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Sociodemographic and Behavioral Predictors of Obesity Among Female Asian Indian Immigrants in the United States

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Walden University
2022

Abstract

Sociodemographic and Behavioral Predictors of Obesity Among Female Asian Indian

Immigrants in the United States

by

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Dietetic Internship, University of Wisconsin–Stout, 2010

Didactic Program, University of Wisconsin–Stout, 2009

MS, Food and Nutrition College of Home Economics, 1995

BS, Home Economics, 1992

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Public Health

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Abstract

Individuals from low-income countries such as those in the Asian region migrate to high-income countries and adopt obesogenic behaviors like sedentary lifestyles and high fat and sugar intake. This results in increased susceptibility to obesity, diabetes mellitus, cardiovascular disease, and stroke. Previous research has demonstrated that migrants from South Asian countries are at an increased risk of developing obesity, type 2 diabetes, and hypertension; however, little is known about the factors that contribute to this phenomenon. This was a quantitative, cross-sectional study guided by the social-ecological model. This study used secondary data from the National Health Interview survey to investigate the predictors of obesity among female South Asian immigrants in the United States. The results of the study showed no significant relationship between obesity and the factors of income, education, employment, neighborhood supportiveness, and length of stay as a proxy for acculturation. However, it did identify an effect between age and overweight and obesity with a logistic regression model that was statistically significant, $\chi2(8) = 23.748$, $p < .005$. The findings of this study can help create an understanding of the causes of obesity in the South Asian population that can then be addressed at individual and community levels. In addition, the information is useful for health organizations interested in working with this community so that they can develop interventions to target the identified predictors.

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Dedication

For my family and friends who supported me throughout this long journey.

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Chapter 1: Introduction to the Study

Obesity is a global public health crisis. Over the last few decades abundance of food and little to no exercise has resulted in overweight and obesity among individuals of all ages, races, and genders across the world. In a 2015 global survey of obesity of 195 countries, 604 million adults and 108 million children were obese. The prevalence of obesity almost doubled in 73 countries and increased in most other countries since 1980 (GBD 2015 Obesity Collaborators, 2017). Further, according to the World Health Organization (WHO, 2018), the number of obese and overweight adults nearly tripled between the years of 1975 and 2016. Thus, obesity requires research and action for control and prevention.

In the United States, the percentage of racial/ethnic minorities continues to increase and is projected to account for approximately 20% of the U.S. population by 2060 (Colby & Ortman, 2015), which has economic, political, psychological, and physical effects on the immigrants as well as host countries through complex and multifactorial mechanisms. The number of South Asian immigrants—those from countries like Pakistan, India, Bangladesh, Sri lanka, Afghanistan, and Nepal (Gany et al., 2019)—in the United States has increased tremendously in last few decades. Upon arrival in the United States, these immigrants face variety of cultural, socioeconomic, linguistic, and structural hindrances to achieving good health (Gany et al, 2019). Along with these factors, there is also a lack of detailed data on the population's unique health, demographic, socioeconomic, cultural, and lifestyle profiles. Although most national health surveys have included the country of origin since 2011, this information is not

available in the publicly available datasets. Thus, limited research is available about health disparities among the South Asian immigrants. This makes it difficult to plan and develop evidence-based interventions to address the various health issues affecting first- and second-generation South Asians in the United States. This cross-sectional, quantitative study was conducted to identify the factors that contribute to obesity and overweight among South Asian female immigrants in the United States.

In this chapter, I will discuss the background of obesity and overweight and South Asian immigrant population group. In addition, I will present the purpose of my research and the research questions and associated hypotheses. I will also discuss the theoretical framework guiding this research as well as an overview of the nature of my study. Assumptions, potential limitations, and delimitations of my study population will also be presented. Finally, I will discuss the significance of this research and the potential for positive social change.

Background

People migrate from their home countries due to social, economic, political, cultural, or environmental reasons (Shumway, & Davis, 2016). These reasons may include poverty, pursuit of a better lifestyle and job, war, natural disasters like floods and earthquakes, and religious persecution (Shumway, & Davis, 2016). International migration increased specially between the years 1990 and 2017 when the number of immigrants increased by 69% (United Nations [UN], 2017).

Migration has economic as well as social implications. It is a complex process that puts individuals in circumstances which may impact their physical and mental well-

being thus increasing their vulnerability to ill health (Montesi et al., 2016). Research indicates that cardiometabolic risk is especially high among racial and ethnic minorities of the United States (Mozaffarian et al., 2016). Due to an increased share of immigrants in the U.S. population, it is now important to understand the determinants of immigrants' health so that policymakers and health practitioners can keep up with their health needs (Neuman, 2014; Fleischman et al., 2015). Migrants of diverse backgrounds face a variety of circumstances which may affect their risks and vulnerability to disease. Therefore, research focused on migrants from different ethnicities is needed for long lasting and better health outcomes.

Obesity is a complex and serious yet treatable medical issue. It has been associated with significant morbidity and mortality in many populations, especially ethnic, minority populations (Wang et al., 2017). There are many studies that have identified the sociodemographic predictors of obesity in African American (Obisesan et al., 2016), Asian (Lim et al., 2015), Hispanic (Smith et al., 2016), and Pacific Islander populations (Lassetter et al., 2014; Subica et al., 2017). Although over the past decade the number of South Asian immigrants has increased dramatically in the United States (Chan et al., 2019), few studies have explored the factors that contribute to obesity among this segment of the population. A review of the literature provided no study on the various factors that lead to obesity and overweight among female South Asian immigrants. This gap in knowledge on the potential risk factors of obesity among this immigrant group includes, but are not limited to, the roles of age, gender, socioeconomic status, and

acculturation, which have been identified as predictors of obesity among other immigrant groups.

In this study, I investigated the risk factors for developing obesity and overweight among female South Asian immigrants residing in the United States. Although there are many studies that look at the predictors of obesity and overweight among the Asian immigrants (Cook et al., 2017; Gong et al., 2018, 2019; Lim et al., 2015) there is no study to date targeting South Asian immigrants in the US. This study is therefore needed to bridge the gap in knowledge among the under researched South Asian immigrant populations and their health needs in the United States.

<h2 style="text-align:center">Problem Statement</h2>

Today, there are more than 5.4 million South Asians residing in the United States, and over 75% of them are foreign born (South Asian Americans Leading Together, 2019). Various studies have shown that immigrants from the South Asian countries are at an increased risk of developing atherosclerosis, obesity, type 2 diabetes, and hypertension (Misra et al., 2017; Volgman, et al., 2018) as compared to their counterparts in their home countries. There have been studies on obesity among Asian Americans (Alpert, & Thomason, 2016; Gong et al., 2018), but none have focused specifically on the South Asian immigrant population in the country. My study addressed this gap by focusingon the factors of age, income, level of education, employment status, neighborhood supportiveness, and acculturation as measured by length of stay that may predict obesity in South Asian immigrants residing in the United States. The data from the study clarifies the risk factors that increase the burden of obesity in this target population. An

understanding of predictors of obesity in specific ethnic populations identifies the factors that contribute to health disparities in the prevalence of obesity-associated chronic diseases (Byrd et al., 2018).

Purpose of the Study

This is a quantitative, cross-sectional study to investigate the predictors of obesity in the female South Asian immigrant population in the United States. I used secondary data from the National Health Interview Survey (2017, 2018) to collect data on individual demographics and other characteristics, such as presence of supportive neighborhood and length of time in United States, that could be used to identify the factors that lead to obesity among the female South Asian immigrant population in the United States.

Research Questions and Hypotheses

RQ 1: Are sociodemographic characteristics (age, and socio-economic status as measured by income, education level, and employment status) predictors of obesity and overweight among female South Asian immigrants in the United States?

$H_0$1: Sociodemographic characteristics (age, and socio-economic status as measured by income, education level, and employment status) are not the predictors of obesity and overweight among female South Asian immigrants in the United States.

$H_1$1: Sociodemographic characteristics (age, and socio-economic status as measured by income, education level, and employment status) are predictors of obesity and overweight among female South Asian immigrants in the United States.

RQ 2: Is living in a supportive neighborhood predictive of obesity and overweight among the female South Asian immigrants in the United States?

$H_0$2: Living in a supportive neighborhood does not predict obesity and overweight among female South Asian immigrants in the United States.

$H_1$2: Living in a supportive neighborhood predicts obesity and overweight among female South Asian immigrants in the United States.

RQ 3: Is level of acculturation (as measured by length of stay in United States) predictive of obesity and overweight among female South Asian immigrants in the United States?

$H_0$3: The level of acculturation (as measured by length of stay in United States) is not predictive of obesity and overweight among female South Asian immigrants in the United States.

$H_1$3: The level of acculturation (as measured by length of stay in United States) is predictive of obesity and overweight among female South Asian immigrants in the United States.

Theoretical Framework

The theoretical framework that helps understand the interplay of the social determinants as they affect the health of an individual is the socioecological model (SEM). The SEM is a theory-based framework that was conceptualized for understanding human development by Urie Bronfenbrenner in the1970s (Kilanowski, 2017). It is an approach that recognizes that the health of an individual is influenced by several factors at multiple levels. The SEM identifies five levels of influence that dictate health behaviors including the interpersonal factors, the interpersonal relations, institutional environment, community factors, and public policy (Schneider, 2014). The SEM is a

theory-based framework that recognizes that the health of an individual is influenced by several factors at multiple levels that influence the health behavior and health outcomes (Robinson, 2008). The SEM suggests that a change in any of these levels can result in changes in individual behavior.

Obesity is a complex condition. It has a multifactorial etiology with interactions among medical (genetic, hormonal) and non-medical (environmental, social, behavioral) factors (Pozza, & Isidori, 2017). The non-medical social, behavioral, and environmental factors continuously play a detrimental role in shaping the health of an individual. The WHO (2018) has termed these factors as the social determinants of health and has defined them as the conditions in which people are born, grow, live, work and age that are a direct result of the distribution of money, power and resources at global, national and local levels. These determinants of health are mostly responsible for health inequities or health disparities within people, communities, and populations.

Because the health of immigrants is shaped by an interaction between personal, environmental, and social factors, several studies have used SEM to understand the health behaviors of immigrants in the United States (Ayala et al., 2014; Lu et al., 2015; Ramos Salas et al., 2015). Thus, using this model as a theoretical framework was appropriate. This model helped identify possible social (acculturation), demographic (age, socioeconomic status, educational level), and environmental (place of residence) risk factors that increase the vulnerability of the South Asian immigrant population to developing obesity and overweight in the United States.

Nature of the Study

This study followed a quantitative cross-sectional study design. I examined how independent variables of age, income, level of education, employment status, perceived supportive neighborhood, and length of stay in United States as a proxy for acculturation are predictive of the dependent variable of obesity and overweight in the target population of the female South Asian immigrants in the United States. The study used data from the National Health Interview Survey, which is conducted by the Centers of Disease Control and Protection. The age criterion for eligibility was female participants between 18–60 years of age. I chose to limit the age to 60 years because of the changes that occur due to old age in a person's body composition such as gradual increase in fat mass, decrease in muscle mass, presence of sarcopenia, and the presence of some degree of underlying systemic inflammation (Batsis et al., 2016). The ethnicity criterion for eligibility was female participants from the variables Asian Indians and Asians (other).

Definition of Terms

Acculturation: Acculturation has been defined as a change in cultural patterns that result from exposure to the host country's lifestyle, environment, and culture (Berry & Sam, 2016; Redfield et al., 1936).

Body Mass index: BMI is a measure of adiposity in the body in relation to an individual's height and weight (Akinyemiju et al., 2016).

Measure of level of acculturation: Length of stay in the United States was used as a proxy to measure the level of acculturation (Commodore-Mensah et al. 2017; McIntire et al., 2021).

Obesity and overweight: Both being overweight, and obesity has been defined as disproportionate accumulation of fat in the body that may adversely affect the health of an individual (WHO, 2018). Obesity is defined as a BMI of $30kg/m^2$ or more and overweight is BMI between $25\text{-}29kg/m^2$ (WHO, 2018).

Socioeconomic status: A sociological construct that identifies an individual's position in the society, as measured by constructs such as occupation, educational level attained, level of income, and the place of residence (Stringhini et al., 2018). For this study the variables that were used to measure socioeconomic status include education level, income level, and employment status.

South Asia: The World Bank (2018) defined the South Asia as the region consisting of Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka. South Asian immigrants are members of the ethnic group native to any of these countries.

South Asian immigrants: Individuals born in any of the South Asian countries who have migrated to the United States as naturalized citizens, legal permanent residents, or undocumented/illegal residents.

Assumptions

I assumed that information received from participants in the National Health Interview Survey is truthful and accurate about their personal statistics, lifestyle, and demographics (age, height and weight, sex, physical activity level, SES, and ethnicity). I also assumed that the study participants were competent to understand and provided information. I also assumed that the participants who declared their race as Asian Indian

and Asian (other) would make up the South Asian immigrant group. These assumptions are necessary in order to ensure that data collected were appropriate for the analyses performed. The assumptions ensured normality, independence, linearity, and homoscedasticity of the data collected.

Scope and Delimitations

This study focused on identifying the predictors of obesity among the female South Asian immigrants in the United States. This study was limited only to the female South Asian immigrants living in the United States. Their ages ranged from 18 to 60 years old. This was a quantitative, cross-sectional study that involved a secondary dataset. The National Health Interview Survey dataset for the years 2017 and 2018 was accessed through the IPUMS health surveys website.

Limitations

This study was limited to public access data from the National Health Interview Survey from the IPUMS Health Surveys. Since only public access data were used, the exact country of origin could not be identified. In the NHIS database the Asian Indians and the Asian (other) choices were chosen to identify immigrants from the South Asian countries.

In addition, there were some limitations associated with the use of secondary data. Although random digit dialing was used to collect the initial data for the survey, there is always a potential for self-selection bias. Response bias can occur in any study that relies on information provided by participants during data collection (Creswell, 2009). Recall bias can occur due to individual responses to the NHIS questioning techniques,

questionnaire designs, and the mental competency of respondents to self-report the information. Recall bias can lead to overestimation or underestimation of the outcomes of this study. In order to account for these limitations, I evaluated the data to ensure that the variables used were consistent with my research topic.

Significance of the Study

Over the last few decades, the U.S. population has evolved into a melting pot of diverse ethnicities. Today, 13.5% of its population is made up of immigrants from other countries (Zong et al., 2018). Of this diverse population, the South Asians make up the largest and the fastest growing group of migrants. Immigrants from South Asian countries are diverse in terms of religion, socioeconomic status, education, and income, which means they have varied needs in terms of health care. Individuals who migrate from South Asia are at an increased risk of developing non-communicable diseases such as obesity, cardiovascular disease, and diabetes (Shah et al., 2015; Thomas & Ashcroft, 2013). Due to lack of physical activity, unhealthy dietary patterns, lack of health care services, demographic location, and language barriers, they are even more susceptible to becoming obese and overweight (Parackal, & Stewart, 2016; Shah et al., 2014). Furthermore, research suggests that females are more likely to be overweight and obese than their male counterparts (Lee, 2017). However, to the best of my knowledge there is no study targeting the various factors that lead to obesity and overweight among female South Asian immigrants. Thus, there is a need for gender specific weight loss strategies to reduce disparities in overweight and obesity (Tsai et al., 2016). This is important for developing gender and ethnicity specific interventions and creating an understanding of

factors that affect weight gain such as acculturation, place of residence in the United

States after migration, education, and income.

This study looked at the relationship between obesity and acculturation,

socioeconomic status, and place of residence on arrival in the United States. The findings

of this study can be used to plan and develop social and health interventions and policies

to prevent and control obesity among the target population. Understanding the underlying

causes of obesity in the South Asian population will provide an insight into what factors

need to be addressed at individual and community levels. The identification of

demographic risk factors such as the presence or lack of ethnically appropriate foods and

the physical environment could improve intervention efforts to reduce obesity disparities

in the South Asian female immigrant population. This information could be especially

useful for health organizations interested in working with this community so that they can

develop interventions to target the identified predictors.

This study will also add to the body of research on the relationship between

migration, immigrants, and their health. Migration results in many economic and social

benefits for the immigrants; however, it come with costs too. Immigrants face a variety of

social, economic, and political circumstances in host countries that pose challenges and

result in an almost complete realignment of life that can have significant consequences on

their health and well-being (Quesada et al., 2014). Although individuals migrate due to

social determinants of health, the process of immigration itself is a social determinant of

health that compels individuals to adapt to new environments and cultures (Castañeda et

al., 2015). Therefore, it is important to understand the impact of the process of migration

on immigrants and health related consequences. This understanding will help health care professionals to comprehend the arrival of immigrants in the host country and the process through which they adopt the obesogenic behaviors of natives so that they can effectively reduce health care cost of immigrants in the country.

Summary

Obesity is a health issue that has physical, emotional, psychological, and financial repercussions. Due to a range of factors, individuals of all ages, ethnicities, and genders are susceptible to developing obesity and overweight. Migration from low income and developing nations to developed countries is also now considered a determinant of health. Among other ethnicities, the South Asian immigrants make up one of the fastest growing groups in the United States. But there has been no study to investigate the factors that contribute to obesity and overweight among female South Asian migrants. This study provided information on significant associations between specific demographic characteristics and obesity. It also identified obesity predictors that are unique to only this population. The findings of this research will be useful in informing the development of appropriate population-based interventions that focus on addressing obesity in this population.

Chapter 2 focuses on an overview of current literature on different predictors of obesity in South Asian as well as other immigrant populations in the United States. It uses current literature to provide insight into how the social ecological model is used as a theoretical framework to explain and predict the phenomena of obesity among the South

Asian immigrants. This chapter also provides an overview of the research question and

hypothesis. Chapter 2 will consist of a detailed literature review.

Chapter 2: Literature Review

Obesity is a complex and serious yet treatable medical issue. It has been associated with significant morbidity and mortality in many populations, especially ethnic, minority populations (Wang et al., 2017). There are many studies that have identified the sociodemographic predictors of obesity in African American (Obisesan et al., 2016), Asian (Lim et al., 2015), Hispanic (Smith et al., 2016), and Pacific Islander populations (Lassetter et al., 2014; Subica et al., 2017). But despite the increase in the number of South Asian immigrants in the United States (Ramkrishan, & Ahmad, 2014), few studies have addressed the factors that contribute to obesity among this segment of the population. Various studies have shown that the immigrants from the South Asian countries are at an increased risk of developing atherosclerosis, obesity, type 2 diabetes, and hypertension (Misra et al., 2017; Volgman, et al., 2018) compared to their counterparts in their home countries. Though studies have been conducted on obesity among Asian Americans (Alpert & Thomason, 2016; Gong et al, 2018), none has focused specifically on the South Asian immigrant population in the country.

My study addresses this gap by focusing on the specific factors of gender, level of education, acculturation as measured by length of stay, socioeconomic status, and presence of supportive neighborhood that may predict obesity in South Asian immigrants residing in the United States. The collected data from the study clarifies the risk factors that increase the burden of obesity in this target population. An understanding of predictors of obesity in specific ethnic populations identifies the factors that contribute to

health disparities in the prevalence of obesity-associated chronic diseases (Byrd et al., 2018).

In Chapter 2, I will explore the literature, examine external knowledge and theories, and synthesize evidence related to obesity and overweight among South Asian immigrants in the United States. Specific search strategies search terms, pertinent databases, and studies will be reviewed to determine how the constructs aligned with my study. In addition, past and current literature on obesity and overweight causation factors will be presented to further elucidate the issue of obesity among South Asian immigrants and other races/ethnicities. The purpose of this review is to emphasize the global impacts of obesity that public health practitioners face around the world.

Search Strategy

The literature review for this study includes relevant and current peer-reviewed articles from different databases from 2016 to 2021. The databases included MEDLINE, PsycARTICLES, Health and Medical Complete, Health Sciences, Journal of the American Medical Association, Academic Search Complete, CINAHP Plus with Full Text, and Center for Disease Control and Prevention. I used the Walden University library database and the Google Scholar to search relevant and current peer-reviewed articles. The following keywords were used to search in the databases: *obesity and immigrants, South Asian immigrants and health behaviors, South Asian immigrants and obesity, obesity and education, etiology of obesity, health and immigrants, immigrants and socioeconomic status, acculturation and obesity, acculturation and immigrants, body mass index and immigrants, age, gender, education, and physical activity, ethnic*

enclaves and obesity, and *racial segregation and health behaviors.* I also expanded the search of the key words including *obesity in African American, Hispanic, Nigerian, Arabic and European, and residing in the United Kingdom,* and *Australia.*

Theoretical Framework

The SEM was used for understanding the predictors of obesity and overweight among the female South Asin immigrant population. The SEM hypothesizes that choices made by individuals are the result of interactions between intrapersonal and interpersonal factors as well as aspects of the social, organizational, and community environments in which they live (Sallis et al., 2015). Therefore, to understand the risk factors of obesity and overweight in South Asian female immigrant population, it is important to appreciate that the differences in the health of individuals occur due to complex interaction of genetic, non-medical, and medical determinants. Furthermore, it is mostly the individual behaviors that result in obesity such as diet and physical activity, which i are shaped by factors that affect the health in general but are at play at individual, community, and societal levels (Kellou et al., 2014; Olvera Alvarez et al., 2018). Interactions among all these factors help determine health behaviors and outcomes.

The SEM is a comprehensive approach that recognizes that the health of an individual is influenced by several factors at multiple levels that influence the health behavior and health outcomes (Robinson, 2008). This model highlights different levels that affect the health of an individual to create a clearer picture of social determinants of health (Robinson, 2008). The SEM identifies five levels of influence that dictate health

behaviors including the interpersonal factors, the interpersonal relations, institutional

environment, community factors, and public policy:

- Intrapersonal or individual factors include the non-modifiable biological factors

    such as age, and gender as well as knowledge, attitudes and skills

- Interpersonal relations such as family, friends, and colleagues

- Community, home, and socio-cultural environments such as household income

    and education level.

- Institutional environment refers to schools, and workplaces that can have a

    distinct effect on an individual's health behavior

- Public policy level that includes the laws and regulations on behavior related to

    health such as food labelling in restaurants. (Schneider, 2014)

The health of immigrants is shaped by an interaction between personal,

environmental, and social factors. Research shows that support from public policies

(Hawkes et al., 2015), and the interpersonal, physical, cultural, and organizational

environments is essential for the prevention and control of obesity (Tabak et al., 2015). A

supportive residential neighborhood may also have protective effect on women's health

because of the presence of immigrant social networks, resulting in increased social and

instrumental support (Abraído-Lanza et al., 2016). Influences from the social

environment are significant contributors to obesity (Mama et al., 2015; Ohri-Vachaspati

et al., 2014). In the presence of a supportive social environment, the decision to change

obesity-related behaviors becomes an easier choice (Campbell, 2015; Hoenink et al.,

2019; Suglia et al., 2016). When migrants transition from their native culture to that of

the host country, the cultural influences could impact their dietary patterns, contributing

to obesity (Harvard School of Public Health, 2014; Lesser, & Gasevic, 2014). In addition,

cultural values are mostly embedded in religious affiliations (Kumar et al., 2015), which

plays an important role in acculturation of immigrant groups (Goforth et al., 2014).

Religious beliefs not only stop individuals from adapting bad habits but also provides

social support that may influence emotional and physical health (Brewer et al., 2014). In

a supportive neighborhood, this religious social support comes from religious institutions

like churches, mosques, and temples. Thus, a combination of intrapersonal influences,

and the sociocultural context in which immigrants live could increase or decrease the risk

of obesity among immigrants.

By applying SEM, the pattern of behavior change regarding health within a

population group is studied within the social context which includes family, friends,

work, neighborhood associates, and community organizations (Ohri-Vachaspati, et al.,

2014). Using this model as a theoretical framework helped the current study identify

possible social (acculturation), demographic (age, socioeconomic status), and

environmental (place of residence) risk factors that increase the vulnerability of the South

Asian immigrant population to developing obesity and overweight in the United States.

The SEM provides a framework that takes into consideration the interaction of individual

behaviors and the environment in the development of health behaviors and weight

outcomes (Kim & Jang, 2018; Raynor & Champagne, 2016). The different levels include

intrapersonal factors, interpersonal factors, institutional or organizational factors,

community factors, and government and public policies (see Figure 1, Table 1).

Figure 1

Socioecological Model for Identifying Factors Predicting Obesity Among South Asian Female Immigrants

Organizational and policy

Facilities at work to maintain health, access to health care.

Community and social neighborhood context

Interpersonal

Family structure, age at which the person migrated, number of years spent in the host country

Intrapersonal

Age, income, level of education, employment status

Obesity and overweight among female South Asian immigrants in US
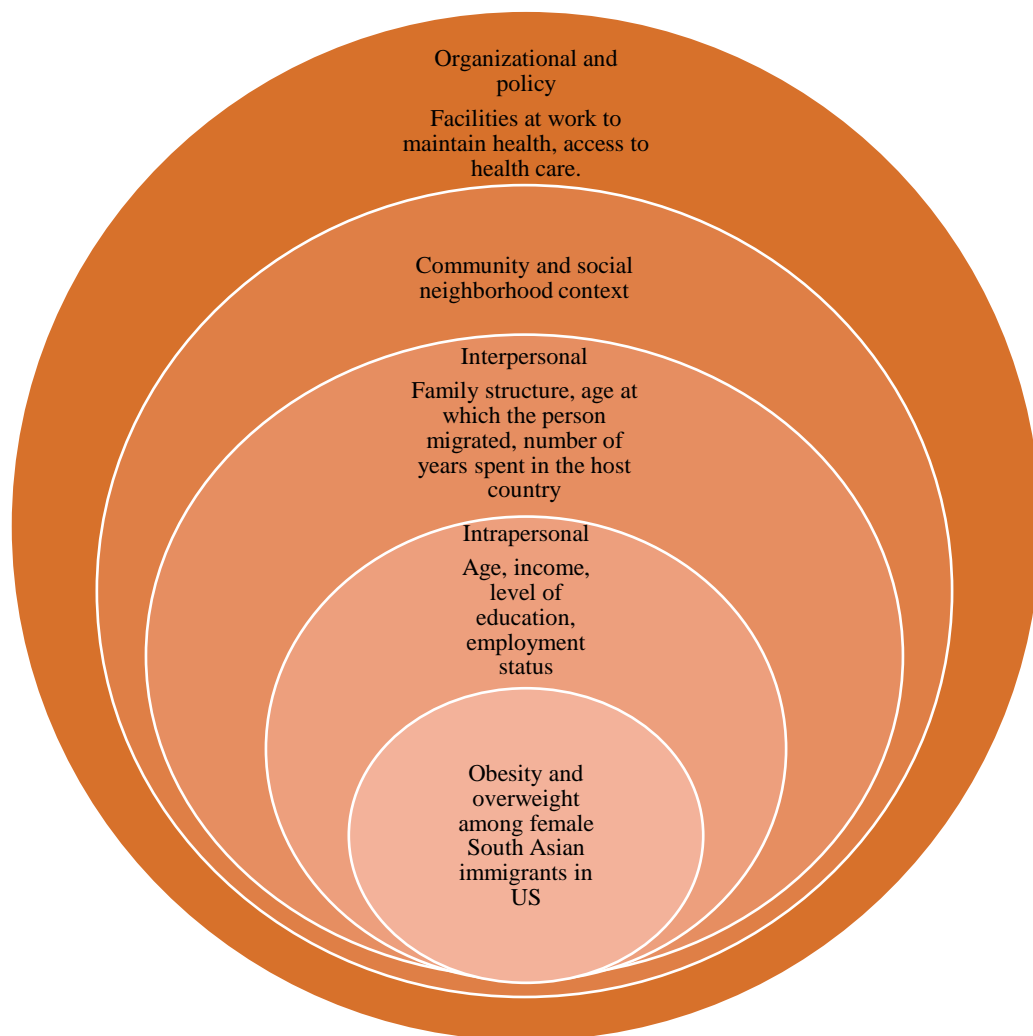
Note. Adapted from "A socioecological framework to understand weight-related issues in Aboriginal children in Canada" by N. D. Willows, A. J. G. Hanley, & T. Delormier, 2012, *Applied Physiology, Nutrition, and Metabolism, 37*(1), 1–13.

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Table 1

The Socioecological Model for Understanding Obesity Among Female South Asian Immigrants in the United States

Level	Description	Factors most relevant to obesity among South Asian female immigrants	Present study variables
Intrapersonal	Biological, psychological, and developmental factors	Older age, low socio-economic status, poor educational status	Age, socio-economic status, weight, height.
Interpersonal	Family, friends, colleagues, other social networks.	Inadequate family and friend support.	Length of stay in the country.
Community and social	Neighborhood context, religious institutes, support groups	Neighborhood, mosques, churches, temples, etc. for support.	Residence in supportive neighborhoods

Note. Adapted from "Social Ecological Approaches to Individuals and Their Contexts,"

by S. D. Golden & J. A. L. Earp, 2012, *Health Education & Behavior, 39*(3), 364–372.

https://doi.org/10.1177/1090198111418634

Literature Review

Over the past decades, researchers have investigated different predictors of

obesity and overweight such as acculturation as measured by length of stay in the host

country (Commodore-Mensah et al. 2017; McIntire et al., 2021), diet, and physical

exercise (D'Alonzo et al., 2020), socioeconomic status (Cook et al., 2017), and

neighborhood context (Borrell et al., 2016). The results indicated that overall, obesity was

associated with acculturation, dietary change in the host culture, stress, physical

inactivity, and low income for immigrant populations (D'Alonzo et al., 2020; Reed et al.,

2017). Although over the past decade the number of South Asian immigrants has

increased dramatically in the United States (Ramkrishan, & Ahmad, 2014), few studies

have explored the factors that contribute to obesity among this population of immigrants.

Therefore, this study focused on exploring the effect of specific factors of socioeconomic

status, acculturation, and the neighborhood context on development of obesity in South

Asian female immigrants residing in the United States.

Immigrants

Immigrants are a diverse group of population that are also referred to as foreign

born individuals. The U.S. Census Bureau (2020) described the term *foreign-born* or

immigrants as individuals who do not have United States citizenship at birth. This group

consists of individuals migrating for a better life, such as students, refugees, and asylum

seekers (U.S. Census Bureau, 2020). The United States is the world's biggest economy

and a popular destination of many immigrants. According to the United Nations (2017),

there were about 49.8 million immigrants in the United States in 2017. This increased

level of immigration has made the United States more culturally, religiously, and

ethnically diverse (Camarota & Zeigler, 2016; Litcher, 2012). An increase in cultural

diversity also means that immigrants now play an important role in defining the health

outcomes of the populations in the United States (Thomas, 2014). Although there have

been advancements in medicine and public health, disparities in health still exist for the

immigrants and minority groups. To overcome these disparities and strengthen the health

of the U.S. population, it is important to emphasize on the cultural competency in health

care through ethnicity specific research.

South Asia

South Asia is a densely populated and diverse region of the world. The World Bank (2018) defined the South Asia as the region consisting of Afghanistan, Bangladesh, Bhutan, India, the Maldives, Nepal, Pakistan, and Sri Lanka (see Figure 2). In 2017, the population of the South Asian countries was over 1.8 billion (United Nations, 2018), making it the most densely populated region of the world. The region is ethnically and religiously diverse and complex.

Figure 2

Geographical Representation of South Asian Countries

Note. From *South Asia*, by World Bank, 2018 (https://data.worldbank.org/region/south-asia). In the public domain.

The World Bank (2018) classifies the South Asian countries as mainly belonging to the low and lower middle-income levels of economic development. Maldives is the only country which is categorized at upper middle-income level (World Bank, 2018). Over the last few decades, the region has gone through rapid demographic,

epidemiological, environmental, and economic changes. Despite the economic growth of the region, problems like unemployment, poverty, poor security, and corruption at all levels of governments persist. Due to these issues many individuals migrate every year to high income countries like the United States, Canada, and the UK for a better lifestyle.

South Asian immigrants in the United States

Over the last few decades, the number of South Asian immigrants in the United States has increased tremendously. Immigration from Asia to the United States rose significantly after the 1965 Immigration and Nationality Act was passed (Zong & Batalova, 2016). This was especially true for South Asian countries (Lesser et al., 2014) which is the fastest growing population among all major ethnic groups (Asia American Federation, 2012; South Asians and Americans Leading Together [SAALT], 2019). The 2013 American Community Survey reported that nearly 4.3 million South Asians live in the United States, which had increased from 3.5 million in Census 2010 (Ramkrishan, & Ahmad, 2014). It has been projected that by the year 2065, South Asians will be the largest immigrant population group in the United States (SAALT, 2019). Of this diverse group, Indians make up about 80% of the total population of the South Asian community, followed by immigrants from Pakistan, Bangladesh, Nepal, Sri Lanka, and Bhutan (SAALT, 2019). Since the South Asian segment of the immigrant population represents the fastest growing ethnic group in the United States, it is important to quantify the risk of obesity among them to inform public health and health promotion strategies. Therefore, South Asian female immigrants are the selected population for this study.

Health of South Asian Population

The South Asia region makes up one quarter of the total world's population (The World Bank, 2013). It has many high priority public health issues such as lack of primary health care training, shortage of health care resources especially in rural areas, and reliance on private sector for health care which ends up being very expensive (Van Weel et al., 2016). South Asian adults are known to be at higher risk for developing cardiovascular disease and diabetes (Bank et al., 2017; Davis et al., 2013; Unnikrishnan et al., 2018). Misra et al (2017) reported that 27% of the deaths in South Asian countries occur due to cardiovascular disease, 4.0% due to diabetes, and 3.0% due to chronic kidney disease. Although the countries in the South Asian region are mostly economically underprivileged, there has been an increasing trend in the prevalence of obesity and overweight across all ages and genders (Jayawardena et al., 2017; Tripathy et al, 2016). This rising trend of obesity and overweight can be attributed to lack of physical activity (Pathak et al., 2018), easy access to calorie dense foods, stress associated behaviors due to social disparities, wealth inequalities, conflicts, and security issues (Misra et al., 2017). Therefore, immigrants from the South Asian countries may already have poor health outcomes before coming to the host country thus adding to the disease burden.

Obesity

Obesity is a growing public health issue that affects individuals of all ages, genders, races, and ethnicities. In 2013, the American Medical Association officially classified obesity as a disease (Puhl, & Liu, 2015). It has been reported that in 2015-

2016, 39.8% of adults and 18.5% of young individuals were obese or overweight (Hales

et al., 2017). Both being overweight, and obesity has been defined as disproportionate

accumulation of fat in the body that may adversely affect the health of an individual

(World Health Organization [WHO], 2018). Obesity is classified in many ways, one of

which is body mass index (BMI). BMI is a measure of adiposity in the body in relation to

an individual's height and weight (Akinyemiju et al., 2016). As there is a strong

correlation between BMI and fat mass upon assessment of a representative population

sample, BMI (kg/m²) is used by most health professionals to screen and diagnose

individuals for obesity and being overweight (Hebebrand et al., 2017). The WHO has

classified obesity according to the BMI (Table 1). According to this classification

individuals with a BMI of 25 to less than 30 are overweight and those with more than 30

are termed as obese (WHO, 2000). As the BMI increases so does the risk of developing

chronic conditions such as diabetes mellitus, heart disease, stroke, depression, and certain

cancers (Table 1).

Table 2

Classification of Overweight and Obesity in Adults by WHO

Classification	BMI	Associated health risks
Underweight	<18.5	Low (But risk of other clinical problems increased.)
Normal range	18.5-24.9	
Overweight	25.0 or higher	Average
Pre-obese	25.0-29.9	Increased
Obesity class 1	30.0-34.9	Moderately increased
Obesity class II	35.0-39.9	Severely increased
Obesity class III	40 or higher	Very severely increased

Note. Adapted from "Obesity: Preventing and Managing the Global Epidemic Report of a

WHO Consultation," by World Health Organization, 2000.

Obesity increases the risk of morbidity and mortality. It has been reported that each 5 kg/m2 higher BMI was on associated with about 30% higher overall mortality, 40% higher vascular mortality, and 60-120% higher for diabetic, renal and hepatic mortality (Prospective studies collaboration, 2009). It was also found that at a BMI of 30–35 kg/m2, the average survival was reduced by 2–4 years among individuals and at 40–45 kg/m2, it was reduced by 8–10 years (Prospective studies collaboration, 2009). Being overweight and obesity are associated with a variety of cardiometabolic diseases, such as type 2 diabetes mellitus, hypertension, hyperlipidemia, metabolic syndrome, cardiovascular disease (CVD), and certain types of cancers, and these conditions in turn contribute to increased mortality (Di Angelantonio et al., 2016). Due to these health-related consequences, obesity, and overweight results in huge public health burden. For this reason, there is increasing need for research regarding relationships between obesity and its predictors in various ethnic groups to help develop more effective public health policies and messages for preventing as well as treating obesity

Etiology of Obesity Among Immigrants

In the United States the immigrants form a heterogeneous population group that differ in terms of race and ethnicity, English language proficiency, conditions before migration, education and income level and settlement experiences. Despite their differences, most immigrants experience similar conditions such as unemployment, lack of health insurance, language barrier, housing conditions, access to social services and immigration status, that can result in health inequity (Castañeda et al., 2015). Furthermore, immigration policies of recent times have made it very difficult for

migrants to acquire access to healthcare and have also marginalized and stigmatized immigrant groups such as refugees and illegal immigrants (Almeida et al., 2016; Angel, & Berlinger, 2018; Hacker et al., 2015; Martinez et al., 2015; Torres et al., 2018). This has placed racial and ethnic groups in the United States at an increased risk of lack of access to care, and poor health outcomes from preventable and treatable conditions.

Obesity is a complex, serious and yet a preventable medical issue. Its etiology is multifactorial but is not fully understood regarding the role of pathophysiology, genetics, and epigenetics in the problem (Mitchelle, & Shaw, 2015). Generally, the risk factors for developing the problems of being overweight and obesity can be categorized into individual, socio-economic, environmental, medical, and psychological factors (Table 3).

Table 3

Risk Factors of Obesity

Categories	Risk factors
Individual	• Unhealthy dietary habits that includes intake of calorie-dense, nutrient-poor food choices. • Sedentary lifestyle • Genetics • Pre- and peri natal exposures
Socio-economic	• Low education status • Poverty
Environmental	• Inappropriate built environment that results in limited accessibility to physical activity resources. • Existence of food deserts that results in limited accessibility to fresh, and healthy food.
Medical	• Presence of diseases such as cushing's syndrome, polycystic ovary syndrome, hypothyroidism. • Intake of medications that may cause weight gain such as corticosteroids and anti-depression medicines.
Psychological	• Depression • Stress

Note. Adapted from "The Epidemiology of Obesity: A Big Picture," by A. Hruby, & F. B. Hu, 2014, *PharmacoEconomics, 33*(7), 673–689. https://doi.org/10.1007/s40273-014-0243-x

Individual Factors. Dietary patterns and diet quality have direct impact on a person's weight. Individuals become overweight or obese due to energy imbalance between the calories eaten and the calories used, resulting in surplus energy and a state of positive energy balance which causes increased body weight (Hruby, & Hu, 2014). Studies have shown that a high calorie diet and sedentary lifestyles contribute to the development of being overweight and obese (Reed et al., 2017; Vilchis-Gil et al., 2015). Research has also found strong correlation between family history of obesity and its early onset in children (Corica et al., 2018; Romero-Ibarguengoitia et al, 2018). In addition, over the years many genome-wide association studies (GWAS) have been conducted to identify obesity gene variants that increase susceptibility to this common metabolic disease (Berndt et al., 2013; Bian et al., 2013). These studies along with transferability studies, and candidate gene studies performed in different populations have identified gene variants that are associated with human obesity and being overweight (Abadi et al., 2016; Locke et al., 2015). About 140 obesity susceptibility genes are found to be associated with BMI, body fat percentage, and waist circumference, thus explaining the pathophysiology of human obesity (Pigeyre et al., 2016).

South Asian individuals have an increased prevalence of diabetes (Karter et al., 2013) and cardiovascular diseases (Misra et al., 2017). Therefore, it is importance to

identify the individual factors that may result in obesity and overweight among immigrants from this part of the world. The proposed study will aim identify some of the individual factors such as sedentary lifestyle, and family history of obesity among South Asian female immigrants.

      Socioeconomic Factors. Socioeconomic factors such as being low-income relative to other members of a society or globally, and correlating lower education levels, can influence body weight and health. In addition, obesity effects socioeconomic status of individuals. The review by Kim and Von den (2018) revealed that individuals who had lower income are more likely to be obese, and the obese tend to have lower incomes when compared with their non-obese individuals. Studies have shown that lower income, poor education status (Newton et al., 2017; Rogers et al., 2015), and shopping at lower-cost stores are factors that have been consistently associated with higher obesity risk (Caspi et al., 2016; Drewnowski et al., 2014). Poor socioeconomic status can promote development of obesity at all ages. It has been shown that poor socioeconomic status during childhood is strongly associated with adult obesity (Chaffe et al, 2015). The relationship between socio-economic status (SES) and obesity can be explained by differences in dietary intake and physical exercise at different levels of SES (Singh et al., 2010). Higher SES correlates with a healthier diet and greater access to exercise facilities (Drewnowski et al., 2014). The association of SES with obesity is further complicated when gender is considered. Studies have shown consistent inverse relationship between low SES and obesity among women, that is, females having a low SES are more vulnerable to developing obesity than females with a middle or high SES (Newton et al.,

2017; Truthmann et al., 2017) and that obese women tend to have lower wages than obese men thus resulting lower socioeconomic status (Kim, & Von den, 2018). Low socioeconomic status leads to calorie dense food choices which then leads to poor health outcomes.

The South Asian immigrants in the U.S. are diverse in terms of socio-economic status, education, and professional skills. Although a clear majority of South Asian immigrants in the US have high professional skills and educational levels, and better income levels, diversity exists within this community today as newer immigrants often struggle in jobs such as taxi drivers, store clerks, or small motel operators (Rahman, & Paik, 2017). This study collected data for education level and family income and will assess the relationship of these variables with the development of obesity and overweight among South Asian female immigrants in the United States.

Environmental Factors. Several environmental factors may lead to obesogenic behaviors. Specially individuals who are genetically vulnerable, may be at an increased risk of developing obesity if they live in an environment that facilitates high energy intake and sedentary lifestyle (Brehm, & D'Alessio, 2014; Kowaleski-Jones et al., 2017). Environmental factors impact the prevalence of obesity in a group of people and have been found to affect weight status and links to food and physical activity behavior. These environmental factors include: (a) access to recreation areas (Wolch et al., 2011), (b) proximity to fast food outlets, especially in low income areas (Mejia et al., 2015, Reitzel et al., 2014); (c) proximity to fast food outlets near schools (Alviola et al., 2014) and (d) the presence of walking and cycling infrastructure (Kowaleski-Jones et al. 2017). In

another study, Fradkin et al (2015) concluded that individuals living in areas with low

SES are more likely to have poor facilities for physical activity and grocery shopping

thus making it difficult to adopt and maintain a healthier lifestyle. Another environmental

factor that can contribute to obesity is existence of food deserts. These are the low-

income areas where healthy foods may be expensive, of poor quality, or inaccessible as

compared to junk, calorie dense and nutrient poor food. Studies have found positive

correlation of neighborhood food environment status such as presence of food desert with

obesity (Burgoine et al., 2017; Chen, Jaenicke, & Volpe, 2016). This study collected data

for the neighborhood and how supportive it is. This information helped identify the effect

of environmental factors on development of obesity and overweight in target population.

      Medical Factors. In addition to the obesogenic lifestyle, there are many primary

medical conditions that lead to excessive weight gain and obesity. Most of these medical

conditions are caused by hormonal imbalances. These include Cushing's syndrome

(caused by the complications of glucocorticoid excess), and Prader-Willi syndrome

(caused by DNA abnormalities) (Mayo Clinic, 2015). Prader Willi Syndrome is the most

common syndromic cause of obesity (Angulo et al., 2015). A few studies have also found

late onset hypogonadism to be a reason for obesity (Kelly, & Jones, 2015; Corona et al.,

2015). In addition, thyroid hormones are also linked to weight gain because they play an

integral role in basal metabolism and thermogenesis; also affecting glucose and lipid

metabolism, fat oxidation, and food intake (Sanyal, & Raychaudhuri, 2016). Therefore,

hypothyroidism has been known to cause excessive weight gain and obesity by decreased

metabolic rate and decreased thermogenesis (Silva et al., 2016; Sanyal, & Rachaudhuri,

2016). In another study, Ganesh et al (2016) found out that women were more likely to develop metabolic syndrome with hypothyroidism rather than men. Thus, hormonal imbalances play a significant role in development of obesity and should be considered as an important factor in treatment choices.

In addition to hormonal imbalances, certain medications also cause excessive weight gain. Although medicines are meant for improving or treating medical problems, they can be associated with weight gain and other adverse side effects (Verhaegen, & Van Gaal, 2017). These include antidepressants, anti-seizure medications (Singhal et al., 2018), diabetes medications like Sulfonylureas (Chaudhry et al., 2017), antipsychotic medications (Tek et al., 2016), steroids (Tamez-Pérez et al., 2015), and beta blockers (Marketou et al., 2017) may also cause obesity. Therefore, considering these probable poor health outcomes combined with the obesity crisis, it is necessary that health care providers consider the weight effects of medications before prescribing them.

Psychological Factors. Stress, depression or anxiety is associated with excessive eating as people tend to use food as a coping mechanism. Psychological stress has been defined as an interrelated set of physiological reactions to unpredictable and mostly uncontrollable conditions where an environmental or internal demand exceeds the natural regulatory range and adaptive capacity of an organism (Koolhaas et al., 2011). In response to chronic stress, the human body produces more of the glucocorticoid and elevated basal glucocorticoid levels which cause energy conservation and appetite stimulation (Lupien et al., 2009; Sominsky, & Spencer, 2014). Due to this mechanism, psychological stress has long been associated with overweight and obesity (Barrington et

al., 2012; Sinha, & Jastreboff, 2013). Depression is another psychological issue that has

been linked to obesity and overweight. Depression not only causes obesity (Olvera et al.,

2015; Lasserre et al., 2014), but also individuals who are obese may experience

depression due to body shaming, social isolation, and discrimination (Ha, & Kim, 2017).

Studies have shown that loneliness and social isolation is associated with increased eating

which may result in overweight and obesity (Mason et al., 2016). Obesity is a physical as

well as psychological problem. Therefore, any intervention program should include

psychological assessment to ensure successful and long-lasting results.

Obesity Among South Asian immigrants

Obesity is a huge public health issue in the US among individuals of all genders,

age groups, and ethnicities. The immigrants from the South Asian countries are at an

increased risk of developing obesity, type 2 diabetes, and hypertension (Commodore-

Mensah et al., 2018). Data suggests that South Asians living in the United States have the

highest rates of overweight/obesity and develop insulin resistance at a lower body mass

index when compared to other ethnic groups (Commodore-Mensah et al., 2018). There

are many studies that document the major changes that occur when people from South

Asian countries migrate to the richer countries as their diets include more of the

convenience foods, sugar concentrated beverages, red meat and dining out (Lesser,

Gasevic, & Lear, 2014; Holmboe-Ottesen, & Wandel, 2012). However, this process of

change is complex and depends on a plethora of factors such as country of origin, urban

or rural residence on arrival, socio-economic and cultural factors, availability of

culturally appropriate foods, and situation in host country (Holmboe-Ottesen, & Wandel,

2012). Many studies have demonstrated that the immigrants from the South Asian countries are at an increased risk of developing obesity, type 2 diabetes, and hypertension (Shih et al, 2014; Du et al, 2017). However, little is known about the factors that contribute to the development of obesity and overweight. Therefore, there is a need to study the factors that specifically affect the health of the South Asian immigrants in order to reduce and control the burden of obesity and overweight among this population group.

Obesity Among Female South Asian immigrants

Obesity is a growing global public health issue that affects women more than the men. World over women are more likely to be obese than men. It has been reported that in the US, between 2011–2014, the age-adjusted prevalence of obesity was 38.3% among women and 34.3% among men (Ogden et al., 2017). In addition, obese women are at an increased risk of developing other life-threatening diseases such as cardiovascular disease, diabetes, hypertension, dyslipidemia, stroke, and cancer (Seiler et al., 2018). It has been suggested that only 5-10% of all cancers occur due to genetic predisposition, while 90-95% can be caused by environmental factors or unhealthy lifestyles, including alcohol consumption, unhealthy eating patterns, and obesity (Schwingshackl et al., 2017). In addition to cancer, about a quarter of all deaths among women in North America and Europe are caused by cardiovascular disease (Record et al., 2015) which is also a consequence of overweight and obesity. Therefore, obesity and its comorbidities contribute to disease burden and increased health care costs.

Following migration, a drastic change in lifestyle of immigrants, results in an increased prevalence of obesity and over-weight. Research has demonstrated that this

phenomenon occurs due to decreased physical activity (Khan, & Jackson, 2015), and increased consumption of calorie dense convenience foods. Khan and Jackson (2015) reported that a group of immigrants from low income South Asian countries in the US exercised on average two days every week. Khan and Jackson (2015) also reported an abnormally large waist circumference in 57% of the females as compared to 43% of males. A change in physical activity among immigrants has been attributed to multiple factors that might be cultural and religious, issues of social relationships, socioeconomic challenges, and environmental factors (Wieland et al., 2015). Thus, poor socioeconomic status, and neighborhood safety issues may lead to reduced physical activity and obesity will eventually result in increased healthcare costs and burden.

Economic Burden of Obesity

Obesity is a global public health problem that poses significant financial burden on the individual as well as national level. In 2014 about 2.1 billion or 30% people around the world were obese or overweight and 5% of the deaths were attributed to these conditions (Tremmel et al., 2017). This alarming increase in the prevalence of obesity is among all genders, ages and ethnicities. Research shows that people who are obese have a shorter life expectancy than their counterparts with normal weight (Kitahara et al., 2014) and are at high risk of developing other chronic diseases such as diabetes mellitus, cardiovascular diseases, cancer, sleep apnea, stroke, and mental health issues such as depression and anxiety (Frühbeck et al., 2013). This strong association between obesity and chronic diseases, inevitably results in an increased use of healthcare by obese and overweight individuals.

Obesity and its associated problems have significant impact on the health care expenditure. This impact can be direct or indirect in nature. Direct healthcare costs include preventive, diagnostic, and treatment services related to obesity and its associated medical issues such as diabetes mellitus, stroke, and cardiovascular issues (CDC, 2018). Indirect costs include the morbidity and mortality costs such as absentee from work which leads to decreased productivity (CDC, 2018). Research shows that an individual suffering from obesity experience about 25% higher healthcare expenditure than an individual with normal weight (Withrow, & Alter, 2011). It is important to emphasize the need for research that studies the disproportionality and the extent of the cost of treating people with different degrees of obesity and its comorbidities as this can help health care professional in making decisions about how to allocate and use resources effectively.

There are several studies that have examined the healthcare expenditure associated with obesity and overweight. Yates et al (2016) estimated the excess costs of overweight and obese (classes I–III) as compared to normal weight persons in southern Germany. Their study was based on self-reported resource utilization and measured BMI of 6731 individuals (31–96 years old) with 9070 observations. They concluded that compared to individuals with normal BMI (18.5 kg/m2 ≤ BMI < 25 kg/m2), direct costs of healthcare started to increase at the obesity level II (35 kg/m2 ≤ BMI < 40 kg/m2), and indirect costs at the overweight level (25 kg/m2 ≤ BMI < 30 kg/m2) (Yates et al., 2016). In another study, An (2015) concluded that between the years 1998 to 2011 the healthcare costs associated with obesity and smoking increased alarmingly in the US. It was reported that the estimated per-capita expenses due to obesity and smoking increased

by 25% and 30% for total health care, 41% and 48% for office-based medical provider services, 59% and 66% for emergency room services, and 62% and 70% for prescriptions. This alarming increase is not just in direct health care costs but also in indirect expenditure too.

Obesity and its associated conditions cost the governments and individuals billions of dollars a year. The huge toll that it takes on health and well-being is beginning to raise social, political, and financial awareness among individuals, communities, states, nations, and international organizations to do more to control this issue. In addition to direct costs, obesity also results in indirect costs in the form of lost productivity and poor economic growth due to lost workdays, lower productivity at work, mortality, and permanent disability (Tremmel et al., 2017). Absenteeism is the most common measure of indirect costs due to the ease in measurement and is defined as the time away from work due to overweight and obesity (Goettler, Grosse, & Sonntag, 2017). Neovius et al., (2012) estimated lifetime productivity losses of $18,064 for overweight and $19390 for obesity by using the human capital approach. Productivity at work due to overweight and obesity is measured in terms of work productivity loss which refers to the value of production that is lost because of morbidity or mortality (Nyman, 2011). In 2010, the production losses due to obesity were estimated to be $73.1 billion (Finkelstein et al., 2010). Other studies that document that obesity is results in productivity loss include Cash et al. (2011), and Nigatu et al., (2016). In another study Lee, Choi, Chang, and Suh (2015) concluded that among patients with diabetes who also had obesity, the loss of productivity costs was 1.02 times greater than normal-weight patients with diabetes.

Therefore, due to high productivity losses, obesity and overweight are serious economic concerns on an individual as well as national level.

An understanding of the factors associated directly or indirectly with obesity puts into perspective the burden on the health services, the national economy, and the individual mental and physical health. By achieving a better and clearer knowledge of the factors that result in obesity will help develop larger and more urgent research projects and programs to prevent and treat it effectively.

Acculturation

There are numerous determinants of overweight and obesity which put certain subgroups of the population more at risk for developing these conditions. This may be especially true for the individuals who migrate from low- to medium-income countries to high-income countries. Studies have shown that upon arrival, immigrants have lower BMI which increases with longer residence in the US (Argys, 2015, Krueger et al., 2014;). This is attributed to the acculturation process. Acculturation has been defined as a change in cultural patterns that result from exposure to the host country's lifestyle, environment, and culture (Redfield et al., 1936). Simply put, acculturation is the assimilation of immigrants into the host society. People migrate to high income countries for a better life, income and opportunities. However, high-income countries also have their fair share of issues such as high mortality rates due to obesity and obesity related diseases (Żukiewicz-Sobczak et al., 2014; World Health Organization, 2018).

Several studies have been conducted about the state of obesity among migrant populations in high income countries such as the US (Commodore-Mensah et al, 2018;

Ro, & Fleischer, 2014), Canada (Ramos Salas et al., 2015; Sercia et al., 2018), United

Kingdom (Hayes et al., 2017), and Australia (Menigoz et al.,, 2016). Most studies

acknowledge the differences between the health patterns of the native and immigrant

populations (Norredam et al., 2014; Vandenheede et al, 2015), health status among

immigrants from different ethnicities (Menigoz et al., 2016), and that the health of

immigrants deteriorates with an increased duration of stay in the host country (Gimeno-

Feliu et al., 2015; Norredam et al, 2014). When migrants first arrive in the host country,

they are generally healthier with lower morbidity and mortality. This phenomenon has

been termed as the Healthy Migrant Effect (Razum, 2008; Kuebran, 2016). A general

explanation of this phenomenon suggests that only those individuals migrate who have

the level of physical, mental, and emotional fitness that is required for the process and

that anyone with marginal or poor health self-exclude themselves from the group

(Kuebran, 2016). However, this phenomenon is short-lived, and the health of immigrants

becomes comparable to those of host populations as they get integrated into the culture of

the host country.

Acculturation has been studied on its own as well as a predictor of health

outcomes. It has been associated not only with health reducing outcomes such as

increased intake of refined sugar and convenience foods (Gasevic & Lear, 2014), and

decreased intake of fruits and vegetables, but also with health enhancing behaviors such

as improved use of preventive healthcare facilities. Most studies have concentrated on the

negative effects of acculturation on the health of immigrants due to changes in cultural,

socio-economic, and psychosocial lifestyle. A study conducted by Denova-Gutiérrez

(2015) demonstrated that Mexican migrants in the US had a higher prevalence of cardiovascular risk factors such as obesity, hypertension, and impaired glucose tolerance as they were eating more of a westernized diet. Similarly, Lesser et al., (2014) demonstrated that although the immigrants from South Asia in Canada did develop some positive dietary habits such as increased intake of fruits and vegetables, there was also an increase in consumption of convenience foods, sugar-sweetened beverages and red meat. In another study Affable et al., (2015) also found that increased duration of stay in the US of Chinese immigrants resulted in an increased risk of obesity among them that can be attributed to a more sedentary lifestyle. However, the target population for most of these studies are the Hispanics/Latinos, or African immigrants. Therefore, there is an increasing need for investigating the effect of acculturation on South Asian migrants as it is one of the fastest growing ethnic groups in the country.

Immigrant research has largely focused on the acculturation process. Mostly there are two type of measures that have been employed in a quest to answer questions regarding the acculturation process among various immigrant groups. Many researchers have developed scale measures to access acculturation such as measuring language, use of media in the host country, values, lifestyle, attitudes and ethnic social relations and networks (Delavari et al., 2013; Hunter-Adams et al., 2017; Rosenburg et al., 2017). Other temporal measures that have been used include the length of residence in the host country and the age at arrival in the host country (Delavari et al., 2013). Although scale measures are more accurate for measuring cultural changes, the temporal measure are easily available and are widely used in immigrant health research (Delavari et al., 2013;

Center for Substance Abuse Treatment, 2014). Also, certain temporal measures are often the only available indicators of acculturation in many of the data sets routinely used to study the health of different ethnic minorities such as the South Asians.

For this research, length of residence in the US will be used to measure acculturation. Length of residence has been used by many researchers (Da Costa et al., 2017; Menigoz et al., 2016; Nguyen et al, 2014) as may influence immigrant overweight and obesity through behavioral change such as adoption of sedentary habits (Murillo et al., 2015) and unhealthy dietary habits such as increased intake of convenience, calorie dense foods (Lesser et al., 2014). Since the target population for this research will comprise of adults only, therefore, the length of residence in the United States will be used to measure the acculturation process.

Neighborhood Context of Obesity Among Immigrants

The U.S. immigrant population is large as it comes from every country of the world, because of which it has diverse cultural, and socioeconomic characteristics and settlement patterns (Kritz, & Gurak, 2015). The destination of immigrant settlement is a choice that has financial, social, and adjustment implications for both immigrants and the receiving area (Hall et al., 2016). Where immigrants choose to live, depends on multiple factors such as presence of friends and acquaintances, proximity of religious institutions and ethnic markets (Al Wekhian, 2015). The Socio-ecological model emphasizes the importance of the effect of community and the socio-cultural environment on an individual's health behaviors. This includes not just the home environment but also the

neighborhood. A safe and clean neighborhood can provide a sense of belonging, and support which ultimately will promote positive health outcomes.

Although genetics and biology are known to account for obesity and overweight among ethnic groups, neighborhood in which the immigrants end up living also help shape their health behaviors thus playing an important role in explaining differences in health outcomes. Fitzpatrick and LaGory (2011) have identified neighborhoods as spaces for shaping health outcomes as they postulate that health is a consequence of how individuals live and where they live. Neighborhoods are no longer considered just a geographic location, in fact they are a product of social and physical environments that affect the health and well-being of individuals by identifying the resources they have access to, the risks and challenges they will face, and the opportunities available to them (Minh et al., 2017). Neighborhoods help shape health of individuals through many different mechanisms such as built environment, social interactions, and sense of safety.

Neighborhoods are an important aspect of immigrant adaptation and acculturation to U.S. society. Research investigating the relationship of supportive neighborhood with obesity has produced mixed results. According to Borrell, Graham, and Joseph (2016) children and adolescents living in non-supportive neighborhoods had a 21% higher chance of being obese than their peers living in supportive neighborhoods. However, Rodriguez et al., (2018) reported a higher mortality due to cardiovascular disease in counties with higher Hispanic ethnic density. This may be because the newly arrived immigrants first settle in a neighborhood with a higher concentration of people from the same country of origin, thus limiting exposure to the host society's culture and norms.

Also such neighborhoods are predominantly exhibit low socio-economic status which translates to limited healthcare and exposure to poor health risks. Still other studies have found no association between ethnic density and development of obesity and chronic conditions like diabetes mellitus and cardiovascular diseases (Grigsby-Toussaint et al., 2015; Lim et al., 2015). These mixed results can be explained by various study differences such as differences in racial/ethnic groups and densities being investigated, as well as a variety of area definitions to operationalize ethnic density (Bécares et al., 2012). Therefore, vigorous research is needed to investigate and better understand the association of obesity and ethnic clustering.

Although the South Asian immigrants form one of the fastest growing ethnic groups in the US, very little research has been done to look in the effect of ethnic clustering on health outcomes. Most of the studies on ethnic clustering and its effects on health have been conducted on Black (Alvarez, & Levy, 2012; Borrell et al., 2016; Kirby et al, 2012), and Latino immigrants (Alvarez, & Levy, 2012; Grigsby-Toussaint et al., 2015; Rodriguez et al. 2018). A few studies have looked at the health of Asian immigrants as related to ethnic clustering. For example, Kandula et al., (2009) found that Asian American women living in California in ethnically clustered areas were less likely to smoke, yet higher smoking rates were reported by Li et al., (2013) among first-generation Asian immigrant men in New York City (NYC). These mixed results regarding neighborhood and its association to immigrant health may be due to the cultural, economic and social diversity of Asian Americans (Lim et al.,2017). Although the South Asian population is the fastest growing (Asia American Federation, 2012;

SAALT, 2015) there is no research that has looked at supportive neighborhood and its

association with the development of obesity and being overweight among the South

Asian immigrants. In the US, the five states that have the largest South Asian immigrant

population are California, New York, New Jersey, Texas, and Illinois (SAALT, 2019).

The metropolitan cities that have the largest concentration of this population group

include New York City, Chicago, Washington, DC, Los Angeles, and San Francisco

(SAAALT, 2019). Table 4 shows the top 5 metropolitan cities with the highest South

Asian immigrant populations.

Table 4

Top 5 Metropolitan Areas with Highest South Asian Immigrants

Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka
New York City	Atlanta, GA	New York City, NY	New York City, NY	New York City, NY	New York City, NY
Washington DC	Dallas, TX	Chicago, IL	Washington DC	Houston, TX	Los Angeles, CA
Detroit, MI	Houston, TX	Washington, DC	Dallas, TX	Chicago, IL	Washington, DC
Los Angeles, CA	Seattle, WA	Los Angeles, CA	Boston, MA	Washington, DC	San Francisco, CA
Philadelphia, PA	Phoenix, AZ	San Francisco, CA	San Francisco, CA	Dallas, TX	Dallas. TX

Note. From "A demographic snapshot of South Asians living in the United States," by

South Asian Americans Leading Together, 2019 (https://saalt.org/wp-

content/uploads/2019/04/SAALT-Demographic-Snapshot-2019.pdf)

*Data for Maldivian population is not available as only those population groups are listed

that have a population of 100 or more within a geographic area.

Obesity is public health issue caused by a variety of factors. The focus of obesity

research has moved beyond individual behavior to social factors such as relationships and

support systems and environmental factors such as the built environment and the

shopping and exercise facilities available (Kramer et al., 2016). Where immigrants settle eventually may have a profound effect on their health behaviors and outcomes. To date there is no study that has looked at the relationship of South Asian immigrants and the characteristics of their neighborhood and the development of obesity and overweight. This study aims to address this gap in literature and will determine the association between living in a neighborhood which is supportive to the South Asian immigrants and development of obesity and overweight among females. This will help public health professionals in better understanding the predictors of obesity in this population which will eventually lead to targeted health programs for improved efficacy.

Summary and Conclusion

Obesity is one of the most researched public health issues. This literature review represents the growing knowledge and abundance of literature on obesity. The wide-ranging literature review is a summary of peer reviewed scholarly articles in the study of obesity in a diverse range of cohorts (Asian Americans, Latinos, Black Americans, etc.). There is no doubt that a complex interaction between social and demographic risk factors lead to obesity and overweight among individuals. The causes of obesity and outcomes of obesity are unique and differ in different populations. Although many researchers and government organization seek to identify racial disparities in health, their efforts are hindered by the limited availability and inconsistent quality of data on race, ethnicity, and other characteristics of individuals. Some national datasets do collect information about racial and ethnic background of individuals but unfortunately this information is absent from the public access domain because of which more generalized research is conducted

more often. This chapter identified a gap in literature by looking at obesity predictors in South Asian immigrants so that prevention could be tailored to their unique risk factors. Now that this chapter is complete, the researcher will now proceed to the methodology of the research in chapter 3. In Chapter 3, I will discuss the proposed methodology for the study including the use of secondary data, the study design and rationale, sample setting, operationalization and constructs, data collection, the G*Power analysis, the parameter, method of analysis, and ethical considerations.

Chapter 3: Research Method

This quantitative, cross-sectional study looked at the relationship between obesity and acculturation, socioeconomic status, and residence in supportive neighborhoods to investigate the predictors of obesity in the female South Asian immigrant population in the United States. Secondary data from the National Health Interview Survey (2017, 2018) was used to collect data on individual demographics such as age and socioeconomic status, and other characteristics such as presence of supportive neighborhood, and length of time in United States. This information can be useful for health organizations interested in developing interventions to target the identified predictors in this population. This chapter will provide a description of the research methodology used to carry out this research. In addition, I will describe the research design, sample population, data collection, and analysis methods.

Research Design and Rationale

This is a study with cross-sectional research design. The aim of the study was to find out whether independent variables of age, socioeconomic status (as measured by income, level of education, and status of employment), acculturation (as measured by length of stay), and residence in supportive neighborhood are predictive of obesity outcomes in the sample population (dependent variable). This study used secondary data to identify a snapshot of the demographics and lifestyle characteristics that exist in the study population between a specific timeframe (see Frankfort-Nachmias & Nachmias, 2015). A cross-sectional study focuses on the current association between the variables being investigated in the study population (Creswell, 2013; Frankfort-Nachmias &

Nachmias, 2015). This research design was appropriate for this study because it did not require any follow-up ,and I did not aim to test an intervention or treatment between control and experiment groups. The data used for this research were secondary. There are several advantages of using secondary data. The most important benefits of using secondary data include its economical aspect, breadth of data available, and the fact that data collection process is carried out by expert and professional individuals that may not be available to individual researchers or small research projects (Boslaugh, 2007).

Methodology

Population

For this study, data from NHIS from 2017–2018 was used. The target population consisted of the female immigrants from South Asian countries between the ages of 18–60. Female immigrants above the age of 60 were not included because increasing age can impact BMI (Mui et al., 2018).

Sampling and Sampling Procedure

The NHIS is a cross-sectional household national survey conducted every year as face-to-face interviews by the NCHS, which is part of the CDC. The target population for the NHIS are the civilian, non-institutionalized individuals who are 18 years of age and older (CDC, 2020). The survey excludes people with no fixed household address, active-duty military personnel and civilians living on military bases, persons in long-term care institutions, persons in prisons and jails, and U.S. citizens living in foreign countries (CDC, 2020).

The NHIS dataset uses stratified, multistage probability sampling of the civilian, noninstitutionalized, and nationally representative resident of United States (CDC, 2020). The NHIS uses geographically clustered sampling methods to select the sample for interview and ensures that it is nationally representative. The NHIS survey focuses on particular demographic characteristics of the population that accurately answers the research questionnaires and also fluent in English and Spanish/Hispanic (CDC, 2020). Subjects are randomly selected and are notified about the nature of the study and the expected outcome (CDC, 2020). The sampling process for the survey gets started by dividing the country into 1,689 geographic areas (National Center for Health Statistics (NCHS), 2020). After that within some states, the geographic areas are divided into two strata defined by population density mostly urban counties and rural counties (NCHS, 2020). The geographic areas from all the rest of the states form one stratum and clusters of addresses are then defined within each stratum consisting of approximately 2,500 addresses per cluster (NCHS, 2022). The sample design for NHIS is redesigned every 10 years. The redesign for the 2016–2025 NHIS, expected to yield about 27,000 adult and 9,000 child completed interviews in 35,000 households (NCHS, 2022).

For this study I used the secondary dataset from the CDC/NHIS collected for the years 2017–2018. It was the most current data containing both the independent and dependent variables available to the public in the public domain. I used data from 2 years to ensure sufficient sample size for the population selected. NHIS data were available for use as the public data set and the restricted-use contractual data set. The public dataset includes general information collected during the survey, whereas the later contains

confidential information that can lead to identification of survey respondents. For my

study, the public data set was obtained for which no special permission was needed.

I used G*Power version 3.1.9.7 software to calculate the sample size, anticipating

the use of binominal logistic regression as the statistical test method. The following

factors were used to calculate the sample size in G*Power software: alpha (α err

probability) - 0.05, medium effect size – 0.15 and power (1-β err probability) - 0.95. The

power is the magnitude of the strength of the study and determines the viability of the

null hypothesis (University of Wisconsin, n.d). The effect size is considered the main

finding of a quantitative study that tells the degree to which what variables are being

investigated are present in a sample population which can be representative of a larger

population (Sullivan, & Feinn, 2012). The power was set at 0.95 or (95%, confidence

interval CI), (1-β err prob), this was the probability of estimated participants assumed to

be sufficient enough to find statistical effect size of 0.3% or (30%), anticipated odd ratio

(OR) significance of 1.3, and R2 = 0. Pr(Y=1/X=1) H0 = 0.2. Using the G*power

software, a sample size of 104 will result in a power of .95 which shows that this sample

size will be adequate to achieve a high power thus reducing the chance of type II error.

Data Source

As mentioned data was obtained from the National Health Interview Survey for

2017–2018. NHIS monitors the health of the United States population through the

collection and analysis of data on a broad range of health topics (CDC, 2020). A major

strength of this survey lies in the ability to categorize these health characteristics by many

demographic and socioeconomic characteristics. The survey provides population-based

estimates on a wide range of variables such as health insurance coverage, health status, and health care utilization (Blewett et al., 2016). Each year they work with a sufficient sample size to allow analyses on the basis of age, race, gender, income, and other population characteristics (Blewett et al. 2016). NHIS data has been used widely to monitor trends in obesity and overweight (Commodore-Mensah et al., 2018; Mui et al., 2018, Weissman et al., 2019).

Instrumentalization and Operationalization of Constructs

Data from the NHIS were accessed from the IPUMS website. The NHIS is the principal source of information on the health of the civilian noninstitutionalized population of the United States. It is one of the major data collection programs of the NCHS which is part of the CDC.

Operationalization

Operationalization refers to the ability to translate the variables in research to methods and procedures that make them observable (Webster & Sell, 2014). Operationalization lays out what will be measured, how it will be measured, and what rules will be assigned to different values to be observed and how these values will be interpreted (Webster & Sell, 2014). This study hypothesized that socioeconomic status, level of acculturation (as measured by length of stay in United States), and residence in a supportive neighborhood are predictive of obesity and overweight among the female South Asian immigrants in the United States. This study measured constructs of three levels of social influence of social ecology: (a) intrapersonal (age, socio economic status as measured by income, education, and employment status), (b) interpersonal

(acculturation as measured by length of stay in United States), and (c) community (presence of supportive neighborhood). This allowed for the examination of the relationship between these influences and the prevalence of obesity in the sample population. Both being overweight, and obesity has been defined as disproportionate accumulation of fat in the body that may adversely affect the health of an individual (WHO, 2018).

Dependent Variable

The dependent variable for this study was the presence or absence of overweight and obesity. BMI was calculated within the survey by using self-reported weight in kilograms divided by self-reported height in meters squared and rounded to the nearest 0.1 kg/m2. For this study body mass index was used as a categorical variable: (a) Normal weight (BMI less than 24.9), (b) Overweight/ obese (BMI of more than 25-29.9).

Independent Variables

The independent variables of this study were age, socioeconomic indicators (level of education, income, employment status), presence of supportive neighborhood, and acculturation as measured by the length of stay in the US. For the purpose of analyses, age was used as a continuous variable, and level of education, income, and employment status, and supportive neighborhood were used as categorical variable.

Acculturation has been defined as a change in cultural patterns that result from exposure to the host country's lifestyle, environment, and culture (Berry, & Sam, 2016; Redfield et al., 1936). For the purpose of this research, length of stay in US was used as proxy for determining acculturation among the sample population. In analysis I used

years lived in US as categorical variable as less than 1 year to less than 5 years, 5 years to less than 10 years, 10 years to less than 15 years, and 15 years or more.

The sociodemographic characteristics that were included in the analysis included age, South Asian subgroup, education, income, employment status, neighborhood supportiveness, and number of years lived in US. I conducted binary regression analysis for each of the research questions. I used length of stay in US as a covariate in research questions 1 and 2, and age as a covariate in research questions 2 and 3. This helped improve the model and achieve more precise results.

Data Analysis Plan

The data analysis for the study was run by using SPSS version 27. The first step to data analysis is to clean the data. Therefore, I first identified which variables were to be used in the analysis, what these variables will look like, and how these variables will interact with each other. In addition, extra spaces and cells will be deleted. My initial plan was to create composite variables for socio economic status and supportive neighborhood based on the variables measured. However, I was unable to do this as no guidelines were given in the original data set for such treatment of the variables. Thus, each of the socio-economic variables (income, education, and employment status) were looked at individually. Weighs were attached to all respondents in a group to compensate for non-respondents in the same group.

Data analysis was conducted to answer the following research questions:

- RQ1 Are sociodemographic characteristics (age, and socio-economic status as measured by income, education level, and employment status) predictors of obesity and overweight among female South Asian immigrants in the US?

- RQ2 Is living in a supportive neighborhood predictive of obesity and overweight among the female South Asian immigrants in the US?

- RQ 3 Is level of acculturation (as measured by length of stay in US) predictive of obesity and overweight among female South Asian immigrants in the US?

By using SPSS 27, descriptive statistics were used to summarize the characteristics of the sample population. The percentage distribution, frequency distribution, central tendencies, and distribution in histogram shape was computed. By providing a summary of all the information collected, the quantitative observations of the type of data will provide an initial picture of what exists in the sample population. The descriptive analysis of the independent variables was conducted by bivariate analysis to examine BMI by age, income level, education level, and the country of origin. The percentage distribution, frequency distribution, central tendencies, and distribution in histogram shape helped analyze the association between the two variables. A positive correlation between any two variables means they vary together. As one variable increases, so does the other. A negative correlation between two variables means they do not vary together. As one variable increases, the other decreases, and vice versa (Creswell, 2013). Binary logistic regression will be performed statistically to show the association between age, level of education, income level, country of origin, length of stay in the country, presence of supportive neighborhood, and obesity status. Binominal

logistic regression predicts the probability that an observation falls into one of two categories of a dichotomous dependent variable based (in this case normal weight or overweight/obese) on one or more independent variables that can be either continuous or categorical (age, income, education, employment status, supportive neighborhood, and length of stay in US). A two-tailed alpha with p<0.05 will be considered statistically significant for all analyses.

The assumptions for performing binary logistic regression include the following:

1. The dependent variable should be measured on a dichotomous scale.

2. There should be one or more independent variables which can be continuous, or categorial.

3. There should be independence of observations and the dependent variable should have mutually exclusive and exhaustive categories.

4. It assumes that there is a linear relationship between the logit of the independent variables and the dependent variables but does not assume a linear relationship between the actual dependent and independent variables (Anderson, n.d).

Assumptions 1, 2 and 3 were checked first before conducting the test in SPSS. Assumption #4 was checked in SPSS by performing Pearson test for linear relationship, and variance inflation factor (VIF) for multicollinearity. In case of violation of one or more assumptions, transforming variables is often done to correct for outliers and violation of normality, linearity, and homoscedasticity/homogeneity. However, this limits the interpretation to the transformed scores (Schreiber-Gregory et al. 2018).

Binary logistic regression was performed statistically to show the association between age, level of education, income level, country of origin, presence of supportive neighborhood, length of stay in US, and obesity status. The binary logistic regression was found to be most appropriate for this study because there were several independent variables (age, income level, education level, neighborhood variables, length of stay in US, and country of origin) and one dependent variable measured on a dichotomous scale (Mertler, & Reinhart, 2016). The aim of this data analysis was to generate new information about predictors of obesity among the South Asian female immigrants in the US.

Threats to Validity

A study is valid when its conclusions are well-founded and accurately represent the sample population. NHIS dataset has been validated and used several times in the past (Mui, Hill, & Thorpe, 2018, Weissman, Russell, Ansah, & Jay, 2019, Commodore-Mensah et al., 2018). However, there may be some level of content and construct validity threats for my study. Firstly, NHIS relies on self-reported data which can result in interview bias. Secondly, I used the public dataset which meant that some of the variables were inaccessible as they were included only in the restricted use dataset. This may be a limitation of the study as well as a threat to its validity.

Ethical Procedures

This study used NHIS archived, de-identified secondary data available in the public domain for public use. Before conducting data collection, approval was obtained from the Walden University IRB office. All data was stored in a password protected

personal computer and no one else had access to the information on the computer. I will retain all relevant data to the study for five years after the completion of this study after which the flash drive will be physically destroyed.

The U.S. Census Bureau collects the data for the National Health Interview Survey throughout the year (NCHS, 2022). About 750 interviewers are trained and directed by health survey supervisors in the U.S. Census Bureau Regional Offices to conduct interviews for NHIS using computer-assisted face-to-face personal interviewing (NCHS, 2022). A telephone interview may also be conducted to follow-up after the initial face-to-face interview or when the respondent requests a telephone interview (NCHS, 2022). CDC and NCHS ensures that ethical procedures are followed throughout the data collection process. NHIS is approved by the Research Ethics Review Board of the National Center for Health Statistics and the U.S. Office of Management and Budget (NCHS, 2022). All NHIS participants are required to provide oral consent prior to participation. Furthermore, NCHS collects and uses information that participants provide in accordance with System of Records Notice 09-20-0164, Health and Demographic Surveys Conducted in Probability Samples of the United States (NCHS< 2022).

Summary

Obesity is a huge public health issue in the US among individuals of all genders, age groups, and ethnicities. In this chapter I described the methodology for the proposed study, and outlined the main components of this study, which includes the research questions, research design, data collection, data analysis plan, sampling procedures, and ethical procedures. The study population comprised of female south Asian immigrants in

the US. This study used secondary data from NHIS 2017 and 2018 dataset. The data was analyzed using descriptive and inferential statistics, binary logistic regression analysis, and correlation coefficients for dependent and independence variables. Chapter 4 will present the results of the study in the form of tables and graphs.

Chapter 4: Results

This quantitative, cross-sectional study evaluated the predictors of obesity in the female South Asian immigrant population in the United States. The SEM guided the identification of factors that contribute to the development of overweight and obesity in female South Asian immigrants in the United States. The study hypothesized that socioeconomic indicators (income, education, and employment status), level of acculturation (as measured by length of stay in United States), and residence in a supportive neighborhood are predictive of obesity and overweight among the female South Asian immigrants in the United States.

In this chapter I present the results of the analysis that I ran on the data. First, descriptive analysis was conducted for each of the dependent and independent variables. After that binary logistic regression was conducted for each research question. The results were then presented in the form of tables, which will be presented in this chapter.

Data Collection

Secondary data were used from the National Health Interview Survey to evaluate the relationship of independent variables of age, income, education, employment status, presence of supportive neighborhood, and number of years spent in United States to the dependent variable of presence of overweight and obesity based on the BMI of the South Asian female immigrants in the United States. The extracted data were then cleaned for gender, age, main racial background, country of birth, and body mass index. After cleaning, the data set included 169 female South Asian immigrants living in the United States. The data were then analyzed by using SPSS V 27 to identify the relationship

between independent variables (age, gender, SES, acculturation, and perceived supportiveness of the neighborhood) and dependent variable (overweight and obesity) in the sample population.

The aim of this data analysis was to generate new knowledge about predictors of overweight and obesity among South Asian female immigrants living in the United States. To accomplish this, the data set had to be cleaned before analysis could be done. Then only females between 18 to 60 years of age were selected. In addition, individuals who had reported their main racial background as Asian Indians and Other Asians were chosen for analysis. Body mass index was first changed into a categorical variable from a continuous one. Then underweight individuals were excluded as this study was looking at predictors of overweight and obesity only. Body mass indexes of 15 individuals were deleted and treated as missing values as they were reported as unrealistic values which was causing errors in the analysis. Body mass index was divided into two categories namely Normal weight (18.00 to 24.99), and Overweight and Obese (25.00 or higher).

Initially, the plan was to make composite variables for socioeconomic status. However, no guidelines were available in this data set for such a procedure. Thus, I decided to use each of the variables separately as predictors of overweight and obesity among South Asian female immigrants in United States. Furthermore, the categories in variables of education, earnings, and employment were condensed and they were recoded into new variables as some of the categories had only one or two values. Education was recoded into having three categories (Up to 12 years of school, 1 to 4 years of college, 5+ years of college), and employment into two categories (employed, not employed). The

new variable for earning had five categories namely $01 to $19,999, $20,000 to $54,999, $55,000 to $74,999, $75,000 and over, and refused to answer/not be ascertained/ or don't know as I combined the last three categories into one. All new categories were used in the analysis and none of the cases were removed or omitted.

A neighborhood supportiveness composite variable was created by obtaining an average of the variables close knit neighborhood, neighborhood reliability, neighborhood trust ability, and neighborhood helpfulness. The number obtained was then rounded up or down to the nearest whole number. The results were interpreted as 1 being very supportive and 5 as very unsupportive.

The variable number of years in United States was used to assess acculturation of the sample population. This variable was also modified to having four categories instead of 5. The new categories were Less than 1 year to less than 5 years, 5 years to less than 10 years, 10 years to less than 15 years, and 15 years or more.

Results

Research Questions and Hypotheses

RQ 1: Are sociodemographic characteristics (age, and socioeconomic status as measured by income, education level, and employment status) predictors of obesity and overweight among female South Asian immigrants in the United States?

$H_0 1$: Sociodemographic characteristics (age, and socioeconomic status as measured by income, education level, and employment status) are not the predictors of obesity and overweight among female South Asian immigrants in the United States.

$H_1$1*:* Sociodemographic characteristics (age, and socioeconomic status as measured by income, education level, and employment status) are predictors of obesity and overweight among female South Asian immigrants in the United States.

RQ2 Is living in a supportive neighborhood predictive of obesity and overweight among the female South Asian immigrants in the United States ?

$H_0$2: Living in a supportive neighborhood does not predict obesity and overweight among female South Asian immigrants in the United States.

$H_1$2: Living in a supportive neighborhood predicts obesity and overweight among female South Asian immigrants in the United States .

RQ 3 Is level of acculturation (as measured by length of stay in United States) predictive of obesity and overweight among female South Asian immigrants in the United States ?

$H_0$3*:* The level of acculturation (as measured by length of stay in United States) is not predictive of obesity and overweight among female South Asian immigrants in the US.

$H_1$3*:* The level of acculturation (as measured by length of stay in United States) is predictive of obesity and overweight among female South Asian immigrants in the United States.

Univariate Analysis

Table 5 presents a concise summary of the demographic data for the study participants.

Table 5

Descriptive Analysis of Final Sample

Variable	Frequency	Percent	Valid percent	Cumulative percent
Age of participants				
Age 18 to 30	45	26.6	26.6	26.6
Age 31 to 40	71	42.0	42.0	68.6
Age 41 to 50	31	18.3	18.3	87.0
Age 51 to 60	22	13.0	13.0	100.0
Body mass index				
Normal weight	84	49.7	49.7	49.7
Overweight/obese	85	50.3	50.3	100.0
Earnings				
$01 to $19,999	20	11.8	11.8	11.8
$20,000 to $54,999	26	15.4	15.4	27.2
$55,000 to $74,999	11	6.5	6.5	33.7
$75,000 and over	37	21.9	21.9	55.6
Refused to answer/not be ascertained/ or don't know	75	44.4	44.4	100.0
Education				
Up to 12 years of school	13	7.7	7.7	7.7
1 to 4 years of college	69	40.8	40.8	48.5
5+ years of college	87	51.5	51.5	100.0
Employment status				
Employed	116	68.6	68.6	68.6
Not employed	53	31.4	31.4	100.0
Total	169	100.0	100.0	
Years in US				
Less than 1 year to less than 5 years	50	29.6	29.8	29.8
5 years to less than 10 years	25	14.8	14.9	44.6
10 years to less than 15 years	35	20.7	20.8	65.5
15 years or more	58	34.3	34.5	100.0

The total sample size comprised of 169 females. Forty-two percent were between 31 to 40 years of age. The sample was almost equally divided between the normal weight and overweight and obese categories according to their body mass indices. In terms of weight, 49.7% fell in the normal weight category, and 50.3% were in the overweight and obese category. Most of the individuals in the sample (44%) did not disclose or did not know their earnings, and about 22% had $75,000 or more listed as their income. Results regarding education showed that about 42% of individuals in the sample had 1 to 4 years of college education, and 51% had 5+ listed as their educational level. Sixty-nine percent of the sample was employed while only 31% were unemployed. Data for number of years spent in United States showed that 34% of the individuals have live 15 years or more in the United States, and 29.6% had lived less than 1 to less than 5 years in the country.

Assumptions

The first assumption for binary logistic regression is that the response variable only takes two possible outcomes which in this case are normal weight, and overweight and obese. The second assumption is that there are one or more independent variables, which can be either continuous or categorical. The independent variables for this study include age, education, earnings, employment status, years spent in United States, and neighborhood supportiveness. Age is the only variable, which is continuous, the rest are all categorical. The third assumption states that there should be independence of observations and the dependent variable should have mutually exclusive and exhaustive categories. The assumption of linearity in logistic regression is that the model is correctly

specified. Linearity of the continuous variables with respect to the logit of the dependent variable was assessed via the Box-Tidwell (1962) procedure. A Bonferroni correction was applied using all 16 terms in the model resulting in statistical significance being accepted when $p < .00312$ (Tabachnick & Fidell, 2014). Based on this assessment, all continuous independent variables were found to be linearly related to the logit of the dependent variable We know this because all p values are greater than.00312 (i.e., they were .312, .227).

Binominal Logistic Regression by Research Questions

RQ 1

A binary logistic regression analysis was conducted to investigate if there is a relationship between the dependent variable of body mass index (normal weight, overweight and obese) and independent variables of age, earnings, education, and employment status. Table 6 shows results of the binomial logistic regression that was performed to ascertain the effects of age, education, earnings, and employment status on the likelihood that participants have overweight and obesity. The logistic regression model was statistically significant, $\chi2(8) = 23.748$, $p < .005$. The model explained 17.0% (Nagelkerke R^2) of the variance in weight and correctly classified 64.5% of cases. Sensitivity was 67.9%, specificity was 61.9%, positive predictive value was 64% and negative predictive value was 65%. Of the five predictor variables only one was statistically significant: age. Increasing age was associated with an increased likelihood of being overweight and obese. This partially supports the null hypothesis and alternative

hypothesis under Research Question 1, as only age was found to have statistically

significant relationship with overweight and obesity.

Table 6

Logistic Regression Predicting Likelihood of Overweight/Obesity Based on Age, Earnings, Education, and Employment Status

		B	S.E.	Wald	Df	Sig.	Odds ratio	95% CI Lower	95% CI Upper
Step 1[a]	Age	.078	.019	16.043	1	.000	1.081	1.041	1.123
	EDUrecode			.086	2	.958			
	EDUrecode(1)	-.040	.700	.003	1	.955	.961	.244	3.789
	EDUrecode(2)	.062	.687	.008	1	.928	1.064	.277	4.087
	Employ-recode(1)	.796	.437	3.321	1	.068	2.216	.942	5.214
	Earnings recode			1.004	4	.909			
	Earnings recode(1)	-.059	.645	.008	1	.927	.942	.266	3.333
	Earnings recode(2)	-.444	.842	.278	1	.598	.642	.123	3.342
	Earnings recode(3)	-.225	.612	.135	1	.714	.799	.240	2.653
	Earnings recode(4)	.187	.555	.114	1	.736	1.206	.407	3.575
	Constant	-3.120	1.096	8.098	1	.004	.044		

a. Variable(s) entered on step 1: Age, EDUrecode, Employ-recode, Earnings recode.

RQ 2

Table 7 shows the results of a binomial logistic regression, which was performed

to ascertain the effects of neighborhood supportiveness and time living in present

neighborhood on the likelihood that participants are overweight/obese. The logistic

regression model was statistically significant, $\chi^2(5) = 9.66$, $p < .001$. The model

explained 7.8% (Nagelkerke R^2) of the variance in weight and correctly classified 51.6%

of cases. Sensitivity was 30%, specificity was 46%, positive predictive value was 60.5%

and negative predictive value was 56.4%. Of the two predictor variables none were

statistically significant. The results support the null hypothesis and rejects the alternative

hypothesis for Research Question 2.

Table 7

Logistic Regression Predicting Likelihood of Overweight/Obesity Based on Neighborhood Supportiveness and Time Living in Present Neighborhood

		B	S.E.	Wald	Df	Sig.	Odds ratio	95% CI Lower	95% CI Upper
Step 1[a]	Neighborhood supportiveness	-.026	.219	.014	1	.906	.974	.634	1.497
	Time living in present neighborhood			8.385	4	.078			
	Time living in present neighborhood(1)	-.160	.450	.126	1	.723	.852	.353	2.060
	Time living in present neighborhood(2)	.204	.456	.201	1	.654	1.226	.502	2.997
	Time living in present neighborhood(3)	1.385	.618	5.018	1	.025	3.994	1.189	13.417
	Time living in present neighborhood(4)	1.076	.909	1.400	1	.237	2.932	.494	17.413
	Constant	-.119	.564	.044	1	.833	.888		

a. Variable(s) entered on step 1: Neighborhood supportiveness, Time living in present neighborhood.

RQ 3

Table 8 shows the results of a binomial logistic regression, which was performed to ascertain the effects of years living in United States. The logistic regression model was not statistically significant, $\chi2(3) = 6.114$, $p < .05$. The model explained 4.8% (Nagelkerke R^2) of the variance in weight and correctly classified 58.3% of cases. Sensitivity was 42.9%, specificity was 73.8%, positive predictive value was 62% and negative predictive value was 56.4%. None of the predictor variables was statistically significant. Therefore, the results support the null hypothesis and rejects the alternative hypothesis for Research Question 3.

Table 8

Logistic Regression Predicting Likelihood of Overweight/Obesity Based on Years in United States

	B	S.E.	Wald	Df	Sig.	Odds ratio	95% CI Lower	95% CI Upper

Step 1[a]	Years in US1			.628	2	.731			
	Years in US1(1)	.080	.491	.027	1	.870	1.084	.414	2.835
	Years in US1(2)	.268	.352	.581	1	.446	1.307	.656	2.604
	Constant	-.160	.284	.319	1	.572	.852		

a. Variable(s) entered on step 1: Years in US1.

Summary

This study focused on investigating the predictors of overweight and obesity in a sample of 169 female South Asian immigrants in the United States. Six main predictor variables age, level of education, income, employment status, length of stay as a proxy for acculturation, and level of neighborhood supportiveness were tested against overweight and obesity in a binominal logistic regression model. The binary logistic regression analysis showed no statistically significant association between income, education, employment status, neighborhood supportiveness, and years in United States (as proxy for acculturation) on overweight and obesity outcomes in the sample population. Age was the only predictor variable that had statistically significant association with overweight and obesity. These results partially support the Null Hypothesis 1, and fully support Null Hypotheses 2 and 3. In Chapter 5, I interpret these results, and provide recommendations for future research and implications for social change based on the findings of this study.

Chapter 5: Discussion, Recommendations, and Conclusions

The purpose of this quantitative, cross-sectional research was to investigate the relationship between age, socioeconomic indicators (income, education, and employment status), neighborhood supportiveness, years spent in United States (acculturation), and obesity in the female South Asian immigrant population. Secondary data from the National Health Interview Survey from 2017–2018 were used to collect data on individual demographics such as age and socioeconomic status, and other characteristics such as presence of supportive neighborhood, and length of time in United States that could be used to identify the factors that lead to obesity among the female South Asian immigrant population in the United States. This study focused on investigating the predictors of overweight and obesity in a sample of 169 female South Asian immigrants in the United States. Six main predictor variables age, level of education, income, employment status, length of stay as a proxy for acculturation, and level of neighborhood supportiveness were tested against overweight and obesity in a binominal logistic regression model. The binary logistic regression analysis showed no statistically significant association between income, education, employment status, neighborhood supportiveness, and years in United States (as proxy for acculturation) on overweight and obesity outcomes in the sample population. Age was the only predictor variable that had statistically significant association with overweight and obesity.

Interpretation of findings

Obesity is a major public health issue in the United States. Over the last few decades there has been an ongoing increase in the obese status of many population groups

(Murphy et al., 2017; Savadati et al., 2019). This continued surge points toward a need to obtain a better understanding of what increases their chances to become obese. The differences in prevalence and risk of obesity may be explained by variations in genetic makeup (including ethnicity) between populations as well as due to the differences in the degree to which local environments are obesogenic (Murphy et al., 2017). Racial and ethnic minority groups are known to be more susceptible to develop obesity-related complications, after taking weight into account (Ludwig & Ebbeling, 2018). Therefore, the identification of different predictors of overweight and obesity in the various immigrant populations of the United States is an important part of the public health plan to prevent and address this ongoing issue.

This research was conducted to identify the predictors of obesity in a sample of South Asian female immigrants in the United States. The purpose was to investigate whether level of education, income, employment status, acculturation (measured by length of stay), and neighborhood supportiveness were predictors of overweight and obesity outcomes in the sample population of South Asian female immigrants who have lived in the United States 1 or more years. This research fills a gap about possible heterogeneity in obesity predictors in the immigrant populations in the United States. The female South Asian adult immigrant population in the United States was chosen because it has been never studied alone. The research questions and hypotheses that guided this study were developed to provide baseline information of what exists in a sample population of female South Asian immigrants and what basic predictors of overweight and obesity contributed to the disease burden.

Binary logistic regression was performed to ascertain the effects of age, level of education, income, employment status, neighborhood supportiveness, and length of stay in United States (as proxy of acculturation) on the likelihood that participants will be overweight or obese. Though the results did not show any effect between the five predictor variables and obesity, it identified an effect between age and overweight and obesity. The logistic regression model was statistically significant, $\chi2(8) = 23.748$, $p < .005$. The model explained 17.0% (Nagelkerke R^2) of the variance in weight and correctly classified 64.5% of cases. Sensitivity was 67.9%, specificity was 61.9%, positive predictive value was 64%, and negative predictive value was 65%. Increasing age was associated with an increased likelihood of being overweight and obese. This partially supports the null hypothesis and alternative hypothesis under Research Question 1, as only age was found to have statistically significant relationship with overweight and obesity. This is consistent with the mixed findings of numerous studies. For example, Amin (2022) reported that age was a significant predictor of overweight and obesity among Middle Eastern women. However, Duru (2020) reported that the binary logistic regression model indicated that sociodemographic factors including age did not predict change in behavior leading to obesity.

In this study I found no statistical significance between the supportiveness of the neighborhood and the development of overweight and obesity among female South Asian immigrants, which is contrary to previous research. For example, Yoshida et al. (2018) reported that increased social support reduced the risk of overweight and obesity among Mexican immigrants. However, the existing literature is limited in providing substantive

information regarding neighborhood supportiveness and obesogenic behaviors among immigrants. A few studies have looked at some features of the social environment and their association with obesogenic behaviors with focus on physical activity (Kim et al. 2020; Murillo et al., 2019). According to Borrell et al. (2016), children and adolescents living in non-supportive neighborhoods had a 21% higher chance of being obese than their peers living in supportive neighborhoods which contradicts the results of my research.

In this study I also looked at acculturation as a predictor of overweight and obesity among female South Asian immigrants. No statistical significance was found between the acculturation as measured by the number of years spent in United States and development of overweight and obesity among female South Asian immigrants in the country. These results were consistent with the findings of previous researchers like Temircan (2017) and Obisesan et al. (2017). However, Klabunde et al. (2020) reported that each additional year of living in the United States added 6% to the odds of overweight and obesity among Brazilian immigrants in Massachusetts.

The social ecological model dictated this research. It is a comprehensive approach that recognizes that the health of an individual is influenced by factors at multiple levels that influence the health behavior and health outcomes (Robinson, 2008). This model highlights various levels that affect the health of an individual to create a clearer picture of social determinants of health (Robinson, 2008). The SEM identifies five levels of influence that dictate health behaviors including the interpersonal factors, the interpersonal relations, institutional environment, community factors, and public policy

(Schneider, 2014). The findings of the study reveal that only interpersonal factor (age) had statistically significant relationship with overweight and obesity. To sum up this study found no statistically significant association between income, education level, employment status, neighborhood supportiveness, and acculturation as measured by the length of stay in US, and obesity among female South Asian migrant women. Nevertheless, this study has found statistically significant association between age and overweight and obesity in this sample group.

Limitations of the study

To the best of my knowledge this is the only study that has looked at predictors of overweight and obesity among female South Asian immigrants. The results of this study could provide useful insights into the health of female South Asian immigrants in the US. Despite the importance of this study there are many limitations that need to be highlighted too. This was a cross-sectional study, because of which its results could be affected by reverse causality, that is, the overweight and obesity status could influence the employment status and income level. In addition, I used length of stay in US as a proxy measure of acculturation. Acculturation is a multiplex concept regarding how immigrants change and adapt to the different norms, values, and practices of the new society they migrate to. In order to study this complex predictor, researchers have used rough proxies such as nativity or generational status, length of stay in the host country, and language. Proxies are unidimensional and reveal only one direction of findings (Dahlan et al. 2019). My study used only one proxy for acculturation—years lived in the US. More in-depth studies are needed to examine other dimensions of acculturation too,

such as social interactions with people of the same ethnicity, the language in which

people consume media, and preferences for types of diets typically eaten. In addition, my

study only looked at socio-demographic predictors of obesity and overweight among

female south Asian immigrants in US. Lifestyle predictors like physical activity, diet, and

health education were not included. This study focused on obesity and its relationship to

acculturation, age, income, education, employment status, and the neighborhood.

For this study I used the secondary dataset from the CDC/NHIS collected for the

years 2017-18. It was the most current data containing both the independent and

dependent variables available to the public in the public domain. Although there are

many advantages of using secondary data, there are some limitations too. The possibility

of under or over reporting of self-reported data from participants could limit accurate data

collection, analysis, and interpretation. For example, it was very surprising that 44% of

the sample did not know their income. This could have impacted the analysis and

interpretation of the results. Another limitation of using secondary data is language

barrier which may have led to misunderstandings and misinterpretations of the questions.

In addition, the data available for public access was limited in identifying the country of

origin.

Recommendations

Immigrants are an important part of the US population. In 2019, immigrants made

up 14% (44.9 million) of the national population out of which 22.0 million were women,

20.4 million were men, and 2.5 million were children (Immigrants in the United States,

2021). Immigrants from South Asian countries in the United States comprises of

individuals with origin from Bangladesh, Bhutan, India, Nepal, Pakistan, Sri Lanka, and the Maldives. Out of these India was one of the top countries of origin with 6% of immigrants coming from there (Immigrants in the United States, 2021). The south Asian female population is a unique group with its own distinct characteristics which is why it was selected for this study. However, this is a small step towards broader more extensive research which is needed to study overweight and obesity among this population group.

This study and the existing literature highlight the fact that predictors of overweight and obesity exist that are not applicable to all population groups in the United States. Despite the fact that a lot of investment has been made by countries in public health research and campaigns regarding overweight and obesity in specific immigrant population groups Commodore-Mensah et al. (2018) reported that immigrants from Indian subcontinent had the highest prevalence (73%) of overweight and obesity. This highlights that there may be other factors or predictors that may increase the vulnerability of the selected population group to overweight and obesity after immigration. It is important to find out specific factors such as profession that increase the vulnerability of this population group to overweight and obesity after immigration, beside the well-known predictors of obesity. Another aspect that needs to be explored is whether obesity is a temporary phenomenon in this population or does it change as socio-economic status improves or as individuals move from one geographical location to another. Previous research has shown that poor family functioning as indicated by emotional, physical, and psychological activities among members of the family is associated with childhood obesity (Cyril et al., 2016). Therefore, it is important to study the family dynamics and

living situations of this population group and how they can impact the weight of individuals over time. Furthermore, future studies may also include predictors like physical activity, diet, presence of ethnic grocery stores, and religion to get a clearer picture of presence of overweight and obesity among this population.

The female South Asian immigrant population is a unique and under studied population. This research has raised many unanswered questions. Therefore, for future research the focus should be on a more comprehensive study that will provide a more complete and in-depth study of what exists in the South Asian immigrant community in the United States. Researchers can do this is by conducting longitudinal studies which allow for the tracking of obesity outcomes relative to varying predictive factors. Longitudinal studies are repeated observations of the same variables over time; thus, they can examine obesity outcomes relatively to length of stay, change in socio-economic status, and use a validated acculturation scale. Also, researchers could study the differences in obesity outcomes as it relates to immigrants born in South Asian countries who have migrated to the United States against those who have South Asian parents but born in the United States. This will provide a clearer understanding of the effects of acculturation in the population. Future researchers may also consider collecting data by themselves rather than using secondary data set. Various methods of data collection can be used, for example face-to-face interviews and online questionnaires. This will facilitate more participants to take part in the research.

Implications for Social Change

The South Asian population is one of the fastest growing immigrant groups in the US. Understanding the underlying causes of obesity in this group will provide insight into the factors that need to be addressed to control the epidemic of obesity. This study will specifically add to the body of research on the relationship between migration, immigrants, and their health. Migration results in many economic and social benefits for the immigrants, however, it does come with costs too because of which it is important to understand the impact of migration on migrants and health outcomes. This understanding will help healthcare professionals to comprehend the arrival of immigrants in the host country and the process through which they adopt the obesogenic behaviors of natives so that they can effectively reduce healthcare cost of immigrants in the country.

To the best of my knowledge there is no other study like this one regarding this particular population group. As a new study it may provide current information about age, income, education level, employment status, acculturation, and neighborhood supportiveness and overweight and obesity among female South Asian immigrants in US. The results of this study indicate that some predictors of obesity that exist in other immigrant groups may not apply to the South Asian immigrant population. Public health professionals can use this information to identify other predictors specifically demographic or socio-ecological factors that can then be targeted for developing obesity prevention interventions in this population. It is noteworthy to appreciate that in identifying a lack of association between commonly known predictors of obesity and obesity outcomes, this study may have prompted a debate about protective psychosocial

factors that are unique to this population. Health professionals who work with this population may, therefore, have the opportunity to conduct more comprehensive research which will help them to develop appropriate interventions that promote and strengthen these factors, as well as other known general factors.

Since there is limited research on obesity in female South Asian immigrant population in the United States this study will provide a better understanding, and knowledge that can be used as a basis for future research for overweight and obesity among female South Asian immigrant population. This research will help bring about better healthcare outcome by providing an insight into predictors of overweight and obesity in this particular immigrant population. Researchers and healthcare professionals can use this study to target demographic and socio-ecological factors that result in overweight and obesity among female South Asian immigrants in the U.S.

Conclusion

This research was aimed at studying the predictors of overweight and obesity among female South Asian immigrants in the U.S. The variables that were studied in this research included age, income, education level, employment status, neighborhood supportiveness, and acculturation as length of time in U.S. The results showed an association between only age and overweight and obesity. The research highlights that different proxy measures of acculturation, including length lived in the U.S capture various aspects of acculturation in relationship to health. This study also supports the thesis that different population groups may have predictors that are unique to them such as Klabunde et al., (2020) found that long duration of time lived in the U.S.A increased

odds of overweight and obesity for Brazilian immigrants living in Massachusetts.

Similarly, Herter-Aeberli et al., (2019) concluded that the most important risk factors for

childhood obesity in Switzerland were poor parental education, non-Swiss origin of the

parents, low physical activity of the child, and male sex. Therefore, in order to get better

health outcomes in different minority immigrant groups, it is important not to generalize

predictors of overweight and obesity. This will mask the uniqueness of obesity in

different migrant population groups and may result in a one size fits all policy and

interventions from policy makers and researchers.

References

Abadi, A., Peralta-Romero, J., Suarez, F., Gomez-Zamudio, J., Burguete-Garcia, A. I.,

    Cruz, M., & Meyre, D. (2016). Assessing the effects of 35 European-derived

    BMI-associated SNPs in Mexican children. *Obesity, 24*(9), 1989–1995. Portico.

    https://doi.org/10.1002/oby.21590

Abraído-Lanza, A. F., Echeverría, S. E., & Flórez, K. R. (2016). Latino immigrants,

    acculturation, and health: Promising new directions in research. *Annual Review of*

    Public Health, 37(1), 219–236. https://doi.org/10.1146/annurev-publhealth-

    032315-021545

Afable, A., Yeh, M.-C., Trivedi, T., Andrews, E., & Wylie-Rosett, J. (2015). Duration of

    US residence and obesity risk in NYC Chinese immigrants. *Journal of Immigrant*

    and Minority Health, 18(3), 624–635. https://doi.org/10.1007/s10903-015-0216-y

Akinyemiju, T., Meng, Q., & Vin-Raviv, N. (2016). Association between body mass

    index and in-hospital outcomes. *Medicine, 95*(28), e4189.

    https://doi.org/10.1097/md.0000000000004189

Almeida, J., Biello, K. B., Pedraza, F., Wintner, S., & Viruell-Fuentes, E. (2016). The

    association between anti-immigrant policies and perceived discrimination among

    Latinos in the US: A multilevel analysis. *SSM - Population Health, 2*, 897–903.

    http://doi.org/10.1016/j.ssmph.2016.11.003

Alpert, P., & Thomason, D. L. (2016). Metabolic syndrome: Differences for Asian

    Americans is in their percentage of body fat. *Asian/Pacific Island Nursing*

    Journal, 1(3), 70–81. https://doi.org/10.9741/23736658.1025

Alvarez, K. J., & Levy, B. R. (2012). Health advantages of ethnic density for African

American and Mexican American elderly individuals. *American Journal of Public

Health, 102*(12), 2240–2242. http://doi.org/10.2105/AJPH.2012.300787

Alviola, P. A., Nayga, R. M., Thomsen, M. R., Danforth, D., & Smartt, J. (2014). The

effect of fast-food restaurants on childhood obesity: A school level analysis.

Economics & Human Biology, 12, 110–119.

https://doi.org/10.1016/j.ehb.2013.05.001

Al Wekhian, J. (2015). Acculturation process of Arab-Muslim immigrants in the United

States. *Asian Culture and History, 8*(1), 89. https://doi.org/10.5539/ach.v8n1p89

Amin, N. S. (2022). Prevalence of overweight among the middle eastern adult population

in the United States. *International Social Science Review (Online), 98*(1), 1–18.

https://www.proquest.com/scholarly-journals/prevalence-overweight-among-

middle-eastern-adult/docview/2647725542/se-2

Anderson, S. (n.d). *Logistic regression*. http://schatz.sju.edu/multivar/guide/logistic.pdf

Angel, J. L., & Berlinger, N. (2018). The Trump Administration's assault on health and

social programs: Potential consequences for older Hispanics. *Journal of Aging &

Social Policy, 30*(3-4), 300–315. https://doi.org/10.1080/08959420.2018.1462678

Angulo, M. A., Butler, M. G., & Cataletto, M. E. (2015). Prader-Willi syndrome: A

review of clinical, genetic, and endocrine findings. *Journal of Endocrinological

Investigation, 38*(12), 1249–1263. https://doi.org/10.1007/s40618-015-0312-9

An, R. (2015). Health care expenses in relation to obesity and smoking among U.S.

adults by gender, race/ethnicity, and age group: 1998–2011. *Public Health,*

129(1), 29–36. https://doi.org/10.1016/j.puhe.2014.11.003

Argys, L. (2015). Consequences of the obesity epidemic for immigrants. *IZA World of Labor*. https://doi.org/10.15185/izawol.210

Asian American Federation. (2012). A demographic snapshot of South Asians in the United States. http://saalt.org/wp-content/uploads/2012/09/Demographic-Snapshot-Asian-American-Foundation-2012.pdf

Astell-Burt, T., Feng, X., Croteau, K., & Kolt, G. S. (2013). Influence of neighbourhood ethnic density, diet and physical activity on ethnic differences in weight status: A study of 214,807 adults in Australia. *Social Science & Medicine, 93*, 70–77. https://doi.org/10.1016/j.socscimed.2013.06.006

Bank, I. E. M., Gijsberts, C. M., Teng, T.-H. K., Benson, L., Sim, D., Yeo, P. S. D., Ong, H. Y., Jaufeerally, F., Leong, G. K. T., Ling, L. H., Richards, A. M., de Klejin, D. P. V., Dahlstrom, U., Lund, L. H., & Lam, C. S. P. (2017). Prevalence and clinical significance of diabetes in Asian versus White patients with heart failure. *JACC: Heart Failure, 5*(1), 14–24. https://doi.org/10.1016/j.jchf.2016.09.015

Barrington, W. E., Ceballos, R. M., Bishop, S. K., McGregor, B. A., & Beresford, S. A. A. (2012). Perceived stress, behavior, and body mass index among adults participating in a worksite obesity prevention program, Seattle, 2005–2007. *Preventing Chronic Disease*, *9*. https://doi.org/10.5888/pcd9.120001

Batsis, J. A., Mackenzie, T. A., Bartels, S. J., Sahakyan, K. R., Somers, V. K., & Lopez-Jimenez, F. (2016). Diagnostic accuracy of body mass index to identify obesity in older adults: NHANES 1999-2004. *International Journal of Obesity (2005),*

40(5), 761–767. https://doi.org/10.1038/ijo.2015.243

Bécares, L., Shaw, R., Nazroo, J., Stafford, M., Albor, C., Atkin, K., Kiernan, K., Wilkinson, R., & Pickett, K. (2012). Ethnic density effects on physical morbidity, mortality, and health behaviors: A systematic review of the literature. *American Journal of Public Health, 102*(12), e33–e66. https://doi.org/10.2105/ajph.2012.300832

Berndt, S. I., Gustafsson, S., Mägi, R., Ganna, A., Wheeler, E., Feitosa, M. F., ... & Esko, T. (2013). Genome-wide meta-analysis identifies 11 new loci for anthropometric traits and provides insights into genetic architecture. *Nature genetics*, *45*(5), 501. http://doi:10.1038/ng.2606

Berry, J. W., & Sam, D. L. (2016). Theoretical perspectives. In D. L. Sam & J. W. Berry (Eds.), *The Cambridge handbook of acculturation psychology* (pp. 11–29). New York: Cambridge University Press.

Bharmal, N., Kaplan, R. M., Shapiro, M. F., Mangione, C. M., Kagawa-Singer, M., Wong, M. D., & McCarthy, W. J. (2014). The Association of duration of residence in the United States with cardiovascular disease risk factors among South Asian immigrants. *Journal of Immigrant and Minority Health*, *17*(3), 781–790. http://doi:10.1007/s10903-013-9973-7

Bian, L., Traurig, M., Hanson, R. L., Marinelarena, A., Kobes, S., Muller, Y. L., Malhotra, A., Huang, K., Perez, J., Gale, A., Knowler, W. C., Bogardus, C., & Baier, L. J. (2013). MAP2K3 is associated with body mass index in American Indians and Caucasians and may mediate hypothalamic inflammation. Human

Molecular Genetics, 22(21), 4438–4449. https://doi.org/10.1093/hmg/ddt291

Blewett, L. A., Dahlen, H. M., Spencer, D., Rivera Drew, J. A., & Lukanen, E. (2016). Changes to the design of the National Health Interview Survey to support enhanced monitoring of health reform impacts at the state level. *American Journal of Public Health, 106*(11), 1961–1966. http://doi:10.2105/ajph.2016.303430

Brehm, B. J., & D'Alessio, D. A. (2014). Environmental Factors Influencing Obesity. https://www.ncbi.nlm.nih.gov/books/NBK278977/

Borrell, L. N., Graham, L., & Joseph, S. P. (2016). Associations of neighborhood safety and neighborhood support with overweight and obesity in US children and adolescents. *Ethnicity & Disease*, *26*(4), 469. http://doi:10.18865/ed.26.4.469

Brewer, G., Robinson, S., Sumra, A., Tatsi, E., & Gire, N. (2014). The influence of religious coping and religious social support on health behavior, health status and health attitudes in a British christian sample. *Journal of Religion and Health*, *54*(6), 2225–2234. https://doi.org/10.1007/s10943-014-9966-4

Burgoine, T., Mackenbach, J., Lakerveld, J., Forouhi, N., Griffin, S., Brage, S., … Monsivais, P. (2017). Interplay of socioeconomic status and supermarket distance is associated with excess obesity risk: A UK cross-sectional study. *International Journal of Environmental Research and Public Health*, *14*(11), 1290. http://doi:10.3390/ijerph14111290

Byrd, A. S., Toth, A. T., & Stanford, F. C. (2018). Racial disparities in obesity treatment. *Current obesity reports, 7*(2), 130–138. https://doi.org/10.1007/s13679-018-0301-

3

Camarota A. S., Zeigler, K. (2016) Immigrants in United States: A profile of the foreign-

born using 2014 and 2015 Census Bureau data. Center of Immigration Studies.

https://cis.org/sites/cis.org/files/immigrant-profile_0.pdf

Campbell, M. K. (2015). Biological, environmental, and social influences on childhood

obesity. *Pediatric Research*, *79*(1-2), 205–211. http://doi:10.1038/pr.2015.208

Cano, M. Á., Schwartz, S. J., Castillo, L. G., Unger, J. B., Huang, S., Zamboanga, B. L.,

Romero, A. J., Lorenzo-Blanco, E. I., Córdova, D., Des Rosiers, S. E., Lizzi, K.

M., Baezconde-Garbanati, L., Soto, D. W., Villamar, J. A., Pattarroyo, M., &

Szapocznik, J. (2016). Health risk behaviors and depressive symptoms among

Hispanic adolescents: Examining acculturation discrepancies and family

functioning. *Journal of Family Psychology, 30*(2), 254–265.

https://doi.org/10.1037/fam0000142

Cash, S. W., Beresford, S. A. A., Henderson, J. A., McTiernan, A., Xiao, L., Wang, C.

Y., & Patrick, D. L. (2011). Dietary and physical activity behaviors related to

obesity-specific quality of life and work productivity: baseline results from a

worksite trial. *British Journal of Nutrition*, *108*(06), 1134–1142.

http://doi:10.1017/s0007114511006258

Caspi, C. E., Tucker-Seeley, R. D., Adamkiewicz, G., Roberto, C. A., Stoddard, A. M., &

Sorensen, G. C. (2016). Food hardship and obesity in a sample of low-income

immigrants. *Journal of Immigrant and Minority Health*, *19*(1), 130–137.

http://doi:10.1007/s10903-016-0344-z

Castañeda, H., Holmes, S. M., Madrigal, D. S., Young, M.-E. D., Beyeler, N., &

Quesada, J. (2015). Immigration as a social determinant of health. *Annual Review*

of Public Health, *36*(1), 375–392. http://doi:10.1146/annurev-publhealth-032013-

182419

Center for Disease Control and Prevention. (2018). Overweight and obesity.

https://www.cdc.gov/obesity/adult/defining.html

Center for Disease Control and Prevention. (2020) National Health Interview Survey.

https://www.cdc.gov/nchs/about/factsheets/factsheet_nhis.htm

Center for Substance Abuse Treatment (US). (2014) Improving cultural competence.

Rockville, MD: Substance abuse and mental health services administration (US).

(Treatment Improvement Protocol (TIP) Series, No. 59.) Appendix B, Instruments

to measure identity and acculturation.

https://www.ncbi.nlm.nih.gov/books/NBK248425/

Chaffee, B. W., Abrams, B., Cohen, A. K., & Rehkopf, D. H. (2015). Socioeconomic

disadvantage in childhood as a predictor of excessive gestational weight gain and

obesity in midlife adulthood. *Emerging Themes in Epidemiology*, *12*(1), 4.

http://doi:10.1186/s12982-015-0026-7

Chaix, B., Bean, K., Daniel, M., Zenk, S. N., Kestens, Y., Charreire, H., … Pannier, B.

(2012). Associations of supermarket characteristics with weight status and body

fat: A multilevel analysis of individuals within supermarkets (RECORD Study).

PLoS ONE, *7*(4), e32908. http://doi.org/10.1371/journal.pone.0032908

Chan, K., De Souza, L. R., Kobayashi, K., & Fuller-Thomson, E. (2019). Diabetes and

diabetes care among non-obese South Asian Americans: Findings from a

population-based study. *Diabetes & Metabolic Syndrome: Clinical Research &*

Reviews, 13(1), 96–102. http://doi:10.1016/j.dsx.2018.08.025

Chang, V. W., Hillier, A. E., & Mehta, N. K. (2009). Neighborhood racial isolation,

disorder and obesity. *Social Forces*, *87*(4), 2063–2092.

http://doi:10.1353/sof.0.0188

Chaudhury, A., Duvoor, C., Reddy Dendi, V. S., Kraleti, S., Chada, A., Ravilla, R.,

Marco, A., Shekhawat, N. S., Montales, M. T., Kuriakose, K., Sasapu, A., Beebe,

A., Patil, N., Musham, C. K., Lohani, G. P., & Mirza, W. (2017). Clinical review

of antidiabetic drugs: Implications for Type 2 diabetes mellitus management.

Frontiers in endocrinology, 8, 6. https://doi.org/10.3389/fendo.2017.00006

Chen, D., Jaenicke, E. C., & Volpe, R. J. (2016). Food environments and obesity:

household diet expenditure versus food deserts. *American Journal of Public*

Health, *106*(5), 881–888. http://doi:10.2105/ajph.2016.303048

Chircop, A., Shearer, C., Pitter, R., Sim, M., Rehman, L., Flannery, M., & Kirk, S.

(2013). Privileging physical activity over healthy eating: "Time" to choose?

Health Promotion International, 30(3), 418–426.

http://doi:10.1093/heapro/dat056

Chiswick, B. R., & Miller, P. W. (2004). Where Immigrants Settle in the United States.

Journal of Comparative Policy Analysis: Research and Practice, *6*(2), 185–197.

http://doi:10.1080/1387698042000273479

Colby, S. L., & Ortman, J. M. (2015). Projections of the size and composition of the U.S

population: 2014 to 2060. Population estimates and projections. *Current Population Reports*. P25-1143. US Census Bureau. https://files.eric.ed.gov/fulltext/ED578934.pdf

Commodore-Mensah, Y., Ukonu, N., Cooper, L. A., Agyemang, C., & Himmelfarb, C. D. (2017). The association between acculturation and cardiovascular disease risk in Ghanaian and Nigerian-born African immigrants in the United States: The Afro-Cardiac Study. *Journal of Immigrant and Minority Health, 20*(5), 1137–1146. http://doi:10.1007/s10903-017-0644-y

Commodore-Mensah, Y., Selvin, E., Aboagye, J., Turkson-Ocran, R.-A., Li, X., Himmelfarb, C. D., Ahima, R. S., & Cooper, L. A. (2018). Hypertension, overweight/obesity, and diabetes among immigrants in the United States: an analysis of the 2010–2016 National Health Interview Survey. *BMC Public Health, 18*(1). https://doi.org/10.1186/s12889-018-5683-3

Commodore-Mensah, Y., Ukonu, N., Obisesan, O., Aboagye, J. K., Agyemang, C., Reilly, C. M., Dunbar, S. B., & Okosun, I. S. (2016). Length of residence in the United States is associated with a higher prevalence of cardiometabolic risk factors in immigrants: A contemporary analysis of the National Health Interview Survey. *Journal of the American Heart Association, 5*(11). https://doi.org/10.1161/jaha.116.004059

Cook, W. K., Tseng, W., Tam, C., John, I., & Lui, C. (2017). Ethnic-group socioeconomic status as an indicator of community-level disadvantage: A study of overweight/obesity in Asian American adolescents. *Social Science &*

Medicine, 184, 15–22. https://doi.org/10.1016/j.socscimed.2017.04.027

Corica, D., Aversa, T., Valenzise, M., Messina, M. F., Alibrandi, A., De Luca, F., & Wasniewska, M. (2018). Does family history of obesity, cardiovascular, and metabolic diseases influence onset and severity of childhood obesity? *Frontiers in Endocrinology, 9*. https://doi.org/10.3389/fendo.2018.00187

Corona, G., Vignozzi, L., Sforza, A., Mannucci, E., & Maggi, M. (2015). Obesity and late-onset hypogonadism. *Molecular and Cellular Endocrinology, 418*, 120–133. https://doi.org/10.1016/j.mce.2015.06.031

Cyril, S., Halliday, J., Green, J., & Renzaho, A. M. N. (2016). Relationship between body mass index and family functioning, family communication, family type and parenting style among African migrant parents and children in Victoria, Australia: a parent-child dyad study. *BMC Public Health, 16*(1). https://doi.org/10.1186/s12889-016-3394-1

da Costa, L. P., Dias, S. F., & Martins, M. do R. O. (2017). Association between length of residence and overweight among adult immigrants in Portugal: A nationwide cross-sectional study. *BMC Public Health, 17*(1). https://doi.org/10.1186/s12889-017-4252-5

Dahlan, R., Badri, P., Saltaji, H., & Amin, M. (2019). Impact of acculturation on oral health among immigrants and ethnic minorities: A systematic review. PLOS ONE, 14(2), e0212891. https://doi.org/10.1371/journal.pone.0212891

D'Alonzo, K. T., Vilaró, F. M., Joseph, M. E., Oyeneye, V., Garsman, L., Rosas, S. R., Castañeda, M., & Vivar, M. (2020). Using concept mapping within a community-

academic partnership to examine obesity among Mexican immigrants. *Progress in community health partnerships: research, education, and action, 14*(2), 173–185. https://doi.org/10.1353/cpr.2020.0016

Davis, T. M. E., Coleman, R. L., & Holman, R. R. (2013). Ethnicity and long-term vascular outcomes in Type 2 diabetes: a prospective observational study (UKPDS 83). *Diabetic Medicine*, *31*(2), 200–207. http://doi:10.1111/dme.12353

Delavari, M., Sønderlund, A. L., Swinburn, B., Mellor, D., & Renzaho, A. (2013). Acculturation and obesity among migrant populations in high income countries – a systematic review. *BMC Public Health, 13*(1). https://doi.org/10.1186/1471-2458-13-458

Denova-Gutiérrez, E., Tucker, K. L., Flores, M., Barquera, S., & Salmerón, J. (2015). Dietary patterns are associated with predicted cardiovascular disease risk in an urban Mexican adult population. *The Journal of Nutrition*, *146*(1), 90–97. https://doi:10.3945/jn.115.217539

Global BMI Mortality Collaboration, Di Angelantonio, E., Bhupathiraju, S., Wormser, D., Gao, P., Kaptoge, S., Berrington de Gonzalez, A., Cairns, B. J., Huxley, R., Jackson, C., Joshy, G., Lewington, S., Manson, J. E., Murphy, N., Patel, A. V., Samet, J. M., Woodward, M., Zheng, W., Zhou, M., Bansal, N., … Hu, F. B. (2016). Body-mass index and all-cause mortality: individual-participant-data meta-analysis of 239 prospective studies in four continents. *Lancet (London, England), 388*(10046), 776–786. https://doi.org/10.1016/S0140-6736(16)30175-1

Di Cesare M, Bentham J, Stevens GA, et al. (2016) Trends in adult body-mass index in

200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19·2 million participants. *The Lancet* 387:1377–96.doi:10.1016/S0140-6736(16)30054-X

Drewnowski, A., Moudon, A. V., Jiao, J., Aggarwal, A., Charreire, H., & Chaix, B. (2014). Food shopping behaviors and socioeconomic status influence obesity rates in Seattle and in Paris. *International Journal of Obesity* (2005), *38*(2), 306–314. http://doi.org/10.1038/ijo.2013.97

Du, Y., Shih, M., Lightstone, A. S., & Baldwin, S. (2017). Hypertension among Asians in Los Angeles County: Findings from a multiyear survey. *Preventive Medicine Reports, 6*, 302–306. https://doi.org/10.1016/j.pmedr.2017.03.009

Duru, A. A. (2020). Demographic, lifestyle, and psychosocial predictors of obesity among nigerian igbo immigrants (Order No. 27993632). Available from Dissertations & Theses @ Walden University; *ProQuest One Academic*. (2408767474). https://www.proquest.com/dissertations-theses/demographic-lifestyle-psychosocial-predictors/docview/2408767474/se-2

Finkelstein, E. A., DiBonaventura, M. d., Burgess, S. M., & Hale, B. C. (2010). The costs of obesity in the workplace. *Journal of occupational and environmental medicine, 52*(10), 971–976. https://doi.org/10.1097/JOM.0b013e3181f274d2

Fitzpatrick, Kevin and LaGory, Mark. (2011). *Unhealthy Cities: Poverty, Race, and Place in America.* New York: Routledge.

Fleischman, Y., Willen, S. S., Davidovitch, N., & Mor, Z. (2015). Migration as a social determinant of health for irregular migrants: Israel as case study. *Social Science*

& Medicine, 147, 89–97. https://doi.org/10.1016/j.socscimed.2015.10.046

Fradkin, C., Wallander, J. L., Elliott, M. N., Tortolero, S., Cuccaro, P., & Schuster, M. A. (2015). Associations between socioeconomic status and obesity in diverse, young adolescents: Variation across race/ethnicity and gender. *Health Psychology, 34*(1), 1–9. https://doi.org/10.1037/hea0000099

Frühbeck, G., Toplak, H., Woodward, E., Yumuk, V., Maislos, M., & Oppert, J.-M. (2013). Obesity: The Gateway to Ill Health - an EASO Position Statement on a Rising Public Health, Clinical and Scientific Challenge in Europe. *Obesity Facts, 6*(2), 117–120. Portico. https://doi.org/10.1159/000350627

GBD 2015 Obesity Collaborators. (2017). Health effects of overweight and obesity in 195 countries over 25 years. *New England Journal of Medicine*, *377*(1), 13-27. http://doi:10.1056/NEJMoa1614362

Ganesh Pandian, B., Sireesha, P., Ping, N. Y., & Parashuram, N. (2016). Monitoring the Prevalence of Metabolic Syndrome Among Hypothyroid Patients and Assessing the Effect of Anti-Hypothyroid Treatment on it Among the South Indian Population. *Journal of Young Pharmacists, 8*(2), 104–107. https://doi.org/10.5530/jyp.2016.2.8

Gany, F., Palaniappan, L., Prasad, L., Acharya, S., & Leng, J. (2017). South Asian Health. From Research to Practice and Policy: An Overview. *Journal of Immigrant and Minority Health, 21*(S1), 3–6. https://doi.org/10.1007/s10903-017-0552-1

Gimeno-Feliu, L. A., Calderón-Larrañaga, A., Diaz, E., Poblador-Plou, B., Macipe-

Costa, R., & Prados-Torres, A. (2015). The healthy migrant effect in primary care. Gaceta Sanitaria, 29(1), 15–20. https://doi.org/10.1016/j.gaceta.2014.07.007

Goettler, A., Grosse, A., & Sonntag, D. (2017). Productivity loss due to overweight and obesity: a systematic review of indirect costs. *BMJ Open, 7*(10), e014632. https://doi.org/10.1136/bmjopen-2016-014632

Golden, S. D., & Earp, J. A. L. (2012). Social ecological approaches to individuals and their contexts. *Health Education & Behavior, 39*(3), 364–372. https://doi.org/10.1177/1090198111418634

Goforth, A. N., Oka, E. R., Leong, F. T. L., & Denis, D. J. (2014). Acculturation, acculturative Stress, religiosity and psychological adjustment among Muslim Arab American adolescents. *Journal of Muslim Mental Health, 8*(2). https://doi.org/10.3998/jmmh.10381607.0008.202

Gong, S., Wang, K., Li, Y., & Alamian, A. (2018). Geographic differences in obesity prevalence and its risk factors among Asian Americans: findings from the 2013–2014 California Health Interview Survey. *Scientific Reports, 8*(1). https://doi.org/10.1038/s41598-018-29906-5

Gong, S., Wang, K., Li, Y., & Alamian, A. (2019). The influence of immigrant generation on obesity among Asian Americans in California from 2013 to 2014. *PLOS ONE, 14*(2), e0212740. https://doi.org/10.1371/journal.pone.0212740

Grigsby-Toussaint, D. S., Jones, A., Kubo, J., & Bradford, N. (2015). Residential Segregation and Diabetes Risk among Latinos. *Ethnicity & Disease, 25*(4), 451. https://doi.org/10.18865/ed.25.4.451

Gupta, N., Goel, K., Shah, P., & Misra, A. (2012). Childhood Obesity in Developing Countries: Epidemiology, Determinants, and Prevention. *Endocrine Reviews, 33*(1), 48–70. https://doi.org/10.1210/er.2010-0028

Guven, C., & Islam, A. (2015). Age at migration, language proficiency, and socioeconomic outcomes: Evidence from Australia. *Demography, 52*(2), 513–542. https://doi.org/10.1007/s13524-015-0373-6

Ha, H., Han, C., & Kim, B. (2017). Can Obesity Cause Depression? A Pseudo-panel analysis. *Journal of Preventive Medicine and Public Health, 50*(4), 262–267. https://doi.org/10.3961/jpmph.17.067

Hacker, K., Anies, M. E., Folb, B., & Zallman, L. (2015). Barriers to health care for undocumented immigrants: a literature review. *Risk Management and Healthcare Policy*, 175. https://doi.org/10.2147/rmhp.s70173

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2017). Prevalence of Obesity Among Adults and Youth: United States, 2015-2016. NCHS data brief, (288), 1–8. https://pubmed.ncbi.nlm.nih.gov/29155689/

Hall, M., Tach, L., & Lee, B. A. (2016). Trajectories of Ethno-racial diversity in American communities, 1980-2010. *Population and Development Review, 42*(2), 271–297. Portico. https://doi.org/10.1111/j.1728-4457.2016.00125.x

Han, T. S., & Lean, M. E. (2016). A clinical perspective of obesity, metabolic syndrome and cardiovascular disease. JRSM Cardiovascular Disease, 5, 204800401663337. https://doi.org/10.1177/2048004016633371

Harris, N., Minniss, F., & Somerset, S. (2014). Refugees Connecting with a New Country

through Community Food Gardening. International Journal of Environmental Research and Public Health, 11(9), 9202–9216. https://doi.org/10.3390/ijerph110909202

Hayes, L., White, M., McNally, R. J. Q., Unwin, N., Tran, A., & Bhopal, R. (2017). Do cardiometabolic, behavioural and socioeconomic factors explain the 'healthy migrant effect' in the UK? Linked mortality follow-up of South Asians compared with white Europeans in the Newcastle Heart Project. Journal of Epidemiology and Community Health, 71(9), 863–869. https://doi.org/10.1136/jech-2017-209348

Hawkes, C., Smith, T. G., Jewell, J., Wardle, J., Hammond, R. A., Friel, S., Thow, A. M., & Kain, J. (2015). Smart food policies for obesity prevention. *The Lancet, 385*(9985), 2410–2421. https://doi.org/10.1016/s0140-6736(14)61745-1

Hebebrand, J., Holm, J.-C., Woodward, E., Baker, J. L., Blaak, E., Durrer Schutz, D., Farpour-Lambert, N. J., Frühbeck, G., Halford, J. G. C., Lissner, L., Micic, D., Mullerova, D., Roman, G., Schindler, K., Toplak, H., Visscher, T. L. S., & Yumuk, V. (2017). A Proposal of the European Association for the Study of Obesity to Improve the ICD-11 Diagnostic Criteria for Obesity Based on the Three Dimensions Etiology, Degree of Adiposity and Health Risk. Obesity Facts, 10(4), 284–307. Portico. https://doi.org/10.1159/000479208

Herter-Aeberli, I., Osuna, E., Sarnovská, Z., & Zimmermann, M. B. (2019). Significant decrease in childhood obesity and waist circumference over 15 Years in Switzerland: A repeated cross-sectional study. *Nutrients, 11*(8), 1922.

https://doi.org/10.3390/nu11081922

Higgs, S. (2015). Social norms and their influence on eating behaviors. *Appetite, 86,* 38–

44. https://doi.org/10.1016/j.appet.2014.10.021

Hoenink, J. C., Lakerveld, J., Rutter, H., Compernolle, S., De Bourdeaudhuij, I., Bárdos,

H., Charreire, H., Oppert, J. M., & Mackenbach, J. D. (2019). The moderating

role of social neighborhood factors in the association between features of the

physical neighborhood environment and weight status. *Obesity Facts, 12*(1), 14–

24. Portico. https://doi.org/10.1159/000496118

Holmboe-Ottesen, G., & Wandel, M. (2012). Changes in dietary habits after migration

and consequences for health: a focus on South Asians in Europe. *Food &*

Nutrition Research, 56(1), 18891. https://doi.org/10.3402/fnr.v56i0.18891

Hruby, A., & Hu, F. B. (2014). The Epidemiology of Obesity: A Big Picture.

PharmacoEconomics, 33(7), 673–689. https://doi.org/10.1007/s40273-014-0243-

x

Hunter-Adams, J., Cochran, J., Laird, L. D., Paasche-Orlow, M. K., & Geltman, P. L.

(2017). Acculturation and a potential relationship with oral health outcomes

among Somali refugees in Massachusetts. *Journal of Immigrant and Minority*

Health, 20(2), 351–359. https://doi.org/10.1007/s10903-017-0650-0

Immigrants in the United States. (2021). American Immigration Council.

https://www.americanimmigrationcouncil.org/research/immigrants-in-the-united-

states

Isasi, C. R., Ayala, G. X., Sotres-Alvarez, D., Madanat, H., Penedo, F., Loria, C. M.,

Elder, J. P., Daviglus, M. L., Barnhart, J., Siega-Riz, A. M., Van Horn, L., & Schneiderman, N. (2015). Is acculturation related to obesity in Hispanic/Latino adults? Results from the Hispanic community health study/study of Latinos. *Journal of Obesity*, *1*–8. https://doi.org/10.1155/2015/186276

Jayawardena, R., Ranasinghe, P., Wijayabandara, M., Hills, A. P., & Misra, A. (2017). Nutrition Transition and Obesity Among Teenagers and Young Adults in South Asia. *Current Diabetes Reviews, 13*(5). https://doi.org/10.2174/1573399812666160808100211

Jin, K., Gullick, J., Neubeck, L., Koo, F., & Ding, D. (2017). Acculturation is associated with higher prevalence of cardiovascular disease risk-factors among Chinese immigrants in Australia: Evidence from a large population-based cohort. *European Journal of Preventive Cardiology, 24*(18), 2000–2008. https://doi.org/10.1177/2047487317736828

Kandula, N. R., Wen, M., Jacobs, E. A., & Lauderdale, D. S. (2009). Association between neighborhood context and smoking prevalence among Asian Americans. *American Journal of Public Health, 99*(5), 885–892. https://doi.org/10.2105/ajph.2007.131854

Karter, A. J., Schillinger, D., Adams, A. S., Moffet, H. H., Liu, J., Adler, N. E., & Kanaya, A. M. (2013). Elevated rates of diabetes in Pacific Islanders and Asian subgroups. *Diabetes Care, 36*(3), 574–579. https://doi.org/10.2337/dc12-0722

Kellou, N., Sandalinas, F., Copin, N., & Simon, C. (2014). Prevention of unhealthy weight in children by promoting physical activity using a socio-ecological

approach: What can we learn from intervention studies? *Diabetes &*

Metabolism, 40(4), 258–271. https://doi.org/10.1016/j.diabet.2014.01.002

Kelly, D. M., & Jones, T. H. (2015). Testosterone and obesity. *Obesity Reviews, 16*(7),

581–606. https://doi.org/10.1111/obr.12282

Khan, S. A., & Jackson, R. T. (2015). The prevalence of metabolic syndrome among low-

income South Asian Americans. *Public Health Nutrition, 19*(3), 418–428.

https://doi.org/10.1017/s1368980015001330

Kilanowski, J. F. (2017). Breadth of the socio-ecological model. *Journal of*

Agromedicine. https://doi.org/10.1080/1059924x.2017.1358971

Kim, W., Kreps, G. L., & Shin, C.-N. (2015). The role of social support and social

networks in health information–seeking behavior among Korean Americans: a

qualitative study. *International Journal for Equity in Health, 14*(1).

https://doi.org/10.1186/s12939-015-0169-8

Kim, T. E., & Jang, C.-Y. (2018). The relationship between children's flourishing and

being overweight. *Journal of Exercise Rehabilitation, 14*(4), 598–605.

https://doi.org/10.12965/jer.1836208.104

Kim, T. J., & Von dem Knesebeck, O. (2018). Income and obesity: what is the direction

of the relationship? A systematic review and meta-analysis. *BMJ Open*, 8(1).

https://doi: 10.1136/bmjopen-2017-019862

Kim, Y., Ritchie, L., Landgraf, A., Hasson, R. E., & Colabianchi, N. (2020). The role of

the neighborhood social environment in physical activity among Hispanic

children: Moderation by cultural factors and mediation by neighborhood norms.

International Journal of Environmental Research and Public Health, 17(24),

9527. https://doi.org/10.3390/ijerph17249527

Kitahara, C. M., Flint, A. J., Berrington de Gonzalez, A., Bernstein, L., Brotzman, M.,

MacInnis, R. J., Moore, S. C., Robien, K., Rosenberg, P. S., Singh, P. N.,

Weiderpass, E., Adami, H. O., Anton-Culver, H., Ballard-Barbash, R., Buring, J.

E., Freedman, D. M., Fraser, G. E., Beane Freeman, L. E., Gapstur, S. M., …

Hartge, P. (2014). Association between class III obesity (BMI of 40–59 kg/m2)

and mortality: A pooled analysis of 20 prospective studies. *PLoS Medicine, 11*(7),

e1001673. https://doi.org/10.1371/journal.pmed.1001673

Klabunde, R. A., Lazar Neto, F., Louzada, A., de Moura, R. F., Calixto, F. M., Danaei,

G., & Castro, M. C. (2020). Prevalence and predictors of overweight and obesity

in Brazilian immigrants in Massachusetts. *BMC Public Health, 20*(1).

https://doi.org/10.1186/s12889-020-8144-8

Koolhaas, J. M., Bartolomucci, A., Buwalda, B., de Boer, S. F., Flügge, G., Korte, S. M.,

Meerlo, P., Murison, R., Olivier, B., Palanza, P., Richter-Levin, G., Sgoifo, A.,

Steimer, T., Stiedl, O., van Dijk, G., Wöhr, M., & Fuchs, E. (2011). Stress

revisited: A critical evaluation of the stress concept. *Neuroscience &*

Biobehavioral Reviews, 35(5), 1291–1301.

https://doi.org/10.1016/j.neubiorev.2011.02.003

Kowaleski-Jones, L., Brown, B. B., Fan, J. X., Hanson, H. A., Smith, K. R., & Zick, C.

D. (2017). The joint effects of family risk of obesity and neighborhood

environment on obesity among women. *Social Science & Medicine, 195*, 17–

24. https://doi.org/10.1016/j.socscimed.2017.10.018

Kramer, M. R., Raskind, I. G., Van Dyke, M. E., Matthews, S. A., & Cook-Smith, J. N. (2016). Geography of Adolescent Obesity in the U.S., 2007-2011. *American journal of preventive medicine, 51*(6), 898–909. https://doi.org/10.1016/j.amepre.2016.06.016

Kritz, M. M., & Gurak, D. T. (2015). U.S. Immigrants in dispersed and traditional settlements: National origin heterogeneity. *International Migration Review, 49*(1), 106–141. https://doi.org/10.1111/imre.12177

Krueger, P. M., Coleman-Minahan, K., & Rooks, R. N. (2014). Race/ethnicity, nativity, and trends in BMI among U.S. adults. *Obesity, 22*(7), 1739–1746. Portico. https://doi.org/10.1002/oby.20744

Kuerban, A. (2015). Healthy Migrant Effect on Smoking Behavior Among Asian Immigrants in the United States. Journal of Immigrant and Minority Health, 18(1), 94–101. https://doi.org/10.1007/s10903-014-0155-z

Kumar, R., Seay, N., & Karabenick, S. A. (2015). Immigrant Arab adolescents in ethnic enclaves: Physical and phenomenological contexts of identity negotiation. *Cultural Diversity and Ethnic Minority Psychology, 21*(2), 201–212. https://doi.org/10.1037/a0037748

Lasserre, A. M., Glaus, J., Vandeleur, C. L., Marques-Vidal, P., Vaucher, J., Bastardot, F., Waeber, G., Vollenweider, P., & Preisig, M. (2014). Depression With Atypical Features and Increase in Obesity, Body Mass Index, Waist Circumference, and Fat Mass. JAMA Psychiatry, 71(8), 880.

https://doi.org/10.1001/jamapsychiatry.2014.411

Lassetter, J. H., Clark, L., Morgan, S. E., Brown, L. B., VanServellen, G., Duncan, K., & Hopkins, E. S. (2014). Health literacy and obesity among native Hawaiian and Pacific Islanders in the United States. *Public Health Nursing, 32*(1), 15–23. https://doi.org/10.1111/phn.12155

Lee, S., Choi, I., Chang, C., & Suh, D. (2015). Productivity Loss Costs Attributable to Obesity in Working Patients with Diabetes in the US. *Value in Health, 18*(7), A604. https://doi.org/10.1016/j.jval.2015.09.2081

Lee, Y. (2017). Slender women and overweight men: gender differences in the educational gradient in body weight in South Korea. *International Journal for Equity in Health, 16*(1). https://doi.org/10.1186/s12939-017-0685-9

Lesser, I. A., Gasevic, D., & Lear, S. A. (2014). The Association between Acculturation and Dietary Patterns of South Asian Immigrants. *PLoS ONE, 9*(2), e88495. https://doi.org/10.1371/journal.pone.0088495

Li, S., Kwon, S. C., Weerasinghe, I., Rey, M. J., & Trinh-Shevrin, C. (2013). Smoking among Asian Americans: acculturation and gender in the context of tobacco control policies in New York City. Health promotion practice, 14(5 Suppl), 18S–28S. https://doi.org/10.1177/1524839913485757

Lichter, D. T. (2012). Immigration and the new racial diversity in rural America. *Rural Sociology, 77*(1), 3–35. https://doi.org/10.1111/j.1549-0831.2012.00070.x

Lim, S., Yi, S. S., Lundy De La Cruz, N., & Trinh-Shevrin, C. (2015). Defining ethnic enclave and its associations with self-reported health outcomes among Asian

American adults in New York City. *Journal of Immigrant and Minority Health, 19*(1), 138–146. https://doi.org/10.1007/s10903-015-0334-6

Locke, A. E., Kahali, B., Berndt, S. I., Justice, A. E., Pers, T. H., Day, F. R., Powell, C., Vedantam, S., Buchkovich, M. L., Yang, J., Croteau-Chonka, D. C., Esko, T., Fall, T., Ferreira, T., Gustafsson, S., Kutalik, Z., Luan, J., Mägi, R., Randall, J. C., Winkler, T. W., … Speliotes, E. K. (2015). Genetic studies of body mass index yield new insights for obesity biology. *Nature, 518*(7538), 197–206. https://doi.org/10.1038/nature14177

Loury, G. C., Modood, T., & Teles, S. M. (Eds.). (2005). Ethnicity as social capital: community-based institutions and embedded networks of social relations. Ethnicity, Social Mobility, and Public Policy, 131–159. https://doi:10.1017/cbo9780511489228.006

Lupien, S. J., McEwen, B. S., Gunnar, M. R., & Heim, C. (2009). Effects of stress throughout the lifespan on the brain, behavior and cognition. *Nature Reviews Neuroscience, 10*(6), 434–445. https://doi.org/10.1038/nrn2639

Ludwig, D. S., & Ebbeling, C. B. (2018). 90th Anniversary Commentary: Obesity among Offspring of US Immigrants: After 20 Years, a Need to Safeguard Children from the Obesogenic Environment. *The Journal of nutrition*, 148(10), 1674–1677. https://doi.org/10.1093/jn/nxy152

Marketou, M., Gupta, Y., Jain, S., & Vardas, P. (2017). Differential Metabolic Effects of

 Beta-Blockers: an Updated Systematic Review of Nebivolol. *Current*

 Hypertension Reports, 19(3). https://doi.org/10.1007/s11906-017-0716-3

Mama, S. K., Diamond, P. M., McCurdy, S. A., Evans, A. E., McNeill, L. H., & Lee, R.

 E. (2015). Individual, social and environmental correlates of physical activity in

 overweight and obese African American and Hispanic women: A structural

 equation model analysis. *Preventive Medicine Reports, 2*, 57–64.

 https://doi.org/10.1016/j.pmedr.2015.01.001

Martínez-González, M. A. (2016). Benefits of the Mediterranean diet beyond the

 Mediterranean Sea and beyond food patterns. *BMC Medicine, 14*(1).

 https://doi.org/10.1186/s12916-016-0714-3

Martinez, O., Wu, E., Sandfort, T., Dodge, B., Carballo-Dieguez, A., Pinto, R., Rhodes,

 S., Moya, E., & Chavez-Baray, S. (2013). Evaluating the impact of immigration

 policies on health status among undocumented immigrants: A systematic review.

 Journal of Immigrant and Minority Health, 17(3), 947–970.

 https://doi.org/10.1007/s10903-013-9968-4

Mason, T. B., Heron, K. E., Braitman, A. L., & Lewis, R. J. (2016). A daily diary study

 of perceived social isolation, dietary restraint, and negative affect in binge eating.

 Appetite, 97, 94–100. https://doi.org/10.1016/j.appet.2015.11.027

Mayo Clinic. (2015). Obesity. https://www.mayoclinic.org/diseases-

 conditions/obesity/symptoms-causes/syc-20375742

McIntire, R. K., Scalzo, L., Doran, C., Bucher, K., & Juon, H.-S. (2021). Acculturation

and Hypertension Diagnoses Among Hispanics in California. *Journal of Racial and Ethnic Health Disparities, 9*(3), 946–953. https://doi.org/10.1007/s40615-021-01033-4

Mejia, N., Lightstone, A. S., Basurto-Davila, R., Morales, D. M., & Sturm, R. (2015). Neighborhood food environment, diet, and obesity among Los Angeles County adults, 2011. *Preventing Chronic Disease, 12*. https://doi.org/10.5888/pcd12.150078

Menigoz, K., Nathan, A., & Turrell, G. (2016). Ethnic differences in overweight and obesity and the influence of acculturation on immigrant bodyweight: evidence from a national sample of Australian adults. *BMC Public Health, 16*(1). https://doi.org/10.1186/s12889-016-3608-6

Minh, A., Muhajarine, N., Janus, M., Brownell, M., & Guhn, M. (2017). A review of neighborhood effects and early child development: How, where, and for whom, do neighborhoods matter? *Health & Place, 46,* 155–174. https://doi.org/10.1016/j.healthplace.2017.04.012

Misra, A., Tandon, N., Ebrahim, S., Sattar, N., Alam, D., Shrivastava, U., Narayan, K. M. V., & Jafar, T. H. (2017). Diabetes, cardiovascular disease, and chronic kidney disease in South Asia: current status and future directions. *BMJ, j1420*. https://doi.org/10.1136/bmj.j1420

Mitchell, S., & Shaw, D. (2015). The worldwide epidemic of female obesity. *Best Practice & Research Clinical Obstetrics & Gynecology*, *29*(3), 289–299. https://doi.org/10.1016/j.bpobgyn.2014.10.002

Montesi, L., Caletti, M. T., & Marchesini, G. (2016). Diabetes in migrants and ethnic minorities in a changing World. *World Journal of Diabetes, 7*(3), 34. https://doi.org/10.4239/wjd.v7.i3.34

Mozaffarian, D., Benjamin, E. J., Go, A. S., Arnett, D. K., Blaha, M. J., Cushman, M., Das, S. R., de Ferranti, S., Després, J. P., Fullerton, H. J., Howard, V. J., Huffman, M. D., Isasi, C. R., Jiménez, M. C., Judd, S. E., Kissela, B. M., Lichtman, J. H., Lisabeth, L. D., Liu, S., … Stroke Statistics Subcommittee (2016). Heart disease and stroke statistics-2016 update: A report from the American Heart Association. *Circulation, 133*(4), e38–e360. https://doi.org/10.1161/CIR.0000000000000350

Mui, P., Hill, S. E., & Thorpe, R. J. (2018). Overweight and Obesity Differences Across Ethnically Diverse Subgroups of Asian American Men. *American Journal of Men's Health, 12*(6), 1958–1965. https://doi.org/10.1177/1557988318793259

Murillo, R., Albrecht, S. S., Daviglus, M. L., & Kershaw, K. N. (2015). The role of physical activity and sedentary behaviors in explaining the association between acculturation and obesity among Mexican-American adults. *American Journal of Health Promotion, 30*(1), 50–57. https://doi.org/10.4278/ajhp.140128-quan-49

Murillo, R., Reesor, L. M., Hernandez, D. C., & Obasi, E. M. (2019). Neighborhood Walkability and Aerobic Physical Activity among Latinos. *American Journal of Health Behavior, 43*(4), 802–811. https://doi.org/10.5993/ajhb.43.4.13

Murphy, M., Robertson, W., & Oyebode, O. (2017). Obesity in International Migrant Populations. *Current Obesity Reports, 6*(3), 314–323.

https://doi.org/10.1007/s13679-017-0274-7

NCD Risk Factor Collaboration (NCD-RisC) (2016). Trends in adult body-mass index in 200 countries from 1975 to 2014: a pooled analysis of 1698 population-based measurement studies with 19·2 million participants. *Lancet (London, England), 387*(10026), 1377–1396. https://doi.org/10.1016/S0140-6736(16)30054-X

National Center for Health Statistics. (2020) National Health Interview Survey, 2019. Public-use data file and documentation. https://www.cdc.gov/nchs/nhis/data-questionnaires-documentation.htm.

Neovius, K., Rehnberg, C., Rasmussen, F., & Neovius, M. (2012). Lifetime Productivity Losses Associated with Obesity Status in Early Adulthood. *Applied Health Economics and Health Policy, 10*(5), 309–317. https://doi.org/10.1007/bf03261865

Ng, M., Fleming, T., Robinson, M., Thomson, B., Graetz, N., Margono, C., ... & Abraham, J. P. (2014). Global, regional, and national prevalence of overweight and obesity in children and adults during 1980–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, 384(9945), 766-781. https://doi:10.1016/S0140-6736(14)60460-8 PMID: 24880830

Nguyen, H.-H. D., Smith, C., Reynolds, G. L., & Freshman, B. (2014). The Effect of Acculturation on Obesity Among Foreign-Born Asians Residing in the United States. *Journal of Immigrant and Minority Health, 17*(2), 389–399. https://doi.org/10.1007/s10903-014-0027-6

Neuman, S. (2014). Are immigrants healthier than native residents? *IZA World of Labor*.

https://doi.org/10.15185/izawol.108

Newton, S., Braithwaite, D., & Akinyemiju, T. F. (2017). Socio-economic status over the life course and obesity: Systematic review and meta-analysis. *PLOS ONE, 12*(5), e0177151. https://doi.org/10.1371/journal.pone.0177151

Nigatu, Y. T., van de Ven, H. A., van der Klink, J. J. L., Brouwer, S., Reijneveld, S. A., & Bültmann, U. (2016). Overweight, obesity and work functioning: The role of working-time arrangements. *Applied Ergonomics, 52*, 128–134. https://doi.org/10.1016/j.apergo.2015.07.016

Norredam, M., Agyemang, C., Hoejbjerg Hansen, O. K., Petersen, J. H., Byberg, S., Krasnik, A., & Kunst, A. E. (2014). Duration of residence and disease occurrence among refugees and family reunited immigrants: test of the 'healthy migrant effect' hypothesis. *Tropical Medicine & International Health, 19*(8), 958–967. https://doi.org/10.1111/tmi.12340

Nyman, J. A. (2011). Productivity costs revisited: toward a new us policy. *Health Economics, 21*(12), 1387–1401. https://doi.org/10.1002/hec.1795

Obisesan, O., Kuo, W.-H., Brunet, M., Obisesan, A., Akinola, O., & Commodore-Mensah, Y. (2017). Predictors of obesity among Nigerian immigrants in the United States. *Journal Of Immigrant And Minority Health, 19*(2), 328–332. https://doi.org/10.1007/s10903-016-0404-4

Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2014). Prevalence of Childhood and Adult Obesity in the United States, 2011-2012. *JAMA, 311*(8), 806. https://doi.org/10.1001/jama.2014.732

Ogden C, Carroll M, Fryar C, Flegal K. (2015) Prevalence of obesity among adults and

    youth: United States, 2011–2014. NCHS Data Brief 2015; 219:1–8.

    https://www.cdc.gov/nchs/data/databriefs/db219.pdf

Ogden, C. L., Fakhouri, T. H., Carroll, M. D., Hales, C. M., Fryar, C. D., Li, X., &

    Freedman, D. S. (2017). Prevalence of obesity among adults, by household

    income and education — United States, 2011–2014. MMWR. *Morbidity and*

    Mortality Weekly Report, 66(50), 1369–1373.

    https://doi.org/10.15585/mmwr.mm6650a1

Ohri-Vachaspati, P., DeLia, D., DeWeese, R. S., Crespo, N. C., Todd, M., & Yedidia, M.

    J. (2014). The relative contribution of layers of the Social Ecological Model to

    childhood obesity. *Public Health Nutrition, 18*(11), 2055–2066.

    https://doi.org/10.1017/s1368980014002365

Olvera, R. L., Williamson, D. E., Fisher-Hoch, S. P., Vatcheva, K. P., & McCormick, J.

    B. (2015). Depression, obesity, and metabolic syndrome: prevalence and risks of

    comorbidity in a population-based representative sample of Mexican Americans.

    The Journal of clinical psychiatry, 76(10), e1300–e1305.

    https://doi.org/10.4088/JCP.14m09118

Olvera Alvarez, H. A., Appleton, A. A., Fuller, C. H., Belcourt, A., & Kubzansky, L. D.

    (2018). An integrated socio-environmental model of health and well-being: a

    conceptual framework exploring the joint contribution of environmental and

    social exposures to health and disease over the life span. *Current Environmental*

    Health Reports, 5(2), 233–243. https://doi.org/10.1007/s40572-018-0191-2

Parackal, S., Stewart, J., & Ho, E. (2016). Exploring reasons for ethnic disparities in diet-
and lifestyle-related chronic disease for Asian sub-groups in New Zealand: a
scoping exercise. *Ethnicity & Health, 22*(4), 333–347.
https://doi.org/10.1080/13557858.2016.1246424

Park, Y., Neckerman, K. M., Quinn, J., Weiss, C., & Rundle, A. (2008). Place of birth,
duration of residence, neighborhood immigrant composition and body mass index
in New York City. *International Journal of Behavioral Nutrition and Physical
Activity, 5*(1). https://doi.org/10.1186/1479-5868-5-19

Pathak, S., Modi, P., Labana, U., Khimyani, P., Joshi, A., Jadeja, R., & Pandya, M.
(2018). Prevalence of obesity among urban and rural school going adolescents of
Vadodara, India: a comparative study. *International Journal of Contemporary
Pediatrics, 5*(4), 1355. https://doi.org/10.18203/2349-3291.ijcp20182480

Pigeyre, M., Yazdi, F. T., Kaur, Y., & Meyre, D. (2016). Recent progress in genetics,
epigenetics and metagenomics unveils the pathophysiology of human obesity.
Clinical Science, 130(12), 943–986. https://doi.org/10.1042/cs20160136

Pillen, H., Tsourtos, G., Coveney, J., Thodis, A., Itsiopoulos, C., & Kouris-Blazos, A.
(2017). Retaining traditional dietary practices among Greek immigrants to
Australia: The role of ethnic identity. *Ecology of Food and Nutrition, 56*(4), 312–
328. https://doi.org/10.1080/03670244.2017.1333000

Pozza, C., & Isidori, A. M. (2017). What's Behind the Obesity Epidemic. *Imaging in
Bariatric Surgery, 1*–8. https://doi.org/10.1007/978-3-319-49299-5_1

Prospective Studies Collaboration. (2009). Body-mass index and cause-specific mortality

in 900 000 adults: collaborative analyses of 57 prospective studies. The Lancet,

373(9669), 1083–1096. https://doi.org/10.1016/s0140-6736(09)60318-4

Puhl, R. M., & Liu, S. (2015). A national survey of public views about the classification

of obesity as a disease. *Obesity, 23*(6), 1288–1295. Portico.

https://doi.org/10.1002/oby.21068

Quesada, J., Arreola, S., Kral, A., Khoury, S., Organista, K. C., & Worby, P. (2014). "As

Good As It Gets": Undocumented Latino day laborers negotiating discrimination

in San Francisco and Berkeley, California, USA. *City & Society, 26*(1), 29–

50. https://doi.org/10.1111/ciso.12033

Rahman, Z., & Paik, S. J. (2017). South Asian immigration and education in the U.S.:

historical and social contexts. *Social and Education History, 6*(1), 26.

https://doi.org/10.17583/hse.2017.2393

Ramakrishnan, K., Ahmad, Z. F. (2014) State of Asian Americans and Pacific Islanders

series: A multifaceted portrait of a growing population. Center for American

Progress. https://cdn.americanprogress.org/wp

content/uploads/2014/04/AAPIReport-comp.pdf

Ramos Salas, X., Raine, K., Vallianatos, H., & Spence, J. C. (2015). Socio-cultural

determinants of physical activity among Latin American immigrant women in

Alberta, Canada. *Journal of International Migration and Integration, 17*(4),

1231–1250. https://doi.org/10.1007/s12134-015-0460-y

Raynor, H. A., & Champagne, C. M. (2016). Position of the Academy of Nutrition and

Dietetics: Interventions for the treatment of overweight and obesity in adults.

Journal of the Academy of Nutrition and Dietetics, 116(1), 129–147.

https://doi.org/10.1016/j.jand.2015.10.031

Razum, O. (2008). Migrant Mortality, Healthy Migrant Effect. *Encyclopedia of Public Health,* 932–935. https://doi.org/10.1007/978-1-4020-5614-7_2188

Record, N. B., Onion, D. K., Prior, R. E., Dixon, D. C., Record, S. S., Fowler, F. L., Cayer, G. R., Amos, C. I., & Pearson, T. A. (2015). Community-wide cardiovascular disease prevention programs and health outcomes in a rural county, 1970-2010. *JAMA, 313*(2), 147. https://doi.org/10.1001/jama.2014.16969

Redfield, R., Linton, R., & Herskovits, M. J. (1936). Memorandum for the study of acculturation. *American Anthropologist, 38*(1), 149–152.

https://doi.org/10.1525/aa.1936.38.1.02a00330

Reed, J. R., Struwe, L., Bice, M. R., & Yates, B. C. (2017). The impact of self-monitoring food intake on motivation, physical activity and weight loss in rural adults. *Applied Nursing Research, 35*, 36–41.

https://doi.org/10.1016/j.apnr.2017.02.008

Reitzel, L. R., Regan, S. D., Nguyen, N., Cromley, E. K., Strong, L. L., Wetter, D. W., & McNeill, L. H. (2014). Density and proximity of fast food restaurants and body mass index among African Americans. *American Journal of Public Health, 104*(1), 110–116. https://doi.org/10.2105/ajph.2012.301140

Ro, A., & Bostean, G. (2015). Duration of U.S. stay and body mass index among Latino and Asian immigrants: A test of theoretical pathways. *Social Science & Medicine, 144*, 39–47. https://doi.org/10.1016/j.socscimed.2015.09.001

Rodriguez, F., Hu, J., Kershaw, K., Hastings, K. G., López, L., Cullen, M. R., Harrington, R. A., & Palaniappan, L. P. (2018). County-level Hispanic ethnic density and cardiovascular disease mortality. *Journal of the American Heart Association, 7*(19). https://doi.org/10.1161/jaha.118.009107

Rogers, R., Eagle, T. F., Sheetz, A., Woodward, A., Leibowitz, R., Song, M., Sylvester, R., Corriveau, N., Kline-Rogers, E., Jiang, Q., Jackson, E. A., & Eagle, K. A. (2015). The Relationship between childhood obesity, low socioeconomic status, and race/ethnicity: Lessons from Massachusetts. *Childhood Obesity, 11*(6), 691–695. https://doi.org/10.1089/chi.2015.0029

Romero-Ibarguengoitia, M. E., Vadillo-Ortega, F., Caballero, A. E., Ibarra-González, I., Herrera-Rosas, A., Serratos-Canales, M. F., León-Hernández, M., González-Chávez, A., Mummidi, S., Duggirala, R., & López-Alvarenga, J. C. (2018). Family history and obesity in youth, their effect on acylcarnitine/aminoacids metabolomics and non-alcoholic fatty liver disease (NAFLD). Structural equation modeling approach. *PLOS ONE, 13*(2), e0193138. https://doi.org/10.1371/journal.pone.0193138

Ro, A., & Fleischer, N. (2014). Changes in health selection of obesity among Mexican immigrants: A binational examination. *Social Science & Medicine, 123*, 114–124. https://doi.org/10.1016/j.socscimed.2014.10.047

Rosenberg, N., Daviglus, M. L., DeVon, H. A., Park, C. G., & Eldeirawi, K. (2017). The Association between parity and inflammation among Mexican-American women of reproductive age varies by acculturation level: Results of the National Health

and Nutrition Examination Survey (1999–2006). *Women's Health Issues, 27*(4), 485–492. https://doi.org/10.1016/j.whi.2017.03.002

Sallis, J. F., & Owen, N. (2015). Ecological models of health behavior. In K. Glanz, B. K. Rimer, & K. "V." Viswanath (Eds.), Health behavior: Theory, research, and practice (pp. 43–64). Jossey-Bass/Wiley.

Sanyal, D., & Raychaudhuri, M. (2016). Hypothyroidism and obesity: An intriguing link. *Indian Journal of Endocrinology and Metabolism, 20*(4), 554. https://doi.org/10.4103/2230-8210.183454

Savadatti, S. S., Bell, E. M., Gates, M. A., Hosler, A. S., Yucel, R. M., & Misra, R. (2019). Metabolic syndrome among Asian Indians in the United States. *Journal of Public Health Management and Practice, 25*(1), 45–52. https://doi.org/10.1097/phh.0000000000000738

Schilling, T., Rauscher, S., Menzel, C., Reichenauer, S., Müller-Schilling, M., Schmid, S., & Selgrad, M. (2017). Migrants and refugees in Europe: Challenges, experiences and contributions. *Visceral Medicine, 33*(4), 295–300. Portico. https://doi.org/10.1159/000478763

Schreiber-Gregory, D., Jackson, H. M., & Bader, K. (2018). Logistic and linear regression assumptions: Violation recognition and control. Henry M Jackson Foundation. https://www.lexjansen.com/wuss/2018/130_Final_Paper_PDF.pdf

Schwingshackl, L., Schwedhelm, C., Galbete, C., & Hoffmann, G. (2017). Adherence to Mediterranean diet and risk of cancer: An updated systematic review and meta-analysis. *Nutrients, 9*(10), 1063. https://doi.org/10.3390/nu9101063

Seiler, A., Chen, M. A., Brown, R. L., & Fagundes, C. P. (2018). Obesity, Dietary Factors, Nutrition, and Breast Cancer Risk. Current Breast Cancer Reports, 10(1), 14–27. https://doi.org/10.1007/s12609-018-0264-0

Sercia, P., Girard, A., & Boucher, V. G. (2018). The transformation of healthy lifestyles related to obesity in context of social integration of recent immigrants. *Canadian Psychology, 59*(2), 187–196. https://doi.org/10.1037/cap0000105

Shah, A. D., Vittinghoff, E., Kandula, N. R., Srivastava, S., & Kanaya, A. M. (2015). Correlates of prediabetes and type II diabetes in US South Asians: findings from the mediators of atherosclerosis in South Asians living in America (MASALA) study. *Annals of Epidemiology, 25*(2), 77–83. https://doi.org/10.1016/j.annepidem.2014.10.013

Shah, S. M., Loney, T., Dhaheri, S. A., Vatanparast, H., Elbarazi, I., Agarwal, M., Blair, I., & Ali, R. (2015). Association between acculturation, obesity and cardiovascular risk factors among male South Asian migrants in the United Arab Emirates – a cross-sectional study. *BMC Public Health, 15*(1). https://doi.org/10.1186/s12889-015-1568-x

Shih, M., Du, Y., Lightstone, A. S., Simon, P. A., & Wang, M. C. (2014). Stemming the tide: Rising diabetes prevalence and ethnic subgroup variation among Asians in Los Angeles County. *Preventive Medicine, 63*, 90–95. https://doi.org/10.1016/j.ypmed.2014.03.016

Shumway, J. M., & Davis, J. A. (2015). Economic freedom, migration, and income change in the United States: 1995 to 2010. *The Professional Geographer, 68*(3),

390–398. https://doi.org/10.1080/00330124.2015.1102028

Silva, A. C. D., Tan, H. L., Rawof, N., & Vilakazi, B. (2016). Analyzing the Effects of
Treating Hypothyroidism and Subclinical Hypothyroidism on Body Mass. Revista
Brasileira de Obesidade, Nutricao e Emagrecimento, (60), 288. https://search-
ebscohost.com.ezp.waldenulibrary.org/login.aspx?direct=true&db=edsgea&AN=e
dsgcl.531171218&site=eds-live&scope=site

Sinha, R., & Jastreboff, A. M. (2013). Stress as a common risk factor for obesity and
addiction. *Biological Psychiatry, 73*(9), 827–835.
https://doi.org/10.1016/j.biopsych.2013.01.032

Singhal, B., Gupta, S., Choudhary, V., & Saini, S. (2018). Metabolic syndrome and
cardiovascular disease risk in patients with depressive disorder on anti-depressive
medication. *Journal Of Clinical and Diagnostic Research*.
https://doi.org/10.7860/jcdr/2018/28702.12029

Singh, G. K., Siahpush, M., & Kogan, M. D. (2010). Neighborhood socioeconomic
conditions, built environments, and childhood obesity. *Health Affairs, 29*(3), 503–
512. https://doi.org/10.1377/hlthaff.2009.0730

Skinner, A. C., Perrin, E. M., & Skelton, J. A. (2016). Prevalence of obesity and severe
obesity in US children, 1999-2014. *Obesity, 24*(5), 1116–1123. Portico.
https://doi.org/10.1002/oby.21497

Smith, T. M., Colón-Ramos, U., Pinard, C. A., & Yaroch, A. L. (2016). Household food
insecurity as a determinant of overweight and obesity among low-income
Hispanic subgroups: Data from the 2011–2012 California Health Interview

Survey. *Appetite, 97*, 37–42. https://doi.org/10.1016/j.appet.2015.11.009

Sominsky, L., & Spencer, S. J. (2014). Eating behavior and stress: a pathway to obesity. *Frontiers in Psychology*, 5. https://doi.org/10.3389/fpsyg.2014.00434

South Asian Americans Leading Together. (2019). A demographic snapshot of South Asians living in the United States. https://saalt.org/wp-content/uploads/2019/04/SAALT-Demographic-Snapshot-2019.pdf

Stringhini, S., Carmeli, C., Jokela, M., Avendaño, M., McCrory, C., d'Errico, A., Bochud, M., Barros, H., Costa, G., Chadeau-Hyam, M., Delpierre, C., Gandini, M., Fraga, S., Goldberg, M., Giles, G. G., Lassale, C., Kenny, R. A., Kelly-Irving, M., Paccaud, F., … Kivimäki, M. (2018). Socioeconomic status, non-communicable disease risk factors, and walking speed in older adults: multi-cohort population based study. *BMJ, k1046*. https://doi.org/10.1136/bmj.k1046

Subica, A. M., Agarwal, N., Sullivan, J. G., & Link, B. G. (2017). Obesity and associated health disparities among understudied multiracial, Pacific Islander, and American Indian adults. *Obesity, 25*(12), 2128–2136. Portico. https://doi.org/10.1002/oby.21954

Suglia, S. F., Shelton, R. C., Hsiao, A., Wang, Y. C., Rundle, A., & Link, B. G. (2016). Why the neighborhood social environment is critical in obesity prevention. *Journal of Urban Health, 93*(1), 206–212. https://doi.org/10.1007/s11524-015-0017-6

Sullivan, G. M., & Feinn, R. (2012). Using Effect Size—or Why the P Value Is Not Enough. *Journal of Graduate Medical Education, 4*(3), 279–282.

https://doi.org/10.4300/jgme-d-12-00156.1

Tabak, R. G., Hipp, J. A., Marx, C. M., & Brownson, R. C. (2015). Workplace Social and Organizational Environments and Healthy-Weight Behaviors. *PLOS ONE, 10*(4), e0125424. https://doi.org/10.1371/journal.pone.0125424

Tamez-Pérez, H. E. (2015). Steroid hyperglycemia: Prevalence, early detection and therapeutic recommendations: A narrative review. *World Journal of Diabetes, 6*(8), 1073. https://doi.org/10.4239/wjd.v6.i8.1073

Temircan, Z. (2017). Predictors of Obesity, Acculturation, and Perceived Stress in Meskhetian Turk (Ahiska) immigrants in the United States. Walden Dissertations and Doctoral Studies.

Tek, C., Kucukgoncu, S., Guloksuz, S., Woods, S. W., Srihari, V. H., & Annamalai, A. (2015). Antipsychotic-induced weight gain in first-episode psychosis patients: a meta-analysis of differential effects of antipsychotic medications. *Early Intervention in Psychiatry, 10*(3), 193–202. Portico. https://doi.org/10.1111/eip.12251

The World Bank; Institute for Health Metrics and Evaluation. (2013) The Global Burden of Disease: Generating Evidence, Guiding Policy—South Asia Regional Edition. Seattle, WA: Institute for Health Metrics and Evaluation, University of Washington, and Human Development Network.

Thomas, A., & Ashcraft, A. (2013). Type 2 Diabetes risk among Asian Indians in the US: A pilot study. *Nursing Research and Practice, 2013*, 1–8. https://doi.org/10.1155/2013/492893

Thomas, B. (2014). Health and Health Care Disparities: The Effect of Social and Environmental factors on individual and population health. *International Journal of Environmental Research and Public Health, 11*(7), 7492–7507. https://doi.org/10.3390/ijerph110707492

Thomson, M. D., & Hoffman-Goetz, L. (2009). Defining and measuring acculturation: A systematic review of public health studies with Hispanic populations in the United States. *Social Science & Medicine, 69*(7), 983–991. https://doi.org/10.1016/j.socscimed.2009.05.011

Torres, S. A., Santiago, C. D., Walts, K. K., & Richards, M. H. (2018). Immigration policy, practices, and procedures: The impact on the mental health of Mexican and Central American youth and families. *American Psychologist, 73*(7), 843–854. https://doi.org/10.1037/amp0000184

Townsend, N., & Foster, C. (2011). Developing and applying a socio-ecological model to the promotion of healthy eating in the school. *Public Health Nutrition, 16*(6), 1101–1108. https://doi.org/10.1017/s1368980011002655

Tremmel, M., Gerdtham, U.-G., Nilsson, P., & Saha, S. (2017). Economic Burden of Obesity: A Systematic literature review. *International Journal of Environmental Research and Public Health, 14*(4), 435. https://doi.org/10.3390/ijerph14040435

Tripathy, J. P., Thakur, J. S., Jeet, G., Chawla, S., Jain, S., & Prasad, R. (2016). Urban rural differences in diet, physical activity and obesity in India: are we witnessing the great Indian equalization? Results from a cross-sectional STEPS survey. *BMC Public Health, 16*(1). https://doi.org/10.1186/s12889-016-3489-8

Truthmann, J., Mensink, G. B. M., Bosy-Westphal, A., Hapke, U., Scheidt-Nave, C., & Schienkiewitz, A. (2017). Physical health-related quality of life in relation to metabolic health and obesity among men and women in Germany. *Health and Quality of Life Outcomes, 15*(1). https://doi.org/10.1186/s12955-017-0688-7

Tsai, S. A., Lv, N., Xiao, L., & Ma, J. (2016). Gender differences in weight-related attitudes and behaviors among overweight and obese adults in the United States. *American Journal of Men's Health, 10*(5), 389–398. https://doi.org/10.1177/1557988314567223

Tseng, M., Wright, D. J., & Fang, C. Y. (2014). Acculturation and dietary change among Chinese immigrant women in the United States. *Journal of Immigrant and Minority Health, 17*(2), 400–407. https://doi.org/10.1007/s10903-014-0118-4

Ultimate visa Corporation. (2017). Reasons or causes of migration. https://www.ultimatevisa.com/causes-for-migration/

United Nations, Department of Economic and Social Affairs, Population Division (2016). International Migration Report 2015: Highlights (ST/ESA/SER.A/375). http://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2015_Highlights.pdf

United Nations, Department of Economic and Social Affairs, Population Division (2017). International Migration Report 2017 (ST/ESA/SER.A/403). http://www.un.org/en/development/desa/population/migration/publications/migrationreport/docs/MigrationReport2017.pdf

United Nations. (2018). UN data. http://data.un.org/default.aspx

United States Census Bureau. (2020). Foreign born.

https://www.census.gov/topics/population/foreign-born.html

Unnikrishnan, R., Gupta, P. K., & Mohan, V. (2018). Diabetes in South Asians:

phenotype, clinical presentation, and natural history. *Current Diabetes Reports,*

18(6). https://doi.org/10.1007/s11892-018-1002-8

Vandenheede, H., Willaert, D., De Grande, H., Simoens, S., & Vanroelen, C. (2015).

Mortality in adult immigrants in the 2000s in Belgium: a test of the 'healthy-

migrant' and the 'migration-as-rapid-health-transition' hypotheses. *Tropical*

Medicine & International Health, 20(12), 1832–1845.

https://doi.org/10.1111/tmi.12610

Van Hulst, A., Roy-Gagnon, M.-H., Gauvin, L., Kestens, Y., Henderson, M., & Barnett,

T. A. (2015). Identifying risk profiles for childhood obesity using recursive

partitioning based on individual, familial, and neighborhood environment factors.

International Journal of Behavioral Nutrition and Physical Activity, 12(1).

https://doi.org/10.1186/s12966-015-0175-7

van Weel, C., Kassai, R., Qidwai, W., Kumar, R., Bala, K., Prasad Gupta, P., Haniffa, R.,

Rajapaksa Hewageegana, N., Ranasinghe, T., Kidd, M., & Howe, A. (2016).

Primary healthcare policy implementation in South Asia. *BMJ Global Health*,

1(2), e000057. https://doi.org/10.1136/bmjgh-2016-000057

Verhaegen, A. A., & Van Gaal, L. F. (2017). Drug-induced obesity and its metabolic

consequences: a review with a focus on mechanisms and possible therapeutic

options. *Journal of Endocrinological Investigation, 40*(11), 1165–1174.

https://doi.org/10.1007/s40618-017-0719-6

Vilchis-Gil, J., Galván-Portillo, M., Klünder-Klünder, M., Cruz, M., & Flores-Huerta, S. (2015). Food habits, physical activities and sedentary lifestyles of eutrophic and obese school children: a case–control study. BMC Public Health, 15(1). https://doi.org/10.1186/s12889-015-1491-1

Volgman, A. S., Palaniappan, L. S., Aggarwal, N. T., Gupta, M., Khandelwal, A., Krishnan, A. V., Lichtman, J. H., Mehta, L. S., Patel, H. N., Shah, K. S., Shah, S. H., & Watson, K. E. (2018). Atherosclerotic cardiovascular disease in South Asians in the United States: Epidemiology, risk factors, and treatments: A scientific statement from the American Heart Association. *Circulation, 138*(1). https://doi.org/10.1161/cir.0000000000000580

Wang, L., Southerland, J., Wang, K., Bailey, B. A., Alamian, A., Stevens, M. A., & Wang, Y. (2017). Ethnic differences in risk factors for obesity among adults in California, the United States. *Journal of Obesity, 2017*, 1–10. https://doi.org/10.1155/2017/2427483

Webster, M., Jr., & Sell, J. (Eds.). (2014). *Laboratory experiments in the social sciences* (2nd ed.). Elsevier Academic Press.

Wieland, M. L., Tiedje, K., Meiers, S. J., Mohamed, A. A., Formea, C. M., Ridgeway, J. L., … Sia, I. G. (2015). Perspectives on physical activity among immigrants and refugees to a small urban community in Minnesota. *Journal of Immigrant and Minority Health / Center for Minority Public Health*, 17(1), 263–275. http://doi.org/10.1007/s10903-013-9917-2

Weissman, J. D., Russell, D., Ansah, P., & Jay, M. (2019). Disparities in healthcare

    utilization among adults with obesity in the United States, findings from the

    NHIS: 2006–2015. *Population Research and Policy Review, 38*(3), 403–415.

    https://doi.org/10.1007/s11113-018-09507-w

Withrow, D., & Alter, D. A. (2011). The economic burden of obesity worldwide: a

    systematic review of the direct costs of obesity. *Obesity Reviews, 12*(2), 131–141.

    https://doi.org/10.1111/j.1467-789x.2009.00712.x

Wojcicki, J. M., Schwartz, N., Jiménez-Cruz, A., Bacardi-Gascon, M., & Heyman, M. B.

    (2011). Acculturation, dietary practices and risk for childhood obesity in an

    ethnically heterogeneous population of Latino School children in the San

    Francisco Bay Area. *Journal of Immigrant and Minority Health, 14*(4), 533–539.

    https://doi.org/10.1007/s10903-011-9553-7

Wolch, J., Jerrett, M., Reynolds, K., McConnell, R., Chang, R., Dahmann, N., Brady, K.,

    Gilliland, F., Su, J. G., & Berhane, K. (2011). Childhood obesity and proximity to

    urban parks and recreational resources: A longitudinal cohort study. *Health

    & Place, 17*(1), 207–214. https://doi.org/10.1016/j.healthplace.2010.10.001

World Bank. (2018). South Asia. Retrieved from https://data.worldbank.org/region/south-

    asia

World Health Organization. (2000). Obesity: preventing and managing the global

    epidemic Report of a WHO Consultation (WHO Technical Report Series 894).

    http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/

World Health Organization. (2018). Obesity and overweight.

http://www.who.int/mediacentre/factsheets/fs311/en/

Yates, N., Teuner, C. M., Hunger, M., Holle, R., Stark, R., Laxy, M., Hauner, H., Peters,

A., & Wolfenstetter, S. B. (2016). The economic burden of obesity in Germany:

Results from the population-based KORA Studies. *Obesity Facts, 9*(6), 397–409.

Portico. https://doi.org/10.1159/000452248

Yoshida, Y., Broyles, S., Scribner, R., Chen, L., Phillippi, S., Jackson-Thompson, J.,

Simoes, E. J., & Tseng, T.-S. (2018). Social support modifies the negative effects

of acculturation on obesity and central obesity in Mexican men. *Ethnicity &*

Health, 25(8), 1103–1114. https://doi.org/10.1080/13557858.2018.1492708

Zhou, M. (2014, February). The Formation of Ethnic Resources and Social Capital in

Immigrant Neighborhoods: Chinatown and Koreatown in Los Angeles. Working

Paper NYU Law/Wagner Colloquium on Urban Affairs.

Zong, J., Batalova, J. (2016). Asian immigrants in the United States. Migration Policy

Institute. www.migrationpolic.org

Zong, J., Batalova, J., & Hallock, J., (2018). Frequently requested statistics on

immigrants and immigration in United States. Retrieved from

https://www.migrationpolicy.org/article/frequently-requested-statistics-

immigrants-and-immigration-united-states

Żukiewicz-Sobczak, W., Wróblewska, P., Zwoliński, J., Chmielewska-Badora, J.,

Adamczuk, P., Krasowska, E., Zagórski, J., Oniszczuk, A., Piątek, J., & Silny, W.

(2014). Obesity and poverty paradox in developed countries. *Annals of*

Agricultural and Environmental Medicine, 21(3), 590–594.

https://doi.org/10.5604/12321966.1120608

Appendix: Data Dictionary

Variable name	Variable label	Type of variable	Variable values	Inclusion criteria
AGE	Age reports the individual's age, in years since their last birthday.	Continuous		
SEX	indicates whether the person was male or female. Starting in 2019, "Unknown-refused" and "Unknown-don't know" responses are allowed.	Categorical	1 Male 2 Female 7 Unknown-refused . 8 Unknown-not ascertained 9 Unknown-don't know	Only the female participants will be included in the study.
RACEA	Self-reported main racial background	Categorical	100 White 200 Black/African American 300 Aleut, Alaskan Native, or American Indian 310 Alaskan Native, American Indian 320 Alaskan Native, Eskimo 330 Aleut 340 American Indian 400 Asian or Pacific Islander 410 Asian 411 Chinese 412 Filipino 413 Korean 414 Vietnamese 415 Japanese 416 Asian Indian 420 Pacific Islander 421 Hawaiian 422 Samoan 423 Guamanian 430 Other Asian or pacific islander 431 Other Asian or Pacific Islander (1992-1995) 432 Other Asian or Pacific Islander (1996) 433 Other Asian or Pacific Islander (1997-1998) 434 Other Asian (1999 forward) 500 Other Race	416 Asian Indian 434 Other Asian
REGIONBR	Reports region of birth of respondents.		01 United States 02 Mexico, Central America, & Caribbean islands 03 South America 04 Europe 05 Russia and former USSR areas 06 Africa	08 Indian subcontinent

			07 Middle east	
			08 Indian Subcontinent	
			09 Asia	
			10 SE Asia	
			11 Elsewhere	
			99 Unknown	
YRSINUS	Number of years spent in US.	Categorical (Ordinal)	0 NIU 1 Less than 1 year 2 1 year to less than 5 years. 3 5 years to less than 10 years 4 10 years to less than 15 years 5 15 years or more 9 Not Ascertained	
EDUCREC2		Categorical (Ordinal)	10 Never attended 20 Grades 1-4 31 grades 5-7 32 Grade 8 41 Grades 9-11 42 Grade 12 51 1-3 years of college 54 4 yrs of college/Bachelor's degree 60 5+ years of college 97 unknown/refused	Socio economic status will be calculated as a composite variable based on the income and the education level.
EARNINGS	An individual's total earning during the previous calendar year.	Categorical (Ordinal)	00 NIU 01 $01 to $4999 02 $5000 to $9999 03 $10000 to $14999 04 $15000 to $19999 05 $20000 to $24999 06 $25000 to $34999 07 $35000 to $44999 08 $45000 to $54999 09 $55000 to $64999 10 $65000 to $74999 11 $75000 and over 97 Unknown-refused 98 Unknown-not ascertained 99 Unknown-don't know	Socio economic status will be calculated as a composite variable based on the income and the education level.
EMPSTATSA	Reports the corrected employment status for the week prior to the date of the interview.		0 NIU 1 Working for pay at job or business 2 With job or business, not at work 3 Looking for work 4 Working without pay at job or business 5 Not working or looking for work 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	

BMICAL	BMI calculated from height and weight.	Categorical	18-<25 = Normal weight 25-<30 = Overweight ≥30 = Obese	
NBHDTIME	Length of time living in present neighborhood	Categorical	0 NIU 1 Less than 1 year 2 1-3 years 3 4-10 years 4 11-20 years 5 More than 20 years 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	People living in a neighborhood from less than one year to more than 20 years will be included in the study.
NBHDCLKT	How much do you agree that this is a close-knit neighborhood	Categorical	0 NIU 1 Definitely agree 2 Somewhat agree 3 Somewhat disagree 4 Definitely disagree 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	
NBHDCTON	How much do you agree that there are people you can count on in this neighborhood	Categorical	0 NIU 1 Definitely agree 2 Somewhat agree 3 Somewhat disagree 4 Definitely disagree 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	
NBHDTRUST	How much do you agree that people in this neighborhood can be trusted	Categorical	0 NIU 1 Definitely agree 2 Somewhat agree 3 Somewhat disagree 4 Definitely disagree 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	
NBHDHELP	How much do you agree that people in this neighborhood help each other out	Categorical	0 NIU 1 Definitely agree 2 Somewhat agree 3 Somewhat disagree 4 Definitely disagree 7 Unknown-refused 8 Unknown-not ascertained 9 Unknown-don't know	A composite supportive neighborhood Variable will be created to score the neighborhood information.