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Acculturation and Dietary Pattern Among Iranian American Immigrants in the United States of America

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ACCULTURATION AND DIETARY PATTERN AMONG IRANIAN IMMIGRANTS IN THE UNITED STATES OF AMERICA

by

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ABSTRACT

ACCULTURATION AND DIETARY PATTERN AMONG IRANIAN AMERICAN IMMIGRANTS IN THE UNITED STATES OF AMERICA

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Under the Supervision of Professor Julia Snethen

Acculturation of the Iranian American immigrants and its influence on dietary patterns of Iranian was investigated. Effect of exposure to the U.S. culture and Western diets and prevalence of chronic diseases were examined. Acculturation was measured using the Iranian Acculturation Scale, and total acculturation score is calculated. Dietary patterns were measured using the Block Brief Food Questionnaire (BFQ), total foods and beverages consumed over the past year, as specified in BBFQ, were studied.

Two hundred seven (N=207) Iranian American immigrants completed the acculturation, food frequency and socio-demographic questionnaires. All participants were born in Iran, were 18 years of age or older and had lived more than one year in the U.S. About 37.5% of participants had acculturation scores indicating Iranian values; the majority (62.5%) had either adapted American values (26.5%) or had combined some American values (36%).

Results indicate age at arrival, length of stay, English fluency, education and income are major factors determining level of acculturation, dietary patterns and prevalence of chronic diseases among Iranian American immigrants. Consumption of Western diet and level of acculturation was less among participants who lived longer (>10 years) in the U.S. and were older when they arrived to the US. The rate of family history of diabetes among participants was 39.1%., though 9% had pre-diabetes and 4% reported being diagnosed with Type 2 diabetes. A majority of the participants (87%) reported no secondary health concerns related to dietary

intake. As Iranian American immigrants grow older their consumption of red meats, fast foods, soft drinks, potatoes, salty snacks, refined grains and sweets were significantly decreased and they consumed more vegetables.

Given growing Iranian immigrants in U.S., a deep understanding of factors influencing dietary patterns of Iranian immigrates is necessary. Our study with small sample size (207) has several limitations, which should be rectified by future researchers. Therefore, conclusion about association between level of acculturation, dietary patterns and prevalence of chronic diseases among participants is limited. New Iranian immigrants especially those with school-aged children may become more aware of consumption of Western diet and ill effects on their overall wellbeing.

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Chapter 1:

Background

Overweight and obesity constitute a global pandemic that has affected people from different socioeconomic backgrounds both in developing and developed countries (Ng et al., 2014). Individuals become overweight/obese because they consume more calories than they expend. This disproportion consumption of calories consumed considered as the ultimate contributor to weight gain. Based on Keats and Wiggins study (2014), the prevalence of overweight and obesity is increasing at a much faster rate in developing countries than in Western countries. Ongoing improved economies in developing countries have an unfavorable effect on the continuing progressions of nutrition transition (Ferretti & Mariani, 2017). Nutrition transition and lifestyle changes in developing countries have caused a high prevalence of overweight/obesity and other non- communicable diseases that are associated with overweight/obesity (Ferretti & Mariani, 2017).

Based on World Health Organization (WHO) data from 1975 through 2016,The Non-Communicable Disease Risk Factor Collaboration (NCD-RisC), 2016). Globally obesity is more prevalent in female adults (15%), compared with male adults (11%). In 2016, WHO's appraisal of adults 18 years and older, indicated there were more than 1.9 billion people who were overweight worldwide. Almost 650 million of these people were obese (WHO factsheet, 2018). Such findings are very troubling because being overweight or obese is a strong risk factor for developing a variety of disabling and chronic health complications such as diabetes and cardiovascular diseases (WHO, 2015).

Overweight, obesity and other non- communicable chronic diseases have an enormous impact on medical health care cost at the personal and societal level. Each year the health care

cost of obesity related diseases is growing. Cawly and Meyerhoefer (2012) estimated the annual U.S. health care costs of obesity and its health-related consequences in adults was as high as $209.7 billion, expressed in year 2008 dollars. The $209.7 billion is equal to 20.6% of U.S. national health care expenditures that were spent to treat obesity-related illness, which is more than double the previous estimate of 9.1% by Finkelstein et al., in 2009. Obesity and obesity related health issues cost businesses and organizations $4.3 billion annually in the U.S. due to obesity related job absenteeism, costs for disability and unemployment benefits (Cawley & Meyerhoefer, 2012). Because of an array of non-communicable diseases associated with overweight and obesity worldwide, country members of WHO have put together a common goal. The worldwide common goal is to stop the escalation of overweight and obesity by 2025 (World Health Assembly, 2013).

Overweight and obesity increase the risk of developing diabetes significantly (WHO, 2015). Diabetes is a chronic disease that develops when the body cannot produce any of the hormone insulin (Type I), or when cells in the body can't use insulin efficiently (Type II). One of the key characteristics of diabetes is hyperglycemia. If hyperglycemia is not treated for a long period of time, it can lead to serious organ damage and serious health complications such as cardiovascular diseases, neuropathy, nephropathy and blindness (International Diabetes Federation, Diabetes Atlas- 8th edition, 2017).

Ninety percent of all cases of diabetes are Type II diabetes. The other 10% of diabetes cases are Type I and/ or gestational diabetes. Type II diabetes is strongly linked to overweight, obesity, ethnicity, genetics, and older age (IDF, 2017). Lack of symptom manifestation in persons with Type II diabetes can lead to the development of complications of undiagnosed

chronic hyperglycemia. For example, diabetes frequently is detected only when a patient has a foot ulcer, blurred vision or infection (IDF, 2017).

Based on WHO (2015), diabetes is an important cause of mortality, morbidity, and health care-system costs in the world. Individuals with diabetes have a lower life expectancy due to premature death. They also have other diseases that are linked to diabetes like cardiovascular disease, nephropathy, and blindness which places an economical burden on both individuals and countries (International Diabetes Federation (IDF), Diabetes Atlas 6th edition, 2013). In 2013 diabetes claimed almost 1.3 million lives globally, putting it amongst the prominent causes of mortality globally (Lozano et al, 2013). Based on an extensive literature review from the newest and the most complete data from 219 countries and territories, Guariguata et al., (2013) assessed that almost 382 million adult individuals globally had diabetes and predicted that, if the prevalence of diabetes continues at the same rate, by the year 2035 almost 592 million adult individuals will have diabetes which will put enormous constrain on world's health care cost.

Individuals with diabetes have more sick days, which effects their income. Diabetes also adds to a country's financial burden due to work place absence and higher medical expenditure (Boyle et al., 201; Ng et al., 2014). The International Diabetes Federation in 2013 appraised the health care cost related to diabetes to be approximately $548 Billion U.S. dollar (IDF Diabetes Atlas 6th edition). The International Diabetes Federation in 2013 reported that diabetes is most prevalent in Middle Eastern and North African countries compared with other countries in the world. The prevalence of diabetes in Middle Eastern and North African countries was 10.9%. Thus almost 35 million adults had diabetes in Middle Eastern and North African countries (Diabetes Atlas 6th edition, 2013). Middle Eastern countries are part of the continent of Asia and encompass almost 60% of the world's population. The continent of Asia is comprised of five

regions (Eastern Asia, Southern Asia, Central Asia, South-Eastern Asia and Western Asia) and 48 countries (United Nations, 2017).

The latest report from International Diabetes Federation (Diabetes Atlas 8th edition, 2017) indicated that, among Middle Eastern and North African countries, Iran is ranked number three among the five top countries for the numbers of individual with diabetes right after Egypt and Pakistan. Diabetes in Iran is most prevalent among younger age group (20–59 years old), in contrast to other countries in which there is a higher prevalence of diabetes among individuals 60 years and older. The prevalence of diabetes in Iran was higher in women (12.9%) compare with (9.9%) among men (Esteghamati et al, 2014). Developing diabetes at a younger age (20–59 years old) can put enormous strain on personal and Iranian national health care cost, workforce and quality of life of Iranians (Esteghamati et al, 2014). The Iranian national prevalence of diabetes in 2011 was 11.4% among Iranian adults aged 25–70 which is higher than what IDF estimated in 2013 (Esteghamati et al, 2014). Not only is the prevalence of diabetes high among Iranians in Iran but the prevalence of pre-diabetes is also very high. The Iranian national prevalence of pre-diabetes, was 14.6% in 2011 among participants between the ages of 25-70. The prevalence of pre-diabetes was much higher among older adults (29.2%) (56-70 years) compared with the youngest (25–34 years) 3.3% (Esteghamati., et al., 2014).

Not only are the preceding issues influential in countries of origin, but the development of overweight and diabetes also increases when individuals from developing countries immigrate to a developed country (Afshin, 2015; Delavari et al., 2013; Hsu, 2015). The development of overweight after immigration has been found to further increase immigrants' risk for developing diabetes significantly due to obesogenic behaviors of Western countries (Bennet et al., 2013; Bennet et al., 2015). Examining the existing literature reveals overweight and diabetes are more

prevalent among immigrants compared with natives both in the U.S. and in Europe (Bennet et al., 2013; Bennet et al., 2015 Iverson et al., 2013; Shah et al., 2015). The higher prevalence of chronic conditions like obesity and diabetes and their associated health complications among immigrants adds an extra economic burden on the host country's health care cost (Boyle et al., 2010; Ng et al, 2014).

Worldwide, international migration has increased dramatically from 2000 to 2015 (United Nations, 2015). In 2015 more than 244 million people, worldwide were displaced from their birth country (United Nations, 2015). Individuals who migrate to a new country become exposed to the host culture, and the process by which immigrants adjust and adapt to their host country upon exposure is known as acculturation (Berry, 2003). Moreover, the acculturation process that an immigrant may experience are: *integration* (strong orientation to both cultures), *assimilation* (stronger orientation to host culture), *separation* (stronger orientation to heritage culture), and *marginalization* (weak orientation to both cultures) (Berry, 1980). Each time immigrants encounter the new, dominant host culture they change and learn new beliefs, behaviors, values, attitudes, and language (Berry, 2003). Continuous exposure to the host culture not only affect an immigrant's values, attitudes, and language but also effects immigrants' food habits and food consumption (Park et al., 2014).

Immigrants' adaptation to the dietary patterns and practices of their new environment is called dietary acculturation (Satia et al., 2002). For immigrants in Western countries, the process of acculturation includes adaptation to the Western lifestyle, diet and physical activity patterns (e.g., dietary acculturation) (Satia, 2010). Immigrants' adaptation to a Western diet which is high in fat, low in fruits, vegetables, complex carbohydrates and high consumption of processed food is of concern, because it can lead to overweight, obesity, and diabetes. (Attanapola, 2013;

Iverson et al., 2013). A concern about individuals from the Middle East who immigrate to the U.S. is the potential to develop an unhealthy Westernized dietary pattern, associated with developing diet-related chronic conditions. Currently very little is known about how exposure to Western host culture affects Iranian American immigrant's dietary patterns and health outcomes, particularly the incidents of overweight and diabetes. Therefore, a better understanding of how exposure to American culture affects the dietary patterns of Iranian immigrants could provide greater insight into their risk factors for developing overweight and diabetes. Thus, a first place to begin to gain an understanding is to measure Iranian immigrants' dietary patterns in the U.S. and is the focus of this study.

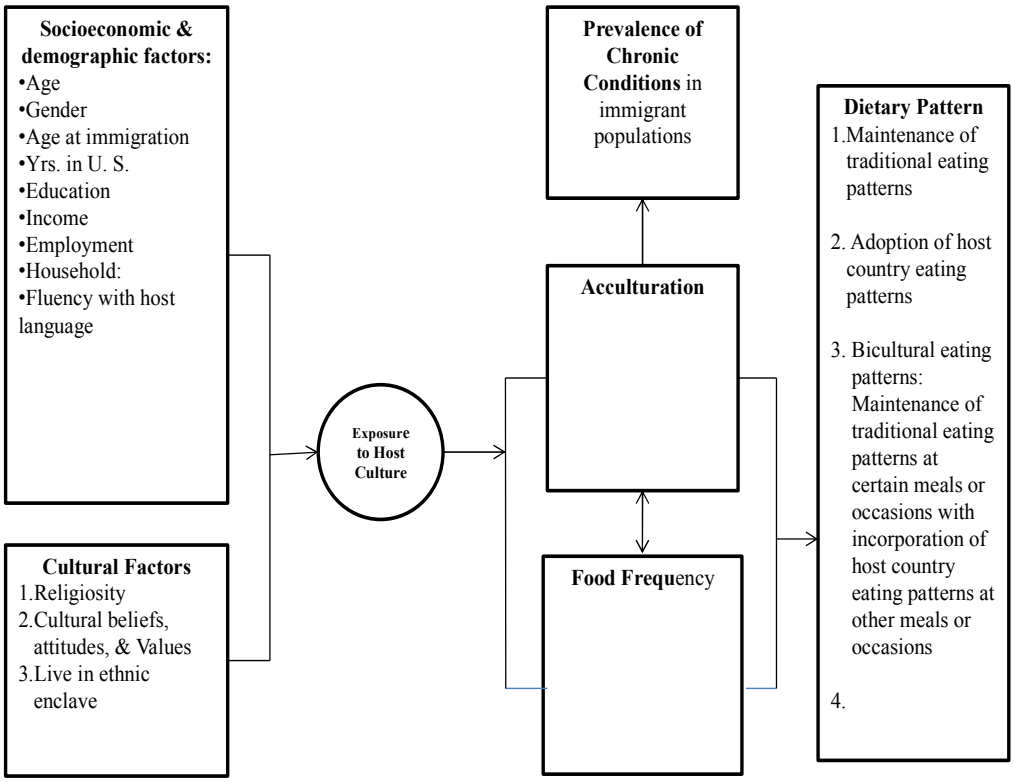
Purpose

The purpose of this study was to examine the influence of exposure to the U.S. as a host culture on Iranian immigrants' acculturation and dietary patterns. A secondary purpose was to examine how exposure to the host culture influences the Iranian immigrant's development of overweight and consequently the risk of developing pre-diabetes or diabetes.

Theoretical Framework

The conceptual framework of this research study is based on the theoretical processes of dietary acculturation that has been set forth by Satia (2010). According to Satia, dietary acculturation refers to the processes that occur when immigrants are exposed to the host country and adopt the dietary patterns of their host country. In 2003, she theorized that acculturation by immigrants is a complex multi-dimensional process as shown in Figure 1.

*Figure 1: Satia's Process of Dietary Acculturation**



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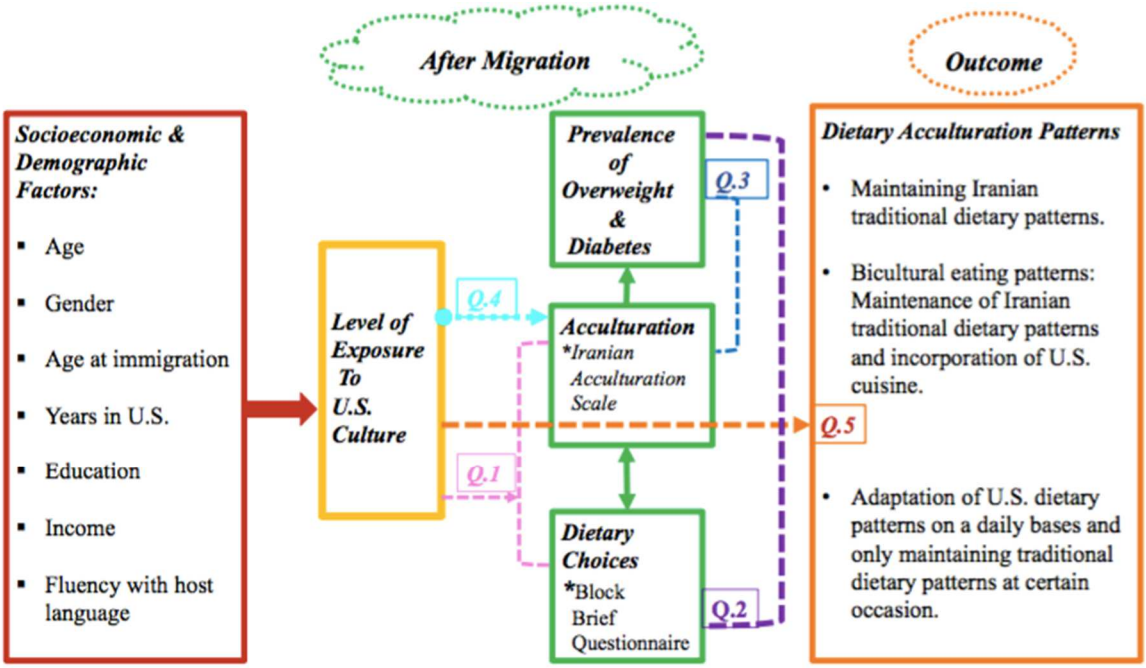
In her model, Satia (2010) puts forth a complex and dynamic relationship among sociological, socio-demographic, and cultural factors that was combined with the exposure to the host country. Previous factors can lead to acculturation process and changes in dietary choices which can lead to prevalence of chronic conditions (overweight/obesity, diabetes) among immigrants. Level of acculturation and changes in dietary intake can change immigrants dietary pattern. Satia proposes three dietary acculturation patterns after exposure to the host culture: maintenance of traditional eating pattern, adaptation to host country eating pattern, and bicultural eating pattern. These patterns reflect a combination of the complex and dynamic relationships among an immigrant's socio-economic, socio-demographic, and cultural factors combined with the immigrant's exposure to the host country. Satia's approach has been used to measure

participant's dietary pattern in this study. Satia's theoretical model has also been used to develop the concept map of this study which directed the research questions. The conceptual framework of this research study with research questions numbered is depicted in Figure 2 below.

Figure 2: Adapted Model with Study Variables



Research Questions

The study answered the following research questions:

1. What are the socioeconomic and sociodemographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?
2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes are considered?
3. Is the acculturation of Iranian immigrants to the U. S. associated with their prevalence of being overweight and diabetes?

4. Is there an association between length of exposure to the host culture and the Iranian immigrants level of acculturation?
5. How Iranian immigrants' length of exposure to host culture and level of acculturation differ by dietary acculturation patterns?

Definitions of Terms

The following variables will be discussed throughout this dissertation: (1) Acculturation (2), Dietary patterns, (3) Exposure to host culture, (4) Food Grouping, (5) Food Frequency, (6) Immigrant, (7) Overweight (8) Dietary patterns (Bi-cultural, Iranian, Western). The definition for each variable is described.

Acculturation.

Conceptual definition. The cultural process immigrants experience when they move to a new country including, in this study, the use of Farsi language when participants talk with friends and families, read book or news, watch TV, listening to music or radio, language that is used for writing, ethnic identity, celebration of holidays.

Operational definition. Changes in cultural factors that happen when an Iranian immigrates to the U.S. was measured by the total score on Iranian Acculturation Scale (Appendix A**).** The scale measures language use, media use, attitudes, attributions related to ethnic groups, motives for immigration and one question on eating habits (Shahim, 2007).

Dietary patterns.

Conceptual definition. Dietary pattern is defined as the total food combinations consumed by Iranian immigrants in America on a regular basis (Tucker, 2010; Slattery, 2010).

Operational definition. Participant responses to the brief food questionnaire (2013) (Appendix B) based on the following pre-defined categories (Asghari, 2012):

The Traditional Iranian dietary pattern (Esmaillzadeh et al, 2008) that is composed of wheat-based unrefined, whole wheat bread, beans, rice, yoghurt, fruits and vegetables.

The Western dietary pattern (Hu, 2002) that is composed of high quantity of red meat and processed food, low consumption of fruits, vegetables, highly processed wheat products, sugar and fat.

The Bicultural dietary pattern (Satia, 2010).is one in which immigrants keep their Traditional Iranian dietary pattern and incorporate some of the U.S. cuisines.

Exposure to host culture.

Conceptual definition. Length of time immigrants to the U.S. culture by interacting with Americans through work, school, social life, etc., immigrants are exposed will learn, adjust, and adapt to the behaviors and lifestyle of the host culture (Satia, 2010).

Operational definition. Length of exposure to the U.S. culture was measured by a response to question number 27 on the Iranian Acculturation Scale (Shahim, 2007).

Food grouping.

Conceptual definition. Based on the composition of nutrients in the Brief Food Questionnaire food items.

Operational definition. Fourteen pre-established food groupings from Asghari et al., (2012) study were used to group food items selected in the Brief Food Questionnaire.

Food frequency.

Conceptual definition. The frequency of food items in Brief Food Questionnaire that were consumed by each participant.

Operational definition. The self-administered Brief Food Questionnaire (Appendix B) was used to determine participants food intake over the past year in the form of a Likert scale.

The frequency of consumption of each food item was measured with scale rating from 1-9. The maximum frequency of the foods eaten within each food grouping was used as a score for that food group. For example, the Dairy Food Group is comprised of milk, yogurt, ice cream, cheese, etc. If a participant consumed milk every day (9 score), ice cream twice a month (4 score), and cheese a few times a year (2 score), the score for dairy food group for this individual would be 9.

Immigrant.

Conceptual definition. A person who has crossed an international border and has moved away from their home country or country of origin to a host, or destination country (International Organization for Migration, 2010).

Operational definition. An Iranian American immigrant who had moved from Iran and settled in U.S.A. for at least a year.

Overweight.

Conceptual definition. Excess weight/ body fat (CDC, 2003).

Operational definition. Self- reported height and weight of each participant was used to compute their BMI, determined by dividing weight in kilogram by height squared. BMI between 25-29.9 was considered overweight. BMI 30 or higher was considered obese. However, in this study the overweight and obese categories were combined into one category titled overweight.

Significance

The immigrant population from Asia, including Iran is growing in the U.S. at a fast rate. Current health related data in Asian-American subgroups are aggregated and are scarce in the literature, particularly for Iranian immigrants regarding their population-based health status in the U.S. Further, when Iranian immigrants have been part of a study in other Western countries,

they generally have been reported in an aggregated grouping of "Middle Eastern immigrants" (Garnweidner et al, 2012; Iverson et al, 2013).

However, immigrants from Asia are not a homogenous group, they consist of various subgroups of ethnicity and different disease patterns and prevalence. Result from numerous studies (Hastings et al., 2015), Jose et al., 2014), Keppel et al., 2010), Kim et al., 2010), & (Palaniappan et al., 2010) indicate that each ethnicity has its own culture and a different level of obesity and disease-related conditions which is different from other ethnicities. Based on an extensive literature review done by Delavari (2013), when immigrants from developing countries move to developed countries they acquire obesogenic behavior. Adaptation to a Western dietary pattern among immigrants is responsible for developing a higher prevalence of overweight and an array of disease complications that are related to overweight (Shah et al, 2015). The development of overweight after immigration has been found to further increase immigrants' risk for developing diabetes significantly due to obesogenic behaviors of Western countries (Bennet et al., 2013; Bennet et al., 2015). The higher prevalence of chronic conditions like obesity, diabetes, with their associated health complications among immigrants, adds an extra economic burden on the host country's health care cost (Boyle et al., 2010; Ng et al, 2014). Based on the international Diabetes Federation (2013) report, diabetes is most prevalent in Middle Eastern and North African countries compared with the rest of the countries in the world. Given the growing Iranian immigrant population in the U.S. and their exposure to the American culture, a better understanding of the factors influencing Iranian immigrant's dietary patterns after migration is essential.

Studying Iranian immigrants in the U.S. will provide an opportunity to understand how exposure to the host culture possibly influencing Iranian immigrants' dietary behavior and their

overall health status. Understanding the complex process of acculturation and its effect on changes that leads to poor health are essential data for developing culturally appropriate interventions, prevention strategies and policy recommendations. Study results from acculturation and its possible association with chronic conditions among subgroups of Asian immigrants will add to the scarce literature in this subgroups. Immigrant's health research will generate knowledge that currently is missing for Iranian immigrants in Western countries. Research is needed to develop interventions, policy and programs that are evidence-based and are grounded in solid research. Furthermore, research is vital for making of public health policy, planning, and programming.

Chapter 2:

Review of Literature

This chapter describes review of the current literature regarding acculturation, dietary acculturation, and their possible effect on immigrants' health from different ethnic groups both in the Europe and in the U.S. Dietary acculturation concept developed by Satia (2010), factors influencing dietary acculturation process and Satia's three Approaches for Measuring Dietary Patterns was discussed. Berry's acculturation concept was also described. Additionally, this chapter also presents the theoretical framework used in developing a concept map which guided this study.

Review of Literature

Acculturation not only impacts an individual's day-to-day behavior, but also transforms their broader cultural expressions, such as customs, dietary patterns, and language (Vaeth et al, 2012; Dela Cruz et al, 2013). Cultural practices, values, and identities can be transformed by prolonged intercultural contact (Ward et al, 2016). A number of factors (length of residency in the host country, age, the ability to speak English, the frequency and depth of social connections, culturally linked habits and customs) can influence acculturation (Smith & Franzen- Castle, 2012).

In order to describe the immigrant's dietary patterns two recent in-depth research studies done by Garnweidner et al, (2012), and Terragni et al. (2014) who explored the early phase of dietary acculturation after exposure to host culture were chosen. What follows are a brief presentation of the participants and the findings of their studies.

In-depth interviews were conducted by Garnweidner et al, (2012), with twenty-one female ages between 25 – 60 years old with different marital and employment status, reasons for immigration and length of residency in Norway. The length of residency ranged between two – thirty-five years but on average half of the participants had lived in Norway for less than ten years. The study participants were immigrants from Algeria, Egypt, Iran, Lebanon, Morocco, Pakistan, Somalia, Sri Lanka, Turkey and Iraq who were living in Oslo, Norway at the time of the study. Participants lived in immigrant dense areas of Oslo, Norway. All participants had a low-to-middle socioeconomic status in Norway and lived in some low-to-middle socioeconomic status neighborhoods.

Terragni et al. (2014) explored the early phase of dietary acculturation after exposure to host culture. Twenty-one immigrant women from South Asia, Africa, and the Middle East were interviewed to recall the early period after their migration to Norway and what they remembered about their experience of shopping and eating in the host country. Participants' current food habits, organization of family meals, and knowledge and definition of Norwegian food were also explored. The participants had immigrated to Norway at different times (1970s and 1990s) and for different reasons (refugees, asylum seekers, being united with other family members), but all participants had in common the experience of leaving behind a familiar world and having to shop, cook, and eat in a new context. Shortly after immigrating to Norway, a number of situations seemed to challenge their previous knowledge of food, food purchasing, food preparation, and eating. What follows are examples of how exposure to host country's food culture affected the participant's dietary patterns.

Social Developmental Factors

Researchers have identified many possible moderators to acculturation, such as socio-economic and socio-demographic characteristics and factors relevant to migration, such as age at migration, educational level, generational level, proficiency in the language of the host country, ethnic enclaves, and religiosity (Barry 2006; Phinney et al., 2001; Schwartz et al., 2010; Nguyen & Benet-Martinez, 2010). While each immigrant goes through a unique acculturation process, patterns quickly emerge as immigrant populations are studied, as described below.

Age at migration. The older an immigrant is at time of immigration, the stronger their sense of cultural origin and the more difficulty they have adapting to the host country (Eylem Gevrek, Gevrek & Gupta, 2013). Constant exposure to the host culture through school, sports, popular media, and other aspects of daily life leads younger immigrants to assimilate more quickly and easily to their host culture (Bornstein & Cote, 2006). First-generation adult immigrants are more likely to retain their mother tongue but their children may lose it due to extensive interaction with the host language, because they are integrated into the school system and develop a social life beyond the home (Hakuta, Bialystok, & Wiley, 2003). Parents, especially mothers who do not work outside the home, have less exposure to the host culture and may have more daily interaction with other members from their country of origin. Furthermore, connecting with a culturally distinct enclave of fellow immigrants could delay acculturation and thus reinforce the language, values, and behaviors of the country of origin. (Hao and Kim, 2009). Lastly, the older the immigrant is at the point of entry to the host country, the longer the acculturation process, which is due to fewer opportunities for exposure to the language and other mainstream aspects of the host country (Nghe, Mahalik, & Lowe, 2003).

Education level. Padilla (1980) suggests that acculturation is influenced by the educational level of an immigrant. Education helps immigrants adjust to the host society because it fosters development of the analysis and problem-solving skills necessary for successfully navigating a new culture. Since education level often correlates with higher income and occupational status, it also may indicate increased access to the resources and relationships needed to ease into the acculturation process (Berry, 2006; Schwatz, et al., 2010). Immigrants with higher education levels are more likely to research their host country before immigrating and thus have a head start on those immigrants who are less informed about the language, norms, values, and behaviors of their host country (Berry et al., 2002).

Length of stay and generational level. Generational level is an important predictor in determining the trajectory of the acculturation process. First-, second-, and third-generation immigrants have vastly different experiences of acculturation (Bornstein & Cote, 2006). Second-generation immigrants may feel mostly secure in their identity with their host culture, while third-generation immigrants may be even more secure in their identification with their host culture. Identification with the host culture may be due to greater exposure to the socializing influences of their host country and less exposure to the cultural aspects of the home country of their grandparents (Satia, 2010). Creighton et al., (2012) defined "immigrant generation" as follows: "First generation" is defined as foreign-born immigrants regardless of length of their stay in the U.S. "Second generation" is defined as U.S.-born individuals with at least one foreign-born parent. Individuals in the "third plus (3+) generation" are born in the U.S. with no foreign-born parents. Through acculturation, the health of immigrants declines or improves with increasing years of residence in high-income countries through the loss of culture-specific

health-protective practices or by adopting the health behaviors of the host society (Fuller-Thomson et al, 2011).

Language. Immigrants often shift from the language of their mother tongue to the language of their host country during the process of acculturation. Immigrants who are unsure of their language ability may avoid expanding their social networks beyond the immigrant community, thereby possibly delaying their acculturation process. A common language begins to create a sense of belonging, but cultural competence goes beyond language to understanding social and historical context. Padilla (1980) found that higher competency with the host language is related to smoother interaction with the larger society, and thus may lead to feelings of greater integration. As language acquisition improves, immigrants will have more interaction with the native people of the host country, thereby providing the potential to change immigrants' eating habits, particularly with their consumption of fat and red meat (Creighton et al., 2012).

Gender. Daviglus et al. (2016) examined the association between acculturation and the prevalence of a low risk (LR) cardiovascular disease profile among 14,757 adult men and women from a multinational Latino background over a three-year period. According to the U.S. national guidelines for diabetes, the risk of cardiovascular diseases will be lower among individuals who are non-smokers and who do not have diabetes, coupled with lack of obesity, blood pressure and low levels of cholesterol. Results of Daviglus et al. (2016) indicated that LR of cardiovascular disease prevalence was highest among men with Central American backgrounds and lowest among men with Mexican and Dominican backgrounds. LR of cardiovascular disease prevalence was highest among women with Cuban and South American backgrounds and lowest among those with Puerto Rican backgrounds. LR profile was most prevalent among those who were more more educated and less acculturated, and among younger

women. Overall the prevalence of CVD was higher among men than among women in this study and the prevalence of CVD among men was higher among less acculturated men (Daviglus et al, 2016).

Cultural Factors

Exposure to Host Culture. Researchers have established the role of exposure to host culture and Western diet in shaping the burden of overweight and obesity. Both immigrants and natives are negatively affected by exposure to Western diet because natives have moved and immigrants will move from plant-based, nutrient-dense diets to consumption of highly processed, calorie-dense diets derived from animal sources (Western diet), the result is a high prevalence of obesity and other obesity related health consequences like diabetes and CVD (Nguyen et al, 2015). The causes of obesity are multifactorial and are mostly due to an imbalance between energy intake and energy expenditure (Powel et al, 2011). It is reported that rate of obesity has increased dramatically in the U.S. In a study by (Flegal et al., 2016) the age-adjusted prevalence of obesity in the US was 35.0% among men and 40.4% among women in 2013- 2014.

In addition to poor health, consequence of exposure to Western diet is increase in economic burden at both the individual and national levels (Arya, 2015). **R**esearchers have also found that the longer an immigrant is exposed to the American culture and Western diet, the greater is the risk that the immigrant will become obese. It is reported that immigrants to the U.S. carry a disproportionate burden of chronic conditions, including obesity, diabetes and hypertension (Karter, et al, 2013, Daouli, et al, 2014, Bharmal, et al, 2014.

Immigrating to a new country, especially one with significantly different values, practices, beliefs, and types of food, can be very difficult, especially when considering the sociological and demographic factors. The process of transitioning from a known culture to an

unknown culture can be disorienting and stressful, as an immigrant perceived or actual need to fit in sociologically with the host country can feel overwhelming. As a result, researchers must understand the acculturation process immigrants may go through when exposed to their host culture.

Satia's "Three Approaches for Measuring Dietary Patterns". According to Satia (2003), three are three approaches for measuring dietary patterns. Dietary pattern is a pragmatic tool for exploring the associations among health and disease (Slattery, 2010). The resulting data from dietary pattern studies will allow researchers to identify associations between dietary patterns and health concerns, and thus conduct further intervention studies to see if dietary patterns influence or prevent disease. An additional public health objective to consider is the importance of encouraging Middle Eastern immigrants to retain their traditional, protective dietary patterns (Satia, 2010).

Satia in her study done in 2003 indicated that currently there are three approaches for measuring dietary patterns:

1. *Single-Item Measures.* Level of education, income, and age at immigration are examples of single-item measures that may give a general idea of an immigrant's acculturation level; however, these measures will not yield the information needed for developing health promotion programs, such as dietary interventions.
2. *Acculturation Scales.* Acculturation scales are much more useful and accurate for classifying an immigrant's level of acculturation; however, they are not useful for assessing dietary acculturation, because acculturation scales do not include diet-specific acculturation indicators.

3. *Food-based Measures.* The two available measures that can reliably measure the level of dietary acculturation are food frequency questionnaires and dietary acculturation scales. The measures can be used to identify whether the immigrants have kept their original dietary patterns, mixed some of the host culture's dietary patterns with the original, or have completely adopted the new dietary patterns. Even though food-based measures assess dietary acculturation, they do not take into account the factors that are important in the process of dietary acculturation, particularly socioeconomic, cultural, and demographic factors.

These three approaches for measuring dietary patterns have been used to develop culturally sensitive dietary acculturation scales by several scientists. In 2011, Serafica developed a dietary acculturation scale for Filipino immigrants in the U.S. (Serafica, 2011). Then Vargas (2014) confirmed the reliability and validity of Serafica (2011)'s dietary acculturation scale for Filipino immigrant population in the U.S. Vankatesh (2014) also used Satia's dietary acculturation model to develop a dietary acculturation scale for Asian Indian American immigrants. Other researchers have also used Satia's dietary acculturation model to assess dietary acculturation among the participants in their studies (Khan, 2014; Erber, 2014, Dekker et al, 2011; 2013 & et al 2015).

Dietary patterns have been studied by other researchers (Tucker, 2010; Slattery, 2010 as the total food combinations consumed by individuals and/or groups of individuals. In fact, dietary acculturation was studied as early as 1990s. The goal of studying dietary pattern was to investigate its relationships to health outcomes in individuals and in groups of individuals (Tucker, 2010; Slattery, 2010). Historically, the traditional dietary pattern of persons from Middle Eastern countries tends to be seasonal, rich in whole grains, high in fiber, low in high-

glycemic foods, rich in fruits and vegetables, and a more diverse diet with limited processed foods (Hawalla et al, 2016). Previous studies (Fuller-Thomson et al, 2011; Dean, 2010; Maximova et al, 2011) show that the dietary patterns of new immigrants tend to be healthier than more established immigrants who follow the Western diet, and recent immigrants are reported to have fewer chronic conditions.

Food Frequency Questionnaire (FFQs)

Food frequency questionnaires (FFQs) are commonly used to assess regular dietary patterns among individuals over a period of time, often during the past 6-12 months (Serra Majem et al 2006). FFQs are widely used because it is easy for participants to complete and it yields data that enables researchers to assess long-term dietary patterns in a relatively easy, cost-efficient manner and with lesser burden. It can be self-administered or administered by an interviewer. FFQs usually contain between 100-150 questions, and it is widely used by epidemiology researchers to study the link between dietary patterns and different diseases or based on research questions. FFQs also can help to explore the intake of specific nutrients such as Calcium and Vitamin D (Thompson and Subar, 2008).

The use of FFQs ranks the dietary intake of individuals as low, medium and high compared with other individuals in that particular study population. In other words, dietary intake is measured by an estimate rather than the absolute dietary intake (Shim and Kim, 2014).

FFQs should be affiliated with a food arrangement database to allow assessment of nutrient intakes for the reported portion size of each dietary item included in the survey and the database. Dietary intake of each food item and for each study subject is computed by dietary analysis software designed specifically for the FFQs (Mulligan et al. 2014). For example, when the purpose of a study is to compare the association between dietary patterns and disease,

researchers will use the FFQs and the dietary intake of participants will be compared with the whole population as high, medium or low rather than measuring the precise food intake (Thompson and Subar, 2008). The data on diet resulting from FFQs are used in large epidemiological studies to determine the possible links between diet and a specific disease, such as cancer or diabetes. Another possible use for FFQs is to lay out the dietary patterns linked to suboptimal consumptions of specific nutrients (Thompson and Subar, 2008).

There are usually three elements in any FFQs:

1. Food list
2. Amount of the food that was consumed, and
3. How often the food items were consumed in units of time.

Lists of food items in FFQs are based on foods commonly consumed in the study population (Cade et al. 2004) and reflect the food habits and common practices in that particular group due to different factors such as age, gender, ethnicity, culture and economic status, all of which influence dietary intake. Having the proper FFQ that is sensitive to the purpose of the study and the group being studied is essential in this method of diet assessment (Shai et al, 2004).

Maintaining Traditional Eating Patterns

Results from Garnweidner et al (2012), in-depth interview study among several female immigrants indicated that participants preserved their original food culture at every eating event, irrespective of time of day, day of week, or special occasions, as the following statement exemplifies: “I do not eat Norwegian food. I always eat Egyptian food”. Participants had found strategies to preserve important aspects of their original food culture. Findings indicated that participants searched in the new food culture for food items that are similar to those in their

original food culture: “I like rice pudding. It is similar to our “kiribat” a Sri Lankan participant indicated (Garnweidner et al, 2012). Many participants reported that their husbands refused to eat dishes associated with the host country’s food culture. Increased time of residence did not necessarily enhance the adoption of the host country’s food culture. Some participants who lived in Norway for several years stated that their food habits were now more in line with their original food habits than in the first years after immigration, mainly because of the increased availability of ethnic food items (Garnweidner et al, 2012).

When participants were asked about shopping routines, many participants reported going to ethnic food stores to buy food from their country of origin. As previously stated, the increased availability of ethnic food stores enabled continuity of their original food culture. For example, when a woman was asked what kind of food items she missed the most from her country of origin, she answered: “Oh, nothing. I prepare everything here as well” (Iraqi). (Garnweidner et al, 2012).

Bi-Cultural Eating Patterns

In bicultural eating patterns, participants adhered less strictly to their original food culture while simultaneously adopting some of the host country’s food culture. As one Pakistani participant indicated in Garnweidner et al.’s study in 2012 “when I prepare Pakistani food for several days, then it’s time to vary and prepare Norwegian food for her family.” Other participants in the same study mentioned adopting elements from the host country’s food culture, but modifying them in their own way. Many participants had increased their consumption of fish, particularly salmon, after immigration. They reported eating fish several times a week; however, to achieve cultural appropriateness of their meals, participants said that they prepared fish and fish products “in their own way,” which often implied adding spices and, for instance, frying it

instead of "the Norwegian way of just poaching." For example, a Pakistani woman said that she had to "cheat a bit" when she prepared fish cakes or salmon, which implied that she added Pakistani spices. This practice illustrates a very common way to pursue continuity: participants transformed novel ingredients or unknown dishes into culturally appropriate meals by using spices or familiar preparation methods (Garnweidner et al, 2012).

In bicultural eating patterns, some participants described combining their original food culture and the host country's food culture in the same meal: they served meatballs with rice instead of potatoes, which is typical for the Norwegian food culture (Garnweidner et al, 2012). Other participants in Garnweidner et al (2012), study mentioned adopting elements from the host country's food culture, but modifying them in their own way. For example, many participants had increased their consumption of fish, particularly salmon, after immigration. They reported eating fish several times a week; however, to achieve cultural appropriateness of their meals, participants said that they prepared fish and fish products "in their own way," which often implied adding spices and, for instance, frying it instead of "the Norwegian way of just poaching." For example, a Pakistani woman said that she had to "cheat a bit" when she prepared fish cakes or salmon, which implied that she added Pakistani spices. This practice illustrates a very common way to pursue continuity: participants transformed novel ingredients or unknown dishes into culturally appropriate meals by using spices or familiar preparation methods (Garnweidner et al, 2012). Bicultural eating patterns was also seen among participants in Terragni et al., (2014) study. Participants indicated that they used to eat a warm lunch at home with other family members when they lived in their heritage country, however when they moved to Norway, the organization of the day at school or work meant that their family members had to eat lunch a cold lunch outside the home. The Norwegian lunch usually consists of open

sandwiches with spreads prepared at home and wrapped up in paper called ‘matpakke’ or lunchbox. This format of a cold, packed lunch was unknown to most of the participants and their family members, and many recalled that they did not know how to prepare it (Terragni et al., 2014). “I did not really know what ‘matpakke’ was but I needed to change our meal format after migration. In my country, we do not make this. The children have breakfast and then they go to school and come back home for lunch. School children do not have food with them, they maybe take an apple with them to school. Here you need a ‘matpakke’ and I learned to make it for my children” (Terragni et al., 2014).

According to Garnweidner et al (2012), immigrants have limited continuity of their heritage dietary pattern, when they indicate daily practice of the host country’s food culture, and maintenance of their heritage food culture only for special meals served for special occasions. In this context, participants continued with their original food culture at religious festivals and social gatherings, as the following quotation illustrates: “At Ramadan, only, we prepare our food from our home country” (Iraqi).

Role of Genetic in Occurrence of Chronic Conditions

In 2010, Wandell et al reviewed 17 articles that reported findings related to diabetes in immigrant populations in Scandinavian countries. He concluded that there was a high risk of diabetes in non-European immigrants, especially in the Middle East and South Asian regions. In some cases, immigrants experienced ten times the risk experienced by the native population. Immigrant women had a substantially higher risk for diabetes than immigrant men. Genetic sensitivity, combined with lifestyle factors, seems to be the likely cause explained Wandell et al., (2010).

In order to gain a broader perspective of the influence of dietary acculturation on health risks for immigrant groups in dietary transition, Wandell reviewed an additional 48 articles in 2013. He concluded that the risk of overweight and obesity seems to be high among many immigrant groups, with a consequently higher risk of diabetes, cardiovascular disease, and coronary heart disease. In 2014, Wandell et al studied the differences in anthropometric measures in immigrants and Swedish-born individuals in two large, older-adult population-based samples. Among other comparisons of immigrant groups with the native Swedish population, Wandell et al found that Middle Eastern women immigrants had higher scores on all anthropometric measures compared with Swedish-born women. While several researchers in Europe have established that immigrant groups from the Middle East have higher rates of obesity, leading to higher risk for cardiovascular disease and diabetes, this has not been established for Middle Eastern immigrants to the U.S.

Results from Wandell et al. studies confirm and reflect the high prevalence of obesity and diabetes that has been reported in Middle Eastern countries. International Diabetes Federation (IDF) in 2013 reported that DM is most prevalent in the Middle East and North Africa (MENA) countries compare with the rest of the countries in the world. The prevalence of DM in MENA countries was at 10.9%. Based on IDF estimate in 2013 almost 35 million adults had DM in MENA countries (IDF Diabetes Atlas 6th edition, 2013). The latest report from IDF (2017) indicated that Iran is ranked number three for the total of individual with DM among MENA countries (IDF Diabetes Atlas 8th edition 2017).

To provide a good understanding of the prevalence of non-communicable diseases and their associated risk factors in Iran, Esteghamati, et al. (2014) conducted a study. Esteghamati, et al. (2014) used the available data from the Surveillance of Risk Factors of Non-Communicable

Diseases (SuRFNCD) between 2005- 2007 and data from SuRFNCD 2011 were used to estimate the prevalence of obesity, diabetes and impaired fasting glucose at a national level in Iran (Esteghamati, et al. 2014). 11,867 adult individuals aged 25–64 years participated in SuRFNCD-2011. In SuRFNCD-2007 3342 adult individuals aged 25–64 years participated and in SuRFNCD-2005 a total of 51,903 adult individuals aged 25–64 years participated. Laboratory evaluation was performed on all participants and participants were instructed to not consume anything but water overnight for 12-14 hours prior to their blood test. Participants were also asked two questions "(1) Have you ever been told by a doctor or other health worker that you have diabetes?" (2) "Are you currently taking oral medication or insulin for diabetes prescribed by a doctor or other health worker?" If participants responds to both questions were no and their fasting plasma glucose (FPG) concentrations were ≥7 mmol/L, they were classified as Undiagnosed DM. Participants were classified as impaired fasting glucose (IFG), if their (FPG) concentrations were between 5.6 and 6.9 mmol/L. The Iranian national prevalence of DM in 2011 was 11.4% among Iranian adults aged 25–70. The Iranian national prevalence of IFG was 14.6% in 2011 among participants between the ages of 25-70. The prevalence of IFG was much higher 29.2% among older adults (56-70 years) compare with the youngest (25–34 years) 3.3%. The prevalence of DM was 12.9% in women compare with 9.9% among men Esteghamati A, et al. (2014).

Two factors have been found to be responsible for the surge of DM in Iran. Factor one is Urbanization and factor two is improved socioeconomic (Esteghamati et al, 2014). DM in Iran is most prevalent among younger age group (20–59 years old), in contrast with other countries that have higher prevalence of DM among individuals 60 years and older. The prevalence of DM was higher in women (12.9%) compare with (9.9%) among men (Esteghamati et al, 2014).

Developing DM in a younger age has a huge impact on Iran's health care cost, workforce and quality of life of Iranian individuals (Esteghamati et al, 2014). The Iranian national prevalence of DM in 2011 was 11.4% among Iranian adults aged 25–70 which is higher than what IDF estimated in 2013 (Esteghamati et al, 2014). The Iranian national prevalence of Impaired Fasting Glucose (IFG) was 14.6% in 2011 among participants between the ages of 25-70. The prevalence of IFG was much higher 29.2% among older adults (56-70 years) compare with the youngest (25–34 years) 3.3% (Esteghamati A, et al., 2014).

Obesity and Type 2 Diabetes in U.S.

The 2011-12 National Health and Nutrition Examination Survey conducted by the U.S. Centers for Disease Control and Prevention (CDC) revealed the comparatively low prevalence of obesity in Asian Americans, yet research from Asia, as well as on Asian-American populations in the U.S., shows that their risk for diabetes has increased dramatically (Afshin et al, 2015; Lu et al, 2014; Rahim et al, 2014; Musaiger et al, 2012). Clinicians who work with Asian Americans have indicated that many of their Asian-American patients with diabetes are not overweight. In several studies, when Asian Americans and Whites had the same BMI level, it was shown that more Asian Americans had diabetes than did Whites in the population being studied (King et al, 2012; Rhee et al, 2015). A difference in body fat distribution, i.e., more visceral than peripheral fat, may explain this increased diabetes risk because it is associated with insulin resistance. At the same BMI level, Asian men and women have higher body fat composition than Whites (Shah et al 2015; Kim et al., 2016). These differences in body composition may contribute to variations in the prevalence of diabetes**.** The Diabetes Atlas edition from 2013 predicts that Asia and Africa will have the highest proportions of individuals with diabetes in 2030. This increase may be due

to increasing age, urbanization, positive family history, obesity, and hypertension (Rhee et al, 2015).

When Hastings et al (2015) studied the leading causes of death among Asian-American subgroups between 2003-2011, she noted that our understanding of Asian-American mortality rates was distorted due to U.S. federal surveys based on death certificates, which did not distinguish between Asian subgroups before 2003. The Asian continent comprises a vast number of countries, yet current U.S. federal surveys capture data from only six Asian-American populations (Chinese, Indian, Filipino, Japanese, Korean, and Vietnamese.) After 2003, U.S. federal surveys aggregated Middle Eastern countries with a number of other countries in an "other Asian" category equal to 16% of the Asian-American population. Hastings et. al. (2015) surmised that the American Community Survey, which lumps these diverse populations together, creates an important knowledge gap in Asian-American health. The health of these rapidly expanding populations is made vulnerable when there is little evidence to recommend research agendas, create public health policy, and offer clinical guidelines. Even though Asian Americans do not have the BMI levels associated with overweight or obesity found in Whites, they are already at risk for many obesity-related disorders due to their body composition and possibly other genetic factors. Therefore, the standard protocols for identifying diabetes risk may not be appropriate for Asian Americans.

Nutrition transition and lifestyle changes in Asian countries have caused a high prevalence of obesity and diabetes. As the trend for Asians to gain weight due to Western-influenced dietary and environmental changes continues across Asian regions, it will become increasingly important to study Asians engulfed in Western culture while living in Western countries (Afshin et al, 2015; Hsu et al, 2015). The U.S. Census Bureau has divided Asian-

Americans into seven major subgroups: Asian Indians, Japanese, Vietnamese, Chinese, Filipino, Koreans, and "other"; therefore, this literature review will concentrate on these categories.

Another issue in this subgroup is that there are no longitudinal cohort studies in the Asian subgroup. Existing studies are cross-sectional, in which BMI is calculated from self-reported height and weight and self-identification as having diabetes (Hsu et al, 2015). In 2011, Lee et al used The National Health Interview Survey from 1997-2008 to study the diabetes prevalence rates for Asian Americans and found that the prevalence of diabetes was 40% higher in this population compared with the general population (Lee et al, 2011). Gupta et al in 2011 used the New York City Health and Nutrition Examination Survey data to study diabetes in different ethnic subgroups and found that South Asian Americans had the highest rate of diabetes prevalence compared with other Asian populations and Whites (Gupta et al, 2011). Staimez et al. (2013) systematically reviewed publications from 1988-2009 that studied overweight/obesity/ diabetes among Chinese, Filipinos, Koreans, Vietnamese, and South Asians; only two studies provided longitudinal data.

Health Disparities Among Asian-American Immigrant:

In order to study the potential causes of health disparities among immigrants, researchers first must understand the concept of acculturation, factors that influence the acculturation process and how exposure to the host country influences the adoption of dietary patterns related to overweight/obesity and subsequent negative health outcomes.

Delavari et al (2013) conducted a systematic review of research exploring acculturation and obesity among migrant populations in high-income countries. One important finding from the review was that study results varied depending on how acculturation was measured. Focusing his review on studies that used a standardized acculturation scale, Delavari compared studies that

examined overweight/obesity among adult migrants as they migrated from low-income countries to high-income countries. Delavari found nine articles that met these criteria. All the studies were based in the U.S., with migrant groups from eight different countries, although none were from the Middle East. Of the nine studies, six used bi-directional acculturation scales and three used uni-directional scales.

The literature review of Delavari, et. al. (2013) provides evidence to suggest that immigrant populations from low-income countries to high-income countries show a significant change in obesogenic behaviors in the host society, and immigrant's obesogenic behaviors are associated with exposure to the host culture. Regional differences in cultural influence on body image, food choice, and physical activity could explain differences in the impact of acculturation on BMI.

In a study that used a qualitative approach to data gathering and analysis, Delavari et al (2013) explored the experiences of migration and the determinants of obesity among recent Iranian immigrants in Australia. Participants expressed that stress during the initial immigration transition, as well as political/religious changes, affected their ability and willingness to adopt positive health behaviors post-migration. Socioeconomic status appeared to moderate the acculturation experience for participants. Gender was also influential on dietary choices and levels of physical activity among these immigrants. Participants acknowledged that body image differed from their country of origin to that of their host country: in Iran attractive means "slim" and in Australia attractive means "fit."

The environmental changes experienced by Iranian immigrants, especially women immigrants, led to increased physical activity. Lack of clothing restrictions, increased leisure time, accessibility of parks and exercise facilities, and role models of women exercising enabled

Iranian immigrant women to partake in more physical activity in their host country than in their country of origin. Government-sponsored health promotion campaigns also appeared to support a healthy diet and an increase in physical activity post-migration. By focusing on Iranian immigrants, this study explored the migration experience of an atypical migrant population: well educated, emigrating for reasons related to personal freedom rather than economic advancement, and coming from a country with rates of obesity similar to high-income countries. An important contribution of Delavari et al's study (2013) is that it highlights differences in acculturation patterns and their impact on obesity among immigrants from countries that vary widely on the Human Developmental Index (HDI).

In a later study, Delavari et al (2015) pointed out that while it is well established that when immigrants tend to gain weight then they move from low-income countries to high-income countries; however, the obesity risks of migrating from middle-income countries to high-income countries have been understudied. Behavioral changes stemming from patterns of cultural adaptation may explain only some of the post-migration risks for obesity. Factors other than migration may also be influential, such as obesity-related environmental factors. In the Iranian population in this study, the pattern of acculturation (relative integration, assimilation, separation, or marginalization) did not correlate with unhealthy BMI, diet, or physical activity.

Epidemiology researchers in a number of different countries, particularly Scandinavian countries, have studied the health status of Middle Eastern immigrants living in their countries. Immigrants from Iran, Iraq, Turkey, and Pakistan are the primary populations studied. Comparing the health status of Iraqi immigrants in Sweden with that of native Swedes, Bennet et al (2013, 2015) looked specifically at-risk factors associated with the early onset of diabetes, as well as glycemic control in non-diabetics. Bennet et al found that diabetes onset occurred six

years earlier for the Iraqi immigrants. The clustering of diabetes in the family history of the Iraqi immigrants studied was found to be nearly six times higher than that of native Swedes (23.2% versus 3.6%), establishing that Iraqi ethnicity independently raised the health hazard for these immigrants. Among those Iraqi immigrants not previously diagnosed with diabetes, HbA1c levels were slightly higher than that of native Swedes, again explained by clustering in family history rather than age, obesity, lifestyle, or socioeconomic status. Development of obesity after immigration was found to further increase risk for chronic disease. The Bennet et al (2013, 2015) study findings confirmed the very alarming finding of Wild et al (2004) study that the Middle Eastern population develop diabetes at much younger age (45-64) compare with population in developed countries which the prevalence of diabetes will increase in those that are 65 years and older.

Other international researchers have focused on studying the health consequences of dietary acculturation on Middle Eastern immigrants. Iverson (2011) studied Middle Eastern immigrants from Iran, Pakistan, and Turkey, as well as South Asian immigrants from Sri Lanka and Vietnam living in Oslo, Norway. Studying the differences in BMI from the time all the participants were 25 years old to the time of the survey, they found that the five populations of immigrants had different patterns of gains in BMI compared with each other, as well as compared with the general Norwegian population. Their major finding was that those immigrants with BMIs lower than the native population when young gained more weight than natives, and that those immigrants with higher BMIs than natives when young gained less weight than the native population. The predicted result is a convergence of BMIs for everyone in the country, with native Norwegians and immigrants alike achieving similar BMIs later in their adult lives. In a 2013 study, Iverson et al hypothesized that acculturation, measured by language skill, reduces

the gap of BMI gain between natives and immigrants. Although Iverson found that language skills predict BMI change, time of residency was found to have no effect on BMI changes in the immigrants studied. When studying immigrants in Norway, Iverson et al (2011, 2013) used language acquisition as a measure of acculturation because it is directly related to social interaction and integration.

Another Norwegian research, Jenum et al (2012), studied diabetes susceptibility among the same immigrant ethnic groups that Iverson studied to assess the association between adiposity and diabetes among those immigrant groups compared with the native Norwegian population. Jenum et al used socioeconomic condition as a confounding factor in the study and used BMI, waist circumference, and waist-to-hip ratio as a measure of adiposity. Adiposity was found to be higher among immigrant women than immigrant men. All five-immigrant groups were found to have higher rates of diabetes than the native Norwegian population, even given the same adiposity level. Pakistani and Sri Lankan immigrants had the highest prevalence of diabetes among the immigrant groups studied (20-26%).

In 2013 Carlson and Rise et al. examined risk differences between Swedish-born individuals compared with groups of foreign-born individuals. The overall risk of cardiovascular disease and mortality are higher in certain groups, which may be partly explained by more diabetes among immigrants from North Africa, parts of Asia, and the Middle East. Rabanal et al (2015) conducted a longitudinal study in which the entire Norwegian population aged 35-64 was studied for 15 years to determine the burden of stroke and acute myocardial infarction (AMI) among immigrants compared with the native population. The findings showed that ethnic groups differed in risk of AMI and stroke. Middle Eastern immigrants, both men and women, were found to have a lower risk of AMI compared with ethnic Norwegian and other immigrant groups.

Tran et al (2011) studied cardiovascular disease by diabetes status in five ethnic minority groups (from Sri Lanka, Pakistan, Iran, Vietnam, and Turkey) compared with ethnic Norwegians. Obesity and physical inactivity were prevalent in the majority of ethnic minority groups, regardless of diabetes status, whereas systolic and diastolic blood pressures were higher in Norwegians. In nearly all ethnic groups, individuals with diabetes had a higher waist-to-hip ratio (WHR) and body mass index compared with individuals without diabetes. Higher rates of cardiovascular disease were found among all ethnic minority groups compared with ethnic Norwegians, yet these differences were not related to diabetes status.

Wandell et al (2011) studied the prevalence of blood lipid disturbances in Swedish and foreign-born 60-year-old men and women in Stockholm, Sweden. The results show a higher prevalence of dyslipidaemia in men and women of foreign-born origin compared with Swedish-born. Non-European immigrants were found to have lower levels of total cholesterol and High Density Lipoprotein (HDL) cholesterol and higher levels of triglycerides among immigrants compared with ethnic Norwegians. Low HDL and high triglycerides lead to metabolic syndrome and abdominal obesity. The data linked obesity to physical inactivity among immigrants in Sweden.

Attanapola (2013) looked at the development of high levels of obesity as the consequence of migration to Norway. Their findings, in accordance with other researchers, showed that behavior changes influenced by migration are related to an increased risk for cardiovascular disease and diabetes in Middle Eastern immigrants. Previously, Raberg-Kjollesdal et al (2011), compared the risk factors for obesity, cardiovascular disease, and diabetes in Middle Eastern immigrants with that of the general Norwegian population. They came to the same conclusion: immigrants face health disparities based on dietary acculturation, environmental factors, and

behavioral changes, especially women immigrants. Hjelseth et al. (2011) studied Pakistani women immigrants in Norway and found that a lack of physical activity contributed to their high rates of overweight (98%) and obesity (40%), putting these women at risk of developing Type 2 diabetes.

Garnweidner et al (2012) conducted a qualitative study exploring how female immigrants from the Middle East and Northern Africa perceive their host country's food culture, identify aspects of their original food culture they considered important enough to preserve, and determine how they go about preserving them. Three patterns of dietary acculturation were identified: strict continuity, flexible continuity, and limited continuity of the original food culture. Strict continuity involves a rigid adherence to daily eating patterns from their homelands, such as maintaining strict eating times. Flexible continuity allows for the adoption of certain dietary elements and eating times of the host culture, such as eating sandwiches rather hot meals for lunch. Limited continuity involves just maintaining dietary patterns of their homeland for religious and social gatherings. Taste, preparation effort and method, and adherence to religious dietary practices are all variables in continuity patterns. Garnweidner et al found that not all food acculturation led to negative health effects. For example, eating more fish as a way to acculturate to the food culture of Norway could have positive health benefits.

The health consequences of obesity in Asian Americans are both personally costly and an economic burden on our health care system, posits Nguyen et al (2015). In her study of the hidden Asian-American obesity epidemic, Yi et al. (2015) noted that Asian Americans are often studied as one population even though national subgroups are distinctive due to differences in socioeconomic status, access to resources, migration patterns, and immigration histories. When collecting health data, European host countries categorize their immigrant populations with finer

distinctions than the U.S., i.e., based on nationality rather than broad regions that span highly diverse dietary practices, immigration patterns, socioeconomic backgrounds, and disease occurrence. Powell et al (2014) also lamented the lack of federal data on specific Asian subgroups when studying the mortality rate from cardiovascular disease and stroke among Asian Americans.

The 2010 U.S. Census Bureau classified people as Asian if they claimed their origins are from the Far East, Southeast Asia, or the Indian subcontinent (Hoeffel et al., 2012). Different ethnicities, cultures, languages, and risk factors of their disease profile within each of these Asian regions makes it hard to classify people in heterogeneous populations (Arya, 2015). The heterogeneous groups of individuals from the various countries of Asia also have underlying differences genetically, environmentally, and culturally that influence modifiable and non-modifiable risk factors of disease (Gujral et al., 2013; Islam et al., 2013; Karter et al., 2013; Ma & Chan, 2013).

The top three minority groups in the U.S. are African Americans, Hispanic Americans and Asian Americans (Hoeffel et al., 2012). More than 18 million (4.8%) of the U.S. population identified themselves as Asian American, with the majority born outside the U.S. (Hoeffel et al., 2012). Asian Americans are the nation's fastest growing minority population, growing four times faster than the overall U.S. population. (U.S. Census Bureau, 2010) Migration has contributed to more than half of this growth rate. The Asian-American population is projected to reach 34.4 million people and comprise 8.2% of the overall population by 2060 (U.S. Census Bureau, 2012). Even though Asian Americans are the third largest minority group in the U.S., they are often left out of studies researching minority-based health disparities. The resulting gap in knowledge calls for further investigation in health disparities in Asian Americans.

Limitations on Application of Health Disparities in USA

Aggregated data that does not distinguish between Asian subgroups can be problematic. For example, Ma & Chan (2013) looked at the data from the Women's Health Initiative, a longitudinal study that collected data from across the U.S. from Asian American, White, Hispanic, and African American women. Although there was data from 4,190 Asian-American women who identified as Chinese, Indo-Chinese, Japanese, Korean, Pacific Islander, or Vietnamese, the data was not disaggregated by Asian region and insights into population-based health issues were lost. After adjusting for demographic factors, smoking, and family history of diabetes, Asian Americans had a higher risk for diabetes than Whites.

In another example, the Diabetes Study of Northern California (Distance) followed almost two million adults for one year. Data was disaggregated into 12 single racial/ethnic groups, including seven distinct Asian subgroups. The incidence rates for diabetes were highest among Pacific Islanders, followed by South Asians and Filipinos. The BMI at diagnosis varied among the different Asian subgroups from 27.2 kg/m2 in Chinese, 28.7 kg/m2 in Japanese, 29.0 kg/m2 in Filipinos, and 29.6 kg/m2 in South Asians compared with a mean BMI of 33.4 kg/m2 in Whites, 34.3 kg/m2 in Hispanics, and 35.5 kg/m2 in African Americans. The finding that the prevalence of diabetes is higher among all Asian subgroups at lower BMI rates warrants further disaggregated study. While some data exist for several Asian subgroups, there is limited data on other subgroups in this heterogeneous population (Karter et al, 2013).

Furthermore, there are a number of studies that show an increased prevalence of diabetes and metabolic syndrome in the Filipino American population (Lee & Brancati 2011, Choi et al., 2013). A few studies have studied the relationship between acculturation and diabetes (Ancheta et al., 2014; Lee et al. 2011). In 2014 Ancheta compared the prevalence of metabolic syndrome

in women who were native Filipinos with women who were Filipino immigrants to the U.S.. She collected waist circumference, fasting glucose, triglycerides, high-density lipoprotein (HDL), and blood pressure. Despite the fact that the immigrant women had higher BMIs, both populations had the same rate of metabolic syndrome. Filipino American men were found to have a higher prevalence of both diabetes and metabolic syndrome compared with Filipino American women (Choi et al., 2013; Dalusong-Angosta and Gutierrez, 2013).

Lastly, a recent study found no evidence to suggest an increased risk of total mortality among Asian Americans within the BMI range of 20-25 kg/m2 (Park et al 2014). BMI may be effective as a simple initial screening tool to identify diabetes risk for Americans but not for Asian Americans. More research needs to be done to determine the most accurate assessment tools for diabetes risk in Asian Americans. For example, according to the American Diabetes Association, there is compelling evidence that lower cut points for BMI denote increased diabetes risk for some racial and ethnic groups (2014). Because diabetes risk is under-recognized for Asian Americans based on the existing BMI criteria, they will not fully benefit from the strategies that are available to prevent an early diagnosis of diabetes. It is imperative to develop better screening tools than BMI as a risk marker for Asian Americans.

Summary

This literature review demonstrated key evidence and revealed gaps in the literature about health disparities among Asian immigrants in Europe and in the U.S., providing a strong rationale for studying the effects of exposure to the U.S. culture in Iranian immigrants in the U.S. The evidence demonstrating that Asians immigrating to Europe tend to come from different countries than Asian immigrants to the U.S. has revealed significant limitations in the health data for Asian-American populations. For instance, Middle Easterners immigrate to Europe more than

to the U.S.; since health data about Middle Eastern immigrants has been collected in Europe, some research has been conducted using both aggregated and disaggregated data describing health disparities among immigrants. For example, there is data about the high prevalence of Type 2 diabetes in Middle Eastern immigrants to Europe. In the U.S., on the other hand, Middle Eastern immigrants are categorized as "other" in national health surveys and the U.S. census; therefore, there is a paucity of disaggregated information about their health status. However, it has been established that there are significant health disparities among Asian-American immigrants, especially Type 2 diabetes.

Furthermore, according to the U.S. Census data in 2012 and the University of Sussex's Global Migrant Origin Database (2000), the U.S. has the largest Iranian population outside of Iran (330,000, which is thought to be an underestimate). Because the Iranian population in the U.S. is growing, and there is a dearth of data about the health status of Iranian immigrants, this study will help close an important gap in the literature.

Lastly, understanding the impact of acculturation on immigrants' health will enable progress on Healthy People 2020's goal of reducing the health inequities experienced by immigrants.

Chapter 3:

Research Design and Method

This chapter presents the research design and methodology that was used in this study. To examine the influence of exposure to the U.S. culture on the Iranian immigrant's acculturation and dietary patterns the Iranian acculturation scale (Appendix A), the Brief Food Questionnaire (Appendix B), and the demographic survey (Appendix C), were used to answer research questions.

The Iranian acculturation scale was used to measure the cultural, socioeconomic and demographic factors that can affect the level of acculturation among Iranian Immigrants. Data were used in combination with data from the Brief Food Questionnaire to assess the dietary acculturation patterns.

A demographic questionnaire based on the theoretical underpinning of the study was used to collect data on key variables including (but not limited to): body mass index, gender, present age, age at time of immigration, marital status, income, English fluency, family history of diabetes, a history of pre-diabetes and diabetes. Respondents level of dietary acculturation and their dietary pattern were used to examine the relationship to being overweight and having diabetes. Recruitment of participants data analysis, and data management were explained.

Design

A descriptive exploratory (Cuthill, 2002) cross-sectional study design (Bethlehem, 1999) was used for this study. This design was employed because no information was found addressing the variable in this study. The acculturation process, dietary patterns and prevalence of being overweight and diabetes among Iranian American immigrants were explored.

Sample

For this study, a total of 207 Iranian-American immigrants who were 18 years and older were recruited to obtain statistical meaningful results. Sample size was based on a power analysis (Cohen, 1988) with an anticipated effect size of 0.15 for correlation, an alpha level of 0.05, and the desired statistical power level of 0.8. According to Cohen (1998), the required sample size was at least 79 participants. Participants for this study were self-identified first-generation Iranian immigrant adults who met the following inclusion criteria: (a) able to read and write in English, (b) born in Iran, (c) living in the U.S. for one year or longer, (d) 18 years or older. Participants were excluded if (a) they were not born in Iran, (b) had lived in the U.S. is less than one year or (c) who were not able to read and write in English.

Participants Recruitment

Participants were recruited from multiple sites including (but not limited) to the Persian Cultural Organizations (PCO) situated in the greater Milwaukee, and in Chicago, in Stockton (CA), Great Falls (VA), and Houston (TX). In addition, requests to access the student Persian Culture Association at the University of Wisconsin-Milwaukee, and at the University of Wisconsin – Madison were made to the individual university Facebook website administrator. Several strategies were employed to recruit participants: Emails were sent to key PCO contact persons to request they post a flyer (Appendix D) with study information, including how to contact the PI. Flyers were also posted in local Milwaukee Persian stores (restaurants and grocery stores), in one Iranian healthcare professional's office, and in one Moslem mosque frequented by Iranians. The flyer was also posted at various locations on the UWM campus to reach out to the Iranian student group at UWM. Once a participant contacted the PI and agreed to take part in this study, an appointment was scheduled to administer the questionnaire. If there

were at least 10 eligible participants from any location in the U.S. who were willing to participate in the study, the PI met them as a group at a mutually agreeable date and time. Thus, in addition to collecting data from participants in Milwaukee the PI flew to Washington D.C. and L.A. to collect data.

Instruments

Three instruments were used in this study: the Iranian Acculturation Scale (Shahim, 2007), Brief Food Questionnaire (2013), and a demographic questionnaire. What follows are the description, validity and reliability, and scoring information for each instrument.

Iranian acculturation scale.

Description. Based on the definition of acculturation by Berry (1997), an acculturation scale was developed by Shahim (2007) to examine the level of acculturation among first-generation adult Iranian immigrants in Toronto, Canada. The scale is comprised of 26 Likert-type items "to measure language *(7* items), media use (4 items), eating habits (1 item), attributions related to ethnic groups (5 items), motives for immigration (3 items), and attitudes (6 items). Also, endorsement items (How important is it that Iranian tradition be followed) were included as recommended by Kang (2006). Questions in a second section address age, occupation, education, sex, length of stay in Canada and other countries before coming to Canada, and age on arrival in Canada (Shahim, 2007, p. 56)". An example of a response choice is "Only Farsi (1) Mostly Farsi (2) In English and Farsi (3) Mostly English (4) Only (5) English".

Eight of the questions had four response options. The rest of the questions have three response options. Only question 19 had two response options.

Reliability. The stability of a measure found in repeated measurements of the same phenomenon is called reliability (Deniz, et al., 2013). Shahim (2007) reported the Cronbach's

alpha for her acculturation scale as 0.83, which means her scale has an acceptable internal consistency. Cronbach's Alpha value of 0.82 suggesting that the Iranian Acculturation Scale is internally consistent in this sample.

Validity. Shahim (2007) used the demographic information of participants in Toronto, Canada to validate the Acculturation scale. The Pearson correlation between the acculturation scores and (a) total years a person lived in Canada was .38 ($p<.001$) and (b) age upon arriving in Canada was -.48 *(p* <.001). The younger the age of arrival in Canada and the longer a person lived in Canada, the greater their level of acculturation.

Scoring. To calculate a mean acculturation score, response option one always receives the lowest score (1) and the last response option receives the highest score. For example, question 10: "*In what language do you communicate with your spouse at home?"* The first response option (only Farsi) got a score of one while the fifth response option (only English) got a score of 5. A greater score indicates a greater level of acculturation. An acculturation score was calculated as a sum of numerical ratings that was given to each response option of each twenty-six questions except for responses to questions 20, 21, 22, 23, 25, 26, which were reverse scored, due to the nature of the questions. A low acculturation score indicates low level of acculturation, reflecting Iranian values; whereas an acculturation score of 2 or 3 indicates an integrated bicultural status, and an acculturation score of 4 or 5 indicates high Western acculturation values (Shahim, 2007).

Brief food questionnaire.

Description. The Brief Food Questionnaire (2013), (Block company), (Appendix B), was selected to measure the dietary choices of Iranian immigrants in the U.S. and is one of the most widely used food questionnaire. There are 92 food related questions in the Brief Food

Questionnaire that measured usual food choices of participants in the past year, including (but not limited) to meals, snacks and foods that were consumed in a restaurant plus carryout food.

The food choices included in the Brief Food Questionnaire were based on the consumption of the usual food items described by the U.S. Department of Agriculture (USDA). Food and nutrient data in Brief Food Questionnaire were based on USDA Food Composition Databases. Two types of questions for each food category were considered; namely "how often" and "how much" food was consumed. Choices for "how often" or frequent, food was eaten include: (1) never, (2) a few times per year, (3) once per year, (4) 2-3 times per month, (5) once per month, (6) Twice per week, (7) 3-4 times per week, (8) 5-6 times per week or (9) every day. Choices for "how much" food was consumed included: (a) ¼ cup, (b) ½ cup, (c) 1 cup and (d) 2 cups or (e) if appropriate by 1-2 Tablespoons.

Reliability. According to literature from the Block company, the Brief Food Questionnaire reliability was high, with Pearson correlation coefficients, ranging from 0.57 to 0.90 (macronutrients) and from 0.65 to 0.88 (micronutrients from supplements and food).

Validity. Boucher et al., (2005) report**, "**The Brief food Questionnaire validity was moderate to high, with Pearson correlation coefficients having a median of 0.59, ranging from 0.11 to 0.73 (macronutrients) and from 0.50 to 0.76 (micronutrients from supplements and food)" (p. 84) in a sample of 166 women.

Scoring. The Brief Food Questionnaire was formatted to be scanned and was scored by a computer software program (NutritionQuest ©). This program estimated the consumption of calories and nutrients from food groups such as saturated fat and trans-fat, carbohydrates, added sugar, protein, vegetable and fruit intake based on the items in the Brief Food Questionnaire. Additional questions regarding types of food consumed (i.e. milk was whole, 2% or fat free)

were considered to permit precise estimates of intake of energy and nutrients. Calories were estimated by combining the intake frequency of responses with the specific portion sizes and the nutrient values assigned to each food. Wheat-based unrefined, whole wheat bread, beans, rice, yoghurt, quantity of fruits vegetables, fresh leafy greens, nuts, variety and quantity of herbs, red meats processed food, highly processed wheat products, sugar and fat was among the dietary products of interest. Food groups used in the dietary pattern analysis are presented in Table 1.

Table 1: Food groups used in Dietary Pattern Analysis

Food groups	**Food items**
Red Meat	Beef, lamb, veal, ground red meat
Fast Food	Fried potatoes, French fries, sausages, pizza
Eggs	Egg
Fruits and Dried Fruits	Orange, tangerine, lemon, lime, grapefruit, banana, apple, pear, strawberry and other berries, peach, cherries, fig, different types of Mellon, cantaloupe, raisins, grapes, kiwi, apricots, nectarine, mulberry, plums, persimmons, pomegranates, date, natural fruit juices, any types of dried fruits.
Vegetables	Cabbage, cauliflower, Brussels sprouts, kale, carrots, tomato sauce, tomato paste, spinach, lettuce, cucumber, eggplant, celery, green peas, green beans, green pepper, turnip, corn, squash, zucchini, mushrooms, onions and garlic, green leafy vegetables, all types of herbs.
Dairy	Whole and low-fat milk, yoghurt, any type of cheese, yoghurt drink, chocolate milk, ice cream, kashk (yoghurt cooked then dried), strained yoghurt.
Potatoes	Potatoes
Whole Grains	Wheat, barley, rye, oats, bulgur, and any types of Iranian dark breads.
Salty Snacks	Potato chips, corn puffs, crackers, biscuits, popcorn, pickled vegetables.
Legumes	Beans, peas, lima beans, broad beans, lentils, soya beans, peanuts,
Nuts	almonds, pistachios, walnuts, hazelnuts, roasted seeds.
Refined Grains	All types of white breads, noodles, pasta, rice, sweet bread, white flour, biscuits.
Poultry and fish	Chicken, any kind of fish and other seafood, turkey.
Sweets	Sugar, candies, Iranian confectioneries, jam, jelly, honey, sweet chocolates, cookies, cakes, confections, caramels.

Demographic Questionnaire

Demographic data about key variables including (but not limited to) body mass index, gender, present age, age at time of immigration, marital status, income, English fluency, family history of diabetes, a history of pre-diabetes and diabetes, height, weight, gender and if female participants were pregnant and the date of filling out the questionnaire were obtained from either information on the socio-demographic form or the BFQ.

Independent study variables. Considered in this study were: (1) Age at immigration, (2) Acculturation group, (3) Being overweight, (4) Fluency with English language, (5) Family history of diabetes, (6) Having pre-diabetes, (7) Having diabetes, (8) Income, and (9) Marital status.

Dependent variables. Dependent variables considered in this study were: (1) Level of acculturation, and (2) Dietary patterns.

Protection of Human Subjects

Prior to administration of this research, the study was reviewed and approved by the UWM Institutional Review Board for the Protection of Human Subjects (IRB) (Appendix E). The UWM Institutional Review Board granted "Exempt Status under Category 2". In order to maintain the subjects' privacy, a numeric code was assigned to each individual participating in the study. Participants received verbal and written information prior to participating in this study, and were informed that by completing the survey packet they were giving their consent to participation in this study. Participants were told participation was entirely voluntary, and they could withdraw from the study at any time prior to submission of the survey packet.

Data Collection

The Iranian-American immigrants who volunteered to participate in this study were

contacted the PI by phone or by email. A mutually agreed place and time was arranged to administer the survey packet. During the pre-arranged meeting participants received both written and verbal information regarding their participation to ensure they were informed regarding the project, and their agreement to participate. The informed consent document was provided in a hard copy to the participants that they were giving their informed consent to be a subject in this study. Participants were informed they could discontinue their participation at any time. At the beginning of each survey, there was a statement that by completing this survey, they agreed to participate in this investigation.

The survey packet was comprised of Iranian Acculturation scale (Appendix A), Brief Food questionnaire (Appendix B), and socio-demographic information form (Appendix C). In order to pair their food intake, level of their acculturation and the level of their socio-economic status. Each participant was asked to compete a survey packet, which took approximately 20-25 minutes. A $10 Starbucks gift was given to each participant after the completion of the surveys in appreciation for their time/efforts. Data were collected over a two-month period.

Missing Data

If a respondent failed to answer 80% or more of the acculturation questionnaire they were excluded from the analysis. If a participant answered at least 80% the mean of the answered questions for that scale was substituted for the missing values (Plichta & Kelvin, 2013).

Data Analysis

Distribution of scores was examined to assess normality. Survey data were analyzed using the Statistical Package for the Social Sciences (SPSS ® version 20). The alpha level of significance was set at 0.05. Descriptive statistics of means, standard deviations, frequencies, and percentages were computed to describe the demographic characteristics of the sample.

Differences between the nominal variables of gender, English fluency, and level of education were examined using t-tests and ANOVA (Gravetter, & Wallnau, 2007). Pearson Product Moment correlations (Mukaka, 2012) were computed to describe the relationship between the interval level demographic variables of length of stay in the US, current age and age of arrival with Acculturation Scores.

Dietary acculturation groupings. Based on previous research by Asghari et al., (2012), the Brief Food Questionnaire scores of food items were aggregated into 14 predetermined food groupings. Prior to perfuming a factor analysis, the Bartlett test of Sphericity (Snedecor & Cochran, 1989) and Kaiser-Meyer-Olkin Measure (Cerny & Kaiser, 1977) of sampling adequacy were conducted to determine if the correlations were strong enough to perform factor analysis.

A frequency score was given to each food item in the groups based on how often the food item was consumed. Possible responses were every day coded as 9; 5-6 times/week coded as 8; 3-4 timed/week coded as 7; twice/week coded as 6; once/week coded as 5; 2-3 times/month coded as 4; once/month coded as 3; a few times/year coded as 2; and never coded as 1. The maximum frequency of each of the grouping of foods was used to represent the category. For example, if a participant ate yoghurt five to six times a week, yoghurt had a code of eight. If the same person ate ice cream once per week the code for ice cream was five and if they drank milk once a month the code for milk was three. Therefore, a new category of "Dairy" was created and coded as 8, the maximum frequency in the food group. This was done for each of the 14 food groups and each participant. Once the maximum frequency of each of the 14 food groups was computed, factor analysis (MacCallum& Austin, 2000) was preformed to identify dietary patterns of the participants (Iranian, Western, or Bicultural).

Acculturation groupings. A cluster analysis (Aggarwal & Reedy, 2014) was performed on the Acculturation scale scores to determine three groups which were to represent acculturated, transitional and Iranian, based on a very broad definition of Berry's *bi-dimensional acculturation*. The groups were identified as acculturated, transitional or Iranian based on the rank order of the scores on the Iranian Acculturation Scale. The cluster group with the highest acculturation scale scores was identified as "Acculturated". The cluster group with the second highest acculturation scale score was identified as "Transitional" The cluster group with the lowest acculturation scale scores was identified as "Iranian" (See Table 4). As none of the participants had an acculturation score of 4 or 5, which was the score identified as Acculturated, a median split was employed to create two categories: transitional and Iranian acculturation scores. An One-Way ANOVA (Gravetter & Wallnau, 2007) was conducted to determine whether there were any statistically significant differences in the mean Acculturation scores between the three groups.

Analysis for each research question

The following describes the analysis for all five research questions.

Research question 1. What are the socioeconomic and sociodemographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?

In order to identify factors influencing participants level of Acculturation, Pearson Product Moment Correlations (Mukaka, 2012) were conducted with the interval level measures of acculturation, age at arrival, current age of participants, and length of stay in the US. ANOVA (Gravetter & Wallnau, 2007) was conducted to determine whether the interval level acculturation score differed by English fluency. A Tukey HSD (Haynes, 2013) was conducted to identify which groups differed. English Fluency (Not at all fluent, Somewhat fluent, Fluent, and Very

fluent).

Spearman Rho correlations (Rees, 2007) were computed to examine the relationship of Iranian immigrant's 14 dietary choices and with the sociodemographic variables of age of arrival, current age and length of exposure to U.S. culture.

In order to identify sociodemographic factors influencing participants food choices, an ANOVA was conducted to determine if participants food choices differed by English fluency and t-tests were conducted to determine whether participants food choices differed by gender, income, and level of education .

Research question 2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes considered?

This question was answered by computing three t-tests (Gravetter & Wallnau, 2007) for each of the dietary acculturation patterns (Western and Iranian) measured at the interval level. The independent variables were being overweight, having diabetes or having pre-diabetes.

Research question 3. Is the acculturation of Iranian immigrants to the U. S. associated with their prevalence of being overweight, pre-diabetic or diabetic?

The associations of the acculturation of Iranian immigrants in the U.S. with their health conditions (being overweight, pre-diabetic or diabetic) were examined by conducting three t-tests (Gravetter & Wallnau, 2007) with an acculturation score as the dependent variable. The first set of t-tests was conducted between the participants who had diabetes and the 199 participants without diabetes. The second set of t-tests was conducted between the 19 participants who had been diagnosed with pre-diabetes and the 188 participants without pre-diabetes. The third set of

t-tests was conducted between participants who were obese with participants who were not obese.

Research question 4. Is there an association between length of exposure to the U.S. culture and the Iranian immigrants level of acculturation?

This question was answered using two analytic approaches. The first approach was by computing a Pearson's correlation (Mukaka, 2012) between the interval variables of length of exposure to the U.S. culture, and participant level of acculturation. The second approach was to stratify the interval variable length of exposure into two groups based on living in the US less than 10 years as compared to living in the U.S. 10 years and longer. Then a t-test (Gravetter & Wallnau, 2007) was preformed to compare the difference in the acculturation score between the two groups.

Research question 5. How does Iranian immigrants' length of exposure to host culture and level of acculturation differ by dietary acculturation patterns?

A Two-Way ANOVA (Gravetter & Wallnau, 2007) for each of the dietary patterns (Iranian and Western) was computed using the mean dietary pattern score as the dependent variable. The interval variable length of exposure was stratified into two groups based on living in the US less than 10 years as compared to living in the U.S. 10 years and longer. Because the acculturation score did not reach the score of 4 or 5, the value which is required to be considered acculturated the independent variable, acculturation score was dichotomized based on a median split.

Summary

In this chapter the design, instruments and data analysis were described. The Iranian Acculturation Scale was used to assess acculturation of Iranian-American immigrants. The Brief Food Questionnaire was used to measure the dietary pattern of participants.

Given the growing Iranian immigrant population in the U.S. and the high prevalence of being overweight and diabetes among Iranian population in Iran a better understanding of their health status after immigration to the U.S. is warranted. Understanding factors that affect their eating and physical activity patterns after migration and how their new lifestyle affects their overall health is important to prevent further weight gain. Having a better may lead to the development of culturally sensitive interventions as proclaimed by Osei-Kwasi et al. (2016). Result of this study may provide insight into the health status of Iranian immigrants in the U.S., preliminary information about their dietary patterns, and how their dietary pattern may affect their diabetic status. Results from this study may be used as a springboard for the future studies in this field, not only for Iranian immigrants but also for other Middle Eastern immigrants in the U.S.

CHAPTER 4:

Results

This chapter presents the findings about the acculturation and dietary patterns among Iranian immigrants and their relationship to chronic health conditions, specifically overweight, pre-diabetes and diabetes. This chapter includes the descriptive characteristics, dietary patterns, and acculturation levels of participants in this study. The data were analyzed using the SPSS® program version 21. The first section of this chapter describes the characteristics of the sample. The second section of this chapter presents the results of the following research questions:

1. What are the socioeconomic and sociodemographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?
2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes considered?
3. Is the acculturation of Iranian immigrants to the U. S. associated with their prevalence of being overweight and diabetes?
4. Is there an association between length of exposure to the host culture and the Iranian immigrants level of acculturation?
5. How Iranian immigrants' length of exposure to host culture and level of acculturation differ by dietary acculturation patterns?

Descriptive analysis of Participant Characteristics

Two hundred and seven Iranian immigrants completed the acculturation, food frequency, and socio-demographic questionnaires. All participants were born in Iran, were 18 years of age or older, and had lived in the U.S. for at least one year. A majority (56%) of the participants were female, more than half (52%) were less than forty years old, with a mean age of forty-four years

(±14.9).

The length of residence (*M*= 16 years ±15.2) was calculated by subtracting the participants age at arrival to the US from their current age. Forty-five percent of the participants had lived in the U.S. for more than ten years. Almost two-thirds (72%) of the participants rated their English fluency as fluent or very fluent. The mean age when participants arrived in the U.S. was forty-four years (SD±10.3). Almost three quarters (72%) identified themselves as married. Most participants (96%) were college educated. Thirty-three percent of the participants earned over $100,000 per year, whereas 29% of all the participants earned between $25,000 - $99,999 per year.

One hundred ninety-four of the participants (94%) provided their height and weight, from which BMI was calculated and then categorized by the CDC groupings. Participants mean BMI was 22 ± 9.8. Approximately forty percent were normal weight while 44.3% were overweight.

Data from 207 respondents were examined to identify if participants had a family history of diabetes, a diagnosis of pre-diabetes or a diagnosis of diabetes. Thirty-nine percent indicated having family history of diabetes. Almost 10% had been told by their physician that they were pre-diabetic, and almost 4% reported having diabetes (Table 2).

*Table 2: Category, Number, Percent, Mean, and Median of the Demographic Variables (*N*=207)*

Variables	Category	N	Percent	Mean	Median
Age at arrival		207		44 yrs.	39 yrs.
Age	18-30	37	18.1%		
	31-40	68	33.3%		
	41-55	38	18.6%		
	More than 55	61	29.9%		
BMI	Underweight	29	14.9%	22.02	24.31
	Normal Healthy weight	79	40.7%		
	Overweight	60	30.9%		
	Obese	26	13.4%		
Years living in the US	1-3 years	48	23.5%	16 yrs.	8 yrs.
	4-5 years	31	15.2%		
	6 to 10 years	34	16.7%		
	More than 10 years	91	44.6%		
Gender	Male	89	43.0%		
	Female	114	55.1%		
Education	High School	9	4.4%		
	College (BA or BS)	54	26.6%		
	Graduate Student	79	38.9%		
	Doctorate (MD or PhD)	61	30.0%		
Marital	Married	148	71.5%		
	Single/Divorced/Widowed	59	28.5%		
Income	Less than $24,999	79	38.2%		
	$25,000 -$49,999	21	10.1%		
	$50,000- $74999	25	12.1%		
	$75,000-$99,999	14	6.8%		
	$100,000-$124,999	16	7.7%		
	over $125,000	52	25.1%		
English Fluency	Mot at all	11	5.3%	2.98	3.00
	Somewhat	46	22.2%		
	Fluent	87	42.0%		
	Very Fluent	63	30.4%		
Pre-Diabetic (DM)	Yes	19	9.2%	1.91	2.00
Family History of DM	Yes	81	39.1%	1.61	2.00
Have Diabetes	Yes	8	3.9%	1.96	2.00

Food Groupings. The Brief Food Questionnaire (BFQ) (Block, 2013) was used to obtain information about participant's dietary intake from food items. The dietary intake, collected in BFQ, was categorized into pre-defined fourteen food groups (Asghari, 2012). Frequency data for each food group are presented in Table 3.

Table 3: Mean, Median, Mode, Standard Deviation, Minimum, and Maximum by Food Groups

Food Groups	Mean	Median	Mode	SD	Minimum	Maximum
Fruit	7.57	8	9	1.39	2	9
Vegetable	7.28	7	7	1.46	3	9
Refined	6.85	7	7	1.72	1	9
Dairy	7.13	7	9	1.69	1	9
Wholegrains	6.05	7	7	2.27	1	9
Red meat	5.55	6	7	1.97	1	9
Poultry	5.18	5	5	1.67	1	9
Eggs	5.41	5.5	6	1.73	1	9
Nuts	3.41	3	1	2.25	1	9
Potato	3.86	4	4	1.67	1	9
Snacks	6.54	7	7	1.73	3	9
Fast food	4.46	4	5	1.52	1	9
Salty snacks	3.65	3	2	1.81	1	9
Soft drinks	2.58	2	1	1.99	1	9

Key: Choices for "how often" food was eaten includes: (1) never, (2) a few times per year, (3) once per year, (4) 2-3 times per month, (5) once per month, (6) Twice per week, (7) 3-4 times per week, (8) 5-6 times per week or (9) every day.

Acculturation Score. Participant's level of acculturation was measured using the Iranian Acculturation Scale (IAS), (Shahim, 2009, Appendix C). The acculturation score was calculated as a mean of the numerical ratings given to each of the response option. The mean (SD), median, and mode for each item are presented in Table 4. None of the participants had an acculturation score between 4 and 5, which indicates a high level of acculturation based on Shahim's (2007) scoring. The highest total mean score on the IAS for this study was 3.67 which is at most a transitional level of acculturation.

Table 4: Mean, Standard Deviation and Median for Each Item in the Acculturation Scale

Questions	Mean	SD	Median
1. In what language do you usually think?	2.72	.833	3.00
2. When was the last time you read a book in Farsi	2.79	1.25	3.00
3. When was the last time you read the newspaper or read news on the internet in Farsi	1.68	1.17	1.00
4. When was the last time you watched Iranian TV, video or listened to Persian Radio?	1.75	1.22	1.00
5. When was the last time you listened to Persian music?	1.29	.714	1.00
6. What type of food do you eat more often?	2.18	1.23	2.00
7. How important to you is it that the Iranian tradition be followed?	1.85	.721	2.00
8. How often do you attend Iranian recreational events?	2.07	.718	2.00
9. How often do you attend Iranian religious events?	**3.30**	**.958**	**4.00**
10. In what language do you communicate with your spouse at home? (if applicable)	1.78	1.024	1.00
11. In what language do you use to communicate with your children?	2.62	1.14	3.00
12. What language do you use when you communicate with your Iranian friends?	1.70	.752	2.00
13. In what language are your reading skills better?	1.84	.929	2.00
14. In what language are your writing skills better?	1.90	1.15	2.00
15. What ethnic group do you identify with?	2.16	.94	2.00
16. How do you see your future and progress in the U.S.?	3.27	.596	3.00
17. We came to the US to improve the future of our children (if you have children)	2.42	1.464	3.00
18. We came to the US to improve our career opportunities and future	*1.71*	*1.038*	*1.00*
19. Marriage of children	2.72	.697	3.00
20. To what extent do you celebrate holidays such as Christmas, Easter, and Thanksgiving?	2.09	.578	2.00
21. Dating of female teenagers	2.10	.640	2.00
22. Association of female teenagers and young adults with the opposite sex	2.14	.662	2.00
23. Out of ten of your friends how many are Iranian?	2.08	.843	2.00
24. The major consideration in choosing a spouse for your children.	**3.67**	**.780**	**4.00**
25. Dating of male teenagers	2.11	.602	2.00

Note: **Bold** numbers reflect high acculturation

Research questions:

1. What are the socioeconomic and sociodemographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?
2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes considered?
3. Is the acculturation of Iranian immigrants to the U. S. associated with their prevalence of being overweight and diabetes?
4. Is there an association between length of exposure to the host culture and the Iranian immigrants level of acculturation?
5. How Iranian immigrants' length of exposure to host culture and level of acculturation differ by dietary acculturation patterns?

Preamble

Several computations were performed prior to answering research questions. Computations performed for both BFQ and the Iranian Acculturation Scale are presented below.

BFQ. The food items from the BFQ were categorized into fourteen pre-specified food groups based on Asghari's (2012) food groupings. The Kaiser-Meyer-Olkin (KMO) test which is a measure of the proportion of variance explained among variables (14 food groups) was conducted (Cerny & Kaiser, 1977). The KMO value for these data was 0.761 which measures sampling adequacy. The obtained KMO reflects an adequate sample to perform factor analysis. Given this information, a principal component factor analysis (MacCallum & Austin, 2000) with an orthogonal rotation was performed on the 14 food groups to identify the proposed dietary patterns (Western, Iranian, and Bi-cultural). However, after performing the first factor analysis,

inspection of the findings indicated that a three-factor analysis was statistically insignificant. The decision was made to perform another factor analysis forcing the 14 food groups into two dietary patterns: Iranian and Western.

The Iranian dietary pattern, included nuts, vegetables, eggs, fruit, poultry whole grains, and dairy (Esmaillzadeh & Azadbakht, 2008) and explained 22% of the variance. The dietary pattern with high intake of red and processed meats, refined grains, sweets, French fries, and high-fat dairy products was labeled the Western pattern and explained an additional 15% of the variance in the data. Factor loadings for both Western foods and Iranian foods are displayed in Table 5.

Table 5: Factor Loading of Food Frequency Groups for Western and Iranian Dietary Patterns

Food Groups	**Western**	**Iranian**
Fast Food	0.768	
Salty Snacks	0.703	
Soft Drinks	0.668	
Sweet	0.659	
Refined Grains	0.566	
Red Meat	0.479	
Potatoes	0.442	0.438
Nuts	0.352	0.240
Vegetable		0.717
Egg		0.626
Fruit		0.620
Poultry		0.523
Whole Grains		0.439
Dairy	0.327	0.344

Acculturation Scores. As none of the participants had an acculturation score of 4 or 5, which was the score identified as Acculturated, a median split was employed to create two categories: transitional and Iranian acculturation scores. Median scores equal to or greater than of 2.33 were categorized as transitional (range = 2.33- 3.47) while median scores less than 2.33

were categorized as Iranian (range =1.50-2.32). These categories were used in the analyses of research questions.

Analysis of Research Questions

The following section provides a detailed description of the analysis of each of the research question. Tables (6 – 12) are provided to clarify the steps taken to answer each research questions. The concept model that was specifically designed for this study was followed during the process of analyzing the data (Figure 2).

Research question 1. What are the factors influencing Iranian immigrant's level of acculturation and their dietary choices?

Factors reported in the literature (Satia, 2003) that influence the level of acculturation and dietary choices among immigrants include: age at arrival, current age of participants, length of exposure to U.S. culture, English fluency, gender and level of education. The factors influencing the level of acculturation were analyzed to specifically identify those factors which were most influential on participants level of acculturation and dietary choices. Separate analysis were performed to answer these question related to acculturation and dietary choices.

Acculturation. Pearson product moment correlations (Mukaka, 2012) were conducted with the interval level variables of acculturation, age at arrival ($r = -0.445$, $p < 0.0005$). current age of participants' ($r = 0.226$, $p < 0.002$) and their length of stay in the U.S. ($r = 0.526$, $p < 0.0005$). The findings suggest that as the age at arrival and length of stay increase, the level of the participants acculturation increases. Acculturation was inversely associated with age at arrival. The older the participants were at the time of arrival, the less acculturated they become (Table 6).

Table 6: Correlation Matrix of current age, age at arrival, length of exposure and acculturation

	What is your current age	How long have you lived in the US	Acculturation score
At what age did you arrive in the U.S.?	.303	-.355	-.445
What is your current age		.783	.226
How long have you lived in the US			.526

ANOVA (Gravetter & Wallnau, 2007) was conducted to determine whether the interval level acculturation score differed by English fluency. There was a significant difference in the level of acculturation based on participants self-reported English fluency (F (3, 201) = 37.756, p < 0.0005). A Tukey HSD (Haynes, 2013) was conducted to identify which groups differed. Participants who rated their English as very fluent had a greater acculturation score (2.73 ± .43) than did participants who rated their English as fluent (2.31± .29), somewhat fluent (2.04±.35), and not at all fluent (2.05 ± .29).

T-tests (Gravetter & Wallnau, 2007) were conducted to determine differences in the acculturation score between gender, marital status, income and education. There were no significant differences in the mean acculturation score based on gender (t (186) = 0.011, p=.99) or marital status (t = .620 (172), p=.54). There were significant differences in the mean acculturation score based on income (t (135) = 2.59, p=.011) and education (t (201) = 2.09, p=.041). Participants with and income level of more than $75,000 had an acculturation score (2.41 ± .48) greater than those with less than $75,000 income (2.22 ± .34). Participants with an educational level above a graduate degree had a greater acculturation score (2.46 ± .39) than those with a college degree or less (2.33 ± .45).

Given food groups were ordinal level variables, Spearman's rho correlations (Rees, 2007)

were computed to examine the relationship of acculturation score (2.36, ± .438), age of arrival, current age and length of exposure to U.S. culture with the participants dietary choices. Inspection of the findings indicated that as participants grew older and resided longer in the U.S., the frequency of the consumption of red meats, fast foods, soft drinks, potatoes, salty snacks, refined grains, and sweets decreased significantly. The participant's fruit consumption ($r = -0.096$, $p < 0.005$) and fast food ($r = -0.177$, $p < 0.01$) were negatively correlated with their age; older participants were less likely to consume fruit and fast food. The participants vegetable consumption ($r = .0238$, $P < 0.01$) was positively correlated with their age of arrival in the U.S. However, the magnitude of these correlations was too small for the findings to be of interest.

Dietary Choices. Spearman Rho correlations (Rees, 2007) were computed to examine the relationship of Iranian immigrant's (ordinal level) 14 food groups and with the interval sociodemographic variables of age of arrival, current age and length of exposure to U.S. culture. Results are presented in Table 7. There was a positive correlation between acculturation and age of arrival ($r=0.44$) and with length of exposure to U.S. culture ($r=0.46$). However, no significant relationships remained after adjusting for multiple comparisons.

Table 7: Factors Influencing Level of Acculturation and Dietary Choices

Food groups	Age Arrived	Age	Exposure to U.S. Culture
Red Meat	0.071	-0.237**	-0.268**
Fast Food	-0.177*	-0.367**	-0.218**
Eggs	0.132	0.047	-0.027
Fruits	0.167*	-0.003	-0.096
Vegetables	-0.029	0.191**	0.238**
Soft Drinks	0.079	-0.203**	-0.213**
Dairy	0.109	-0.03	-0.09
Potatoes	-0.048	-0.281**	-0.205**
Whole Grains	0.099	-0.013	-0.055
Salty Snacks	-0.126	-0.355**	-0.251**
Nuts	-0.025	-0.095	-0.059
Refined Grains	0.071	-0.244**	-0.280**
Poultry	0.028	-0.11	-0.11

Sweets	-0.112	-0.229**	-0.270**
Acculturation	**0.438****	0.197**	**0.461****

Correlation is significant at the 0.05 level (2-tailed) *
Correlation is significant at the 0.01 level (2-tailed).

T-tests were computed using the maximum frequency of consumption in each of the 14 food groups as the dependent variable and marital status, income and level of education as the independent variables. Inspection of results indicated that unmarried participants ate more potatoes (5.00± 1.33) than married participants (4.27±1.59) (t(172) =2.26, p=.014). Participants earning $75,000 or more consumed more vegetables (M=7.61± .99) than participants earning less than $75,000(7.10±1.58) (t (134) =2.2, p=.025). Participants having a graduate degree consumed fewer whole grains (5.57± 2.36) than participants with less than a graduate degree (6.27±2.19) (t (200) =2.05, p=.042). However, after adjusting for multiple comparisons, the only significant finding was that females consumed more vegetables (7.64±1.30) than males (6.93±1.45) (t (185) =3.52, p=.001).

Fourteen One-Way ANOVAs were conducted to examine the association of fluency in English with the 14 food groups. Participants who indicated they were not fluent at all ate more fruits (8.36±.924) than those who indicated they were very fluent (7.22±1.42) (F (3,200)=3.03, p=.030). Given the number of computations, this finding may be due to chance. A probability of 0.0035 (A Bonferroni adjustment) would be required to achieve statistical significance.

In summary, age at arrival, current age, length of exposure to U.S. culture were factors that influenced the level of acculturation of this study's participants. The younger the participants were at the time of their arrival to the U.S. the greater was their English fluency and their level of acculturation. Immigrants who were older at the time of their arrival to the U.S. were less acculturated. No differences was found between participants level of acculturation and their gender. Participants who rated their English as very fluent were significantly more acculturated

than participants who rated their English as somewhat fluent or not at all fluent.

Research question 2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes are considered?

This question was answered by computing two sets of three t-tests (Gravetter & Wallnau, 2007). The first set of three t-tests was conducted using the Western dietary pattern was as the dependent variable measured at the interval level with the independent variables of overweight, having pre-diabetes or having diabetes. The second sets of three t-tests was conducted using the Iranian dietary acculturation pattern as the dependent variable measured at the interval level with the independent variable of overweight, having pre-diabetes or having diabetes. No significant differences were found between either of the two dietary patterns and any of the independent variables (Tables 8 and 9).

Table 8: Mean scores of Iranian Dietary Patterns by chronic conditions (pre-diabetes, diabetes and overweight)

	Participant does not have a chronic condition			Participant has a chronic condition			
	n	Mean	SD	n	Mean	SD	t (df) p
Diabetes	8	6.23	1.06	196	6.11	.923	.353(203) p =.724
Pre-diabetic	19	6.07	0.97	186	2.37	0.444	0.250(203) p =.803
Obesity	88	6.14	0.89	110	6.11	0.947	.260 (197) p =.795

Table 9: Mean scores of Western Dietary Patterns and pre-diabetes, diabetes and overweight

	Have condition			Does not have condition			
	n	Mean	SD	n	Mean	SD	t (df) p
Diabetes	8	4.01	1.58	197	4.61	1.05	1.54(203) p=.124
Pre-diabetic	19	4.14	0.984	186	4.64	1.08	1.90(203) p=.058
Overweight	88	4.61	1.159	111	4.57	1.02	.300(203) P=.764

Research question 3. Is the acculturation of Iranian immigrants in the U.S. associated with their prevalence of overweight, pre-diabetes and diabetes?

The association of the acculturation of Iranian immigrants in the U.S. with the participants' health conditions (being overweight, pre-diabetic or diabetic) was examined by conducting three t-tests (Gravetter & Wallnau, 2007) with the acculturation score as the dependent variable. Three independent t-tests were computed to determine whether participants acculturation scores (2.36, $\pm$ .438) differed by the presence or absence of a health condition. Score, between participants with diabetes, participants with a diagnosis of pre-diabetes, and participants with a BMI over 25 (being overweight). No significant differences was found between the eight participants with diabetes and the rest of the participants (t (203) =.83 p=.39). No significant difference was found between the 19 participants with pre-diabetes and the rest of the participants, as both groups had a mean of 2.37 (t (203) = .009, p =.99). Additionally, no significant difference was found in the Acculturation Score between participants who were overweight and those who were not overweight (t (197) =.188, p=.87), (Table 10). In summery acculturation scores did not differ by health condition.

Table 10 :Acculturation Score and Chronic Conditions

	Has condition			Does not have condition			
	n	Mean	SD	n	Mean	SD	t (DF) p
Diabetes	8	2.58	0.413	197	2.32	0.389	1.84(203) p=.063
Pre-diabetic	19	2.37	0.388	186	2.37	0.444	0.009(203) p=.993
Overweight	88	2.35	0.376	111	2.30	0.376	.756 (197) p=.451

Question Four: Is there an association between length of exposure to the U.S. culture and the Iranian immigrants level of acculturation?

This question was answered using two analytic approaches. The first approach was by computing a Pearson's Product Moment correlation coefficient (Mukaka, 2012) between the interval variables of length of exposure to the U.S. culture and level of acculturation. A statistically significant correlation ($r(191) = .526$, $p < .0005$) was found between the length of time participants had been exposed to U.S. culture and their level of acculturation. The longer participants lived in the U.S., the greater their level of acculturation.

The second analytic approach was to stratify the interval variable, length of exposure, into two groups based on living in the US less than 10 years as compared to living in the U.S. 10 years and longer. A t-test was performed to determine if the mean level of acculturation of the participants residing in the U.S. for more than 10 years was different than those living in the US less than 10 years or more. Participants living in the U. S for more than 10 years had a greater acculturation score ($M = 2.56$, $SD = .483$) than those living in the U.S. less than 10 years ($M = 2.28$, $SD = .326$; $t(191) = 5.89$, $p < .0005$)

Research question 5. How does Iranian immigrants' length of exposure to host culture and level of acculturation differ by dietary acculturation patterns?

A Two-Way ANOVA (Gravetter & Wallnau, 2007) for each of the dietary patterns (Iranian and Western) was computed using the mean dietary pattern score as the dependent variable. The interval variable, length of exposure, was stratified into two groups based on living in the US less than 10 years and living in the U.S. 10 years and longer. Because the acculturation score did not reach the score of 4 or 5, the value which is required to be considered acculturated the independent variable, acculturation score was dichotomized based on a median split.

Each dietary pattern was used as a dependent variable. For the *Western dietary pattern*, a significant interaction effect (F 1,184 = 4.022, p = .046) was found between the level of acculturation and length of exposure to the U.S. culture (Table 11). **Need to describe this interaction**

Table 11: Two-way ANOVA of the Mean Western Dietary Pattern Score by Length of Exposure and Level of Acculturation

Western dietary pattern score			
Length of Exposure	Level of Acculturation	Mean	Std. Error
1-Up to 10 years	1-Iranian	4.941	0.123
	2-Transitional	5.157	0.153
2-More than 10 years	1-Iranian	4.346	0.183
	2-Transitional	3.970	0.122

The association between length of exposure (less than 10 years and more than 10 years), level of acculturation and *Iranian Dietary Pattern Score* were also explored. There were no significant differences based on length of exposure to U.S. culture (F 1,188 = .389 p =.280) or the Acculturation group (F 1,188 = 4.100, p =.292). There was no interaction effect (F 1,188 = 1.33, p=.250) (Table 12).

Table 12: Two-way ANOVA of the Mean Iranian Dietary Pattern Score by Length of Exposure and Level of Acculturation

Iranian dietary pattern score			
Length of Exposure	Level of Acculturation	Mean	Std. Error
1-Up to 10 years	1-Iranian	6.200	0.113
	2-Transitional	6.039	0.141
2-More than 10 years	1-Iranian	6.454	0.168
	2-Transitional	5.980	0.113

Results indicated that consumption of the Western dietary pattern was greater among participants who were exposed less than 10 years to the U.S. culture compared with the participants who were exposed to the U.S. culture more than 10 years. In summary participants' who had lived in the U.S. and had been exposed to the U.S. culture less than 10 years consumed more Western foods compared with participants who had lived in the U.S. for more than 10 years (Table 12). Participants with greater acculturation scores and *less than 10 years* of exposure to U.S. culture scored higher on the Western dietary pattern score than those with lower acculturation scores and less than 10 years of exposure to U.S. culture. Participants with *higher acculturation scores* who had *more than 10 years* of exposure to the U.S. culture *scored lower on the Western dietary* pattern compare with participants with lower acculturation score and had *more than 10 years* of exposure to the U.S. culture (Table 12).

Summary of Findings

This chapter provide an analysis of findings based on the gathered data of the study. Multiple statistical tests were computed in this exploratory cross-sectional descriptive study. The level of acculturation was associated with being female, length of exposure to the host culture (less than 10 years VS more than 10 years), current age, and age at arrival in the U.S. The younger participants were when they arrived in the U.S., the longer they were exposed to the U.S. culture, the more acculturated they became. The more fluent the participants were in

English, the greater their acculturation level. A significant inverse association was found between Iranian immigrants' acculturation score (*M*=2.36) and the consumption of red meat, fast foods, soft drinks, potatoes, salty snacks, refined grains, and sweets decreased significantly as they grew older and resided longer in the U.S. No association was found between acculturation, dietary pattern, and any chronic condition (overweight, pre-diabetes, and diabetes).

Chapter 5

Discussion, Conclusions, and Recommendation

The purpose of this study was to examine the influence of exposure to the U.S. host culture on the Iranian immigrant's acculturation and dietary patterns. A secondary purpose was to examine how exposure to the host culture influences the Iranian immigrant's development of overweight and consequently the risk of developing pre-diabetes or diabetes. The conceptual framework for this investigation was based on the theoretical processes of dietary acculturation set forth by Satia (2010). The study answered the following five research questions:

1. What are the socioeconomic and socio demographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?
2. What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre- diabetes or having diabetes are considered?
3. Is the acculturation of the Iranian immigrant to the U. S. associated with their prevalence of overweight and diabetes?
4. Is there an association between length of exposure to the host culture and the Iranian immigrants level of acculturation?
5. Does Iranian immigrants' length of exposure to host culture and level of acculturation predict dietary acculturation patterns?

Summary of the Main Findings of the Study

The main findings of this investigation indicated that the participants level of acculturation was associated with: (a) their age of arrival to the U. S., (b) length of exposure to the host culture, and (c) English fluency of the participants. The younger the participants were when arriving to the U.S. and the longer participants were exposed to the U.S. culture, the higher the

level of acculturation. Participants who were more fluent in English, had a higher level of acculturation.

A significant inverse association was found between Iranian immigrants' acculturation score (M=2.36) and their consumption of Westernized foods including: red meats, fast foods, soft drinks, potatoes, salty snacks, refined grains, and sweets. Participants ate significantly fewer Westernized foods as they grew older and resided longer in the U.S. No association was found between the participants level of acculturation, dietary pattern, or any chronic condition (overweight, pre-diabetes, and diabetes).

The participants length of exposure to the host culture, (grouped as less or more than 10 years), their level of acculturation and dietary patterns were also explored. The transitional acculturation group who resided in the U. S. less than 10 years ($M \geq 2.36$) had a Western dietary pattern more frequently than participants residing in the U. S. over 10 years.

Questions

Question One: What are the socioeconomic and socio-demographic factors that influence Iranian immigrant's level of acculturation and their dietary choices?

Based on this study's conceptual framework sociodemographic factors upon exposure to the U.S. culture will effect participants level of acculturation. What follows are a description of socioeconomic and socio-demographic factors that influenced participant's level of acculturation in this study.

Age at arrival and acculturation

The finding of this study indicated that acculturation was inversely associated with age at arrival. The younger participants were at the time of their arrival to the U.S., the greater their level of acculturation. The older participants were at the time of their arrival to the U.S., the less

acculturated they became. Similar to this study's finding, Delavari et al. (2015) conducted a study on Iranian immigrants in Australia. The purpose the study Delavari et al. (2015) conducted was to explore the relationship between participants level of acculturation and socio-demographics factors. The socio-demographic variables the investigators examined included participants age when they arrived at the host country. According to Delavari et al., immigrants who were younger when they arrived at the host country were more acculturated than participants who were older when they immigrated to Australia.

Findings from this study indicated that the age of arrival to the U. S. was associated with Iranian immigrant's acculturation level. Acculturation level was also explored by Serafica (2014), who conducted a literature review of research on how acculturation and dietary acculturation affected Asian immigrant's dietary intake. Serafica (2014) found that Asians who migrated to the U.S.at an older age were less acculturated then participants who migrated at a younger age to the U.S.

English Fluency and Acculturation

In this study a significant difference was found between participants level of acculturation and the participant's self-reported English fluency. Participants who rated their English as 'very fluent' had a greater acculturation score than those who rated their English as 'fluent', 'somewhat fluent' and 'not fluent at all'. English fluency was significantly higher amongst participants who were younger when they immigrated to the U.S. compared to participants who were older when they immigrated. Additionally, immigrants who were younger when arriving in the U. S. reported higher levels of acculturation than immigrants who were older when they immigrated.

Participants in this study who reported greater fluency in English also reported having a higher level of acculturation. Similarly, English fluency was explored within the Hispanic/Latino population of immigrants to the U. S. by Lora et al. (2018). Lora et al., (2018) used English fluency to measure participants level of acculturation. The investigators found that the level of acculturation was lower among participants who were not fluent in English. English fluency (level of acculturation) was lower among older participants compared with younger participants. English fluency (level of acculturation) was lower among female participants compare with male participants

Income and Acculturation

Participants in this study with lower incomes and educational levels were significantly less acculturated. Immigrants with lower incomes (less than $75,000/year) were in the 'Iranian' acculturation group and were less acculturated than participants whose incomes were $75,000/year or higher. Participants whose income was $75,000/year or higher were identified as being in the 'transitional' acculturation group, and more acculturated. This finding is consistence with Lopez & Yamashita (2017) research findings. Lopez & Yamashita (2017) studied the relationship between income and acculturation among Latino adults in the U.S. To explore the association data from the 2009 to 2010 National Health and Nutrition Examination Survey were used. Their research finding indicated that the more acculturated Latino adults were the higher were their household income.

Education and Acculturation

Participants with less education in this study, who had some college education or a bachelor's degree, had a lower acculturation score than participants with a graduate education. Education was also found to be associated with level of acculturation in a study conducted by

Rosenberg et al., (2017). Rosenberg et al., conducted a secondary analysis to examine the role of acculturation as a modifier of health status among Mexican-American women of reproductive age. Participants with less education (less than high school educational level), had a lower acculturation score than participants with greater than high school education. Rosenberg et al. suggested that as the participants education level often correlated with higher income and occupational status, it may also indicate increased access to the resources and relationships needed to ease into the acculturation process. Income was further discussed in relation to acculturation by

Age and dietary acculturation

The findings of this study indicated that as participants grew older and resided longer in the U.S., the frequency of the consumption of red meats, fast foods, soft drinks, potatoes, salty snacks, refined grains, and sweets decreased significantly. Participant's fruit and fast food consumption were negatively correlated with their age. Older participants were less likely to consume fruits or fast foods. Findings from a study conducted by Serafica (2014) were in line with this study's findings which indicated that Asian immigrants in the U.S. who migrated to the United States at an older age were less acculturated and more likely to maintain their traditional dietary patterns. Consequently Affable et al., (2016) study's findings confirmed this study's findings. Affable et al., (2016) examined the association between length of stay in the United States and risk of becoming overweight among Filipino adult immigrants living in the New York metropolitan area. The result of their study indicated that the risk of overweight among Filipino immigrants increased significantly the longer participants resided in the U.S. and the older they get. The risk of becoming overweight was significantly higher among participants who have lived in the US 10 years or longer compare with participants who have lived 5 years or less in the

U.S. due to adaptation of Filipino immigrants to Western dietary pattern.

English fluency and dietary acculturation

The findings of this study indicated that participants who were not fluent ate more fruits than participants who were very fluent. This finding may be due to chance. The other 13 food groups were statistically insignificant based on the participant's English fluency.

Result of this study is not in line with the study done by Osei-Kwasi et al., (2017) conducted a qualitative study (face-to-face interviews) with adult Ghanaian immigrants living in the U.K. The purpose of their study was to investigate the impact of migration on dietary acculturation amongst Ghanaians living in Greater Manchester. Osei-Kwasi et al., (2017) study suggested that, the U.K. environment contributed to healthier dietary practices among Ghanaian immigrants. Osei-Kwasi et al., (2017) findings indicated that the environment prior to migration interacts with the host country's environment and shapes immigrant's health behaviors. English fluency had a minimal effect on participants acculturation because English, is the official language used in Ghana. Migrants who came from an environment with low availability/consumption of fruits and vegetables into an environment where fruits and vegetables are more available/consumed immigrants will be more likely to increase their consumption of fruit and vegetables after migration.

Result of current study is not in line with the study done by Iverson et al., (2013). Iverson et al., (2013) studied changes in BMI among immigrants from Iran, Pakistan, Sri Lanka, Turkey, and Vietnam compare with native Norwegians BMI in Oslo. Iverson et al., (2013) also assessed fluency in Norwegian language and several socio-economic factors. The result from their study indicated that language fluency effects acculturation because it is directly related to social interaction and integration.

Gender and Marital status influence on dietary choices

Marital status, income and level of education of participants in this study had no effect on participant's dietary choices. The only significant finding was that females consumed more vegetables than males. Finding of current study is consistent with the findings of Abedayo (2017) study. Abedayo (2017) conducted a study was to evaluate the amount and types of healthy foods consumed among Russian, Somali and Kurdish immigrants in Finland. The investigators found that Russian immigrants had a higher consumption of healthy foods than their peers of Kurdish and Somali origin. Women were found to consumption greater amounts of healthy foods, especially fruits and vegetables than men.

Question Two: What is the difference in the dietary acculturation patterns of Iranian immigrants in the U.S. when overweight status, having pre-diabetes or having diabetes are considered?

No difference was found between Iranian and Western dietary patterns for participants with pre-diabetes, diabetes or overweight. and those without pre-diabetes, diabetes and overweight. Conversely, Vargas and Jurado (2016) studied the acculturation, dietary habits, BMI and waist circumference among first generation Filipino American immigrants. Greater acculturation levels were associated with increased BMI and waist circumference among participants with higher fat and carbohydrate intake.

In this investigation we examined the association between dietary acculturation and health of Iranian immigrants to the U. S. No associations were found between dietary acculturation and participants health, (e.g. pre-diabetes, diabetes, overweight) in this study. A similar study was conducted by Okafor et al. (2014) who examined the association between dietary acculturation and health within the African immigrant adult population. Investigators

assessed dietary acculturation amongst participants after their entry to into the U. S. Unlike the findings in this investigation, participants in the Okafor et al study with greater dietary acculturation, had poorer health than immigrants with limited dietary acculturation.

Question Three: Is the acculturation of Iranian immigrants in the U.S. associated with their prevalence of overweight, pre-diabetes and diabetes?

The findings of this study indicated that no significant difference was found in the mean acculturation score between participants (n = 8) with diabetes in this study and the remainder of the participants. No significant difference was found in the mean acculturation score between the 19 participants with pre-diabetes and the rest of the participants. Additionally, no significant difference was found in the mean acculturation score between participants who were overweight and those who were not overweight. Another word acculturation scores did not differ by participant's health condition.

Isasi et al., (2015) also investigated the association between acculturation and the chronic health condition of obesity in the study of Hispanic/Latino adults living in the U.S. Similar to the findings in this study, Isasi et al. found no significant relationship between acculturation and obesity among adult Hispanic immigrants living in the United States. However, the Isasi research team found that prolonged exposure to the environment in the host communities, increased the risk for obesity among Hispanic immigrants.

Delavari et al., (2015) examined the pattern of acculturation in Iranian immigrants to Australia and issues related to obesity. Delavari et al., (2015) found that acculturation patterns among Iranian immigrants living in Australia were not associated with the BMI and waist circumference of the immigrants. According to the investigators, participants acculturation pattern did not have a direct effect on the chronic health condition of obesity. Unlike the findings

in this study, the investigators suggested that obesity was a complex phenomenon influenced by acculturation as well as socioeconomic and demographic characteristics of immigrants (Delavari et al.).

Acculturation and diabetes risk amongst Mexican immigrants was investigated by Anderson et al. (2016). The researchers found that the length of stay in the U.S. had a strong association with acculturation and the participants prevalence of diabetes. Participants who had lived in the U.S. more than 15 years had a higher diabetes prevalence than participants who had lived in the U.S. less than 5 years. The findings from Anderson et al. varied from the current study, were no association was found between Iranian immigrant's acculturation and health status (e.g. pre-diabetes, diabetes, or obesity).

Question Four: Is there an association between length of exposure to the U.S. culture and the Iranian immigrants level of acculturation?

A statistically significant correlation was found in this study between participants' length of stay in the U.S. and their level of acculturation. Participants living in the U. S for more than 10 years had a greater acculturation score than participants residing in the U.S. less than 10 years. The level of acculturation was directly related to the length of stay but inversely related with age of arrival to the U.S. The older participants were at their time of arrival to the U. S., the less acculturated they became. Results from this study are consistent with the findings of Creighton et al., (2012). Creighton et al. investigated the association between Mexican immigrant acculturation, diet, and obesity. The researchers found that Mexican immigrants who were younger when they arrived in the U.S. and had lived in the U.S. longer, were more acculturated. Additionally, the more acculturated the participant were, the greater their rates of obesity (Creighton et al.).

Question Five: Does Iranian immigrants' length of exposure to host culture and level of acculturation predict dietary acculturation patterns?

Length of stay in the U.S.

Participants who resided in the U. S. for less than 10 years followed a more Westernized dietary pattern than participants who resided in the U.S. for more than 10 years. Additionally, participants with greater acculturation scores were found to have resided in the U.S. culture for 10 years or more. Participants who were more acculturated followed an Iranian dietary pattern after living in the U.S. for 10 years or more. Participants with lower acculturation score, who had lived in the U.S. for less than 10 years, followed a more Westernized dietary pattern.

Yoshida et al., (2017) examined the influence of acculturation on dietary patterns in Mexican immigrants residing in the U.S. The investigators also explored whether acculturation influenced dietary patterns based on participants age group. Researchers found that the longer participants lived in the U.S., the more acculturated they became. Participants dietary patterns of older Mexican immigrants was less westernized, and more fruit and vegetable based. The higher the acculturation level of the participants, the more Westernized the Mexican immigrants dietary pattern. Participants with lower levels of acculturation scores, regardless of age group, the less Westernized their dietary pattern. Dietary patterns varied by age and acculturation in Mexican Americans immigrants, as the more acculturated the higher the prevalence of a Mexican dietary pattern. Yoshida et al. (2017) suggests that this finding could be related to older adults being more health conscious.

Regev-Tobias et al. (2012) investigated acculturation of Ethiopian immigrant women in Israel in relation to nutritional status and eating behaviors. Upon arrival to Israel, the African immigrant women were healthier. Unlike the findings of our current study, Regev-Tobias found

that 5 to 10 years after migration, as the African immigrants became more acculturated, and ate a more Westernized diet, they had greater rates of overweight and obesity.

Implications for this Study

In this study the length of stay of the participants was statistically correlated with dietary acculturation. The participants who lived less than 10 years in the US had a greater consumption of a Westernized dietary pattern. The findings from this study suggest that Iranians who immigrate to the U.S. are at greater risk during their first 10 years to develop a Westernized dietary pattern. A Westernized dietary pattern includes many foods that are calorie dense with limited nutritional value. Therefore, health care providers who are caring for clients who have newly immigrated to the U.S. should include a dietary assessment and counseling as needed, to encourage following a healthy dietary pattern.

In this study a majority of participants (56%) reported being underweight or normal weight. Given that these participants did not report weight concerns, healthcare providers efforts should focus on working with individuals to promote healthy eating and effective weight management. However, as nearly half (44%) of the Iranian immigrants reported being categorically overweight or obese, health care professionals need to consider strategies for their health promotion. Incorporating early assessments of dietary patterns into the care of clients, regardless of their weight category, is needed. Prevention programs should begin at the earliest time possible before Iranian immigrants incorporate Western food with their heritage foods.

Additionally, arrangements could be made with immigrants who are established within the host culture to develop their own health promotion and disease prevention programs. Components of this could include inviting healthcare professionals to come into the community

and educate them about the food culture in the U.S. Discussions on strategies for ensuring healthy dietary patterns could also be held with input from the immigrants to the host culture.

Implications for Nursing Research

In this study nearly half (45%) of the participants resided in the US for more than 10 years (16 years ± 15.2). Though the immigrants resided in the host culture for over 10 years, no participants scores reached the "acculturated" level. It was not possible with this data to identify whether participants who were not acculturated were at risk for health concerns (e.g. diabetes, pre-diabetes, obesity). Research studies (Bennett, 2013; Bennett, 2014; Serafica, 2014) reported that immigrants who resided longer in the host country, and were not acculturated, were at greater risk for developing a chronic health condition (e.g. obesity, pre-diabetes, diabetes). Findings in this study did not indicate that immigrants who resided longer in the host country, and were not acculturated, were at greater their risk for developing a chronic health condition (e.g. obesity, pre-diabetes, diabetes). It remains unclear whether the differences in acculturation between studies was due to differences in the participants, design, or the measures. A qualitative research investigation might provide a more comprehensive view of factors that influence the acculturation of the Iranian immigrants. Additional data allow for the identification of the impact of exposure to the host culture on the health of immigrants. Factors that nurses should incorporate into the qualitative investigation would be changes in values and/or belief systems, of the participants.

Implications for Education

Nearly half (45%) of the participants were 45% were overweight, which was surprisingly low, as the literature indicates that the prevalence is much higher. The latest report from International Diabetes Federation (Diabetes Atlas 8th edition, 2017) indicates that, among

Middle Eastern and North African countries, Iran is ranked number three among the five top countries for the numbers of individual with diabetes right after Egypt and Pakistan. Diabetes in Iran is most prevalent among younger age group (20–59 years old). The Iranian national prevalence of diabetes in 2011 was 11.4% among Iranian adults aged 25–70 which is higher than what IDF estimated in 2013 (Esteghamati et al, 2014).

Overweight and obesity increases individuals risk for developing diabetes (WHO, 2015). Unfortunately, limited symptoms of Type II diabetes prevent early diagnosis, treatment and increases the risk for development of complications (International Diabetes Federation (IDF), 2017). Culturally sensitive nursing education could include assessments for early detection of risk factors for developing obesity related to secondary health conditions. Education for nurses on culturally sensitive health promotion specific to preventing obesity and Type II diabetes should include measuring BMI, how to measure waist to hip ratio and waist circumference for all Iranian immigrants and Asian immigrants in the US. Early detection of overweight and Type II diabetes would help with prevention or early treatment for Iranian immigrants and Asian immigrants.

Implication for Practice

Nearly half of the participants in this study (44%) were overweight or obese, with an additional 13% of the participants reporting being pre-diabetic or diagnosed with diabetics.

Nurses in addition to measuring BMI, should consider measuring waist to hip ratio and waist circumference for all Iranian immigrants in US. This would help to identify the risk of developing diabetics for Iranian immigrants and hence reduce financial burden of the Iranian patient and heath case system.

Implications for Policy

No significant differences were found between participants who reported an Iranian or Western dietary pattern and their reported health conditions (e.g. obesity, pre-diabetes, diabetes). However, research has indicated that there is a strong relationship between the Western dietary pattern and the development of health conditions (Delavari, 2013), and nearly half of the participants in this study (44%) were overweight or obese, with an additional 13% of the participants reporting being pre-diabetic or diagnosed with diabetics.

The American Heart Association (2011) has recommended that culturally specific food frequency questionnaires, comparable across Asian subgroups, are needed to effectively assess dietary factors related to diabetes and cardiovascular diseases. Nurses are optimally positioned to develop culturally specific food frequency questionnaires in alignment with the American Heart Association recommendations. Once culturally specific food frequency questionnaires are developed, nurses within the primary care setting could integrate the assessments into the routine screening policies for health and wellness. Health and wellness policies within.

Limitations

In this study the Block Brief Food Questionnaire was not sensitive for identifying the food intake and level of dietary acculturation for Iranian immigrants in US. However other nursing investigators including Serafica (2011) and Venkatesh (2014) have stated that culturally sensitive food questionnaires are required to accurately measure the food intake and level of dietary acculturation for immigrants.

A limitation of this study was the participants self-reported height and weight, which was used to calculate their BMI. Self-report is subject, which may not be accurate. The BMI was the only measure used to identify participants who were overweight or obese. A more effective way

to access the risk of pre-diabetics and diabetes, would be to have multiple measures in addition to the BMI, such as a measurement of waist circumference and waist to hip ratio. Obtaining blood glucose levels is a more invasive measure, but would increase the accuracy of identifying participants with elevated blood sugars indicative of pre-diabetics or diabetes.

Another limitation of this study was the exclusion of participants who could not read, speak and write English, limiting the number of eligible participants. However, the sample size was based on a power analysis (Cohen, 1988) with an anticipated effect size of 0.15 for correlation, an alpha level of 0.05, and the desired statistical power level of 0.8. According to Cohen (1998), the required sample size was at least 79 participants. Therefore, even though the number of participants for this study was 207, it was a large enough sample to have the identified statistical power.

Another limitation of this study was the dietary measurement tools, which were not specific for Iranian immigrant populations. The lack of culturally sensitive tools made it difficult to accurately measure participants' dietary consumption, dietary patterns, and level of acculturation.

No data was collected on the participants life style including level of physical activities, fat and carbohydrate consumption, limiting data on the participants overall health. The cross-sectional design of this study did not allow for ongoing assessments of participants health longitudinally. A longitudinal design would allow for a possible follow up on the health status of the participants over the next 10-20 years.

Recommendation for Future research

Assessments in future research should include the risk of pre-diabetics and diabetes among Iranian immigrants. Multiple measures should be used to identify risk factors for pre-

diabetics and diabetes, including calculating BMI, measurement of waist circumference and waist to hip ratio.

Future research studies should include Iranian immigrants who cannot read, speak and write English and less than 18 years of age. Developing a culturally sensitive food questionnaire with high reliability and validity could be foundational in future research to accurately measure the Iranian immigrant's dietary consumption and dietary patterns.

A mixed methods approach should be considered in the design of future research, to determine physical activities, life style and dietary patterns of the Iranian immigrants. The qualitative component of the study could provide information regarding factors affecting obesity. The mixed method approach would allow for a better understanding of the process of acculturation and dietary acculturation for Iranian immigrants.

This study was based on a cross-sectional method of obtaining data. Conducting longitudinal studies for Iranian immigrants in the U.S. would allow data to be gathered on factors influencing dietary behaviors of Iranian immigrants of all ages across their life span. Data from longitudinal studies will provide greater insight into the health of the Iranian population over time and could identify strategies for preventing the development of obesity and Type II diabetes.

Chapter summary

The purpose of this study was to examine the acculturation and dietary patterns among Iranian immigrants in the U.S. A secondary purpose was to examine how exposure to the US culture influences the Iranian immigrant's development of overweight and consequently the risk of developing pre-diabetes or diabetes. The underpinning of conceptual framework of this research study was based on the theoretical processes of dietary acculturation that has been set

forth by Satia (2010. A conceptual framework of for this study was developed based on Satia's theoretical model (2010) to answer research questions

Based on acculturation score of this study, participants were categorized into Iranian and transitional groups. The level of acculturation in this study was associated with age of arrival, length of exposure to the host culture, and English fluency of the participants. The younger participants were, when they arrived in the U.S., the longer they were exposed to the U.S. culture, the more acculturated they became. The more fluent the participants were in English, the greater their acculturation level. The length of exposure was stratified into two groups based on the median data obtained in this study: less than 10 years and more than 10 years. No association was found between level of acculturation, dietary pattern, and any chronic condition (overweight, pre-diabetes, and diabetes). The participants in the transitional acculturation group consumed more Western foods when their length of stay was less than 10 years.

Based on the participants' level of acculturation and their dietary patterns, the prevalence of obesity, pre-diabetic and diabetes were explored. The Socio-demographic Information Questionnaire was used to obtain data regarding participants' English fluency, income, martial status, age of the arrival, and their health conditions (family history of diabetes, pre-diabetic and diabetes. Many socio-economic and socio-demographic factors were examined to understand which factors have the biggest effect on acculturation and dietary acculturation of Iranian immigrants in the U.S.

In this study the importance of further research was emphasized to determine other factors that could affect dietary acculturation on overall health of Iranian immigrants. The limitations of this study were discussed. Possible solutions and recommendations were provided to rectify the limitations in this study. Based on the results of this study, implications for nursing

research, education, and policy were discussed. Policy recommendations were provided to the nurses in different health care settings.

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Figure 1: Satia's Process of Dietary Acculturation

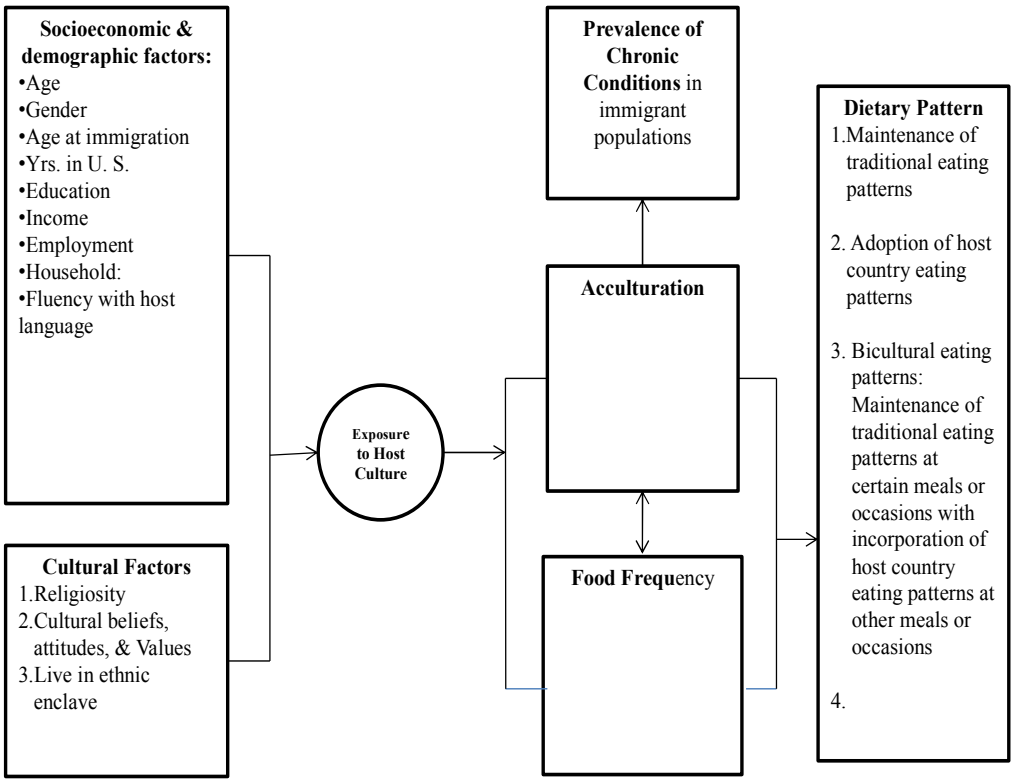
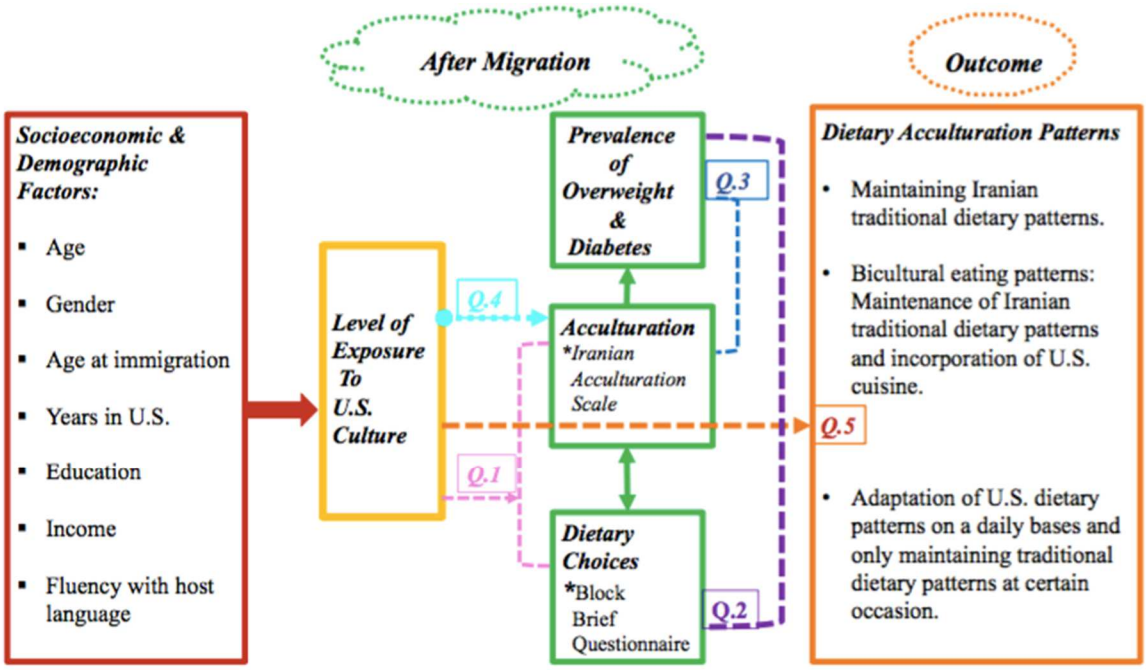


Figure 2: Adapted Model with Study Variables



Appendix A:

Iranian Acculturation Scale

Acculturation Scale

1. In what language do you usually think?

O Only Farsi O Mostly Farsi O In English and Farsi O Mostly English O Only English

2. When was the last time you read a book in Farsi

O Within the last 30 days O Within one year O Never read in Farsi

O Within the last 6 months O More than a year ago

3. When was the last time you read the newspaper or read news on the internet in Farsi

O Within the last 7 days O Within 1 year O Never read in Farsi

O Within the last 30 days O More than a year ago

4. When was the last time you watched Iranian TV, ideo or listened to Persian Radio?

O Within the last 7 days O Within 1 year O Never watch Iranian TV or listen to radio

O Within the last 30 days O More than a year ago

5. When was the last time you listened to Persian music?

O Within the last 7 days O Within 1 year O Never watch Iranian TV or listen to radio

O Within the last 30 days O More than a year ago

6. What type of food do you eat more often?

O Mostly Iranian O More Iranian than none Iranian food O Equal amount of Iranian and non-Iranian

O More non-Iranian than Iranian O Mostly non-Iranian

7. How important to you is it that the Iranian tradition be fillowed?

O Very important O Somewhat important O Not very important O Not at all important

8. How often do you attend Iranian recreational events?

O Once a month O A few times a year O Rarely O Never

9. How often do you attend Iranian religious events?

O Once a month O A few times a year O Rarely O Never

10. In what language do you communicate with your spouse at home? (if applicable)

O Only Farsi O Mostly Farsi O In English and Farsi O Mostly English O Only English

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11. In what language do you use to communicate with your children?

O Only Farsi O Mostly Farsi O In English and Farsi O Mostly English O Only English

12. What language do you use when you communicate with your Iranian friends?

O Only Farsi O Mostly Farsi O In English and Farsi O Mostly English O Only English

13. In what language are your reading skills better?

O Farsi O Both English and Farsi O English and other languages O Only English

14. In what language are your writing skills better?

O Farsi O Both English and Farsi O English and other languages O Only English

15. What ethnic group do you identify with?

O Only with the Iranian ethnic group O only with the Western ethnic group

O Equally with Western and the Iranian ethnic group O Mostly with the Iranian ethnic group

O mostly with the Western ethnic group

16. How do you see your future and progress in the U.S.?

O I am progressing O I am proggressing very much O I am not proggressing very much

17. We came to the US to improve the future of our children (if you have children)

O Totally agree O Somewhat agree O Somewhat dissagree O Disagree

18. We came to the US to improve our career opportunities and future

O Totally agree O Somewhat agree O Somewhat dissagree O Disagree

19. Marriage of children

O Should be arranged by parents with consent of the couple O The couple should initiate the marrage on the:

20. To what extent do you celebrate holidays such as Chistmas, easter, and Thanksgiving?

O To a great extent O To some extent O Not at all

21. Dating of female teenagers

O Should be allowed O Should be allowed under supervision O Should not be allowed

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22. Association of female teenagers and young adults with the opposite sex

O Should be allowed O Should be allowed under supervision O Should not be allowed

23. Out of ten of your friends how many are Iranian?

O 1 to 3 O 3 to 6 O 6 to 9 O 9 to 10

24. The major consideration in choosing a spouse for your children is

O Same religion O Any suitable person

O Same original nationality

O Samre original nationality and religion

25. Dating of male teenagers

O Should be allowed O Should be allowed under supervision O Should not be allowed

26. Association of male teenagers and young adults with the opposite sex

O Should be allowed O Should be allowed under supervision O Should not be allowed

27. How long have you lived in the U.S.?

O Less than 1 year O 1 to 3 years O 3 to 5 years O 5 to 10 years O More than 10 years

28. How long have you lived in another foreign country before coming to the U.S. (if applicable)?

O Less than a year O 1 to 5 years O 5 to 10 years O 10 to 15 years O more than 15 years

29.Classify your education

O Elementary school O College or University (B.A. or B.S.) O Medical Doctorate or phD

O High School O Graduate

30. Classify your profession in Iran (if applicable)

O Specialist O Employee and clerical O Business O Agriculture O worker O none of the above

31. Sex

O Female O Male

32. Classify your age

O 18 to 30 years O 30 to 40 years O 40 to 55 years O More than 55 years

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Appendix B:

Block Brief Food Frequency Questionnaire Sample

RESPONDENT ID NUMBER

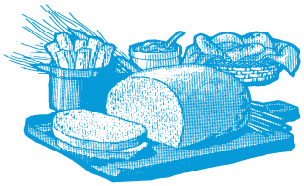
TODAY'S DATE

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

DAY

YEAR 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

BRIEF FOOD QUESTIONNAIRE



This form is about the foods you usually eat.
It will take about 15 - 25 minutes to complete.

- **Please answer each question as best you can. Estimate if you aren't sure.**
- **Use only a No. 2 pencil.**
- **Fill in the circles completely, and erase completely if you make any changes.**

SEX
Male
Female

If female, are you pregnant or breast feeding?
No
Yes
Not female

AGE

WEIGHT pounds

HEIGHT ft. in.

Please print your name in this box.

This form is about your usual eating habits in the past year or so. This includes all meals or snacks, at home or in a restaurant or carry-out. There are two kinds of questions for each food.

HOW OFTEN, on average, did you eat the food during the past year?
*Please DO NOT SKIP any foods. Mark "Never" if you didn't eat it.

HOW MUCH did you usually eat of the food?
*Sometimes we ask how many you eat, such as 1 egg, 2 eggs, etc., ON THE DAYS YOU EAT IT.
*Sometimes we ask "how much" as A, B, C or D. LOOK AT THE ENCLOSED PICTURES. For each food, pick the picture (bowls or plates) that looks the most like the serving size you usually eat. (If you don't have pictures: A=1/4 cup, B=1/2 cup, C=1 cup, D= 2 cups.)

EXAMPLE: This person drank apple juice twice a week, and had one glass each time. Once a week he ate a "C"-sized serving of rice (about 1 cup).

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)	1	2	3	4
Apple juice	○	○	○	○	○	●	○	○	○	How many glasses each time	●	○	○	○
Rice	○	○	○	○	●	○	○	○	○	How much each time	○ A	○ B	● C	○ D

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you eat each of the following foods all year round?														
Eggs, including egg biscuits or Egg McMuffins (Not egg substitutes)	○	○	○	○	○	○	○	○	○	How many eggs each time	○ 1	○ 2	○ 3	○ 4
Bacon or breakfast sausage, including sausage biscuit	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cooked cereals like oatmeal, cream of wheat or grits	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Cold cereals like Corn Flakes, Cheerios, Special K, fiber cereals	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D
Which cereal do you eat most often? **MARK ONLY ONE:** ○ Product 19, Just Right, Total ○ Bran Buds, Raisin Bran, Fruit-n-Fiber, other fiber cereals ○ Other cold cereal, like Corn Flakes, Cheerios, Special K														
Cheese, sliced cheese or cheese spread, including on sandwiches.	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Yogurt (not frozen yogurt)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
How often do you eat each of the following fruits?														
Bananas	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
Apples or pears	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Oranges, tangerines, not including juice	○	○	○	○	○	○	○	○	○	How many	○ 1/2	○ 1	○ 2	○ 3
Applesauce, fruit cocktail, or any canned fruit	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fruit, like grapes, melon strawberries, peaches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you eat each of the following vegetables, including fresh, frozen, canned or in stir fry, at home or in a restaurant?														
French fries, fried potatoes or hash browns	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
White potatoes not fried, incl. boiled, baked, mashed & potato salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Sweet potatoes, yams, or sweet potato pie	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Rice, or dishes made with rice	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Baked beans, chili with beans, pintos, any other dried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Refried beans	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green beans or green peas	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Broccoli	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Carrots, or stews or mixed vegetables containing carrots	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Spinach, or greens like collards	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cole slaw, cabbage	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Green salad	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Raw tomatoes, including in salad	○	○	○	○	○	○	○	○	○	How much	○ 1/4	○ 1/2	○ 1	○ 2
Catsup, salsa or chile peppers	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Salad dressing or mayonnaise (Not lowfat)	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Any other vegetable, like corn, squash, okra, cooked green peppers, cooked onions	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Vegetable soup, vegetable beef, chicken vegetable, or tomato soup	○	○	○	○	○	○	○	○	○	Which bowl		○ B	○ C	○ D

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SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
MEATS														
Do you ever eat chicken, meat or fish? ○ Yes ○ No IF NO, SKIP TO NEXT PAGE														
Hamburgers, cheeseburgers, meat loaf, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much meat	○ 1/8 lb.	○ 1/4 lb.	○ 1/2 lb.	○ 3/4 lb.
Tacos, burritos, enchiladas, tamales	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Beef steaks, roasts, pot roast, or in frozen dinners or sandwiches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Pork, including chops, roasts, or dinner ham	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat beef or pork, do you ○ Avoid eating the fat ○ Sometimes eat the fat ○ Often eat the fat ○ I don't eat meat														
Mixed dishes with meat or chicken, like stew, corned beef hash, chicken & dumplings, or in frozen meals	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Fried chicken, at home or in a restaurant	○	○	○	○	○	○	○	○	○	# medium pieces	○ 1	○ 2	○ 3	○ 4
Chicken or turkey not fried, such as baked, grilled, or on sandwiches	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat chicken, do you ○ Avoid eating the skin ○ Sometimes eat the skin ○ Often eat the skin ○ N/A														
Fried fish or fish sandwich, at home or in a restaurant	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Any other fish or shellfish not fried, including tuna	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Hot dogs, or sausage like Polish, Italian or Chorizo	○	○	○	○	○	○	○	○	○	How many	○ 1	○ 2	○ 3	○ 4
Boloney, sliced ham, turkey lunch meat, other lunch meat	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
When you eat lunch meats, are they ○ Usually low-fat ○ Sometimes ○ Rarely low-fat ○ N/A														

PLEASE DO NOT WRITE IN THIS AREA

SERIAL # ○○○○○○○○○○○○○○○○○○○○○○○○

TYPE OF FOOD	HOW OFTEN IN THE PAST YEAR: NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY	HOW MUCH EACH TIME (SEE PORTION SIZE PICTURES FOR A-B-C-D)				
Pasta, breads, spreads, snacks														
Spaghetti, lasagna, or other pasta with tomato sauce	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Cheese dishes without tomato sauce, like macaroni and cheese	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Pizza, including carry-out	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Biscuits, muffins	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Rolls, hamburger buns, English muffins, bagels	○	○	○	○	○	○	○	○	○	How many each time	○ 1/2	○ 1	○ 2	○ 3
White bread or toast, including French, Italian, or in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Dark bread like rye or whole wheat, including in sandwiches	○	○	○	○	○	○	○	○	○	How many slices	○ 1	○ 2	○ 3	○ 4
Tortillas	○	○	○	○	○	○	○	○	○	How many each time	○ 1	○ 2	○ 3	○ 4
Margarine on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Butter on bread, potatoes or vegetables	○	○	○	○	○	○	○	○	○	How many pats (Tsp.)	○ 1	○ 2	○ 3	○ 4
Peanuts or peanut butter	○	○	○	○	○	○	○	○	○	How many TBSP.	○ 1	○ 2	○ 3	○ 4
Snacks like potato chips, corn chips, popcorn (Not pretzels)	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
Doughnuts, cake, pastry, pie	○	○	○	○	○	○	○	○	○	How many pieces	○ 1	○ 2	○ 3	○ 4
Cookies (Not lowfat)	○	○	○	○	○	○	○	○	○	How many	○ 1-2	○ 3-5	○ 6-7	○ 8+
Ice cream, frozen yogurt, ice cream bars	○	○	○	○	○	○	○	○	○	How much	○ A	○ B	○ C	○ D
When you eat ice cream or frozen yogurt, is it	○ Usually low-fat	○ Sometimes	○ Rarely low-fat	○ N/A										
Chocolate candy, candy bars	○	○	○	○	○	○	○	○	○	How many bars	○ 1 small	○ 1 medium	○ 1 large	○ 2 large

TYPE OF BEVERAGE	HOW OFTEN IN THE PAST YEAR									HOW MUCH EACH TIME SEE PORTION SIZE PICTURES FOR A-B-C-D				
	NEVER	A FEW TIMES per YEAR	ONCE per MONTH	2-3 TIMES per MONTH	ONCE per WEEK	TWICE per WEEK	3-4 TIMES per WEEK	5-6 TIMES per WEEK	EVERY DAY					
How often do you drink the following beverages?														
Real orange or grapefruit juice, Welch's grape juice, Minutemaid juices, Juicy Juice	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Hawaiian Punch, Sunny Delight, Hi-C, Tang, or Ocean Spray juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Kool Aid, Capri Sun or Knudsen juices	○	○	○	○	○	○	○	○	○	How many glasses each time	○ 1	○ 2	○ 3	○ 4
Instant breakfast milkshakes like Carnation, diet shakes like Slimfast, or liquid supplements like Ensure	○	○	○	○	○	○	○	○	○	How many glasses or cans	○ 1	○ 2	○ 3	○ 4
Glasses of milk (any kind)	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3	○ 4
When you drink glasses of milk what kind do you usually drink? **MARK ONLY ONE:**	○ Whole milk ○ Reduced fat 2% milk ○ Low-fat 1% milk				○ Non-fat milk ○ Rice milk ○ Soy milk				○ I don't drink milk or soy milk					
Cream, Half-and-Half or non-dairy creamer in coffee or tea	○	○	○	○	○	○	○	○	○	Total TBSP. on those days	○ 1	○ 2	○ 3-4	○ 5+
Regular soft drinks, or bottled drinks like Snapple (Not diet drinks)	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Beer	○	○	○	○	○	○	○	○	○	How many bottles or cans	○ 1	○ 2	○ 3-4	○ 5+
Wine or wine coolers	○	○	○	○	○	○	○	○	○	How many glasses	○ 1	○ 2	○ 3-4	○ 5+
Liquor or mixed drinks	○	○	○	○	○	○	○	○	○	How many drinks	○ 1	○ 2	○ 3-4	○ 5+

During the past year, have you taken any vitamins or minerals regularly, at least once a month?

○ No, not regularly ○ Yes, fairly regularly →

(IF YES) WHAT DID YOU TAKE FAIRLY REGULARLY?

VITAMIN TYPE	HOW OFTEN					FOR HOW MANY YEARS?					
	DIDN'T TAKE	A FEW DAYS per MONTH	1-3 DAYS per WEEK	4-6 DAYS per WEEK	EVERY DAY	LESS THAN 1 YR.	1 YEAR	2 YEARS	3-4 YEARS	5-9 YEARS	10+ YEARS
Multiple Vitamins. Did you take…											
Regular Once-A-Day, Centrum, or Thera type	○	○	○	○	○	○	○	○	○	○	○
Stress-tabs or B-Complex type	○	○	○	○	○	○	○	○	○	○	○
Antioxidant combination type	○	○	○	○	○	○	○	○	○	○	○
Single Vitamins (not part of multiple vitamins)											
Vitamin A (not beta-carotene)	○	○	○	○	○	○	○	○	○	○	○
Beta-carotene	○	○	○	○	○	○	○	○	○	○	○
Vitamin C	○	○	○	○	○	○	○	○	○	○	○
Vitamin E	○	○	○	○	○	○	○	○	○	○	○
Folic acid, folate	○	○	○	○	○	○	○	○	○	○	○
Calcium or Tums, alone or combined with vit. D or magnesium	○	○	○	○	○	○	○	○	○	○	○
Zinc	○	○	○	○	○	○	○	○	○	○	○
Iron	○	○	○	○	○	○	○	○	○	○	○
Selenium	○	○	○	○	○	○	○	○	○	○	○
Vitamin D, alone or combined with calcium	○	○	○	○	○	○	○	○	○	○	○

If you took vitamin C or vitamin E:

How many milligrams of **vitamin C** did you usually take on the days you took it?

○ 100 ○ 250 ○ 500 ○ 750 ○ 1000 ○ 1500 ○ 2000 ○ 3000+ ○ don't know

How many IUs of **vitamin E** did you usually take on the days you took it?

○ 100 ○ 200 ○ 300 ○ 400 ○ 600 ○ 800 ○ 1000 ○ 2000+ ○ don't know

How often do you use fat or oil in cooking?

○ Less than once per week ○ A few times per week ○ Once a day ○ Twice a day ○ 3+ per day

What kinds of fat or oil do you usually use in cooking? MARK ONLY ONE OR TWO

○ Don't know, or Pam ○ Butter/margarine blend ○ Lard, fatback, bacon fat
○ Stick margarine ○ Low-fat margarine ○ Crisco
○ Soft tub margarine ○ Corn oil, vegetable oil
○ Butter ○ Olive oil or canola oil

Did you ever drink more beer, wine or liquor than you do now? ○ Yes ○ No

Do you smoke cigarettes now? ○ Yes ○ No

IF YES, On the average about how many cigarettes a day do you smoke now?

○ 1-5 ○ 6-14 ○ 15-24 ○ 25-34 ○ 35 or more

What is your ethnic group? (MARK ONE OR MORE)

○ Hispanic or Latino ○ Black or African American ○ American Indian or Alaska Native
○ White, not Hispanic ○ Asian ○ Native Hawaiian or Other Pacific Islander

Thank you very much for filling out this questionnaire. Please take a minute to go back and fill in anything you may have skipped.

PLEASE DO NOT WRITE IN THIS AREA

PLEASE DO NOT WRITE IN THIS AREA

SERIAL #

EM-232725-4

Appendix C:

Demographic Questionnaire

Filling out this Survey indicates that I am at least 18 years old and that I am giving my informed consent to be a subject in this study. This research project has been approved by the University of Wisconsin-Milwaukee Institutional Review Board for the Protection of Human Subjects

Socio-demographic Information

1. At what age did you arrive in the U.S. ? ☐☐

Please fill in the circle for each question:

2. What is your marital status? O Single O Married O Separated O Divorced O Widowed O Single never married

3. How do you rate your English fluency now?
O Not at all fluent O Somewhat fluent O Fluent O Very fluent

4,. What is your total yearly income? (please indicate only one)
O less than $24,999 O $25,000 -$49,999 O $50,000- $74,999 O $75,000-$99,999
O $100,000-$124,999 O over $125,000

5. Do you have diabetes? Yes O No O

6 . Has a doctor ever told you that you are pre-diabetic? Yes O No O

7. Do you have a family history of diabetes? Yes O No O

☐☐☐
For office use only

Draft

Appendix D:

Recruitment Flyer for Iranian-American Immigrant Study

Iranian American Immigrant study

- ***The U. S. has the highest Iranian- born population outside of Iran, yet we don't know much about the health status and disease prevalence among Iranian immigrants in the U.S.***
- ***Genetic sensitivity, combined with nutrition transition to the Western dietary pattern, physical inactivity, and environmental factors among Iranian immigrants in the European countries and Iran seems to be the likely cause for a higher burden of chronic diseases such as type 2 diabetes and heart disease.***
- ***The purpose of this study is to explore if there are any associations among acculturation, selected socio-demographic characteristics and different dietary patterns among Iranian***

You are highly recommended and warmly invited to participate in this study if you are:

- ***Identifying yourself as an Iranian born immigrant.***
- ***Are at least 18 years old and Can read and speak English.***

Iranian Study
414-708-9440

Iranian Study
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Iranian Study
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Appendix E:

IRB #17.329

UNIVERSITY of WISCONSIN
UWMILWAUKEE

Department of University Safety & Assurances

Melody Harries
IRB Administrator
Institutional Review Board
Engelmann 270
P. O. Box 413
Milwaukee, WI 53201-0413
(414) 229-3182 *phone*
(414) 229-6729 *fax*

http://www.irb.uwm.edu
harries@uwm.edu

New Study - Notice of IRB Exempt Status

Date: May 19, 2017

To: Julia Snethen, PhD
Dept: Nursing

CC: Elham Sadeghi

IRB#: 17.329
Title: EXPLORING ASSOCIATION BETWEEN ACCULTURATION AND DIETARY ACCULTURATION PATTERN AMONG IRANIAN AMERICAN IMMIGRANT'S

After review of your research protocol by the University of Wisconsin – Milwaukee Institutional Review Board, your protocol has been granted Exempt Status under Category 2 as governed by 45 CFR 46.101(b). Your protocol has also been granted approval to waive documentation of informed consent as governed by 45 CFR 46.117 (c).

This protocol has been approved as exempt for three years and IRB approval will expire on May 18, 2020. If you plan to continue any research related activities (e.g., enrollment of subjects, study interventions, data analysis, etc.) past the date of IRB expiration, please respond to the IRB's status request that will be sent by email approximately two weeks before the expiration date. If the study is closed or completed before the IRB expiration date, you may notify the IRB by sending an email to irbinfo@uwm.edu with the study number and the status, so we can keep our study records accurate.

Any proposed changes to the protocol must be reviewed by the IRB before implementation, unless the change is specifically necessary to eliminate apparent immediate hazards to the subjects. The principal investigator is responsible for adhering to the policies and guidelines set forth by the UWM IRB, maintaining proper documentation of study records and promptly reporting to the IRB any adverse events which require reporting. The principal investigator is also responsible for ensuring that all study staff receive appropriate training in the ethical guidelines of conducting human subjects research.

As Principal Investigator, it is also your responsibility to adhere to UWM and UW System Policies, and any applicable state and federal laws governing activities which are independent of IRB review/approval (e.g., FERPA, Radiation Safety, UWM Data Security, UW System policy on Prizes, Awards and Gifts, state gambling laws, etc.). When conducting research at institutions outside of UWM, be sure to obtain permission and/or approval as required by their policies.

Contact the IRB office if you have any further questions. Thank you for your cooperation, and best wishes for a successful project.

Respectfully,

Melody Harries

Melody Harries
IRB Administrator

Curriculum Vitae

Elham Sadeghi, RN, Ph. D.

Education

Ph. D. University of Milwaukee, Wisconsin, May 2018
B.S. Gavle University, Gavle, Sweden

Certificate and Licensure

2000 Registered Nurse, Chicago, IL
2000 Nursing License, State of IL
2003 Nursing Licensure Compact (NLC) for these States:
Arizona, Arkansas, Delaware, Florida, Georgia, Idaho, Iowa, Kentucky, Maine, Maryland, Mississippi, Missouri, Montana, Nebraska, New Hampshire, North Carolina, North Dakota, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, West Virginia, Wisconsin, and Wyoming

Work Experiences:

- **Medical/Surgical Nurse** at the St. Joseph Hospital in Chicago, IL (**2001 – 2003**)
- **ICU/CCU Nurse** and worked at the Trinity Hospital, Minot, North Dakota (**2003 – 2005**)
- **ICU/CCU Nurse** at the Colombia St. Mary's Hospital, Milwaukee, WI (**2005 - 2008**)
- **Burn Unit, RN** at the Colombia St. Mary's Hospital, Milwaukee, WI (**2005 - 2008**)

Research Interests:

Childhood Obesity: Based on coursework at Gavle University in Sweden.

Pediatric Population: Based on coursework and research at the University of Wisconsin, Milwaukee.

Iranian American Immigrants: Acculturation and Dietary acculturation among Iranian American Immigrants.

Invited Lectures and Presentations:

- Poster presentation MNRS conference in Minnesota, Minneapolis.
- The Midwest Nursing Research Society (MNRS) presentation on "Acculturation and Dietary Patterns Among Iranian American Immigrants" Presentation on April 12-15, 2018, Cleveland, OH.
- Eta Nu Chapter 2018, Doctoral Student Poster Award on April 19, 2018.
- UWM Health research symposium, Podium and Poster presentation on May 04, 2018.

Skills & Qualifications:

- MS Word, MS Excel, and MS PowerPoint

- SAS (Statistical Analysis System) for Research
- SPSS (Statistical Package for the Social Sciences) Programs for Quantitative Research
- NVivo Computer Software to code qualitative data entry for analysis

Languages Spoken

- English, Swedish, Persian (Farsi)

References

Provided upon request.