ANALYSIS OF HISPANIC COMORBID FACTORS RELATED TO ALZHEIMER'S DISEASE DIAGNOSTIC ASSESSMENT

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ABSTRACT

ANALYSIS OF COMORBID FACTORS RELATED TO ALZHEIMER'S DISEASE DIAGNOSTIC ASSESSMENT

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Hispanic participation in Alzheimer's disease (AD) research studies has been historically low. With low engagement, there are many nuances which are not understood related to AD care in the Hispanic Community. The primary purpose of this study is to analyze a Hispanic data set of risk factors of Alzheimer's Disease. Three predictors have been identified to be highly correlated with the onset of Alzheimer's disease in other populations and will be analyzed to indicate how predictive they are in a diagnosis of Alzheimer's disease in a Hispanic population. This dissertation is available in open access at AURA, https://aura.antioch.edu/ and OhioLINK ETD Center, https://etd.ohiolink.edu

Keywords: Alzheimer's Disease, MMSE, regression model, Hispanic dataset, predictor factors

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CHAPTER I: INTRODUCTION

Alzheimer's disease poses an increased threat and risk for all older adults in the world. Worldwide, around 50 million people have dementia, and there are nearly 10 million new cases every year (World Health Organization, 2020). In 2020, Alzheimer's disease (AD) accounted for 60-70% of all dementia cases in the United States (Alzheimer's Association, 2020).

More than 5 million Americans are currently diagnosed with the disease and it is estimated that 14 million Americans will suffer from AD by the year 2050 (Alzheimer's Association, 2020). It is also estimated that the Hispanic community is anticipated to grow to 43.1 million by 2020 (Ortman & Shin, 2011). By 2050, the number of people aged over 60 years will have increased by 1.25 billion, accounting for 22% of the world's population (Prince, Bryce, Albanese, et al., 2013). With this rate of growth in both the Hispanic community and Alzheimer's diagnosis, there will be an increased presence of older adults needing services. In the Hispanic community, AD is expected to grow from nearly 400,000 in 2012 to approximately 3.5 million by 2060 (Wu, Rodriguez, Jin, Vega, & William, 2019).

With such a large community of individuals, this disease has financial implications on both families and the government. "Health care and long-term services, including out-of-pocket expenses, for those living with Alzheimer's and other dementia is nearly $30,000 per year for those living at home and more than $77,000 per year for those in a residential facility" (Fredriksen-Goldsen, Jen, Bryan, & Goldsen, 2016, pg. 6). The United States alone has spent over $100 billion dollars annually to combat this disease (Rapoport & Wright, 2006). This exorbitant number seems to be enough motivation to grab the attention of advocacy groups, researchers, and government officials. Gaining greater insight has the potential to identify predictors, slowing progression, and ultimately lead to a pathway for prevention.

Overview of the Problem

In recent years, society has seen the increase of the baby boomer generation and the many ailments that manifest themselves with old age. AD is one of the leading dementias affecting our aging population in the United States and across the world (National Cancer Institute, 2018). Awareness of Dementia has caused both concern and acceptance, that a growing majority of our elderly populations are currently facing this disease. Around 50 million people have dementia, and there are nearly 10 million new cases every year (World Health Organization, 2020). While crucial questions have been answered in regard to the pathology of this disease and the different mechanisms that cause its impairment, there are still unanswered questions that require further exploration by research professionals. I will specifically look at how certain health comorbidities in older Hispanics population may inform probability of AD using the The Mini-Mental State Exam (MMSE) . In this dataset, comorbidities have been selected in order to see if they have impact on the diagnosis of Alzheimer's diagnostics in the Hispanic community.

Statement of Purpose

The purpose of my analysis is to explore the various risk factors used to predict AD and how they specifically affect members of the Hispanic community. Research on the subject has been mostly restricted to limited comparisons of Caucasian norms. “While studies have found that ethnic minority patients and their caregivers are not utilizing dementia services to the same extent as others. this has led some authors to suggest that dementia in many ethnic minority patients may be under-diagnosed and under-treated” (Nielsen, Vogel, Phung, Gade, & Waldemar,2011, p.1128).

Limited research suggests that AD does not occur uniformly across all individuals and there are knowledge gaps when it comes to the disease and its effects on the Hispanic

demographic (Santos et al., 2019).“Interestingly, Hispanic individuals have been found to survive longer with AD and have lower mortality risk estimates from any cause relative to Black individuals and White individuals ” (Santos et al., 2019, p.636). It is information and research such as this that show powerful differences in understanding AD and how its effects amongst certain populations differ. For the purpose of this research study, I hope to present how much each comorbid factor contributes to an Alzheimer’s diagnosis in an all hispanic sample. This dissertation plans to answer the following question: Can major risk factors of AD be predictors in identifying and diagnosing AD for a Hispanic sample using a multivariate regression analysis?

CHAPTER II: LITERATURE REVIEW

This Literature Review is intended to offer an overview of three comorbidities (Cardiovascular Disease, Diabetes, and Hypertension) and the impact they have on AD, and the Mini-Mental State Exam (MMSE). The MMSE score by proxy will reveal if a client has AD and the stage of severity at the current assessment. While research related to Alzheimer's comorbidities and risk has been sporadic for many years, it has only become a significant research presence over the past two decades and is a much more recent addition to the field of research when compared with other psychological issues, such as schizophrenia or depression.

Overview of Alzheimer's disease

While the term and idea of dementia has been around since 50 B.C, the actual pathology of the disease process is relatively new and was first discovered in the 1800-1900's. The term dementia was coined by philosopher Lucretius in 50 B.C (Ballenger, 2006). Initially dementia was used to describe someone who is out of their mind (Ballenger, 2006, p.13). It wasn't until the 1800-1900's that the symptomatology and pathology was put together to form subtypes of the disease we know as Alzheimer's (Ballenger, 2006).

In 1906, German neurologist Alois Alzheimer noticed brain tissue with deterioration that was irreversible, and that caused death within 12 years of the start of brain tissue deterioration (Kring, Davidson, Neal, & Johnson, 2013). With Alzheimer's discovery of the disease and its pathology, we understood there was a disease that could impair healthy aging. Over 100 years later, we have a better understanding of how the pathology that Alois Alzheimer observed effects cognition and processing skills, and how it disrupts the activity of everyday living (Yeo, 2011).

Alzheimer 's disease and Comorbidities

The Diagnostic and Statistical Manual of Mental Disorders (DSM-V) defines dementia as the development of multiple cognitive deficits where memory impairment and one or more domains are affected. These domain areas include: aphasia (unable to comprehend language), apraxia (inability to execute motor planning), agnosia (loss of ability to comprehend the meaning of objects, people, sounds, or smells) and executive functioning (regulation of cognitive functioning, reasoning, and problem solving) (American Psychiatric Association, 2000).

In 2020, there were 50 million older adults with a dementia diagnosis worldwide, and there are 10 million newly diagnosed cases every year (World Health Organization, 2020). This is equivalent to one in nine individuals over the age of 65 living with dementia (Alzheimer's Association, 2020). AD is the most common type of dementia, accounting for between 60 to 80 percent of all dementia cases in the United States (World Health Organization, 2020). The presumed causes of AD can be traced to deposits of protein plaques (beta-amyloid protein) that are caused by a buildup of protein tangles (interlocking strands of tau protein) (Alzheimer's Association, 2020). It may also be caused by nerve cell damage to the brain (Alzheimer's Association, 2020). However, it remains unclear if these plaques and tangles are the basis for, or the physical results from, the impairment seen with AD (Alzheimer's Association, 2020).

Comorbidities for AD are largely unknown (Amaducci & Lippi, 1992). However, some epidemiological studies have identified age, gender, education, head injury, stroke, coronary artery disease, and depression, as possible causes (Rocca, & Amaducci, 1991; Rocca et al., 1991). Genetic factors include Down's syndrome, family history, and the epsilon 4 allele on chromosome 19, which is a fat-bound protein circulating in the blood that plays an integral role in cholesterol transport (Heyman et al., 1984; Huff, Auerbach, Chakravarti, & Boiler, 1988; Gurland et al., 1997). One study identifies malnutrition as a potential cause of AD (Abalan,

1984), and similarly, dementia has also been reported in those who have undergone extreme starvation as prisoners of war (Gibberd & Simmonds, 1980). However, only a few of the proposed risk factors for AD are established, such as age and gender (Amaducci & Lippi, 1992). Among environmental factors, socioeconomic status (SES) was reportedly a major contributor to morbidity and mortality rates in AD patients (Strickland et al., 1999). Although this was only one contributor factor when compounded with age and gender lends to increase an individual's probability of diagnosis . In an imaging study conducted at Washington University in 2021, research found that there were interactions between socioeconomic status and race (Meeker et al.,2021). The findings for Dr. Meeker's study was that there was a two to four-fold increase risk of AD for African Americans compared to non-Hispanic Whites, controlling for years of education (Meeker et al.,2021). While we know that SES is a major contributor factor this particular study never broke down the percentage that SES

The understanding of the cause of an AD diagnosis has grown beyond the thought of just old age to certain factors that can increase an individual's rate of developing this disease. Some of these risk factors are cardiovascular disease, diabetes, hypertension, and family genetics (O'Bryant, 2013). The correlation between dementia and vascular-related issue were first recognized by Dr. Hachinski and Dr.Bowler (Couteur, Devin &Wahl, 2017). From the connection and foundation that Dr. Hachinski and his team formed, we are now informed that in many countries of the world, cardiovascular diseases is the most common comorbid feature present in clients diagnosed with AD (Couteur, et al., 2017). Under the umbrella of cardiovascular health, we have stroke, hypertension, and myocardial infarction.

The second leading comorbidity and an additional component of this analysis is diabetes (Meneilly, & Tessier, 2016). **[**Canadian researchers Meneilly and Tessier (2016), have

extensively reviewed the connection between dementia and diabetes. They believe that the risk for dementia in clients with diabetes increases in relation to age, ethnicity, education, depression, and both micro vascular and macro vascular disease. A study of older Mexican Americans found that type 2 diabetes and hypertension contribute more to dementia in this ethnic group than in people of European ancestry: 43% of those with dementia had diabetes, stroke or both (Alzheimer's Association, 2004).

One of the reasons for looking at a Hispanic dataset exclusively is to see if similar outcomes are occurring in this minority group and to also observe any other trends that might be unique to this population. The challenges associated with treating a particular group is having enough research, data and understanding about that particular group to best serve them. For many researchers there is a lack of understanding of how cultural factors interact with sociodemographic factors to contribute to, cause, or exacerbate medical conditions (Ardila, 1995). This is particularly relevant for neuropsychologists who arrive at diagnostic impressions based on patients' performance on evaluations that are largely influenced by factors such as age, education, culture, gender, functional limitations or disability, and intellectual functioning.

Mini-Mental State Exam (MMSE)

The Mini-Mental State Exam (MMSE) is a screening instrument that is considered the gold standard to assess cognitive impairment in geriatric populations (Biessels, & Luchsinger, 2009). Many medical professionals prefer this instrument because of its brevity at only 30 questions (Folstein ,Folstein & McHugh, 1975). Although the MMSE is the most common test used to assess cognition for the past 40 years, it has its flaws and limitations (Biessels, & Luchsinger, 2009). One of those limitations is how "Hispanics were more likely than non-Hispanic White or Black individuals to receive a false-positive classification of dementia when

examined with cognitive screening tests" (Hohl et al., 1999, p. 302). With researchers aware of this limitation, San Diego State University created a native Spanish speaking version of the MMSE (Hohl et al., 1999). Although this development was intended to improve on the limitation of the MMSE, this version of the assessment was unable to fully escape criticism because it did not update group norms for the population (Hohl et al., 1999).

Table 1
MMSE Score Interpretation

Legend for Chart:		
MMSE score	Cognitive status	Associated factors
30 to 24	No cognitive impairment	The scale is less sensitive in identifying very mild cognitive decline because hearing loss, vision loss, and physical frailty may also cause lower scores.
23 to 19	Mild cognitive impairment	For those with less than a ninth-grade education, a score <19 is more indicative of true cognitive loss. Decline in Adult daily living may be a problem. Clinical correlation between MMSE score and functional status is extremely important
18 to 11	Moderate cognitive impairment	Clinical dementia is typically apparent Loss of Adult daily living (ADL) skills is common.
10 to 0	Severe cognitive impairment	Dementia is advanced; the scale is limited by a floor effect in being unable to monitor decline in those patients who score 0 but maintain some cognition. Clinical assessment should focus on functional skills

Definition of the Term Hispanic

The American Census Bureau (2000) defines a Latino or Hispanic as "a person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin regardless of race" (Bureau of the Census, 2000, p.5). The US government considers race and ethnicity to be separate concepts, and acknowledges that race is a social, not a biological construct (Bureau of the Census, 2000). Although this is the current criteria and guidance on labeling and linking

an individual's heritage to Hispanic it is also a term that is ever evolving and changing. Currently the term LatinX is being used more frequently in research to capture groups identified as Hispanic. LatinX is described as gender non-conformity, coalitions across borders, boundaries, status, and unity not only across differences but also across Legislated and/or policed divisions (DeGuzman, 2014). Latinos/Hispanics in the United States are a widely heterogeneous group made up of people migrating from different countries with unique cultural and historical traditions and people born within the U.S. to Hispanic families (Montoro-Rodriguez et al., 2006). In the 2000 Census, 32.8 million people in the United States identified themselves as Hispanic (Bureau of the Census, 2000). Within this broad category, individuals self-identified in the following ways: 66 percent, Mexican; over 14 percent, Central or South American; 9 percent, Puerto Rican; over 6 percent, "other Hispanic"; and 4 percent, Cuban (Therrien and Ramirez, 2001). It was not until 1996 that all states added Latino/Hispanic identifiers to mortality data, and not until 2000 that the U.S. Census Bureau included two minimum categories for ethnicity, Hispanic or Latino and Not Hispanic or Latino, and the acknowledgment that Hispanics could be of any race (National Alliance for Hispanic Health).

As defined by the U.S. Census, Hispanics may be of any race and from more than 25 subgroups by country of origin. A large proportion, particularly of the elderly, were born outside the United States, acculturated to U.S. systems, and may not be comfortable communicating in English. The diversity of this large ethnic group, with its tremendous variation in origins, generational experience, native vs. English language, and acculturation, must be taken into account in designing research, services, and policy to address the issue of dementia in Hispanics. (Alzheimer's Association, 2004, pg.2).

Gap in the Literature

The number of studies on Latinos/Hispanics and AD is relatively small. The scarcity of information is primarily due to the historical lack of data on Latino/Hispanic populations and Latino/Hispanic subgroups identifiers in major data sets, including the census, mortality statistics, medical records, the National Health Interview Survey, and many other data sources (National Alliance for Hispanic Health, 2001). The lack of research data and numbers can potentially be attributed to the lack of health care. Of all ethnic groups in the United States, Hispanic Americans are the least likely to have health insurance (public or private) (National Alliance for Hispanic Health, 2001). Among Hispanic Americans, 37 percent are uninsured, which is twice the percentage of uninsured Whites (American Psychological Association, 2001). As stated earlier environmental factors, socioeconomic status are both major contributors to diagnosis of AD, but we can also compound a lack of access to health care and prevention playing a major role in its diagnosis. With the lack of Hispanic participants interacting with the health care system, it is difficult to compare health outcomes to other ethnic groups and the dominant population. In the United States, investigators have demonstrated that rates of disability differ across ethnic groups. In comparison to their White non-Hispanic counterparts, African Americans demonstrate the highest rates of disability, followed by Hispanic-Americans (Carrasquillo, Lantigua, & Shea, 2000; Gassoumis, Wilber, Baker, & Torres-Gil, 2010). Conservative estimates indicate that AD and related dementia currently affects 5.8 million Americans, with a projected increase to 14 million by 2050 (American Psychological Association 2001). Among the Latino/Hispanic population in the U.S., the number diagnosed with AD is expected to be 43 million by 2020 (Ortman & Shin, 2011).

Among some of the challenges associated with treating Hispanics is the lack of understanding of how cultural factors interact with sociodemographic factors to contribute to, cause, or exacerbate

medical conditions (Ardila, 1995). This is particularly relevant for neuropsychologists who arrive at diagnostic impressions based on patients' performance on evaluations. These evaluations are largely influenced by factors such as age, education, culture, gender, functional limitations, disability, and intellectual functioning. If these professionals have a greater insight into this group's circumstances, they will be able to better understand how this groups behaves and responds.

> Some of the most widely used neuropsychological measures for the assessment of dementia lack adequate specificity among older African Americans. Poor specificity limits the predictive value of test scores and carries an inflated risk of false positive diagnoses of cognitive impairment in normal individuals.
> (Lucas, J, et al, 2005, pg.163)

CHAPTER III: METHOD

Participants

The dataset which was utilized for this analysis was collected as part of Hispanic Established Populations for the Epidemiologic Study of the Elderly (HEPESE) Consortium project. HEPESE consortium is a publicly available dataset of longitudinal clinical evaluation of patients which consists of multiple sites in Arizona, California, Colorado, New Mexico, and Texas that have been collecting data on risk factors for mortality and morbidity in the Mexican-American community in order to contrast how these factors operate differently in non-Hispanic populations since 1993. Participants in the study were collected from the HEPSESE Uniform Data Set (UDS), a publicly available dataset of a standardized and longitudinal clinical evaluation of patients of Hispanic origin. The data was obtained between the years of 2010 and 2013. For this Analysis, wave 07 and 08 were analyzed. All participants in this data set identified as non-White Hispanic and were located in the Southwestern region of the United States.

The UDS originally provided a dataset of 744 participants. The final sample for this Dissertation consisted of 640 participants. The 104 participants which were excluded met exclusion criteria because they either had a missing MMSE score or Missing data points for the 3 variables of Hypertension, Diabetes or Cardiovascular disease. All participants in this data set identified as non-White Hispanic (N= 744) and were located in the Southwestern region of the United States. In terms of the gender of this sample, 64% were female (N = 479), and 36% were male (N =265). The ages of the patients in the sample ranged from 82 to 103 years, with the mean of 88 years.

Experimental design and statistical procedure

To better understand this specific population's health comorbidities and how they

affected the diagnosis of Alzheimer's disease, a statistical analysis was conducted. The analysis was conducted on wave 7 and wave 8 of the HEPESE Consortium project longitudinal study. The type of analysis that was conducted to model and analyze these relationships was multiple regression, a statistical method that tests for the effect of all the independent (Predictor) variables at once, as well as for the effect of each of the independent variables on the dependent (outcome) variable (Creswell, 2009). A predictor variable (or independent variable) is a variable that is hypothesized to predict another variable. An outcome variable (or dependent variable) is a variable that is hypothesized to be predicted by an independent variable (a predictor variable) (Creswell, 2009). In my multivariate regression model, multiple regression analyses was used to explore the relationship (or lack thereof) between comorbidities (Cardiovascular Disease, Diabetes, and Hypertension) and a participant's MMSE score.

A predictive model was created in order to show how much each variable (Cardiovascular Disease, Diabetes, and Hypertension) contributed to the diagnosis of AD (using a MMSE score) in the Hispanic data set. The use of a multivariate regression analysis helped to limit the likelihood of Type I or experiment error secondary to multiple comparisons.

Predictor variable

The predictor variables (X) for the regression equation of this study are comorbidities, which include Cardiovascular Disease, Diabetes, and Hypertension.

Control variables

In order to isolate the effects of one variable that was not the focus of the study (i.e., a control or confounding variable), the researcher controlled for gender and age. The gender variables included two categories: (1) male, and (2) female. Through controlling the variation of this potential confounding variable, it allowed the attribution of a particular relationship between

predictor and outcome to the predictor's influence rather than to the influence of gender (Pole & Bondy, 2012).

Outcome variable

The outcome variable (Y) for this analysis was the participant score on the MMSE, which was used to measure the participants' level of cognitive impairment. The MMSE is a 30-item brief cognitive assessment tool that indicates level of cognitive impairment, ranging from no impairment (scores 24 and above); mild (score 23-19); Moderate (18-11); and severe impairment (scores 0-11). Cognitive impairment had 8 items in the scale ("I remember events," "I remember the day," "I remember my address," "I use the right words," "I understand instructions", "I find my way in the house," "I speak in full sentences," "I recognize people").

Interactions

In order to better understand the moderating effects of the aforementioned control variables, the researcher tested for interactions between the participants' gender, and comorbid risk factors. Interactions examine whether the effect of a predictor variable on an outcome variable differs based upon the level of a different variable (Horn, Jaki, Masyn, Howe, Feaster, Lamont, George, & Kim, 2015).

CHAPTER IV: RESULTS

All analyses were conducted with the use of SPSS software, version 22 (IBM). To facilitate clinical interpretation, all raw scores for the cognitive tests were transformed to T-scores (distribution with a mean of 50 and a standard deviation of 10) using normative data correcting for age. MMSE scores were also corrected for age and gender. Composite variables were created for each comorbidity (Cardiovascular Disease, Diabetes, and Hypertension) by averaging the T-scores for tests that comprised each domain. All major study variables were examined to ensure they met statistical assumptions. The skewness (≤ 2) and kurtosis (≤ 7) values for all continuous study variables indicated that these variables were approximately normally distributed. There were also no outliers on any study variables, as defined by a cutoff of $z > 3.29$ (Tabachnik & Fidel, 2007).

Analysis

In the end, the results that we gathered did not show significant connection between comorbidities and AD diagnosis using the MMSE among the sample of Hispanic participants.

Results

Pearson and Spearman correlations were conducted to examine the association between MMSE and Comorbidities variables at baseline in order to determine potential covariates for use in primary analyses. Regarding Alzheimer's comorbidities, there were no significant correlations between MMSE score and Hypertension ($r = -0.044$, $p > .05$), Heart Disease ($r = .026$, $p > .05$), or Diabetes ($r = -0.003$, $p > .05$). No other significant findings emerged between MMSE including heart disease, hypertension, and diabetes. Results also indicated no significant inverse correlations between baseline gender ($r = .02$, $p > .05$) or age ($r = -.220$, $p > .05$). Results were not significant for all other variables and full results are presented in Table 3

Table 2
Correlations Among Variables

		1	2	3	4	5	6
1	**MMSE Score**						
2	**High Blood Pressure**	-.04					
3	**Heart Disease**	.03	.114**				
4	**Diabetes**	.	.228**	.108**			
5	**Age**	-.220**	.07	-.02	.162**		
6	**Gender**	.02	-.082*	.02	-.05	.04	

Note. *N=643. *p <.05; ** p <.01*

Table 3
Multiple Regression Model

	MODEL A	MODEL B	MODEL C	MODEL D
INTERCEPT	61.56(.84)	62.07(7.5)	62.41(7.61)	62.32(7.61)
Age	-.48(.84)	-.49(0.86)	-.49(.09)	-.5(.87)
Gender	.46(.63)	.55(.64)	.59(.64)	.57(.64)
Diabetes (BP)		-.01(.17)	.10(.34)	.63(.34)
Cardio Vascular Disease (CD)			-.13(.35)	-1.92(.36)
High Blood Pressure (HP)				.30(.30)
R2	0.49	0.51	0.51	0.52

CHAPTER V: DISCUSSION

Summary of Discussion

The purpose of this analysis was to uncover and explore the relationship between comorbid factors and their interaction and AD in a dataset of Hispanic participants. This chapter presents a summary of the findings followed by a discussion of the findings as they relate to the literature. Implications for Alzheimer's, race, and assessments are addressed. The chapter concludes with the limitations and strengths of the study and recommendation for future research.

Implications of results and further study

The main hypothesis stated that 3 major comorbidities for AD could be used to predict Alzheimer's disease using the MMSE assessment. Through conducting the regression analyses, we observed that hypertension, diabetes, and cardiovascular disease did not significantly contribute to predicting AD in our Hispanic sample. However, these results were unexpected and contrary to literature and observations of non-Hispanic samples. Epidemiological research however, has an understanding of this outcome: the field has coined this anomaly as the Hispanic Mortality Paradox.

Hispanic Mortality Paradox

When exploring the relationship between AD diagnosis and comorbid disease in the Hispanic community, there is an epidemiological paradox that must be mentioned, researched, and explored. This phenomenon is called the Hispanic Mortality Paradox and it is observed that, "Hispanics in the United States often experience similar or better health outcomes across a range of health and disease contexts compared with non-Hispanic Whites" (Ruizet, et. al, 2013, p. e52). This research is vital because researchers are only now starting to engage with different

ethnic minority demographics that they previously had limited access to. Epidemiological data show the variability of dementia rates amongst different ethnic minority groups. Compared to Caucasian individuals in the United States, the risk of developing AD for African American individuals is double, while for Hispanic individuals it is 1.5 times greater (Santos et al. 2019). From these findings, we recognize the disease has a different trajectory just by someone's ethnicity. Findings such as this show the scientific community that a person's ethnic background should be in consideration when diagnosing and treating.

While none of the diagnostic or treatment methods currently available can be considered a panacea when it comes to AD, researchers are making strides in identifying traits and pathology that cause different types of dementia. With this knowledge, research must make sure it is being disseminated and put into practice in educating professionals on the front line.

Limitations

In light of the strengths and limitations, investigators may wish to expand upon this study in various ways. Several limitations of the current data set could have contributed to the lack of results and prevent further generalization of the results. This study had a large sample size (n=744) initially, and a 14% dropout rate, due to missing MMSE data resulting in a sample of 640 individuals. The participant sample on the whole was a homogenous group but limited to the geographic region of the Southwestern region of the United States (Arizona, California, Colorado, New Mexico, and Texas).

A critical limitation of the data set is a specific focus solely on the Mexican American sub-group as part of the Hispanic ethnicity. However, when exploring ethnicity and how it interacts with Alzheimer's symptomology, there is an absence of understanding specific to variation between racial categories in the United States. Alzheimer's research historically has

been void of demographic and ethnic/racial groups in the United States. Thus, future researchers are encouraged to examine this limitation to provide renewed information that will address this critical gap in the reviewed literature.

Another limitation of this dataset was the lack of a secondary psychological assessment to track AD diagnosis. Ideally the Montreal Cognitive Assessment (MoCA) would be a great secondary measure to have, since this assessment has been shown to pick up the early onset stages of AD diagnosis more accurately than the MMSE. This secondary measure might have allowed for a larger sample size and younger age range of the data set.

Future Consideration

In future studies, a greater number of minorities should be incorporated into cognition and psychological studies so that they could be equally represented with their White counterparts. Recent research shows that minority groups are not being represented in scientific studies proportional to their population in the United States. The specific dataset used in this dissertation was unique, since typically the Caucasian group makes up more than half of the entire sample. Additionally, some researchers fail to report racial/ethnic identities in their study. In addition to greater numbers of minorities in research, researchers should recognize that race/ethnicity is typically self-reported, which may not always be entirely accurate. One way to mitigate this shortcoming is to have a consistent method to capture racial/ethnic status.

In addition to greater numbers of minorities in research, researchers should recognize that race/ethnicity is typically self-reported, which may not always be entirely accurate. This may be related to the fact that racial/ethnic categories are not strictly biological categories. In other words, “Latin Americans” have a wide range of genotypes of origin, including the percentage of “European” and “African” genetic origin. The same is true of “Hispanic/Latinx”. Also, just

because an individual self-reported a certain racial/ethnic category, that does not implicate that those individuals strongly identify with the culture associated with that racial/ethnic identity. For example, it is possible that individuals who are genetically biracial choose to identify more strongly with one racial/ethnic group than the other.

Conclusion Summary

In summary, the current study found no relationship between health comorbidities (Cardiovascular Disease, Diabetes, and Hypertension) and AD among a sample of older Hispanic adults. The analysis indicates a need for a more diverse Hispanic dataset that included other ethnicities besides Mexican Americans from just the Southwestern region of the United States. Despite the limitations, this type of analysis and research should be explored further to better understand AD . These types of analyses will promote better understanding in providing an overall better quality of life and be informative to caregivers of families with AD .

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