2021

Estimating the Impacts of Acculturation on the Health of Immigrants in the United States

Tingting He
South Dakota State University, tingtinghe@msn.com

ESTIMATING THE IMPACTS OF ACCULTURATION ON THE HEALTH OF IMMIGRANTS IN THE UNITED STATES

BY

TINGTING HE

A dissertation submitted in partial fulfillment of the requirements for the

Doctor of Philosophy

Major in Sociology

South Dakota State University

2021

DISSERTATION ACCEPTANCE PAGE

Tingting He

This dissertation is approved as a creditable and independent investigation by a candidate for the Doctor of Philosophy degree and is acceptable for meeting the dissertation requirements for this degree. Acceptance of this does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Weiwei Zhang, PhD
Advisor Date

Paul Markel, PhD
Department Head Date

Nicole Lounsbery, PhD
Director, Graduate School Date

ACKNOWLEDGEMENTS

I would like to take this chance to express my sincere and heartfelt gratitude to my advisor and committee members. They all are excellent research scholars and professors. Without their help and encouragement, I cannot complete my dissertation.

I would like to express my deepest gratitude to my advisor, Dr. Weiwei Zhang. She is an inspirational advisor. Her consistent help and encouragement keeps me moving forward my Ph.D. degree pursuit without any fear. Her tremendous guidance is valuable resource for this dissertation. I really appreciate her support, assistance, and patience that guided me through this dissertation completion. I am extremely grateful of her help, encouragement, and support over the years.

I am also deeply thankful of my committee members, Dr. Meredith Redlin, Dr. Zhiguang Wang, and Dr. Jixiang Wu, for your valuable comments for this dissertation, your inspiration and support over the years. Dr. Redlin provided me an opportunity of entering into this Ph.D. program in sociology and she always believes I can finish my Ph.D. degree. She helps me build up solid theory foundation for research. Dr. Wang is always providing me support and encouragement since I studied for my master's degree and helping me improve my quantitative analysis skills. Dr. Wu provides the opportunity to work with him for three summers and always encourages and helps me to conduct quantitative research. I am extremely grateful of your help, encouragement, and support over the years.

Thank you to my master's degree advisor, Dr. Scott Fausti and another professor, Dr. Jing Li, for their encouragement and help over the years as well. Finally, I would like

to thank my husband, my son, and my parents, who have been constantly providing me with their love, encouragement, and trust.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 3.

Chapter 5.

ABSTRACT

ESTIMATING THE IMPACTS OF ACCULTURATION ON THE HEALTH OF IMMIGRANTS IN THE UNITED STATES

TINGTING HE

2021

The growth in the immigration population in the U.S. has transformed American demographic profile and has led to magnification in health disparities in the United States. The main purpose of this dissertation is to examine the relationship between acculturation and health behavior, mental health outcomes, and access to health care service among immigrants in the U.S. Relying on the acculturation framework, the dissertation intends to increase the understanding of health disparities and health patterns among immigrants.

The dissertation utilizes the secondary data from National Health Interview Survey (NHIS) data to examine the effects of acculturation on health of immigrants. Measures of Immigrants' acculturation include English language proficiency, duration of living in the U.S., and the citizenship. Statistical modeling is applied to examine how acculturation influences health behavior of immigrants, mental health outcomes of immigrants, and access to health care service of immigrants.

The main findings indicate that immigrants' acculturation can have both detrimental and beneficial effects on health-related behaviors, mental health outcomes, and access to health care service. All measures of acculturation, in particular English language proficiency, are significant factors related to the health status of immigrants.

For future research, this dissertation suggests that improving health and reducing health disparities will need to address acculturation, the educational, economic and environmental factors that affect health behavior, mental health outcomes, and access to health care service among immigrants in the U.S.

CHAPTER ONE: INTRODUCTION

Introduction

The foreign-born population is a significant part of American society because more than 44.9 million immigrants live in the United States (Census Bureau report 2017). Based on the American Community Survey (ACS 2018), 13.7% of the American population are immigrants. The majority of contemporary immigrants, who are from Latin America and Asia, has been a part of the U.S. population. 31.4% of the foreign-born population is from Asia and 50.3% of the foreign-born population is from Latin America after 2010 (Census Bureau report 2017). The foreign-born population becomes more diverse with different countries of origin, culture, religion, and language. The increase of immigrants introduces diverse characteristics to American society, and it becomes important to explore their health outcomes, health-related behaviors, and access to health care services which is extremely critical to American society since immigrants' health has a huge effect on the overall health of the American population. Immigrants in the United States are identified as a vulnerable population, which is related with lower rates of health insurance and poor health outcomes. Immigrants' health disparities are linked with socioeconomic background, immigration status, limited English proficiency, and residential location. Investigating health disparities and health patterns of immigrants is increasingly important for understanding and eliminating health and health care disparities in America.

Foreign-born populations face a number of challenges such as language and cultural barriers. The capability to speak English is an essential determinant of health for immigrants, which increases effective communication with health providers, and then

obtains useful health information and knowledge. Limited English language proficiency increases the risk of inadequate communications with healthcare providers, medication errors and incorrect treatment, and even deaths among immigrants. Language barriers also interfere with the use of preventative and health screening services and result in poor health outcomes. Cultural values impact how a person chooses a way of living their life. Cultural beliefs have a main influence on immigrants' health behavior. For instance, some Chinese immigrants prefer Chinese medicine over western medicine because they think western medicine has more harmful side-effects than Chinese medicine (Liang et al. 2004). Some researchers suggest health providers should recognize patients with different cultures to improve interactions with these patients and increase the quality of care for immigrant patients (Majumdar et al. 2004)

Acculturation plays an important role in immigrant's health. "Acculturation has been defined as the process by which the attitudes, values, beliefs and behaviors of one culture are adopted by an individual from another" (Clark and Hofsess 1998: 37). Acculturation transformations include emotional changes and value alterations (Clark and Hofsess 1998). These changes include learning new values, beliefs, and attitudes and adapting new lifestyle patterns. Longer duration in the United States, U.S citizenship, and English proficiency are indicators of acculturation. Language is one of most common measures of acculturation such as English-language proficiency and English language use in the host country (Alegria et al. 2009; Akresh et al. 2007). Language proficiency is a fundamental element of assimilation and adaptation for immigrants in the host country (Alegria et al. 2009).

Immigrants can adapt themselves with changes in cultural norms when they are exposed to a new culture of the host country. These changes are referred to as "acculturation", which can affect immigrant's health status including health behavior, health outcomes, and access to health care. During the acculturation process, immigrants start to acculturate to the host country's life style. Some negative effects on immigrant health behavior can occur with increased acculturation by the immigrants (Alegria et al. 2009). On the other hand, immigrants tend to be more likely to interact with health institutions if immigrants have a strong awareness of adapting to the culture of their host country such as access to health care. The effect of acculturation on access to health care also varies due to ethnic and gender background (Allena et al. 2014).

The relationship between acculturation and immigrant's health status is complicated. Acculturation can be a risk or a protective factor to influence immigrant's health behavior, health outcomes, and access to health care service. The acculturation process has been described as a stressful experience for immigrants (Simmons 2016). Immigrants are confronted with issues of adopting American culture after they arrive in the U.S. Other studies also showed that less acculturated immigrants have more mental health risks than more acculturated immigrants. Less acculturated immigrants compared to their counterparts, have more stress with adapting to new culture (Marsiglia et al. 2013; Sudhinaraset et al. 2016). Low levels of acculturation cause acculturative stress to increase risk of suicidal behaviors (Lai et al. 2009). A study about Asian American immigrants' discrimination stress found more than 45% of Asian American immigrants reported experiences of discrimination stress (Singh et al. 2014). The relationship

between discrimination stress and depression was positive in the Asian American immigrant group (Singh et al. 2014).

During the acculturation process, the level of acculturation has been found to be negatively associated with the level of stress based on limited English language proficiency and socioeconomic status of immigrants (Gerber et al. 2012). One study that examined the impact of English proficiency on immigrants' acculturation found stress increases for immigrants with limited English proficiency (Lara et al. 2005). The positive effect of acculturation on health of immigrants has found that acculturated immigrants tend to be more likely to interact with health care systems and access more resources to prevent disease. When immigrants start to acculturate to the host society, some of immigrants' original culture may be lost. The negative effect in changing health behavior occurs when immigrant adolescents change from their own health behavior to health risk behaviors as they begin to interact with native groups of same age (Conner and Norman 2017). Although some studies indicated that the effects of acculturation are to encourage immigrants to smoke and drink (Cook et al. 2015; Pudrovska and Anikputa 2016), there are positive effects as well that encourage immigrants to increase their own physical activities.

Acculturation also affects immigrants' access to health care. The process of acculturating to the healthcare systems is associated with health literacy (Escarce 2007). The definition of health literacy is "the degree to which individuals have a capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" (US Department of Health and Human Service Report 2000). Different types of knowledge of health literacy are needed for immigrants when

they access the complicated healthcare services in U.S. Therefore, access to healthcare services becomes the process of acculturation to the healthcare system. Strong English language proficiency helps immigrants keep good communication with health care providers and receive useful health information. Tiwari et al. (2017) found that English-speaking Hispanic adults in Florida were more likely to visit dental clinic than non-speaking Hispanic adults. This result further indicates the positive relationship between language proficiency and dental care. Personal-level barriers to immigrants' access to health care also include the individuals' knowledge of health literacy toward disease and interaction with health care institutions.

The impact of acculturation is attached to immigrants who have characteristics such as socioeconomic status which influences the acculturation process of immigrants. Education seems to be a barrier in determining whether immigrants adapt to the mainstream culture or not. Limited English language and knowledge lead to lacking of understanding mainstream culture value and shortage of accessing interaction with other individuals in mainstream society. Immigrants with low socioeconomic status are more likely to choose maintaining their original culture (Hilmers et al. 2015). Due to acculturation, immigrant lifestyle and actions are changed by cross-cultural interaction (DuBard et al. 2008). The influence of acculturation on health of immigrants is not homogeneous (DuBard et al. 2008; Gerber et al. 2012). Socioeconomic disparities also influence immigrants' acculturation (DuBard et al. 2008). Acculturation has been found to be positively associated with the engagement in health preventive cares among immigrants (Thai et al. 2010; Sudhinarraset et al. 2016). Immigrants change in diet can increase risk of chronic illnesses with increased acculturation (Roger et al. 2011).

Significance of This Study

Reducing health disparities is a main goal of public health. Eliminating health disparities, achieving health equity, and improving the health of all U.S. population groups are the most important goals of Health People 2020 (Health People 2020). Health equity refers to "everyone has the opportunity to be as healthy as possible" and health disparities refers to "difference in health outcomes and their causes among groups of people" (Health People 2020). Health disparities in the United States are associated with various causes which involve race/ethnicity, gender, income, education, disability status, and geography (Health People 2020). The persistence of health disparities becomes a social issue in that it becomes a serious concern leading to the need for continued long-term research on the health of minority population.

Acculturation has been a central factor that plays an important role in immigrant health. The research regarding the impact of acculturation on health began as far back as the 1960's. This researches has contributed significantly to our understanding of many health issues of immigrants, especially the health status of immigrants after settlement.

This study will contribute to better understanding of the effects of acculturation effects on immigrant health from three aspects: health related behaviors such as smoking and drinking, mental health conditions, and access and use of health care services. Further, this dissertation extends the research on immigrant health based on three primary contributions. First, this dissertation comprehensively estimates the impact of acculturation on immigrant health related behaviors, mental health, and health care access. The three important indicators of acculturation are used in this dissertation: English language proficiency, duration of living in the U.S., and American citizenship.

Most studies are limited to comprehensively estimate the impact of acculturation on immigrant health behavior, mental health, and health care access through using IPUMS NHIS data. This dissertation fills the research gap in comprehensively estimating the effects of acculturation on immigrant health including the interaction effects of English language proficiency and length of time in the U.S. and other interaction effects of American citizenship status and length of time in the U.S.

Secondly, this dissertation increases better understanding of immigrant health by exploring effects of the region of birth of immigrants on immigrant health. Therefore, this dissertation also provides new insights into immigrant health research through explaining variation in immigrant health related with the region of birth of the immigrant.

Finally, the framework of acculturation proposed by Arends-Toth and Van de Vijver (Arends-Toth and Van de Vijver 2016) is used in this dissertation to assess the impact of acculturation on immigrant health. This dissertation provides new research evidence regarding the effects of acculturation on how immigrants adapt health behavior, improve mental health conditions, and access health care services.

This dissertation could help policy makers better understand how acculturation can affect the health of immigrants so to effectively reduce the health disparity of immigrants. The implication of this study is that investigating the relationship between acculturation and the health of immigrants will help increase our understanding on how acculturation affects the health of immigrants.

The Structure of This Study

This dissertation examines how acculturation influences and shapes immigrant health among immigrant populations in the United States. The structure of this dissertation includes six chapters. Chapter One presents introduction of this dissertation. Chapter Two presents the literature review. Chapter Three discusses the theoretical framework of this dissertation and describes the acculturation theories guiding this dissertation. Chapter Four presents methodology used in this dissertation. Chapter Five presents the effects of acculturation on immigrant health by indicating the findings based on results of descriptive statistics and logistic models. Chapter Six summarizes the conclusions and discusses the implications of this dissertation.

The Purpose of This Study and Research Questions

The purpose of this study is to examine the relationship between acculturation and health behavior, mental health outcomes, and access to health care service among immigrants in the U.S.

The following three research questions will be addressed:

1. How does acculturation influence health behavior of immigrants?
2. How does acculturation influence mental health outcome of immigrants?
3. How does acculturation influence immigrants' access to health care?

CHAPTER TWO: LITERATURE REVIEW

Health Related Behavior

Health-related behavior are actions taken by individuals. There are two types of health-related behaviors: health risk behaviors and positive health behaviors (Steptoe 2007). Health risk behavior can be defined as actions taken by an individual that can increase risk of disease or injury (Steptoe 2007). Health risk behaviors affect the health and mortality of individuals (Short and Molborn 2015). Health risk behaviors involve smoking, drinking and driving, certain sexual practices, and drug abuse. Drinking is a specific health risk behavior because no drinking to moderate drinking doesn't cause risk while heavy drinking leads to disease or injury.

Positive health behaviors can be defined as actions taken by individuals that can help prevent disease and disability at an early stage, enhance health, and reduce risk of injury (Steptoe 2007). Positive health behavior involves physical activities, consumption of vegetables and fruit, utilization of sunscreen protection, utilization of vehicle seat belts, breast-self-examination, and regular dental care.

Health related behavior is associated with health outcomes. There is a complicated relationship between drinking behavior and health outcomes. Alcohol consumption is a main factor associated with death and disability in the U.S. (Grant et al. 2017). Longer-time alcohol consumption leads to chronic diseases especially cardiovascular and cancer including liver cancer, breast cancer, head and neck cancer, esophageal cancer, and colorectal cancer (NIH Report 2009). The risk of breast cancer is closely associated with increasing alcohol consumption. Women who drink more than

three drinks per day (more than 45 grams) have 1.5 times risk of developing breast cancer than women who are nondrinkers (NIH Report 2009). Heavy drinking has been linked to increased risk of these cancers (Cao et al. 2015). Light to moderate drinking has small and non-significant effect on the overall cancer risk (Cao et al. 2015).

One study focusing on the analysis of the global impact of alcohol on disease and injury was published in *The Lancet in 2018* (Griswold et al. 2018). The study concluded that moderate drinking has a health risk. Individuals who drink one shot per day have 9% increased risk of developing alcohol-related health risks, including breast cancer and tuberculosis, compared with non-drinkers (Griswold et al. 2018). Individuals who drink five shots per day have 37% increased risk of health problems compared with non-drinkers. Griswold et al (2018) also demonstrated that 2.8 million deaths in 2016 are due to alcohol use that is a leading factor for deaths and disability among age 15-49 years old person.

"Cigarette smoking is the leading cause of preventable disease and death in the United States, accounting for more than 480,000 deaths every year, or about 1 in 5 deaths" (U.S. Department of Health and Human Services 2014). Cancers and disease of the respiratory, cardiovascular, and gastrointestinal systems are related with smoking (Zhang and Wang 2008). Although smoking rates have declined between 1997-2007 (Centers for Disease Control 2008), the smoking rate is still high now in American society. Smoking is a major causal factor in lung cancer and in coronary heart disease. Although smoking rate has fallen steadily over last twenty-five years, women's incidence of lung and bronchus cancer has doubled. These reports reveal that smoking can still

predispose an individual's development to cancers and other disease. Smoking can cause chronic disease in old age such as lung cancer.

Immigrant Mental Health

Immigrants have different individual factors and social determinants compared with American population, such as language, religion, socioeconomic status and occupation. Immigrants desire to be assimilated into the society of the host country and adapt its culture The risk for mental health occurs from immigrant experience. The two largest immigrant groups, Latinos and Asians, have been found to be a lower rate of psychiatric disorders compared to U.S. born population (Alegria et al. 2008). These immigrants are less likely to suffer from depressive disorder compared with the U.S. population. An analysis of the Asian-American sample based on the National Epidemiological Survey of Alcohol and Related Conditions (NESARC) found that foreign-born Asian-Americans have a much lower risk of mental illness compared with their American-born counterparts. The risk of mental illness is associated with migration age. The risk of mental illness for immigrants who arrived in the U.S before age of 14 is lower than immigrants who arrived in the U.S after age of 14 because of adopting the culture of U.S and English language proficiency. However other research found no difference in the risk of mental illness among immigrants from Europe, Africa, and the Caribbean who arrived in the U.S at age of 13 or older compared with immigrants who arrived in the U.S before age of 13. Race-based classification in epidemiological studies indicate the difference in mental health of immigrants.

Immigrants are less likely to suffer from depression compared with the American-born population. The findings of depression from subgroups are complicated. Mexican

immigrants have higher risk of depression than U.S born Mexican. Another study discovered Arab immigrants have higher risk of depression than African immigrants. The highest risk group among Arab immigrants reported in the study are those who have Iraqi descent and are Muslims. These results suggest mental health of immigrants may be based on ethnic, time length in the U.S., and age of immigration.

Immigrant Access to Health Care

Immigrants are less likely to have access to health care than U.S. born population (Call et al. 2014). The factors influencing immigrants' health care access include their personal factors, community factors, and system factors (Office of Minority Health Report, 2008). Individual factors involve socioeconomic status, culture, and religion. Community factors include environmental factors and geographic location. Public health care systems also influence immigrants' health care access such as interactions with immigrant patients, programs, and policies.

Financial barriers is one of the most important personal factors. The financial barrier involves insufficient income, lack of employment, and inadequate government financial assistance (Call et al. 2014). Lack of health insurance coverage is also another barrier to access health care resources (Call et al. 2014). Out-of-pocket medical expenses can cause individuals to delay or give up visiting the doctor and getting the medication. Immigrants with lower incomes are particularly at risk of insufficient health insurance coverage (Shi et al. 2014). In fact, individuals without health insurance are less likely to receive preventative services for chronic conditions such as diabetes and cancer from the health care system. Lack of health insurance coverage affects not only health care access,

but also overall health condition. In contrast, individuals with health insurance can better access the health care system and health monitoring resources (Call et al. 2014).

On the other hand, transportation is another factor that affects health care access. Vulnerable populations face a lack of transportation that leads to missing or rescheduling appointments and delaying or skipping medications (Syed et al. 2013). In 2017, 5.8 million individuals in the United States delayed medical care due to lack of transportation (Wolfe et al. 2020). Transportation barriers have an impact on individuals who have low income with chronic conditions to access health care. Limited availability of health care resources also reduces health care access and increases the risk of poor health condition for these individuals. Physician shortages makes them to wait for longer and delayed medical care.

Breast Cancer Risks

Many researches in breast cancer risk demonstrated socioeconomic characteristics and psychological factors that are related to the prevention of breast cancer (Siegler and Costa 1994; Baquet and Commiskey 2000; Lannin et al. 1998). The effect of educational attainment and marital status is linked with breast cancer risk (Bond et al. 2003; Ross et al. 2012). Unmarried women are at higher risk of developing undetected breast cancer than married women (Lannin et al. 1998; Patel et al. 2014). Women with low educational attainment have a higher risk of breast cancer than women with a higher educational attainment (Lanning et al. 1998; Patel et al. 2014)

Age is an important risk factor for breast cancer. The likelihood of developing breast cancer increases when women get older. Women over the age of 50 in the U.S. account for 78% of new breast cancer cases and 87% of breast cancer-related deaths

(Desantis et al. 2011). Other research studies showed breast cancer risk rises when women turn 40 years of age and breast cancer risk increases among young women (Andres et al. 2010; Punam et al. 2014). Some studies indicated that young women with breast cancer are associated a lower survival rate than older women with breast cancer (Anders et al. 2010; Punam et al. 2014). The main reason is that young women are less likely to participate in breast cancer screening than older women, which results in larger masses and more developed disease when young women are diagnosed (Fredholm H et al. 2009).

Low-income women have a higher death rate due to breast cancer in comparison to high-income women (Maly et al. 2011) because low-income women don't participate in mammography screening to ensure early detection of breast cancer. The breast cancer risk is related with women's socioeconomic status (Baquet and Commisky 2000; Maly et al. 2011). Women with low socioeconomic status have higher breast cancer risk than women with high socioeconomic status. Low-income women's unhealthy behaviors increase the risk of breast cancer (Elo et al. 2009; Maly et al. 2011). Low-income women are less likely to afford healthy and nutritious food. They are more likely to consume tobacco and alcohol (Drewnoski and Eichelsdoerder 2010; Himes et al. 2011; Jones et al. 2015). Low-income women are less likely to participate in physical activity that increase breast cancer risk (Lannin et al. 1998; Mc Tiernan et al. 2003; Ward et al. 2004).

Educational attainment is a main component of socioeconomic status. Some studies indicated the women with above high school education have higher risk of breast cancer (Katherine E. et al. 1997) and higher educated women have higher incidence of breast cancer and mortality than lower educated women (Trewin et al. 2017). The higher

educated women are more likely to give first birth at age of 30 and over than lower educated women (Trewin et al. 2017).

Immigration and Breast Cancer Prevention

The majority of foreign-born population is from Latin American and Asian countries in the U.S. (Ryu et al. 2013). 18% of the foreign-born population is living in poverty and 27% of theforeign-born population doesn't have insurance coverage (Stepler et al. 2016). Immigrants without insurance cannot pay and afford their medical needs. Financial constraint becomes a main reason of not being able to access preventative care among uninsured immigrants, who cannot pay and afford the cost of health checkups (Grieco et al. 2012; Stepler et al. 2016)

The cancer screening opportunity is still an issue for low-socioeconomic status individuals (Grieco et al. 2012; Brown et al. 2013; Stepler et al. 2016). There are some barriers of breast cancer prevention among low-income women who don't have insurance and transportations to access health care. Women immigrants who don't have sufficient language proficiency to access health care meet more barriers of breast cancer prevention (Andreeva and Unger 2007; Maly et al. 2011; Nguyen et al. 2012). Some studies have shown that lack of cancer screening among women immigrants is related to English language proficiency, learning about U. S health care system, and cultural health beliefs (Pasa et al. 2006; Wu et al. 2005; Nguyen et al. 2012). English language proficiency is an important factor to influence cancer screening access for women immigrants (Pasa et al. 2006; Wu et al. 2005; Nguyen et al. 2012). Improving English language proficiency is an effective way to increase breast cancer prevention and breast cancer screening awareness for them to better adapt to U.S. health care system (Tejeda et al. 2013).

Acculturation and Immigrant Health

"Acculturation has been defined as the process by which the attitudes, values, beliefs and behaviors of one culture are adopted by an individual from another" (Clark and Hofsess 1998: 147). Acculturation transformations include emotional changes and value alterations (Clark and Hofsess 1998). Acculturation measure may include proximity to ethnic enclaves, personal interactions, employment rates and duration, and language skill acquisition (Alegria 2009). The relationship between acculturation and immigrant health behavior is complicated because the process of acculturation in health behavior could be either positive or negative (Antecol and Bedard 2006). When immigrants start to acculturate to the native society, some of immigrants' original culture may be lost. The negative trend in changing health behavior can happen when immigrant adolescents change from their own health behavior to health risk behaviors as they begin to interact with native group of same age (Bacio et al. 2013). Although some studies indicated that the effects of acculturation are to encourage immigrants to smoke and drink (Galvan and Caetano 2003), there also is a positive effect to encourage immigrants to participate in physical activities.

Some studies have found acculturation has negative effect on heath behavior of immigrants (Lara et al. 2005). Studies reported that acculturation is associated with higher rate of smoking (Bethel and Schenker 2005) and alcohol consumption (Bryant and Kim 2013; Thai et al. 2010). Other studies pointed out that acculturation has a detrimental effect on accepting unhealthy eating habits among both Hispanic immigrants and Asian immigrants (Bethel and Schenker 2005; Neuhouser et al. 2014). The successful adaptation of immigrants has a negative effect on health behaviors of immigrant in the

United States (Lopez-Gonzalez et al. 2005; Zhang and Wang 2008). Additionally, discrimination has been identified as one of the barriers influencing acculturation of immigrants (Takeuchi 2016; Williams 2012). Racial and ethnic discrimination is a main reason of leading to health dispartities in the U.S. (Ayon 2015; National Academy of Science 2015). Perceived discriminations are associated with health behavior and mental health of immigrants such as smoking, alcohol abuse, depression, and anxiety (Williams et al. 2003).

Gerber (2012) found that 57% of research studies examining effects of acculturation on health behavior reveals positive effect of acculturation on participating in physical activities. However, based on previous research studies, gender shows a different effect of acculturation (Black and Markides 1993; Choi et al. 2008; Markides et al. 1990; Zhang and Wang 2008). For instance, acculturation decreases the likelihood of smoking among Asia male immigrants, but it increases the likelihood of smoking among Asia female immigrants (Chen et al. 2013; Unger et al. 2000; Zhang and Wang 2008). The effects of acculturation on health behavior have shown distinctively between male immigrants and female immigrants in the United States since female immigrants are willing to adapt to American society that is more tolerant of women drinking and smoking (Cheng and McBride 2013)

The relationship between acculturation and mental health is mixed. Some studies have shown that acculturation may increase immigrants' daily social interactions in the host country (Abrams et al. 1993; Miranda and Umboefer 1998; Shen and Takeuchi 2001). Acculturation also increases stress or conflict between the culture of home country and host country (Nguyen and Peterson 1993). Many studies showed that language

proficiency is the most important predictor of acculturation for immigrants in the host country. Immigrants' language proficiency may influence immigrants' stress in the host country. Good English language proficiency may facilitate immigrants to access resources in the host country such as health care and also be associated with positive attitudes to protect against stress.

Some studies using length of time in the U.S and English language proficiency as predictors of acculturation indicate greater acculturation is associated with less stress (Lee et al. 2004; Liebkind and Soheim ; 2004; Maclachlan et al. 2004; Mak et al. 2005). Some studies suggested language familiarity is not a main reason for reduction of immigrants' stress in the U.S. Other factors also play important role in immigrants' mental health including socioeconomic status and employment status. Social and economic conditions not only shapes immigrant health behavior but also influences immigrant mental health. Immigrants with low-socioeconomic status are linked to lower acculturation. High language proficiency is associated with high socioeconomic status and better mental health.

Research also has shown immigrant lifestyles are changed through cross-cultural interactions (Andreeva and Unger 2007; Gorman et al. 2010). Immigrants' lifestyles are changed by acculturation, which has advantages and disadvantages in aspects of cancer risk. Increasing physical activities participation may help immigrants protect against cancer. Conversely, increased alcohol consumption and eating disorders may increase cancer risk. Immigrants may experience stress and emotional swings after migration. These impacts might influence their physical and mental health (Boyle et al. 2009;

Gorman et al. 2010). The impact of acculturation is linked to immigrants' adaptation into host society or host country (Hamilton and Hummer, 2011; Castaneda et al. 2015).

The impact of migration brings stress and lack of family support for women immigrants (Kobayashi et al. 2012). Women Immigrants have to confront with acculturation challenges. Although acculturation may have brought conflict between culture of home country and culture of host country, acculturation may influence women immigrant's access to health care system by their health belief and knowledge, English language proficiency to improve communication with health provider, and increasing awareness of preventive care (Adler et al. 2010). Greater acculturation may help women immigrants reduce stress. Women immigrants may delay giving birth and shorten breastfeeding period. The impact of migration brings stress which might elevate breast cancer risk (Andreeva and Unger, 2007; Kobayashi et al. 2012). On the other hand, acculturation to western lifestyles increases the risk of breast cancer (Bray et al. 2004; John et al. 2005). The adoption of unhealthy behavior has been associated with elevated breast cancer risk (Bray et al. 2004; John et al. 2005). The impact of acculturation to immigrant health behavior or unhealthy behavior is not homogeneous, and disparities in racial/ethnic and socioeconomic status should be considered (John et al. 2005; Ghiasvand et al. 2014).

Some women immigrants can refuse to adopt cancer prevention behavior due to their culture of home country and lower educational attainment. Traditional cultural values and norms of women immigrants make them not trust western medicine and breast cancer screening (Wu et al. 2005; Parsa et al. 2006). Community health care systems should take role to help women immigrants become more aware of breast cancer risk and

encourage them to attend breast cancer screenings (Brown and Consedine, 2006; Pourat et al. 2014). Women immigrants should recognize their own prevention needs and adapt to a new cultural context (Brown and Consedine, 2006; Pourat et al. 2014).

Socioeconomic Status (SES) and Health

Socioeconomic status (SES) measured by education, income and occupation, is related to health issues (Deaton 2002). Income is usually defined as whole earnings including wages, interest payments, and profits (Deaton 2002). Individuals with lower incomes usually adopt health risk behaviors, such as smoking and high alcohol consumption (Gerber et al. 2011) as well as lower physical activities resulting in obesity (Singh and Siahpush 2002). Lower income also influences mental health such as psychological pressure and coping with unhealthy behaviors such as smoking, alcohol consumption and unhealthy eating (Gerber et al. 2011; Bacio et al. 2013). Higher income and wealth throughout an individual's life provides adequate conditions to invest in their future health by utilizing healthy behaviors and using health services (Bacio et al. 2013). People with higher incomes are more likely to access preventative health care and then check their health conditions than people with lower incomes (Macdonald 1992). In contrast, good health also helps people with higher income maintain their job and higher income (Galama and van Kippersluis 2010) because poor health limits individuals' ability to work and to lose job opportunities (Health Affairs Report 2018).

Educational attainment also influences health behaviors because the education provides knowledge, skills, and abilities that may be important to avoid or abandon unhealthy behaviors such as health knowledge (Kawachi et al. 2010). Data from the National Survey on Drug Use and Health (NSDUH) indicated that in 2009-10, 35% of

adults who do not have high school diploma are smokers, compared to 30% of high school graduates and 13% of college graduates (Kawachi et al. 2010). Individuals with low socioeconomic status are less likely to eat healthily and are less likely to be physically active than individuals with high socioeconomic status (Bukman et al. 2014).

Moreover, the 2010 Behavioral Risk Factor Surveillance System (BRFSS) data showed that adults without a high school diploma are less likely to participate in physical activities compared with adults who have a high school diploma (Kawachi et al. 2010). It must be noted that not all behavioral risk factors are higher among those with the lower educational attainment. The 2011 BRFSS data showed that binge drinking increases among those who have a bachelor's degree or higher (Kawachi et al. 2010).

Adults with higher education tend to have less income-related pressure and higher income and greater socioeconomic status for a healthy lifestyle which impacts their living style and working in good environment on health behavior (Wilson et al. 2005). Adults with higher education also have huge advantage in finding desirable jobs and thus are less likely to experience work-related stress (Wilson et al. 2005).

Education is the most basic component of socioeconomic status because it affects future career opportunities and earning potential. Education also provides knowledge and life skills to make it easier for higher educated people to obtain information and resources to promote health (Adler and Newman 2002). Education has enormous effect on health inequality, and researchers believe policy should encourage more years schooling and increased access to education on good health (Adler and Newman 2002). Education can increase individual and household income and decrease economic tribulation, both of

which result in increased use of healthcare services and improved quality of life (Salinas et al. 2010).

CHAPTER THREE: THEORETICAL FRAMEWORK

Acculturation Theory

Acculturation Theory is used to understand how acculturation influences immigrants' health. Acculturation is defined as "the process of cultural change that occurs when individuals from different cultural backgrounds come into prolonged, continuous, first-hand contact with each other" (Redfield, Linton, and Herskovits 1936: 146). Acculturation theory includes acculturation conditions, acculturation orientations, and acculturation outcomes (Arends-Toth and Van de Vijver 2006).

Acculturation conditions refer to factors that influence acculturation process such as individual and group level factors. There are three group-level factors: the characteristics of the receiving society, the characteristics of original country, and the characteristics of the immigrant group. Sociologists and anthropologists have referred to as characteristics of the receiving society as the context of reception. The attitudes of receiving-society members towards immigrants and receiving-society members' expectations towards immigrant acculturation, as well as interaction with immigrants, determine whether immigrants are received favorably or unfavorably (Berry et al. 2006; Rohmann et al. 2008). The receiving-society members have distinct attitudes towards immigrants due to different characteristics of immigrants such as different ethnic identity and socioeconomic status (Berry et al. 2006; Rohmann et al. 2008).

The cultural and ethnic background of immigrants are important determinants of acculturation process. In terms of the characteristics of original country, immigrants from English-speaking counties have less stress living in the U.S. than immigrants from non-English-speaking counties. Among black Caribbean immigrants, immigrants who are

from Jamaica have less acculturative stress than immigrants who are from Haiti. Another group level factor is the characteristics of the immigrant group. Immigrants who are from Europe and Canada are the most positively to adapt the new environment in the U.S (Simon et al. 1999; Portes et al. 2001). The reason is that their original culture is similar to American culture (Simon et al. 1999; Portes et al. 2001). Other ethnic immigrants are less favorable than white immigrants from the Europe countries due to ethnic identity (Simon et al. 1999).

Individual level factors such as demographic characteristics and socioeconomic characteristics of immigrants can influence immigrants' acculturation process. The socioeconomic characteristics of immigrant determine whether immigrants have potential competence to conduct acculturation. For example, most immigrants who have lived in enclaves have lower socioeconomic status, so their limited competence determines not to adapt the host culture and new environment very well in the U.S. although they have strong desire to adapt the host culture and new environment. Both group-level factors and individual level factors as acculturation conditions have crucial impacts on shaping the acculturation process of immigrants.

Acculturation orientations refer to acculturation strategies, styles, and attitudes. They are related to cultural adoption and cultural maintenance. There are two main theoretical perspectives related with acculturation orientations: the unidimensional model and two-dimensional model. The two models differ in the relations between mainstream culture adoption and original culture maintenance among immigrants.

Acculturation is originally conceptualized as a unidimensional process (Gordon 1964; Masudaira 2006; Rivera 2010; Schwartz et al. 2010). The unidimensional model

proposes that immigrants discard their cultural heritage when immigrants accept the values, practices, and beliefs of their host country. Early European immigrants followed this model and abandoned their home culture and accepted the host culture (Berry 1997; Nguyen and Von Eye 2002). These European immigrants did not know American culture when immigrants came to the U.S, but they were fully assimilated into American society with the passing of time. This successful assimilation pattern is due to the fact that those early European immigrants had a strong desire to build up a new development in the U.S. and to become a contributing member of American society (Nguyen and Von Eye 2002).

The unidimensional model means both the home culture and the host culture are exclusive (Sung 1985). Immigrants are not able to keep characteristics of their home culture while accepting the culture of the host country. In a unidimensional model, acculturation is an assimilative process when immigrants abandon their home culture in favor of the host culture. Immigrants cannot simultaneously adopt to their host culture and retain home culture, so immigrants are not able to keep characteristics of their home culture. Identifying with the host country's culture is considered as progress and continued retaining of home culture is seen as a defect (Nguyen and Voneye 2002).

The unidimensional model focuses on immigrants changing their culture to be able to assimilate into the host culture, which means abandoning their culture and then fully adopting the host culture (Gordon 1964; Berry et al. 1987; Sam 2006). These immigrants abandon their original cultural beliefs and norms (Lee et al. 2003). The unidimensional model emphasizes assimilation is the only way that immigrants as subordinate groups better adapt dominant culture in the host country (Gordon 1964). The assimilation process is a long-term process of needing immigrants to adopt the dominant

culture. The unidimensional model is used to guide immigrants to fully adopt dominant culture in the host country in order to be identified as members of the host community (Woldemikael 1987). However, this assimilation process may be a failure or a success (Glazer and Moynihan 1970). Although the unidimensional model is very helpful to promote immigrants to adapt to the new environment and culture of the host country, this model cannot be useful for all immigrant groups, such as Asian immigrants groups, that have a strong desire to highly retain their heritage culture. Another group is Muslim group which has strong desire to maintain their religion.

The two-dimensional model has been proposed by Berry (1970). This model focuses on how immigrants deal with their original culture and the culture of the host country. Immigrants need to decide whether the culture of the host country is valuable and their origination culture is worth to maintain (Bourhis et al. 1997). One of the contributions of Berry's two-dimensional model is that maintaining the origination culture and the culture of the host country is conceptually independent. Berry (1970) described this model as simultaneously obtaining the host culture and retaining the home culture (Berry 1980). Immigrants may retain their home culture while adopting the host country culture (Laroche et al. 1998). Many immigrants would like to maintain the origination culture while they have adopted the culture of the host country. The reason is that immigrants also want to retain the social support network through the origination culture connection while they have positive attitude and strong desire toward adopt the culture of the host country (Abraido-Lanza et al. 2006).

Four acculturation strategies that have been proposed in the two-dimensional model involve assimilation, separation, integration, and marginalization. Assimilation

occurs when immigrants adopt the dominant culture and do not retain their home culture (Berry 1997), which is way of comprehensively absorbing in the host culture and relinquishing the origination culture. Assimilation is the only way of acculturation that this unidimensional model proposed. Separation occurs when individuals want to maintain the culture of home country while rejecting the culture of host country (Berry 1997). For instance, some immigrants are unable to speak English after living in the ethnic enclaves for decades in the U.S. (Berry 1997). Separation is a negative way of acculturation to result in immigrant isolation in the host country as a consequence. Integration occurs when individuals are able to adopt the culture of host country while retaining the culture of home country (Berry 1997). Integration is also conceptualized as biculturalism (Riviera et al. 2010). This is a good way of acculturation to help immigrants reduce acculturation stress when immigrants adopt the culture of the host country. Marginalization occurs when individuals reject both the culture of home country and host country (Berry 1997). Some immigrants are not willing to connect to their origination culture. Simultaneously, they are also discriminated against in the host country. They have precluded both their origination culture and the culture of the host country. Some Moroccan-Dutch adolescents and young adults in Netherlands are reluctant to identify their origination culture, but they are discriminated against in the Netherlands. Therefore, they have been rejected in both cultures (VanBergen et al. 2021)

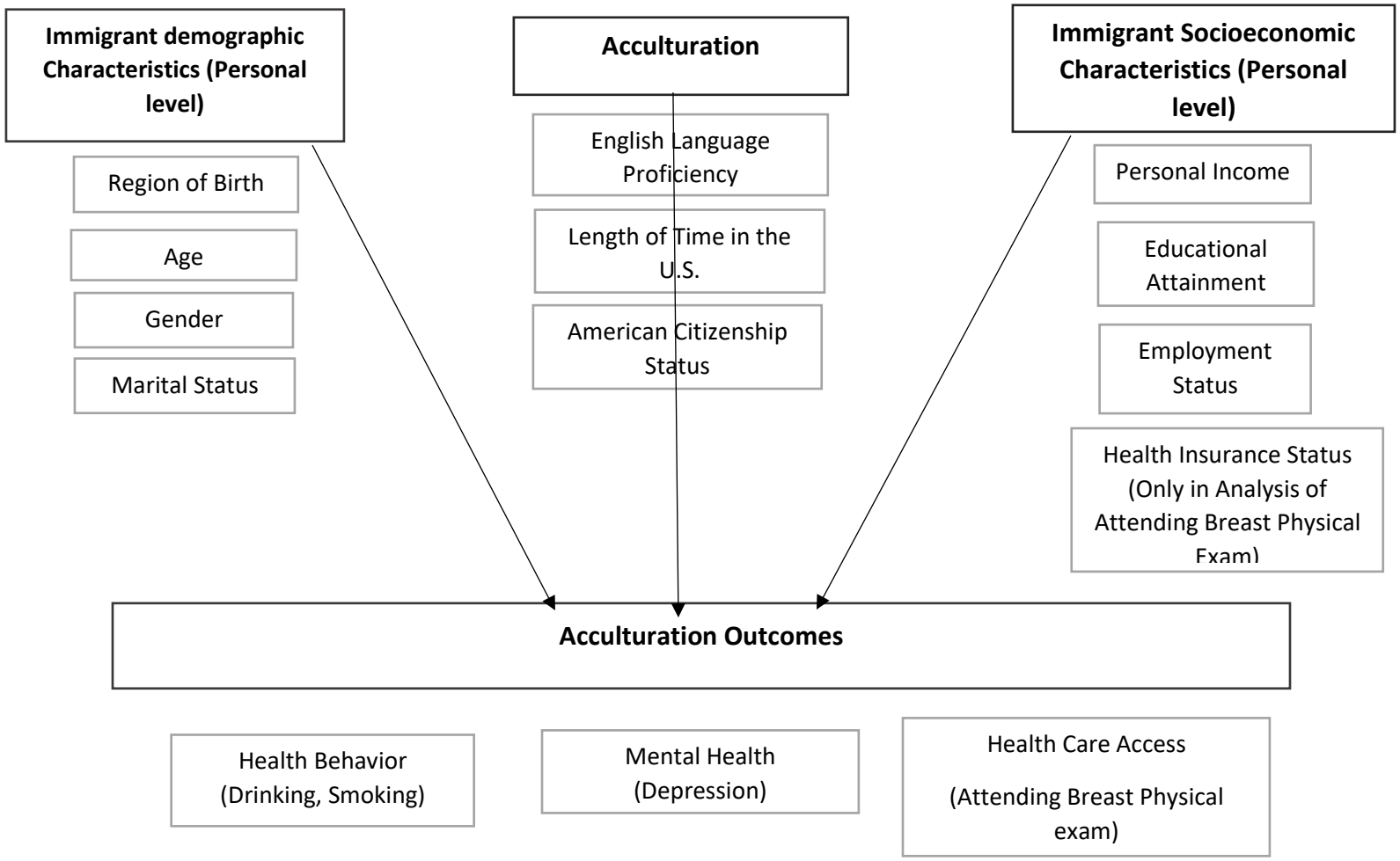
Acculturation processes might be influenced through acculturation conditions, so acculturation outcomes are distinct (Berry 1997; Marfani et al. 2013; Yong et al. 2016). There are three acculturation outcomes proposed by Arends-Toth and Van de Vijver (2006): psychological wellbeing, sociocultural competence in ethnic culture, and

sociocultural competence in mainstream culture. The psychological and sociocultural outcomes reveal distinct outcomes of the acculturation process. Psychological outcomes involve well-being, life satisfaction, and mental health in the host country. This outcome can be viewed as internal adjustments by immigrants through emotional and psychological changes (Arends-Toth and Van de Vijver 2006). Sociocultural outcomes that include sociocultural competence in ethnic culture and sociocultural competence in mainstream culture reveal immigrants' capacity to determine whether their life is influenced by ethnic culture or host culture in the host country (Ward et al. 2001). These outcomes can be viewed as external adjustments by immigrants through behavioral adaption. Both psychological and sociocultural outcomes are correlated and may influence each other (Ward et al. 2001).

Acculturation orientations and outcomes are different. Acculturation orientations refer to attitudes towards certain behavior and acculturation outcomes refer to the real performance of behavior (Arends-Toth and Van de Vijver 2006; Celenk and Van de Vijver 2011). For instance, immigrants' motivation to health care access in the U.S. would be reflecting an attitude towards the mainstream culture whereas immigrants' access to health care in the U.S. would be viewed as an acculturation outcome (Arends-Toth and Van de Vijver 2006; Celenk and Van de Vijver 2011).

This study focuses on exploring the applicability of acculturation theory for analyzing health behavior, mental health, and health care access among immigrants in the U.S. The Conceptual Model with Defined Measures is presented below (figure 3.1).

Figure 3.1 Conceptual Model with Defined Measure



This study has considered the health behavior of immigrants, mental health of immigrants, and health care access of immigrants as the acculturation outcomes which are affected by immigrants' English language proficiency, length of staying in the U.S., American citizenship status, demographic characteristics, and socioeconomic characteristics. Demographic characteristics and socioeconomic characteristics at a personal level are treated as acculturation conditions which influence the health behavior of immigrants, mental health of immigrants, and health care access of immigrants. Additionally, one of the purposes of this study is to expand research of acculturation and its effect on immigrant health through increasing applicability of acculturation theory.

CHAPTER FOUR: METHODOLOGY

Hypotheses

Three research questions in this study focus on how acculturation influences drinking behavior of immigrants, smoking behavior of immigrants, mental health outcomes of immigrants, and immigrants' access to health care. English language proficiency, duration of living in the U.S., and American citizenship status are commonly used for measurement of acculturation. Hypotheses of this study are presented below:

- Immigrants who are more acculturated are associated with increased likelihood of drinking;
- Immigrants who are more acculturated are associated with decreased likelihood of smoking;
- Immigrants who are more acculturated are associated with decreased likelihood of depression;
- Immigrant women who are more acculturated are associated with increased likelihood of attending the breast physical exam.

Data

The overarching research question focuses on how acculturation affects the health of immigrants. This study utilizes the secondary data from National Health interview survey (NHIS) data. To ensure that the sample size is sufficient for statistical analyses, this study uses data of combined Sample Adult Files collected between 2010 and 2018. The National Health Interview Survey (NHIS), a primary data collection program of the National Center for Health Statistics (NCHS), is the main source of information on the health of population in the United States.

The NHIS data contain detailed information on health status, conditions, behaviors, healthcare access and utilization, as well as demographic and socioeconomic characteristics (NHIS 2018). The NHIS dataset provides researchers with data across almost five decades. The study sample consists of one randomly selected person per household to eradicate potential correlations between family members in this survey (IPUMS NHIS Report 2018). Thereby, each person in the Sample Adult File responded for her/himself to the survey questions. These characteristics of NHIS have significant advantages over other nationally based survey (IPUMS NHIS Report 2018).

Dependent Variables

Drinking Behavior

This variable is created from a question in NHIS that asked respondents about drinking status. This variable is coded as the following: respondents reporting lifetime abstainer in their lifetime are coded as no drinking; respondents reporting current light drinker are coded as light drinking; and respondents reporting current moderate drinker are coded as moderate drinking. Based on definition of drinking status from NHIS, light drinkers are those who consume 3 drinks or fewer per week. Moderate drinkers are those who consume more than 3 drinks but no more than 7 drinks per week for women and more than 3 drinks but no more than 14 drinks per week for men (NHIS Report 2018).

Smoking Behavior

Smoking behavior is measured by using the data collected through a question that asked respondents currently smoking/formerly smoking/no smoking status. This variable is coded as the followings: respondents reporting never smoking cigarettes in their

lifetime are coded as no smoking; respondents reporting current smokers are coded as currently smoking; and respondents reporting former smokers are coded as formerly smoking.

Depression

Depression is measured by a dichotomous variable: having depressive symptom and no depressive symptom. The data are collected from a question that asked respondents "how often feel depressed". Respondents reporting Daily, Weekly, Monthly, and a few times a year are recoded having depressive symptoms; respondents reporting never are recoded no depressive symptoms.

Breast Physical Exam

This dependent variable is created from a question in NHIS that asked respondents "Ever had breast physical exam". This variable is recoded as a dichotomous variable (Yes/No). The physical breast exam is one of the most important early breast cancer screenings and increase the chances of finding breast cancer early. Women's age from 25 to 39 should get a breast physical exam every 1 to 3 years. Women should get both a breast physical exam every year and a mammogram every 1 to 2 years when women turn 40 (ACOG Report 2017).

Independent Variables

These independent variables include three types of variables: demographic variables, measures of acculturation, and socioeconomic variables.

Demographic Characteristics

The demographic variables include age, marital status, gender, and region of birth. The age of the respondents is broken down into the following 4 categories: 18 to 29, 30 to 39, 40 to 49, 50 to 59, and 60 and over. When exploring the relationship between acculturation and attending breast physical exam among immigrant women, the age of respondents is recoded into five age intervals: 30 to 39, 40 to 59, 60 to 79, 80 and over. According to respondents' marital status and gender, marital status is grouped into three groups: never married respondents, widowed or divorced and separated respondents, and married respondents. Gender is grouped into two groups: male respondents, and female respondents. The global region of birth is recoded into six groups: Mexico, Central America, Caribbean Islands, South America, Europe, Africa, Middle East, and Asia.

Acculturation

Measures of acculturation in this study include English language proficiency, duration of living in the U.S., and the U.S. citizenship. In order to examine the relationship between language acculturation and health behavior, a question about "Language of interview" in NHIS survey is used to measure English language proficiency. This variable is dichotomized into two categories: English and other languages. Language acquisition such as English-language proficiency and English language use in the host country is one common measure of acculturation (Alegria et al. 2009; Akresh et al. 2007). Language proficiency is a fundamental element of assimilation and adaptation for immigrants in the host country (Alegria et al. 2009). Another indicator of acculturation to be considered is duration of time living in the U.S. This variable is coded into three categories: less than 5 years, 5 years to less than 10 years, and 10 years

or more. Finally, naturalization is also considered to be an indicator of acculturation. This variable is dichotomized into two categories: yes and no.

Socioeconomic Characteristics

The study includes four socioeconomic variables: employment status, personal income, and educational attainment, health insurance coverage. Employment status identifies respondents' current employment status. This variable has three categories: currently working, being out of work, and not in the labor force. Personal income of the respondent is coded into three categories: less than $50,000, from $50,000 to $99,999, and 100,000 and over. The variable measuring Educational attainment has four categories: less than a high school diploma, high school diploma, some college, and bachelor's degree and above. In order to explore the relationship between acculturation and attending breast physical exam among immigrant women, health insurance is divided into two categories: yes and no.

Statistical Methods

Descriptive Statistics Analysis

The descriptive statistical analysis is conducted to better understand the distribution of the independent and dependent variables including frequencies, percentages, means/median, and standard deviations (i.e., measures of central tendency and dispersion) (McPherson 2001). The descriptive analysis helps our understanding of each variable as well as the relationships among these variables in the study. Overall, the descriptive statistics presents a summary of a large dataset and helps in exploring the differences in such research study (McDonald and Kennedy 2004).

In this dissertation, the dependent and independent variable are coded as categorical variables. The characteristics of dependent and independent variables are described by descriptive statistical analysis such as frequencies and percentages.

The Multinomial Logistic Regression Model

Multinomial logistic regression model is used in predicting probabilities of outcomes of categorically dependent variables. The multinomial logistic regression model is effectively used in research studies within dependent variable consisted of a polytomous category with multiple choices. The dependent variables can be discrete, nominal, or unordered variables (Hosmer and Lemeshow 2000). The basic concept of multinomial logistic regression model is that the estimates for the parameter need to be compared with a baseline category (Hosmer and Lemeshow 2000).

In multinomial logistic regression model, one value can be selected as the reference category if a dependent variable has multiple categories. If the first category of a dependent variable is the reference category, the equation is written as below:

$$\text{In}\frac{P(Y=m)}{p(Y=1)}=\beta_0+\Sigma\beta_i X_i$$

Y= a dependent variable. (Y=1 means first category of a dependent variable is the reference category).

P=Probabilities

m= a category of the dependent variable

β_0=log odds of the dependent variable if X_i =0

β_i=parameter estimate for the independent variable

X_i= independent variable i

There are two dependent variables that include smoking status and drinking status. The independent variables include measures of acculturation, demographic variables, and socioeconomic variables. The demographic variables are composed of age, gender, marital status, and region of birth. Socioeconomic variables are composed of personal income, educational attainment, and employment status. It is important to identify the reference category of dependent variables first and then examine the relationship between dependent variables and independent variables.

Immigrant Smoking Behavior

There are three types of smoking status: no smoking, formerly smoking, currently smoking. No smoking was chosen as a reference group. Model 1 estimates the effect of measures of acculturation, demographic variables, and socioeconomic variables on immigrant smoking behavior. Model 2 adds the interaction effect of English language proficiency and duration of living in the U.S on immigrant smoking behavior, which examines the effect of English language proficiency by length of time in the U.S. on smoking behavior among immigrants. Model 2 adds another interaction effect of the U.S. citizenship and duration of living in the U.S on immigrant smoking behavior, which examines the effect of the U.S. citizenship by length of time in the U.S. on smoking behavior among immigrants.

Model 1 is presented below:

$\ln\frac{\Pr(smoking\ status=formerly\ smoking)}{\Pr(smoking\ status=no\ smoking)}$=$\beta_0$+$\beta_1$(English language)+$\beta_2$(Length of U.S.)+$\beta_3$(American Citizenship) +$\beta_4$(Region of birth) + β_5(Gender) +β_6(Marital status)+β_7(Age)+β_8(Education)+β_9(Personal income)+ β_{10}(Employment status)

$\ln\frac{Pr(smoking\ status=currently\ smoking)}{Pr(smoking\ status=no\ smoking)}$= β_0+β_1(English language)+β_2(Length of time of U.S.)+β_3(American Citizenship) +β_4(Region of birth) + β_5(Gender) +β_6(Marital status)+β_7(Age)+β_8(Education)+β_9(Personal income)+ β_{10}(Employment status)

Model 2 is presented below:

$\ln\frac{\Pr(smoking\ status=formerly\ smoking)}{\Pr(smoking\ status=no\ smoking)}$=$\beta_0$+$\beta_1$(English language)+$\beta_2$(Length of time of U.S.)+β_3(American Citizenship) +β_4(Region of birth) + β_5(Gender) +β_6(Marital status)+β_7(Age)+β_8(Education)+β_9(Personal income)+ β_{10}(Employment status) + β_{11}(English language*length of time of U.S.) + β_{12}(American Citizenship*length of time of U.S.)

$\ln\frac{Pr(smoking\ status=currently\ smoking)}{Pr(smoking\ status=no\ smoking)}$= β_0+β_1(English language)+β_2(Length of time of U.S.)+β_3(American Citizenship) +β_4(Region of birth) + β_5(Gender) +β_6(Marital status)+β_7(Age)+β_8(Education)+β_9(Personal income)+ β_{10}(Employment status) + β_{11}(English language*length of time of U.S.) + β_{12}(American Citizenship*length of time of U.S.)

Immigrant Drinking Behavior

There are three types of drinking status: no drinking, light drinking, and moderate drinking. No drinking was chosen as a reference group. Model 1 estimates the effect of

measures of acculturation, demographic variables, and socioeconomic variables on immigrant drinking behavior. Model 2 adds the interaction effect of English language proficiency and duration of living in the U.S on immigrant drinking behavior, which examines the effect of English language proficiency by length of time in the U.S. on drinking behavior among immigrants. Model 2 adds another interaction effect of the U.S. citizenship and duration of living in the U.S on immigrant drinking behavior, which examines the effect of the U.S. citizenship by length of time in the U.S. on drinking behavior among immigrants.

Model 1 is presented below:

$$\ln\frac{\Pr\,(drinking\ status=light\ drinking)}{\Pr\,(drinking\ status=no\ drinking)} = \beta_0+\beta_1(\text{English language})+\beta_2(\text{Length time of U.S.})+\beta_3(\text{American Citizenship})+\beta_4(\text{Region of birth})+\beta_5(\text{Gender})+\beta_6(\text{Marital status})+\beta_7(\text{Age})+\beta_8(\text{Education})+\beta_9(\text{Personal income})+\beta_{10}(\text{Employment status})$$

$$\ln\frac{\Pr\,(drinking\ status=heavy\ drinking)}{\Pr\,(drinking\ status=no\ drinking)} = \beta_0+\beta_1(\text{English language})+\beta_2(\text{Length time of U.S.})+\beta_3(\text{American Citizenship})+\beta_4(\text{Region of birth})+\beta_5(\text{Gender})+\beta_6(\text{Marital status})+\beta_7(\text{Age})+\beta_8(\text{Education})+\beta_9(\text{Personal income})+\beta_{10}(\text{Employment status})$$

Model 2 is presented below:

$$\ln\frac{\Pr\,(drinking\ status=light\ drinking)}{\Pr\,(drinking\ status=no\ drinking)} = \beta_0+\beta_1(\text{English language})+\beta_2(\text{Length time of U.S.})+\beta_3(\text{American Citizenship})+\beta_4(\text{Region of birth})+\beta_5(\text{Gender})+\beta_6(\text{Marital status})+\beta_7(\text{Age})+\beta_8(\text{Education})+\beta_9(\text{Personal income})+\beta_{10}(\text{Employment status})+\beta_{11}(\text{English language*length of time in the U.S.})+\beta_{12}(\text{American Citizenship*length of time of U.S.})$$

$\ln\frac{\Pr(drinking\ status=heavy\ drinking)}{\Pr(drinking\ status=no\ drinking)}$= β_0+β_1(English language)+β_2(Length time of U.S.)+β_3(American Citizenship) +β_4(Region of birth) + β_5(Gender) +β_6(Marital status)+β_7(Age)+β_8(Education)+β_9(Personal income)+ β_{10}(Employment status) + β_{11}(English language*length of time in the U.S.) + β_{12}(American Citizenship*length of time of U.S.)

Binomial Logistic Regression Model

A binomial logistic regression is also used in predicting probabilities of one of the two categories of a dichotomous dependent variable with independent variables that can be either continuous or categorical. A dependent variable takes a values of "0" or "1". The equation is written as below:

$$\text{In}\frac{P}{1-p}=\beta_0+\Sigma\beta_i X_i$$

P is the probability that the event Y occurs. P(Y=1).

β_0=log odds of the dependent variable if X_i =0

β_i=parameter estimate for the independent variable

X_i= independent variable i

There are two dependent variables: depression and attending breast physical exam. The independent variables include measures of acculturation, demographic variables, and socioeconomic variables. The demographic variables are composed of age, gender, marital status, and region of birth. Socioeconomic variables are composed of personal income, educational attainment, employment status, and health insurance coverage (for modeling attending breast physical exam).

Depression

The binomial logistic model is used to estimate the relationship between immigrant depression and measures of acculturation, demographic variables, and socioeconomic variables. Model 1 is a null model without predictors. Model 2 estimates the effect of measures of acculturation on the likelihood of immigrant depression. Model 3 adds demographic variables to estimate the effect of demographic variables on the likelihood of immigrant depression. Model 4 adds socioeconomic variables to estimate the effect of socioeconomic variables on the likelihood of immigrant depression. Model 5 adds the interaction effect of English language proficiency and duration of living in the U.S and the interaction effect of the U.S. citizenship and duration of living in the U.S on the likelihood of immigrant depression, which examines the effect of English language proficiency by length of time in the U.S. on depression among immigrants and examines the effect of the U.S. citizenship by length of time in the U.S. on depression among immigrants.

Model 1 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0$$

Model 2 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0 + \beta_1(\text{English language}) + \beta_2(\text{Length of time of U.S.}) + \beta_3(\text{American Citizenship})$$

Model 3 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0 + \beta_1(\text{English language}) + \beta_2(\text{Length of time of U.S.}) + \beta_3(\text{American Citizenship}) + \beta_4(\text{Region of birth}) + \beta_5(\text{Gender}) + \beta_6(\text{Marital status}) + \beta_7(\text{Age})$$

Model 4 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0 + \beta_1(\text{English language}) + \beta_2(\text{Length of time of U.S.}) + \beta_3(\text{American Citizenship}) + \beta_4(\text{Region of birth}) + \beta_5(\text{Gender}) + \beta_6(\text{Marital status}) + \beta_7(\text{Age}) + \beta_8(\text{Education}) + \beta_9(\text{Personal income}) + \beta_{10}(\text{Employment status})$$

Model 5 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0 + \beta_1(\text{English language}) + \beta_2(\text{Length of time of U.S.}) + \beta_3(\text{American Citizenship}) + \beta_4(\text{Region of birth}) + \beta_5(\text{Gender}) + \beta_6(\text{Marital status}) + \beta_7(\text{age}) + \beta_8(\text{Education}) + \beta_9(\text{Personal income}) + \beta_{10}(\text{Employment status}) + \beta_{11}(\text{English language*length of time of U.S.}) + \beta_{12}(\text{American Citizenship*length of time of U.S.})$$

Attending in a Breast Physical Exam

The binomial logistic model is used to estimate the relationship between immigrant women attending in a breast physical exam and measures of acculturation, demographic variables, and socioeconomic variables. In order to explore the relationship between acculturation and attending breast physical exam among immigrant women in the U.S., the health insurance status as an indicator is added as an in socioeconomic variables. Model 1 is a null model without predictors. Model 2 estimates the effect of measure of acculturation on the likelihood of immigrant women attending in a breast physical exam. Model 3 adds demographic variables to estimate the effect of demographic variables on the likelihood of immigrant women attending in a breast physical exam. Model 4 adds socioeconomic variables to estimate the effect of socioeconomic variables on the likelihood of immigrant women attending in a breast

physical exam. Model 5 adds the interaction effect of English language proficiency and duration of living in the U.S on the likelihood of immigrant women attending a breast physical exam, which examines the effect of English language proficiency by length of time in the U.S. on immigrant women attending in a breast physical exam and examines the effect of the U.S. citizenship by length of time in the U.S. on immigrant women attending a breast physical exam.

Model 1 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0$$

Model 2 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0+\beta_1(\text{English language}) +\beta_2(\text{Length time of U.S.}) +\beta_3(\text{American Citizenship})$$

Model 3 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0+\beta_1(\text{English language}) +\beta_2(\text{Length time of U.S.}) +\beta_3(\text{American Citizenship}) +\beta_4(\text{Region of birth}) + \beta_5(\text{Gender}) +\beta_6(\text{Marital status}) +\beta_7(\text{Age})$$

Model 4 is presented below:

$$\text{In}\frac{P}{1-p} = \beta_0+\beta_1(\text{English language}) +\beta_2(\text{Length time of U.S.}) +\beta_3(\text{American Citizenship}) +\beta_4(\text{Region of birth}) + \beta_5(\text{Gender}) +\beta_6(\text{Marital status}) +\beta_7(\text{age}) +\beta_8(\text{Education})+\beta_9(\text{Personal income}) + \beta_{10}(\text{Employment status}) + \beta_{11}(\text{Health insurance status})$$

Model 5 is presented below:

$\ln\frac{P}{1-p} = \beta_0 + \beta_1$(English language) $+\beta_2$(Length time of U.S.) $+\beta_3$(American Citizenship) $+\beta_4$(Region of birth) $+ \beta_5$(Gender) $+\beta_6$(Marital status) $+\beta_7$(Age) $)+\beta_8$(Education)$+\beta_9$(Personal income)$+ \beta_{10}$(Employment status) $+ \beta_{11}$(Health insurance status) $+ \beta_{12}$(English language*length time of U.S.) $+ \beta_{13}$(American Citizenship*length of time of U.S.)

CHAPTER FIVE: FINDINGS

Descriptive Analysis Results

Drinking Behavior

Table 5.1 includes descriptive statistics of the sample and variables used in modeling immigrants' drinking behavior. Drinking behavior is measured by a three-category variable: no drinking, currently light drinking, and currently moderate drinking. The sample was composed of 13,828 immigrants with 35.65% reporting no drinking, 50.47% currently light drinking, and 13.88% reporting currently moderate drinking. Respondents who did not answer the questions regarding drinking were not included in the analysis. Results of the chi-square tests presented in Table 5.1 showed that drinking behavior is not statistically independent from demographic, socioeconomic, and acculturation factors. The only exception is marital, for which the chi-square test is not statistically significant.

Table 5. 1 Descriptive Statistics for All Variables Included in the Drinking Behavior Analysis

Variable	**Total**	**No Drinking**	**Light Drinking**	**Moderate Drinking**
Drinking Behavior Observations	13,828	4,930	6,979	1,919
			Percentage	
		35.65%	50.47%	13.88%
Demographic Variables				
Age				

18 to 29	36.25%	49.78%	13.97%
30 to 39	33.30%	53.74%	12.96%
40 to 49	36.70%	50.06%	13.24%
50 to 59	35.06%	48.96%	15.98%
60 and over	40.09%	45.28%	14.62%
Chi^2 Test		43.171***	
Gender			
Male	25.1%	53.46%	21.44%
Female	47.5%	47.11%	5.39%
Chi^2 Test		782. 486***	
Education			
Less than high school diploma	44.22%	42.39%	13.4%
High school diploma	37.73%	48.46%	13.82%
Some college	32.41%	54.15%	13.44%
Bachelor's degree and above	29.94%	55.46%	14.60%
Chi^2 Test		210.224***	
Marital Status			
Unmarried	34.34%	50.88%	14.78%
Widowed, divorced, and separated	36.06%	49.49%	14.45%
Married	36.13%	50.62%	13.25%
Chi^2 Test		7.861	
Economic Variables			
Personal Income			
Under $50,000	39.03%	48.47%	12.50%
50,000 to 99,999	26.17%	57.58%	16.25%
100,000 and over	19.55%	56.16%	24.29%
Chi^2 Test		286.216***	

Employment status			
Currently working	35.14%	50.68%	14.19%
Unemployed	33.99%	52.89%	13.12%
Not in labor force	45.36%	44.97%	9.66%
Chi^2 Test		38.620***	
Acculturative variables			
Language proficiency			
English	32.74%	53.05%	14.21%
Other languages	42.51%	44.38%	13.1%
Chi^2 Test		123.167***	
Citizenship			
Yes	37.72%	48.23%	14.04%
No	33.51%	52.78%	13.71%
Chi^2 Test		31.589***	
length of time in the U.S.			
Less than a year to less than 5 years	41.43%	47%	11.56%
5 years to less than 10 years	41.34%	46.69%	11.96%
10 years or more	33.94%	51.56%	14.5%
Chi^2 Test		61.768***	

Note: *P<0.05, **P<0.01, ***P<0.001.

As shown in Table 5.1, respondents with a bachelor's degree or above reporting currently light drinking are 55.46% and moderate drinking at 14.06%. Respondents with less than a high school diploma reporting currently light drinking are 42.39% and reporting currently moderate drinking are 13.4%. For respondents with a high school

diploma, 48.46% reported currently light drinking and 13.82% reported current moderate drinking. For respondents with some college education level, 54.15% reported currently light drinking and 13.44% reported currently moderate drinking. The bivariate relationship between educational attainment and drinking behavior is monotonically positive. As educational attainment level increases, the likelihood of currently light and moderate drinking increases. Respondents with a bachelor's degree or above tend to be more likely to report currently light and moderate drinking than respondents with lower levels of educational attainment.

There is a similar positive relationship between personal income and drinking behavior. As personal income increases, the likelihood of currently moderate drinking increases. Respondents with personal income less than $50,000, 48.47% reported currently light drinking and 12.5% reported currently moderate drinking. Respondents with personal income between$50,000 and $99,999, 56.58% reported currently light drinking and 16.25% reported currently moderate drinking. Respondents with personal income more than or equal to $100,000, 56.16% reported currently light drinking and 24.29% reported currently moderate drinking.

The bivariate relationship between the level of acculturation and the likelihood of reporting drinking is more complex. Immigrants with a longer duration of residence in the U.S., in particular 10 years or more, were more likely to report either light or moderate drinking than their counterparts with a duration of residence shorter than 10 years. Increased English language proficiency was positively associated with the likelihood of both light and moderate drinking. On the other hand, immigrants without

the U.S. citizenship were more likely to engage in light drinking, but less moderate drinking, than those who had acquired the citizenship.

Smoking Behavior

Table 5.2 includes descriptive statistics of the sample and variables used in modeling immigrants' smoking behavior. The measurement of smoking behavior has three categories including no smoking, formerly smoking, and currently smoking. The sample was composed of 32,103 immigrants. 74.15% of immigrants reported no smoking, 14.68% of immigrants reported formerly smoking, and 11.77% of immigrants reported currently smoking. Results of the Chi-square tests presented in Table 5.2 showed that smoking behavior is not statistically independent from demographic, socioeconomic, and acculturation factors.

Table 5. 2 Descriptive Statistics for All Variables Included in the Smoking Behavior Analysis

Variable	**Total**	**No Smoking**	**Formerly Smoking**	**Currently Smoking**
Smoking Behavior Observations	32,103	23,805	4,713	3,585
			Percentage	
		74.15%	14.68%	11.17%
Demographic Variables				
Age				
18 to 29		81.49%	6.92%	11.59%
30 to 39		77.57%	11.30%	11.14%
40 to 49		74.39%	14.65%	10.96%

50 to 59	67.2%	20.09%	12.71%
60 and over	65.36%	26.14%	8.49%
Chi^2 Test		888.021***	
Gender			
Male	65.66%	19.23%	15.11%
Female	83.88%	9.47%	6.65%
Chi^2 Test		782. 486***	
Education			
Less than high school diploma	74.41%	13.43%	12.15%
High school diploma	72.57%	13.40%	14.03%
Some college	70.53%	16.17%	13.29%
Bachelor's degree and above	77.24%	15.28%	7.48%
Chi^2 Test		270.536***	
Marital Status			
Never married	77.25%	9.83%	12.92%
Widowed, divorced, and separated	68.64%	16.83%	14.53%
Married	74.71%	16.13%	9.16%
Chi^2 Test		362.455***	
Socioeconomic Variables			
Income			
Under $50,000	74.6%	13.4%	12%
$50,000 to$99,999	73.03%	17.26%	9.66%
$100,000 and over	72.39%	20.86%	6.76%
Chi^2 Test		192.761***	
Employment status			
Currently working	74.30%	14.64%	11.06%

Unemployed	69.93%	14.56%	15.51%
Not in labor force	74.95%	15.24%	9.82%
Chi^2 Test		30.561***	
Acculturative variables			
Language proficiency			
English	73.68%	15.39%	10.93%
Other languages	75.33%	12.9%	11.77%
Chi^2 Test		34.326***	
Citizenship			
Yes	75.27%	12.83%	11.9%
No	73.1%	16.41%	10.49%
Chi^2 Test		89.32***	
length of time in the U.S.			
less than a year to less than 5 years	78.98%	9.89%	11.14%
5 years to less than 10 years	78.76%	10.38%	10.87%
10 years or more	72.92%	15.86%	11.22%
Chi2 Test	141.984***		

Note: *P<0.05, **P<0.01, ***P<0.001.

Table 5.2 shows respondents with a bachelor's degree or above, 7.48% of them reported currently smoking and 77.24% reported no smoking. For respondents with some college, 13.79% reported currently smoking and 65.58 % reported no smoking. For respondents with a high school diploma, 12.2% reported currently smoking and 74.78% reported no smoking. For respondents with less than a high school diploma, 14.62%

reported currently smoking and 72.54% reported no smoking. The relationship between educational attainment and no smoking is non-linear relationship because respondents with less than high school diploma tend to more likely to report no smoking status than respondents with some college education and high school diploma.

The bivariate relationship between personal income and smoking behavior is negative. As personal income increases, the currently likelihood of being currently smoking decreases. For respondents with personal income less than $50,000, 12% reported currently smoking and 74.3% reported no smoking. For respondents with personal income between $50,000 and $99,999, 9.66% reported currently smoking and 73.03% reported no smoking. For respondents with personal income more than or equal to $100,000, 6.76% reported currently smoking and 72.39% reported no smoking

There is a clear negative relationship between duration length of living time in the U.S. and no smoking. As length of time in the U.S increases, the likelihood of no smoking decrease. For respondents who have been the U.S. for less than a year to less than 5 years, 78.98% reported no smoking. 78.76% respondents who have been the U.S. for 5 to less than 10 years reported no smoking. 72.92% respondents who have been the U.S. for 10 and more years reported no smoking.

Depression

Results of the bivariate analysis of depression and the independent variables are exhibited in Table 5.3. Depression is measured as a dichotomous variable: depression and no depression. The sample is composed of 14,648 respondents. 68.32% of respondents reported no depression, 31.68% of respondents reported having depression. Results of the

chi-square tests presented in Table 5.3 showed that depression is not statistically independent from demographic, socioeconomic, and acculturation factors.

Table 5. 3 Descriptive Statistics for All Variables Included in the Depression Analysis

Variable	**Total**	**Depression**	**No depression**
Depression Observations	14,648	4,641	10,007
		Percentage	
		31.68%	68.32%
Demographic Variables			
Age			
18 to 29		34.47%	65.53%
30 to 39		32.30%	67.70%
40 to 49		30.38%	69.62%
50 to 59		32.38%	67.62%
60 and over		28.11%	71.89%
Chi^2 Test		23.15***	
Gender			
Male		26.72%	73.28%
Female		37.37%	62.63%
Chi^2 Test		191.126***	
Education			
Less than high school diploma		31.68%	68.32%
High school diploma		29.8%	70.2%
Some college		33.65%	66.35%

Bachelor's degree and above	31.36%	68.64%
Chi^2 Test	10.530***	
Marital Status		
Never married	36.32%	63.68%
Widowed, divorced, and separated	39.03%	60.97%
Married	26.99%	73.01%
Chi^2 Test	190.257***	
Socioeconomic Variables		
Income		
Under $50,000	33.39%	66.61%
$50,000 to$99,999	27.48%	72.52%
$100,000 and over	26.32%	73.68%
Chi^2 Test	53.336***	
Employment status		
Currently working	30.76%	69.24%
Unemployed	44.95%	55.05%
Not in labor force	36.81%	63.19%
Chi^2 Test	62.522***	
Acculturative variables		
Language proficiency		
English	30.69%	69.31%
Other language	32.06%	67.94%
Chi^2 Test	36.246***	
Citizenship		
Yes	31.61%	68.39%
No	31.75%	68.25%
Chi^2 Test	176.256***	

length of time in the U.S.		
Less than a year to less than 5 years	30.94%	69.06%
5 years to less than 10 years	31.41%	68.59%
10 years or more	31.8%	68.2%
Chi2 Test	258.623***	

Note: *P<0.05, **P<0.01, ***P<0.001.

The bivariate relationship between personal income and depression of respondents is negative. As personal income increases, the risk of depression decreases. For respondents with personal income less than $50,000, 33.39% reported having depression and 66.61% reported no depression. For respondents with personal income between $50,000 and $99,999, 27.48% reported having depression and 72.52% reported no depression. For respondents with personal income more than or equal to $100,000, 26.32% reported having depression and 73.68% reported no depression.

There is clear relationship between employment status and depression status of respondents. Respondents who are currently working tend to more likely to report no depression than respondents who are unemployed and respondents who are not in labor force. For respondents who are currently working, 69.24% respondents reported no depression and 30.69% respondents reported having depression. For respondents who are unemployed, 55.5% respondents reported no depression and 44.94% respondents reported depression.

There is clear relationship between English language proficiency and depression status of respondents. Respondents who speak English tend to be more likely to report no depression than respondents who speak other languages. For respondents who speak English, 69.31% reported no depression and 30.69% reported having depression. For respondents who speak other language, 67.94% reported no depression and 32.06% reported having depression. Immigrants with a longer duration of residence in the U.S., in particular 10 years or more, were more likely to report depression than their counterparts with a duration of residence shorter than 10 years. On the other hand, immigrants without the U.S. citizenship were more likely to report depression than those who had acquired the citizenship.

Breast Physical Examination

Results of the bivariate analysis of the breast physical examination and the independent variables are presented in Table 5.4. Breast physical examination has two categories including yes and no. The sample is composed of 4,895, female respondents aged 30 and over. 66.5% of immigrants reported access to breast physical exam, 33.5% of immigrants reported no access to breast physical exam. Results of the chi-square tests presented in Table 5.4 showed that access breast physical exam is not statistically independent from demographic, socioeconomic, and acculturation factors.

Table 5. 4 Descriptive Statistics for All Variables Included in Access to Breast Physical Exam Analysis

Variable	**Total**	**Access to exam**	**No access to exam**

Depression	4,895	3,255	1,640
Observations			
		Percentage	
		66.50%	33.50%
Demographic			
Variables			
Age			
30 to 39		61.84%	38.16%
40 to 49		67.54%	32.46%
50 to 59		69.56%	30.44%
60 and over		72.82%	27.18%
Chi^2 Test		31.149***	
Education			
Less than high school diploma		53.29%	46.71%
High school diploma		61.95%	38.05%
Some college		72.57%	27.43%
Bachelor's degree and above		77.12%	22.88%
Chi^2 Test		207.656***	
Marital Status			
Never married		62.31%	37.69%
Widowed, divorced, and separated		67.48%	32.52%
Married		67.15%	32.85%
Chi^2 Test		7.45***	
Socioeconomic			
Variables			
Income			
Under $50,000		64%	36%

$50,000 to$99,999	78.42%	21.58%
$100,000 and over	85.43%	14.57%
Chi^2 Test	74.523***	
Employment status		
Currently working	66.5%	33.5%
Unemployed	63.74%	36.26%
Not in labor force	67.26%	32.74%
Chi^2 Test	408.625***	
Health Insurance		
Having insurance	70.81%	29.19%
No insurance	53.63%	46.37%
Chi^2 Test	122.23***	
Acculturative variables		
Language proficiency		
English	74.44%	25.56%
Other languages	50.03%	49.97%
Chi^2 Test	288.354***	
Citizenship		
Yes	72.29%	27.33%
No	58.29%	41.71%
Chi^2 Test	111.061***	
length of time in the U.S.		
less than a year to less than 5 years	53.44%	46.56%
5 years to less than 10 years	57.32%	42.68%
10 years or more	68.74%	31.26%
Chi2 Test	53.762***	

Note: *P<0.05, **P<0.01, ***P<0.001.

There is clear relationship between personal income and access to breast physical exam of respondents. As personal income increases, the likelihood of access to breast physical exam increases. For respondents with personal income less than $50,000, 64% reported access to breast physical exam and 36% reported no access to breast physical exam. For respondents with personal income between $50,000 and $99,999, 78.42% reported access to breast physical exam and 21.58 % reported no access to breast physical exam. For respondents with personal income $100,000 and over, 85.43% reported access to breast physical exam and 14.57% reported no access to breast physical exam.

Respondents with health insurance tend to more likely to report access to breast physical exam than respondents without health insurance. For respondents with insurance coverage, 70.81% reported access to breast physical exam and 29.19% reported no access to breast physical exam. For respondents without insurance coverage, 53.63% reported access to insurance and 46.37% reported no access to insurance.

Respondents who speak English tend to more likely to report access to breast physical exam than respondents who speak other languages. For respondents who speak English, 74.44% reported access to breast physical exam and 25.56% reported no access to breast physical exam. For respondents who speak other language, 50.33% reported access to breast physical exam and 49.97% reported no access to breast physical exam.

Immigrants with a longer duration of residence in the U.S., in particular 10 years or more were more likely to report access to breast physical exam than their counterparts with a duration of residence shorter. For respondents with a longer duration of residence

in the U.S., in particular 10 years or more, 68.74% reported access to breast physical exam. For respondents who stay in the U.S. less than 10 years, 57.32% reported access to breast physical exam and 53.44% respondents who stay in the U.S. less than 5 years reported access to breast physical exam. Immigrants with the U.S. citizenship were more likely to report access to breast physical exam than those who had not acquire the citizenship. 72.29% respondents with the U.S. citizenship reported access to breast physical exam and 58.28% respondents who had not acquire the citizenship reported access to breast physical exam.

Multinomial Logistic Regression Results

Drinking Behavior

Multinomial logistic regression results regarding drinking behavior of immigrants are represented in Table 5.5 including odds ratio for independent variables.

Table 5. 5 Logistic Analysis of Drinking Behavior

	Model 1		**Model 2**	
	Light Drinking	Moderate Drinking	Light Drinking	Moderate Drinking
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Variables				
Demographic Variables				
Region of Birth: reference= Mexico, Central America, Caribbean Islands				
South America	0.96**	0.91**	0.93**	0.87**
Europe	1.34**	1.41**	1.32**	1.39**
Africa	0.62*	0.58*	0.54	0.5
Middle East	0.43*	0.33*	0.34	0.27
Asia	1.06**	1.14**	1.04**	1.1**
Age: reference category=18 to 29				
30 to 39	1.31**	0.86	1.26**	0.75
40 to 49	1.44**	0.72**	1.41**	0.66*
50 to 59	0.75***	1.16*	0.67**	1.03*
60 and over	0.61***	0.69***	0.56***	0.6***
Sex: reference category=male				
Female	0.93***	0.7***	0.88***	0.65***

Marital status: reference category=never married				
Widowed or divorced and separated	0.91*	0.85*	0.86	0.77
Married	0.88	0.77	0.82	0.72
Socioeconomic Variables				
Education: reference category=high school diploma				
Less than a high school diploma	0.86	0.93	0.86	0.93
Some college	1.43	1.09	1.41	1.08
Bachelor's degree and above	1.6*	1.12*	1.57*	1.06*
Income: reference category= income less than$50,000				
$50,000 to $99,999	1.22***	1.35***	1.22***	1.35***
$100,000 and over	1.37***	1.48***	1.36***	1.47***
Employment Status: reference category=not in labor force				
Currently working	1.25	0.59*	1.22	0.57
Unemployed	1.34	0.73	1.29	0.71
Acculturative variables				
Language proficiency: reference category= Other language				
English	1.44***	1.08***	1.43**	1.06**
Citizenship: reference category=No				
Yes	1.15*	1.14*	1.1*	1.11*
length of time in the U.S.: reference category= less than a year to less than 5 years				

5 years to less than 10 years	0.88*	1.07*	0.82*	1.06*
10 years or more	1.29***	1.27***	1.23**	1.24**
Interaction				
English and 10 years or more in the U.S.			1.38***	1.26***
Citizenship and 10 years or more in the U.S.			1.21*	1.19*
Note*$p<0.05$, **$p<0.01$, ***$p<0.001$				

Model 1 analyzes the effects of demographic variables, socioeconomic variables, and acculturative variables in predicting likelihood of smoking behavior. There are three types of smoking behavior: No drinking (Reference outcome), light drinking, and moderate drinking. Model 2 tests the interaction effects of length of time in the U.S., and Language Proficiency in predicting likelihood of smoking behavior.

In Model 1, the demographic variables include age, gender, and marital status. The variable of age includes 18 to 29, 30 to 39. 40 to 49, 50 to 59, and 60 and over. The respondents of age 30-39 were 1.31 times more likely to report light drinking than those of age 18 to 29 (reference group) because odds ratio was 1.31. This effect is significant based on a p-value being less than 0.01. The respondents of age 40-49 were 1.44 times more likely to report light drinking than those of age 18 to 29 (reference group) because odds ratio was 1.44. This effect is significant based on a p-value being less than 0.01. The respondents of age 50-59 were 0.75 times less likely to report light drinking than those of age 18 to 29 (reference group) because odds ratio was 0.75. This effect is significant based on a p-value being less than 0.001. The respondents of age 60 and over were 0.61 times less likely to report light drinking than those of age 18 to 29 because odds ratio was 0.61. This effect is significant based on a p-value being less than 0.001. The older respondents were less likely to report light drinking than younger respondents. Age is a significant variable for predicting the likelihood of light drinking of immigrants.

Model 1 displays the effects of region of birth on the likelihood of light drinking. Respondents who are from Europe and Asia were more likely to report light drinking when compared to those from Mexico, Central America, and Caribbean Islands. Respondents who are from South America, Africa, and Middle East were less likely to

report light drinking when compared to those from Mexico, Central America, Caribbean Islands. Original culture is a significant factor connected with drinking behavior of immigrants.

Female respondents were 0.93 times less likely to report light drinking than male respondents. This effect is significant based on a p-value being less than 0.001. Female respondents were less likely to report light drinking than male respondents. Respondents who were widowed or divorced and separated were 0.91 times less likely to report light drinking than respondents who were unmarried. The effects of married status were not significant for predicting drinking behavior of immigrants. The effects of widowed, divorced, and separated status were significantly associated with light drinking of immigrants.

The Educational attainments include less than high school diploma, some college, and bachelor's degree or a higher degree. The effect of bachelor's degree or a higher degree was significantly associated with light drinking. Respondents that have bachelor's degree or a higher degree were 1.6 times as likely as those with a high school diploma to report light drinking because odds ratio was 1.6. This effect is significant for predicting the likelihood of immigrant light drinking. The effects of Less than a high school diploma and some college degrees are not significant for predicting the likelihood of immigrant light drinking.

The effect of personal incomes more than or equal to $100,000 was significantly associated with light drinking. Respondents with personal income more than or equal to $100,00 were 1.37 times more likely to report light drinking than respondents with personal income less than $50,000 because odds ratio was 1.37. This effect is significant

based on a p-value being less than 0.001. The effects of personal income were significant for predicting the likelihood of light drinking of immigrants. The increase in the personal income was associated with the increased likelihood of light drinking. This effect indicates higher income immigrants are more likely to be light drinker.

Acculturative variables include language proficiency, American citizenship status, and length of time in the U.S. Respondents who speak English were 1.44 times more likely to report light drinking than respondents who speak other language. The effects of English language proficiency were significant for predicting the likelihood of light drinking. This effect is significant based on a p-value being less than 0.001.

Respondents who have obtained U.S. citizenship were 1.15 times more likely to report light drinking than respondents who have not obtained U.S. citizenship. The influence of U.S. citizenship status was significant for predicting the likelihood of light drinking because this effect is significant for a p-value being less than 0.05. Respondents who have stayed in the U.S. for less than 10 years were 0.88 times less likely to report light drinking than respondents who have been the U.S. less than 5 years. Respondents who have stayed in the U.S. for more than 10 years were 1.29 times more likely to report light drinking than respondents who have stayed in the U.S. less than 5 years. The effects of length of time in the U.S were significant on predicting the likelihood of light drinking of immigrants

Model 1 also estimates that the effects of acculturation, demography characteristics, socioeconomic characteristics on moderate drinking of immigrants. The effects of age 30-39 were not significant on predicting the likelihood of moderate drinking. The respondents of age 40-49 were 0.72 times less likely to report moderate

drinking than those of age 18 to 29 (reference group) because odds ratio was 0.72. This effect is significant based on a p-value being less than 0.01. Model 1 shows that the respondents of age 60 and over were less likely to report moderate drinking than those of age 18 to 29. Respondents who are from Europe and Asia were more likely to report moderate drinking when compared to those from Mexico, Central America, and Caribbean Islands. Respondents who are from South America, Africa, and Middle East were less likely to report moderate drinking when compared to those from Mexico, Central America, and Caribbean Islands

The effects of gender were significant on predicting the likelihood of moderate drinking. Higher Educational attainment and personal income were also significant factors on predicting the likelihood of moderate drinking. Respondents who have a bachelor's degree or above are 1.12 times more likely to report moderate drinking than respondents who have a high school diploma. Respondents with personal income more than or equal to $100,00 were 1.48 times more likely to report moderate drinking than respondents with personal income less than $50,000. The effects of personal income were significantly associated with moderate drinking. As personal income increases, the likelihood of moderate drinking also increases.

Acculturative variables include language proficiency, American citizenship status, and length of time in the U.S. are significant on predicting the likelihood of moderate drinking of immigrants. Respondents who speak English were 1.08 times more likely to report moderate drinking than respondents who speak other language. This effect is significant based on a p-value being less than 0.001. English language

proficiency has significant impact on predicting likelihood of moderate drinking of immigrants.

Respondents who have obtained U.S. citizenship were 1.14 times more likely to report light drinking than respondents who have not obtained U.S. citizenship. The effect of U.S. citizenship was significant on predicting the likelihood of light drinking because this effect is significant based on a p-value being less than 0.01. Respondents who stay in the U.S. for more than 10 years were 1.27 times more likely to report moderate drinking than respondents who stay in the U.S. for less than 5 years. The relationship between the length of time in the U.S. and likelihood of moderate drinking is positive relationship. As the length of time in the U.S. increase, the likelihood of moderate drinking also increases.

In model 2, the interaction effects of English language proficiency and length of time in the U.S. were added to consider their effects on predicting the likelihood of drinking among immigrants. Respondents who stay in the U.S. for more than 10 years and speak English were 1.38 times more likely to report light drinking than respondents who stay in the U.S, for less than 5 years and speak other language. Respondents who stay in the U.S. and speak English were 1.26 times more likely to report moderate drinking than respondents who stay in the U.S, for less than 5 years and speak other language. This interaction effects were significantly associated with drinking behavior among immigrants.

Model 2 also estimated the interaction effects of American citizenship status and length of time in the U.S. Respondents who stay in the U.S. for more than 10 years and who are American citizens were 1.21 times more likely to report light drinking than respondents who stay in the U.S. for less than 5 years and who are not American citizens.

Respondents who stay in the U.S. and are American citizens were 1.19 times more likely to report moderate drinking than respondents who stay in the U.S, for less than 5 years and who are not American citizens. This interaction has significant impact on predicting drinking behavior among immigrants.

Predicted Probabilities

The results of logistic models show that acculturation affects the odds of drinking behavior of immigrants. English language proficiency, citizenship status, and length of time in the U.S. were significantly associated with drinking behavior of immigrants. Predicted probabilities is another way to demonstrate the predictors' effects on predicting the likelihood of drinking behavior.

Figure 5. 1 Predicted Probabilities of Light Drinking by Length of Time in the U.S. and English Language Proficiency

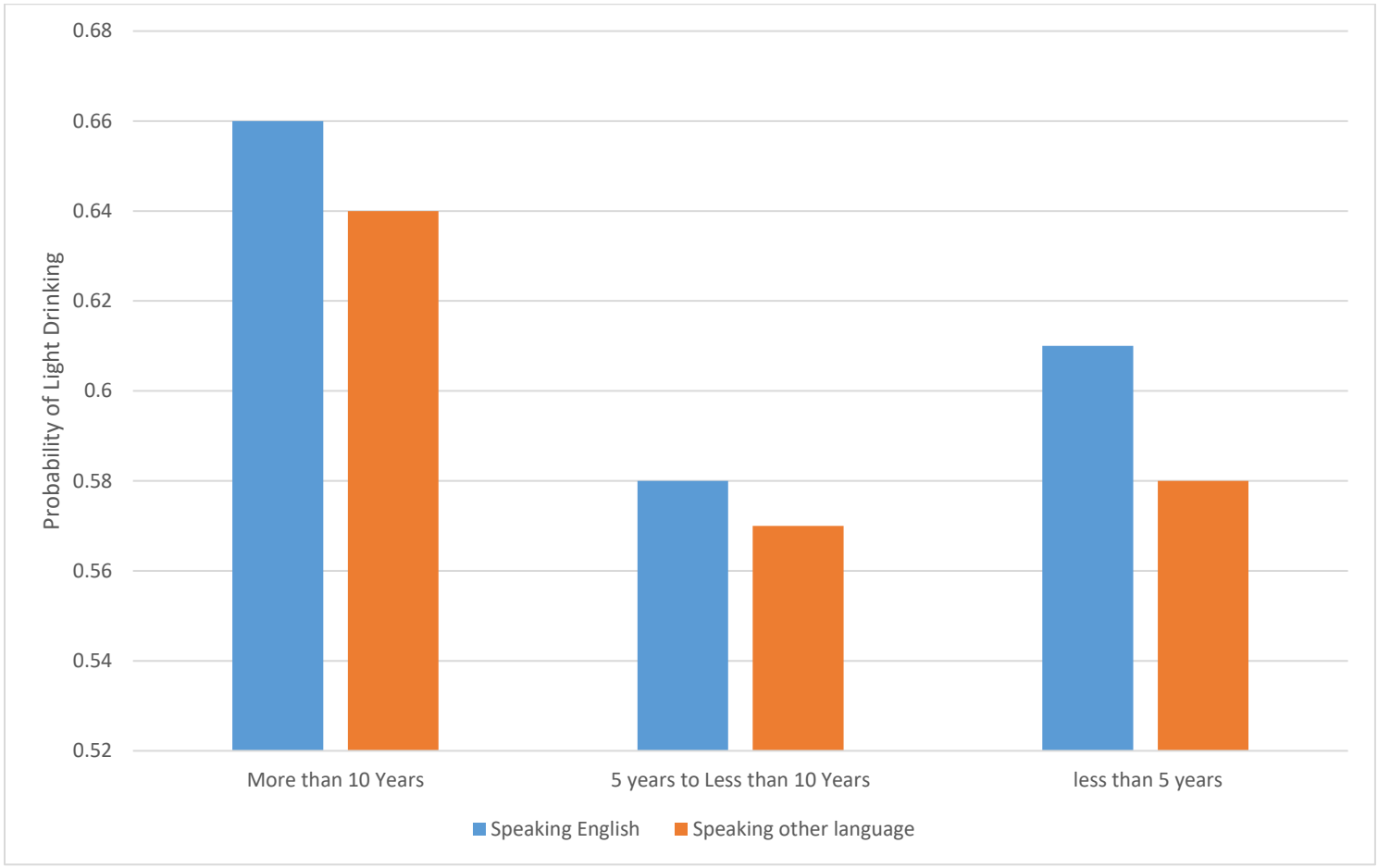


Figure 5. 2 Predicted Probabilities of Moderate Drinking by Length Time in the U.S. and English Language Proficiency

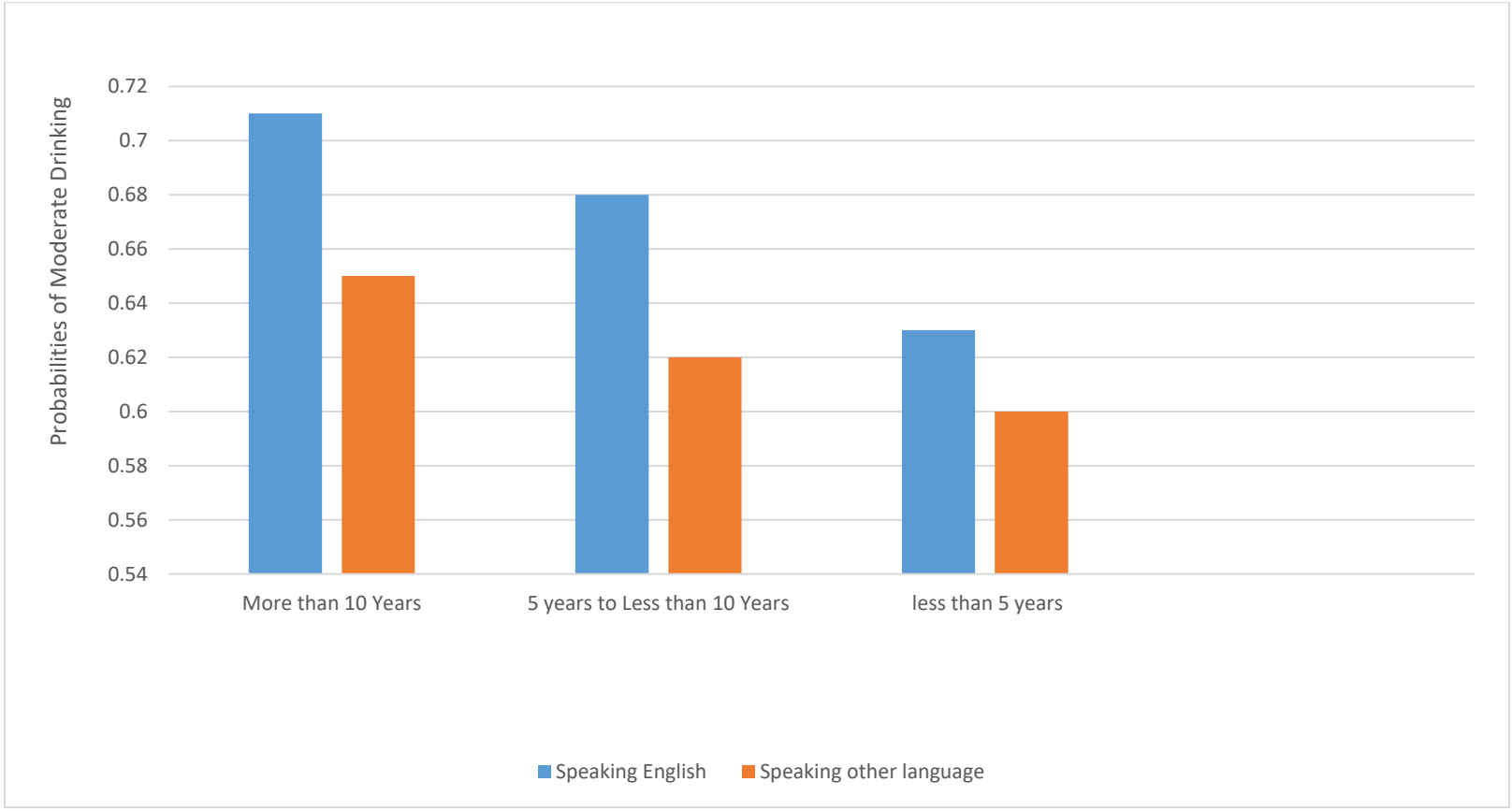


Figure 5. 3 Predicted Probabilities of Light Drinking by Length of Time in the U.S. and the Citizenship Status

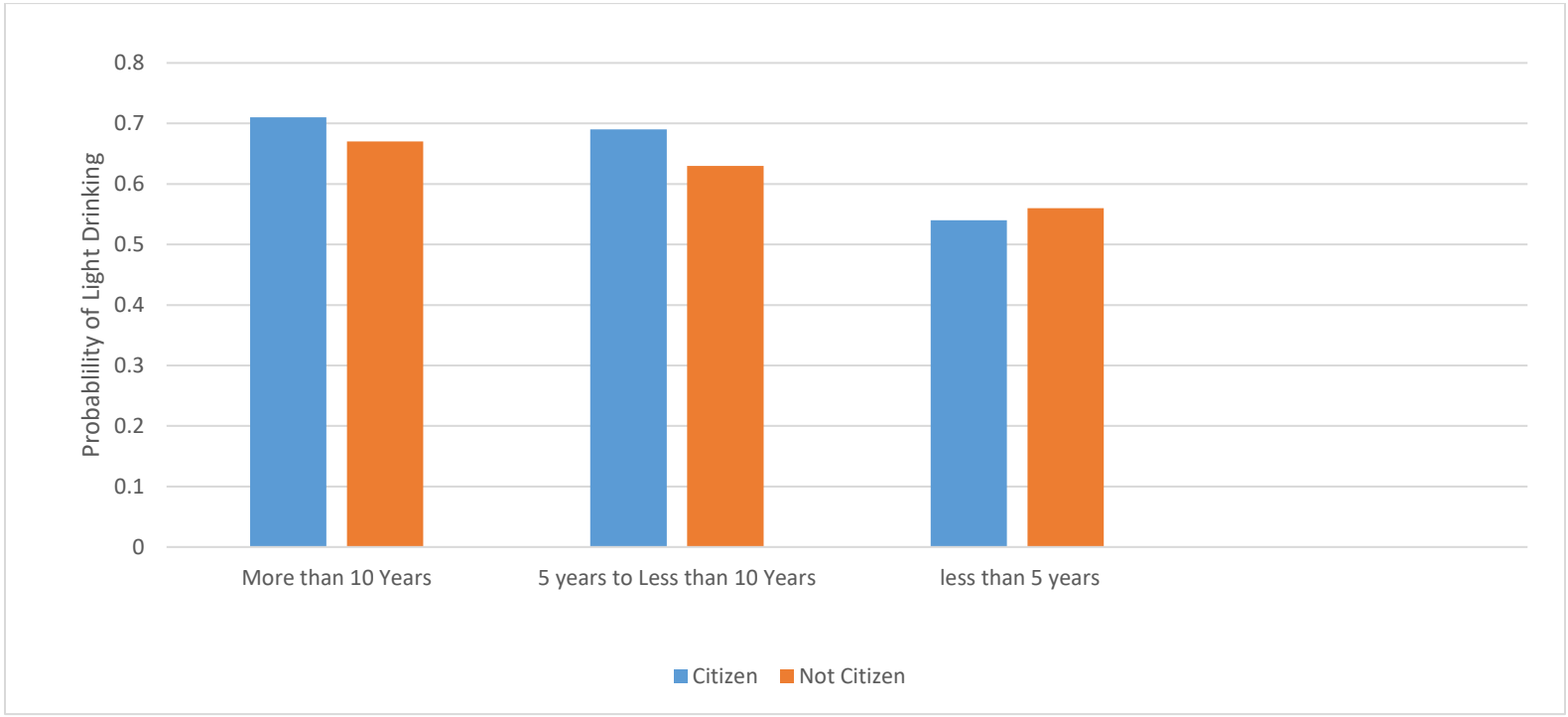


Figure 5. 4 Predicted Probabilities of Moderate Drinking by Length of Time in the U.S. and the Citizenship Status

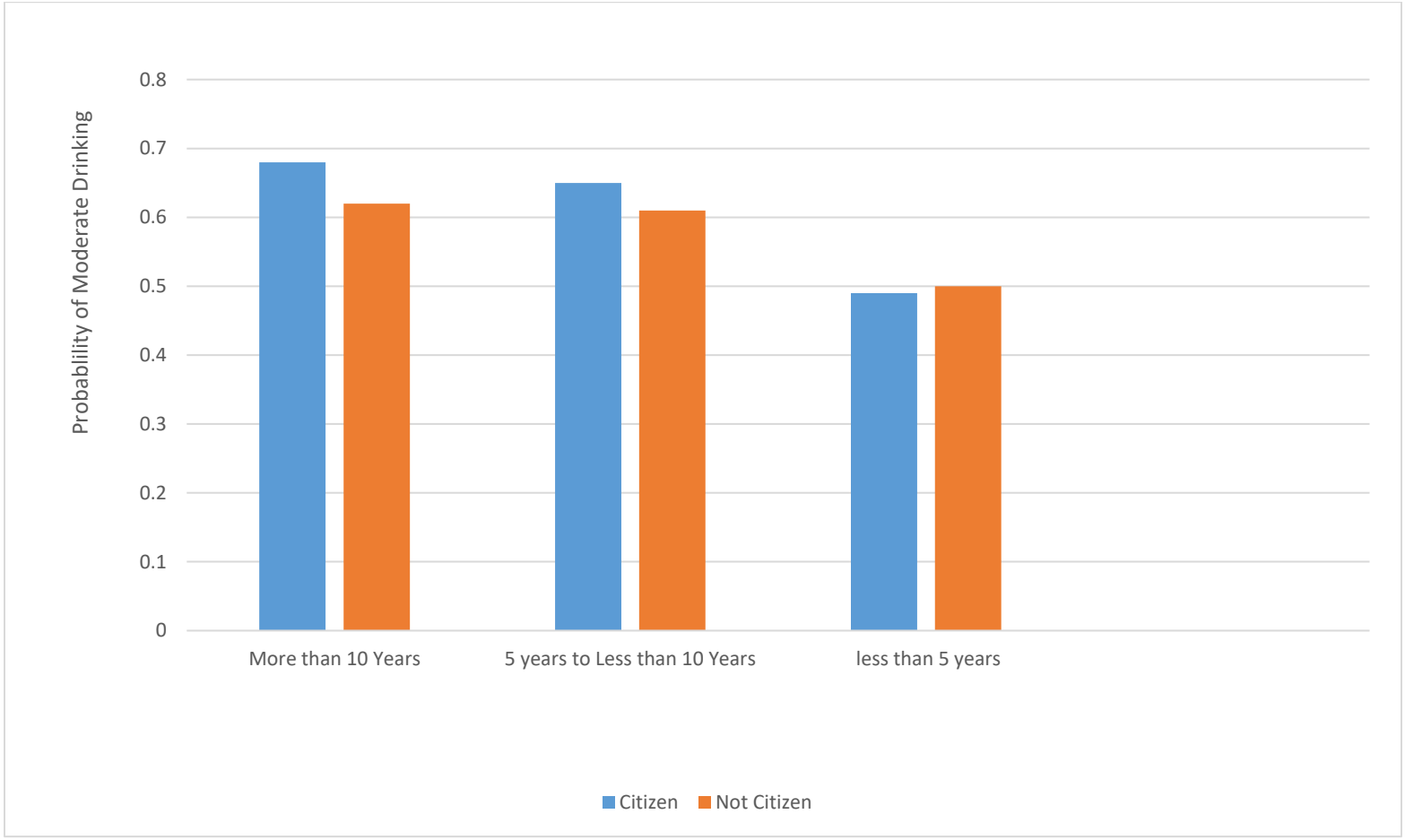


Figure 5. 5 Predicted Probabilities of Light Drinking by Region of Birth

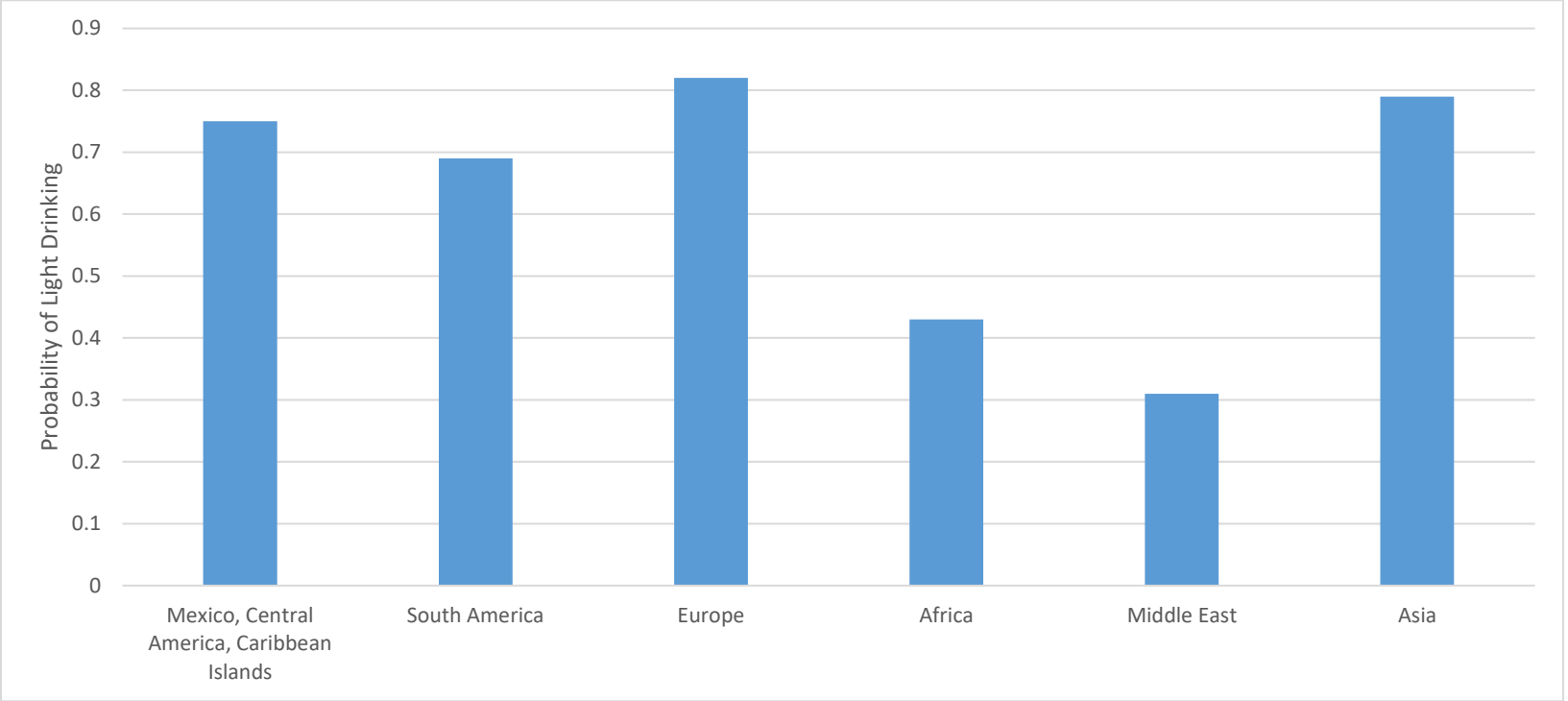
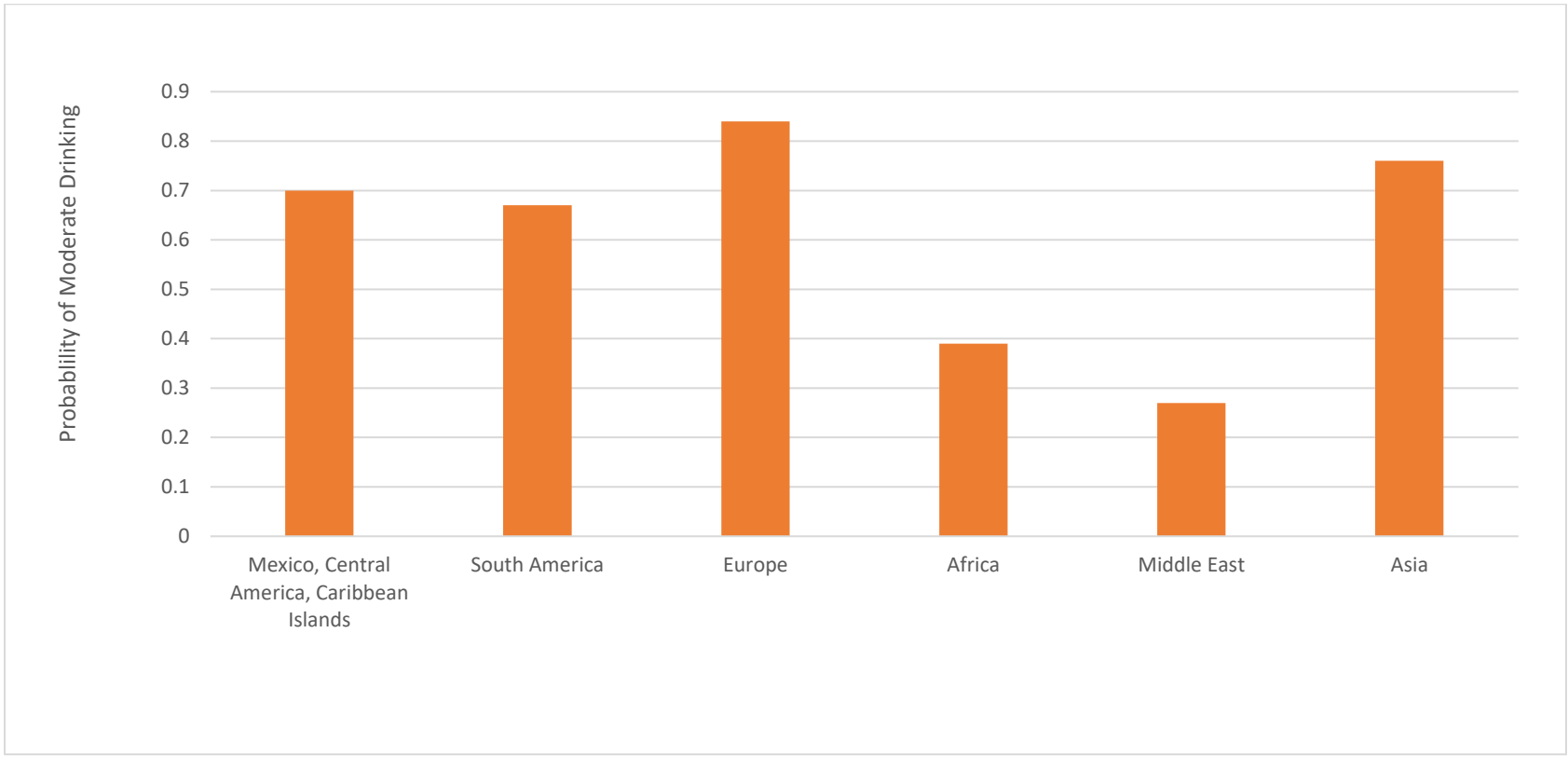


Figure 5. 6 Predicted Probabilities of Moderate Drinking by Region of Birth



Figures 5.1-5.2 show the predicted probability of drinking behavior by interaction effect of length of time in the U.S. and English language proficiency. The highest probabilities of light drinking and moderate drinking of immigrants are immigrants who stay in the U.S. for more than 10 years and speak English language. In contrast, the lowest probability of light drinking and are immigrants who have been stayed in the U.S. for less than 10 years and speak other language. The lowest probability of moderate drinking and are immigrants who stay in the U.S. for less than 5 years and speak other language. These results of predicted probability emphasize that English speaking immigrants are more likely to drink than immigrants who speak other language.

Figures 5.3-5.4 show the predicted probability of drinking behavior among immigrants by interaction effect of length of time in the U.S. and American citizenship status. The highest probabilities of light drinking and moderate drinking of immigrants are immigrants who stay for more than 10 years and are American citizens. In contrast, the lowest probabilities of light drinking and moderate drinking are immigrants who have stayed for less than 5 years and are American citizens.

Figures 5.5-5.6 indicate the predicated probability of drinking behavior of immigrants by region of birth of immigrants. The highest probabilities of light drinking and moderate drinking are immigrants whose region of birth are Europe. The lowest probabilities of light drinking and moderate drinking are immigrants whose region of birth are Middle East. Thereby, the characteristics of original region are connected original country's drinking culture to influence the drinking behavior of immigrants.

Smoking Behavior

Multinomial logistic regression results were based on 2010-2018 datasets. Multinomial logistic regression results regarding smoking behavior of immigrants are represented in Table 5.6 including odds ratio for independent variables.

Table 5. 6 Logistic Analysis of Smoking Behavior

	Model 1		Model 2	
	Formerly Smoking	Currently Smoking	Formerly Smoking	Currently Smoking
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Variables				
Demographic Variables				
Region of Birth: reference= Mexico, Central America, Caribbean Islands				
South America	1.07**	1.14**	1.03*	1.08*
Europe	1.13**	1.28**	1.10*	1.28*
Africa	0.85**	0.63**	0.7*	0.59*
Middle East	0.66**	0.53**	0.59	0.48
Asia	1.24**	1.33**	1.16*	1.25*
Age: reference category=18 to 29				
30 to 39	1.13*	0.73**	1.03	0.54
40 to 49	1.27*	0.76**	1.24*	0.67
50 to 59	1.38*	1.29**	1.31*	1.25*
60 and over	1.41*	0.65**	1.35	0.6***
Sex: reference category=male				

Female	0.62***	0.59***	0.62***	0.55***
Marital status: reference category=never married				
Widowed or divorced and separated	1.29*	1.37*	1.21*	1.3*
Married	1.24*	0.9*	1.2	0.77
Socioeconomic Variables				
Education: reference category=high school diploma				
Less than a high school diploma	1.12	0.87	1.11	0.86
Some college	1.41*	0.82*	1.38	0.79
Bachelor's degree and above	1.36*	0.67*	1.33*	0.62*
Income: reference category= income less than$50,000				
$50,000 to $99,999	1.33***	0.77***	1.33***	0.75***
$100,000 and over	1.4***	0.59***	1.4***	0.56***
Employment Status: reference category=not in labor force				
Currently working	0.93	1.19	0.9	1.06
Unemployed	0.87	1.38	0.85	1.37
Acculturative variables				
Language proficiency: reference category= Other language				
English	1.3***	0.87***	1.27**	0.81**
Citizenship: reference category=No				
Yes	0.73*	1.14*	0.64*	1.11*

length of time in the U.S.: reference category= less than a year to less than 5 years				
5 years to less than 10 years	1.17*	0.85*	1.16*	0.78*
10 years or more	1.49**	1.11**	1.45**	1.09**
Interaction				
English and 10 years or more			1.03*	1.33*
Citizenship and 10 years or more			0.86*	1.18*
Note*$p<0.05$, **$p<0.01$, ***$p<0.001$				

Model 1 analyzes the effects of demographic variables, socioeconomic variables, and acculturative variables in predicting likelihood of smoking behavior among immigrants. There are three type of smoking behavior: no smoking (Referent outcome), formerly smoking, and currently smoking. Model 2 tests both the interaction effects of length of time in the U.S. and English language proficiency and the interaction effects of length of time in the U.S. and American citizenship status on predicting likelihood of smoking behavior of immigrants.

Based on results of model 1, the effects of age and gender are significant on formerly smoking and currently smoking of immigrants. Respondents of age 60 and over were 0.65 times less likely to report currently smoking than respondents of age 18-29. This effect is significant for predicting likelihood of currently smoking. Female respondents were less likely to report currently smoking and formerly smoking than female respondents. This effect indicates female immigrants are less likely to smoke than male immigrants. Gender is a significant factor for predicting likelihood of immigrant smoking behavior.

Model 1 also estimates the effect of region of birth for predicting the likelihood of formerly smoking and currently smoking. Respondents who are from Europe, Asia, and South America were more likely to report formerly smoking and currently smoking when compared to those from Mexico, Central America, Caribbean Islands. Respondents who are from Africa and Middle East were less likely to report formerly smoking and currently smoking when compared to those from Mexico, Central America, Caribbean Islands. The region of birth is significantly associated with the likelihood of immigrant smoking behavior.

Model 1 shows the effect of marital status is significant for predicting the likelihood of formerly smoking and currently smoking. Married respondents were less likely to report currently smoking than unmarried respondents, but respondents who were widowed, divorced, and separated were more likely to report currently smoking than unmarried respondents.

The education levels including some college and the bachelor's degree or above were significantly associated with currently smoking. Respondents with less than a high school diploma were 0.87 times less likely to report currently smoking than those with a high school diploma (reference group) because odds ratio was 0.87, but this effect is not significant for predicting current smoking. Respondents with some college's degree were 0.82 times less likely to report currently smoking than those with a high school diploma because odds ratio was 0.82. Respondents with a bachelor's degree or above were 0.67 times less likely to report currently smoking than those with a high school diploma because odds ratio was 0.67.

Model 1 also shows the effects of personal incomes were significantly associated with smoking behavior. The increase in the personal income was associated with the decreased likelihood of currently smoking. Respondents with personal income between $50,000 and $99,999 were 0.77 times less likely to report currently smoking than respondents with personal income less than $50,000 (reference group) because odds ratio was 0.77. Respondents with personal income with more than or equal to $100,000 were 0.59 times less likely to report currently smoking than respondents with personal income

less than $50,000. Personal income is a significant predictor for predicting smoking behavior of immigrants.

In model 1, the main effects of acculturation are significant in predicting smoking behavior of immigrants. Respondents who speak English were 1.3 times less likely to report formerly smoking than respondents who speak other language. This effect is significant based on a p-value being less than 0.001. Respondents who speak English were 0.87 times less likely to report currently smoking than respondents who speak other language. English language proficiency has significant impact for predicting likelihood of smoking behavior.

Respondents who have obtained U.S. citizenship were 0.73 times less likely to report formerly smoking than respondents who have not obtained U.S. citizenship. Respondents who have obtained U.S. citizenship were 1.14 times more likely to report currently smoking than respondents who have not obtained U.S. citizenship. The effects of U.S. citizenship status were significant for predicting the likelihood of smoking behavior because this effect is significant based on a p-value being less than 0.05. Respondents who stay in the U.S. for more than 10 years were 1.49 times more likely to report formerly smoking than respondents who stay in the U.S. for less than 5 years. Respondents who stay in the U.S. for more than 10 years were 1.11 times more likely to report currently smoking than respondents who stay in the U.S. for less than 5 years.

Model 2 examines the variables for Model 1 and adds interaction effects of English language proficiency and length of time in U.S. Some independent variables are significant which are the same variables as in Model 1 including region of birth, gender, marital status, personal income, and educational attainment. Employment is not a

significant predictor in predicting smoking behavior both in Model 1 and Model 2. All acculturative variables are significant predictor in predicting smoking behavior both in Model 1 and Model 2.

Model 2 shows respondents who stay in the U.S. for more than 10 years and speak English were 1.33 times more likely to report currently smoking than respondents who stay in the U.S. for less than 5 years and speak other language. This interaction effects were significantly associated with smoking behavior of immigrants. Model 2 also estimated the interaction effects of American citizenship status and length of time in the U.S. Respondents who stay in the U.S. for more than 10 years and are American citizens were 1.18 times more likely to report currently smoking than respondents who stay in the U.S. for less than 5 years and are not American citizens. This interaction has significant impact for predicting smoking behavior of immigrants.

Predicted Probabilities

Results of logistic model have shown that acculturation affects the odds of smoking behavior of immigrants. English language proficiency, American citizenship status, and length of time in the U.S. were significantly associated with smoking behavior of immigrants. Predicted probabilities are estimated to identify the acculturation characteristics of immigrants and immigrants' region of birth to the likelihood of immigrant drinking behavior. This method changes the log odds of logistic regression model to fitted probability and estimates the probabilities of the dependent variable.

Figure 5. 7 Predicted Probabilities of Formerly Smoking by Length of Time in the U.S. and English Language Proficiency

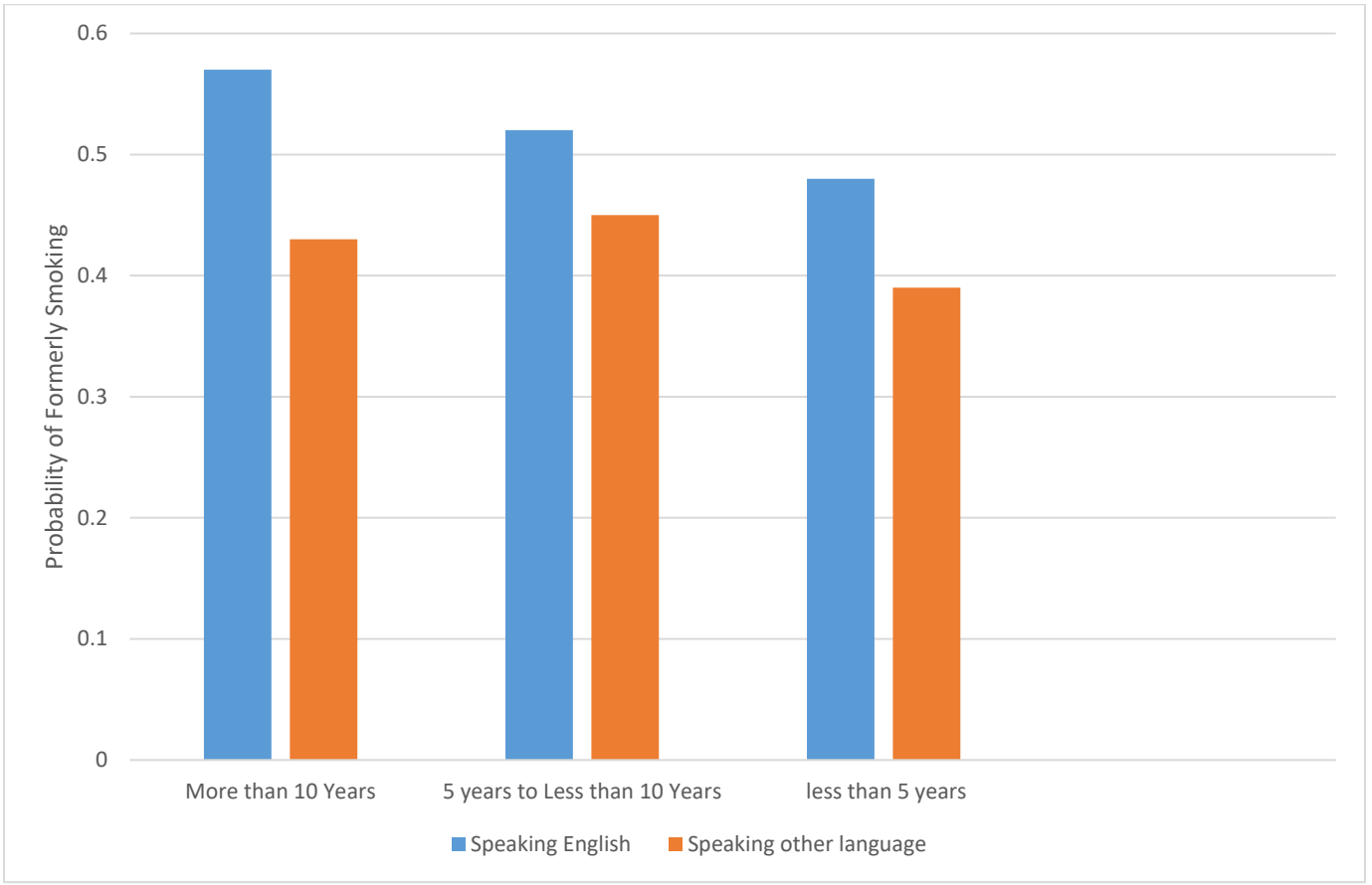


Figure 5. 8 Predicted Probabilities of Currently Smoking by Length of Time in the U.S. and English Language Proficiency

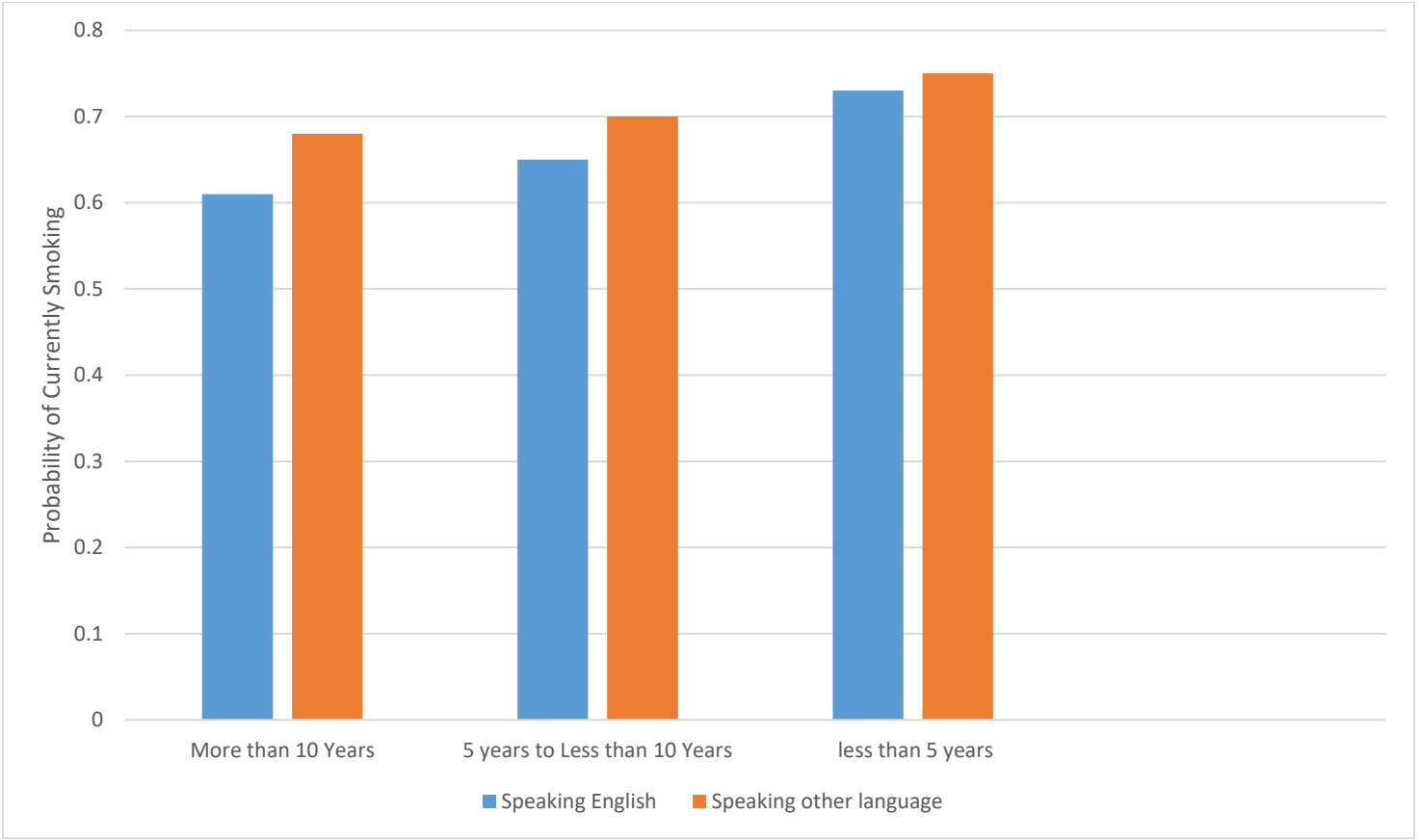


Figure 5. 9 Predicted Probabilities of Formerly Smoking by Length of Time in the U.S. and American Citizenship Status

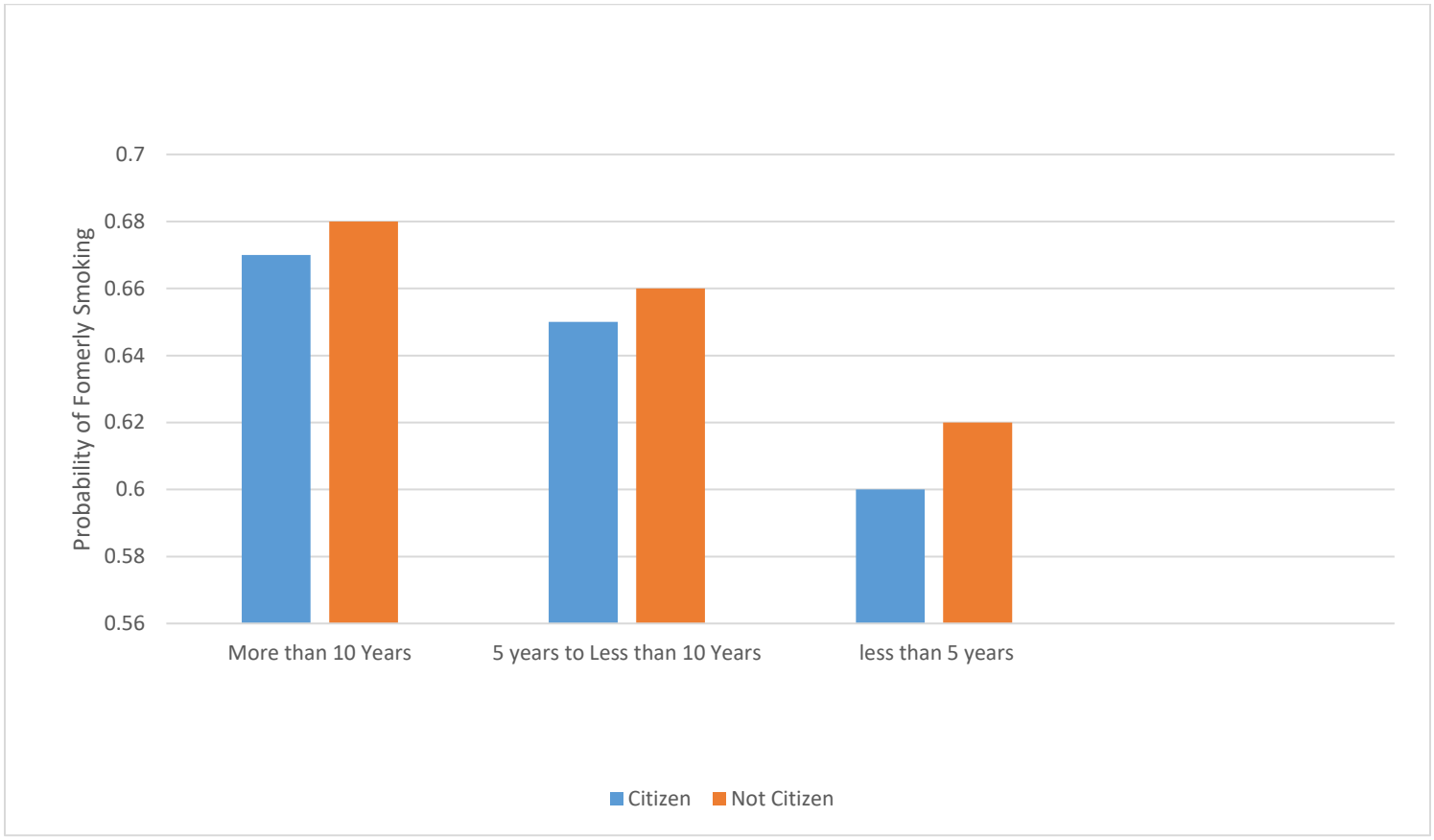


Figure 5. 10 Predicted Probabilities of Currently Smoking by Length of Time in the U.S. and American Citizenship Status

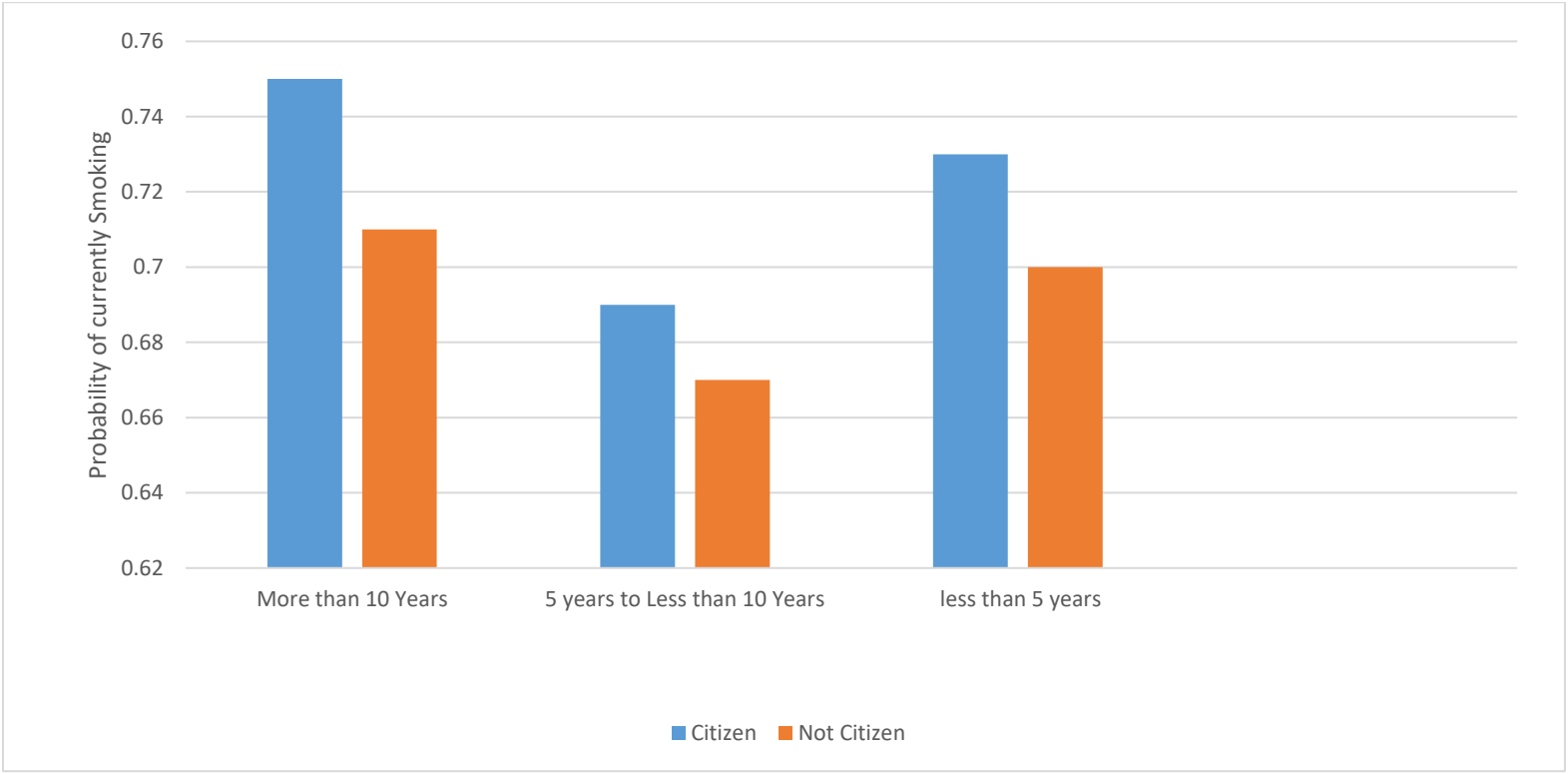


Figure 5. 11 Predicted Probabilities of Formerly Smoking by Region of Birth

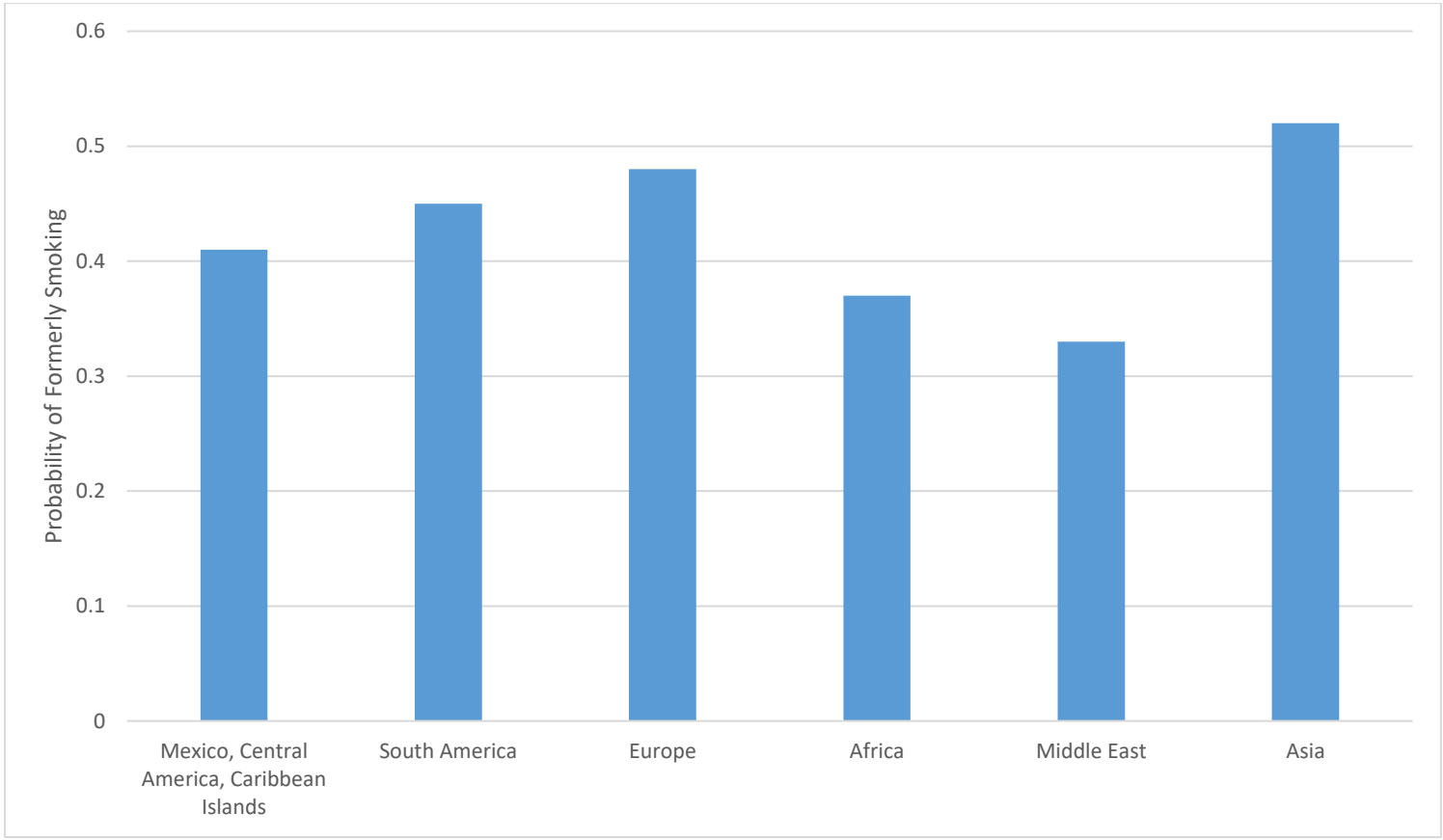
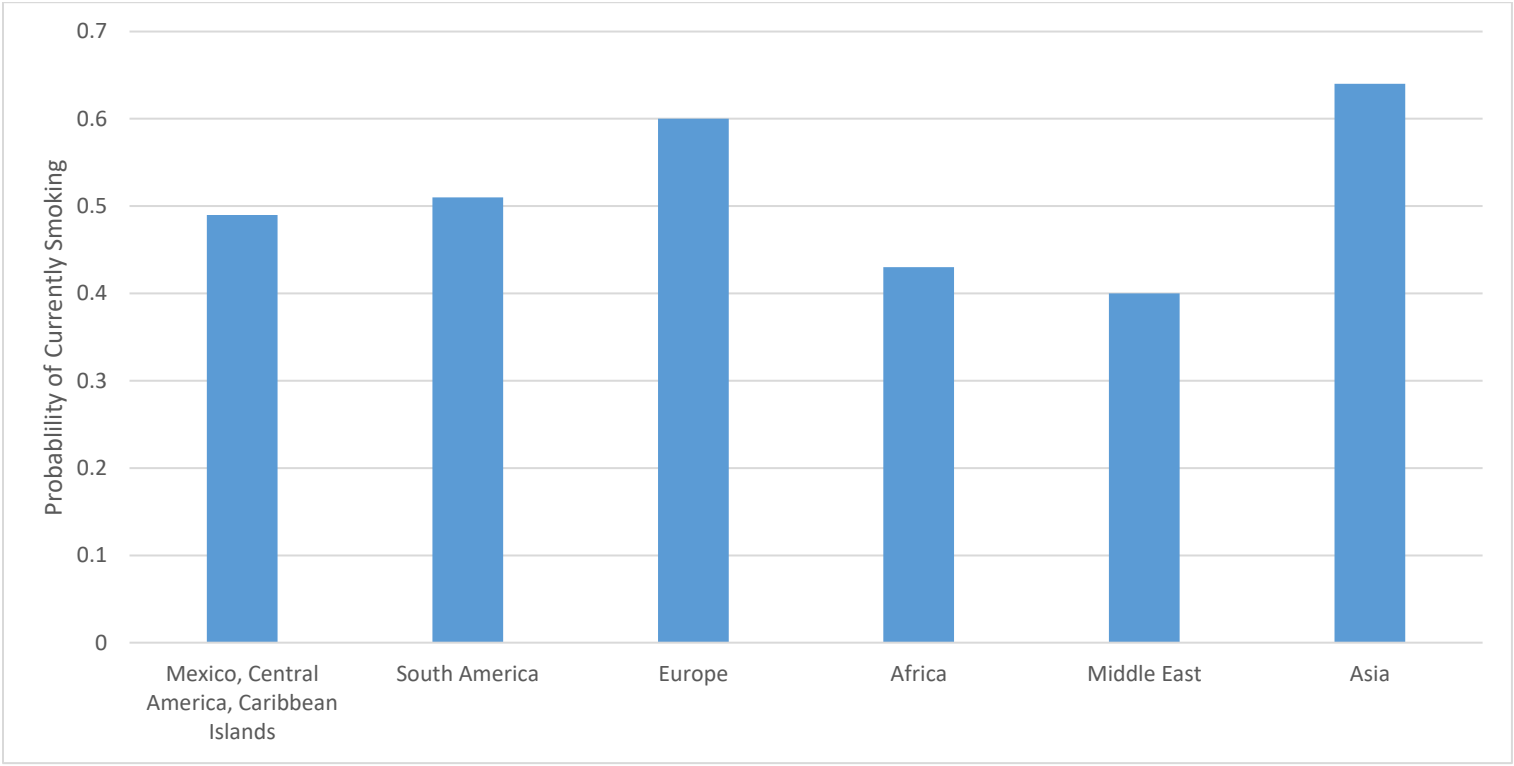


Figure 5. 12 Predicted Probabilities of Currently Smoking by Region of Birth



Figures 5.7-5.8 show the predicted probability of smoking behavior by interaction effects of length of time in the U.S. and English language proficiency. The highest probabilities of formerly smoking of immigrants are immigrants who have stayed in the U.S. for more than 10 years and speak English language. The highest probabilities of currently smoking of immigrants are immigrants who have stayed in the U.S. for less than 5years and speak other language. The lowest probability of currently smoking are immigrants who have been stayed in the U.S. for 10 years and speak English.

Figures 5.9-5.10 show the predicted probability of smoking behavior of immigrants by interaction effects of length of time in the U.S. and American citizenship status. The highest probabilities of currently smoking of immigrants are immigrants who have stayed for more than 10 years and are American citizens. In contrast, the lowest probabilities of currently smoking are immigrants who have stayed for less than 10 years and are not American citizens. The highest probabilities of formerly smoking of immigrants are immigrants who have stayed for more than 10 years and are not American citizens. In contrast, the lowest probabilities of formerly smoking are immigrants who have stayed for less than 5 years and are American citizens. Figures 5.11-5.12 indicate the predicated probability of smoking behavior of immigrants by region of birth of immigrants. The highest probabilities of formerly smoking and currently smoking are immigrants whose region of birth is Asia. The lowest probabilities of formerly and currently smoking are immigrants whose region of birth is Middle East.

Binomial Logistic Model Results

Depression

Logistic regression results were based on 2010-2018 datasets. Logistic regression results regarding depression of immigrants are represented in Table 5.7 including odds ratio (OR) for independent variables.

Table 5. 7 Logistic Analysis of Depression

	Model 1	Model 2	Model 3	Model 4	Model 5
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Variables					
Acculturative variables					
Language proficiency: reference category= Other language					
English		0.73***	0.75***	0.79***	0.8***
Citizenship Status: reference category=No					
Yes		0.78***	0.81***	0.82***	0.83***
length of time in the U.S.: reference category= less than 5 years					
5 years to less than 10 years		0.82***	0.83***	0.85***	0.86***
10 years or more		0.76***	0.78***	0.79***	0.79***
Demographic Variables					

Region of Birth: Mexico, Central America, Caribbean Islands					
South America			0.74**	0.76**	0.78**
Europe			0.61**	0.64**	0.67**
Africa			0.86*	0.87	0.89
Middle East			1.76*	1.72	1.64
Asia			0.68***	0.72***	0.79***
Age: reference category=18 to 29					
30 to 39			1.34*	1.31*	1.23*
40 to 49			1.39**	1.35**	1.29**
50 to 59			1.25**	1.23*	1.14
60 and over			0.78*	0.8*	0.84*
Gender: reference category=male					
Female			1.38*	1.35*	1.27*
Marital status: reference category=never married					
Widowed or divorced and separated			1.24*	1.21*	1.18
Married			1.13*	1.11*	1.08*

Socioeconomic Variables					
Education: reference category=high school diploma					
Less than a high school diploma				1.16*	1.11*
Some college				1.47	1.42
Bachelor's degree and above				1.39***	1.36***
Income: reference category= income less than$50,000					
$50,000 to $99,999				0.62***	0.65***
$100,000 and over				0.53***	0.57***
Employment Status: reference category=not in labor force					
Currently working				0.77*	0.81*
Unemployed				1.38*	1.35*
Interaction					
English and 10 years or more					0.64***

Citizenship and 10 years or more					0.72*

Note*p<0.05, **p<0.01, ***p<0.001

Table 5.7 shows that model 1 is null model without predictors. Model 2 estimates the effects of Acculturative variables on the risk of have depression. The Acculturative variables include Language proficiency, citizenship, and length of time in the U.S. The results of model 1 show that respondents who speak English were 0.73 times less likely to report depression than respondents who speak other language. With regard to citizenship, respondents who are U.S. citizen were 0.78 times less likely to report depression than respondents who have not gained the U.S. citizenship. Respondents who stay in U.S. for 10 years and more were 0.76 times less likely to report depression than respondents who stay in U.S. for less than 5 years. Respondents who stay in U.S. for more than 5 years to less than 10 years were 0.82 times less likely to report depression than respondents who stay in U.S. for less than 5 years. The results of model 2 present that acculturation is significantly associated with depression of immigrant.

Model 3 introduces demographic characteristics to the analysis. The effect of the influence of acculturation over the depression of immigrants is reduced, but still remained significantly strong. The results of model 3 show that respondents who speak English were 0.75 times less likely to report depression than respondents who speak other language. With regard to citizenship, respondents who are U.S. citizen were 0.81 times less likely to report depression than respondents who have not gained the U.S. citizenship. Respondents who stay in U.S. for 10 years and more were 0.78 times less likely to report depression than respondents who stay in U.S. for less than 5 years. Respondents who stay in U.S. for more than 5 years to less than 10 years were 0.83 times less likely to report depression than respondents who stay in U.S. for less than 5 years.

Model 3 shows that respondents whose regional birth place is South America were 0.74 times less likely to report depression compared to those whose regional birth place are Mexico, Central America, and Caribbean Islands. Respondents whose regional birth place are Europe and African are less likely to report depression than respondents who are from Mexico, Central America, and Caribbean Islands. Respondents whose regional birth place are Middle East are 1.76 times more likely to report depression than respondents who are from Mexico, Central America, and Caribbean Islands, but this effect is significant because P value is less than 0.05. Respondents whose regional birth place are Asia were 0.68 times less likely to report depression than respondents who are from Mexico, Central America, and Caribbean Islands. The effects of regional birth place are significant to predict depression of immigrant.

Model 3 also shows the effect of other demographic variables to predict the likelihood of depression. Age of 60 and over were 0.78 times less likely to report depression compared to age of 18 to 29 respondents. This effect was significantly associated with lower odds of the likelihood of depression. Female respondents were more likely to report depression compared to male respondents. Gender was a significant predictor of depression. Married respondents were more likely to report depression than unmarried respondents. Widowed or divorced and separated respondents were also more likely to report depression compared to unmarried respondents. Marital status is significantly associated with depression.

Model 4 includes demographic variables in model 3 and adds socioeconomic variables to the analysis. As shown in Table 5.7, After the inclusion of socioeconomic variables, the influence of acculturation over the depression of immigrants is reduced, but

still remained significantly strong. Respondents who speak English were 0.79 times less likely to report depression than respondents who speak other language. With regard to citizenship, respondents who are U.S. citizen were 0.82 times less likely to report depression than respondents who have not gained the U.S. citizenship. Respondents who stay in U.S. for 10 years and more were 0.79 times less likely to report depression than respondents who stay in U.S. for less than a year to less than 5 years. Respondents who stay in U.S. for were 5 years to less than 10 years were 0.85 times less likely to report depression than respondents who stay in U.S. for less than a year to less than 5 years.

The region birth at South America, Europe, and Asia were statistically significant predictors of depression. Respondents whose region birth is South America were 0.76 times less likely to report depression compared to respondents who the region birth are Mexico, Central America, and Caribbean Islands. Respondents who the region birth are Africa were 0.83 times less likely to report depression compared to respondents whose region birth are Mexico, Central America, and Caribbean Islands, but this effect was not statistically significant. Respondents whose region birth are Europe and Asia were less likely to report depression compared to respondents whose region birth are Mexico, Central America, and Caribbean Islands. These effects were statistically significant to predict depression of immigrants.

In terms of the effect of age, age of 30-29 and 40-49 respondents were more likely to report depression than age of 18-29 respondents. These effects were statistically significant for predicting depression of immigrants. Compared male respondents, female respondents had 1.35 times the odds of reporting depression. In terms of gender, the influence of this variable over the depression of immigrant is statistically significant.

Further, Model 4 revealed that marital status exerts statistically significant impact over the depression of immigrant. Married respondents were more likely to report depression than unmarried respondents. Widowed or divorced and separated respondents were also more likely to report depression compared to unmarried respondents.

With regard to the effect of socioeconomic variables to depression, Educational attainment, personal income, and employment status are significantly associated with depression. Respondents who hold a bachelor degree and over were 1.39 times more likely to report depression than respondents with high school diploma. Moreover, Respondents with personal income $100,00 and over were 0.53 times less likely to report depression than respondents with personal income less than $50,000. Respondents with personal income $50,000 to $99,999 and over were 0.62 times less likely to report depression than respondents with personal income less than $50,000. With regard to the employment status, working respondents were 0.77 times less likely to report depression than respondents who are out of the labor force. Unemployed respondents were 1.38 times more likely to report depression than respondents who are out of the labor force. The effect of employment status is statistically significant. Finally, estimates from Model 4 revealed that socioeconomic status exerts a significant effect over depression of immigrant.

Lastly, Model 5 is a full model and estimates the effects of the interaction between English language proficiency and length of time in U.S and on depression of immigrant. Both English language proficiency and length of time in U.S. are indicators of acculturation. Immigrants who have stayed in the U.S. for more than 10 years and speak English are 0.64 times less likely to report depression than immigrants who have stayed

less than five years and speak other language. Immigrant who have stayed in the U.S. for more than 10 years and are American Citizens were 0.72 times less likely to report depression than immigrants who have stayed in the U.S. for less than 5 years and are not American Citizens. Finally, results from model 5 confirmed the significant association between acculturation and depression of immigrant. The effects of interaction English proficiency and length of time in the U.S. demonstrate the importance of English language proficiency in leading to the risk of depression of immigrants.

Predicted Probabilities

Results of logistic model have shown that acculturation affects the odds of immigrants having depression. The logistic model demonstrates English language proficiency, American citizenship status, and length of time in the U.S. strong association with risk of immigrant having depression. Predicted probabilities are estimated in order to identify the acculturation characteristics of immigrants and immigrants' birth of region on the risk of having depression among immigrants. This method changes the log odds of logistic regression model to fitted probability and estimates the probabilities of the dependent variable.

Figure 5. 13 Predicted Probabilities of Immigrants Having Depression by Length of Time in the U.S. and English Language Proficiency.

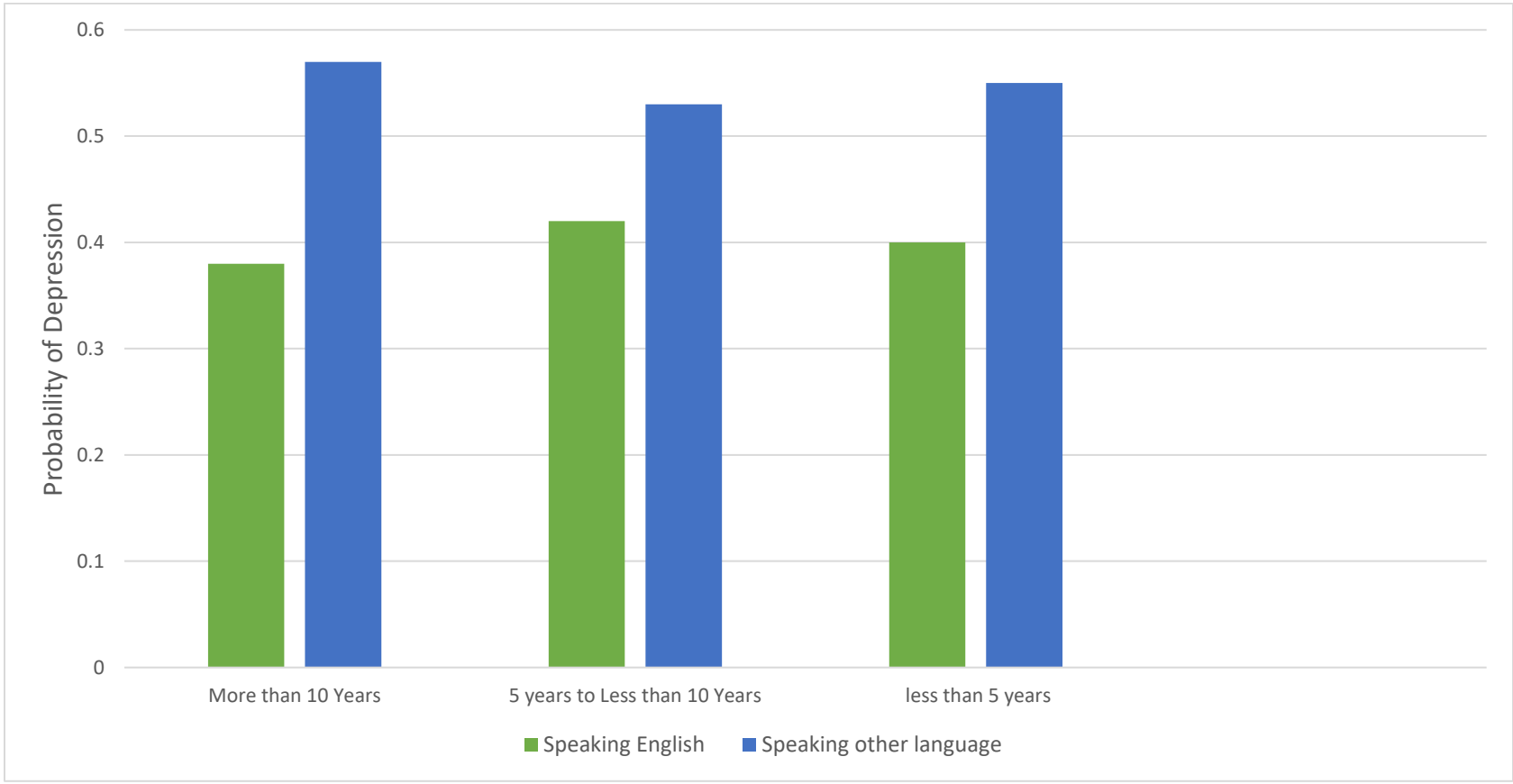


Figure 5. 14 Predicted Probabilities of Immigrants Having Depression by Length of Time in the U.S. and American Citizenship Status.

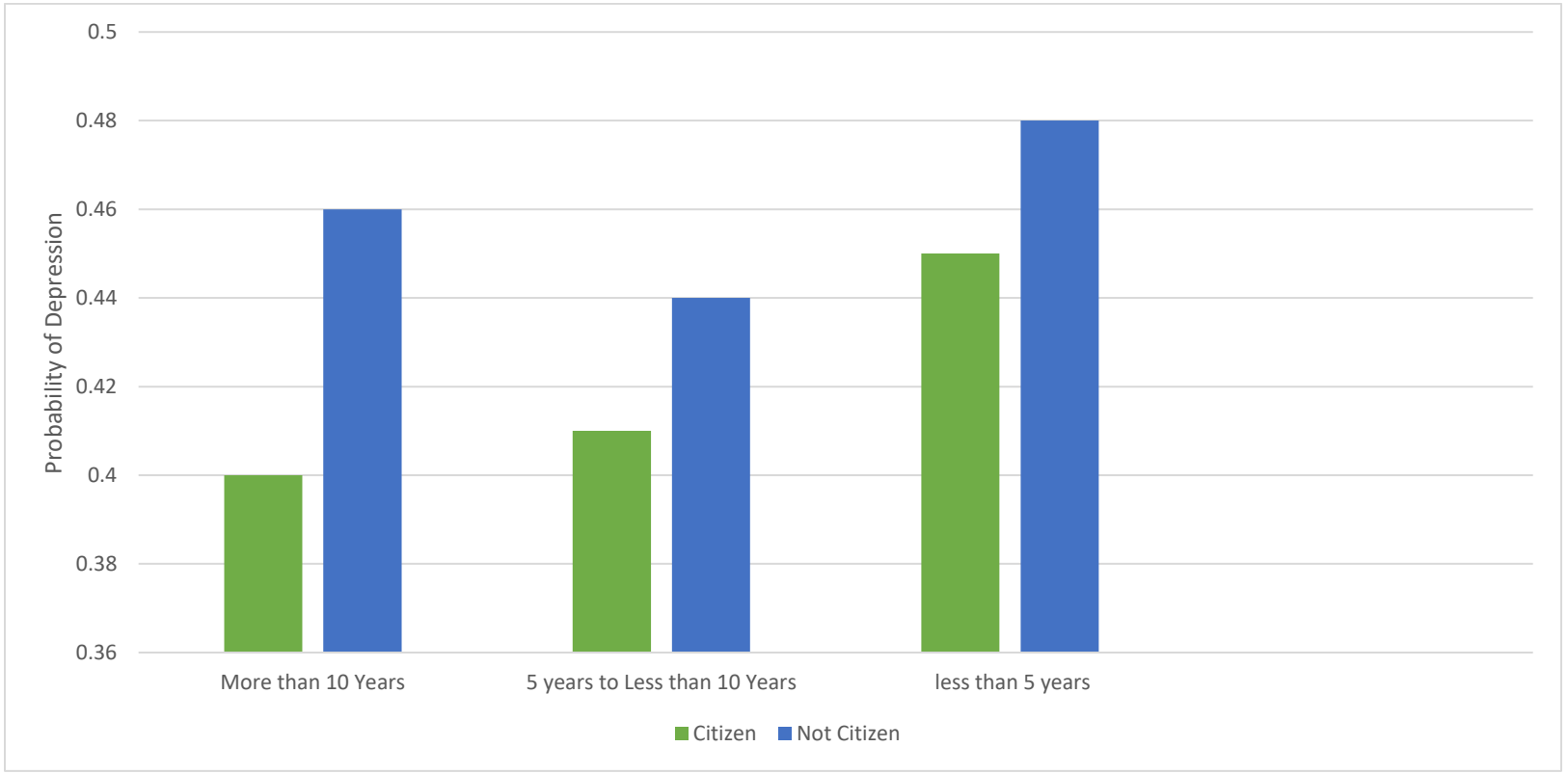


Figure 5. 15 Predicted Probabilities of Immigrants Having Depression by Birth of Region of immigrants

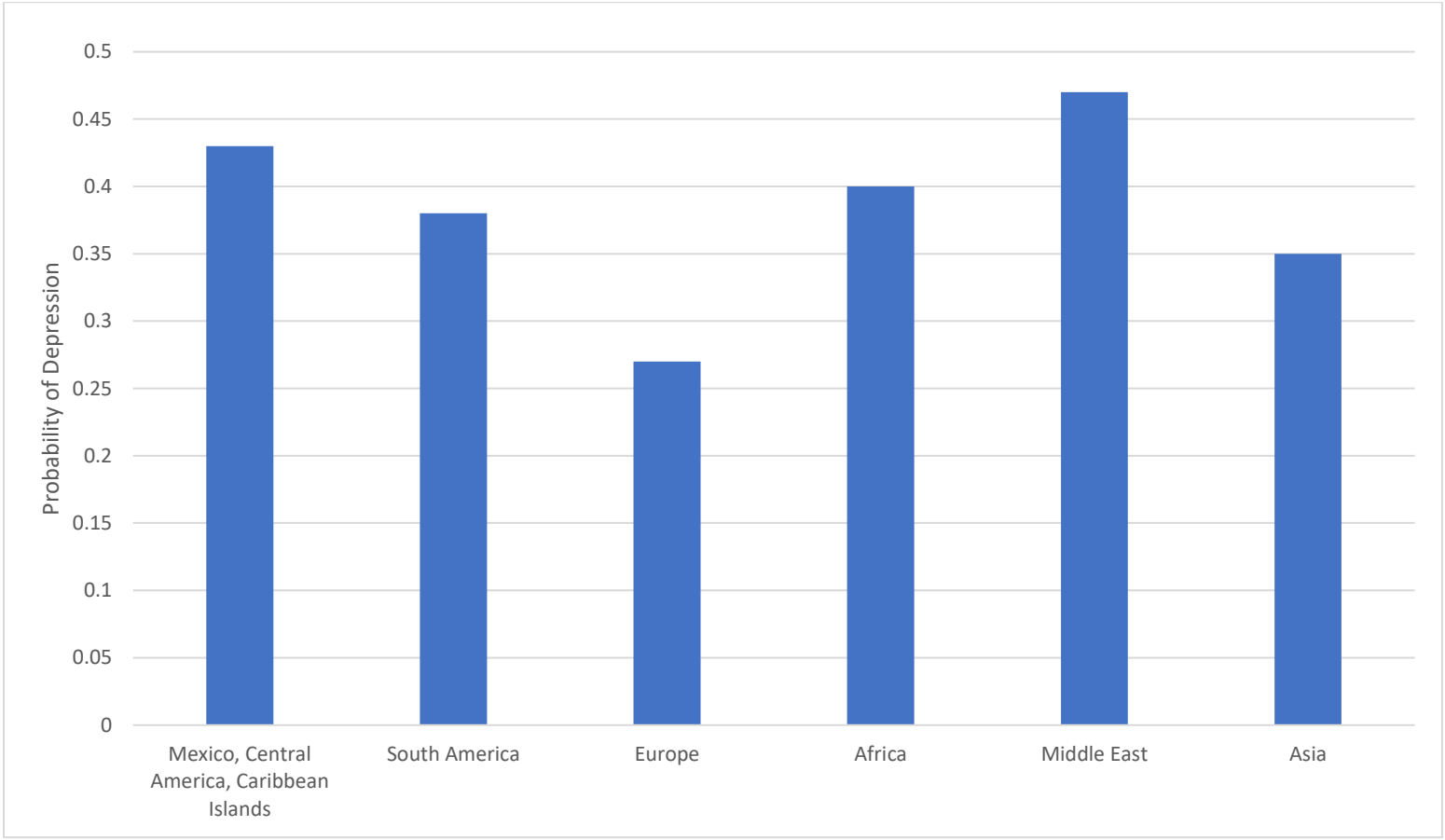


Figure 5.13 shows the predicted probability of immigrant having depression by interaction of length of time in the U.S. and English language proficiency. The highest probabilities of having depression are immigrants who have stayed in the U.S. for more than 10 years and speak other language. In contrast, the lowest probability of having depression are immigrants who have stayed in the U.S. for more than 10 years and speak English. Moreover, the graph displayed that immigrants who speak English are less likely to have depression than immigrant who speak other language

Figure 5.14 shows the predicted probability of immigrant having depression by interaction of length of time in the U.S. and American citizenship status. The highest probability of having depression are immigrants who have stayed for less than 5 years and are not American citizens. In contrast, the lowest probability of have depression are immigrants who have stayed for more than 10 years and are American citizens. Thereby, the Figure 5.14 illustrates that immigrants who are American citizens are less likely having depression. Both Figures 5.13 and 5.14 show the importance of English language proficiency and American citizenship status to the probability of immigrants having depression. Figure 5.15 indicates the predicated probability of immigrant have depression by birth region of immigrants. The highest probability of have depression are immigrants whose birth region are Middle East. The lowest of probability of have depression are immigrants whose birth region are Europe.

Access to breast physical exam

Logistic regression results were based on 2010-2018 datasets. Logistic regression results regarding depression of immigrants are represented in Table 5.7 including odds ratio (OR) for independent variables.

Table 5. 8 Logistic Analysis of Immigrant women attending physical breast exam

	Model 1	Model 2	Model 3	Model 4	Model 5
	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio	Odds Ratio
Variables					
Acculturative variables					
Language proficiency: reference category= Other language					
English		1.41***	1.39***	1.34***	1.34***
Citizenship Status: reference category=No					
Yes		1.38***	1.35***	1.31***	1.32***
length of time in the U.S.: reference category= less than 5 years					
5 years to less than 10 years		1.27***	1.25***	1.2***	1.18***
10 years or more		1.54***	1.51***	1.48***	1.47***
Demographic Variables					

Region of Birth: Mexico, Central America, Caribbean Islands					
South America			1.29**	1.27**	1.25**
Europe			1.42**	1.38**	1.4**
Africa			1.13*	1.1*	1.07*
Middle East			0.67*	0.69*	0.7*
Asia			0.74***	0.71***	0.75***
Age: reference category=18 to 29					
30 to 39			1.19*	1.16*	1.11*
40 to 49			1.3**	1.27**	1.22**
50 to 59			1.36**	1.32**	1.29**
60 and over			1.43*	1.41*	1.37*
Marital status: reference category=never married					
Widowed or divorced and separated			1.2*	1.18	1.17
Married			1.33*	1.09	1.06
Socioeconomic Variables					

Education: reference category=high school diploma					
Less than a high school diploma				0.79***	0.77***
Some college				1.29***	1.29***
Bachelor's degree and above				1.45***	1.47***
Income: reference category= income less than$50,000					
$50,000 to $99,999				1.34***	1.36***
$100,000 and over				1.57***	1.59***
Employment Status: reference category=not in labor force					
Currently working				0.78*	0.83*
Unemployed				0.66	0.67
Health Insurance Status: Reference category=No					
Yes				1.47**	1.5**
Interaction					

English and 10 years or more					1.51***
Citizenship and 10 years or more					1.47**

Note*p<0.05, **p<0.01, ***p<0.001

Model 1 is a null model without predictors. Model 2 shows the estimated effects of acculturative variables including language proficiency, length of time in U.S., and citizenship and on attending breast physical exam. The results of Model 2 demonstrate that respondents who speak English have 1.41 times more likely to attend breast physical exam than respondents who speak other languages. The language proficiency has significantly effect on immigrant women attending breast physical exam. In Model 2, respondents who stay in the U.S. for less than 10 years were 1.27 times more likely to attend a physical breast exam than respondents who stay in the U.S. for less than a year to less than 5 years. Respondents who stay in the U.S. for more than 10 years were 1.54 times more likely to attend physical breast exam than respondents who stay in U.S. for less than 5 years. This results indicates that the length of time in the U.S. is significantly associated with immigrant women attending breast physical exam. The likelihood of attending physical breast exam increases when immigrant women have stayed in the U.S. for longer. Model 2 also shows that respondents who are U.S. citizen were 1.38 times more likely to attend a physical breast exam than respondents who are not U.S. citizen. This result indicates that gaining the U.S. citizenship is significantly associated with increase in likelihood of immigrant women attending physical breast exam.

Model 3 introduces socioeconomic variables to the analysis. The effect of acculturative variables over the likelihood of attending physical breast exam retained significantly positive relation after adding demographic variables. Respondents who speak English are still 39% higher odds of attending physical breast exam than respondents who speak other languages. With regard to length of time in the U.S., Respondents who stay in the U.S. for more than 10 years were 1.51 times more likely to

attend physical breast exam than respondents who stay in U.S. for less than 5 years. Respondents who stay in the U.S. for less than 10 years were 1.25 times more likely to attend a physical breast exam than respondents who stay in the U.S. for less than 5 years. The effect of these variable over the likelihood of attending a physical breast exam remained significant and positive. The likelihood of attending physical breast exam increases when immigrant women have stayed in the U.S. for longer. In terms of the U.S citizenship status, respondents who are U.S. citizen were 1.35 times more likely to attend a physical breast exam than respondents who are not U.S. citizen.

Model 3 shows that respondents whose regional birth place are South America were 1.29 times more likely to attend a physical breast exam compared to those whose regional birth place are Mexico, Central America, and Caribbean Islands. Respondents whose regional birth place are Europe and African are more likely to attend physical breast exam than respondents who are from Mexico, Central America, and Caribbean Islands. Respondents whose regional birth place are Middle east and Asia are less likely to attend physical breast exam than respondents who are from Mexico, Central America, and Caribbean Islands.

Model 3 revealed that age and marital status have a significant effect over immigrant women attending physical breast exam. Age is positively associated with odds of attending physical breast exam. The odds of attending physical breast exam increase when age increases. This effect is significant because p value is less than 0.05. In terms of marital status, married respondents were more likely to attending a physical exam than unmarried respondents. Widowed or divorced and separated respondents were also more likely to attend a physical exam compared to unmarried respondents. Finally, employed

respondents have 25.4% higher odds of attending a physical breast exam than unemployed respondents. Out of labor force respondents have 27.8% higher odds of attending physical breast than unemployed respondents.

Model 4 includes demographic variables of model 3 and adds socioeconomic variables to the analysis. The effect of acculturative variables over the likelihood of attending a physical breast exam retained significantly positive relation after adding demographic variables. Respondents who speak English are still 34 % higher odds of attending physical breast exam than respondents who speak other languages. The significant influence of English language proficiency over the likelihood of immigrant attending breast physical exam is also displayed in Model 4.

With regard to length of time in the U.S., the effect of this variable over the likelihood of attending physical breast exam remained significant and positive. Respondents who stay in the U.S. for more than 10 years were 1.48 times more likely to attend physical breast exam than respondents who stay in U.S. for less than 5 years. Respondents who stay in the U.S. for less than 10 years were 1.2 times more likely to attend physical breast exam than respondents who stay in the U.S. for less than 5 years. The likelihood of attending physical breast exam increases when immigrant women have stayed in the U.S. for longer. In terms of the U.S citizenship status, respondents who are U.S. citizen were 1.31 times more likely to attend physical breast exam than respondents who are not U.S. citizen. Based on the results of data analysis, it is important to reveal that length of time in the U.S. and American citizenship status were significantly associated with the likelihood of immigrants attending breast physical exam.

Model 4 shows that the influence of demographic variables over the likelihood of attending physical breast exam remained significant in the same direction, but marital impact was not significantly associated with the likelihood of attending physical breast exam. In terms of socioeconomic variables, respondents who hold a bachelor degree and over have 45% higher odds of attending a physical breast exam than respondents who hold a high school diploma. This effect is statistically significant. Respondents who hold a college degree have 29 % higher odds of attending a physical breast exam than respondents who hold a high school diploma. In Model 4, estimates show the educational attainment exerts a significantly influence on the likelihood of attending physical breast exam. The likelihood of attending physical breast exam increases when educational attainment increases.

In model 4, the influence of personal income over the likelihood of attending a physical breast exam is significant. Respondents with personal income $100,00 and over were 1.57 times more likely to attend physical breast exam than respondents with personal income less than $50,000. Respondents with personal income $50,000 to $99,999 were 1.34 times more likely to attend physical breast exam than respondents with personal income less than $50,000. The influence of personal income is statistically significant over the likelihood of immigrant women attending physical exam. With regard to the employment status, working respondents were 0.78 times less likely to attend physical breast exam than respondents who are out of the labor force. Unemployed respondents were 0.66 times less likely to attend physical breast exam than respondents who are out of the labor force. The effect of working status was statistically significant over the likelihood of attending a physical breast exam among immigrant women, but the

effect of unemployed status is not statistically significant over the likelihood of attending a physical breast exam. In addition, respondents who have insurance were 1.47 times more likely to attend physical breast exam than respondents who have no insurance. This effect is statistically significant over the likelihood of attending a physical breast exam among immigrant women.

Model 5 is full model and estimates the effects of the interaction between length of time in U.S and English language proficiency on the likelihood of immigrant attending physical breast exam. Immigrants who stay in U.S. for 10 years or more and speak English were 1.51 times more likely to attend physical breast exam than immigrants who stay in the U.S. less than 5 years and speak other language. The effects of interaction reveal English language proficiency is significantly associated with the likelihood of immigrant women attending physical breast exam. The likelihood of attending physical breast exam increases if Immigrants speak English. The likelihood of attending physical breast exam decreases if immigrants speak other language. Another the effects of interaction between length of time in the U.S. and American citizenship status were estimated. Immigrants who stay in U.S. for 10 years or more and are American citizens were 1.47 times more likely to attend physical breast exam than immigrants who stay in the U.S. less than 5 years and speak other language. The likelihood of attending physical breast exam is influenced through what language immigrants speak and his American citizenship status. This interaction effects of length of time in U.S with language proficiency are significantly associated with likelihood of immigrant women attending physical breast exam.

Predicted Probabilities

Results of logistic model have shown that acculturation affects the odds of immigrant women attending breast physical exam. The results of logistic model demonstrate English language proficiency, American citizenship status, and length of time in the U.S. have strong association with risk of immigrant women attending breast physical exam. Predicted probabilities are estimated in order to identify the acculturation characteristics of immigrants and immigrants' birth of region to the likelihood of immigrant women attending breast physical exam. This method changes the log odds of logistic regression model to fitted probability and estimates the probabilities of the dependent variable.

Figure 5. 16 Predicted Probabilities of Immigrant Women Attending Breast Physical Exam by Length of Time in the U.S. and English Language Proficiency.

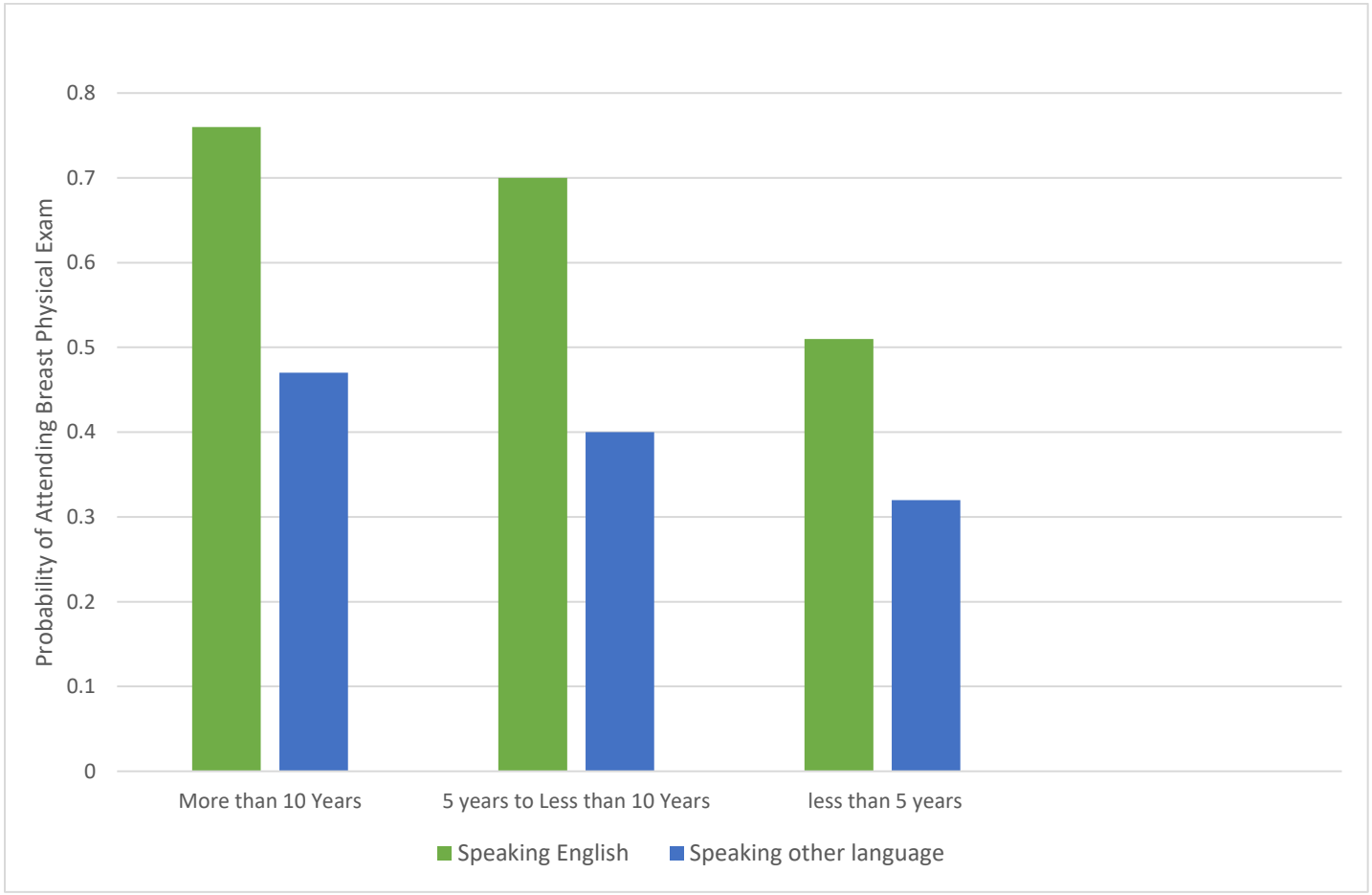


Figure 5. 17 Predicted Probabilities of Immigrant Women Attending Breast physical exam by Length of Time in the U.S. and American Citizenship

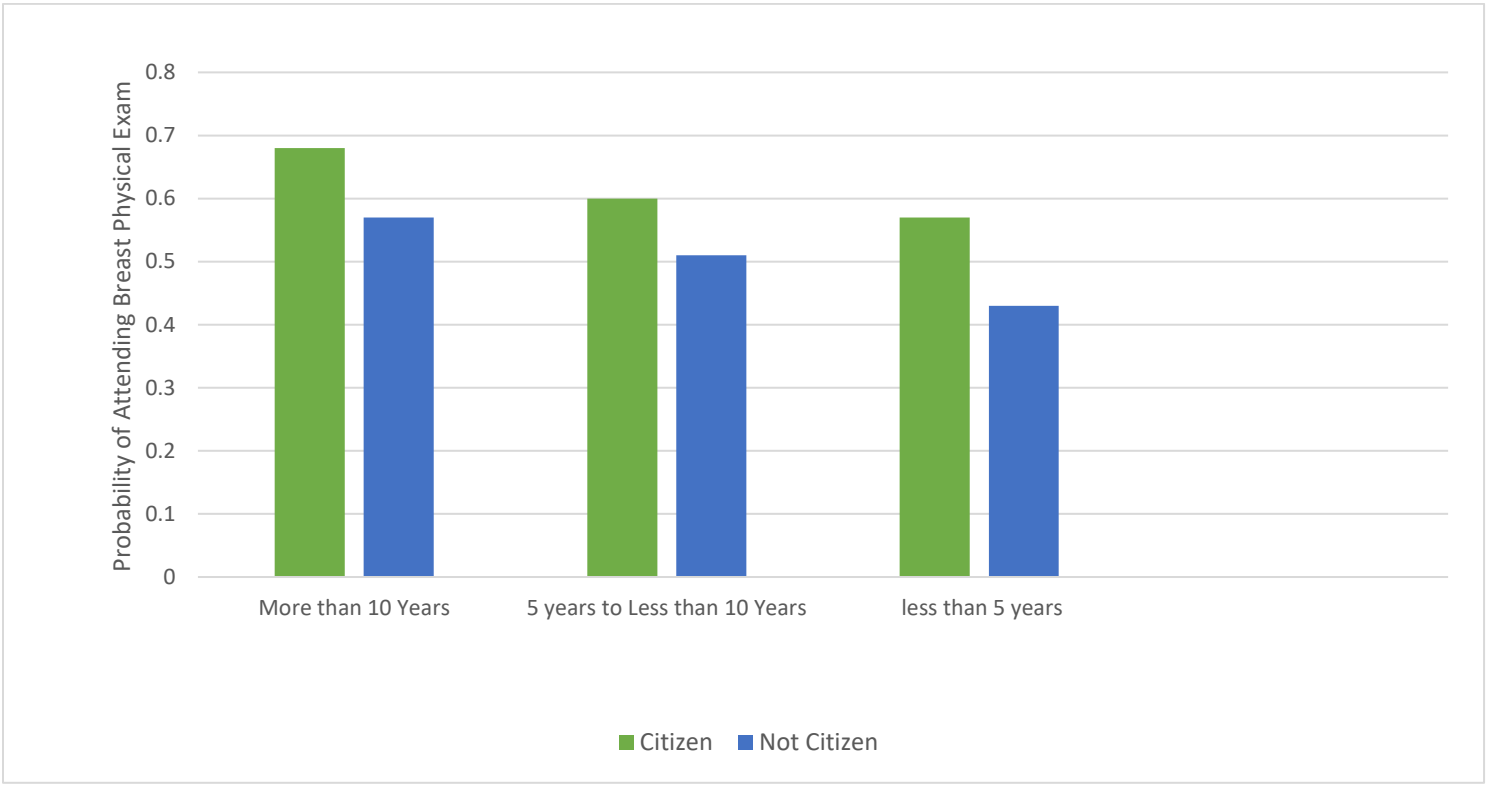


Figure 5.18 Predicted Probabilities of Immigrant Women Attending Breast Physical Exam by the birth region of immigrants

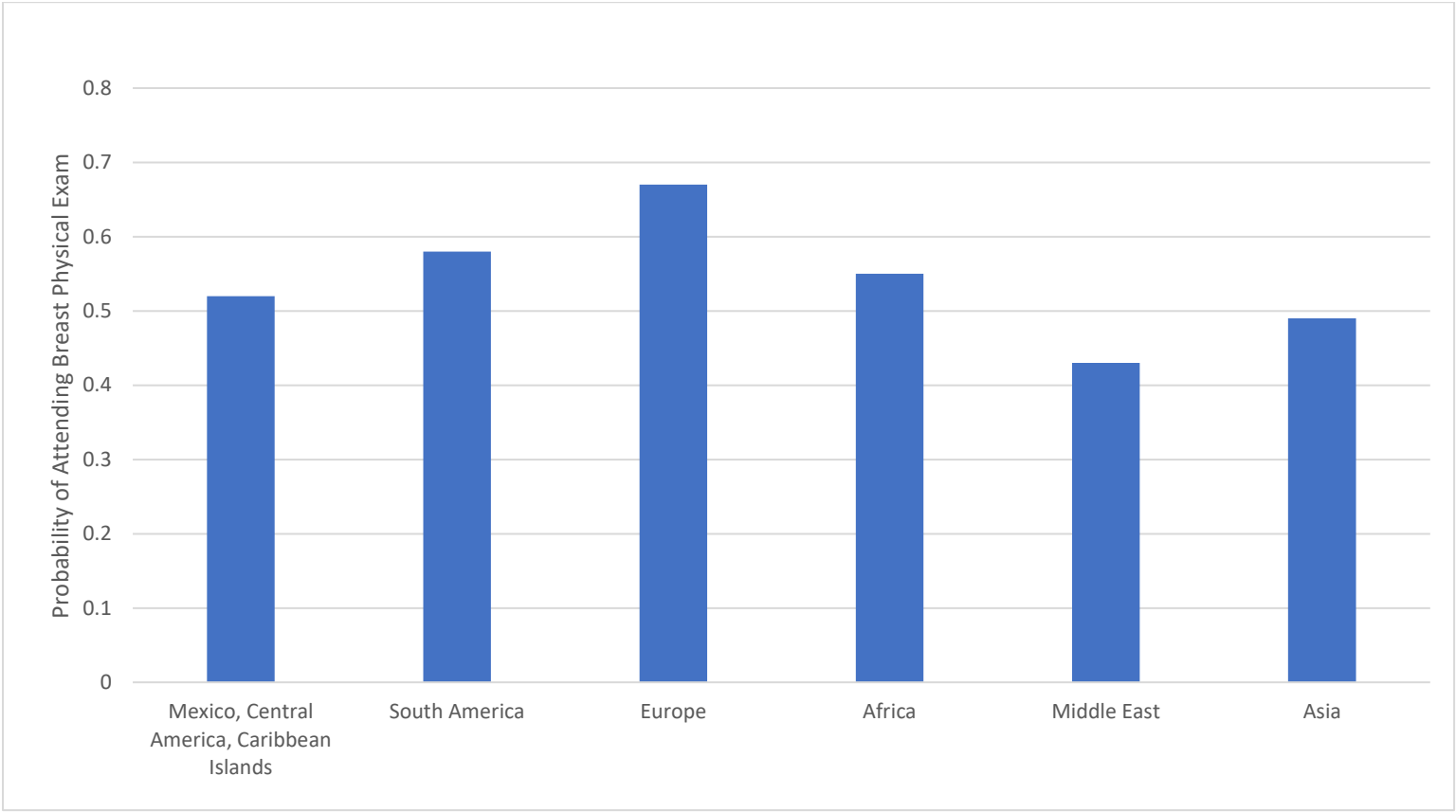


Figure 5.16 shows the predicted probability of immigrant women attending physical by interaction of length of time in the U.S. and English language proficiency. The highest probabilities of immigrant women attending breast physical exam are immigrant women who have stayed in the U.S. for more than 10 years and speak English. In contrast, the lowest probability of immigrant women attending breast physical exam are immigrants who have stayed in the U.S. for less than 5 years and speak other language. Moreover, the graph displayed that immigrants who speak English are more likely to attend breast physical exam than immigrant who speak other language.

Figure 5.17 shows the predicted probability of immigrant women attending breast physical exam by interaction of length of time in the U.S. and American citizenship status. The highest probability of immigrant women having breast physical exam are immigrant women who have stayed for more than 10 years and are American citizens. In contrast, the lowest probability of immigrant women having breast physical exam are immigrant women who have stayed for less than 5 years and are not American citizens. Thereby, the Figure 5.8 presented that immigrant women who are American citizens are more likely to attend breast physical exam. Both Figures 5.16 and 5.17 show the importance of English language proficiency and American citizenship status to the probability of immigrant women attending breast physical exam.

Figure 5.18 indicates the predicated probability of immigrant have depression by birth region of immigrants. The highest probability of immigrant women attending breast physical exam are immigrant women whose birth region are Europe. The lowest of probability of immigrant women attending breast physical exam are immigrant women

whose birth region are Middle East. Thereby, the original region is connected to original culture to influence the probability of immigrant women attending breast physical exam.

CHAPTER SIX: DISCUSSION AND CONCLUSION

Discussion

The purpose of this study is to examine the relationship between acculturation and immigrant's health behavior, mental health outcomes, and access to health care service. Relying on the theoretical framework of acculturation, this study used the IPUMS National Health Interview Survey (IPUMS NHIS) data to explore the effects of acculturation on the health of immigrants which are composed of immigrant health behavior, immigrant mental health, immigrant access to health care service. Both binomial and multinomial logistic regression models were utilized to estimate the effects of acculturation on immigrant's health behavior, mental health, and access to health care.

The major findings of this study are effects of acculturation on immigrants' health. There are three indicators of acculturation: English language proficiency, the length of time of staying in the U.S., and American citizenship status. Immigrants' health includes health behavior, mental health, and access to health care service that are considered as the acculturation outcomes.

The results of estimated the effects of acculturation on immigrants' health behavior indicate acculturation is positively associated with the likelihood of being light or moderate drinkers and the association is statistically significant. English language proficiency as an indicator of acculturation has significant effects on the drinking behavior. The results revealed that immigrants who speak English are more likely to be light and moderate drinkers than immigrants who speak other languages. Immigrants who stay in U.S for more than 10 years are more likely to be light and moderate drinker than immigrants who stay in U.S for less than 5 years. Immigrants who are American citizens

are more likely to be light and moderate drinker than immigrants who are not American citizens. These findings are consistent with previous research showing that acculturation may impact drinking pattern of immigrants (Ross and Wu 1995; Galama and van Kippersluis 2018; Kawachi et al. 2010).

With regard to the effects of acculturation on immigrants smoking behavior, English language proficiency, length of time in the U.S., and American citizenship status are significant factors that influence immigrants smoking behavior. This analysis shows that immigrants who speak English are less likely to be currently smoking than immigrants who speak other languages. Immigrants who stay in U.S for more than 10 years are more likely to be currently smoking than immigrants who stay in U.S for less than 5 years. Immigrants who are American citizens are more likely to be currently smoking than immigrants who are not American citizens.

Both drinking and smoking behaviors might be the outcome of acculturation, which can be seen as result of interactions with individuals in new cultural environment. This evidence also indicates acculturation is a complex phenomenon because acculturation is a dynamic process while immigrants can change their attitudes, beliefs, and behaviors after adapting to the new culture. There are differences between the effects of English language proficiency on immigrants drinking behavior and smoking behavior. Data analysis indicated the effects of English language proficiency is positive for predicting immigrants drinking behavior. On the other hand, the effects of English language proficiency are negative for predicting immigrants smoking behavior. English language proficiency is associated with social network process. Immigrants drinking behavior is also associated with interactions with individuals in host country. Immigrants

with higher English language proficiency are likely to drink because English language proficiency is an important condition for social interaction with other members in the American society. English language proficiency also helps immigrants access health knowledge and information, so it influences the likelihood of immigrants' smoking behavior. English language proficiency is also related with immigrant educational attainment.

In terms of effects of demographic variables on immigrants' health behavior, this study has contributed to immigrant health research by examining the relationships between immigrants' birth of region and immigrants' drinking and smoking behaviors. Drinking behavior among immigrants could be affected through drinking culture of home country and host country. The drinking behavior is distinct by country due to different drinking cultures and social acceptance of drinking (Cook and Caetano 2014). People in countries such as China, Vietnam, and India usually drink alcohol in social activities (World Health organization 2014). People in countries such as Indonesia and Malaysia are less likely to drink alcohol due to their sociocultural background and religious (World Health organization 2014). The drinking culture of home country is associated with immigrant drinking behaviors in the United States (Cook et al. 2015). European and Asian drinking culture is characterized by greater alcohol use, whose drinking pattern is more likely to consume alcohol (Cook et al. 2015). This study finds that immigrants from Europe and Asia are more likely to drink than immigrants from Mexico, Central America, and Caribbean Island. Immigrants from Africa and Middle East are less likely to currently drink than immigrants from Mexico, Central America, and Caribbean Island.

This study also highlights the effects of educational attainment and personal income on health behavior. Educational attainment and personal income levels were found to be positively associated with an increasing likelihood of drinking. The effects of personal income levels are significant for predicting immigrants to engage in light or moderate drinking. Immigrants with income more than or equal to $100,000 were more likely to currently drink than immigrants with income less than $50,000. This finding is consistent with previous research reporting that high-income and higher educated Americans are more likely drinking than other Americans (Gallup's annual Consumption Habits poll 2015). A possible explanation is that Americans with high socioeconomic status may be able to afford alcohol as they want to drink (Gallup's annual Consumption Habits poll 2015). In addition, these individuals are more likely to eat in restaurant, go on vacation, and socialize with coworkers. These factors also affect the likelihood of drinking (Gallup's annual Consumption Habits poll 2015). The findings of this study indicate that high-income and higher educated immigrants have same drinking patterns as high-income and highly educated Americans.

On the other hand, immigrants with high socioeconomic status have strong desire to assimilate into the society of host country than immigrants with low socioeconomic status (Sudhinarraset et al. 2016). Immigrants with high socioeconomic status have higher level of cultural adaptation and positive attitudes toward drinking alcohol in the United States (Sudhinarraset et al. 2016). They believe that drinking alcohol is a style of cultural adaptation. The findings of this study regarding high-income and higher educated immigrants being more likely to drink alcohol are consistent with the acculturation

process influenced by personal characteristics such as socioeconomic status (Brown and Bean 2006; Portes and Zhou 1993).

Educational attainment and personal income levels were found to be negatively associated with likelihood of immigrants smoking in this study. Immigrants' socioeconomic status determines that high-income and higher educated immigrants were less likely to smoke than individuals with low-income and low level of education. Higher educational attainment shape individuals' health beliefs and ability to choose high quality of life and understand importance of good health conditions for a life of high quality (CDC Report 2020). Higher income provides individuals adequate conditions to invest in their future health by choosing healthy behaviors and accessing health care services (Galama and Kippersluis 2018). In addition, good health conditions can also help people with higher income maintain their jobs and higher income (Galama and van Kippersluis 2010) because poor health conditions limit individuals' ability to work and reduce job opportunities (Health Affairs Report 2018). These perspectives not only are applied to explain smoking behavior of high income and higher educated Americans but also it is used to explain smoking behavior of high income and higher educated immigrants because high socioeconomic status is an important factor to prevent immigrants smoking (National Cancer Institution 2017). These findings provide evidence to support higher level of education and high income are associated with preventing immigrants smoking.

The findings of this study showed that immigrants with less than a high school diploma were less likely to smoke than immigrants with above high school diploma. The findings also supported the findings in recent studies that smoking was not associated with socioeconomic status inequalities among some racial/ethnic minority populations

such as Hispanic and African American individuals (Assari and Mistry 2019; Assari et al. 2018). These studies found high socioeconomic status African American and Hispanic individuals living in community that includes predominantly African American and Hispanic populations have increasing risk of smoking (Assari and Mistry 2019; Assari et al. 2018). Although socioeconomic status is not significantly associated smoking among some racial/ethnic minority populations, higher educational attainment and reduced poverty are still very important factors to prevent smoking among racial/ethnic minority populations (Rodriquez et al. 2019).

This study also estimates the effects of acculturation on the risk of having depression among immigrants through binominal logistic regression. English language proficiency as an indicator of acculturation is a significant factor for predicting the risk of having depression among immigrants. The effects of English language proficiency on the risk of having depression among immigrants is negative. Immigrants who speak English have less risk of having depression than immigrant who speak other languages. This finding is consistent with the findings of previous research, which English language proficiency is recognized as an important factor to associate with the mental health of immigrants and ethnic minorities (Zhang et al. 2012). The implication of this finding suggests the English language proficiency has a positive impact on decreasing risk of having depression among immigrants. This finding also is linked with English language proficiency facilitating cultural adaptation and enhancing confidence of immigrants to adapt new culture.

With regard to the effects of length of time of staying in U.S. and American citizenship status on the risk of having depression, the length of time of staying in U.S.

has significant positive impact on the risk of having depression. The risk of having depression increases when immigrants stay in U.S. for longer. Immigrants who are American citizen have lower risk of having depression than immigrants who are not American citizen. These findings provide evidence to support the perspective from prior studies that citizenship status of country of residence influences immigrant mental health (Wunderlich 2005; Hochman 2011; Vink et al. 2013, Maehler 2019).

The findings of this study revealed the effects of birth of region on the risk of having depression among immigrants. Immigrants from Europe, South America, Africa and Asia have lower risk of having depression than immigrants from Mexico, Central America, and Caribbean Island. Immigrants from Middle East have higher risk of having depression than immigrants from Mexico, Central America, and Caribbean Island. These findings also confirm previous finding that Middle Eastern immigrants in the United States suffered higher rate of serious psychological distress (Alboqoor et al. 2021).

Another finding regarding gender and having depression is consistent with previous research that women tend to have higher risk of having depression than men (Alegria et al. 2007; Jang et al. 2012; McKenna et al. 2005). Women have higher depression because women suffer more emotional stress due to gender-based roles such as retaining balance between family responsibility and career development (Alegria et al. 2007; Jang et al. 2012; McKenna et al. 2005). Other findings show that the effects of marital status on the risk of having depression is a significant factor for predicting the risk of having depression among immigrants. The risk of having depression decreases when immigrants are married. Indeed, this finding suggests that family support plays an

important role in decreasing the risk of having depression among immigrants plays an important role.

This study also examined the effects of socioeconomic characteristics on risk of having depression among immigrants. Both effects of personal income and employment status are significant factors for predicting risk of having depression among immigrants. Personal income has significant negative effect on the risk of having depression among immigrants. The risk of having depression decreases when personal income increases. Current working status has negative effect on the risk of having depression among immigrants. The risk of having depression decreases when immigrants are currently working. The findings of this study support personal income level and employment status are significant predictors for predicting the risk of having depression among immigrants.

This study also examines the effects of acculturation on the likelihood of immigrant women attending breast physical exam. Results from the binomial logistic model show that the effects of acculturation have significant positive effect on the likelihood of immigrant women attending breast physical exam. The effect of English language proficiency on the likelihood of immigrant women attending breast physical exam is positive. Immigrant women who speak English have increased more likelihood of attending breast physical exam than immigrant women who speak other languages.

The length of time of staying in U.S. as an indicator of acculturation is another significant factor for predicting the likelihood of immigrant women attending breast physical exam. The effect of length of time of staying in U.S. is significantly positive on the likelihood of immigrant women attending in breast physical exam. The likelihood of immigrant women attending breast physical exam increases when immigrant women stay

in U.S. for longer. The effect of American citizenship status is significantly positive on the likelihood of immigrant women attending breast physical exam. Immigrant women who is American citizen are more likely to attend breast physical exam than immigrant women who is not American citizen.

This study also estimates the effects of demographic characteristics on immigrant women attending breast physical exam. Analysis through binomial logistic model reveals that immigrants from Europe and South America are more like to attend breast physical exam than immigrants from Mexico, Central America, and Caribbean Island. Immigrants from Africa, Asia, and Middle East are less than likely to attend breast physical exam than immigrants from Mexico, Central America, and Caribbean island. The effect of marital status is significant for predicting the likelihood of immigrant women attending breast physical exam. Immigrant women who are married are more likely to attending breast physical exam than immigrant women who are unmarried. The effect of age reveals significantly positive on the likelihood of attending breast physical exam. Immigrant women are more likely to participate in breast physical exam when age increases.

This study explores the influence of immigrant socioeconomic characteristics over their breast physical exam attendance. Both effects of personal income and educational attainment are significant for predicting immigrant women attending breast physical exam. Both educational attainment and personal income have significantly positive effects on immigrant women attending breast physical exam. The likelihood of immigrant women attending physical breast exam increases when the educational

attainment of immigrant women increases. The likelihood of immigrant women attending physical breast exam increases when personal income of immigrant women increases.

Other indicators of socioeconomic characteristics have significant effects on the likelihood of immigrant women attending breast physical exam. One interesting finding from the effects of employment status is that immigrant women who are not in the labor force are more likely to attend breast physical exam than unemployed immigrant women. In addition, the effect of health insurance status is significantly positive on the likelihood of immigrant women attending breast physical exam. Immigrant women who have health insurance are more likely to attending breast physical exam than immigrant women who have no insurance.

With regard to the overall findings, results of descriptive statistics and logistic regression show the English language proficiency of immigrants plays an important role in immigrants' health. The effect of English language remains significant and positive on immigrant drinking behavior and immigrant women attending breast physical exam after controlling for demographic variables and socioeconomic variables in logistic models. The effect of English language remains significant and negative on immigrant currently smoking and depression after controlling for demographic variables and socioeconomic variables in logistic models. This study also estimates the interaction effects of English language proficiency and length of time in the U.S on immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam. Analysis from logistic models reveals that English language proficiency still plays the most important role to influence immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam. Lastly,

predicted probabilities also support that English language proficiency plays an important role in predicting immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam.

In terms of the effect of American citizenship status, the effect of American citizenship status remains significant and positive on immigrant drinking behavior and immigrant women attending breast physical exam and remains significant and negative on immigrant currently smoking behavior and depression after controlling for demographic variables and socioeconomic variables in logistic models. This study also examines the interaction effects of American citizenship status and length of time in the U.S on immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam. The results of logistic models reveal that American citizenship is significantly and positively associated with immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam. Lastly, predicted probabilities also support that American citizenship status plays an important role in predicting immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam. These findings support that the American citizenship status presents immigrants' positive attitude to adapting American culture.

Although the effect of length of time in the U.S. is significantly associated with immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam, this study suggests that length of time in the U.S is not regarded as a main factor to influence immigrants' drinking and smoking behavior, immigrants' depression, and immigrant women attending breast physical exam by

examining the interaction effects of English language proficiency and length of time in the U.S and American citizenship status and length of time in the U.S. The English language proficiency and American citizenship status are the two most important indicators of acculturation. English proficiency reflects immigrants' ability to adapt American culture and the new environment. The American citizenship status reflects immigrants' attitude to adopt American culture.

Study Limitation

This study explored immigrants' acculturative characteristics, demographic characteristics, socioeconomics characteristics measured at the individual levels. These characteristics estimated their effects on immigrant health behavior, mental health, access to health care. Although English language proficiency, the length of time of staying in U.S., and American citizenship status are used as indicators to measure acculturation in this study, multifaceted acculturation measurement is needed to comprehensively analyze the effects of acculturation on immigrant health. The multifaceted acculturation measures involve measure of psychological acculturation such as changes in cultural values, norms, attitudes. The multifaceted acculturation measure may capture more detailed information with regarding to immigrant acculturation. Limited acculturation measure may not estimate the effects of psychological acculturation on immigrant health.

Neighborhood and community environment are important factors of affecting immigrant health. The acculturation theory mentioned the impact of surrounding context on immigrant adaptation. Neighborhood and community environment can influence on immigrants' health and adaptation. Castaneda (2015) highlighted the importance of neighborhood characteristics on health and health behavior of immigrants and

investigated the effects of neighborhood with high rate of diabetes on health and health behavior of immigrants in Southern Texas. Good environment conditions of neighborhood and community include physical conditions and social conditions. Physical conditions involve green space, sidewalks, parks, and good health care service. Social conditions mean that a neighborhood and community establishes a collective environment that shapes social interactions among residents of neighborhood and members of community. Both physical conditions and social conditions of neighborhood and community are important to immigrant health (Brulle and Pellow 2006). The characteristics of neighborhood and community can help us better explore immigrants' health behavior, mental health, and access to health care. This study is limited in examining the effects of neighborhood and community characteristics to immigrant health behavior, mental health, and access to health care.

This study increases attention to the effects of acculturation on immigrants' health. However, NHIS data set does not provide enough information on immigrants' being documented or undocumented. There are differences in acculturative characteristics among documented immigrants and undocumented immigrants due to disparity on demographic and socioeconomic characteristics. The effects of disparity on acculturative characteristics, demographic and socioeconomic characteristics arouse disparity on health behavior, mental health, and access to health care among documented immigrants and undocumented immigrants. Immigrants' legal status as one of acculturation conditions may affect both immigrant acculturation and health. Immigrants' legal status should be considered to evaluate their effects on immigrant health behavior, mental health, and health care access. This study sample doesn't provide enough data to understand effects

of immigrant legal status on immigrant health behavior, mental health, and access to health care.

Future Study

According to the acculturation theory, English language proficiency, the length of time in U.S., American citizenship status, and demographic and socioeconomic characteristics of individuals emphasize micro level factors that affect health of immigrants. The macro level emphasizes the effects of neighborhood environment and community context on health of immigrants. The future studies could consider the effects of neighborhood environment and community context on health behavior, mental health, and health care access among immigrants.

Based on limited data on immigrants participating in physical activity, this study unfortunately cannot estimate the effects of acculturation on immigrants participating in physical activities. Insufficient level of physical activities is one of the factors leading to global mortality (Hagstromer et al. 2007). Increasing the proportion of populations meeting sufficient level of physical activities is global public health priority (WHO report 2010). Future studies need to pay more attention to the effects of acculturation on immigrants participating in physical activities and on what factors influence immigrants participating in physical activities.

The effects of acculturation on health of undocumented immigrants should be considered for future study as well. The difference on the effects of acculturation on health of legal immigrants and undocumented immigrants could better understand the impacts of acculturation on health behavior, mental health, health care access among

immigrants. In summary, there are many questions regarding immigrants' health and researchers need to continue exploring these issues.

Recommendations for Practice

In terms of recommendations, the first one is clinical settings. They can provide immigrants a welcoming environment such as providing translator phones and posting signs in various languages, which result in immigrants getting effective health information from health providers. This is important in health care. It helps eliminate health disparities caused by language barrier of immigrants. Health care services also need to provide health education programs to educate immigrants on the benefits of attending breast physical exam and help build on their knowledge of health behaviors. Health education programs play an important role in preventing disease and enhancing quality of life (Health People 2010). It improves health outcomes of immigrants through developing health education workshops such as effective physical activities, chronic disease, and breast health. The health education program is to produce positive health outcomes among the immigrant populations and help immigrants better access to health care services.

This study emphasizes the importance of English language proficiency to immigrants' health. English language proficiency can help immigrants reduce acculturation stress and increase health care access. English language proficiency also helps immigrants access health knowledge and information. It is very helpful for immigrants to determine their health behaviors such as controlling their alcohol intake, quitting smoking and improving their mental health in the U.S. Based on the implication of immigrants learning English, government should increase budget to immigrants

learning center to offer more free English classes and job training programs. These programs can help immigrants become lifelong learners and independent, contributing citizens in the U.S.

Based on the findings of this study, our society and government should pay more attention to low-income immigrants and low-income immigrant communities. Government should make all efforts to help low-income immigrants obtain access to resources such as affordable medical and mental health council services. Government needs to provide low-income immigrants economic assistance for expensive emergency care and hospitalization. Government needs to increase budget to expand good medical and educational resources to improve health outcome of low-income immigrants and work with state and federal policymakers to address how to reduce health disparities' problems.

Conclusion

The primary purpose of this study was to examine the relationship between acculturation and immigrants' health. Three research questions of this study focused on how immigrant acculturation influences health behavior of immigrants, mental health of immigrants, and health care access of immigrants and what are the main factors that affect the immigrants' health. Three research questions were explored in three empirical analyses. The main findings of this study from threes empirical analysis emphasized the importance of language acculturation on immigrants' health including health behaviors of immigrants, mental health of immigrants, and health care access. This finding provides evidence to support insights that English language proficiency is a key factor to influence immigrant health and is an important reason to explain health disparities among

immigrants. The findings of this study also provide the evidence to answer research questions of this study. English language proficiency, the length of time of staying in the U.S., and American citizenship status significantly influences immigrants' health behavior, mental health, and health care access.

In terms of the application of the acculturation theory, health behavior of immigrants, mental health of immigrants, and health care access of immigrants were viewed as acculturation outcomes in this study. The acculturation outcomes were affected by both levels of acculturation measured by English language proficiency, duration of residence, and citizenship, and individual acculturation conditions including demographic and socioeconomic characteristics. At this point, this study expands the immigrant health research by improving understanding of immigrant health using the acculturation theory. This study provides evidence to support the implication and roles of acculturation that help immigrants succeed socially and economically in the U.S. and improve immigrants' health behavior, mental health, and health care access through acculturation process.

The findings of this study also emphasize the importance of personal income and educational attainment for improving immigrants' health behavior, mental health, health care access and reducing health disparities. At the same time, this study helps better understand health disparities that are also caused by educational and economic disadvantages of immigrants. The findings of this study also suggest that improving health and reducing health dipartites of immigrants need to address the acculturation, educational, and economic factors.

REFERENCES

Akresh, Ilana Redstone. 2007. “Dietary Assimilation Hispanic Immigrants and Health among to the United States.” *Journal of Health and Social Behavior* 48(4):404–17.

Alegria M, Canino G, Shrout PE, Woo M, Duan N, Vila D, et al. 2008. “Prevalence of mental illness in immigrant and non-immigrant US Latino groups.” *American Journal of Psychiatry* 165(3):359-69.

Alegria, Margarita. 2009. “The Challenge of Acculturation Measures: What Are We Missing? A Commentary on Thomson & Hoffman-Goetz.” *Social Science and Medicine* 69(7):996–98.

ACOG Report 2017 “Breast Cancer Risk Assessment and Screening in Average-Risk Women”.

Allena, Jennifer Dacey., Caitlin Caspib, May Yang, Bry Leyvad, Anne M. Stoddard, Sara Tamers, Reginald D. Tucker-Seeley, Glorian C.Sorensena. 2014. “Pathways between acculturation and health behaviors among residents of low-income housing: The mediating role of social and contextual factors” *Social Science & Medicine* 123: 26-36.

Anders, Carey K. Rebecca Johnson, Jennifer Litton, Marianne Phillips, Archie Bleyer. 2010. “ Breast Cancer before Age 40 Years.” *National Institute of Heath.*

Adler, Nancy E, and Katherine Newman. 2002. “Socioeconomic Disparities in Health: Pathways and Policies” *Health Aff (Millwood)* 21(2):60-76.

Andreeva, Valentina A, Jennifer B Unger, Mary Ann Pentz. 2007. “Breast cancer among immigrants: a systematic review and new research directions” *Journal of Immigrant and Minority Health* 9(4):307-22

Antecol, Heather and Kelly Bedard. 2006. “Unhealthy Assimilation: Why Do Immigrants Converge to American Health Status Levels?” Demography 43(2):337–60.

Arends-Tóth, J., and van de Vijver. 2006. “Assessment of psychological acculturation.” *The Cambridge Handbook of Acculturation Psychology Cambridge: Cambridge University Press* pp. 142–162.

Ayon, Ceilia, 2015. “Economic, Social, and health effects of discrimination on Latino immigrant families.” *Washington, DC: Migration Policy Institute*.

Bacio, Guadalupe A, Vickie M. Mays, and Anna S. Lau. 2013. “Drinking Initiation and Problematic Drinking among Latino Adolescents: Explanations of the Immigrant Paradox.” *Psychology of Addictive Behaviors* 27(1):14–22

Baquet, Claudia, Patricia Commiskey. 2000. “Socioeconomic factors and breast carcinoma in multicultural women” *Cancer* 88: 1256-64.

Bethel, Jeffrey W. and Marc B. Schenker. 2005. “Acculturation and Smoking Patterns among Hispanics: A Review.” American Journal of Preventive Medicine 29(2):143–48.

Bond Huie, Stephanie A, Patrick M. Krueger, Richard G. Rogers and Robert A. Hummer. 2003. “Wealth, race, and mortality.” *Social Science Quarterly* Vol.84. No3.

Boyle, Elizabeth Heger ., Ahmed Ali. 2009. “Culture, Structure, and the Refugee Experience in Somali Immigrant Family Transformation” *International Migration* 48(1):47 – 79.

Brown, Dustin C, Mark D Hayward, Jennifer Karas Montez, Robert A Hummer, Chi-Tsun Chiu, Mira M Hidajat. 2012. “The significance of education for mortality compression in the United States” *Demography* 49(3):819-40.

Brown, William Michael, Nathan S Consedine, Carol Magai. 2006. “Time spent in the United States and breast cancer screening behaviors among ethnically diverse immigrant women: evidence for acculturation? *Journal of Immigrant and Minority Health* 8(4):347-358.

Bryant, Ami N. and Giyeon Kim. 2013. “The Relation between Acculturation and Alcohol Consumption Patterns among Older Asian and Hispanic Immigrants.” Aging and Mental Health 17(2):147–56.

Call, Kathleen Thiede, Angela R Fertig, Joanne Pascale. 2021 “Factors associated with accurate reporting of public and private health insurance type” *Health Service Research* 26 August 2021.

Cao, Yin, Walter C Willett, Eric B Rimm, Meir J Stampfer, Edward L Giovannucci. 2015. “Light to moderate intake of alcohol, drinking patterns, and risk of cancer: results from two prospective US cohort studies” *The BMJ* 351.

Castañeda, Heide., Seth M. Holmes, Daniel S. Madrigal, Maria-Elena DeTrinidad Young, Naomi Beyeler, and James Quesada. 2015. “Immigration as a social determinant of health.” Annual review of public health (36):375-392.

Centers for Disease Control 2020. Healthy People (https://www.cdc.gov/dhdsp/hp2020.htm).

Centers for Disease Control. 2007. "Cigarette smoking among adults --- United States." *Morbidity Mortality Weekly Report*, 56(44), 1157-1161.

Centers for Disease Control. 2008b. Quick stats. General information on alcohol use and health.

Cheng, Hui G, and Orla McBride. 2013. "An Epidemiological Investigation of Male-Female Differences in Drinking and Drinking-Related Problems between US-Born and ForeignBorn Latino and Asian Americans." Journal of Addiction 2013:631912.

Clark, L., L. Hofsess. 1998 *Acculturation S. Loue (Ed.), Handbook of Immigrant Health*, Plenum Press, New York. 37-59.

Conner, Mark and Paul Norman. 2017. "Health behaviour: Current issues and challenges" *Psychology & Health* 32(8): 895-906.

Cook, Won K., Katherine J. Karriker-Jaffe, Jason Bond, and Camillia Lui. 2015. "Asian American Problem Drinking Trajectories During the Transition to Adulthood: Ethnic Drinking Cultures and Neighborhood Contexts." *American Journal of Public Health* 105(5): 1020-1027.

Deaton, Augus. 2002. "Policy Implications of the Gradient Of Health And Wealth." Health Affairs 21(2): 13-30.

DeSantis, Carol. Rebecca Siegel, Priti Bandi, Ahmedin Jemal. 2011. “Breast Cancer Statistics.” *American Cancer Society.*

Drewnowski, Adam & Petra Eichelsdoerfer. 2010. “Can Low-Income Americans Afford a Healthy Diet?” *Nutrition Today* 44(6): 246–249.

DuBard, C. Annette, and Ziya Gizlice. 2008. “Language Spoken and Differences in Health Status, Access to Care, and Receipt of Preventive Services Among US Hispanics” *American Journal of Public Health* 98(11):2021-8.

Elo, Irma. 2009. “Social Class Differentials in Health and Mortality: Patterns and Explanations in Comparative Perspective” *Annual Review of Sociology*. Vol.35 553-572.

Escarce, J. J. 2007. “Racial and ethnic disparities in access to and quality of health care” *Research Synthesis Report No. 12*. Princeton, NJ: Robert Wood Johnson Foundation.

Fredholm, Hanna, Sonja Eaker, Jan Frisell, Lars Holmberg, Irma Fredriksson, Henrik Lindman. 2009. “Breast cancer in young women: poor survival despite intensive treatment” *Journal of Plos One.*

Galvan, F.H., and R. Caetano. 2003. “Alcohol Use and Related Problems among Ethnic Minorities in the United States.” *Alcohol Research and Health* 27(1):87–94.

Galama, Titus J. and Hans van Kippersluis. 2018. “A Theory of Socio-economic Disparities in Health over the Life Cycle” *The Economic Journal 33(3):19–29.*

Gerber, Markus, Dean Barker, and Uwe Pühse. 2012. “Acculturation and Physical Activity among Immigrants: A Systematic Review.” *Journal of Public Health (Germany)* 20(3):313–41

Gerber, Markus, Dean Barker, and Uwe Pühse. 2012. “Acculturation and Physical Activity among Immigrants: A Systematic Review.” *Journal of Public Health (Germany)* 20(3):313–41.

Ghiasvand, Reza., Hans-Olov Adami, Iraj Harirchi, Rahim Akrami, Kazem Zendehdel. 2014. “Higher incidence of premenopausal breast cancer in less developed countries; myth or truth?” *BMC Cancer*. Vol 14, No 343.

Gorman, Bridget K., Jen'nan Ghazal Read, Patrick M Krueger. 2010. “Gender, acculturation, and health among Mexican Americans” *Journal social and health behavior* 51(4):440-457.

Grant, Bridget F. S Patricia Chou, Tulshi D Saha, Roger P Pickering, Bradley T Kerridge, W June Ruan , Boji Huang, Jeesun Jung , Haitao Zhang , Amy Fan, Deborah S Hasin. 2017. “Prevalence of 12-Month Alcohol Use, High-Risk Drinking, and DSM-IV Alcohol Use Disorder in the United States, 2001-2002 to 2012-2013: Results From the National Epidemiologic Survey on Alcohol and Related Conditions” *JAMA Psychiatry* Sep 1;74(9):911-923.

Grieco, Elizabeth M., Yesenia D. Acosta, G. Patricia de la Cruz, Christine Gambino, Thomas Gryn, Luke J. Larsen, Edward N. Trevelyan, and Nathan P. Walters. 2012. “The Foreign-Born Population in the United States: 2010” American Community Survey Reports. U.S. Department of Commerce. U.S. Census Bureau.

Griswold, Max G, Nancy Fullman, Caitlin Hawley, Nicholas Arian, Stephanie RM Zimsen, Hayley D Tymeson, et al. 2018. "Alcohol use and burden for 195 countries and territories, 1990–2016: a systematic analysis for the Global Burden of Disease Study 2016" *Lancet* Sep 22;392(10152):1015-1035.

Gallup's annual Consumption Habits poll, 2015 (https://news.gallup.com/poll/184358/drinking-highest-among-educated-upper-income-americans.aspx).

Hamilton, Tod. G., Hummer, Rober. A. 2011. "Immigration and the health of U.S. Black adults: Does country of origin matter?" *Social Science & Medicine* 73(10): 1551–1560

Heck, Katherine, E R Pamuk. 1997. "Explaining the relation between education and postmenopausal breast cancer" *American Journal of Epidemiology* 145(4):366-72.

Hilmers, Angela, Antonio Bernabe-Ortiz, Rober H. Gilman, Ann Y McDermott, Liam Smeeth, and J. Jaime Miranda, 2016. "Rural to Urban Migration: Socioeconomic Status But Not Acculturation was Associated with Overweight/Obesity." *Journal of Immigrant and Minority Health* 18: 644-651.

Himes, Christine. 2011." Relationship among Health Behaviors, Health, and Mortality." International Handbbok of Adult Mortality.

Hosmer, David, W., and Stanley Lemeshow. 2000. *Applied Logistic Regression (Second Edition*). New York: John Wiley & Sons, Inc.

Huffman, Jeff C., Felicia A. Smith, Mark A. Blais, Marguerite E. Beiser, James L. Januzzi and Gregory L. Fricchione. 2006. "Rapid Screening for Major Depression in PostMyocardial Infarction Patients: An Investigation using Beck Depression Inventory II Items." *Heart* 92(11):1656-1660.

IPUMS NHIS 2018 (https://nhis.ipums.org/nhis)

John, Esther M., Amanda I Phipps, Adam Davis, Jocelyn Koo. 2005. "Migration history, acculturation, and breast cancer risk in Hispanic women" *Cancer Epidemiology Biomarkers and Prevention* 14(12):2905-13.

Jones, L. G. Bates, M. Bellis. 2015. "Relationship between alcohol-attributable disease and socioeconomic status, and the role of alcohol consumption in this relationship: a systematic review and meta-analysis" *BMC Public Health.* Vol 15.

Joshi, S., Jatrana, S., Paradies, Y., & Priest, N. 2014. "Differences in health behaviors between immigrant and non-immigrant groups: a protocol for a systematic review." *Systematic Reviews*. 25(3):61.

Kobayashi, Karen M., Steven G Prus. 2012. "Examining the gender, ethnicity, and age dimensions of the healthy immigrant effect: Factors in the development of equitable health policy" International Journal for Equity in Heath.

Kawachi, Ichiro., Nancy E. Adler, and William H. Dow. 2010. "Money, schooling, and health: Mechanisms and causal evidence" *Annals of The New York Academy of Science* 56(3):647-652.

Lai, DWL. Thomson C 2009. “The impact of perceived adequacy of social support on caregiving burden of family caregivers.” *Families in Society*. 92: 99–106.

Lannin, Donald R. Holly F. Mathews, Jim Mitchell, et al. 1998. “Influence of Socioeconomic and Cultural Factors on Racial Differences in Late-Stage Presentation of Breast Cancer”. *Journal of the American Medical Association.* 279(22):1801-1807.

Lara, Marielena, Cristina Gamboa, M.Iya Kahramanian, Leo S. Morales, and David E.Hayes Bautista. 2005. “Acculturation and Latino Health in the United States: A Review of the Literature and Its Sociopolitical Context*.” Annual Review of Public Health* 26:367–97.

Lee, Okhee. 2003. “Equity for culturally and linguistically diverse students in science education: Recommendations for a research agenda” *Teachers College Record* 105(3): 465-489.

Liang, w., Yuan, E., Mandelblatt, J., and Pasick, R. (2004). How do older Chinese Women view Health and Cancer Screening? Results from focus groups and implications for interventions. *Ethnicity and Health*. 9(3): 283-304.

Liebkind, Karmela., Inga Jasinskaja-Lahti, Erling Solheim. 2004. “ Cultural Identity, Perceived Discrimination, and Parental Support as Determinants of Immigrants' School Adjustments: Vietnamese Youth in Finland” *Journal of Adolescent Research* 19(6)

Lopez-Gonzalez, Author Lorena. Veronica C. Aravena, Robert A. Hummer, and Lorena Lopezgonzalez. 2005. “Immigrant Acculturation, Gender and Health Behavior: A Research Note.” *Social Forces* 84(1):581–93.

MacLachlan, Malcolm., Caroline Smyth, Fiona Breen, Tonya Madden. 2004. “Temporal acculturation and mental health in modern Ireland” *International Journal Social psychiatry* 50(4):345-350.

Macdonald, Gordon 1992. Communication Theory and Health Promotion. In R. Bunton & G. Macdonald (Eds.), *Health Promotion Disciplines and Diversity* (pp. 182-201): Routledge.

Majumdar,B., Browne, G., Roberts, J., and Carpio, B. 2004. “Effects of cultural sensitivity training on health care provider attitude and patient outcomes.” *Journal of Nursing scholarship.* 36(2): 161-166.

Mak, Winnie W. S., Sylvia Xiaohua Chen, Euncie. C. Wong, Nolan W.S. Zane, 2005. “A psychosocial model of stress distress relationship among Chinese Americans.” *Journal of Social and Clinical Psychology* 24(3): 422–424.

Maly, Rose C., Barbara Leake, Cynthia M. Mojica, Yihang Liu, Allison L. Diamant, Amardeep Thind. 2011. “What Influences Diagnostic Delay in Low-Income Women with Breast Cancer?” *Journal of Women’s Health* 20(7): 1017–1023.

Marsiglia, F., Booth, J., Baldwin, A., Ayers, S. 2013. “Acculturation and Life Satisfaction among Immigrant Mexican Adults.” *Advances in Social Work*. Vol. 14. No 1.

Mc Tiernan, Anne. 2003. “Behavioral risk factors in breast cancer: can risk be modified?” Oncologist. Vol. 8.

McDonald, James Ted, and Steven Kennedy. 2004 “Insights into the 'Healthy Immigrant Effect': Health Status and Health Service Use of Immigrants to Canada” *Social Science & Medicine.* 59: 1613-1627.

McPherson, G. 2001. Applying and interpreting statistics: A comprehensive guide (2nd ed.). New York: Springer-Verlag.

Miranda, Alexis, Debia L Umboefer, 1998. “Depression and social interest differences between lations indissimilar acculturation stages.” *Journal of Mental Health Counseling* 20(2):159-171.

National Academy of Sciences, E., and Medicine. 2015. “Integration of Immigrants into American society.” *Washington, DC: National Academy Press.*

Neuhauser, Linda, and Gary Kreps. 2014. “Integrating Design Science Theory and Methods to Improve the Development and Evaluation of Health Communication Programs” *Journal of Health Communication* 19(12):1460-71.

Nguyen, Clarice. 2012. “Cancer Screening and Asian American Immigrant Women” Stanford University.

Parsa, N. 2012. “Environmental Factors Inducing Human Cancers” *Iranian Journal of Public Health* 41(11): 1–9.

Parsa, Parisa., Mirnalini Kandiah, H Abdul Rahman, Na Mohd Zulkefli. 2006. “Barriers for breast cancer screening among Asian women: a mini literature review” *Asian Pacific Journal of Cancer Prevention* 7(4):509-14.

Patel, Kushal. Mohamed Kanu, Jianguo Liu, Brea Bond, Elizabeth Brown, Elizabeth Williams, Rosemary Theriot, Stephanie Bailey, Maureen Sanderson, and Margaret Hargreaves. 2014. Factors influencing Breast Cancer Screening in Low-Income African Americans in Tennessee. *Journal of Community Health* 39(5): 943-950.

Pourat, Nadereh.,Steven P. Wallace, Max W. Hadler, and Ninez Ponce. 2014. “Assessing Health Care Services Used By California’s Undocumented Immigrant Population In 2010” *Health Affair* 33(5):840-7.

Pudrovska, T. and B. Anikputa. 2016. "Early-Life Socioeconomic Status and Mortality in Later Life: An Integration of Four Life-Course Mechanisms." *The Journals of Gerontology.Series B, Psychological Sciences and Social Sciences* 69(3):451-460.

Punam, Rana, Jenna Sussman, Jonanthan Ratcliffe, Magaret Forbes, Mark Levine, Nicole Hodgson. 2014. “Young Women with breast cancer: Needs and experiences.” *American Association for Cancer Research.*

Roger, Véronique L., Alan S. Go, Donald M. Lloyd-Jones, Robert J. Adams, Jarett D. Berry, Todd M. Brown, Mercedes R. Carnethon, Shifan Dai, Giovanni de Simone and Earl S. Ford. 2011. "Heart Disease and Stroke Statistics—2011 Update1. about 1. about these Statistics2. American Heart Association's 2020 Impact Goals3. Cardiovascular Di." *Circulation* 123(4): 209.

Rohmann, Anette., Ursula PiontKowski, Annette Van Randenborgh. 2008. “When Attitudes Do not Fit: Discordance of Acculturation Attitudes as an Antecedent of Intergroup Threat” *Society for Personality and Social Psychology* 34(3): 307-320.

Ross, Catherine. Ryan Masters, Robert Hummer. 2012. “Education and the Gender Gaps in Health and Mortality” *Demography*. 49(4): 1157-1183.

Ryu, So Yeon , Catherine M. Crespi, Annette E. Maxwell. 2013 “What factors explain disparities in mammography rates among Asian American immigrant women? A population-based study in California” *Women Health Issues* 23(6): e403-e410.

Samina T. Syed, Ben S. Gerber, Lisa K. Sharp. 2013. “Traveling Towards Disease: Transportation Barriers to Health Care Access” *Journal of Community Health* 38(5): 976-993.

Salinas, Jennifer J. and Kristin M. Sheffield. 2011. “English Language Use, Health and Mortality in Older Mexican Americans.” *Journal of Immigrant and Minority Health / Center for Minority Public Health* 13(2):232–38.

Shen, Biing-Jiun, David Takeuchi. 2001. “A Structural Model of Acculturation and Mental Health Status Among Chinese Americans” *American Journal of Community Psychology* 29(3):387-418.

Shi, Leiyu, Chien-Chou Chen, Xiaoyu Nie, Jinsheng Zhu, Ruwei Hu. 2014. “Racial and socioeconomic disparities in access to primary care among people with chronic conditions” *American board of family medicine* 27(2): 189-192.

Short, Susan E. and Stefani Molborn. 2015. “Social determinants and health behaviors: conceptual frames and empirical advances” *Current Opinion in Psychology* 5(1): 78-84.

Siegler, Ilene C, Paul Costa. 1994. “Personality and breast cancer screening behaviors”. *Annals of Behavioral Medicine*. 16(4):347-351.

Simmons, Alan B. 2016. “Immigration policy: Imagined Futures*” Immigrant Canada,* 21-50.

Singh, Gopal K. and Mohammad Siahpush. 2014. “Widening Rural–Urban Disparities in Life Expectancy, U.S., 1969–2009” *American Journal of Preventive Medicine* 46(2): E19-E29.

Singh, Gopal K., and Mohammad Siahpush. 2002. “Increasing rural-urban gradients in US suicide mortality, 1970-1997.” *American Journal of Public Health*, 92: 1161-1167.

Steptoe, Andrew 2007. “Health Behavior and Stress” *Encyclopedia of Stress (Second Edition)* Page 262-266.

Sudhinaraset, May, Christina Wigglesworth, and David T. Takeuchi. 2016. “Social and Cultural Contexts of Alcohol Use Influences in a Social–Ecological Framework.” *Alcohol Research* 38(1):35-45.

Takeuchi, David T, 2016. “Vintage Wine in New Bottles: Infusing Select Ideas into the Study of Immigration, Immigrants, and Mental health.” *Journal of Health Social Behavior* 57(4): 423-435.

Tejeda, Silvia, Julie S. Darnell, Young I. Cho, Melinda R. Stolley, Talar W. Markossian, and Elizabeth A. Calhoun. 2013. "Patient Barriers to Follow-Up Care for Breast and Cervical Cancer Abnormalities" *Journal Women's Health* 22(6): 507–517.

Thai, Nghi D., Christian M. Connell, and Jacob Kraemer Tebes. 2010. "Substance Use among Asian American Adolescents: Influence of Race, Ethnicity, and Acculturation in the Context of Key Risk and Protective Factors." *Asian American Journal of Psychology* (14):261–74.

Tiwari, Albino and Judith Albino, 2017. "Acculturation and Pediatric Minority Oral Health Interventions" *Dental Clinics of North America*. 61(3): 549–563.

Trewin, Cassia B. Bjørn Heine Strand, Harald Weedon-Fekjær, Giske Ursin. 2017. "Changing patterns of breast cancer incidence and mortality by education level over four decades in Norway, 1971–2009" *European Journal of Public Health* 27(1):160–166.

U.S. Department of Health and Human Services. 2000. Healthy People 2010: Understanding and Improving Health. Washington, DC: U.S. Government Printing Office.

U.S. Department of Health and Human Services. 2014 "The Health Consequences of Smoking—50 Years of Progress A Report of the Surgeon General." Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2014.

U.S. National Cancer Institute 2017. "A Socioecological Approach to Addressing Tobacco- Related Health Disparities" U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute. National Cancer Institute Tobacco Control Monograph, No.22, NIH Publication, No, 17-CA-8035A.

Unger, J. B., Tess Boley Cruz, Louise Ann Rohrbach, Kurt M. Ribisl, Lourdes Baezconde-Garbanati, Xinguang Chen, and Dennis R. Trinidad, 2000. "English Language Use as a Risk Factor for Smoking Initiation among Hispanic and Asian American Adolescents: Evidence for Mediation by Tobacco-Related Beliefs and Social Norms*." Health Psychology : Official Journal of the Division of Health Psychology, American Psychological Association* 19(5):403–10.

Van Bergen, Diana., Allard R. Feddes, Doret J. de Ruyter. 2021 " Perceived discrimination against Dutch Muslim youths in the school context and its relation with externalising behavior" Oxford Review of Education 47(4): 475-494.

Ward, Elizabeth, Ahmedin Jemal, Vilma Cokkinides, Gopal K Singh, Cheryll Cardinez, Asma Ghafoor, Michael Thun. 2004. "Cancer disparities by race/ethnicity and socioeconomic status" *A Cancer Journal for Clinicians*. 54(2):78-93.

Wilson Meg. *2005.* "Health-promoting behaviors of sheltered homeless women" *Family & Community Health.*28(1): 51–63.

Williams, David R. 2012. "Miles to go before we sleep: racial inequities in health" *Journal of Health Social Behavior* 53(3): 279-295.

Williams, David R., Harold W. Neighbor, James S. Jackson. “Racial/ethnic discrimination and health: findings from community studies.” *American Journal of Public Health* 93(2): 200-208.

Wolfe, Mary K, Noreen C McDonald, G Mark Holmes. 2020. “Transportation Barriers to Health Care in the United States: Findings From the National Health Interview Survey, 1997-2017” *American Journal of Public Health*. 110(6):815-822.

Wu, Tsu-Yin, Brady West, Yu-Wen Chen, Clara Hergert. 2005. “Health beliefs and practices related to breast cancer screening in Filipino, Chinese and Asian-Indian women” *Cancer Detection and Prevention* 30(1):58-66.

Zhang, Jing., & Zhongmiao Wang. 2008. “Factors associated with smoking in Asian American adults: A systematic review” *Nicotine & Tobacco Research* 10(5): 791–801.