

Impact of Food Intake Habits on Weight among University of Guam Students

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Abstract

This study investigated the dietary habits of college age students via a survey to identify factors that may impact weight among students at University of Guam. Applying a quantitative approach, this study examined the relationship between the students' food intake habits and Body Mass Index (BMI), using BMI as an indicator of the students' body fatness. The data-gathering instrument for this study was an online survey asking students to self-report their frequency of various dietary intakes. The results of 313 completed and usable surveys showed a high consumption of fast food and sugar beverages among the students, which impacted their weight gain. Males and females displayed similar dietary intake patterns for most food types with male students consuming a higher intake of beverages with sugar per week than females. These findings show that a high frequency of certain foods and beverages can have an impact on weight, as half of the college students in this study were either overweight or obese with a significantly larger percentage of males than females in these weight categories. Further research in this regard is recommended to include a longitudinal study examining college students' weight from college entrance to graduation.

Key Words: nutrition, diet, health, obesity, quality of life

1.1 Background

The World Health Organization has estimated that nearly two billion people in the world today are overweight or obese, and the incidence and degree of obesity among adults, adolescents, and children continues to grow (2013). A recent article in the Pacific Daily News states that five of the top eight heaviest populations worldwide are found in the Pacific Islands, including Micronesia (Pacific Daily News, May 30, 2014).

As obesity rates around the world continue to rise, the age of onset is lowering. The transition from adolescence to adulthood may be a particularly risky time for weight gain (Nelson, Story, Larson, Neumark-Sztainer, and Lytl, 2008). Obesity rates among college aged adults have more than doubled in the past 30 years, and data suggests this trend is continuing (Nelson, et al., 2008). In fact, weight gain among new college students has become so prevalent that it has been termed the "Freshman 15" (Janeway, 2014).

A report by the University of New Hampshire indicates that college age adults are a widely understudied demographic in relation to the prevalence of obesity (University of New Hampshire, 2007). With the understanding that a high rate of obesity is found among Pacific Island populations in general, and knowing that college age students are an understudied demographic in terms of prevalence of obesity and may be especially vulnerable to weight gain, it may be particularly beneficial to universities to understand the diet and exercise habits of its students. University of Guam, an educational hub of Micronesia, may find this of particular importance.

1.2 Body Mass Index

Researchers usually measure obesity based on Body Mass Index or BMI (Center for Disease Control and Prevention, 2011).

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A formula is used to calculate how much fat a person has by comparing height to weight, and sometimes takes age into account (BMIcalculator.org, 2009). A person is considered overweight if he has a BMI equal to or greater than 25 and obese if he has a BMI equal to or greater than 30 (World Health Organization, 2013). The percent of overweight and obese American college students was nearly 30% in the fall of 2011 (Carter, 2012).

1.3 Obesity

Obesity rates among young adults have gradually increased over the last 50 years, but have risen significantly in recent decades. For those venturing off to college for the first time, the newfound freedom, and independence can be a time of physical, intellectual, and emotional growth and maturity. It can, however, also be a time of serious weight gain. A recent study by Searing weighed and measured 131 freshmen in their first month of college and again at the end of their senior year. During the four years, 70% of the students gained weight and the percent of students categorized as overweight or obese increased from 18% to 31% by the time of graduation (2012). Racette, Deusinger, Strub, Highstein and Deusinger reported similar findings in their 2005 study of 764 freshmen and sophomores.

Researchers are looking for factors that may contribute to this increase in average body weight (Jeffrey & French, 1998). Campbell suggests that factors such as stress and calories from alcohol may play a role (2013). Carter (2012) adds late nights and easy access to fast food to the list and says that students making decisions amid new environmental and social factors may also have an impact. In *Preventing the Freshman 15*, Janeway concludes that college students are gaining weight and developing poor health habits because of not only diet and exercise behaviors, but many are also becoming heavier simply because of whom they choose as friends and how their families behave (2014).

1.4 Diet

Although a number of factors have been shown to contribute to weight gain, research continues to indicate that two primary factors that tend to have the greatest impact are diet and exercise. While some weight gain among college students likely results from continued maturation and physical development, dietary choices also play a significant role (Hellmich, 2008). Easy access to fast food and high calorie cafeteria offerings and vending machine snacks often contributes to weight gain (O'Connor, 2012), but Janeway (2014) adds that even students who try to eat healthy may not have sufficient nutritional education to see hidden fats and sugars in the foods they choose.

While eating habits can be influenced by many factors, food and beverage marketing may have a particularly powerful influence on college age adults. Young adults are a highly desirable market, particularly among fast food and soft drink companies, and advertising campaigns spend billions of dollars on advertising to attract this demographic (Nelson, et al., 2008). One long term investigation, the Coronary Artery Risk Development in Young Adults (CARDIA), showed that people who ate fast food two or more times per week had an average weight gain of 10 pounds more than study participants who ate fast food less than once a week (Health and Wellness, 2011). A study by Miller, La Brunda, La Brunda and Amin found that more than half of their participants who routinely ate fast food 4 or more times per week were overweight or obese (2013). Eating in restaurants or fast food generally increases calorie intake, and people who choose fast food as a meal three or more times a week run a higher risk of obesity (Greenwood & Stanford, 2008).

1.5 Gender

There are some differences in weight gain reported between male and female college students. A study based on analysis of data from the National College Health Risk Behavior Survey shows that based on self-reported height and weight, 35% of college students were overweight or obese. Male students were more likely to be overweight than female students, but females were more likely to be trying to lose weight (Lowry, Galuska, Fulton, Wechsler, Kann, & Collins, 2000). The study also showed that nearly 3% of females and 20% of males gained weight over their first year of college. In fact, Hellmich reports that 60% of college students gain weight during their freshman year with an average weight gain for women of 7.5 pounds and for men almost 9 pounds (Hellmich, 2008). Hellmich further says that things get worse by the time students enter their senior year reporting that 67% of college women report an average weight gain of 10 pounds from freshman year, and 86% of college males report an average gain of 14 pounds during the same time (2008).

2. Methodology

2.1 Purpose of the Study and Research Questions

The purpose of this quantitative study was to investigate the diet habits of college students in the University of Guam to identify factors that may impact weight gain. This study examined the relationship between the college students' diet quality and Body Mass Index (BMI). The research question guiding this study was: What dietary factors contribute to an individual's increase in weight?

2.2 Hypothesis

The three hypotheses for this study examined the relationship between the participants' diet habits and BMI. The categorical variables were the participants' BMI weight categories, food intake frequency categories, breakfast frequency categories, and largest meal of the day categories. Three null hypotheses were tested:

H01: There is no association between food type intake and BMI.

H02: There is no association between breakfast intake and BMI.

H03: There is no association between the largest meal of the day intake and BMI.

2.3 Data Gathering Instrument

The data-gathering instrument for this study was an on-line survey requesting for participant demographics (gender and age) and information about the participants' various diet habits that could affect weight gain. Eight survey items pertained to the participants' dietary habits, and two survey items asked for the participants' height and weight. The height and weight values were used to calculate the participants' BMI using the formula: [weight (lbs.)] divided by [height (in.)]² times 703 (CDCP, 2011). The dietary survey items had three parts. The first six survey items utilized a five-level Likert scale rating asking the participants to identify the frequencies of specific dietary habits from 1 = "rarely or never" to 5 = "seven or more times per week." The seventh survey item asked the participants to identify the frequency they ate breakfast per week utilizing a five-level Likert scale rating from 1 = "never" to 5 = "always." The remaining survey item utilized categorical mealtime choices.

2.4 Participants

Potential participants included 3,017 students attending the University of Guam during academic year 2013-2014. A total of 313 students participated in the study. This sample size represented a 95% confidence level with a 5% margin of error. The sample (N = 313) was comprised of University of Guam students who responded to the study's online survey questionnaire. Of the 313 participants, 133 (42%) were males, and 180 (58%) were females. Most of the participants (92%) were 18 to 30 years old (n = 288). In the remaining age categories, 20 participants (6%) were 31 to 40 years old, 4 participants (1%) were 41 to 50 years old, and 1 participant (0.3%) was 51 years or older.

2.5 Data Collection

Students in classes from academic divisions across the University were invited to participate in the survey via e-mail and face-to-face requests. Each participant was asked to complete a survey that would take approximately 10 minutes. A total of 313 surveys were complete and useable for this study.

2.6 Data Analysis

Data analysis was done using the Statistical Package for the Social Sciences (SPSS) software, version 20. For each survey item, descriptive statistics were first presented to provide a snapshot of the participants' BMI categories and their responses using frequencies, percentages, and means. In order to determine the relationship between dietary habits and weight, a Chi-Square Test of Independence was employed. In a chi-square test, the statistical analysis examines the relationship or the association between two categorical variables, and the statistical results can also show the significance and strength of the relationship between the variables (Vogt, 2007). To test for a 95% level of confidence, the alpha level was set at 0.05. If a significance was determined, then the strength of any association between the variables was determined by the resulting correlation coefficient as follows: 0 to .1 little if any association, .1 to .3 low association, .3 to .5 moderate association, and > .5 high association.

3. Results

3.1 BMI Weight Categories

BMI is interpreted using standard weight categories that are applied for all age categories and for both males and females (CDCP, 2011). These weight categories are: underweight (BMI < 18.5), normal weight (BMI of 18.5 to 24.9), overweight (BMI of 25.0 to 29.9) and obese (BMI \geq 30.0). A breakdown of the participants' BMI by these weight categories and by gender is shown in Table 1.

Table 1: Frequency and Percentages of Participants' BMI (N = 313)

BMI	N (%)		N (%)
	Males (n=133)	Females (n=180)	Group(N=313)
Under weight	3(2%)	10(6%)	13(4.2%)
Normal weight	43(32%)	99(55%)	142(45.4%)
Over weight	47(35%)	35(19%)	82(26.2%)
Obese	40(30%)	36(20%)	76(24.3%)

Based on the participants' BMI, close to half of the participants were normal weight with a few even underweight (49.6%), while half of the participants were overweight or obese (50.5%). By gender, a significantly larger percentage of males (65%) than females (39%) were overweight or obese. Likewise, a significantly larger percentage of females (55%) than males were in the normal weight range. A slightly higher number of females (6%) than males (2%) were underweight.

3.2 Type of Food Intake

Six items on the survey examined the frequency of specific food type and beverage intake. The survey items used a five-level Likert scale rating. Table 2 provides descriptive statistics of the participants' responses for each survey item (N = 313). The responses by gender are provided in Table 3 (n = 133 males; n = 180 females).

Table 2: Frequency and Percentage of Dietary Habits per Week (N = 313)

Type of Food Intake	N (%)					Mean	SD
	1 Rarely or Never	2 1-3 times per month	3 1-3 times per week	4 4-6 times per week	5 7+ times per week		
1. Fast-food	24(8%)	71(23%)	130(42%)	70(22%)	18(6%)	2.96	0.99
2. Take-out food	41(13%)	123(39%)	114(36%)	33(11%)	2(0.6%)	2.46	0.87
3. Home cooked meals	12(4%)	13(4%)	79(25%)	130(42%)	79(25%)	3.80	0.99
4. Packaged meals	40(13%)	79(25%)	115(37%)	66(21%)	13(4%)	2.79	1.05
5. Snacks (non-fruit/non-salad)	19(6%)	28(9%)	94(30%)	91(29%)	81(26%)	3.60	1.14
6. Sugar beverages	44(14%)	38(12%)	83(27%)	71(23%)	77(25%)	3.32	1.34

For the 313 participants represented in this study, the dietary habits with the three highest mean values were frequency of eating home cooked meals, non-fruit or non-salad snacks, and sugar beverages (M = 3.80, M = 3.60, and M = 3.32, respectively), with more than half of the participants indicating they consume these food types 1 to 3 times or more per week (92%, 85%, and 75%, respectively). Fast food intake had the fourth highest mean (M = 2.96) with 68% of the participants indicating they eat fast food 1 to 3 times or more per week. The lowest mean value was frequency of take-out food intake (M = 2.46), with 48% of the participants stating they eat takeout food 1-3 times or more per week.

Table 3: Frequency and Percentage of Dietary Habits by Gender (Males: n = 133; Females: n = 180)

Type of Food Intake	Gender	1 Rarely or Never	2 1-3 times per month	3 1-3 times per week	4 4-6 times per week	5 7+ times per week	Mean	Mean Difference
1. Fast food	Males:	12(9%)	25(19%)	41(31%)	40(30%)	15(11%)	3.16	0.35
	Females:	12(7%)	46(26%)	89(49%)	30(17%)	3(2%)	2.81	
2. Take-out food	Males:	22(17%)	41(31%)	50(38%)	19(14%)	1(0.8%)	2.52	0.10
	Females:	19(11%)	82(46%)	64(36%)	14(8%)	1(0.6%)	2.42	
3. Home cooked meals	Males:	8(6%)	5(4%)	31(23%)	59(44%)	30(23%)	3.74	0.11
	Females:	4(2%)	8(4%)	48(27%)	71(39%)	49(27%)	3.85	
4. Packaged meals	Males:	10(8%)	34(26%)	50(38%)	33(25%)	6(5%)	2.93	0.25
	Females:	30(17%)	45(25%)	65(36%)	33(18%)	7(4%)	2.68	
5. Snacks (non-fruit/non-salad)	Males:	8(6%)	11(8%)	37(28%)	33(25%)	44(33%)	3.71	0.19
	Females:	11(6%)	17(9%)	57(32%)	58(32%)	37(21%)	3.52	
6. Sugar beverages	Males:	12(9%)	13(10%)	32(24%)	27(20%)	49(37%)	3.66	0.60
	Females:	32(18%)	25(14%)	51(28%)	44(24%)	28(16%)	3.06	

In comparing male and female responses for each survey item, the highest mean difference between the two genders was for sugar beverages intake with 81% of males versus 68% of females indicating they consumed sugar beverages 1 to 3 times or more per week ($M = 3.66$ and $M = 3.06$, respectively). The second highest mean difference between the two genders was for fast food intake with 72% of males versus 68% of females stating they consumed fast foods 1 to 3 times or more per week ($M = 3.16$ and $M = 2.81$, respectively). Home cooked meals intake was the only survey item in which females had a higher mean average than males ($M = 3.85$ and $M = 3.74$, respectively).

3.3 Breakfast Intake

The seventh survey item examined the frequency of breakfast intake. Table 4 provides the frequencies and percentages of the participants' responses as a group ($N = 313$) and by gender ($n = 133$ males; $n = 180$ females).

Table 4: Frequency and Percentage of Breakfast Intake per Week (N = 313)

	N (%)					Mean	SD
	1 Never	2 1-2 days per week	3 3-4 days per week	4 5-6 days per week	5 Always		
Breakfast Intake	20(6%)	67(21%)	68(22%)	60(19%)	98(31%)	3.48	1.30
Males (n=133):	3(2%)	26(20%)	30(23%)	32(24%)	42(32%)	3.63	1.18
Females (n=180):	17(9%)	41(23%)	38(21%)	28(16%)	56(31%)	3.36	1.37

For survey item 7, more than half of the participants (72%) indicated they eat breakfast 3 to 4 days or more per week. By gender, a higher percentage of males than females stated they eat breakfast 3 to 4 days or more per week (79% and 68%, respectively). Additionally, more females than males indicated they never eat breakfast (9% and 2%, respectively).

3.4 Largest Meal of the Day

This last survey item pertained to the participants' largest meal of the day. The item used a set of five categorical meal choices. Table 5 provides the frequencies and percentages of the participants' responses as a group ($N = 313$) and by gender ($n = 133$ males; $n = 180$ females).

Table 5: Frequency and Percentage for Largest Meal of the Day (N = 316)

Survey Item	N(%)					Mean	SD
	1 Breakfast	2 Lunch	3 Dinner	4 Snacks	5 Equal		
8. Which meal is your largest meal of the day?	16(5%)	99(31%)	154(49%)	4(1%)	43(14%)	2.87	1.03
Males (n=135):	5(4%)	40(30%)	65(48%)	3(2%)	22(16%)	2.96	1.06
Females (n=181):	11(6%)	60(33%)	87(48%)	2(1%)	21(12%)	2.80	1.02

For survey item 8, the highest percentage for largest meal of the day is dinner (49%). Lunch had the second highest percentage of participant responses (31%). Only 5% and 1% of the participants indicated that breakfast and snacks are their largest meals, respectively. Percentages of male and female responses in each category were similarly distributed with 48% of both genders also indicating dinner as their largest meal. Snacks received the fewest responses by males and females (2% and 1%, respectively).

3.5 Hypotheses

Table 6 shows the chi-square test of independence results for the three hypotheses tested in this study.

Table 6: Associations between Food Intake and BMI

Type of Food Intake	χ^2	<i>p</i> -value
1. Fast food	39.30	.00
2. Take-out food	14.72	.26
3. Home cooked meals	15.09	.24
4. Packaged meals	12.83	.38
5. Snacks(non-fruit/non-salad)	8.27	.76
6. Sugar beverages	25.40	.01
7. Breakfast intake	15.09	.24
8. Largest meal of the day	23.72	.02

Hypothesis 1: Null Hypothesis 1 states there is no association between food type intake and BMI. Six food type intakes were referenced in this hypothesis: fast food, take-out food, home cooked meals, packaged meals, non-fruit/non-salad snacks, and sugar beverages. The chi-square analysis revealed no association exists between the participants' BMI and intake of take-out food, home cooked meals, packaged meals, and non-fruit or non-salad snacks ($p > .05$). Thus, for these four food types, the null hypothesis failed to be rejected. However, the chi-square analysis revealed an association exists between BMI and two food type intakes: fast food ($\chi^2(12) = 39.30, p = .00$) and sugar beverages ($\chi^2(12) = 25.40, p = .01$). The chi-square statistic values were statistically significant ($p \leq .05$); therefore, for these two food type intakes (fast food and sugar beverages), the null hypothesis was rejected. An association exists between fast food and sugar beverage intake and BMI. The correlation coefficient showed a low association between fast food and BMI ($V = .21$) and sugar beverage and BMI ($V = .20$).

Hypothesis 2: Null Hypothesis 2 states there is no association between breakfast intake and BMI. The chi-square analysis revealed no association between the participants' BMI and breakfast intake frequency ($\chi^2(12) = 15.09, p = .24$). Thus, the null hypothesis failed to be rejected.

Hypothesis 3: Null Hypotheses 3 states there is no association between largest meal of the day and BMI. The chi-square analysis revealed an association exists between largest meal of the day and BMI ($\chi^2(12) = 23.72, p = .02$). The chi-square coefficient was statistically significant ($p \leq .05$); therefore, the null hypothesis was rejected. The correlation coefficient showed a low association between when the largest meal of the day is eaten and BMI ($V = .20$). The results showed that 75% of those participants whose largest meal was breakfast were in the underweight or normal BMI categories, while 54% of those whose largest meal was dinner and 58% of those who ate equal size meals were in the overweight or obese categories.

4. Conclusions

This study examined the dietary habits of University of Guam students and the relationship between these dietary habits and their impact on the students' weight as measured by their BMI. A snapshot of the college students' dietary habits showed some healthy eating habits with high frequency intakes of home cooked meals and low frequency of non-fruit/non-salad snacks per week. However, the students also indicated they frequently consume fast food and sugar beverages. The study results showed that the students' fast food and sugar beverage intake was associated with their BMI; more specifically, higher frequency consumption of fast food and sugar beverages was associated with higher BMI. Furthermore, a significantly higher percentage of male students indicated a high consumption of sugar beverages per week than the females. Likewise, a larger percentage of male students than female students in this study were overweight or obese. These findings support Greenwood and Sanford's (2008) contention that dietary habits impact weight gain, and for college students, easy access to fast food and high calorie cafeteria offerings often contribute to weight gain (O'Connor, 2012). Additionally, as noted by Hellmich (2008), a higher percentage of college males report greater weight gain from their freshman year to senior year than college females.

In this study, although the students indicated they eat breakfast frequently (with half of the students stating they eat breakfast at least five or more days a week), the study results showed that frequency of breakfast intake alone was not associated with the students' BMI. However, breakfast meal size was associated with their BMI. Well over half of the college students who identified breakfast as their largest meal of the day, had normal weight or were underweight. More than half of the participants who reported eating their largest meal equally across all mealtime categories were either overweight or obese.

In summary, the results of this study present a snapshot of the dietary habits of the University of Guam students and the effect these habits have on the students' weight. Fast foods and sugar beverages were popular diet choices among the students surveyed. Research shows that these types of dietary choices can contribute to weight gain (Greenwood & Stanford, 2008; Health & Wellness, 2011; Hellmich, 2008; O'Connor, 2012). Albeit these dietary habits may have been an established pattern for some students before entering college, as Carter (2012) notes, late nights, easy access to fast foods, and a new social environment in college life can impact students' diet choices and behaviors. Such transition from adolescence to adulthood can be a critical time for weight gain (Nelson et al., 2008). As such, recommendations for future research include a longitudinal study examining a cohort of the University's students from entrance to graduation to better understand how college life may influence dietary habits leading to weight gain. Insights from this study and future studies can assist the University in providing nutritional educational for its students, creating awareness of dietary impact, and urging students to examine their diet practices to make diet choices which lead to a healthier lifestyle.

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