults.

References

Administration on Aging. (2010). A statistical profile of Hispanic older Americans aged 65+. Retrieved from http://www.aoa.gov/AoARoot/Aging_Statistics/ minority_aging/Facts-on-Hispanic-Elderly.aspx

Al Hazzouri,A. Z., Haan, M. N., Kalbfleisch, J. D., Galea, S., Lisabeth, L. D., & Aiello, A. E. (2011). Life-course socioeconomic position and incidence of dementia and cognitive impairment without dementia in older Mexican Americans: Results From the Sacramento Area Latino Study on Aging. *American Journal of Epidemiology. 173*(10) 1148-1158. doi:10.1093/aje/kwq483

Alvarez, P., Rengifo, J., Emrani, T., & Gallagher-Thompson, D. (2014). Latino older adults and mental health: A review and commentary. Clinical Gerontologist: *The Journal Of Aging And Mental Health, 37*(1), 33-48. doi:10.1080/07317115.2013.847514

Aponte, R. (1991). Urban Hispanic poverty: Disaggregations and explanations. *Social Problems, 38*(4), 516–528.

Arisa, E. (2011). United States life tables, 2007. *National Vital Statistics Reports, 59*(9):1-60.

Arisa, E. (2015). United States life tables, 2011. *National Vital Statistics Reports, 64*(11):1-63.

Aragones, A., Hayes, S. L., Chen, M. H., González, J., & Gany, F. M. (2014). Characterization of the Hispanic or Latino population in health research: A systematic review. *Journal Of Immigrant And Minority Health, 16(*3), 429-439. doi:10.1007/s10903-013-9773-0

Barrett, M. S., Chua, W. J., Crits-Christoph, P., Gibbons, M. B., & Thompson, D. (2008). Early withdrawal from mental health treatment: Implications for psychotherapy practice. *Psychotherapy: Theory, Research, Practice, Training, 45,* 247–267.

Barrio, C., Palinkas, L., Yamada, A., Fuentes, D., Criado, V., Garcia, P., & Jeste, D. (2008). Un

    met needs for mental health services for Latino older adults: Perspectives from con

    sumers, family members, advocates, and service providers. *Community Mental Health*

    Journal, 44(1), 57–74.

Bassuk SS, Glass TA, Berkman LF. 1999. Social disengagement and incident cognitive decline

    in community-dwelling elderly persons. *Ann Intern Med 131,* 165–173.

Bennett, D. A., Arnold, S. E., Valenzuela, M. J., Brayne, C., & Schneider, J. A. (2014). Cognitive

    and social lifestyle: Links with neuropathology and cognition in late-life. *Acta Neu*

    ropathologica, 127(1), 137-150. doi:10.1007/s00401-013-1226-2

Berry, W. J. (1997). Immigration, acculturation, and adaptation. *Applied Psychology: An In*

    ternational Review, 46(1), 5-34

Bhalla, R.K., Butters, M.A., Mulsant, B.H., Begley, A.E., Zmuda, M.D., Schoderbek, B., Pol

    lock, B.G., Reynolds 3rd, C.F., Becker, J.T., 2006. Persistence of neuropsychologic

    deficits in the remitted state of late-life depression. *Am. J. Geriatr. Psychiatry 14*, 419–

    427.

Brody, D.J., Pratt, L.A, & Hughes, J.P., (2018). Prevalence of Depression Among Adults Aged 20

    and Over: United States, 2013–2016. NCHS data brief, No 303. National Center for

    Health Statistics.

Butters, M.A., Whyte, E.M., Nebes, R.D., Begley, A.E., Dew, M.A., Mulsant, B.H., Zmuda,

    M.D., Bhalla, R., Meltzer, C.C., Pollock, B.G., Reynolds 3rd, C.F., Becker, J. T., 2004.

    The nature and determinants of neuropsychological functioning in late-life depression.

    Arch. Gen. Psychiatry 61, 587–595.

Cabassa, L. J. (2003). Measuring acculturation: Where we are and where we need to go. Hispan

ic *Journal of Behavioral Sciences, 25,* 127–146.

Cabassa, L. J., & Hansen, M. C. (2007). A systematic review of depression treatments in primary

care for Latino adults. *Research On Social Work Practice, 17*(4), 494-503.

Carmichael, O., Mungas, D., Beckett, L., Harvey, D., Tomaszewski Farias, S., Reed, B., . . .

Decarli, C. (2012). MRI predictors of cognitive change in a diverse and carefully

characterized elderly population. *Neurobiology of Aging, 33*, 83–95.

Clark, C. M., DeCarli, C., Mungas, D., Chui, H. I., Higdon, R., Nuñez, J., . . . van Belle, G.

(2005). Earlier onset of Alzheimer disease symptoms in Latino individuals compared

with Anglo individuals. *Archives of Neurology, 62,* 774–778.

Centers for Disease Control and Prevention. (2011). Cognitive Impairment: A Call for Action.

Retrieved February 14, 2016, from http://www.cdc.gov/aging/pdf/cognitive_impairment/

cogimp_poilicy_final.pdf

Centers for Disease Control and Prevention. (2017). Depression is Not a Normal Part of Growing

Older. Retrieved April 29, 2018, from https://www.cdc.gov/aging/mentalhealth/

depression.htm

Coin, A. et al. (2010). Does religiosity protect against cognitive and behavioral decline in

Alzheimer's dementia? *Current Alzheimer Research, 7,* 445–452.

Colcombe, S.J., Kramer, A.F., Erickson, K.I., Scalf, P., 2005. The implications of cortical

recruitment and brain morphology for individual differences in inhibitory function in

aging humans. *Psychol. Aging 20*, 363–375.

Collado, A., Lim, A. C. and MacPherson, L. (2016). A systematic review of depression

psychotherapies among Latinos. Clinical Psychology Review, 45, 193–209.

Corrigan, P. (2004). How stigma interferes with mental health care. *American Psychologist, 59,* 614–625

Cunningham, A., Ruben, JD., & Narayan, KM. (2008). Health of foreign-born people in the United States: a review. *Health Place, 14*(4):623-35. doi: 10.1016/j.healthplace. 2007.12.002.

Czernochowski, D., Fabiani, M., & Friedman, D. (2008). Use it or lose it? SES mitigates age related decline in a recency/recognition task. *Neurobiology Of Aging, 29*(6), 945-958. doi:10.1016/j.neurobiolaging.2006.12.017

Dickinson, W. J., Potter, G. G., Hybels, C. F., McQuoid, D. R., & Steffens, D. C. (2011). Change in stress and social support as predictors of cognitive decline in older adults with and without depression. *International Journal Of Geriatric Psychiatry, 26*(12), 1267-1274. doi: 10.1002/gps.2676

Diniz, B.S., Butters, M.A., Albert, S.M., Dew, M.A., Reynolds 3rd, C.F., 2013. Late-life depress sion and risk of vascular dementia and Alzheimer's disease: systematic review and meta-analysis of community-based cohort studies. *Br. J. Psychiatry 202*, 329–335.

Dwight-Johnson, M., & Lagomasino, J. T. (2007). Addressing depression treatment preferences of ethnic minority patients. *General Hospital Psychiatry, 29*, 179–181. doi:10.1016/ j.genhosppsych.2007.02.001

Escobar, J.I., & Vega, W.A. (2000). Mental health and immigration AAAs. *Journal of Mental and Nervous Disease, 188,* 736–740.

Everett, B. G., Rogers, R. G., Hummer, R. A., & Krueger, P. M. (2011). Trends in educational

attainment by race/ethnicity, nativity, and sex in the United States, 1989–2005. *Ethnic*

*And Racial Studies, 34(*9), 1543-1566. doi:10.1080/01419870.2010.543139

Falicov, J. C. (2009). Commentary: On the wisdom and challenges of culturally attuned treat

ments for Latinos. *Family Process, 48*(2), 292–309.

Farias, S. T., Mungas, D., Hinton, L., & Haan, M. (2011). Demographic, neuropsychological, and

functional predictors of rate of longitudinal cognitive decline in Hispanic older adults.

The American Journal Of Geriatric Psychiatry, 19(5), 440-450. doi:10.1097/JGP.

0b013e3181e9b9a5

Farias, S. T., Mungas, D., Reed, B., Carmichael, O., Beckett, L., Harvey, D., . . . Decarli, C.

(2012). Maximal brain size remains an important predictor of cognition in old age,

independent of current brain pathology. *Neurobiology of Aging, 33,* 1758–1768.

Franzini, L., Ribble, JC., & Keddie, AM. (2001) Understanding the Hispanic paradox. *Ethnicity*

& Disease. 11(3):496-518.

Folstein, M.F., Folstein, S.E., & McHugh, P.R. (1975). "Mini-mental state." A practical method

for grading the cognitive state of patients for the clinician. *Journal of Psychiatric*

Research, 12, 189–198.

Gallagher, D., Kiss, A., Lanctot, K., & Herrmann, N. (2016). Depressive symptoms and conga

tive decline: A longitudinal analysis of potentially modifiable risk factors in community

dwelling older adults. *Journal Of Affective Disorders*, 190235-240. doi:10.1016/j.jad.

2015.09.046

Garcia, G. (2011). *Mexican American and immigrant poverty in the United States. The Springer series on demographic methods and population analysis*. New York, NY: Springer.

Grace, J., Nadler, J. D., White, D. A., Guilmette, T. J., Giuliano, A. J., Monsch, A. U., & Snow, M. G. (1995). Folstein vs Modified Mini-Mental State Examination in geriatric stroke: Stability, validity, and screening utility. *Archives Of Neurology, 52*(5), 477-484. doi: 10.1001/archneur.1995.00540290067019

Gurland, B. J., Wilder, D. E., Lantigua, R., Stern, Y., Chen, J., Killeffer, E. P., & Mayeux, R. (1999). Rates of dementia in three enthoracial groups. *International Journal Of Geriatric Psychiatry, 14*(6), 4 81-493. doi:10.1002/(SICI)1099-1166(199906)14:6<481::AID-GP S959>3.0.CO;2-5

González, H. M., Mungas, D., & Haan, M. N. (2002). A verbal learning and memory test for English- and Spanish-speaking older Mexican-American adults. *The Clinical Neuropsychologist, 16*(4), 439-451. doi:10.1076/clin.16.4.439.13908

Haan, M. N., Al-Hazzouri, A. Z., & Aiello, A. E. (2011). Life-span socioeconomic trajectory, nativity, and cognitive aging in Mexican Americans: The Sacramento Area Latino Study on Aging. *The Journals Of Gerontology: Series B: Psychological Sciences And Social Sciences, 66B*(Supp 1), 102-110. doi:10.1093/geronb/gbq071

Haan, M. N., Mungas, D. M., Gonzalez, H. M., Ortiz, T. A., Acharya, A., & Jagust, W. J. (2003). Prevalence of Dementia in Older Latinos: The Influence of Type 2 Diabetes Mellitus, Stroke and Genetic Factors. *Journal Of The American Geriatrics Society, 51*(2), 169-177. doi:10.1046/j.1532-5415.2003.51054.x.

Hamilton, T. G. (2015). The healthy immigrant (migrant) effect: In search of a better native-born

comparison group. *Social Science Research,* 54353-365. doi:10.1016/j.ssresearch.
2015.08.008

Hernandez, R., Prohaska, T. R., Wang, P.-C., & Sarkisian, C. A. (2013). The longitudinal
relationship between depression and walking behavior in older Latinos: The
"¡Caminemos!" study. *Journal of Aging and Health, 25*, 319–341.

Hill, T. D., Angel, J. L., Balistreri, K. S., & Herrera, A. P. (2012). Immigrant status and cognitive
functioning in late-life: An examination of gender variations in the healthy immigrant ef
fect. *Social Science & Medicine, 75(*12), 2076-2084. doi:10.1016/j.socscimed.
2012.04.005

Hill, P. C. and Pargament, K. I. (2003). Advances in the conceptualization and measurement of
religion and spirituality: implications for physical and mental health research. *American
Psychologist, 58,* 64–74. doi:10.1037/0003–066X.58.1.64.

Ho, A. P. Y. (2007). A peer counselling program for the elderly with depression living in the
community. *Aging & Mental Health, 11,* 69–74

Holland, J. C. et al. (1999). The role of religious and spiritual beliefs in coping with malignant
melanoma. *Psycho-Oncology, 8,* 14–26.

Holtzman RE, Rebok GW, Saczynski JS, Kouzis AC, Wilcox Doyle K, et al. 2004. Social
network characteristics and cognition in middle-aged and older adults. *J Gerontol B Psy
chol Sci Soc Sci 59*: 278–284.

Jasso G, Massey D, Rosenzweig M, Smith J. Immigrant health: Selectivity and acculturation. In:
Anderson N, Butano R, Cohen B, editors. Critical perspectives on racial and ethnic
differences in health in late life. Springer Publishing Company; New York: 2004. pp.

227–266.

Jeste, D. V., Alexopoulos, G. S., Bartels, S. J., Cummings, J. L., Gallo, J. J., Gottlieb, G. L., . . .
Lebowitz, B. D. (1999). Consensus statement on the upcoming crisis in geriatric mental
health: Research agenda for the next 2 decades. *Archives*
of General Psychiatry, 56, 848–853.

Karel, M. J., Gatz, M., & Smyer, M. A. (2012). Aging and mental health in the decade ahead:
What psychologists need to know. *American Psychologist, 67,* 184–198.

Kessler, R. C., Berglund, P. A., Bruce, M. L., Koch, J. R., Laska, E. M., Leaf, P. J., . . . Wang, P.
S. (2001). The prevalence and correlates of untreated serious mental illness. *Health Ser*
vices Research, 36, 987–1007.

Klap, R., Unroe, K. T., & Unützer, J. (2003). Caring for mental illness in the United States: A
focus on older adults. *The American Journal of Geriatric Psychiatry, 11*, 517–524.

Kwag, K., Jang, Y., & Chiriboga, D. (2012). Acculturation and depressive symptoms in
Hispanic older adults: Does perceived ethnic density moderate their relationship? *Journal*
of Immigrant and Minority Health, 14, 1107–1111.

Lackey, G.F. (2008). ''Feeling blue'' in Spanish: A qualitative inquiry of depression among Mex
ican immigrants. *Social Science & Medicine, 67*, 228–237.

Lagomasino, I. T., Dwight-Johnson, M., Miranda, J., Zhang, L., Liao, D., Duan, N., & Wells, K.
B. (2005). Disparities in depression treatment for Latinos and site of care. *Psychiatric*
Services, 56(12), 1517-1523. doi:10.1176/appi.ps.56.12.1517

Langheim, F. P. (2014). Poor access to health care as a social determinant of mental health.
Psychiatric Annals, 44(1), 52-57. doi:10.3928/00485713-20140108-09

Levine, E. G. and Targ, E. (2002). Spiritual correlates of functional well-being in women with

    breast cancer. *Integrative Cancer Therapies, 1,* 166–174.

Lewinsohn, P. M., Seeley, J. R., Roberts, R. E., & Allen, N. B. (1997). Center for Epidemiologic

    Studies Depression Scale (CES-D) as a screening instrument for depression among

    community-residing older adults. *Psychology And Aging, 12*(2), 277-287. doi:

    10.1037/0882-7974.12.2.277

Lewis-Fernandez, R., Das, A.K., Alfonso, C., Weissman, M.M., & Olfson, M. (2005). Depres

    sion in US Hispanics: Diagnostic and management considerations in family practice.

    Journal of the American Board of Family Practice, 18, 282–296.

Lincoln, A. K., Shepherd, A., Johnson, P. L., & Castaneda-Sceppa, C. (2011). The impact of

    resistance exercise training on the mental health of older Puerto Rican adults with type 2

    diabetes. *The Journals Of Gerontology: Series B: Psychological Sciences And Social*

    Sciences, 66(5), 567-570. doi:10.1093/geronb/gbr034

Loong, P. Z. (2017). The Association between Acculturation and Cognitive function among Chi

    nese elderly in Chicago. *Journal of Psychiatry, 20*(5), 75

Lopez, M. J. (2013). Poverty among Hispanics in the United States. In M. T. Mora & A. Davila

    (Eds.), *The economic status of the hispanic population: Selected essays* (pp. 49–64).

    Charlotte, NC: Information Age Publishing.

Lopez-Gonzalez, L., Aravena, V., Hummer, R. (2005) Immigrant acculturation, gender and

    health behavior: A research note. *Social Forces, 84*:581–593.

Lu, P.H., Edland, S.D., Teng, E., Tingus, K., Petersen, R.C., Cummings, J.L., Alzheimer's Dis

    ease Cooperative Study Group, 2009. Donepezil delays progression to AD in MCI sub

jects with depressive symptoms. *Neurology 72*, 2115–2121.

Lupien, S.J., Fiocco, A., Wan, N., Maheu, F., Lord, C., Schramek, T., Tu, M.T., (2005). Stress

hormones and human memory function across the lifespan. *Psychoneuroendocrinology*

30, 225–242.

Miller, W. C., Anton, H.A., Townson, A.F. (2008). Measurement properties of the CESD scale

among individuals with spinal cord injury. *Spinal Cord. 46*(4):287-92.

Mueller, P. S., Plevak, D. J. and Rummans, T. A. (2001). Religious involvement, spirituality, and

medicine: implications for clinical practice. *Mayo Clinic Proceedings, 76,* 1225–1235.

doi:10.4065/76.12.1225.

Moreno-John, G., Gachie, A., Fleming, C. M., Nápoles-Springer, A., Mutran, E., Manson, S.

M., & Pérez-Stable, E. J. (2004). Ethnic minority older adults participating in clinical

research: Developing trust. *Journal of Aging & Health, 16*(5 Suppl), 93S–123S.

Mungas, D., Beckett, L., Harvey, D., Tomaszewski Farias, S., Reed, B., Carmichael, O., . . .

Decarli, C. (2010). Heterogeneity of cognitive trajectories in diverse older persons.

Psychology and Aging, 25, 606–619. http://0-dx.doi.org.ignacio.usfca.edu/10.1037/

a0019502

Mungas, D., Reed, B. R., Farias, S. T., & Decarli, C. (2009). Age and education effects on

relationships of cognitive test scores with brain structure in demographically diverse

older persons. *Psychology and Aging, 24,* 116–128.

National Alliance on Metal Illness. (2009). Depression in Older Persons. Retrieved July 27,

2018, from https://www.ncoa.org/wp-content/uploads/Depression_Older_Persons_Fact

Sheet_2009.pdf

National Institute of Mental Health. (2016). Major Depression. Retrieved July 27, 2018, form

https://www.nimh.nih.gov/health/statistics/major-depression.shtml

Orrenius, P., & Zavodny, M. (2013). Trends in poverty and inequality among Hispanics. In R. S.

Rycroft (Ed.), *The economics of inequality, poverty, and discrimination* (pp. 217–235).

Santa Barbara, CA: Praeger.

Ortman, J.M., Velkoff, V. A., & Hogan, H. (2014). An aging nation: The Older Population in the

United States. U. S. Census Bureau.

Pew Hispanic Center. (2015) Retrieved from http://pewhispanic.org/

Radloff, L. S. (1977). The CES-D Scale: A self-report depression scale for research in the general

population. *Applied Psychological Measurement, 1*(3), 385-401. doi:10.1177/014662

167700100306

Rajan, K. B., Hebert, L. E., Scherr, P. A., de Leon, C. M., & Evans, D. A. (2013). Disability in

basic and instrumental activities of daily living is associated with faster rate of decline in

cognitive function of older adults. *The Journals Of Gerontology: Series A: Biological

Sciences And Medical Sciences, 68A*(5), 624-630. doi:10.1093/gerona/gls208

Rosselló, J., Bernal, G. and Rivera-Medina, C. (2008). Individual and group CBT and IPT for

Puerto Rican adolescents with depressive symptoms. *Cultural Diversity and Ethnic

Minority Psychology, 14*, 234–245.

Rusch, L. C., Kanter, J. W., Manos, R. C., & Weeks, C. E. (2008). Depression stigma in a pre

dominantly low income African American sample with elevated depressive symptoms.

Journal of Nervous and Mental Disease, 196, 919–922.

Scarmeas, N., Levy, G., Tang, M. -., Manly, J., & Stern, Y. (2001). Influence of leisure activity

on the incidence of Alzheimer's disease. *Neurology, 57*(12), 2236-2242.

Schwartz, S. J., Unger, J. B., Zamboanga, B. L., & Szapocznik, J. (2010). Rethinking the concept

of acculturation: Implications for theory and research. *American Psychologist, 65*, 237–

251.

Schwarzbaum, E. S. (2004). Low-income Latinos and dropout: Strategies to prevent dropout.

Journal of Multicultural Counseling and Development, 32, 296–306.

Seeman, T. E., Lusignolo, T. M., Albert, M., & Berkman, L. (2001). Social relationships, social

support, and patterns of cognitive aging in healthy, high-function older adults: MacArthur

studies of successful aging. Health Psychology, 20, 243–255.

doi10.1037=0278-6133.20.4.243

Sheline, Y. I., Gado, M. H. and Kraemer, H. C. (2003). Untreated depression and hippocampal

volume loss. *The American Journal of Psychiatry*, 160, 1516–1518. doi: 10.1176/appi.a

jp.160.8.1516.

Sirey, J. A., Bruce, M. L., Alexopoulos, G. S., Perlick, D. A., Raue, P., Friedman, S. J., & Mey

ers, B. S. (2001). Perceived stigma as a predictor of treatment discontinuation in young

and older outpatients with depression. *The American Journal of Psychiatry, 158,* 479–

481.

Siordia, C., & Leyser-Whalen, O. (2014). Mexican Americans' lucky few and baby boom co

    horts: How is relative cohort size related to the likelihood of being out-of-poverty? *Socio*

    logical Focus, 47(3), 163–173.

Springer, M.V., McIntosh, A.R., Winocur, G., Grady, C.L., (2005). The relation between brain

    activity during memory tasks and years of education in young and older adults.

    Neuropsychology 19, 181–192.

Steffens, D. C., Otey, E., Alexopoulos, G. S., Butters, M. A., Cuthbert, B., Ganguli, M., & ...

    Yesavage, J. (2006). Perspectives on depression, mild cognitive impairment, and cogni

    tive decline. Archives Of General Psychiatry, 63(2), 130-138. doi:10.1001/archpsyc.

    63.2.130

Sullivan, D. H., & Ziegert, A. L. (2008). Hispanic immigrant poverty: Does ethnic origin matter?

    Population Research and Policy Review, 27(6), 667–687.

Teng, E.L., & Chui, H.C. (1987). The Modified Mini-Mental State (3MS) Examination. *J Clin*

    Psychiatry. 48(8):314-8.

Teng, E. L. , Chui, H. C., & Gong, A. (1990). Comparisons between the Mini-Mental State Exam

    (MMSE) and its modified version-the 3MS Test. In K. Hasegawa & A. Homma (Eds.),

    Psychogeriatrics: Biomedical and Social Advances (pp. 189-192). Amsterdam: Excerpta

    Medical.

U.S. Census Bureau. (2017). Quick Facts United States. Retrieved June 23, 2018, form https://

    www.census.gov/quickfacts/fact/table/US/PST045217

U.S. Census Bureau. (2018). Demographic Turning Points for the United States: Population Pro

    jections for 2020 to 2060. Retrieved July 27, 2018, form https://www.census.gov/library/

publications/2018/demo/p25-1144.html

U.S. Department of Health and Human Services. (1999). Mental health: A report of the Surgeon

    General. Rockville, MD: U.S. Department of Health and Human Services, Substance

    Abuse and Mental Health Services Administration, Center for Mental Health Services,

    National Institutes of Health, National Institute of Mental Health.

U.S. Department of Health and Human Services. (2001a). Mental health: Culture, race, and

    ethnicity- A supplement to mental health: A report of the Surgeon General. Rockville,

    MD: U.S. Department of Health and Human Services, Substance Abuse and Mental

    Health Services Administration, Center for Mental Health Services.

U.S. Department of Health and Human Services. (2001b). Culture, race, and ethnicity: a

    supplement to mental health: a report of the surgeon general. Rockville,

    MD: U.S. Department of Health and Human Services, Human Services, Public Health

    Service.

Üstün, T. B., Ayuso-Mateos, J. L., Chatterji, S., Mathers, C., & Murray, C. L. (2004). Global

    burden of depressive disorders in the year 2000. *The British Journal Of Psychiatry,*

    184(5), 386-392. doi:10.1192/bjp.184.5.386

van Beljouw, I., Verhaak, P., Prins, M., Cuijpers, P., Penninx, B., & Bensing, J. (2010). Reasons

    and determinants for not receiving treatment for common mental disorders. *Psychiatric*

    Services, 61, 250–257.

Wilson, R. S., Bennett, D. A., Gilley, D. W., Beckett, L. A., Barnes, L. L., & Evans, D. A. (2000).

    Premorbid reading activity and patterns of cognitive decline in Alzheimer disease.

    Archives Of Neurology, 57(12), 1718-1723. doi:10.1001/archneur.57.12.1718

Xu, W., Tan, L., Wang, H., Tan, M., Tan, L., Li, J., & ... Yu, J. (2015). Education and risk of de

mentia: Dose-response meta-analysis of prospective cohort studies. *Molecular Neurobi

ology*, doi:10.1007/s12035-015-9211-5

Appendix A

Table 1

Characteristics of Participants

Gender	
Male (%)	745 (41.6%)
Female (%)	1044 (58.4%)
Gross Income Last Month	
Less than 1000 (%)	748 (42.8%)
1000-1499 (%)	358 (20.0%)
1500-1999 (%)	199 (11.1%)
2000-2499 (%)	163 (9.1%)
2500 or more (%)	246 (13.8%)
Country of Origin	
United States (%)	970 (54.2%)
Mexico (%)	809 (45.2%)
Years of Education	($M = 7.24$, $SD = 5.34$)
Age	($M = 70.6$, $SD = 7.11$)
Number of Deaths	464 (25.9%)

Table 2

Correlational Analyses Among Variables in Study

	CESD_2	MSE_5D	Years of Education	Income	Mortality	Nativity
CESD_2	--					
MSE_5D	-.048	--				
Years of Education	-.228**	.254**	--			
Income	-.264**	.200**	.543**	--		
Mortality	+.099**	+-.113*	+-.113**	+.122**	--	
Nativity	+.141**	+-.166**	+-.471**	+-.348**	-.007	--
SEVLT	-.026	.566**	.290**	.223**	+-.054	+-.117**

Note. * *p* < .05, ** *p* < .001. CESD_2= Depression, MSE3_5D = Risk of dementia, SEVLT = Cognitive Functioning +Spearman correlation was used to test the association between the categorical variables of death status and country nativity with depression scores, risk for dementia, and cognitive functioning.

Table 3

Chi-square between Nativity and Mortality

		Mortality	
		No	Yes
Nativity	U.S.	721	249
	Mexico	598	211

Chi-Square = .039, p > .05

Table 4

Unstandardized, Standardized, and Significance Levels of Model in Figure 2 (Standard Errors in Parentheses); N = 883

Parameter Estimate	Unstandardized	Standardized	p
Measurement Model Estimates			
Delay_CH on			
MSE3_5D	-0.67 (0.28)	-0.26	0.015
Age	-0.01 (0.03)	-0.03	0.663
Education	-0.03 (0.03)	-0.06	0.342
Income	-0.24 (0.11)	-0.12	0.027
Origin	0.07 (0.31)	0.01	0.818
Gender	0.21 (0.29)	0.03	0.463
MSE_5D on			
CESD_2	0.02 (0.01)	0.18	0.000
Age	0.06 (0.01)	0.31	0.000
Education	-0.06 (0.02)	-0.24	0.001
Income	-0.03 (0.05)	-0.03	0.584
Origin	0.25 (0.12)	0.11	0.029
Gender	0.05 (0.12)	0.02	0.685

Note. Delay_CH on = Cognitive Functioning, MSE3_5D = Risk for dementia, CESD_2= Depression.
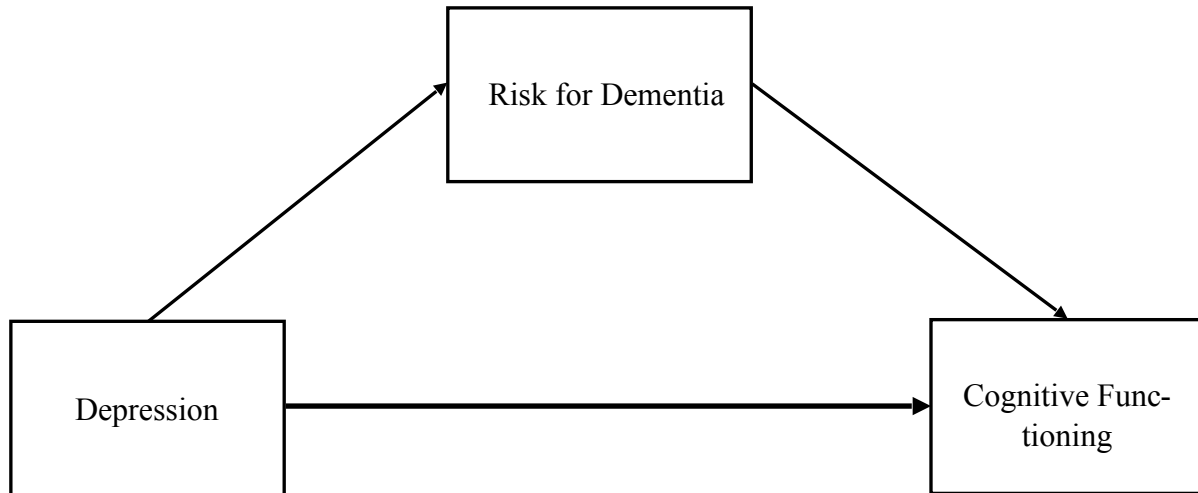
Appendix B

Figure 1. Depression at time 1 was used to predict dementia status at time 4, which was in turn used to predict change in cognition from T1 to T6. Covariate of interest; nativity, socioeconomic status, education, gender and age were included predicting all endogenous variables to ensure these variables did not account for the associations of interest.
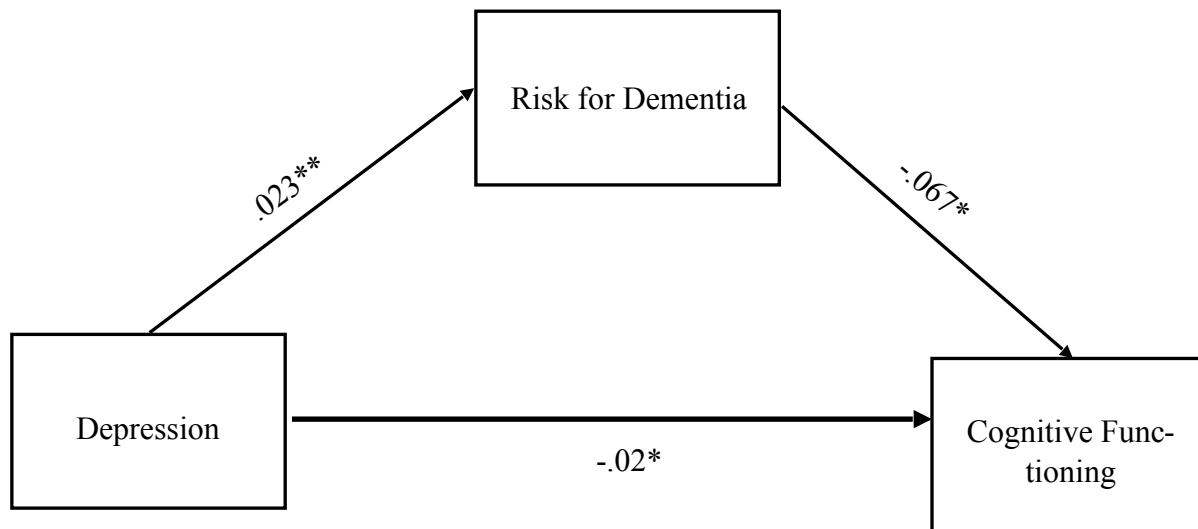
Figure 2. Depression at time 1 was used to predict dementia status at time 4, which was in turn used to predict change in cognition from T1 to T6. Covariate of interest; nativity, socioeconomic status, education, gender and age were included predicting all endogenous variables to ensure these variables did not account for the associations of interest.