

**ACCULTURATION, DIET AND PSYCHOLOGICAL HEALTH OF ASIAN
INTERNATIONAL STUDENTS AT THE UNIVERSITY OF DELAWARE**

by

Heng Jiang

A thesis submitted to the Faculty of the University of Delaware in partial
fulfillment of the requirements for the degree of Master of Science in Human Nutrition

Spring 2015

© 2015 Heng Jiang
All Rights Reserved

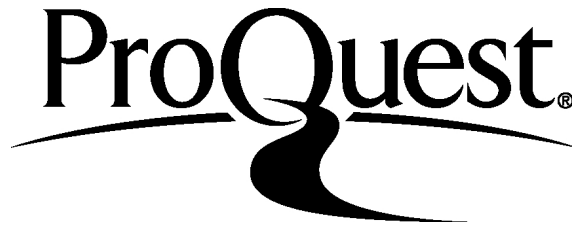
ProQuest Number: 1596865

All rights reserved

INFORMATION TO ALL USERS

The quality of this reproduction is dependent upon the quality of the copy submitted.

In the unlikely event that the author did not send a complete manuscript and there are missing pages, these will be noted. Also, if material had to be removed, a note will indicate the deletion.



ProQuest 1596865

Published by ProQuest LLC (2015). Copyright of the Dissertation is held by the Author.

All rights reserved.

This work is protected against unauthorized copying under Title 17, United States Code
Microform Edition © ProQuest LLC.

ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 - 1346

**ACCULTURATION, DIET AND PSYCHOLOGICAL HEALTH OF ASIAN
INTERNATIONAL STUDENTS AT THE UNIVERSITY OF DELAWARE**

by

Heng Jiang

Approved: _____
Sheau Ching Chai, Ph.D, R.D.
Professor in charge of thesis on behalf of the Advisory Committee

Approved: _____
P. Michael Peterson, Ed.D.
Chair of the Department of Behavioral Health and Nutrition

Approved: _____
Kathleen S. Matt, Ph.D.
Dean of the College of Health Sciences

Approved: _____
James G. Richards, Ph.D.
Vice Provost for Graduate and Professional Education

ACKNOWLEDGMENTS

I would like to acknowledge my advisor, Dr. Sheau Ching Chai, for introducing me to the world of research, for all of her time, sharing, encouragement and patience guiding me through my graduate study. I must also greatly appreciate the time and guidance exhibited by my other committee members as well: Dr. Cheng-Shun Fang for his expertise and Dr. Mia Papas who helped me with a great amount of statistical work. I would also like to thank Jim Rovin from the National Cancer Institute for answering all my questions about diet questionnaire and undergraduate volunteers at Dr. Chai's lab with data entry work. Finally, I would like to thank my parents for their endless love, trust and support. I would not be who I am and where I am now without them.

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES.....	vii
LIST OF ABBREVIATIONS.....	viii
ABSTRACT.....	ix

Chapter

1	INTRODUCTION	1
2	LITERATURE REVIEW	3
2.1	Acculturation Theory	3
2.2	Acculturation and Diet	5
2.3	Acculturation and Psychological Health	7
2.4	Study Abroad and Related Challenges.....	9
3	SPECIFIC AIMS	11
3.1	Statement of the Research Problem	11
3.2	Specific Aims	11
4	METHODS	12
4.1	Study Design.....	12
4.2	Study Tools.....	13
4.2.1	Demographic Questionnaire	13
4.2.2	Dietary Screener Questionnaire	13
4.2.3	Asian American Multidimensional Acculturation Scale (AAMAS)	14
4.2.4	Kessler 6	16
4.3	Statistical Analysis.....	17
4.3.1	Acculturation.....	17
4.3.2	Dietary Nutrient Intake.....	18
4.3.3	Psychological Health	18
4.3.4	Acculturation and Diet.....	18

4.3.5	Acculturation and Psychological Health	19
5	RESULTS	20
5.1	Subjects	20
5.2	Demographics	20
5.3	Changes in Acculturation with Demographic Characteristics.....	21
5.4	Dietary Nutrient Intake by Demographic Characteristics	22
5.5	Psychological Health.....	23
5.6	Dietary Nutrient Intake and Acculturation	23
5.7	Psychological Health and Acculturation	24
6	DISCUSSION	25
6.1	Acculturation	25
6.2	Acculturation and Diet	26
6.3	Acculturation and Psychological Health	27
6.4	Strengths and Limitations.....	29
6.5	Summary	30
	REFERENCES	41
Appendix		
A	IRB LETTER	47
B	RECRUITMENT EMAIL.....	48
C	DEMOGRAPHIC QUESTIONNAIRE	50
D	KESSLER 6.....	52
E	ASIAN AMERICAN MULTIDIMENSIONAL ACCULTURATION SCALE AAMAS-EA.....	54
F	ASIAN AMERICAN MULTIDIMENSIONAL ACCULTURATION SCALE AAMAS-CO	56

LIST OF TABLES

Table 1.	Definition of Portion Size Estimation for Each Dietary Factor on the Dietary Screener Questionnaire	31
Table 2.	Relationship between Dietary Factors and Food Items on the Dietary Screener Questionnaire*	32
Table 3.	Demographic Characteristics of the Study Population (n=172).....	33
Table 4.	Acculturation to American Culture and Original Culture and Their Association with Demographic Characteristics.....	34
Table 5.	Estimates of Daily Dietary Intakes and Their Relation to Demographic Characteristics	35
Table 6.	Psychological Health Status by Demographic Characteristics.....	36
Table 7.	The association between Acculturation Level and Dietary Intakes.....	37
Table 8.	Kessler 6 and Acculturation	38

LIST OF FIGURES

Figure 1.	Percentage of Participants Across Four Acculturation Statuses.....	39
Figure 2.	Percentage of Participants Having SPD Across Four Acculturation Statuses.....	40

LIST OF ABBREVIATIONS

Asian American Multidimensional Acculturation Scale	AAMAS
Country of origin	CO
European American	EA
Dietary screener questionnaire	DSQ
Kessler 6	K6
University of Delaware	UD
Non-specific psychological distress	SPD

ABSTRACT

Background: Acculturation is generally defined as the changes in behavior and values that occur during the transition to a new cultural environment. Accumulating evidence showed that immigrants change their diet and experience various psychological problems after immigration, which may also be related to their acculturation status. The number of international students is continually increasing in the United States and more than 50% of them are from Asian countries. However, there is a lack of research describing both diet and psychological health and examining their association with acculturation level among Asian international students.

Aims: The primary aim of this study was to describe the dietary nutrient intakes and psychological health status of Asian international students at the University of Delaware after their immigration to the U.S. The secondary aim was to investigate the association between their acculturation level and dietary nutrient intakes and psychological health.

Methods: This study was an online survey administered through Qualtrics®. It included a total of 70 questions from demographic questionnaire, dietary screener questionnaire (DSQ), Asian American Multidimensional Acculturation Scale (AAMAS) and Kessler 6 (psychological screener). Recruitment emails were sent out to all Asian international students currently enrolled at the University of Delaware. A total of 172 students (out of 1,143) completed the survey with intact data from these questionnaires. Linear regression models were fit to examine the association between normally distributed diet and acculturation data and demographic characteristics. Beta

and 95% CI were reported. For non-normally distributed diet and acculturation data, non-parametric Kruskal-Wallis was performed and median and interquartile range were presented.

Results: As the length of U.S. residence increased, the overall acculturation level to American culture (Beta 0.02; 95% CI: 0.004, 0.036) and maintenance of original culture (Beta 0.006; 95% CI 0.002, 0.009) both increased. About 22.8% of this study population are bicultural. When comparing with male, female consumed significantly lower calcium (Beta -0.1; 95% CI -0.2, 0.0), added sugar (Beta -0.3; 95% CI -0.5, -0.2), fiber ($p=0.03$) and sugar sweetened beverages ($p<0.01$). Calcium and dairy consumption were significantly higher among Indian students than those from China and South Korea. Although non statistically significant, female were still 1.2 times more likely to have non-specific psychological distress (SPD) than male (OR 2.2; 95% CI 0.9, 5.2); and students from other Asian countries (OR 1.6; 95% CI 0.5, 5.7) were 60% more likely and those from South Korea (OR 0.7; 95% CI 0.1, 5.7) were 30% less likely to have SPD than Chinese students.

No significant association between acculturation and nutrient intakes was reported, and this association did not differ between male versus female or between Chinese versus Indian students. Although non-significant, people who were more acculturated to American culture had lower Kessler 6 score (Beta -0.04; 95% CI -0.3, 0.2), whereas those showed higher attachment to original culture had higher Kessler 6 score (Beta 1.1; 95% CI -0.3, 2.4). The percentage of having SPD was highest among individuals with assimilation status (17.8%), followed by separation (17.0%), integration (15.4%) and marginalization (12.5%). Moreover, both American language adoption (Beta -1.1; 95% CI -2.0, -0.1) and original language maintenance (Beta -1.5;

95% CI -2.6, -0.3) were negatively associated with score on Kessler 6, that is, the higher host culture language acquirement and original language maintenance, the better performance on Kessler 6.

Conclusion: No significant association between diet and acculturation level was observed in this current study population. Future studies using a larger sample population with longer U.S. residence is warranted to further investigate their association. The psychological health status could be affected not only by the contact with host and original culture, but also by the academic environment where lots of pressure originate. Moreover, in the efforts to improve psychological health of Asian international students, challenges specific to this population such as the language barrier should be addressed, especially for Chinese students.

Chapter 1

INTRODUCTION

Acculturation is generally defined as the changes in behavior and values that occur during the first-hand continuous contact with a new cultural environment.¹ It includes different degrees of maintenance of original culture and contact and participation in new culture.² Accumulating evidence show that immigrants experience changes in food consumption and dietary patterns accompanied with the acculturation process.³⁻⁵ A recent study of Chinese American females provides longitudinal evidence that acculturation increases with length of U.S. residence and is significantly associated increased energy density of the diet, percent of energy from fat and sugar intake.⁴ Asia-born college students in Florida were found to consume significantly more fats/sweets, dairy products, and fruits and fewer meats/meat alternatives and vegetables after their immigration to the U.S.⁵

Immigrants also reported to experience various psychological problems after immigration to a totally new cultural environment. Berry and his colleagues concluded that high acculturation to host cultures is associated with positive health outcomes and low acculturation is associated with negative health outcomes.⁶ However, conflicting findings exist regarding acculturation statuses and its relation to immigrants' psychological health. Differed findings may result from the different measures of acculturation: bidimensional measurement, which reviews culture maintenance and adoption as bipolar opposites;⁷ and unidimensional measurement, which describes culture maintenance and adoption as two independent process. A major critique of the

unidimensional model was its failure to take into account the possibility that an individual could highly adhere to both the origin and host cultures. Thus, updated information regarding the association between psychological health and acculturation level measured by bidimensional model is needed.

International study is gaining popularity in recent years. According to the Academic Cooperation Association, an estimated 886,052 foreign students came to the U.S. for education purposes in the 2013/2014 school year. Students from China, India, and South Korea make up of about 50% of all international students.⁸ The number of international students is also rapidly increasing at the University of Delaware (UD). Currently, approximately 3,484 international students are at the UD with students from China accounting for 47% of the total number of international students. These international students play an important part in U.S. higher education not only because of their substantial contribution to U.S. economy but also because their academic efforts and abilities to conduct research in key fields of science and technology. However, as a special immigrant group, international students were found to experience depression, anxiety and identity confusion⁹ due to the challenges they need to cope with after transition to a new environment, including language barrier, cultural differences, academic and financial difficulties.¹⁰⁻¹²

Therefore, a study focuses on the diet and psychological health of international students during the process of acculturation is both imperative and important.

Chapter 2

LITERATURE REVIEW

2.1 Acculturation Theory

Redfield, Linton, and Herskovits¹³ defined acculturation as the process of cultural changes that occur when individuals from different cultural backgrounds come into “continuous, first-hand contact with each other”. In other words, acculturation is the acculturative changes an individual makes to accommodate in response to the host culture.¹⁴ Three interrelated aspects of adjustments are identified: a) psychological changes such as experiencing depression or anxiety due to the lack of cultural identity; (b) sociocultural changes such as linguistic and academic adjustment, and interacting with people from different cultural backgrounds; (c) economic adaption such as different living and food expenses.¹⁵ Overall, two different models of acculturation involving cultural maintenance and adoption have been built: unidimensional and bidimensional. A unidimensional model describes cultural maintenance and adoption as bipolar opposites. That is, an individual can either adopt host-culture behaviors and values or maintain the corresponding attributes from their culture of origin. The unidimensional model incorrectly “assume increments of involvement in the American host society culture necessarily entail corresponding decrements of engagement from the immigrant’s traditional culture”.¹⁶ A major critique of the unidimensional model was its failure to represent biculturalism, that is, the high adherence to both native and host cultures. Accordingly, a bicultural person is defined as an individual who “has extensive socialization and life experiences and

participates actively in two or more cultures”.¹⁷ Therefore, individuals may maintain the features of their own culture and absorb the new attributes of the host culture simultaneously. Unlike unidimensional model, the bidimensional model treats cultural maintenance and adoption as two distinct dimensions, each represents the acculturation to native and host cultures independently. Thus, it permits accurate determination of the extent to which individuals may acculturate to the host culture and to the culture of origin.¹⁸

As the earliest attempt to explain the acculturation variations within Asian Americans, Sue and Sue¹⁹ proposed that individuals could be categorized into three types based on the degree to which they attach the original group and dominant group: traditional, Asian American type and marginal. Similarly, Berry and his colleagues²⁰ proposed four basic statuses that represent various levels of the combination of cultural maintenance and participation and adoption: integration, assimilation, separation, and marginalization. Integration encompasses maintenance of one’s original culture while participating in the activities of the new culture. This type of status is also referred to biculturalism and is similar to Sue and Sue’s¹⁹ “Asian American” type. Individuals with this attitude are believed to be cognitively flexible and be able to live creatively in both original and host cultures.²¹ Assimilation refers to a relatively low maintenance of original culture but high adoption of beliefs and behaviors from the host culture. Individuals with this attitude usually have a preference of absorbing the host culture over maintaining the original culture. Opposite to assimilation, separation is described as the high maintenance of heritage culture but low identification with the new culture and people in this status shows no

interest in the contact with other groups. Accordingly, marginalization depicts the situation in which people has low contact with both the original and host cultures.

A lot of acculturation measurements have been developed based on either unidimensional framework or bidimensional framework. In a recent overview of acculturation measurements, Celenk and Van de Vijver²² analyzed the item contents of 50 instruments, and concluded that the majority of the instruments measured acculturation behaviors (86.3%), which refers to actual acts regarding language use and food choice. Assumed to be mostly related to acculturation outcomes, cultural behaviors have been an important area of acculturation studies.

2.2 Acculturation and Diet

Dietary factors have been implicated to be associated with the cause and prevention of many diseases such as coronary heart diseases, cancer, hypertension and type 2 diabetes.²³⁻²⁶ Thus, making the consumption of a healthy, nutritionally balanced diet essential for normal human body functions. Dietary guidelines of many countries recommend people to make healthier diet choices by consuming lots of fruits and vegetables, eating more fish (including oily fish) and less salt and do not skip breakfast.²⁷ The dietary guidelines for Americans (2010) encourage people to build a nutrient-balanced, healthy plate with suggestions include: make half of the plate fruits and vegetables; drink skim or 1% milk; choose whole-grain foods; and vary the protein food choices (seafood, beans).²⁸

However, some undesirable changes in food consumptions and dietary pattern have been reported among different immigrant groups along with their transition to a new cultural environment. For instance, highly acculturated Hispanics were reported to consume fewer servings of fruits and vegetables per day than less acculturated

Hispanics, but their fruits and vegetables consumption is still higher than non-Hispanic whites. Moreover, fat intakes were slightly higher, though not statistically significant, among highly acculturated Hispanics compared with low-accultured Hispanics.²⁹ Pakistani and Sri-Lanka immigrants in Norway³⁰ were found to reduce their meal frequency to conform to host country's norms. South Asian immigrants in Canada increased their fruits and vegetables consumption, but also increased the consumption of convenient foods, sugar-sweetened beverages and red meat and the frequency of dining out³¹.

The transition from high school to college play an important role in the development of a healthy lifestyle and dietary habits based on the fact that most students will primarily be responsible for their food choices/preparation and live independently for the first time^{32, 33}. And unhealthy lifestyle and eating habits that were adopted during this period may exert a substantial influence on health in adult life.³⁴⁻³⁶ As for international students, going abroad and being in a total new living and study environment may also have various impacts on their diet and nutrient intakes. An increase in the consumption of high calorie American food items and a gradual shift in the dietary patterns towards the American diet was observed among the international students at the Virginia Tech.³⁷ Greek students in Glasgow, Scotland consumed less fresh fruits, meat and cheese and more snacks than their domestic counterparts; and were unable to maintain their traditional Mediterranean diet, a diet that is known to promote health and prevent disease, after leaving their home country.³⁸ Altered food consumption were also reported among Asian students who consumed significantly more fats/sweets, dairy products, and fruits and less meats/meat alternatives and vegetables after they had lived in America for an average

of 25 months. Moreover, 62% of the respondents experienced weight gains about 5 lbs. The underlying factors included no time to prepare and unavailability of traditional foods, and ethnic foods being more expensive in the United States.⁵

2.3 Acculturation and Psychological Health

Psychological health has been widely examined in the investigations of acculturation as an outcome variable which includes but not limited to attitudes toward professional mental health counseling^{39,40}, psychological distress⁴¹, depressive symptoms^{42,43}, and subjective well-being⁴⁴. Moreover, Berry and his colleagues⁶ found individuals with integration attitudes experience minimal stress, and those in the assimilation status are intermediately stressed. In contrast, those who with the separated status are stressed and those who feel marginal in a new cultural environment tend to be highly stressed. When acculturation is measured by cognitive and behavioral items (e.g., language, food, accommodation and friendship), integrated Chinese students in Australia showed higher levels of subjective well-being compared to their peers who are assimilated, separated or marginalized.⁴⁴ Similarly, aimed at synthesizing and summarizing the direction and magnitude of the relationship between acculturation and depression among the Asian American population living in North America, Gupta et al.⁴⁵ ran a meta-analysis includes 38 studies (32 examined acculturation to American culture; 15 examined orientation to Asian culture; 9 examined both) that investigated depression as a specific psychological outcome. Electronic databases such as PsychInfo, Medline, Academic Search Premier, and ProQuest Digital Dissertations were searched and words like Asia, Acculturation, and well-being were included as key terms. They found a negative, statistically significant relationship between the acculturation degree and depression level (higher

acculturation is associated with less depression) when acculturation is measured as orientation to the U.S. culture; When acculturation is measured as orientation to the original culture, a negative, non-significant relationship was also observed. However, it should be noted that most of the studies included in this meta-analysis only measured the acculturation to either of the two cultures and were reviewing acculturation as a unidimensional process instead of a bidimensional process. As being pointed out by the researcher, the complexity of the relation between acculturation and psychological health may have been better examined using multidimensional measures of acculturation strategies.

Gender-related difference in the association between acculturation and psychological outcomes was also reported. A secondary analysis with data from the 2008 British Columbia Adolescent Health Survey (BC AHS) showed that acculturation level as measured by length of residence in Canada was associated with five times higher odds of emotional distress among Southeast Asian young women. Among young men, however, there was no difference in the experience of distress in terms of acculturation level.⁴² Again, acculturation was measured by unidimensional model including three simple questions: foreign-born status; language other than English spoken at home most of the time; and length of residence in Canada. Furthermore, acculturation levels and its related mental health symptoms were also reported among different immigrant groups. Among three groups of immigrants in a mental health care of Netherland, Turkish migrants showed most original culture maintenance followed by Moroccan migrants, while Surinamese migrant showed participation tendency in Dutch society. When put the three migrant groups together, a lower mental health symptom level (somatization, depression and anxiety) was

reported among those with higher degree of acculturation to the host culture and a higher symptom level was found among those with more preservation of traditional culture. Additionally, this relationship holds for Moroccan and Turkish immigrants, while none appeared for Surinamese migrants.⁴⁶

2.4 Study Abroad and Related Challenges

International study is becoming increasingly prevalent worldwide and the United States has traditionally been a major attraction for international students because it is generally perceived as a great source of advanced education and technology.⁴⁷ It is estimated that the number of international students at colleges and universities in the United States increased by 72 percent comparing with year 2000 to 886,052 students in the 2013/14 academic year. Students from the top three countries—China, India, and South Korea—now represent approximately 50 percent of the total enrollment of international students in the United States. Being the biggest contributor, Chinese student enrollments increased to more than 274,000, now making up 31 percent of all international students in the United States. According to the U.S. Department of Commerce, international students' spending in all 50 states contributed more than \$27 billion to the U.S. economy in 2013. Moreover, students from around the world also contribute to America's scientific and technical research and bring international perspectives into U.S. classrooms, providing an opportunity to recruit highly-qualified graduates with skills, and often help to build up longer-term business relationships and bring economic benefits.⁸ For international students, going abroad to study is a valuable opportunity to broad their visions, fulfill their personal dreams, even a big step toward a totally different life. However, transition to a new environment may be challenging for this specific population. Although all college and

university students encounter problems in a new educational and social environment, such as managing their lives independently for the first time, making new friends and adjusting to new schedules.¹¹ International students, however, have to cope with challenges that are unique to them due to the demands for cultural adjustment,⁴⁸ that is, language barrier, loneliness, family expectations, culture shock, financial difficulties and racial discrimination.¹² The most significant, prevalent challenge for most international students is probably the language barrier, which seriously weakens their ability to understand lecture contents, to take notes, to express their opinions and ask questions on class, and even to finish assignments.⁴⁹ Another source of stress is financial difficulties, which is the most concern for international students and the general assumption that all international students are wealthy is erroneous. Unlike native students, off-campus employment is referred to as illegal by immigration regulations and federal financial aid is also unavailable to non-residents.⁵⁰ Thus, their monetary problems are more difficult to resolve and most of them have to rely on the parents to pay the high tuitions. The support from their families and their expectations also render international students high pressure since some of them simply assume international students are supposed to achieve high academic standards.⁵¹ Because of the need for coping all these challenges, international students are at greater risk for various psychological problems. And it is more difficult for Asian international students and especially Chinese students to adjust to the U.S. compared with European international students due to the more cultural differences they may experience.⁵² Therefore, it is necessary to take a look at the psychological health of this particular population in the transition process and to investigate its relation to other factors.

Chapter 3

SPECIFIC AIMS

3.1 Statement of the Research Problem

The transition to a new environment may result in various changes in dietary intakes and psychological outcomes among immigrant groups. With a total of 886,052 foreign students came to the U.S. for education purposes in the 2013/2014 school year, students from China, India, and South Korea make up of about 50 percent of all international students. Therefore, it is important to investigate the dietary intakes and general psychological health of this population-specifically Asian international students after their immigration to the U.S. A comprehensive analysis of acculturation, dietary intakes and psychological health may lead to a greater understanding of their health status and provide a foundation for developing health care strategies for this population.

3.2 Specific Aims

The primary aim of this study was to describe the dietary nutrient intakes and psychological health status of Asian international students at the University of Delaware after their immigration to the U.S. The secondary aim was to investigate whether their dietary nutrient intake and psychological health was associated with their acculturation level to the American culture or to the original culture.

Chapter 4

METHODS

4.1 Study Design

This study was approved by the institutional review board at the University of Delaware. It is an online survey distributed through Qualtrics[®] survey software which allows researcher to set up and design their own survey and distribute survey to participants through email. A total of 70 questions from demographic questionnaire, dietary screener questionnaire (DSQ), Asian American Multidimensional Acculturation Scale (AAMAS) and Kessler 6 were utilized for data collection. For this current study, the email list that contains email addresses of all Asian international students (aged 18 years or older) currently enrolled at the University of Delaware was obtained from the Office for International Students and Scholars. All the email addresses were uploaded as a panel to Qualtrics[®] for survey distribution purpose by a third party from the Department of Behavioral Health and Nutrition. Then it was sent out to target population by the same person on February 23rd and a reminding email was sent out on March 3rd. This online survey was activated and open to responses collection for a total of two weeks from February 23rd to March 8th. After data collection completed, three winners were drawn and given the gift card valued \$100 each by a third party from the department. Neither the principal investigator nor the advisor had the access to the email addresses during the whole study process.

4.2 Study Tools

4.2.1 Demographic Questionnaire

The purpose of this questionnaire is to collect background information such as age, gender, current education level, country of origin, length of residence in the U.S. (in months) and monthly food expenses. The participants were also asked to indicate whether they gained weight after their arrival in the U.S. If yes is chosen, they also need to indicate how much weight (in lbs.) they gained.

4.2.2 Dietary Screener Questionnaire

The DSQ is a short dietary assessment instrument developed by the Risk Factor Monitoring and Methods Branch of National Cancer Institute. It is developed given the circumstances when assessment of the total diet is not required or when time is constrained and it can be used for characterizing a population's median intakes or examining interrelationships between diet and other variables.

The 26-item DSQ asks about the frequency of consumption in the past month of selected foods and drinks and captures intakes of fruits and vegetables, dairy/calcium, added sugars, whole grains/fiber, red meat, and processed meat. Example questions include, “During the past month, did you eat any hot or cold cereals?” “During the past month, how often do you hot or cold cereal?” Responses could be reported as times per day, times per week or times per month. First of all, the frequency responses are converted to a common unit of time, i.e. times per day in this case. The weekly and monthly frequencies were converted to daily frequency by dividing them by 7 and 30, respectively. DSQ scoring algorithms were developed by the NCI research team to convert screener responses to estimates of individual dietary intake for fruits and vegetables (cup equivalents), dairy (cup equivalents), added

sugars (tsp), whole grains (ounce equivalents), fiber (g), and calcium (mg) using the What We Eat in America 24-hour dietary recall data from the 2003-2006 NHANES. The definition of portion size estimation for each dietary factor can be found in **Table 1**.

The intakes of each dietary factor were calculated based on several food items as shown in **Table 2**. For example, the intakes of fruits and vegetables were calculated from the consumption of fruit, fruit juice, salad, fried potatoes, other potatoes, dried beans, other vegetables, tomato sauce, salsa and pizza. The exposure sugar-sweetened beverages is defined in the Dietary Guidelines for Americans, 2010 as: "Liquids that are sweetened with various forms of sugars that add calories. These beverages include, but are not limited to, soda, fruitades and fruit drinks, and sports and energy drinks." For our analyses, we defined this exposure as including the above types of drinks plus coffees and teas when sweetened with sugar.

The web-based demonstration of DSQ is publicly available online and the link is <http://appliedresearch.cancer.gov/nhanes/dietscreen/questionnaires.html>.

4.2.3 Asian American Multidimensional Acculturation Scale (AAMAS)

Largely adapted from the Suinn–Lew Asian Self-Identity Acculturation Scale (SL-ASIA), AAMAS is a multidimensional measurement of acculturation with four construct domain: cultural identity, language, cultural knowledge and food consumption. AAMAS was developed based on three principles. The first was that AAMAS was orthogonal and be able to distinguish between the dimensions of acculturation to host culture and Asian culture of origin. The second principle guiding the development of AAMAS was the ease of use with multiple Asian ethnic groups. Unlike other acculturation measures that are ethnic specific, AAMAS use the phrase

“culture of origin” to allow the participants to indicate his or her culture without listing each ethnic group individually. The third guiding principle is that AAMAS takes into consideration of the existence of pan-ethnicity among Asian Americans, which is becoming common given the fact that Asian Americans are increasingly marrying interethnically among Asian American group.¹⁸

AAMAS consists of 15 items to measure the acculturation of Asian American to one’s Asian culture-of-origin, other Asian American cultures and the European American culture. Therefore, it comprises three subscales: Culture of Origin (AAMAS-CO), Other Asian American Cultures (AAMAS-AA), and European American Culture (AAMAS-EA). Respondents rate on a 6-point Likert scale (1=not very much; 6=very much) the extent to which they participate in a particular culture in regard to each of the three cultural groups. The score on each domain is the average of the sum of each item within each domain and the score on each subscale is based on the sum of the score on each domain. We only used AAMAS-CO and AAMAS-EA in this current study based on our study population and study aims. Sample items in the AAMAS include, “How well do you speak the language of . . .,” “How often do you eat the food of . . .,” “How much do you practice the traditions and keep the holidays of . . .,” and “How much do you interact and associate with people from...”

In terms of reliability, Chung et al.¹⁸ reported coefficient alphas ranging from 0.76 to 0.91 for the three subscales across three studies. In addition, a 2-week test–retest coefficient stability was computed and coefficients was 0.89 for AAMAS-CO, 0.75 for AAMAS-AA, and 0.78 for AAMAS-EA. In terms of validity, criterion-related, concurrent, and divergent validity was reported for the three subscale scores based on comparisons with measures of cultural identity, acculturation, generation

status, intergenerational conflict, and self-esteem. Kim et al.⁴¹ also reported coefficient alphas of 0.90 and 0.91 for the AAMAS-CO and the AAMAS-EA, respectively.

4.2.4 Kessler 6

The Kessler 6 (K6) is widely used as a standardized and validated measure of non-specific psychological distress (SPD). K6 scale was developed with support from the U.S. government's National Center for Health Statistics for use in the redesigned U.S. National Health Interview Survey (NHIS). The scales were designed to be sensitive around the threshold for the clinically significant range of the distribution of nonspecific distress in an effort to maximize the ability to discriminate cases of serious mental illness from non-cases.⁵³ The K6 is now utilized in the core of the NHIS, in the annual National Household Survey on Drug Abuse and in the Behavioral Risk Factor Surveillance System administered by 26 states, the District of Columbia and Puerto Rico.

Participants were asked to indicate how frequently they experienced symptoms of psychological distress (e.g., nervous, hopeless) during the past 30 days. Responses are recorded using a 5-category Likert scale (1 none of the time; 2 a little of the time; 3 some of the time; 4 most of the time; 5 all of the time). The optimal cut point is 6-18 versus 19+. Therefore, a score of less than 19 is indicative of the absence of SPD and a score of 19 or more is indicative of the presence of SPD.

According to the National Comorbidity Survey, K6 are being validated in primary care clinics, community mental health centers, and social welfare offices. In the US, a number of studies are using the K6 in studies of minority samples. Scale properties are reported to be stable in minority sub-samples of the large surveys.

4.3 Statistical Analysis

4.3.1 Acculturation

Most of the scores on acculturation scale are normally distributed except AAMAS-CO and its language and food consumption domains. Therefore, they were natural logarithmically transformed and reflected when appropriate in order to approximate a more normal distribution. Then, linear regression models were fit to examine the association between demographic characteristics such as the length of U.S. residence and country of origin (where are you from) and normally distributed acculturation scores. Beta and 95% confidence interval (CI) were reported. And the between group difference within country of origin category was examined using China as the reference group. The association between those demographic characteristics and non-normally distributed acculturation score was investigated using non-parametric method of Kruskal-Wallis. Median and interquartile range for the acculturation score was reported.

Additionally, in order to identify the possible impact of acculturation status according to Berry's theory⁶, a median split was applied to AAMAS-EA and AAMAS-CO, that is, orientation toward the culture of origin (OC; median=21) versus orientation towards the American culture (EA; median=15). And the overall acculturation status was further categorized into four category: marginalization (EA and CO<median); separation (CO $\geq$ median and EA<median); assimilation (CO<median and EA $\geq$ median); integration (CO $\geq$ median and EA $\geq$ median). The percentage of participants within each category was presented in histogram.

4.3.2 Dietary Nutrient Intake

Daily intake of eight dietary factors was reported using basic descriptive statistics. Data that were not normally distributed are presented as median and interquartile range and they were natural logarithmically transformed to approximate a normal distribution. The associations between demographic characteristics and normally distributed nutrient intake data were examined by linear regression models; and its associations with non-normally distributed nutrient intake data were examined by Kruskal-Wallis.

4.3.3 Psychological Health

Based on the total score on Kessler 6, psychological health status was categorized into having no SPD (6-18) and having SPD (≥ 19). The number and percentage of participants with or without SPD within each categorical demographic characteristic (education level, gender, monthly food expenses and country of origin) were reported. The odds ratio (OR) and the 95% CI was also presented.

4.3.4 Acculturation and Diet

Linear regressions were fit to examine the changes of dietary intakes (dependent variable) along with changes of acculturation level (AAMAS-EA or AAMAS-CO) and three different models were created. In model 1, only acculturation level was included as independent variable. In model 2, gender and the interaction between gender and acculturation level (gender*acculturation) were also included as independent variables. Therefore, whether the association between dietary intakes and acculturation level differed across gender was examined. Similarly, the association between dietary intakes and acculturation level across different countries (China vs India) was examined in model 3 by adding country and the interaction between

country and acculturation level (country*acculturation) to independent variables. Beta and 95% CI were reported. The changes in intake of non-normally distributed nutrient along with acculturation level only (model 1) were examined by Kruskal-Wallis, with median and interquartile range reported. All three models were multivariable adjusted.

4.3.5 Acculturation and Psychological Health

Multiple linear regression model adjusted for covariates (e.g. age, gender, length of U.S. residence and country of origin) was fit to examine the changes in scores on Kessler 6 along with the acculturation to American culture or original culture. Beta and 95% CI were reported.

The percentage of having SPD within each category of overall acculturation status was also presented in histogram.

All analyses were performed using SPSS Pro V22.0. Statistical significance was set at $p < 0.05$.

Chapter 5

RESULTS

5.1 Subjects

A total of 1,143 emails were sent out and 210 surveys were submitted. 36 of them were excluded because of missing responses to the diet, acculturation or K6 questionnaires and 2 were excluded due to missing demographic information. Therefore, a total of 172 participants with intact demographic, diet, acculturation and psychological health information were included in this analysis.

5.2 Demographics

Results of demographic information are presented in **Table 3**. Subjects were exclusively Asian international students currently enrolled at the University of Delaware and 45.9% of them are master students and 54.1% are Ph.D. students. The majority of the participants are from China (60.7%) and India (22%). 85 (49.1%) of them are male and 88 (50.9%) of them are female, with an average age of 26.3 years and an average U.S. residence of 29.2 months. The weight gain was not normally distributed, therefore, median was reported. 55.2% of them reported weight gain with a median of 10.0 lbs. since their arrival to the U.S. and 4 (2.3%) of them had a weight gain of more than 30 lbs. The median rate for weight gain is 0.4 lbs per month after their arrival. In terms of monthly food expenses, 42.2% of them reported of \$200-300, 32.4% of \$300-400 and 11.6% of more than \$400.

5.3 Changes in Acculturation with Demographic Characteristics

Table 4 describes the changes in AAMAS score with the length of U.S. residence and different countries of origin in our sample. Overall, acculturation to American culture was positively associated with the length of U.S. residence ($p=0.02$). With a 10 months increase in the length of U.S. residence, there was a 1.2 (Beta 0.02; 95% CI: 0.004, 0.036) increase in level of acculturation to American culture, as indicated by the increased score on AAMAS-EA. In terms of acculturation to original culture, increasing length of U.S. residence was also accompanied by a small, but statistically significant ($p<0.01$) increase in the score on AAMAS-CO (Beta 0.006; 95% CI 0.002, 0.009). When look at each of the four domains within each subscale, significant association was still observed. As length of U.S. residence increased, adoption to both American language (Beta 0.008; 95% CI 0.003, 0.013) and cultural knowledge (Beta 0.008; 95% CI 0.002, 0.013) also increased. However, American cultural identity was not affected by the residence length in the U.S. Concurrently, there was a very small but significant decrease in the maintenance in original cultural identity (Beta -0.005; 95% CI -0.009, -0.001) and original cultural knowledge (Beta -0.006; 95% CI -0.01, -0.001). More importantly, we observed a small increase in American food adoption (Beta 0.003; 95% CI -0.004, 0.009) and a significant increase in the original food consumption as the length of U.S. residence increased (Beta 0.003; 95% CI 0.001, 0.005).

Participants from different countries also showed different acculturation level. When comparing with Chinese students, those come from South Korea and India had a significantly higher acculturation level to American culture (Beta 2.2, 95% CI 0.2, 4.2; Beta 2.2, 95% CI 1.2, 3.2, respectively) and to its language (Beta 0.6, 95% CI 0.08, 1.2; Beta 1.0, 95% CI 0.7, 1.3, respectively). Indian students also had a

significantly higher adoption to American food and South Korean had a significantly higher maintenance to original culture.

We also compared each two of the four country groups and found that there was no difference in the general acculturation level to American culture, to American food and the maintenance of original culture between students from South Korea and India. Chinese students showed the lowest American language adoption but there was no difference in the original language maintenance among these groups (Chi-Square 6.4; $P=0.09$).

Figure 1 showed the percentage of participants within each acculturation status. 27.5% of them were separated and 26.3% of them were assimilated. 22.8% of them showed bicultural potential (integrated) and 23.4% were marginalized.

5.4 Dietary Nutrient Intake by Demographic Characteristics

The estimates of daily dietary nutrient intake and their association with some demographic characteristics was presented in **Table 5**. For instance, the median of daily fiber intake is 15.5 g; calcium 857.3 mg; added sugar 13.4 tsp; fruits and vegetables 2.6 cup equivalents. Among all these nutrient groups, only added sugar consumption was negatively associated with the length of U.S. residence (Beta -0.005; 95% CI -0.008, -0.001). Compared to male, female consumed significantly lower calcium (Beta -0.1; 95% CI -0.2, 0.0), added sugar (Beta -0.3; 95% CI -0.5, -0.2), fiber ($p=0.03$) and sugar sweetened beverages ($p<0.01$). Among all the participants grouped by their country of origin, there was no difference in the consumption of added sugar, wholegrains, fruits and vegetables (with or without French fries), fiber ($p=0.68$), dairy ($p=0.26$) and sugar sweetened beverages ($p=0.64$). Calcium and dairy consumption

were significantly higher among Indian students than those from China and South Korea but were similar between Indian students and those from other Asian countries.

No education level related differences in nutrient intakes were observed.

5.5 Psychological Health

Table 6 showed the risk of having SPD by categorical demographic characteristics. Overall, there was no significant association between the risk for SPD and education level, gender, monthly food expenses and country of origin. However, it should be noted that female were 1.2 times more likely to have SPD than male (OR 2.2; 95% CI 0.9, 5.2). Compared with those with only \$100-200 food expenses per month, those spent about \$200-300 and \$300-400 were 20% (OR 0.8; 95% CI 0.3, 2.7) and 60% (OR 0.4; 95% CI 0.1, 1.4) less likely to have SPD, respectively. Moreover, when using China as the reference group, participants from other Asian countries (OR 1.6; 95% CI 0.5, 5.7) were 60% more likely and those from South Korea (OR 0.7; 95% CI 0.1, 5.7) were 30% less likely to have SPD.

5.6 Dietary Nutrient Intake and Acculturation

The association between dietary nutrient intakes and AAMAS-EA or AAMAS-CO was presented in **Table 7**. We did not find any statistically significant association between intakes of eight nutrient groups and acculturation to American culture or maintenance of original culture. But with the increasing acculturation to American culture, there was a small increase in the consumption of added sugar (Beta 0.01; 95% CI -0.02, 0.04) and whole grains (Beta 0.06; 95% CI -0.02, 0.1), which decreased concurrently with the increasing maintenance of original culture (Beta -0.002; 95% CI -0.04, 0.04 and Beta -0.06; 95% CI -0.15, 0.04, respectively). After including gender

and country and their interaction with acculturation in model 2 and model 3, this association did not change, that is, there is no significant difference in the association between dietary nutrient intakes and AAMAS-EA or AAMAS-CO in male versus female or in Chinese students versus Indian students.

5.7 Psychological Health and Acculturation

The association between participants' acculturation level and their psychological health measured by Kessler 6 was presented in **Table 8**. Although no significant association between the acculturation level and score on Kessler 6 was observed, people who were more acculturated to American culture had lower Kessler 6 score (Beta -0.04; 95% CI -0.3, 0.2), indicating better psychological health status. Whereas those showed higher attachment to original culture had higher Kessler 6 score (Beta 1.1; 95% CI -0.3, 2.4), which means unfavorable psychological health status. When look at each domain within each subscale, we found than both the adoption to American language and the maintenance of original language are negatively associated with Kessler 6. With one point increment in American language acquirement, the score on Kessler 6 decreased about 1 (Beta -1.1; 95% CI -2.0, -0.1); and with one point increment in original language maintenance, the score on Kessler 6 decreased about 1.5 (Beta -1.5; 95% CI -2.6, -0.3).

When splitting the study population into four acculturation statuses, the percentage of participants having SPD for the four categories of overall acculturation status was presented in **Figure 2**.

Chapter 6

DISCUSSION

6.1 Acculturation

Utilizing a multidimensional acculturation scale with four specific domains, we found a significantly positive association between the acculturation to American culture and the length of U.S. residence; With a 10 months increase in the length of U.S. residence, there was a 1.2 (Beta 0.02; 95% CI: 0.004, 0.036) increase in level of acculturation to American culture. This was consistent with previous study by Tseng et al.⁴ which reported that increasing length of U.S. residence was associated with a small (about 1 %/year) but significant increase in acculturation score ($p < 0.01$). Additionally, we observed that a 10 months increase in length of U.S. residence was also accompanied by a 1.1 increase in the overall maintenance of original culture (Beta 0.006; 95% CI 0.002, 0.009). Furthermore, we found a trend toward bicultural food consumption among our study population, with an increase in original food consumption (Beta 0.003; 95% CI 0.001, 0.005) and American food consumption (Beta 0.003; 95% CI -0.004, 0.009) as they stay longer in America. This bicultural food consumption potential reflects dietary acculturation, which aligns with the findings of other studies on Filipino Americans^{53, 54}, Korean Americans⁵⁵, Thais⁵⁶, Chinese Americans and Chinese Canadians⁵⁷.

We also compared the acculturation level between different original country groups. Students come from South Korea and India showed both relatively higher level of acculturation to American culture and maintenance of original culture and

their acculturation level to American culture (Beta 2.2, 95% CI 0.2, 4.2; Beta 2.2, 95% CI 1.2, 3.2, respectively) is significantly higher than those from China but this did not differ between South Korea and India. Chinese students showed the lowest American language adoption which indicated that Chinese students had more difficulty to acculturate to the U.S. than other international students.¹² Similar to previous study³¹, we did not find gender-related difference in the overall acculturation to American culture, maintenance of original culture and food consumption in both America and original country. However, female showed higher level of adoption to American language and cultural knowledge than male, and the difference approached statistical significance ($p=0.07$, $p=0.06$, respectively).

Consistent with Berry's theory²⁰ of four acculturation statuses-integration, assimilation, separation, and marginalization, we found that 22.8% of our study population showed bicultural potential (integration), 23.4% had low contact to both American and original culture (marginalization), 27.5% of them were separated and 26.3% of them are assimilated.

6.2 Acculturation and Diet

Previous studies observed that immigrants increased their consumption of fats, dairy, meat⁵ and foods high in energy density⁴ after immigration. In this current study, however, the only significant change in nutrient intake along with the U.S. residence was added sugar (Beta -0.005; 95% CI -0.008, -0.001). We also investigated gender and country-related difference in nutrient intakes. Compared to male, female consumed significantly lower calcium (Beta -0.1; 95% CI -0.2, 0.0), added sugar (Beta -0.3; 95% CI -0.5, -0.2), fiber ($p=0.03$) and sugar sweetened beverages ($p<0.01$). Calcium and dairy consumption were significantly higher among Indian students than

those from China and South Korea. Even though Hindu population is predominant in India, which is mostly vegetarian, many Indians also consume milk and dairy products besides of vegetable products to receive their daily protein. Dairy products are the most important ingredients in most Indian meals.

Even though we observed a bicultural food consumption potential, there was no significant changes across eight nutrient intakes along with either the acculturation to American culture or the maintenance of original culture. This is possibly due to the different measurements that we used in this study: the food consumption domain within acculturation scale and dietary screener questionnaire. It should be noted that the former measures the general food consumption attitudes and behaviors toward a specific culture by asking participants to score on two questions “how much do you like the food of...” and “how often do you actually eat the food of...”; while the latter estimates the actual nutrients intakes. It could be expected that participants adopted American foods and maintained original foods but the total intakes of specific nutrients did not change while they acculturated since many food groups from other origins share the same components with American foods at a lower or higher concentrations. Therefore, the total intake might remain at the same level. Another possible explanation is that the U.S. residence of our study population was not long enough to have a significant effect on dietary nutrient intakes compared to the study population of Tseng et al.⁴, which have lived in the U.S. for an average of 7.5 years.

6.3 Acculturation and Psychological Health

There was a negative, significant association between the adoption to American language and K6, that is, the higher ability to master English, the better psychological health status. This is supported by the discovery that language barrier

was the most significant challenge for international students since it affects their ability to understand lectures and achieve academic requirements⁴⁹. Although it was non-significant, female were 1.2 times more likely to have SPD than male (OR 2.2; 95% CI 0.9, 5.2) in this current study. Similarly, data from the 2008 British Columbia Adolescent Health Survey revealed that young women reported significantly higher rates of extreme levels of stress and despair compared to young men.³⁶ Furthermore, as one of the source of stress among international students⁵, we found that compared with those with only \$100-200 food expenses per month, those spent about \$200-300 and \$300-400 were 20% (OR 0.8; 95% CI 0.3, 2.7) and 60% (OR 0.4; 95% CI 0.1, 1.4) less likely to have SPD, respectively.

Previous study⁴⁴ found that both strong host and original culture identification and contact predicted enhanced subjects well-being. In this current study we found that there is a trend of better psychological health status along with the acculturation to American culture and worse psychological health status along with maintenance to original culture. Based on Berry's theory⁶ that immigrants with integration status are minimally stressed and those marginalized are highly stressed, it has been proposed that Asian international students may be more confident and less stressed when they could both maintain the original culture and adopt to new culture, or when they assimilate to the new culture; and show high levels of psychological symptoms when they feel it difficult to hold on to the original culture under the impact of new culture, or feel uncertain between two cultural environment.⁵⁹ However, we found in our study population that those marginalized are minimally stressed with a percentage of having SPD of 12.5%, followed by integration (15.4%), separation (17.0%), and assimilation (17.8%). It is possible that the psychological health status of our population is based

not only on their contact with American and original culture, but also on their academic environment where a lot of pressure originates since the academic requirements and work load for master and Ph.D. students is both high and heavy. However, this needs to be further examined because of the lack of undergrad students in our study sample. Previous studies also reported different results from Berry's theory. Shim et al.⁶⁰ found that assimilated East Asian students in Germany displayed least depressive symptoms of all acculturation groups; whereas Behrens et al.⁶¹ reported that both subjects with integration status and subjects with separation status showed less depressive symptoms than those with assimilation.

6.4 Strengths and Limitations

Several strengths of this study are as follows. The acculturation level is measured using a multidimensional acculturation model (AAMAS) with four specific domains rather than being measured by only the length of residence or the unidimensional model. Compared to other models, AAMAS was orthogonal and be able to distinguish between the acculturation to host culture and Asian culture of origin. Most of the items in the AAMAS are behavioral in nature and describe activities such as food consumption, language usage, traditions practice and interact with people, which are assumed to be mostly related to acculturation outcomes. Additionally, DSQ was used to measure the intakes across eight dietary factors of our study population, which is a short dietary assessment instrument developed by NCI and reduces the data collection period and recall load for participants. However, there are also some limitations of this study. First of all, our final analysis only included master and Ph.D. students at the University of Delaware. No undergraduates responded to this online survey. It is unknown whether their diet, acculturation and

psychological health are different from that of those included for final analysis. Therefore, this study cannot be generalizable to all Asian international students at the U.S. Although the overall acculturation is categorized into four statuses based on Berry's theory, the AAMAS was not developed for that purpose and no optimal cut point was presented by the developer of AAMAS. Therefore, it remains unclear whether this categorization is accurate. Although Kessler 6 has been reported to be stable in minority samples of the large surveys in the U.S., the cut point for Kessler 6 being used now is based on the assumption that our population has the same prevalence of SPD as the total U.S. population. However, there is a possibility that the prevalence is not the same in our sample as in the U.S. population. Future studies might be done focusing on the association between these factors among a larger sample representing the whole population with longer residence in the U.S.

6.5 Summary

Our study described the dietary nutrient intakes, psychological health status and acculturation level of international students from Asian countries at the University of Delaware (UD). We also investigated the changes of nutrient intakes and psychological health along with the acculturation process. We did not observe a significant association between diet and acculturation level in this current study. Future studies using a larger sample population with longer U.S. residence are warranted to further investigate their association. In the efforts to improve psychological health of Asian international students, pressure from academic study and also challenges specific to this population such as the language barrier should be addressed, especially for Chinese students.

TABLES

Table 1. Definition of Portion Size Estimation for Each Dietary Factor on the Dietary Screener Questionnaire

Vegetables (cup equivalent)	1 cup raw or cooked
	1 cup vegetable juice
	2 cups leafy salad greens
Fruits (cup equivalent)	1 cup raw or cooked
	½ cup dried fruits
	1 cup fruit juice
Dairy (cup equivalent)	1 cup milk, fortified soy beverage, or yogurt
	1 ½ ounces of natural cheese
	2 ounces of processed cheese
Whole grains (ounce equivalent)	1 one-ounce slice of whole grain bread
	1 ounce of uncooked whole grain pasta or rice
	½ cup of cooked whole grain rice, pasta, or cereal; 1 whole grain tortilla (6 inch diameter)
	1 whole grain pancake (5 inch diameter)
	1 ounce (or about 1 cup cereal flakes) ready-to-eat whole grain cereal

Table 2. Relationship between Dietary Factors and Food Items on the Dietary Screener Questionnaire*

Food item	Dietary factor						
	<i>Fruits and vegetables (cup equivalents per day)</i>	<i>Added sugars (tsp per day)</i>	<i>Added sugars from sugar-sweetened beverages (tsp per day)</i>	<i>Dairy (servings per day)</i>	<i>Calcium (mg)</i>	<i>Fiber (gm)</i>	<i>Whole grains (servings per day)</i>
Fruit		Soda	Fruit drinks		All or nearly all foods	All or nearly all foods	Cereal
Fruit juice		Fruit drinks					Cereal type
Salad		Cookies, cake, pie					Whole grain bread
Fried potatoes		Doughnuts					Popcorn
Other potatoes		Ice cream		Milk			Whole grain rice
Dried beans		Sugar/honey in coffee/tea	Sugar/honey in coffee/tea	Cheese			
Other vegetables		Candy		Ice cream			
Tomato sauce				Pizza			
Salsa							
Pizza							

Each of the 26 items on the screener was selected because of its relationship to one or more dietary factors of interest in dietary guidance. This relationship is depicted above

Table 3. Demographic Characteristics of the Study Population (n=172)

<i>Characteristics</i>	<i>Mean (sd)</i>
Age (years)	26.3 (3.0)
Length of U.S. Residence (months)	29.2 (23.8)
Weight Gain (lbs.)^a	<i>Median (Q1, Q3)</i>
	10.0 (5.0, 15.0)
	<i>N (%)</i>
0	77 (44.8)
>0-15	72 (41.9)
16-30	19 (11.0)
>30	4 (2.3)
Weight Gain Rate (lbs./month)^a	0.4 (0.2, 0.8)
Gender	<i>N (%)</i>
<i>Male</i>	85 (49.4)
<i>Female</i>	87 (50.6)
Country of Origin	<i>N (%)</i>
<i>China</i>	105 (61.0)
<i>India</i>	38 (22.1)
<i>South Korea</i>	9 (5.2)
<i>Taiwan</i>	3 (1.7)
<i>Other</i>	17 (9.9)
Current Education Level	<i>N (%)</i>
<i>Master student</i>	79 (45.9)
<i>Ph.D. student</i>	93 (54.1)
Monthly Food Expenses (\$)	<i>N (%)</i>
<i>100-200</i>	24 (14.0)
<i>200-300</i>	72 (41.9)
<i>300-400</i>	56 (32.6)
<i>>400</i>	20 (11.6)

^a Non-normally distributed, median and interquartile range Q1, Q3 were reported

Table 4. Acculturation to American Culture and Original Culture and Their Association with Demographic Characteristics

	AAMAS -EA	Cultural Identity	Cultural Knowledge	Food consumption	Language	AAMAS -CO^b	Cultural Identity	Cultural Knowledge ^b	Food consumption	Language ^c
	Beta (95% CI)									Median (Q1, Q3)
Length of U.S. Residence (months)	0.02* (0.004, 0.036)	0.0	0.008** (0.002, 0.013)	0.003 (-0.004, 0.009)	0.008** (0.003, 0.013)	0.006** (0.002, 0.009)	-0.005* (-0.009, -0.001)	-0.006* (-0.01, -0.001)	0.003* (0.001, 0.005)	6.0 (5.8, 6.0)
China	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	6.0 (5.8, 6.0)
South Korea	2.2* (0.2, 4.2)	0.3 (-0.3, 0.8)	0.3 (-0.4, 1.0)	0.6 (-0.2, 1.5)	0.6* (0.08, 1.2)	0.4* (0.01, 0.8)	-0.6* (-1.2, -0.05)	-0.6* (-1.2, -0.03)	0.2 (-0.1, 0.4)	5.8 (5.0, 6.0)
India	2.2** (1.2, 3.2)	0.5** (0.2, 0.8)	0.02 (-0.4, 0.4)	0.7** (0.3, 1.1)	1.0** (0.7, 1.3)	0.08 (-0.1, 0.3)	-0.07 (-0.4, 0.2)	0.05 (-0.3, 0.4)	0.04 (-0.1, 0.2)	6.0 (5.6, 6.0)
Other	0.5 (-0.9, 1.9)	0.2 (-0.2, 0.6)	-0.3 (-0.9, 1.2)	-0.1 (-0.7, 0.5)	0.8** (0.4, 1.2)	-0.08 (-0.4, 0.2)	-0.3 (-0.7, 0.1)	0.3 (-0.2, 0.7)	-0.1 (-0.3, 0.09)	6.0 (5.9, 6.0)

AAMAS-EA: acculturation to American culture; AAMAS-CO: acculturation to original culture

^b Values were natural log transformed prior to linear regression; ^c Language was not normally distributed and Kruskal-Wallis was performed

*p<0.05; **p<0.01

Table 5. Estimates of Daily Dietary Intakes and Their Relation to Demographic Characteristics

	Calcium (mg) ^b	Added Sugar (tsp) ^b	Whole Grains (ounce equivalents) ^b	Fruits and Vegetables (cup equivalents) ^b	Fruits and Vegetables (except French fries) (cup equivalents) ^b	Fiber (g) ^d	Diary (cup equivalents) ^d	Added Sugar from Sugar Sweetened Beverages (tsp) ^d
Median (Q1, Q3)	785.4 (605.8, 982.5)	12.6 (8.7, 16.5)	0.5 (0.1, 1.1)	2.4 (2.0, 3.1)	2.4 (1.9, 3.0)	13.9 (11.5, 17.2)	1.6 (1.0, 2.0)	3.9 (1.1, 7.6)
Beta (95% CI)						Median (Q1, Q3)		
Length of U.S. Residence	0.0 (-0.003, 0.002)	-0.005 (-0.008, -0.001)**	-0.006 (-0.01, 0.003)	0.0 (-0.002, 0.002)	0.0 (-0.002, 0.002)	13.9 (11.5, 17.2)	1.6 (1.0, 2.0)	3.9 (1.1, 7.6)
Gender								
<i>Male</i>	Ref	Ref	Ref	Ref	Ref	14.8 (12.0, 17.9)	1.8 (1.1, 2.1)	4.9 (2.1, 8.8)
<i>Female</i>	-0.1* (-0.2, 0.0)	-0.3** (-0.5, -0.2)	0.04 (-0.4, 0.4)	-0.04 (-0.14, 0.06)	-0.02 (-0.1, 0.1)	13.4* (10.8, 16.6)	1.5 (1.0, 1.8)	2.8** (0.5, 4.9)
Country of Origin								
China	Ref	Ref	Ref	Ref	Ref	14.2 (11.3, 17.2)	1.6 (1.0, 1.9)	3.8 (1.1, 6.9)
South Korea	-0.2 (-0.4, 0.03)	0.02 (-0.4, 0.4)	-0.1 (-1.1, 0.8)	-0.16 (-0.39, 0.07)	-0.16 (-0.4, 0.08)	12.8 (9.8, 15.2)	1.0 (0.8, 1.2)	2.6 (0.9, 11.3)
India	0.2** (0.08, 0.4)	0.1 (-0.1, 0.3)	0.1 (-0.4, 0.6)	-0.06 (-0.2, 0.1)	-0.09 (-0.22, 0.05)	13.3 (12.0, 17.6)	1.8** (1.5, 2.6)	4.3 (1.6, 7.6)
Other	0.1 (-0.07, 0.3)	0.2 (-0.1, 0.5)	0.4 (-0.3, 1.1)	0.03 (-0.14, 0.21)	0.04 (-0.15, 0.22)	16.3 (11.5, 18.9)	1.9 (0.9, 2.1)	4.3 (0.6, 8.7)

^b Values were natural log transformed prior to linear regression; ^d Data were not normally distributed and Kruskal-Wallis was performed

*p<0.05; **p<0.01

Table 6. Psychological Health Status by Demographic Characteristics

	No SPD N (%)	SPD N (%)	OR (95% CI)
Education			
<i>Master student^e</i>	65 (82.3)	14 (17.7)	1.0
<i>Ph.D. student</i>	80 (86.0)	13 (14.0)	0.8 (0.3, 1.7)
Gender			
<i>Male^e</i>	76 (89.4)	9 (10.6)	1.0
<i>Female</i>	69 (79.3)	18 (20.7)	2.2 (0.9, 5.2)
Monthly Food Expenses (\$)			
<i>100-200^e</i>	19 (79.2)	5 (20.8)	1.0
<i>200-300</i>	59 (81.9)	13 (18.1)	0.8 (0.3, 2.7)
<i>300-400</i>	51 (91.1)	5 (8.9)	0.4 (0.1, 1.4)
<i>>400</i>	16 (80.0)	4 (20.0)	0.95 (0.2, 4.1)
Country of Origin			
<i>China^e</i>	91 (84.3%)	17 (15.7%)	1.0
<i>South Korea</i>	8 (88.9%)	1 (11.1%)	0.7 (0.1, 5.7)
<i>India</i>	33 (86.8%)	5 (13.2%)	0.8 (0.3, 2.4)
<i>Other</i>	13 (76.5%)	4 (23.5%)	1.6 (0.5, 5.7)

^eReference group

Table 7. The association between Acculturation Level and Dietary Intakes

	Calcium (mg)	Added Sugar (tsp)	Whole Grains (ounce equivalents)	Fruits and Vegetables (cup equivalents)	Fruits and Vegetables (no French fries) (cup equivalents)	Fiber (g)	Diary (cup equivalents)	Added Sugar from Sugar Sweetened Beverages (tsp)
	Beta (95% CI)							
AAMAS-EA¹	0.01 (-0.01, 0.03)	0.01 (-0.02, 0.04)	0.06 (-0.02, 0.1)	0.01 (-0.01, 0.03)	0.01 (-0.01, 0.03)	13.9 (11.5, 17.2)	1.6 (1.0, 2.0)	3.8 (1.1, 7.6)
AAMAS-EA²	-0.02 (-0.05, 0.02)	0.03 (-0.03, 0.08)	-0.1 (-0.3, 0.02)	-0.03 (-0.07, 0.01)	-0.03 (-0.07, 0.01)	-0.16 (-0.35, 0.04)	-0.12 (-0.3, 0.1)	-0.3 (-1.6, 0.9)
AAMAS-EA³	-0.01 (-0.06, 0.04)	0.03 (-0.04, 0.1)	0.2 (-0.01, 0.4)	0.03 (-0.02, 0.08)	0.04 (-0.01, 0.09)	0.02 (-0.03, 0.07)	0.01 (-0.07, 0.09)	-0.1 (-0.5, 0.3)
AAMAS-CO¹	0.006 (-0.02, 0.03)	-0.002 (-0.04, 0.04)	-0.06 (-0.15, 0.04)	0.01 (-0.02, 0.03)	0.01 (-0.01, 0.04)	13.9 (11.5, 17.2)	1.6 (1.0, 2.0)	3.8 (1.1, 7.6)
AAMAS-CO²	-0.003 (-0.05, 0.05)	0.06 (-0.01, 0.1)	0.05 (-0.1, 0.2)	0.02 (-0.03, 0.07)	0.02 (-0.03, 0.07)	0.01 (-0.04, 0.06)	-0.06 (-0.1, 0.02)	0.3 (-0.2, 0.7)
AAMAS-CO³	0.01 (-0.05, 0.07)	0.05 (-0.04, 0.1)	0.01 (-0.2, 0.2)	0.03 (-0.03, 0.08)	0.02 (-0.04, 0.08)	0.04 (-0.01, 0.1)	-0.03 (-0.1, 0.06)	0.5 (-0.04, 1.0)

¹Independent variable: AAMAS-EA (CO); ² Independent variable: AAMAS-EA (CO), gender and AAMAS-EA (CO)*gender; ³ Independent variable: AAMAS-EA (CO), country of origin and AAMAS-EA (CO)*country of origin.

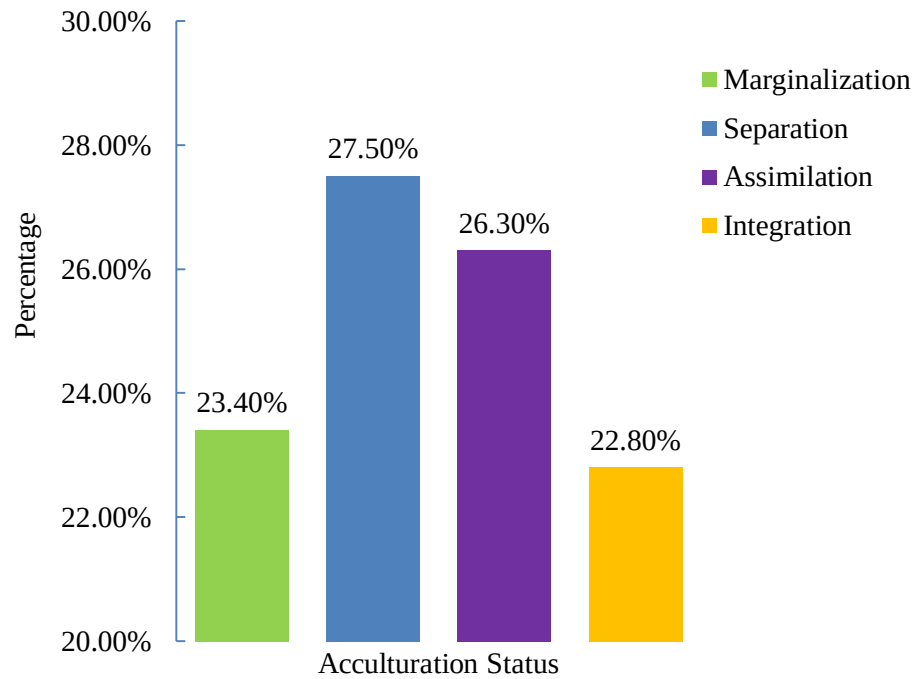
All models were multivariable adjusted

Table 8. Kessler 6 and Acculturation

	Kessler 6 Beta (95% CI)
AAMAS-EA	-0.04 (-0.3, 0.2)
Cultural Identity	-0.9 (-1.9, 0.09)
Language	-1.1 (-2.0, -0.1)*
Cultural Knowledge	0.2 (-0.6, 0.9)
Food Consumption	0.5 (-0.1, 1.1)
AAMAS-CO	1.1 (-0.3, 2.4)
Cultural Identity	-0.4 (-1.4, 0.6)
Language	-1.5 (-2.6, -0.3)*
Cultural Knowledge	-0.1 (-1.0, 0.8)
Food Consumption	1.5 (-0.4, 3.4)
Adjusted for age, gender, length of residence and country of origin	
*p<0.05	

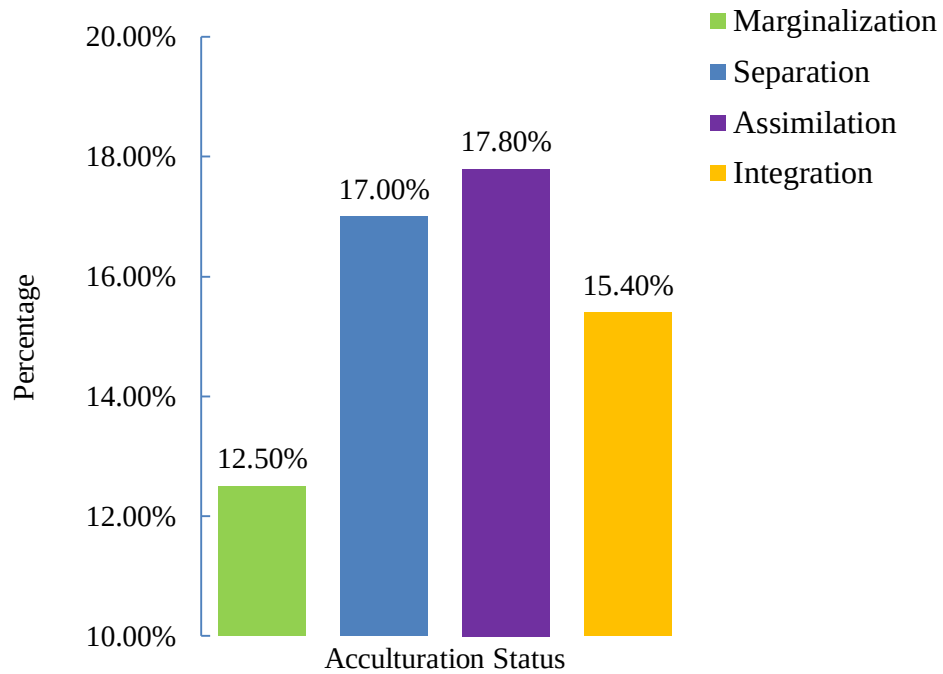
FIGURES

Figure 1. Percentage of Participants Across Four Acculturation Statuses



Acculturation status was categorized into four category based on the median of AAMAS-EA (EA; median=15) and AAMAS-CO (OC; median=21): marginalization (EA and CO<median); separation (CO $\geq$ median and EA<median); assimilation (CO<median and EA $\geq$ median); integration (CO $\geq$ median and EA $\geq$ median)

Figure 2. Percentage of Participants Having SPD Across Four Acculturation Statuses



The categorization of acculturation status is same as Figure 1

SPD categorization was based on the total score on Kessler 6. A score of 6-18 is indicative of without SPD and ≥ 19 is having SPD

REFERENCES

1. Kim BSK, Atkinson DR, Yang PH. The Asian values scale: development, factor analysis, validation, and reliability. *J Couns Psychol.* 1999; 46: 342-352.
2. Berry JW. Acculturation as varieties to adaptation. In A. M. Padilla (Ed.), *Acculturation: Theory, models, and some new findings* (pp. 9-25). 1980. Boulder, CO: Westview.
3. Lv N, Cason KL. Dietary pattern change and acculturation of Chinese Americans in Pennsylvania. *J Am Diet Assoc.* 2004; 104: 771–778.
4. Tseng M, Wright JD, Fang YC. Acculturation and dietary change among Chinese immigrant women in the United States. *J Immigrant Minority Health.* 2015; 17(2): 400-407.
5. Pan Y, Dixon Z, Himburg S, Huffman F. Asian students change their eating patterns after living in the United States. *J Am Diet Assoc.* 1999; 99:54–57.
6. Berry JW, Kim U, Minde T, Mok D. Comparative studies of acculturative stress. *International Migration Review.* 1987; 21: 491-511.
7. Benet-Martínez V. (in press). Multiculturalism: Cultural, personality, and social processes. In: Deaux K, Snyder M, ed. *Handbook of Personality and Social Psychology.* Oxford, United Kingdom: Oxford University Press.
8. Institute of International Education. International student enrollment trends, 2013-2014. In: Open Doors Report on International Educational Exchange. Available at: <http://opendoors.iienetwork.org/> Published 2014. Accessed February, 2012.
9. Berry JW. Marginality, stress and ethnic identification in an acculturated Aboriginal community. *J Cross Cult Psychol.* 1970; 1: 239-252.
10. Hyun J, Quinn B, Madon T, Lustig S. Mental health need, awareness, and use of counseling services among international graduate students. *J Am Coll Health.* 2007; 56: 109–118

11. Thurber CA, Walton EA. Homesickness and adjustment in university students. *J Am Coll Health*. 2012; 60(5): 415-419.
12. Han XS, Han XM, Luo QL, Jacobs S, Jean-Baptiste M. Report of a mental health survey among Chinese international students at Yale University. *J Am Coll Health*. 2013; 61: 1-8.
13. Redfield R, Linton R, Herskovits MJ. Memorandum for the study of acculturation. *Am Anthropol*. 1936; 38: 149-152.
14. Graves T. Acculturation, access and alcohol in a tri-ethnic community. *Am Anthropol*. 1967; 69: 306-321.
15. Berry JW. Immigration, acculturation, and adaptation. *APPLIED PSYCHOLOGY: AN INTERNATIONAL REVIEW*. 1997; 46 (1): 5-34.
16. Cortes DE, Rogler L H, Malgady RG. Biculturalism among Puerto Rican adults in the United States. *Am J Community Psychol*. 1994; 22:707–721.
17. Ramirez MIII. Assessing and understanding biculturalism–multiculturalism in Mexican-American adults. In: Martinez Jr JL, Mendoza RH, ed. *Chicano Psychology*. 2nd. New York: Academic Press; 1984: 77-93.
18. Chung RHG, Kim BSK, Abreu JM. Asian American multidimensional acculturation scale: development, factor analysis, reliability, and validity. *Cultur Divers Ethnic Minor Psychol*. 2004; 10(1): 66–80.
19. Sue S, Sue DW. Chinese-American personality and mental health. *Amerasia J*. 1971; 1:36–49.
20. Berry JW, Kim U, Power S, Young M, Bajaki M. Acculturation attitudes in plural societies. *PsycSCAN*. 1989; 38(2):185–206.
21. LaFromboise T, Coleman HLK, Gerton J. Psychological impact of biculturalism: evidence and theory. *Psychol Bull*. 1993; 114:395–412.
22. Celenk O, Van de Vijver F. Assessment of acculturation: issues and overview of measures. Online Readings in Psychology and Culture, 8(1). <http://dx.doi.org/10.9707/2307-0919.1105>.
23. Willett WC. Diet and health: What should we eat. *Science*. 264; 5158: 532–537. <http://www.jstor.org/stable/2883698>.

24. Filer LJ, Lauer RM, Leupker RV. Prevention of atherosclerosis and hypertension beginning in youth. New York: Lea & Febiger; 1994.
25. Powell KE, Caspersen CJ, Koplan JP, Ford ES. Physical activity and chronic disease. *Am J Clin Nutr.* 1989; 49: 999-1006.
26. Salonen JT, Puska P, Tuomilehto J. Physical activity and risk of myocardial infarction, cerebral stroke and death: a longitudinal study in Eastern Finland. *Am J Epidemiol.* 1982; 115: 526-537.
27. Eat well, 8 tips for making healthier choices. 2010. Food Standards Agency Website. www.food.gov.uk/sites/.../files/.../eatwell0708.pdf. Published October 2005. Updated February 2010. Accessed February 2015.
28. U.S. Department of Agriculture and U.S. Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office, December 2010.
29. Neuhouwer ML, Thompson B, Coronado GD, Solomon CC. Higher fat intake and lower fruit and vegetables intakes are associated with greater acculturation among Mexicans living in Washington State. *J. Am. Diet. Assoc.* 2004; 104: 51–57.
30. Wandel M, Raberg M, Kumar B, Holmboe-Ottesen G. Changes in food habits after migration among South Asians settled in Oslo: the effect of demographic, socio-economic and integration factors. *Appetite.* 2008; 50: 376–385.
31. Lesser IA, Gasevic D, Lear SA. The Association between acculturation and dietary patterns of South Asian immigrants. *PLoS ONE.* 2014; 9(2): e88495. doi:10.1371/journal.pone.0088495.
32. Colić Barić I, Štalić Z, Lukešić Ž. Nutritive value of meals, dietary habits and nutritive status in Croatian university students according to gender. *Int J Food Sci Nutr.* 2003; 54(6): 473-484.
33. Grace TW. Health problems of college students. *J Am Coll Health.* 1997; 45: 243–250.
34. Johansen A, Rasmussen S, Madsen M. Health behaviour among adolescents in Denmark: Influence of school class and individual risk factors. *Scand J Public Health.* 2006; 34: 32-40.

35. McLellan L, Rissel C, Donnelly N, et al. Health behavior and the school environment in New South Wales, Australia. *Soc Sci Med*. 1999; 49: 611–619.
36. Vuille J-C, Schenkel M. Social equalization in the health of youth – the role of the school. *Eur J Public Health*. 2001; 11: 287–293.
37. Almohanna A, Barbeau W, Conforti F, Eigel W. Impact of dietary acculturation on the food habits, weight, blood pressure, and fasting blood glucose levels of international college students. *J Am Coll Health*. 2015; doi: 10.1080/07448481.2015.1025075.
38. Kremmyda LS, Papadakia A, Hondrosb G, Kapsokefaloub M, Scott JA. Differentiating between the effect of rapid dietary acculturation and the effect of living away from home for the first time, on the diets of Greek students studying in Glasgow. *Appetite*. 2008; 50: 455–463.
39. Zhang N, Dixon DN. Acculturation and attitudes of Asian international students toward seeking psychological help. *J Multicult Couns Devel*. 2004; 31: 205–222.
40. Kim BSK, Omizo MM. Behavioral enculturation and acculturation, psychological functioning, and help-seeking attitudes among Asian American adolescents. *Asian Am J Psychol*. 2010; 1(3): 175–185.
41. Nguyen HH, Mess ´e LA, Stollak GE. Toward a more complex understanding of acculturation and adjustment: Cultural involvements and psychosocial functioning in Vietnamese youth. *J Cross Cult Psychol*. 1999; 30(1): 5–31.
42. Hilario CT, Vo DX, Johnson JL, Saewyc EM. Acculturation, gender, and mental health of Southeast Asian immigrant youth in Canada. *J Immigrant Minority Health*. 2014; 16:1121–1129.
43. Hwang W, Ting JY. Disaggregating the effects of acculturation and acculturative stress on the mental health of Asian Americans. *Cultur Divers Ethnic Minor Psychol*. 2008; 14(2): 147–154.
44. Zheng X, Sang D, Wang L. Acculturation and subjective well-being of Chinese students in Australia. *J Happiness Stud*. 2004; 5(1): 57–72.

45. Gupta A, Leong F, Valentine JC, Canada DD. A meta-analytic study: the relationship between acculturation and depression among Asian Americans. *Am J Orthopsychiatry*. 2013; 83: 372–385.
46. Nap A, van Loon A, Peen J, van Schaik DJ, Beekman AT, Dekker JJM. The influence of acculturation on mental health and specialized mental healthcare for non-western migrants. *Int J Soc Psychiatry*. 2014; 1-9. doi: 10.1177/0020764014561307.
47. Sandhu DS. An examination of the psychological needs of the international students—implications for counseling and psychotherapy. *Int J Adv Couns*. 1994; 17: 229–239.
48. Mori S. Addressing the mental health concerns of international students. *J Couns Dev*. 2000; 78: 137–144.
49. Cadieux RAJ, Wehrly B. Advising and counseling the international student. *New Directions for Student Services*. 1986; 36: 51–63.
50. Thomas K, Althen G. Counseling foreign students. In: Pedersen PB, Draguns JG, Lonner WJ, Trimble JE, ed. *Counseling Across Cultures*. 3rd ed. Honolulu, HI: University of Hawaii Press; 1989: 205-241.
51. Pedersen PB. Counseling international students. *Couns Psychol*. 1991; 19: 10–58.
52. Kessler RC, Barker PR, Colpe LJ, Epstein JF, Gfroerer JC, Hiripi E, et al. Screening for serious mental illness in the general population. *Arch Gen Psychiatry*. 2003; 60(2): 184-189.
53. Cruz FAD, Lao BT, Heinlein C. Level of acculturation, food intake, dietary changes, and health status of first-generation Filipino Americans in Southern California. *J Am Assoc Nurse Pract*. 2013; 25: 619–630.
54. Johnson-Kozlow M, Matt GE, Rock CL, dela Rosa R, Conway TL, Romero RA. Assessment of dietary intakes of Filipino Americans: Implications for food frequency questionnaire design. *J Nutr Educ Behav*. 2011; 43(6), 505–510.
55. Kim MJ, Lee SJ, Yang-Heui A, Bowen P, Lee H. Dietary acculturation and diet quality of hypertensive Korean Americans. *J Adv Nurs*. 2007; 58(5): 436–445.

56. Sukalakamala S, Brittin HC. Food practices, changes, preferences and acculturation of Thais in the United States. *J Am Diet Assoc.* 2006; 106(1): 103–108.
57. Satia JA, Patterson RE, Kristal AR, Hislop TG, Yasui Y, Taylor VM. Development of scales to measure dietary acculturation among Chinese-Americans and Chinese-Canadians. *J Am Diet Assoc.* 2001; 101(5): 548–553.
58. Atkinson DR, Gim RH. Asian-American cultural identity and attitudes toward mental health services. *J Couns Psychol.* 1989; 36: 209-212.
59. Gu SF. An acculturation scale for Asian international students: development and validation. 2007.
<http://docs.lib.purdue.edu/dissertations/AAI3344000/>.
60. Shim G, Freund H, Stopsack M, K ämmerer A, Barnow S. Acculturation, self-construal, mental and physical health: An explorative study of East Asian students in Germany. *Int J Psychol.* 2014; 49(4): 295–303.
61. Behrens K, del Pozo MA, Großhennig A, Sieberer M, Graef-Calliess IT. How much orientation towards the host culture is healthy? Acculturation style as risk enhancement for depressive symptoms in immigrants. *Int J Soc Psychiatry.* 2014. doi: 10.1177/0020764014560356.

Appendix A
IRB LETTER



RESEARCH OFFICE

210 Hullihen Hall
University of Delaware
Newark, Delaware 19716-1551
Ph: 302/831-2136
Fax: 302/831-2828

DATE: December 5, 2014

TO: Heng Jiang, Master
FROM: University of Delaware IRB

STUDY TITLE: [682111-1] Acculturation, diet and psychological status of Asian international students at the University of Delaware

SUBMISSION TYPE: New Project

ACTION: DETERMINATION OF EXEMPT STATUS
DECISION DATE: December 5, 2014

REVIEW CATEGORY: Exemption category # (2)

Thank you for your submission of New Project materials for this research study. The University of Delaware IRB has determined this project is EXEMPT FROM IRB REVIEW according to federal regulations.

We will put a copy of this correspondence on file in our office. Please remember to notify us if you make any substantial changes to the project.

If you have any questions, please contact Nicole Farnese-McFarlane at (302) 831-1119 or nicolefm@udel.edu. Please include your study title and reference number in all correspondence with this office.

Appendix B
RECRUITMENT EMAIL

Dear UD Asian international students:

You are invited to participate in this survey because you are an Asian international student. Your responses will help us to understand the association of acculturation, diet and psychological status among Asian international students at UD. In addition, survey responses will be used for my master thesis.

This survey will take approximately 15 minutes to complete. You will be entered into the drawing for a \$100 Barnes & Noble gift card once you have completed the survey. Your participation in this study is completely voluntary. You must be at least 18 years old to participate. You will be anonymous through this survey and all responses will be kept confidential. Your email address will only be used for the drawing. This survey has been approved by University of Delaware IRB# 682111-1. Clicking the link below (or you could copy and paste the link to the browser) indicates that you voluntarily agree to participate in this survey.

Follow this link to the Survey:

[Take the Survey](https://delaware.qualtrics.com/WRQualtricsSurveyEngine/?Q_SS=6mPCOVl4sn6dwUt_8c4cZyKDWM7Qkpn&_=1)

Or copy and paste the URL below into your internet browser:

https://delaware.qualtrics.com/WRQualtricsSurveyEngine/?Q_SS=6mPCOVl4sn6dwUt_8c4cZyKDWM7Qkpn&_=1

I sincerely appreciate your time for completing this survey. If you have any questions about the research study, please contact me, Heng Jiang (jhsmile@udel.edu) or my faculty advisor, Dr. Sheau Ching Chai (scchai@udel.edu).

Heng Jiang

Graduate student, University of Delaware

Department of Behavioral Health and Nutrition

University of Delaware

Appendix C

DEMOGRAPHIC QUESTIONNAIRE

1. What is your gender?
Male Female
2. What is your age?
3. What is your current education level?
 - Freshmen
 - Sophomore
 - Junior
 - Senior and >4 years of college
 - Master student
 - Ph.D. student
4. Where are you from?
 - China
 - India
 - South Korea
 - Japan
 - Hong Kong
 - Taiwan
 - Other (please specify)
5. How long (in months) have you been in U.S.?

6. What is your monthly expenses only on food?

- ☐ \$100-200
- ☐ \$200-300
- ☐ \$300-400
- ☐ More than \$400

7. Did you gain weight since your arrival in U.S.?

- ☐ Yes _____ lbs.
- ☐ No

7a. How much weight did you gain since your arrival in U.S.? **Please report in pounds (lbs.)**

Appendix D

KESSLER 6

1. About how often during the past 30 days did you feel nervous?
 - ☐ None of the time
 - ☐ A little of the time
 - ☐ Some of the time
 - ☐ Most of the time
 - ☐ All of the time
2. About how often during the past 30 days did you feel hopeless?
 - ☐ None of the time
 - ☐ A little of the time
 - ☐ Some of the time
 - ☐ Most of the time
 - ☐ All of the time
3. About how often during the past 30 days did you feel restless or fidgety?
 - ☐ None of the time
 - ☐ A little of the time
 - ☐ Some of the time
 - ☐ Most of the time
 - ☐ All of the time
4. About how often during the past 30 days did you feel so depressed that nothing could cheer you up?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

5. About how often during the past 30 days did you feel that everything was an effort?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

6. About how often during the past 30 days did you feel worthless?

- None of the time
- A little of the time
- Some of the time
- Most of the time
- All of the time

Appendix E

ASIAN AMERICAN MULTIDIMENSIONAL ACCULTURATION SCALE AAMAS-EA

These next questions are going to ask about your feelings to Americans/American culture. Please indicate how much these descriptions applied to you using scale from 1 (not very much) to 6 (very much). Please be as honest as possible.

Cultural identity

1. How much do you identify with Americans?
2. How much do you feel you have in common with Americans?
3. How proud are you to be a part of American?
4. How much do you interact and associate with Americans?
5. How much would you like to interact and associate with Americans?
6. How **negative** do you feel about Americans?-reversed score

Language

1. How well do you speak English?
2. How well do you understand English?
3. How well do you read and write in English?

Cultural knowledge

1. How knowledgeable are you about the culture and traditions of America?
2. How knowledgeable are you about the history of America?

3. How much do you actually practice the traditions and keep holidays of America?

4. How often do you listen to music or look at movies and magazines from America?

Food consumption

1. How much do you like the food of America?

2. How often do you actually eat the food of America?

Appendix F

ASIAN AMERICAN MULTIDIMENSIONAL ACCULTURATION SCALE AAMAS-CO

These next questions are going to ask about your feelings to your Culture of Origins. Please indicate how much these descriptions applied to you using scale from 1 (not very much) to 6 (very much). Please be as honest as possible.

Cultural identify

1. How much do you identify with the people of your original country?
2. How much do you feel you have in common with the people of your original country?
3. How proud are you to be a part of the people of your original country?
4. How much do you interact and associate with the people of your original country?
5. How much would you like to interact and associate with the people of your own country?
6. How **negative** do you feel about the people of your own country?

Language

1. How well do you speak your language of origin?
2. How well do you understand your language of origin?
3. How well do you read and write in your language of origin?

Cultural knowledge

1. How knowledgeable are you about the culture and traditions of your country of origin?
2. How knowledgeable are you about the history of your country of origin?
3. How much do you actually practice the traditions and keep holidays of your country of origin?
4. How often do you listen to music or look at movies and magazines from your country of origin?

Food consumption

1. How much do you like the food of your country of origin?
How often do you actually eat the food of your country of origin?