Health and Health-related Behaviors before and after Coming to the U.S. among Newly Arrived International Students

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Abstract

Study-related migration is a major component of international migration, but less is known about the health and acculturation processes of international students. To capture the early stages of adaptation and integration into new environments, we sampled newly arrived international students (n=120) at two large universities in the Southeast United States within one month of their arrival and conducted surveys and anthropometric measurements to learn about their health and health-related behaviors. Students were on average 25 years old, 58% were women, 42% were from East Asia. Direct measurements showed that 66% had a normal body weight, 8% were underweight, 21% were overweight, 5% were obese and 24% had a high waist circumference. Students from South Asia were most often overweight or obese. Pre-migration diets had been quite diverse, with the highest diversity among East Asians and lowest diversity and most frequent consumption of high sugar and fat foods among South Asians.

INTRODUCTION

Foreign-born individuals represent about 13% of the U.S. population, approximately 40 million people. [1] In the era of globalization, where higher education has increased dramatically, international students are a leading force of global migration. In the United States (U.S.), international students are a major component of international migration and a diverse and growing population. There are currently 1.1 million international students in the U.S., with almost 0.3 million newly arrived this academic year. [2] More than half come from Asia, with the top ten places of origin of international students in the U.S being China, India, South Korea, Saudi Arabia, Canada, Vietnam, Taiwan, Japan, Mexico, and Brazil. [2]

International students experience major lifestyle changes upon migration, including having to adapt to new educational and social environments. After arrival in the U.S., international students are exposed to different socio-cultural environments compared to their home countries. The process of adjustment and adaptation to a new culture, referred to as acculturation, may encompass physical, physiological and health-behaviors changes. [3] These changes among international student may be occurring through the adoption of health- related ideas, values, and behaviors that are different from former lifestyles.[4,5] Studies about international students have reported that migration is associated with negative changes in diet and health, such as high alcohol intake, increased BMI and decreased physical activity [6-8]. Compared with local students, studies have reported international students to have a higher risk for weight gain, stress, and psychological problems.[9,10]

Studies on populations migrating from developing countries to developed countries have shown health and health-behaviors in their home countries are usually healthier than those in developed

countries; yet these behaviors converge towards or become worse than those of the host country population. [11,12] Most studies on health and health-behaviors of international students have however been limited to small samples [3,13], only undergraduate students [3], only graduate students [14], or to students from specific regions (Asia,[15] Gulf countries [16]), or to select health-behaviors namely diet, drinking, food preference, and physical activity. [3,13] Less is known about other health-related behaviors of international students including sleep, meal practices, dietary restrictions before and after moving from their home country. Understanding pre-migration and post-migration changes will shed light on the very early stages of adaptation and integration into new environments. Furthermore, little is known about international students' perceptions of foods and beverages related to healthfulness and newness of foods. The presence of and access to new foods and beverages may influence international students' food perceptions and preference and provides insights to the food environments in which they now live. [17]

In this study, we aimed to explore how health and health-related behaviors, specifically body weight and factors associated with diet, physical activity, and sleep, change with migration among international students. We recruited a newly arrived cohort of arriving in the U.S. for the 2018-19 academic year and interviewed them within 1 month of arrival. Below, we will describe what we learned from this first wave of data; by PAA 2019, we will have followed them up at 3 months and 6 months post-arrival.

METHODS

Study setting

We recruited 120 newly arrived international students within a month of arrival in the US. These students were recruited at the international student orientation fairs of two major universities in

the Southeast in summer 2018. Within two days of recruitment, participants completed a self-administered health survey in English which we developed drawing on instruments created for our previous research with newly arrived immigrant youths and adults. We also measured the participant's height, weight, and waist circumference. The Institutional Review Board at Emory University approved the study.

Data and Research Methods

Health and health-behaviors survey

The survey consisted of questions on socio-demographic characteristics including age, gender, place of birth, migration history, degree program, living arrangements, and financial support of study; a major component of the survey pertained to health, including questions about health-behaviors before and after arrival in the U.S. Specifically, we asked participants about their diet, physical activity, sleep, and screen time before they arrived in the U.S. Screen time was defined as time spent watching television or looking at their computer, phone, or tablet. The survey included a 26-item Food Frequency Questionnaire (FFQ) where participants were asked to report their usual monthly food consumption while in their home country. The FFQ comprised key commonly foods and beverages. Participants were asked "How often in a month did you usually eat or drink the item while you were in your home country". The responses options for the FFQ included every day, few times a week, once a week, few times a month, once a month, and never. The survey also included questions on current eating behaviors such as where the majority of meals are got from and the place where foods and beverages are purchased and questions on perceptions of food and body image. Participants were asked to list three foods that they discovered upon arriving in the U.S., three foods that they considered healthy, three foods that

they considered unhealthy, and three foods chains that they reported seeing both in their home country and in the U.S.

Anthropometric measurements

Trained interviewers measured participants' height, weight, and waist circumference using standardized procedures. Height was measured in centimeters using a stadiometer, weight was measured in kilograms using a digital scale, and waist circumference was measured in cm to the nearest 0.25 cm using a standard tape measure. We took two readings for each measurement and calculated the average of both readings.

Statistical analysis

We analyzed data using Statistical Analysis Software (SAS® version 9.4; SAS Institute, Cary, NC). We conducted descriptive analysis to check the distribution and completeness of all variables. Socio- demographic and dietary responses were coded and categorized into variables for analysis. To look at difference in health and health-behaviors between participants, we collapsed the participants' country of birth to create a region variable with four categories: Europe and South Americas, South Asia, East Asia, and Other.

We calculated BMI as weight in kg divided by height squared (m^2) and used the WHO definition to classify weight status as underweight (BMI <18.5), normal weight (BMI 18.5-24.9), overweight (BMI 25-29.9), and obese (BMI ≥30). We also calculated mean and standard deviation for anthropometric measurements (height, weight, BMI, waist circumference, and high waist circumference). High waist circumference was defined for males as waist circumference ≥ 90 cm and for females as ≥ 80 cm. BMI has been typically used to define the degrees of

overweight and obesity, [18,19] whereas waist circumference (WC) is a better predictor of abdominal fat than BMI. [20,21]

For analysis, consumption frequencies in the FFQ were coded as a measure of times per week: daily=7, few times per week=3, once a week=1, few times a month=0.5, once a month=0.25, and never=0. To look at overall food consumption patterns, we created a diet diversity score by providing a score of 1 if the person consumed the food group and 0 if he or she did not consume each food group and summing the scores for the 26 food groups in the FFQ. The diet diversity score ranged from 0 to 26. Diet diversity is the variety of foods consumed or available in a household and is considered a proxy for nutrient adequacy of the diet of individuals. We calculated the overall diet diversity score and the diet diversity score of participants by region. The distribution of intake of each item was first examined. For all variables of interest, we examined overall distributions and differences by region. We used analysis of variance (ANOVA) and chi-square tests for bivariate comparisons between subgroups of international students.

We conducted word cloud analysis for the four questions that asked participants to list three foods of beverages each that 1) they discovered upon arriving in the U.S., 2) considered healthy, 3) considered unhealthy, and 4) reported foods chains both in their home country and in the U.S. We determined the most frequently mentioned foods and beverages in each category.

Preliminary Results

The demographic and health-related characteristics of the newly arrived international students are shown in **Table 1**. On average, the students were 25 years old, 58% were female, and 73%

were enrolled in a Masters' degree program. The majority of newly arrived international students were from East Asia (42%), lived with a roommate or a partner (87%), and were self-funding their studies in the U.S. (49%).

Students from different regions of the world had different situation in their lives in the U.S. The majority of students who lived alone or with a roommate or partner was from East Asia (60% and 43% respectively), while students living with family were most frequently from other regions (ie. Ghana, Iraq, Singapore, Israel, Nigeria). Over half of self-funded students were from East Asia (56%), while the majority of students funded by their home country were from Europe & Americas (56%), and the largest proportion of students on a scholarship were from South Asia (42%).

In terms of health characteristics, 66% had a normal body weight, but 8% were underweight, 21% were overweight, and 5% were obese; 24.2% had a high waist circumference. BMI, weight status, and waist circumference were significantly different among students from different regions ($p < 0.05$); students from South Asia had the highest weight (72 kg), BMI (26 kg/m^2), and waist circumference (87 cm) while students from East Asia had the lowest weight (58 kg), BMI (21 kg/m^2), and waist circumference (73 cm). We show the weight status of newly arrived international students in the US in **Figure 1**.

Weekly food consumption (times/week) and dietary diversity of the international students before arriving in the U.S. are shown in **Table 2**. Students from all regions had fairly diversified diets, with the average diet diversity score (range 0-26) being 23.7; dietary diversity was highest among East Asians. The most commonly consumed foods were vegetables (9.8 times per week),

meat (7.6 times/week), and breads and cereals (4.9) and grains (4.9 times per week). Soda and snacks were seldom consumed (1.3 times and 1.4 times per week, respectively). Consumption of most foods was significantly different across regions. Students from East Asia most frequently consumed meat, vegetables, eggs, soup, and fermented foods or drinks; students from South Asia most frequently consumed grains, legumes and pulses, fats (oil, butter or clarified butter), nuts and seeds; students from Europe and the Americas most frequently consumed alcohol.

The health-related behaviors of newly arrived international students since being in the US are shown in **Table 3**. Since arriving in the US, students reported 7.5 hours of sleep per night, with 52% reporting no change in sleep duration. Since arriving in the US, student reported spending 4.4 hours per day of screen time and almost half reported less screen time than in their home country. There was no difference in sleep and screen time behaviors among students from different regions. Since being in the U.S., most students cooked their own meals (84%). The majority of student did not avoid or restrict any foods or beverage, but 27% did not eat meat (pork, beef, poultry or seafood), 13% did not consume alcohol, and 4% did not consume dairy products or eggs. Students from South Asia most often had dietary restrictions.

We show results of the word cloud analysis in **Figures 2-5**. According to the newly arrived international students in the U.S., Burger King, Dominos, and Chili's were the most common food chains that were both in the US and in their home country. The most frequently mentioned new foods that international student discovered were sodas, jambalaya, guacamole, Mexican-food, hot-dog, grits, and beef. The newly arrived international students in the U.S most frequently reported vegetables, salads, and fruits frequently mentioned as healthy and soda, coke, and french-fries as unhealthy foods and beverages.

Discussion

To capture the early stages of adaptation and integration into new environments, we sampled 120 newly arrived international students at two large universities in the Southeast U.S within one month of their arrival and conducted surveys and anthropometric measurements to learn about their health and health-related behaviors. Direct measurements showed that 66% had a normal body weight, but 8% were underweight, 21% were overweight, 5% were obese and 24% had a high waist circumference. Students from South Asia were most often overweight or obese. Pre-migration diets had been quite diverse, with the highest diversity among East Asians and lowest diversity and most frequent consumption of high sugar and fat foods among South Asians.

Compared with studies that have looked at health outcomes and health-behaviors of people who have already resided in the U.S. for many years[22], our study captured both pre-migration health-behaviors such as diet, physical activity, sleep and screen time use and post-migration health-behaviors within a month of arrival. As international students move from one country to another, they may adopt and assimilate to the customs and culture of their hosts. This adoption may affect their health behaviors which implications for their health. [14] In our study, overall pre-migration diet diversity score (range 0-26) was 23.7 and was the highest among international students from East Asia. We learned that students from South Asia had the most dietary restrictions with the most prominent being meat restrictions. Dietary restrictions could be a result of cultural values and concerns surrounding what foods are acceptable in the diet.

Previous studies of international students have been limited to evaluating certain aspects of the diet using only FFQs [16] or diet habits questionnaires [14] or evaluating food experiences using qualitative approaches such the photovoice method [13]. In our study, we not only looked at food

consumption and dietary behaviors, but also included qualitative questions to understand international students' perceptions of foods and beverages related to healthfulness and newness of foods. The addition of qualitative questions served as a useful adjunct to the quantitative findings. The creation of a diet diversity score enabled us to look at the variety of food groups consumed by international students from different regions. There was a correlation between the foods and beverages listed as healthy and unhealthy and the frequency of consumption of items listed by international students. For instance, soda and coke were the most frequently mentioned unhealthy foods and beverages and were also seldom consumed by international students.

Even so, we found varying weight status, food consumption patterns, and dietary restrictions on arrival among international students. The finding that international students from South Asia were most often overweight or obese and had the most frequent consumption of high sugar and fat foods is in line with studies that report susceptibility to overweight and obesity among people from developing countries that have migrated to developed countries [23,24]. As such, migrant populations maybe arriving already in poor health from home country even though newly arrived migrants are reported to be healthier than the host population – the phenomenon called the 'Healthy Migrant Effect'. [22,25] While acculturation is considered to have positive effects for immigrants, including better socioeconomic profiles and increased occupational opportunities, there is mixed evidence of unhealthy assimilation or deterioration in health profiles with longer duration in the U.S. Changes in health behaviors over time is believed to contribute to improving or worsening the overall health status of immigrants. [26] While several studies have indicated worsening health profiles with longer duration in the U.S [27-29], a review of the empirical support for the negative acculturation theory among Asian immigrants to determine if and when it is an

appropriate interpretation for duration patterns found no consistent evidence that health behaviors decline with time. [30]

The strengths of our study included our ability to recruit 120 students from across the world that were enrolled in undergraduate, master and doctoral degree programs in two large Universities in the U.S. More importantly, we were able to evaluate several health-behaviors both pre-migration and within a month after arrival in the U.S. The food healthfulness perception questions and questions on food chains common to their home country and in the US and foods newly discovered in the U.S. provide additional insights to international students integration in the U.S. and provide information about the food environment in their home country and in the U.S. While we will be able to evaluate the change in health and health-related behaviors among international students only after our follow-up data collection, our baseline results indicate the need for accessible, targeted, culturally-sensitive health promotion and early intervention programs. As international students arrive at colleges and universities, campuses could adopt strategies to better help their international students build lifelong healthy behaviors. For instance, nutrition professionals at universities could facilitate a positive food environment.

Next steps

Before PAA, we will conduct multivariate analysis to evaluate the association between region, weight status, dietary intake, and other health-related behaviors including sleep, physical activity, and screen time. We will consider weight status as the outcome variable and age, sex, and region as the main independent variables. The multivariate regression models will be adjusted for health-related behaviors including diet diversity score, sleep, physical activity, and screen time.

In addition, we will collect follow-up data from at the international student 3 months and 6 months after their arrival in the US. Participants will contacted to come for their 3-month study visit in October-November 2018 and 6-month study visit February-March 2019. Participants will be asked to complete a survey which will include some repeated questions and some new questions. We should have preliminary data from both rounds of follow-up by PAA 2019. The longitudinal data will enable us to evaluate change in health and health-related behaviors among newly arrived international students in the early stages of acculturation. The study will continue to follow respondents to examine changes in weight status and health behaviors over the first six months of living in the U.S.

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Tables and Figures

Table 1. Demographic and health characteristics among newly arrived internationals students in the U.S.

Characteristic (%, 95% CI)	Overall (n=120)	Europe & Americas (n=25)	South Asia (n=34)	East Asia (n=50)	Other [a] (n=11)
Demographic Characteristics					
Age (years) [b]	25.1 (24.3, 25.8)	24.0 (22.6, 25.5)	26.5 (25.2,27.8)	24.4 (23.2, 25.6)	26.4 (23.3, 29.4)
Sex					
Male	42.5 (33.9, 51.6)	21.6 (12.3, 35.0)	35.3 (23.4, 49.4)	35.3 (23,4, 49.4)	7.8 (2.9,19.3)
Female	57.5 (48.4,66.1)	20.3(12.3, 31.5)	23.2 (14.6,34,7)	46.4 (34.9, 58.2)	10.1(4.9, 19.9)
Degree program enrolled					
Undergrad	20.8 (14.4, 29.1)	52.0 (32.9, 70.5)	4.0 (0.5, 23.9)	28.0 (13.9, 48.4)	16.0 (6.1, 35.9)
Master	72.5 (63.8, 79.8)	10.3 (5.4, 18.8)	33.3 (24.2, 44.0)	49.4 (39.0, 60.0)	6.9 (3.1, 14.6)
Doctoral	6.7 (3.3, 12.8)	37.5 (12.4, 71.8)	50.0 (19.8, 80.2)	0.0	12.5 (1.7, 54.3)***
Living situation in the U.S.					
Alone	4.2 (1.7, 9.8)	20.0 (26.6, 69.6)	0.0	60.0 (19.7, 90.1)	20.0 (2.6, 69.6)
With roommate/partner	86.6 (79.1, 91.6)	22.3 (15.3, 31.5)	30.1 (22.0, 39.7)	42.7 (33.5, 52.5)	4.9 (2.0, 11.2)
With family	9.2 (5.2, 16.0)	9.1 (12.4, 44.4)	18.2 (4.5, 51.1)	27.3 (8.9, 58.9)	45.5 (20.1, 73.4) ***
Scholarship and/or aid					
Scholarship from US university	43.3 (34.7, 52.4)	26.9 (16.6, 40.6)	42.3 (29.6, 56.1)	23.1 (13.5, 36.5)	7.7 (2.9, 18.9) ***
Aid from home country	13.3 (8.3, 20.8)	56.3 (32.2, 77.7)	0.0	37.5 (17.7, 62.5)	6.3 (0.9, 34.0) ***
Self-funded/family support	49.2 (40.3, 58.1)	15.3 (8.1, 26.9)	18.6 (10.6, 30.8)	55.9 (43.0, 68.1)	10.2 (4.6, 21.0)**
Health Characteristics					
BMI (kg/m^2) [b]	22.9 (22.1, 23.6)	22.7 (21.5, 23.8)	25.6 (24.0, 27.1)	21.0 (20.3, 21.7)	22.9 (19.7, 26.1) ***

Weight status					
Underweight (BMI ≤18.5)	7.9 (4.1, 14.6)	22.2 (5.5, 58.3)	11.1 (1.5, 50.5)	55.6 (24.9, 82.5)	11.1 (1.5, 50.5)
Normal weight (BMI 18.5-24.9)	65.8 (56.5, 74.0)	26.7 (17.8, 37.9)	16 (9.3, 26.2)	49.3 (38.1, 60.6)	8 (3.6, 16.8)
Overweight (BMI 25-29.9)	21.1(14.5, 29.6)	8.3 (2.1, 28.2)	66.7 (45.9, 82.5)	12.5 (4.0, 32,7)	12.5 (4.0, 32.7)
Obese (BMI ≥ 30)	5.3 (2.4, 11.3)	16.7 (2.2, 63.7)	66.7 (26.5, 91.8)	0.0	16.7 (2.2, 63.7)***
Weight (kg) [b]	65.0 (62.2, 67.7)	67.4 (62.0, 72.8)	71.8 (67.2, 76.5)	58.2 (54.9, 61.5)	66.4 (50.9, 81.8) ***
Height (cm) [b]	168.0 (166.0, 170.0)	172.1 (166.9, 177.2)	167.7 (164.4, 171.0)	165.9 (163.0, 168.8)	168.3 (159.9, 176.7)
Waist circumference (cm) [b]	79.2 (76.9, 81.5)	79.0 (75.2, 82.7)	87.5 (82.5, 92.6)	73.3 (71.0, 75.6)	79.2 (68.6, 89.8) ****
High waist circumference [c]	24.2 (17.3, 32.7)	6.9 (1.7, 24)	75.9 (57.1, 88.1)	3.4 (0.5, 21.1)	13.8 (5.2, 31.7)***

*P <0·05, **P <0·01, ***P<0·001 for differences among participants from different regions.

[a] Other region participants were from Ghana, Iraq, Singapore, Israel, and Nigeria.

[b] Values are mean and 95% CI.

[c] High waist circumference was defined for males as waist circumference ≥ 90 cm and for females as ≥ 80 cm.

Table 2. Weekly consumption (times/week) of foods and beverages among internationals students while in their home country.

		Consumption by region (times/week)			
Food groups [a]	**Overall Consumption (times/week)**	**Europe & Americas (n=25)**	**South Asia (n=34)**	**East Asia (n=50)**	**Other** [b] **(n=11)**
Usual food groups					
Breads and cereals	4.9 (4.3, 5.5)	5.3 (3.9, 6.8)	4.8 (3.6, 6.0)	4.4 (3.5, 5.3)	6.1 (3.6, 8.5)
Grains	4.9 (4.5, 5.3)	2.2 (1.5, 3.0)	5.9 (5.3, 6.6)	5.8 (5.2, 6.3)	3.9 (2.4, 5.3)***
Legumes and pulses	2.1 (1.8, 2.5)	1.2 (0.6, 1.8)	3.5 (2.7, 4.4)	1.9 (1.3, 2.4)	1.3 (0.6, 2.1) ***
Dairy	4.8 (4.3, 5.2)	5.3 (4.4, 6.2)	5.3 (4.5, 6.2)	4.4 (3.7, 5.2)	3.4 (1.8, 5.1)
Eggs	3.7 (3.3, 4.2)	3.1 (2.1, 4.0)	3.2 (2.3, 4.2)	4.7 (4.1, 5.3)	2.2 (1.4, 3.0) **
Meats [c]	7.6 (6.7, 8.5)	6.1 (4.8, 7.5)	3.4 (2.2, 4.7)	10.9 (9.6, 12.1)	8.8 (5.0, 12.6) ***
Fruit	4.2 (3.8, 4.7)	4.3 (3.3, 5.3)	4.5 (3.6, 5.4)	4.3 (3.6, 4.9)	3.4 (2.6, 4.2)
Vegetables	9.8 (9.0, 10.6)	8.6 (6.6, 10.6)	10.4 (8.6, 12.1)	10.8 (9.8, 11.7)	6.1 (3.7, 8.5) **
Sweets, desserts, sugar or honey	5.5 (4.7, 6.2)	5.5 (3.9, 7.1)	7.1 (5.6, 8.6)	4.6 (3.6, 5.7)	4.4 (1.5, 7.3) *
Beverages					
Tea/coffee	4.0 (3.5, 4.6)	4.6 (3.3, 5.9)	4.6 (3.5, 5.7)	3.5 (2.6, 4.3)	3.4 (1.2, 5.7)
Fruit juice [e]	1.7 (1.4, 2.0)	1.9 (1.0, 2.8)	1.7 (1.2, 2.1)	1.4 (0.9, 1.9)	2.5 (1.2, 3.8)
Soda	1.3 (1.0, 1.7)	1.6 (0.7, 2.4)	0.9 (0.4, 1.4)	1.6 (1.0, 2.1)	1.1 (0.3, 2.0)
Alcoholic beverage	0.9 (0.6, 1.1)	1.3 (0.7, 1.9)	0.6 (0.3, 1.0)	0.8 (0.4, 1.2)	0.7 (0, 1.5)
Fats [d]	4.1 (3.6, 4.6)	3.6 (2.5, 4.8)	5.3 (4.5, 6.1)	3.9 (3.1, 4,7)	2.4 (0.4, 4.5) *
Nuts and seeds	2.0 (1.6, 2.4)	1.4 (0.6, 2.2)	3.8 (2.9, 4.8)	1.4 (0.9, 1.8)	0.8 (0.3, 1.3) ***
Miscellaneous					
Burger or pizza	0.7 (0.5, 0.9)	0.8 (0.5, 1.1)	0.9 (0.4, 1.3)	0.6 (0.5, 0.8)	0.4 (0.2, 0.6)
Soup	2.0 (1.7, 2.4)	1.2 (0.6, 1.8)	0.9 (0.5, 1.2)	3.1 (2.5, 3.7)	2.9 (0.9, 4.8) ***
Snacks [f]	1.4 (1.1, 1.7)	0.9 (0.5, 1.2)	1.8 (1.0, 2.6)	1.3 (0.9, 1.7)	1.2 (0.4, 2.0)
Fermented foods or drinks	0.6 (0.3, 0.8)	0.3 (0, 0.5)	0.3 (0, 0.7)	1.0 (0.5, 1.5)	0.2 (0.1, 0.4) *
Diet Diversity Score (range 0-26) [g]	23.7 (23.4, 24.1)	23.7 (22.8, 24.6)	22.3 (21.6, 23.0)	24.8 (24.3, 25.2)	23.1 (20.9,25.3) ***

*P <0·05, **P <0·01, ***P<0·001 for differences among participants from different regions.

[a] Values are mean and 95% CI.

[b] Other region participants were from Ghana, Iraq, Singapore, Israel, and Nigeria.

[c] Meats include pork, lamb, poultry, and seafood.

[d] Fats include oil, butter and clarified butter.

[e] Fruit juice include fresh and packaged fruit juices.

[f] Snacks include foods like popcorn and chips.

[g] A diet diversity score was calculated by providing a score of 1 if the person consumed the food item and 0 if he or she did not consume each food group and summing the scores for the 26 food groups in the FFQ. The diet diversity score ranged from 0 to 26.

Table 3. Health-related behaviors of new international students after arrival in the U.S.

Characteristic (%, 95% CI)	Overall (n=120)	Europe & Americas (n=25)	South Asia (n=34)	East Asia (n=50)	Other [a] (n=11)
Current eating behaviors					
Majority of meals are from					
Cooking	84.2 (76.4, 89.7)	21.8 (14.7, 31.0)	29.7 (21.5, 39.4)	38.6 (29.6, 48.5)	9.9 (5.4, 17.5)
Campus dining hall/meal plan	6.7 (3.3, 12.8)	25.0 (6.2, 62.7)	0.0	75.0 (37.3, 93.8)	0.0
Restaurants	9.2 (5.1, 15.9)	9.1 (1.2, 44.4)	36.4 (14.2, 66.4)	45.5 (20.1, 73.4)	9.1 (1.2, 44.4)
Dietary restrictions					
Meat [b]	26.7 (19.5, 35.4)	18.8 (8.6, 36.1)	65.6 (47.7, 80.0)	6.3 (1.5, 22.1)	9.4 (3.0, 25.6) ***
Dairy Products/Eggs	6.7 (3.3, 12.8)	0.0	62.5 (28.2, 87.6)	12.5 (1.7, 54.3)	25.0 (6.2, 62.7)*
Nuts/Gluten	1.7 (0.4, 6.5)	0.0	50.0 (5.7, 94.3)	50.0 (5.7, 94.3)	0.0
Alcohol	12.5 (7.6, 19.8)	13.3 (3.3, 40.9)	46.7 (23.9, 70.9)	40.0 (19.0, 65.4)	0.0
Other [c]	1.7 (0.4, 6.5)	0.0	50.0 (5.7, 94.3)	50.0 (5.7, 94.3)	0.0
Reasons for dietary restriction					
Personal belief	71.1 (55.9, 82.7)	21.2 (10.4, 38.5)	60.6 (43.2, 75.7)	9.1 (2.9, 24.9)	9.1 (2.9, 24.9)***
Medical condition	22.2 (12.2, 37.0)	0.0	30.0 (9.9, 62.7)	60.0 (29.5, 84.3)	10.0 (1.4, 47.3)
Other [d]	8.9 (3.3, 21.9)	25.0 (3.3, 76.6)	50.0 (12.1, 87.9)	25.0 (3.3, 76.6)	0.0
Other current health behaviors					
Daily sleep duration (hours/day) [e]	7.5 (7.2, 7.7)	7.7 (7.3, 8.1)	7.2 (6.9, 7.5)	7.7 (7.1, 8.2)	7.4 (6.4, 8.3)
Change in sleep duration since coming to the U.S.					
Sleep more	21.2 (14.7, 29.6)	20.0 (8.5, 40.2)	20.0 (8.5, 40.2)	48.0 (29.5, 67.1)	12.0 (3.9, 31.6)
Sleep less	27.1 (19.8, 35.9)	15.6 (6.6, 32.7)	21.9 (10.7, 39.5)	56.3 (38.8, 72.3)	6.3 (1.5, 22.1)

None change	51.7 (42.6, 60.7)	24.6 (15.3, 37.0)	36.1 (25.0, 48.9)	29.5 (19.4, 42.2)	9.8 (4.4, 20.4)
Daily screen time (hours/day) [e]	4.3 (3.8, 4.9)	3.8 (2.6, 5.0)	4.2 (3.2, 5.2)	4.8 (4.1, 5.5)	4.6 (2.2, 7.1)
Change in screen time since coming to the U.S.					
More screen time	17.4 (11.5, 25.5)	15.0 (4.9, 37.9)	25.0 (10.7, 48.1)	40.0 (21.3, 62.2)	20.0 (7.6, 43.1)
Less screen time	47.0 (37.9, 56.2)	24.1 (14.4, 37.3)	33.3 (22.0, 47.0)	37.0 (25.2, 50.7)	5.6 (1.8, 16.0)
No change	35.7 (27.4, 44.9)	22.0 (11.8, 37.3)	24.4 (13.6, 40.0)	43.9 (29.6, 59.3)	9.8 (3.7, 23.5)

*P <0·05, **P <0·01, ***P<0·001 for differences among participants from different regions.
[a] Other region participants were from Ghana, Iraq, Singapore, Israel, and Nigeria.
[b] Meats includes pork, beef, poultry, and seafood.
[c] Other food that participants restricted or avoided included green onion and sugar sweetened beverages.
[d] Other reasons for dietary restriction are: don't find them healthy as compared to other foods/meats, don't eat them, don't like the taste, or don’t like taste/odor.
[e] Values are mean and 95% CI.
[f] Screen time includes watching television or looking at a computer, phone or tablet.

Figure 1. Weight status of newly arrived International students [a]

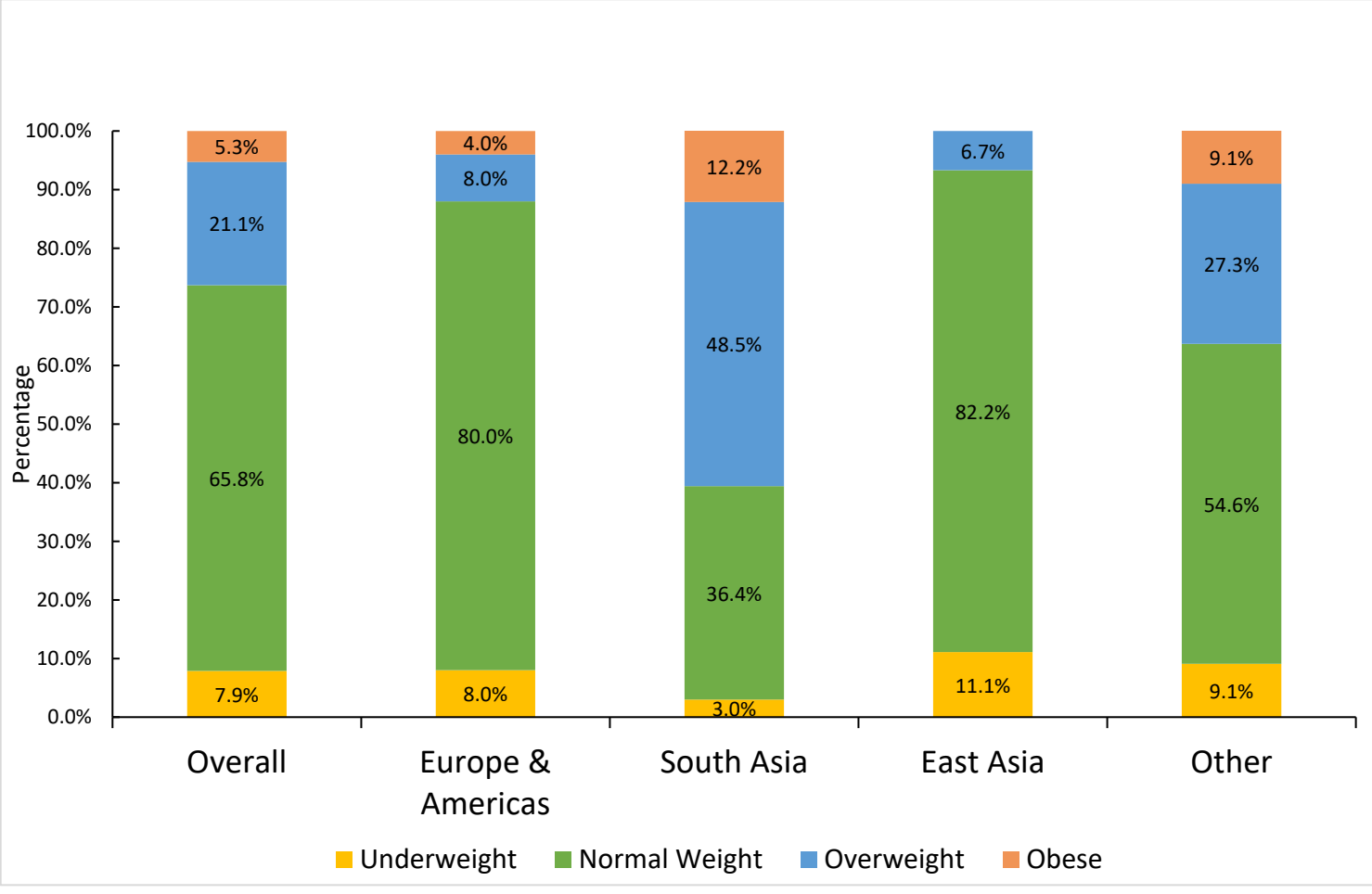


Figure 2. Foods and beverages that were discovered by newly arrived international students upon arriving in the U.S.

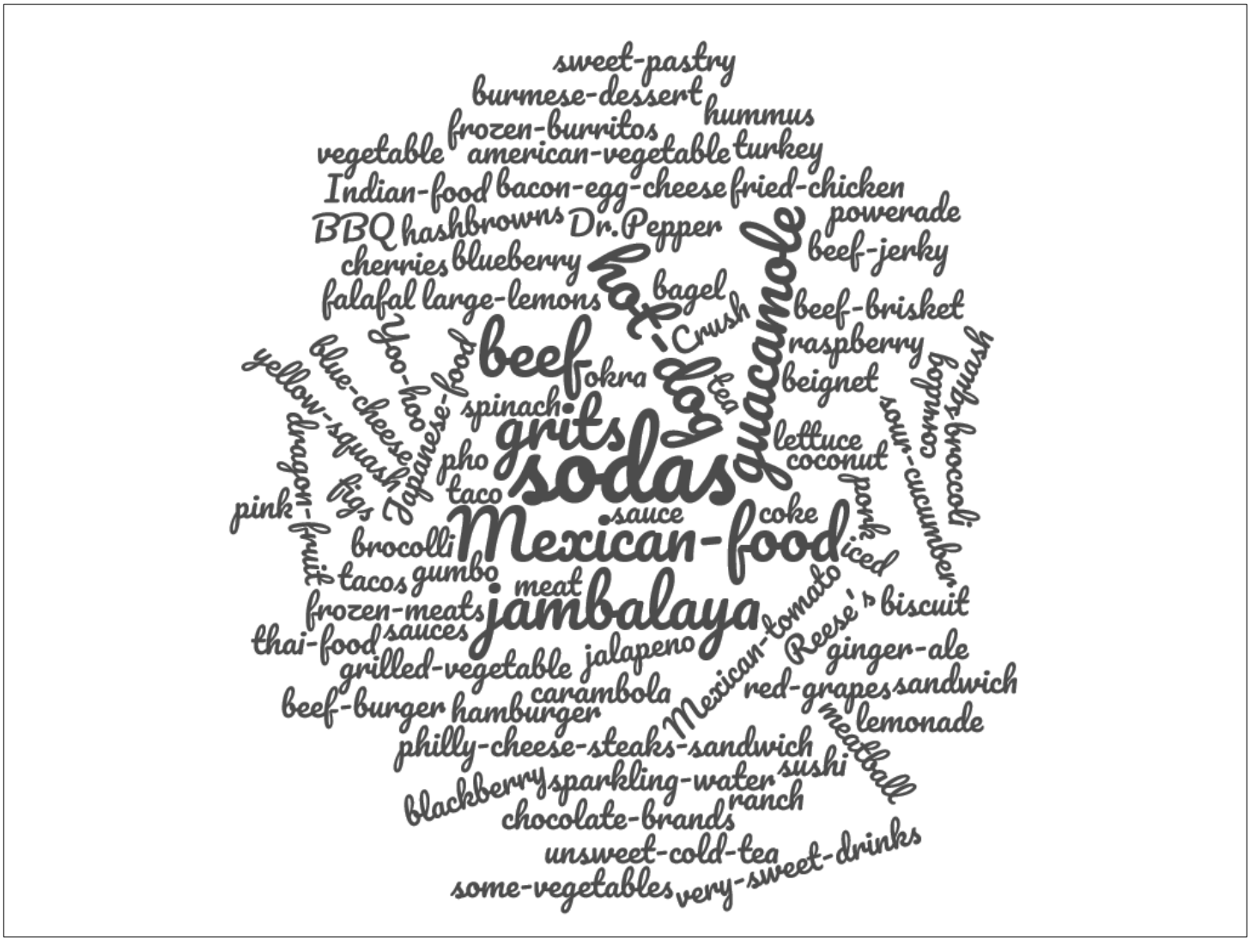


Figure 3. Food chains that newly arrived international students reported seeing both in their home countries and in the U.S.

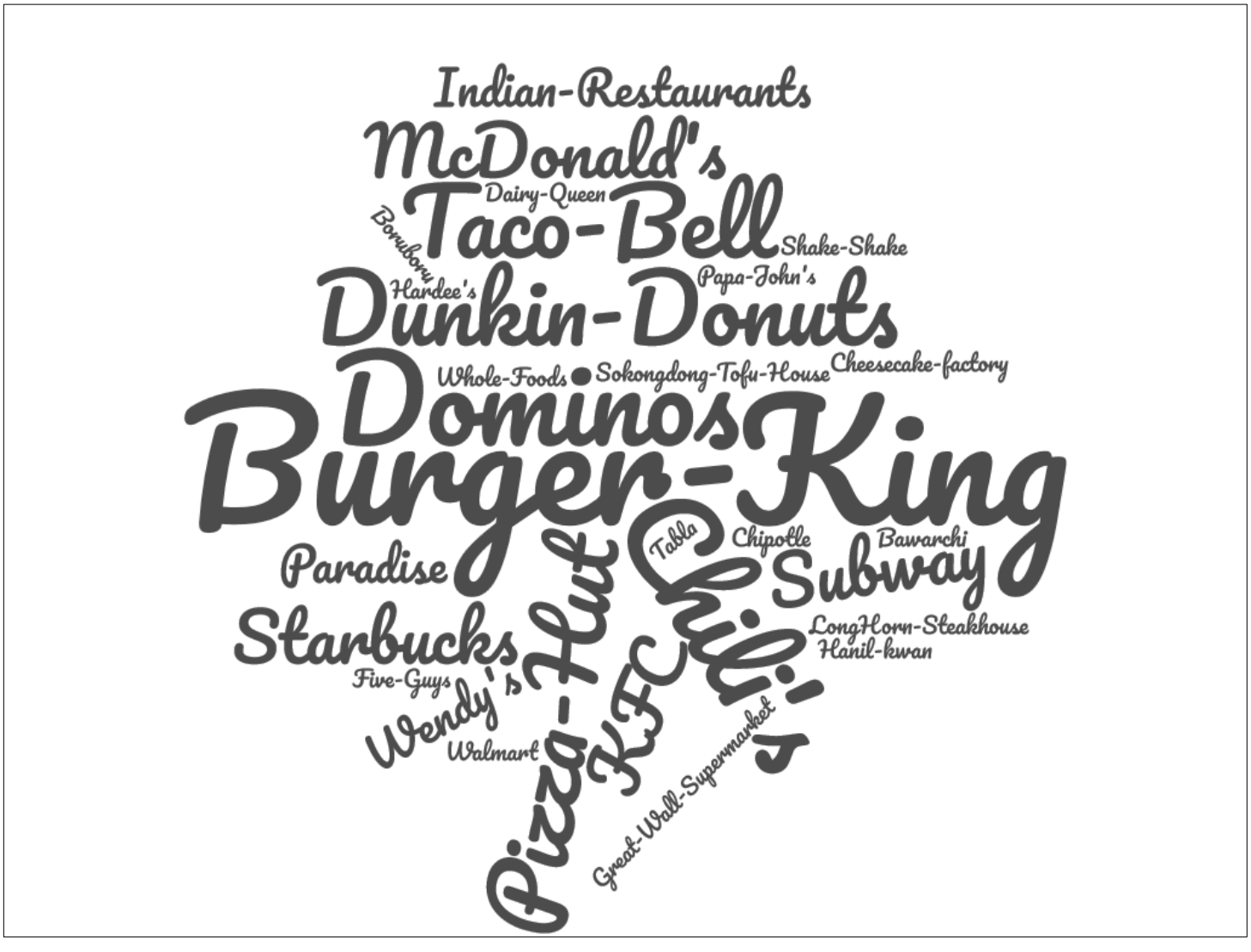
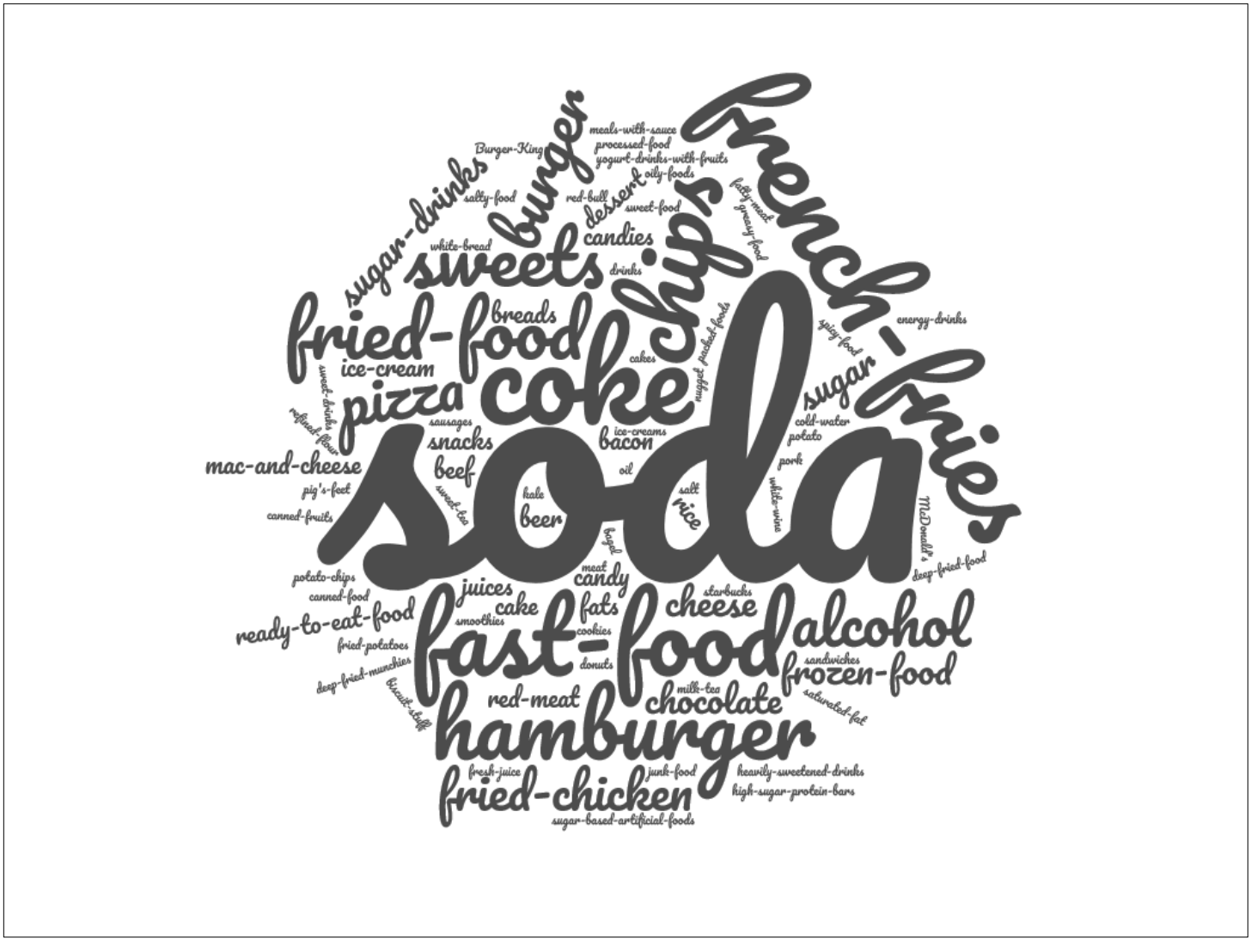


Figure 4. Foods and beverages considered healthy by international students

Figure 5. Foods and beverages considered unhealthy by international students



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