5-15-2020

Association Between Income, Education, Diabetes, Dyslipidemia, and Hypertension in Mexican Americans, Other Hispanics and Non-Hispanic Whites

Nora Molina
Georgia State University

ABSTRACT

ASSOCIATION BETWEEN INCOME, EDUCATION, HYPERTENSION, DIABETES, AND DYSLIPIDEMIA IN MEXICAN AMERICANS, OTHER HISPANICS, AND NON-HISPANIC WHITE AMERICANS.

By

NORA MOLINA

May 5, 2020

INTRODUCTION: Recent studies have found there is an association between socioeconomic status, education, and race/ethnicity. Existing statistics have shown Hispanics to be one of the largest minority groups in the United States, making up roughly 30% of the population and projected to become largest ethnic minority group in the United States. As a growing population, Hispanics face many barriers related to social determinants of health, including income and education. These social determinants of health (SDH) can impact an individual's overall health and influence the rate of certain chronic diseases such as diabetes, dyslipidemia, and hypertension. Currently, 17% of Hispanics have diabetes, approximately 22% have dyslipidemia, and 17% have hypertension. For the purposes of this analysis, Hispanic population is not monolithic and include two subgroups--Mexican American and Other Hispanic.

AIM: The purpose of this study is to examine the relationship between income and education, and risks of diabetes, dyslipidemia, and hypertension among Mexican American, Other Hispanic, and Non-Hispanic Whites. It is hypothesized that there will be a strong association between income level, education, and diabetes, dyslipidemia, and hypertension in these population groups.

METHODS: The National Health and Nutrition Examination Survey (NHANES), a secondary dataset from the National Center for Health Statistics was used. The survey years analyzed were from 2013-2014, and 2015-2016. Odds ratios from multivariate logistic regression analyses were used to estimated risk of diabetes, dyslipidemia, and hypertension.

RESULTS: A total of 3,188 eligible participants were analyzed in this study. Income and education were not associated with odds of diabetes among Mexican Americans, Other Hispanics, and Non-Hispanic Whites. Being a Mexican Americans and of Other Hispanics were associated with 1.66 greater odds of diabetes compared to Non-Hispanic Whites. Mexican Americans and Other Hispanics achieved the lowest rates of education. Binary logistic regression showed that when controlling for other variables such as age, gender, BMI, and smoking, results were not significant overall as the null was captured in 95% CI.

DISCUSSION: There was not a strong association between income, education, and the presence of diabetes, dyslipidemia, and hypertension among Mexican Americans and Other Hispanic Non-Hispanic Whites.

Association between Socioeconomic status and Hypertension, Diabetes, and Dyslipidemia in Mexican American, Other Hispanic, and Non-Hispanic White Americans.

by

NORA E. MOLINA

B.A., JAMES MADISON UNIVERIVERISTY
B.S., JAMES MADISON UNIVERSITY

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree

MASTER OF PUBLIC HEALTH

ATLANTA, GEORGIA
30303

APPROVAL PAGE

Association between Socioeconomic status and Hypertension, Diabetes, and Dyslipidemia in Mexican American, Other Hispanic, and Non-Hispanic White Americans.

by

NORA E. MOLINA

Approved:

Ike Okosun, MS, MPH, PhD, FTOS, FACE
Committee Chair

Imelda Reyes, DNP, MPH, CPNP, FNP-BC
Committee Member

May 5, 2020
Date

Acknowledgments

I would personally like to thank everyone who contributed their time and help.

Author's Statement Page

In presenting this thesis as a partial fulfillment of the requirements for an advanced degree from Georgia State University, I agree that the Library of the University shall make it available for inspection and circulation in accordance with its regulations governing materials of this type. I agree that permission to quote from, to copy from, or to publish this thesis may be granted by the author or, in his/her absence, by the professor under whose direction it was written, or in his/her absence, by the Associate Dean, School of Public Health. Such quoting, copying, or publishing must be solely for scholarly purposes and will not involve potential financial gain. It is understood that any copying from or publication of this dissertation which involves potential financial gain will not be allowed without written permission of the author.

Nora Molina
Signature of Author

TABLE OF CONTENTS

List of Tables

Introduction

1.1 Background

Hispanics/Latinos are one of the largest ethnic minority groups in the United States (U.S.), and represent a variety of countries. For this analysis, the term Hispanic will be used to reference both Hispanic and Latino. In 2014, Hispanics made up 17.4% of the U.S. population and are projected to increase to about 28.6% of the population by 2060 (Velasco et al., 2016). This number is significant because as the Hispanic population rises, it is important to understand the community and its needs, and the resources available to them. Furthermore, a rising population can lead to a potential increase in prevalence rates of chronic diseases and risk factors. Hispanics are noted as having higher prevalence rates of diabetes and obesity compared to Non-Hispanic Whites (Cuevas et al., 2016).

Risk factors for cardiovascular disease include diabetes, hypertension, and dyslipidemia. It is important to define these chronic conditions: Diabetes occurs when the body is unable to make enough insulin or does not properly use insulin, preventing blood sugar levels from remaining within normal limits or does use. Dyslipidemia is characterized by an abnormal amount of LDL (“bad” cholesterol), HDL (“good” cholesterol), and triglycerides (fat stored in the body) above 200 mg/dl. Lastly, hypertension is defined as an individual having blood pressure above 140 mmHg, systolic or above 90 mmHg, diastolic, according to NHANES during the 2013 -2016 cycle years. This is alarming as cardiovascular disease is the second leading cause of death for Hispanics, ranking just behind cancer (Balfour et al., 2016). Understanding this growing population and its risk factors has the potential to lead to improved health outcomes for its members.

According to the Centers for Disease Control and Prevention (CDC), Hispanics in the U.S. are 50% more likely to die from diabetes compared to Non-Hispanic Whites and have a 23% increased risk of obesity (2015). The U.S. Department of Health and Human Services states, "77% of Mexican-American women were overweight or obese" (Kirsch & Ball, 2018). Diabetes can have tremendous effects on the Hispanics community. Hispanics tend to have worsened glycemic control and, in addition, have higher rates of diabetes complications compared to Non-Hispanic White (Zamudio et al., 2017). Despite progress in terms of health programs and preventions for Hispanics, chronic diseases continue to be major menaces for this population.

Geography also plays a role in the prevalence of chronic diseases among Hispanics. U.S. born Hispanics have a 29% higher risk of elevated blood pressure, and 45% increased risk of higher total cholesterol compared to foreign-born Hispanics (CDC, 2015). Hispanics have poorer health outcomes due poor health management skills, lack of resources, lower levels of literacy and lower levels of health literacy. Hypertension (high blood pressure) among Hispanic adults in the U.S. was at about 22% in 2015. And at least 81% of Hispanic men and 78% of Hispanic women are considered obese according to a study by McCurley et al., 2017. Geography can affect where an individual can go to seek care, whether transportation is available, and the availability of immediate resources. These different factors are known as social determinants of health (SDH).

In more recent years, SDH has become important in understanding health disparities and inequalities. SDH is different social circumstances that can affect a person's overall health. This includes place of birth, income, education, access to healthcare, and occupation (Centers for Disease Control and Prevention, 2019). SDH have also been known to include biological and

genetic factors. The U.S. is one of the most developed nations in the world; however, it has one of the highest rates of inequality (Beltran-Sanchez et al., 2016). It is important to acknowledge that while "equality" is synonymous with the discussion of SDH, "equity" is the word that needs to be front and center when discussing SDH (Kirsch & Ball, 2018). Equality is defined as individuals receiving the same resources without addressing their specific necessity. Equity goes one step further by addressing those additional needs. Disparities continue to exist to the extent that inequities are not talked about when addressing the Hispanic population.

Health disparities are defined as differences in health related to social, environmental, and economic disadvantage. This disadvantage is seen in the Hispanic population. Many socioeconomic factors affect access to care, including education, income, and low-paying jobs. Individuals with lower socioeconomic status tend to have higher rates of morbidity, which can increase cardiac risk factors among patients (Schröder et al., 2016). In addition, worsening health can lead to death.

Education, an essential SDH, is a strong predictor for health outcomes into adulthood. Around 61%, Hispanics have a high school education, and 17.8% earn a college degree compared to the high school graduation rates for Non-Hispanic Whites of 90.4%, with 29% college educated (Aguayo-Mazzucato et al., 2019). Among Hispanic youth, high school dropout rates are higher than non-Hispanic Whites, and while enrollment among Hispanics is increasing at 2-yr college institutions (May & Witherspoon, 2019), many Hispanics may be enrolling in two-year college institutions due to economic constraints that prevent continuing their education in a four-year institution. Culture-ecological models have suggested that social position can also have a significant impact on education. Social position refers to generation status (i.e., first or second-generation). Hispanic youth who are the first generation to seek to increase their

education level often deal with challenges related to lower socioeconomic status, compared to second-generation Hispanics who tend to finish high school, attend a four-year institution, and possibly attend graduate school (May & Witherspoon, 2019). While many first-generation Hispanic children may want a better life than their parents had, many Hispanic children from immigrant families do not have the financial security to attend college, and many first-generation youths have to seek financial support through other means than reliance on family resources. Education can have implications on the type of job an individual has, their living location, and access to healthcare. Individuals with low levels of education generally have low-paying occupations, which is also associated with documentation of legal U.S. residency, underemployment, and very low to no knowledge about workers' rights (Rangel Gómez et al., 2019). Those with lower levels of education may not seek better opportunities because their education level keeps them at the same location or prevents them from being aware of available resources and may contribute to their not seeking medical help due to the inability to properly understand the healthcare system.

Access to healthcare is a another strong SDH. While the number of Hispanics covered by either private or public insurance has decreased in recent years, 27.2% of Hispanics still lacked health insurance in 2018 (National Center for Health Statistics, 2018). In the United States, President Obama signed the Affordable Care Act (ACA) in 2010. The ACA, included three primary goals: The first goal was to provide more affordable insurance by providing consumers with "premium tax credits" (*Affordable Care Act (ACA)—HealthCare.gov Glossary*, n.d.). The second goal was to expand Medicaid programs, and the last goal was to lower costs of healthcare (*Affordable Care Act (ACA)—HealthCare.gov Glossary*, n.d.). Even after the implementation of the ACA, there remained many obstacles to the Hispanic community. Many

Hispanics continue to lack health insurance due to lack of education, are unable to receive the tax credit, struggle with legal immigration status, and still pay full cost for health insurance. Before the implementation of the ACA, the rate of insured for Hispanic adults was 40.5%.By 2014 the rate of uninsured Hispanics had decreased by 7.1 % (Rangel Gómez et al., 2019). Knowledge and awareness of the benefits of the ACA remain relatively low among Hispanic populations. Mexicans and Central Americans were found to be less likely to have insurance coverage (Gonzales & Sommers, 2018). Lack of insurance can negatively influence how often an individual seeks care, and inhibit proper management of diseases such as dyslipidemia, hypertension, and diabetes.

Healthcare access can be related to health outcomes. For example, Spanish-speaking Hispanics often cannot find providers who speak their language, making provider-patient interaction difficult. Language barriers can lead to misunderstandings between patients and providers. This communication obstacle also leads to problems with understanding patient concerns and has led to fewer medical resolutions (Flower et al., 2017). While professional medical language interpretation services have become more available for patients, this resource may not be available in certain areas causing increased problems with patient-provider interaction (Arthur et al., 2015). This problem has caused many Hispanics to rely more on family members as interpreters, including young children (Arthur et al., 2015).

Many studies aim to describe the overall health of Hispanics. Due to increased SDH, Hispanics often have poorer health outcomes. Hispanics have lower death rates compared to Non-Hispanic Whites (Price & Khubchandani, 2016). As mentioned previously, studies have shown SDH influences overall health outcomes. Socioeconomic status and education are known to be strong predictors of chronic disease outcomes. If there is a weaker association, then that can

further suggest other SDH predictors could be stronger. Using this study can also help identify where certain gaps lie for future programs and health education aimed at reducing chronic disease rates among Hispanics.

I.2 Purpose of Study

The first purpose of this study is to determine the strength of the association between income and chronic diseases among Hispanics compared to Non-Hispanic White. The second purpose of this study is to determine the association between education level and chronic diseases among Hispanics compared to Non-Hispanic White. There are several aims of this analysis. The first aim is to determine whether income is a strong predictor of diabetes, dyslipidemia, and hypertension in the study population. The second aim is to determine if education is a strong predictor of diabetes, dyslipidemia, and hypertension in the study population. It is hypothesized that there will be a strong association between income level, education, and diabetes, dyslipidemia, and hypertension using NHANES 2013-2016 dataset. This analysis extends research on this topic by identifying additional recommendations for this important public health issue.

Literature Review

L1. Socioeconomic factors – Income and Education

Despite being one of the world's largest industrialized nations, the United Nations states the U.S has one of the highest rates of inequalities (Beltran-Sanchez et al., 2016). Socioeconomic factors (SES) can lead to greater risks for worsened health outcomes such as diabetes, dyslipidemia, and hypertension. Lower SES can affect education level, social support, occupation, and access to resources. Individuals with lower SES have the greatest need for medical services and treatment (Schröder et al., 2016). Lower SDH, can also affect other behaviors increasing the risk of diabetes, dyslipidemia, and hypertension. These behaviors include poor diet, being physically inactive, and increased substance use (Schröder et al., 2016). As mentioned previously, cardiovascular disease is the leading cause of death among Hispanics.

Hispanics who are foreign-born have lower income levels, are less likely to have health insurance, and are more likely to live in disadvantaged neighborhoods (Hamilton, 2015). Hispanics had an average household income level of $39,600 in 2014 (Velasco-Mondragon et al., 2016). This average income was almost 52% lower than those of Non-Hispanic Whites. Foreign-born Hispanics may have less knowledge about healthcare systems and about where to access resources. Feliciano has said that those who migrate to the U.S. from greater distances tend to have stronger socioeconomic status (Fenelon et al., 2017). Many citizens flee for better opportunities such as economic gain, along with access to other resources and benefits (Rodriguez et al., 2017). Hispanics are on average about 15 years younger and are four times more likely to have not finished school (Schröder et al., 2016). It was found that immigrants who move for economic reasons have more labor skills compared to colleagues who remained in their native country who have more education (Hamilton, 2015). Education systems

in other countries may lack resources for educating their students. Some Hispanic children may leave their education due to family financial hardships.

L2. Regional Differences

Many studies, unfortunately, tend to combine all Hispanics into one category, whether they are from Central America, South America, or the Caribbean. There are many differences among U.S. Hispanic populations, including a difference in genetics, culture, and even environmental exposures. Very little information is known about the use of the term "Hispanic" before the year 1976. After 1976, the label "Hispanic" was adopted as a comprehensive demographic label by the U.S. Census Bureau (Arias & Hellmueller, 2016), making it challenging to identify and quantify different cultures, political beliefs, and policy beliefs. Using one word to describe a diverse population, limits the identification of different Hispanic groups living in the U.S. This internal population diversity is very important, as it was found that Hispanics/Latinos prefer to identify to their country of origin instead of describing themselves using the term Hispanic (Conomos et al., 2016). (Is the previous sentence necessary? What does it add?)

Hispanics have a significant impact in U.S. communities. History shows that many Hispanics associate with the areas that were previously acquired by the U.S. from Mexico. The treaty marking the end of the Mexican-American War, for example, added Texas, California, New Mexico, parts of Arizona, Utah, to other states with heavily Hispanic presence (Arias & Hellmueller, 2016)—but also indicates that there are cultural, political, and social differences even among that larger Hispanic group. More Hispanics in Texas may vote Republican, for example, due to the overall political climate in Texas, compared to Hispanics living in

California. Hispanics tend to assimilate to the political climate of the location in which they reside (Mirilovic & Pollock, 2018). In addition, Hispanics may have different experiences due to the simple fact of resource availability. For example, some states have not expanded Medicaid, specifically the South. Hispanics may live in more rural areas where obtaining resources and seeing medical providers may be a challenge, even for those Hispanics who seek help.

L3. Lack of Rigorous Analysis

The first known rigorous analysis of Hispanic mortality rates used data from 1979 to 1987 (McDonald & Paulozzi, 2019). This study demonstrated evidence of the 'healthy migrant' and 'salmon' effects. The healthy migrant effect is defined as Hispanics who immigrate to the U.S. and are healthier; the salmon effect is defined as unhealthy Hispanics moving back to their native country to die (McDonald & Paulozzi, 2019). Early studies did not collect accurate information and did not correctly count Hispanic deaths. The literature on Hispanics is minimal, as most studies fail to acknowledge separate sub-communities within the Hispanic community (Balfour et al., 2016). Many of these differences are readily observed, such as natural spoken language, diet, and behaviors. Not all Hispanics share the same characteristics; there are distinct regional differences. The first well-known cardiovascular study is the Framingham heart study that began in 1948 and continues into this day.

There are nine other major studies on cardiovascular disease, but only two specifically focus on the Latino community. 1999, the Multi-Ethnic Study of Atherosclerosis investigated the prevalence of atherosclerosis in an ethnically diverse sample consisting of both men and women (Balfour et al., 2016). The second study focusing exclusively on Hispanic health was the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). This study investigated rates

of cardiovascular disease prevalence among 16,400 Hispanics, which also represented different Hispanic subgroups (Balfour et al., 2016). HCHS/SOL was a cohort study of individuals who identified as Hispanic/Latino from four different U.S. metropolitan areas.(Conomos et al., 2016) and was one of the first studies to include individuals who identified as Cuban, Mexican, Central American, or South America. Although HCHSS is still recognized as one of the most significant studies for the Hispanic population, there is need for an updated study. For the meantime HCHS/SOL's has a current study contract that is scheduled to end in 2024.

L4. Barriers

Previous research on Hispanics has addressed many barriers. These barriers include physical barriers such as lack of transportation and lack of access to care, as well as capability barriers such as health literacy (Gutierrez et al., 2017). Transportation can have tremendous effects on health as simple as preventing a patient from seeing a medical provider or even picking up medicine from a pharmacy, especially for Hispanics in rural communities where resources and access may already be scarce. A study by Lee et al. (2018), noted that study participants concerned about chronic diseases who came to a health screening had previous family members who died due to chronic health conditions. When the Hispanic population first arrived in the U.S., it settled into large cities. Hispanic immigrants are now more likely to settle in smaller cities and rural areas of the Midwest and Southeast (Fenelon et al., 2017). This can be attributed to lower cost of living, and possibly to the number of lower-skilled jobs that are readily available to recent immigrants. Recently arrived immigrants, specifically those who immigrate to rural areas, lack health insurance, face higher costs for healthcare services, wrestle with undocumented status, and experience language barriers (Sangaramoorthy & Guevara, 2017). All these barriers can lead to additional concerns for individuals, even if they are

documented legal immigrants, particularly if the person recently immigrated and may not know how to apply for, or where to seek assistance. If they are undocumented, immigrants may have no desire to seek health services for fear of deportation.

Language translation services have created another barrier for the Hispanic community. Many Hispanics have settled in the same area, including Cubans in South Florida, and Puerto Ricans and Dominicans in New York. Due to higher concentrations of Hispanics, there has been less need, thus a smaller supply of translation services for other healthcare (Nathenson et al., 2016). Lack of translation services can lead to inaccurate communication between the patient and the provider—another possible reason for why Hispanics may not seek immediate health care. Hispanics with limited English proficiency tend to be uninsured (Nathenson et al., 2016). The ACA allowed for more individuals to be covered, but not all ACA were made available to all Hispanics, as many remained undocumented and uninsured. Community navigators, while beneficial, are another resource that may not be feasible for those who may not have sufficient knowledge of how to the system works to know that these resources exist

Methods and Procedures

M1. Origin of Data

This secondary data analysis was done using the 2013-2014 and 2015-2016 National Health and Nutrition Examination Survey (NHANES) surveys. NHANES is a cross-sectional study done on non-institutionalized participants across the U.S. and is conducted by the National Center for Health Statistics, part of the Centers and Disease Control and Prevention.

NHANES focuses on different populations and represents about 5,000 people located across U.S, each year. In addition, Hispanics are always oversampled in order to have reliability and more precise representation (Centers for Disease Control and Prevention, 2020). The components of the NHANES data include medical, dental, laboratory tests, and physiological measurements (Center for Disease Control and Prevention, 2020). The measurements captured in NHANES are completed in mobile centers where the team is made up of physicians, medical staff, and health technicians to help collect the data (Center for Disease Control and Prevention, 2020). NHANES categorizes participants as either Mexican American, or Other Hispanic.

The Institutional Review Board at Georgia State University had determined in advance that the NHANES dataset is not designated human subject research and therefore does not require IRB approval.

Procedures

P1. Sample

In total, 18 variables were selected from NHANES 2013- 2016 survey years. All analyses of this thesis were done using SAS software, version 9.4. The first step was to identify and select covariates for the analysis. Once the covariates were determined, they were imported from the Centers for Disease Control and Prevention's NHANES website, which is readily available for

public use. After relevant variables were imported, both data sets were combined and sorted by the variable participant's identification number. Additional variables were created which included CHOL (cholesterol variable), DIAB (diabetes variable), HBP (hypertension variable), EDUC (education variable), and AHI (annual household income variable). The final dataset was further coded to include only individuals who were Mexican-American, Other Hispanic, and Non-Hispanic White. The final dataset (n=3188) excluded children who were less that 18 years of age.

P2. Education and Annual Household Income

For this analysis, education variable was recoded into a categorical variable. Initially, the variable for education in NHANES was DMDEDUC3. This variable accounted for different education levels for participants aged 19 years and younger. The variable DMDEDUC2 represented the level of education for participants 20 years and above. DMDEDUC3 and DMDEDUC2 were recoded into the EDUC variable, which included only participants 18 years and above. The recoded EDUC variable consisted of middle school, high school, high school/GED graduate, some college, and college graduate. The annual household income level was also converted into a categorical variable: low income (<$44,999), middle income ($45,000 - $74,999), and high income (>$75,000).

P2. Diabetes

Type 2 diabetes (DIAB) in this analysis was a dichotomous variable. The DIAB variable was created based on five different types of criteria. Three of the variables utilized results of survey questions: first variable, DIQ010, considered the result of the following question "Has a doctor ever told you that you have diabetes?" The second variable was DIQ070: "Do you take

any diabetic pills to lower blood sugar?" The third variable used was DIQ050: "Are you taking insulin now?" Two other variables considered test results: LBXGLT, identified two-hour oral glucose tolerance (mg/dL) greater or equal to 200 mg/dL. LBXGLU was the final variable and identified plasma fasting glucose levels greater or equal to 120 mg/dL. If the participants had any of the above characteristics, they were defined as having diabetes.

P3. Dyslipidemia (Abnormal cholesterol levels)

The CHOL variable was created using four distinct criteria: the variable LBXTC, identified total cholesterol level greater or equal to 200 mg/dL. The variable BPQ080, considered the result of the following survey question "Has a doctor told you to have a high cholesterol level?" Finally, the variable BPQ100D, evaluated responses to: "Are you now taking prescribed medication?" If the participants had any of these characteristics, they were defined as having dyslipidemia.

P4. Hypertension (Elevated blood pressure)

The HBP variable had the means of the second and third readings of both systolic and diastolic to provide a more accurate reading used two other NHANES questions. For this study, HBP was defined as having mean systolic blood pressure greater or equal to 140 mmHg or having mean diastolic blood pressure greater or equal to 90 mmHg. HBP could also be determined by a participant answering yes to the question: "Has a doctor ever told you you have high blood pressure?" or to the question: "Do you currently take blood pressure medication?".

P5. Covariates

In both NHANES survey years (2013-2014 and 2015-2016), there were other variables controlled for the analysis, including gender, race/ethnicity, age, BMI (body mass index). Other

covariates included annual household income, smoking status, marital status, country of birth, moderate recreational activity, alcohol use in the past 12 months (continuous variable), healthy diet, and number of meals prepared away from home (continuous variable). Table 1 demonstrates all variables and how these variables were defined in SAS.

Table 1. Variable name and SAS code format

Variable	**SAS Code**
Race/Ethnicity*	Mexican American = 1 Other Hispanic = 2 Non-Hispanic White = 3 (**Reference group)**
Gender*	Male =1 (**Reference group)** Female =2
Age*	Continuous variable
Education*	Middle School = 1 High School = 2 High School/GED Graduate = 3 Some College = 4 College Graduate = 5 **(Reference group)**
Annual Household Income*	Low Income = 1 Middle Income = 2 High Income =3 (**Reference group)**

Occupation	Works at private company = 1 Government Employee = 2 Self-Employed/Working in family business = 3
Marital Status	Married/Living with Partner = 1 Widowed = 2 Divorced/Separated = 3
Country of Birth*	U.S. Born = 1 **(Reference group)** Foreign-Born =2
Health Insurance Status	Yes = 1 No = 2
Smoking Status*	Everyday/Some Days = 1 None = 2 **(Reference group)**
Alcohol Use (in the past 12 months)	Continuous variable
Healthy Diet	Excellent/Very Good = 1 Good/Fair = 2 Poor = 3
General View on Health	Excellent/Very Good = 1 Good/Fair = 2 Poor = 3

Moderate Recreational Activity*	Yes = 1 No = 2 **(Reference group)**
BMI*	Continuous variable

** denotes variables controlled in multivariable analysis*

P6. Statistical Analysis

Descriptive statistics were used to evaluate variables. The PROC UNIVARIATE procedure which calculated median, minimum, maximum and IQR (interquartile range) was used for continuous variables (BMI, height, age, alcohol use in the past 12 months, and number meals not prepared at home). All other variables used PROC SURVEYFREQ with CHISQ procedure to calculate row percentages and frequencies of the categorical data to obtain the p-value. Statistical significance was determined with p-value <0.05.

For measure of association using multivariate analysis, PROC SURVEYLOGISITC was used. Weights WTMEC4YR and WTSAF4YR were applied during analysis. Additional parameters for stratum and cluster were also adjusted using SDMVSTRA, and SDMVPSU, respectively. These weights were added to account for survey design complexity of NHANES. Sample weights assign a weight to a sample participant and measures the number of people the sample person represents (Centers for Disease Control and Prevention, 2014). Odds ratio and 95% confidence intervals were also reported. Significance was established if null (or 1) was not included in the CI. In the multivariable analysis, adjustments were made for gender, age, BMI, annual household income, smoking status, foreign-born, and moderate recreational activity.

Results

For this analysis, 741 Mexican Americans, 553 Other Hispanics, and 1894 Non-Hispanic Whites were eligible for this study. The basic demographic characteristics of these studied populations are displayed in Table 2. Non-Hispanic Whites had an older average age of 52.5 years compared to Other Hispanics and Mexican Americans. Nearly 57 % of Mexican Americans and 48.82% of Other Hispanics were of low-income. Mexican Americans were more likely to have a middle school education (28.34%) as their highest level of education compared to Non-Hispanic Whites (3.48%) as shown in Table 2. Approximately 55% of Mexican Americans were foreign-born compared to 65% of Other Hispanics. Both Mexican Americans and Other Hispanics differed in marital status compared to Non-Hispanic White ($p<0.0001$). Mexican Americans had the highest percentage who were married/living with partner (61.94%), while Other Hispanics had the highest percentage who were divorced (32.01%).

Table 3 compared health conditions by study groups. Mexican Americans were more obese as shown by higher BMI values compared to Other Hispanics and Non-Hispanic Whites. Although Mexican Americans had the highest BMI value, Non-Hispanic Whites had the highest average weight (79.95 kg). Certain health behaviors were are also observed to have lower rates in Mexican Americans and Other Hispanics. Smoking rates were less for both Mexican Americans (12.82%) and Other Hispanics (14.83%). Despite having the highest BMI value, most Mexican Americans still viewed their overall health as good/fair (70.31%) compared to Other Hispanics (63.65%) and Non-Hispanic Whites (53.38%).

Table 4 represented chi-square analysis of diabetes, dyslipidemia, and hypertension among the three study groups. Almost 26% of Mexican Americans were considered diabetic, compared to Other Hispanics (24.23%) and Non-Hispanic Whites (20.86%). The p-value

associated with diabetes was not significant (p=0.797). In comparison between Other Hispanics and Mexican Americans, Other Hispanics had the highest percentages of dyslipidemia and hypertension.

Results of multivariate logistic regression analysis results are shown in Table 5. Mexican Americans (OR=1.66, 95% CI = 1.08 – 2.56) and Other Hispanics (OR= 1.66, 95% CI = 1.15 – 2.41) were at greater odds of diabetes compared Non-Hispanic Whites. These findings were statistically significant as null (1) was not included in the confidence interval. Mexican Americans were associated with lower odds (OR = 0.77, 95% CI = 0.57 – 1.03) of dyslipidemia and hypertension (OR = 0.80, 95% CI = 0.63 – 1.02) compared to the odds in Non-Hispanic Whites. Neither result was statistically significant as null was captured in the CI. Other Hispanics were associated with lower odds (OR= 0.68; 95% CI=0.43– 95) of dyslipidemia and hypertension (OR=0.95, 95% CI = 0.69 – 1.32) compared to Non-Hispanic Whites. This effect was not statistically significant with hypertension. Those who were high school/GED graduate were higher odds (OR = 1.59, 95% CI = 1.10 – 2.21) of hypertension. Results were statistically significant.

A continuation of multivariate logistic regression on additional covariates were shown in Table 6. Females were associated with lower odds of diabetes, dyslipidemia, and hypertension. Participants who were foreign-born were associated with higher odds (OR = 1.82, 95% CI = 1.45 – 2.27) of dyslipidemia, and results were statistically significant. Those who do not participate in moderate recreational activity were at greater odds (OR = 1.32, 95% CI=1.06 – 1.72) of diabetes. Results were not statistically significant. Age and BMI were covariates associated with greater odds of diabetes, dyslipidemia, and hypertension.

Table 2. Demographic Characteristics among Mexican American, Other Hispanic, and Non-Hispanic White, using Chi Square, NHANES 2013-2016[+, A]

Participant Characteristics	Mexican American N = 741	Other Hispanic N = 553	Non-Hispanic White N = 1894	P- value*
Age, years				-
Median (IQR)	44 (31-60)	50 (35-63)	52.5 (35-68)	
Gender				0.4897
Male	355 (44.91%)	247 (44.67%)	942 (49.74%)	
Female	386 (52.09%)	306 (55.33%)	952 (50.26%)	
Income Level				<0.0001
Low Income (0-$44,999)	425 (57.35%)	270 (48.82%)	874 (46.15%)	
Middle Income ($45,000 - $74,999)	161 (21.73%)	106 (19.17%)	394 (20.80%)	
High Income ($75,000 +)	106 (14.30%)	117 (21.16%)	573 (30.25%)	
Refused/Don't Know	49 (6.61%)	60 (10.85%)	53 (2.80%)	
Education Level				<0.0001
Middle School	210 (28.34%)	93 (16.82%)	66 (3.48%)	
High School	168 (22.67%)	81 (14.65%)	218 (11.51%)	
High School/GED Graduate	148 (19.97%)	125 (22.60%)	454 (23.97%)	
Some College	165 (22.27%)	156 (28.21%)	613 (32.37%)	
College Graduate	50 (6.75%)	98 (17.72%)	543 (28.67%)	
Occupation				0.0754
Works at a private company	344 (80.56%)	227 (75.67%)	747 (75.61%)	
Government Employee	46 (10.77%)	35 (11.67%)	136 (13.77%)	
Self-Employed/Working in Family Business	33 (7.73%)	37 (12.33%)	99 (10.02%)	
Refused/Don't Know	4 (0.94%)	1 (0.33%)	6 (0.61%)	
Birthplace				<0.0001
U.S	331 (44.67%)	192 (34.72%)	1803 (95.20%)	
Foreign Born	410 (55.33%)	361 (65.28%)	90 (4.75%)	
Marital Status				<0.0001
Married/Living with Partner	459 (61.94%)	322 (58.23%)	1147 (60.56%)	
Widowed	50 (6.75%)	36 (6.51%)	174 (9.19%)	
Divorced/Separated	174 (23.48%)	177 (32.01%)	504 (26.61%)	
Don't Know/Refused	58 (7.83%)	18 (3.25%)	69 (3.64%)	
Health Insurance Status				<0.0001
Yes	477 (64.37%)	408 (73.78%)	1644 (86.80%)	
No	260 (35.09%)	145 (26.22%)	245 (12.94%)	
Refused/Don't know	4 (0.54%)	0	5 (0.26%%)	

Note. + participants are 18 years or older, [A] denotes row percentage, * p-value <0.05

Table 3. Health Condition Characteristics among Mexican America, Other Hispanic, Non-Hispanic White from the NHANES 2013-2016[+, A] Survey

Participant Characteristics	Mexican American N = 741	Other Hispanic N = 553	Non-Hispanic White N = 1894	P-value*
Weight, kg				-
Median (IQR)	78.15 (67.30-90.40)	75.50 (65-89)	79.85 (67.95-95.50)	
Minimum, Maximum	40.40,198.90	39.8,176.5	39.80, 184.5	
Height, cm				-
Median (IQR)	162.97 (155.9-169.7)	163.20 (156.4,170.5)	168.90 (161.85,176.45)	
Minimum, Maximum	137.6, 193.3	141.9, 201	139,198.40	
Body Mass Index, kg/m^2				-
Median (IQR)	29.20 (26.2-33.5)	28.50 (24.6-32.9)	27.80 (24-32.8)	
Minimum, Maximum	16.2, 59.1	16, 57.2	16.2, 70.1	
Body Mass Index, kg/m^2				<0.0001
Underweight (<18.5)	9 (1.21%)	10 (1.80%)	52 (2.75%)	
Healthy Weight (18.5<24.9)	121 (16.33%)	137 (24.77%)	533 (29.20%)	
Overweight (25 < 29.9)	277 (37.39%)	191 (34.54%)	601 (31.73%)	
Obese (30>)	334 (45.07%)	215 (38.87%)	708 (37.38%)	
Moderate Work Activity				
Yes	260 (35.09%)	185 (33.45%)	789 (41.66%)	
No	480 (64.78%)	368 (66.56%)	1104 (58.29%)	
Smoker				<0.0001
Yes (Everyday, Some days)	95 (12.82%)	82 (14.83%)	405 (21.38%)	
No	150 (20.24%)	137 (24.77%)	556 (29.36%)	
Missing	496 (66.94%)	334 (60.40%)	933 (49.26%)	
Alcohol Use^				-
Median (IQR)	1 (1-3)	1.5 (1-3)	2 (1-4)	
Healthy Diet				<0.0001
Excellent/Very Good	104 (14.04%%)	131 (23.69%)	613 (32.37%)	
Good	272 (36.716%)	237 (42.86%)	814 (42.98%)	
Fair/Poor	365 (49.26%)	185 (33.45%)	467 (24.66%)	
Number of Meals Not Prepared at Home				-
Median (IQR)	2 (0-21)	2 (0-21)	2 (0-20)	
General View on Health				<0.0001
Excellent/Very Good	135 (18.22%)	148 (26.76%)	738 (38.97%)	
Good/Fair	521 (70.31%)	352 (63.65%)	1011 (53.38%)	

Poor	39 (5.26%)	17 (3.07%)	55 (2.90%)	
Language Spoken at Home~				0.0369
Only Spanish	275 (37.21%)	195 (35.45%)		
More Spanish than English	112 (15.16%)	86 (15.64%)		
Both Equally	106 (14.34%)	89 (16.18%)		
More English than Spanish	144 (19.49%)	82 (14.91%)		
Only English	102 (13.80%)	98 (17.82%)		

Note. + participants are 18 years or older, [A] denotes column percentage, ~ only done for MA, & OH, * p-value <0.05, ^denotes Alcohol use in the past 12 months

Outcome Variables	Mexican American n=741	Other Hispanic n=553	Non-Hispanic White n=1894	P-value*
Diabetes				0.797
Yes	191 (25.78%)	134 (24.23%)	395 (20.86%)	
No	550 (74.22%)	419 (75.77%)	1499 (79.14%)	
Dyslipidemia				<0.0001
Yes	401 (54.12%)	313 (56.60%)	1146 (60.51%)	
No	340 (45.88%)	240 (43.40%)	748 (39.49%)	
Hypertension				<0.0001
Yes	251 (33.87%)	215 (38.88%)	837 (44.19%)	
No	490 (66.13%)	338 (61.12%)	1057 (55.81%)	

Analysis among Mexican American, Other Hispanic, Non-Hispanic White from the NHANES 2013-2016$^{+,A}$ Survey

Table 4. Chi Square

Note. + participants are 18 years or older, ^{A} denotes column percentage, * p-value <0.05,

Table 5. Logistic Regression Analysis Using Predictor Variable on the Outcome Variables from the NHANES 2013-2016[+] Survey

Predictor Variable	Outcome Variable					
	Diabetes		Dyslipidemia		Hypertension	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Race/Ethnicity						
Mexican American	1.66	1.08 – 2.56	0.77	0.57 – 1.03	0.80	0.63 – 1.02
Other Hispanic	1.66	1.15 – 2.41	0.68	0.43 – 0.95	0.95	0.69 – 1.32
Non-Hispanic White	REF	REF	REF	REF	REF	REF
Socioeconomic Status						
Low Income (0-$44,999)	1.38	0.93 – 1.92	0.78	0.60 – 1.00	1.13	0.93 – 1.39
Middle Income ($45,000 - $74,999)	1.40	0.90 – 2.17	1.13	0.78– 1.64	0.99	0.68 – 1.46
High Income ($75,000 +)	REF	REF	REF	REF	REF	REF

Education Level						
Middle School	1.49	0.82 – 2.70	0.90	0.63 – 1.28	1.66	0.99 – 2.79
High School (no graduate)	1.55	0.90 – 2.70	0.89	0.63 – 1.25	1.31	0.81 – 2.12
High School/GED graduate	1.36	0.78 – 2.37	1.07	0.82 – 1.39	1.59	1.10 – 2.21
Some College	1.48	0.93 – 2.35	1.02	0.74 – 1.40	1.45	1.04 – 2.12
College Graduate	REF	REF	REF	REF	REF	REF

Note. + participants are 18 years or older

Table 6. Logistic Regression Analysis on additional covariates from the NHANES 2013-2016[+] Survey

Predictor Variable	Outcome Variable					
	Diabetes		Dyslipidemia		Hypertension	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
Gender						
Female	0.60	0.49 – 0.71	0.99	0.78 – 1.27	0.89	0.73 – 1.08
Male	REF	REF	REF	REF	REF	REF
Age	1.06	1.05 – 1.07	1.06	1.05 – 1.07	1.07	1.06 – 1.08
Smoking Status						
Yes	0.89	0.58 – 1.36	1.30	0.99 – 1.71	1.17	0.91– 1.52
No	REF	REF	REF	REF	REF	REF
Country of Birth						
Foreign	0.78	0.57– 1.08	1.82	1.45 – 2.27	0.88	0.62 – 1.27
U.S	REF	REF	REF	REF	REF	REF
Moderate Recreational Activity						
No	1.32	1.06 – 1.72	1.13	0.91 – 1.41	1.23	1.0 – 1.51
Yes	REF	REF	REF	REF	REF	REF
BMI	1.08	1.06 – 1.11	1.03	1.02 - 1.05	1.08	1.06 – 1.09

Note. + participants are 18 years or older

Discussion

The aim of this study was to investigate further insight on the associations of income, and education on the odds of diabetes, dyslipidemia, and hypertension among Mexican Americans, Other Hispanics, and Non-Hispanic Whites. Many sociodemographic characteristics were found to be significant in this analysis such as income level, education, birthplace, and general view on health, among other characteristics. There was also an inverse relationship between income and education levels among Mexican Americans, and Other Hispanics, after controlling for BMI and other sociodemographic characteristics. There was a weaker association between socioeconomic status and education levels among the three race/ethnicity groups. Mexican Americans and Other Hispanics were at greater odds of developing diabetes and lower odds of developing hypertension and dyslipidemia compared to Non-Hispanic Whites after adjusting for sociodemographic factors. Results from this analysis did not support my hypothesis.

Income and education are important socioeconomic factors that can affect different aspects of health. Diabetes, dyslipidemia, and hypertension continues to pose a threat to the Hispanic community. As mentioned previously, Hispanics are a diverse group across many sectors, people in this group have differences in socio-cultural, environmental, and genetic factors (Feng et al., 2018). SDH can affect certain behaviors such as diet and physical activity. Some Hispanics are exposed to new behaviors when trying to assimilate to U.S culture and may adopt unhealthy eating habits (Beltran-Sanchez et al., 2016). These findings have important implications for helping providers assess and treat different Hispanic communities to improve their health. According to a previous study done by Kim et al., Hispanics were found to have higher rates of diabetes, compared to Non-Hispanic Whites (2018). In that same study, Hispanics had lower rates of hypertension and dyslipidemia compared to Non-Hispanic Whites.

Although sociodemographic characteristics were statistically significant, one way to address results from this study is to analyze the effect of intervention programs. In a meta-analysis done by McCurley et al, culturally tailored diabetes prevention programs were found effective for reducing risk (2017). Considering these implications, by 2060 the Hispanic population is expected to double in size (Do et al., 2017). A larger population is more likely to require additional resources, especially if any additional resources are not already available to the community. Despite different health programs, community efforts, diabetes, dyslipidemia, and hypertension continue to risk the health of the Hispanic population across U.S.

D1. Strengths and Limitations

Strengths of the study include using a secondary dataset the size of NHANES, which allows for variation in variables therefore, more relationships can be studied for further analysis. One limitation of this study was the sample size. The study had original sample of 9,000 participants from both survey years, which decreased to a sample size 3,188. Power decreases with population size decreasing. Another limitation of this study was not using additional covariates for analysis, as mentioned, adding too many variables to the model can skew data results. Using a secondary dataset for analysis can be limiting as there are missing values in some of the variables and this can affect overall outcome. NHANES is a cross-sectional dataset and cannot describes trends. Recall bias is the last limitation as participants may not remember all the answers and may make guesses to the questions.

D2. Future Implications

While this study did not identify stronger associations, the study is clinically relevant as statistically insignificant results can also provide misleading results of the Hispanic community.

For example, cholesterol and diabetes had weaker associations but it is still a relevant disease that needs to be addressed. Hispanic health continues to be a public health concern due to increased SDH. It is important to understand how these diseases are affecting the community in giving appropriate resources. Further studies specifically focusing on the Hispanics can help in understanding more detailed behaviors. Incorporating more variables can help understand how geographically Hispanics are different. Creating additional studies where different Hispanics are studied in different geographic areas across the U.S. can also show where health disparities lie. and what differences can attribute to differences geographically in additional to different Hispanic subgroups. Geographic differences play a role in the health of subgroups of Hispanics. Differences in Hispanic subgroups can be attributed to geography. Continuous studies dedicated to Hispanic groups, can allow for additional funding resources to help the community. Additional health policies and even target health programs can be created and implemented to target where health inequities exist.

Conclusion

In conclusion, the results of this study showed, despite having lower socioeconomic status and education level, Hispanics had lower odds of developing hypertension and dyslipidemia. Yet, they had higher odds of developing diabetes in comparison to Non-Hispanic Whites. This raises many concerns and demonstrates the need to focus more on effective health education intervention programs and improve health literacy for Hispanics. Future studies should aim to work towards improving health inequities especially where resources may be scarce or limited.

References

Adjei Boakye, E., Varble, A., Rojek, R., Peavler, O., Trainer, A. K., Osazuwa-Peters, N., & Hinyard, L. (2018). Sociodemographic Factors Associated With Engagement in Diabetes Self-management Education Among People With Diabetes in the United States. *Public Health Reports*, *133*(6), 685–691. https://doi.org/10.1177/0033354918794935

Affordable Care Act (ACA)—HealthCare.gov Glossary. (n.d.). HealthCare.Gov. Retrieved February 3, 2020, from https://www.healthcare.gov/glossary/affordable-care-act/

Aguayo-Mazzucato, C., Diaque, P., Hernandez, S., Rosas, S., Kostic, A., & Caballero, A. E. (2019). Understanding the growing epidemic of type 2 diabetes in the Hispanic population living in the United States. *Diabetes/Metabolism Research and Reviews*, *35*(2), e3097. https://doi.org/10.1002/dmrr.3097

Arias, S., & Hellmueller, L. (2016). Hispanics-and-Latinos and the U.S. Media: New Issues for Future Research. *Communication Research Trends*, *35*(2), 4–21.

Arthur, K. C., Mangione-Smith, R., Meischke, H., Zhou, C., Strelitz, B., Acosta Garcia, M., & Brown, J. C. (2015). Impact of English Proficiency on Care Experiences in a Pediatric Emergency Department. *Academic Pediatrics*, *15*(2), 218–224. https://doi.org/10.1016/j.acap.2014.06.019

Avilés-Santa, M. L., Colón-Ramos, U., Lindberg, N. M., Mattei, J., Pasquel, F. J., & Pérez, C. M. (2017). From Sea to Shining Sea and the Great Plains to Patagonia: A Review on Current Knowledge of Diabetes Mellitus in Hispanics/Latinos in the US and Latin America. *Frontiers in Endocrinology*, *8*, 298–298. PubMed. https://doi.org/10.3389/fendo.2017.00298

Aviles-Santa, M. L., Heintzman, J., Lindberg, N. M., Guerrero-Preston, R., Ramos, K., Abraido-Lanza, A. L., Bull, J., Falcon, A., McBurnie, M. A., Moy, E., Papanicolaou, G., Pina, I. L.,

Popovic, J., Suglia, S. F., & Vazquez, M. A. (2017). Personalized medicine and Hispanic health: Improving health outcomes and reducing health disparities—A National Heart, Lung, and Blood Institute workshop report. *BMC Proc*, *11*(Suppl 11), 11. https://doi.org/10.1186/s12919-017-0079-4

Balfour, P. C., Jr., Ruiz, J. M., Talavera, G. A., Allison, M. A., & Rodriguez, C. J. (2016). Cardiovascular disease in Hispanics/Latinos in the United States. *Journal of Latina/o Psychology*, *4*(2), 98–113. pdh. https://doi.org/10.1037/lat0000056

Beltran-Sanchez, H., Palloni, A., Riosmena, F., & Wong, R. (2016). SES Gradients Among Mexicans in the United States and in Mexico: A New Twist to the Hispanic Paradox? *Demography*, *53*(5), 1555–1581. https://doi.org/10.1007/s13524-016-0508-4

Bhargava, S., Bámaca-Colbert, M. Y., Witherspoon, D. P., Pomerantz, E. M., & Robins, R. W. (2017). Examining Socio-Cultural and Neighborhood Factors Associated with Trajectories of Mexican-Origin Mothers' Education-Related Involvement. *Journal of Youth and Adolescence*, *46*(8), 1789–1804. https://doi.org/10.1007/s10964-016-0628-6

Calvo, R., Carr, D. C., & Matz-Costa, C. (2017). Another Paradox? The Life Satisfaction of Older Hispanic Immigrants in the United States. *Journal of Aging and Health*, *29*(1), 3–24. https://doi.org/10.1177/0898264315624901

Cameron, K. A. (2019). Chronic Conditions, from A to Z: Life expectancy is lower in America than in other developed nations, mainly due to the toll of chronic conditions, many of which are preventable. *Generations*, 8.

Centers for Disease Control and Prevention. (2015, May 5). *¡A la Buena Salud! – To Good Health!* Centers for Disease Control and Prevention. https://www.cdc.gov/vitalsigns/hispanic-health/index.html

Centers for Disease Control and Prevention. (2018). *Hypertension among adults aged 20 and over, by selected characteristics: United States, selected years 1988–1994 through 2013–2016.* https://www.cdc.gov/nchs/data/hus/2018/022.pdf

Centers for Disease Control and Prevention. (2019, April 9). *Social Determinants of Health*. https://www.cdc.gov/socialdeterminants/index.htm

Centers for Disease Control and Prevention. (2019). *Hispanic/Latino Americans and Type 2 Diabetes*. Diabetes. https://www.cdc.gov/diabetes/library/features/hispanic-diabetes.html

Centers for Disease Control and Prevention. (2020, January 8). *NHANES - About the National Health and Nutrition Examination Survey*. https://www.cdc.gov/nchs/nhanes/about_nhanes.htm

Centers for Disease Control and Prevention. (2020). *High Cholesterol Facts*. Cholesterol. https://www.cdc.gov/cholesterol/facts.htm

Cervantes, R. C., Gattamorta, K. A., & Berger-Cardoso, J. (2019). Examining Difference in Immigration Stress, Acculturation Stress and Mental Health Outcomes in Six Hispanic/Latino Nativity and Regional Groups. *Journal of Immigrant and Minority Health*, *21*(1), 14–20. https://doi.org/10.1007/s10903-018-0714-9

Chambers, E. C., Hanna, D. B., Hua, S., Duncan, D. T., Camacho-Rivera, M., Zenk, S. N., McCurley, J. L., Perreira, K., Gellman, M. D., & Gallo, L. C. (2019). Relationship between area mortgage foreclosures, homeownership, and cardiovascular disease risk factors: The Hispanic Community Health Study/Study of Latinos. *BMC Public Health*, *19*(1), 77–77. mnh. https://doi.org/10.1186/s12889-019-6412-2

Commodore-Mensah, Y., Selvin, E., Aboagye, J., Turkson-Ocran, R.-A., Li, X., Himmelfarb, C. D., Ahima, R. S., & Cooper, L. A. (2018). Hypertension, overweight/obesity, and diabetes among

immigrants in the United States: An analysis of the 2010-2016 National Health Interview Survey. *BMC Public Health*, *18*(1), 773–773. https://doi.org/10.1186/s12889-018-5683-3

Conomos, M. P., Laurie, C. A., Stilp, A. M., Gogarten, S. M., McHugh, C. P., Nelson, S. C., Sofer, T., Fernández-Rhodes, L., Justice, A. E., Graff, M., Young, K. L., Seyerle, A. A., Avery, C. L., Taylor, K. D., Rotter, J. I., Talavera, G. A., Daviglus, M. L., Wassertheil-Smoller, S., Schneiderman, N., … Laurie, C. C. (2016). Genetic Diversity and Association Studies in US Hispanic/Latino Populations: Applications in the Hispanic Community Health Study/Study of Latinos. *The American Journal of Human Genetics*, *98*(1), 165–184. https://doi.org/10.1016/j.ajhg.2015.12.001

Cuevas, A. G., Dawson, B. A., & Williams, D. R. (2016). Race and Skin Color in Latino Health: An Analytic Review. *American Journal of Public Health*, *106*(12), 2131–2136. s3h.

Demby, N., & Northridge, M. E. (2018). Delivering Equitable Care to Underserved Communities. *Am J Public Health*, *108*(11), 1446–1447. https://doi.org/10.2105/AJPH.2018.304701

Dillon, F. R., Ertl, M. M., Corp, D. A., Babino, R., & De La Rosa, M. (2018). Latina young adults' use of health care during initial months in the United States. *Health Care for Women International*, *39*(3), 343–359. PubMed. https://doi.org/10.1080/07399332.2017.1388382

Do, D. P., Frank, R., Cheng, Z., & Iceland, J. (2017). Hispanic Segregation and Poor Health: It's Not Just Black and White. *American Journal of Epidemiology*, *186*(8), 990. edb.

Eguia, E., Cobb, A. N., Kirshenbaum, E. J., Afshar, M., & Kuo, P. C. (2018). Racial and Ethnic Postoperative Outcomes After Surgery: The Hispanic Paradox. *Journal of Surgical Research*, *232*, 88–93. https://doi.org/10.1016/j.jss.2018.05.074

Fenelon, A., Chinn, J. J., & Anderson, R. N. (2017). A comprehensive analysis of the mortality experience of hispanic subgroups in the United States: Variation by age, country of origin, and nativity. *SSM - Population Health*, *3*, 245–254. https://doi.org/10.1016/j.ssmph.2017.01.011

Feng, C., Paasche-Orlow, M. K., Kressin, N. R., Rosen, J. E., López, L., Kim, E. J., Lin, M.-Y., & Hanchate, A. D. (2018). Disparities in Potentially Preventable Hospitalizations: Near-National Estimates for Hispanics. *Health Services Research*, *53*(3), 1349–1372. https://doi.org/10.1111/1475-6773.12694

Flower, K. B., Skinner, A. C., Yin, H. S., Rothman, R. L., Sanders, L. M., Delamater, A., & Perrin, E. M. (2017). Satisfaction With Communication in Primary Care for Spanish-Speaking and English-Speaking Parents. *Academic Pediatrics*, *17*(4), 416–423. https://doi.org/10.1016/j.acap.2017.01.005

Garcia, M. A., & Reyes, A. M. (4). Prevalence and Trends in Morbidity and Disability Among Older Mexican Americans in the Southwestern United States, 1993–2013. *Research on Aging*, *40*(4), 311. edb.

Gonzales, S., & Sommers, B. D. (2018). Intra-Ethnic Coverage Disparities among Latinos and the Effects of Health Reform. *Health Services Research*, *53*(3), 1373–1386. https://doi.org/10.1111/1475-6773.12733

Gutierrez, A. P., McCurley, J. L., Roesch, S. C., Gonzalez, P., Castañeda, S. F., Penedo, F. J., & Gallo, L. C. (2017). Fatalism and hypertension prevalence, awareness, treatment and control in US Hispanics/Latinos: Results from HCHS/SOL Sociocultural Ancillary Study. *Journal of Behavioral Medicine*, *40*(2), 271–280. https://doi.org/10.1007/s10865-016-9779-x

Hamilton, T. G. (2015). The healthy immigrant (migrant) effect: In search of a better native-born comparison group. *Social Science Research*, *54*, 353–365. https://doi.org/10.1016/j.ssresearch.2015.08.008

Khambaty, T., Schneiderman, N., Llabre, M. M., Elfassy, T., Moncrieft, A. E., Daviglus, M., Talavera, G. A., Isasi, C. R., Gallo, L. C., Reina, S. A., Vidot, D., & Heiss, G. (2020). Elucidating the Multidimensionality of Socioeconomic Status in Relation to Metabolic Syndrome in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). *Int J Behav Med*. https://doi.org/10.1007/s12529-020-09847-y

Kim, E. J., Kim, T., Conigliaro, J., Liebschutz, J. M., Paasche-Orlow, M. K., & Hanchate, A. D. (2018). Racial and Ethnic Disparities in Diagnosis of Chronic Medical Conditions in the USA. *Journal Of General Internal Medicine*, *33*(7), 1116–1123. https://doi.org/10.1007/s11606-018-4471-1

Kirsch, B., & Ball, T. (2018). People Who Cannot Afford Boots Cannot Pull Themselves Up by the Bootstraps: An Evidence-Based Exploration of Health Disparities, Social Determinants of Health, and How Medical Writers Can Help. *AMWA Journal: American Medical Writers Association Journal*, *33*(2), 51–57.

Lariscy, J. T., Hummer, R. A., & Hayward, M. D. (2015). Hispanic Older Adult Mortality in the United States: New Estimates and an Assessment of Factors Shaping the Hispanic Paradox. *Demography*, *52*(1), 1–14. https://doi.org/10.1007/s13524-014-0357-y

Lariscy, J., Nau, C., Firebaugh, G., Hummer, R., Lariscy, J. T., & Hummer, R. A. (2016). Hispanic-White Differences in Lifespan Variability in the United States. *Demography*, *53*(1), 215.

Lee, M. J., Sobralske, M. C., & Fackenthall, C. (2016). Potential Motivators and Barriers for Encouraging Health Screening for Cardiovascular Disease Among Latino Men in Rural

Communities in the Northwestern United States. *Journal of Immigrant and Minority Health*, *18*(2), 411–419. https://doi.org/10.1007/s10903-015-0199-8

Lee, S., Alvarado-Leiton, F., Vasquez, E., & Davis, R. E. (2019). Impact of the Terms "Regular" or "Pasable" as Spanish Translation for "Fair" of the Self-Rated Health Question Among US Latinos: A Randomized Experiment. *American Journal of Public Health*, *109*(12), 1789–1796. s3h.

Lewis, T. T., Cogburn, C. D., & Williams, D. R. (2015). Self-reported experiences of discrimination and health: Scientific advances, ongoing controversies, and emerging issues. *Annual Review of Clinical Psychology*, *11*, 407–440. PubMed. https://doi.org/10.1146/annurev-clinpsy-032814-112728

Markides, K. S., & Rote, S. (2019). The Healthy Immigrant Effect and Aging in the United States and Other Western Countries. *The Gerontologist*, *59*(2), 205–214. https://doi.org/10.1093/geront/gny136

May, E. M., & Witherspoon, D. P. (2019). Maintaining and attaining educational expectations: A two-cohort longitudinal study of Hispanic youth. *Developmental Psychology*, *55*(12), 2649–2664. https://doi.org/10.1037/dev0000820

McCurley, J. L., Gutierrez, A. P., & Gallo, L. C. (2017). Diabetes Prevention in U.S. Hispanic Adults: A Systematic Review of Culturally Tailored Interventions. *Am J Prev Med*, *52*(4), 519–529. https://doi.org/10.1016/j.amepre.2016.10.028

McDonald, J. A., & Paulozzi, L. J. (2019). Parsing the Paradox: Hispanic Mortality in the US by Detailed Cause of Death. *Immigrant and Minority Health*, *21*(237). https://doi.org/10.1007/s10903-018-0737-2

McGee, S. A., & Claudio, L. (2018). Nativity as a Determinant of Health Disparities Among Children. *Journal of Immigrant & Minority Health*, *20*(3), 517.

Meraya, A. M., Dwibedi, N., Innes, K., Mitra, S., Tan, X., & Sambamoorthi, U. (2018). Heterogeneous Relationships between Labor Income and Health by Race/Ethnicity. *Health Services Research*, *53*, 2910–2931. a9h. https://doi.org/10.1111/1475-6773.12802

Mirilovic, N., & Pollock, I., Philip H. (2018). Latino Democrats, Latino Republicans and Interest in Country of Origin Politics. *Political Science Quarterly (Wiley-Blackwell)*, *133*(1), 127–149. https://doi.org/10.1002/polq.12734

Morales, J., Glantz, N., Larez, A., Bevier, W., Conneely, M., Fan, L., Reed, B., Alatorre, C., Paczkowski, R., Ahmed, T., Mackenzie, A., Duncan, I., & Kerr, D. (2020). Understanding the impact of five major determinants of health (genetics, biology, behavior, psychology, society/environment) on type 2 diabetes in U.S. Hispanic/Latino families: Mil Familias—A cohort study. *BMC Endocrine Disorders*, *20*(1), 4–4. PubMed. https://doi.org/10.1186/s12902-019-0483-z

Munnell, A. H. (2019). Socioeconomic Barriers to Working Longer: Less-educated older workers have experienced fewer gains in health and life expectancy and face more discrimination from employers. *Generations*, *43*(3), 42–50.

Munsell, E., Kilmer, R., Vishnevsky, T., Cook, J., & Markley, L. (2016). Practical Disadvantage, Socioeconomic Status, and Psychological Well-Being Within Families of Children with Severe Emotional Disturbance. *Journal of Child & Family Studies*, *25*(9), 2832–2842. https://doi.org/10.1007/s10826-016-0449-y

Nam, S., Snih, S. A., & Markides, K. S. (2015). Sex, Nativity, and Disability in Older Mexican Americans. *Journal of the American Geriatrics Society*, *63*(12), 2596–2600. https://doi.org/10.1111/jgs.13827

Nathenson, R. A., Saloner, B., Richards, M. R., & Rhodes, K. V. (2016). Spanish-Speaking Immigrants' Access to Safety Net Providers and Translation Services Across Traditional and Emerging US Destinations. *Milbank Quarterly*, *94*(4), 768–799. https://doi.org/10.1111/1468-0009.12231

Rangel Gómez, M. G., López Jaramillo, A. M., Svarch, A., Tonda, J., Lara, J., Anderson, E. J., & Rosales, C. (2019). Together for Health: An Initiative to Access Health Services for the Hispanic/Mexican Population Living in the United States. *Frontiers in Public Health*, *7*. https://doi.org/10.3389/fpubh.2019.00273

Rodriguez, N., Paredes, C. L., & Hagan, J. (2017). Fear of Immigration Enforcement Among Older Latino Immigrants in the United States. *Journal of Aging and Health*, *29*(6), 986–1014. https://doi.org/10.1177/0898264317710839

Rote, S. M., & Moon, H. (2016). Racial/Ethnic Differences in Caregiving Frequency: Does Immigrant Status Matter? *The Journals of Gerontology: Series B*, *73*(6), 1088–1098. https://doi.org/10.1093/geronb/gbw106

Sangaramoorthy, T., & Guevara, E. M. (2017). Immigrant Health in Rural Maryland: A Qualitative Study of Major Barriers to Health Care Access. *Journal of Immigrant and Minority Health*, *19*(4), 939–946. https://doi.org/10.1007/s10903-016-0417-z

Schröder, S. L., Richter, M., Schröder, J., Frantz, S., & Fink, A. (2016). Socioeconomic inequalities in access to treatment for coronary heart disease: A systematic review. *International Journal of Cardiology*, *219*, 70–78. https://doi.org/10.1016/j.ijcard.2016.05.066

Schutt, R. K., & Mejía, C. (2017). Health Care Satisfaction: Effects of Immigration, Acculturation, Language. *Journal of Immigrant and Minority Health*, *19*(6), 1372–1378. https://doi.org/10.1007/s10903-016-0409-z

Sharmeen Shommu, N., Ahmed, S., Rumana, N., Barron, G. R. S., McBrien, K. A., & Chowdhury Turin, T. (2016). What is the scope of improving immigrant and ethnic minority healthcare using community navigators: A systematic scoping review. *International Journal for Equity in Health*, *15*, 1.

Valles, S. A. (2016). The challenges of choosing and explaining a phenomenon in epidemiological research on the "Hispanic Paradox." *Theoretical Medicine and Bioethics*, *37*(2), 129–148. https://doi.org/10.1007/s11017-015-9349-1

Vargas, E. D., Winston, N. C., Garcia, J. A., & Sanchez, G. R. (2016). Latina/o or Mexicana/o?: The Relationship between Socially Assigned Race and Experiences with Discrimination. *Sociology of Race and Ethnicity (Thousand Oaks, Calif.)*, *2*(4), 498–515. PubMed. https://doi.org/10.1177/2332649215623789

Velasco-Mondragon, E., Jimenez, A., Palladino-Davis, A. G., Davis, D., & Escamilla-Cejudo, J. A. (2016). Hispanic health in the USA: a scoping review of the literature. *Public Health Reviews*, *37*, 31–31. PubMed. https://doi.org/10.1186/s40985-016-0043-2

Velasco-Mondragon, E., Jimenez, A., Palladino-Davis, A. G., Davis, D., & Escamilla-Cejudo, J. A. (2016). Hispanic health in the USA: a scoping review of the literature. *Public Health Reviews*, *37*, 31–31. PubMed. https://doi.org/10.1186/s40985-016-0043-2

Zamudio, C. D., Sanchez, G., Altschuler, A., & Grant, R. W. (2017). Influence of Language and Culture in the Primary Care of Spanish-Speaking Latino Adults with Poorly Controlled Diabetes:

A Qualitative Study. *Ethnicity & Disease*, *27*(4), 379–386. PubMed.

https://doi.org/10.18865/ed.27.4.379