



THE UNIVERSITY OF THE WEST INDIES
AT ST. AUGUSTINE, TRINIDAD AND TOBAGO

A Research Paper
Submitted in partial requirements
for HUEC 3012
of
The University of the West Indies

Title: Dietary patterns of University Students

Student Name: Deidre Archie

Project Supervisor: Selby Nichols, PhD.

Year Submitted: 2009

Department of Agricultural Economics & Extension
Faculty of Food and Agricultural



DIETARY PATTERNS OF UNIVERSITY STUDENTS

A Research Paper

Submitted in Partial requirements for HUEC 3012

Of

The University of the West Indies

Deidre Archie

Supervised by Dr. Selby Nichols

2009

TABLE OF CONTENTS

List of Figures	2
List of Tables	3
List of Acronyms/ Terms	4
Abstract	6
Introduction	7
Literature Review	10
Methodology	15
Results	17
Discussion	35
Limitations	35
Conclusion	35
References	36
Appendix	43

List of Figures	Page
Figure 1A illustrates healthy diet using percentages from the food frequency questionnaire (all food groups).	21
Figure 1B illustrates an analysis of the 24hr recall	22
Figure 1C illustrates the three combination multi mix concept (food from animals or legumes, fruit or vegetables, staples	23
Figure 1D illustrates the three comparison multi mix using the data from 24hr recall	24
Figure 1E illustrates the two combination multi mix concept FFQ (meats, dairy or legumes and staple)	25
Figure 1F illustrates the two combination multi mix concept 24hr recall (meats, dairy or legumes and staple)	26
Figure 2A illustrates dietary pattern (snacks, fat & soda) of students by gender	27
Figure 2B illustrates dietary pattern (snacks, fat & soda) of students by gender	28
Figure 3A illustrates dietary pattern(snack, fat and soda by gender and year of entry 2007	29
Figure 3B illustrates dietary pattern(snack, fat and soda by gender and year of entry 2007	30
Figure 3C illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009	31
Figure 3A illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009	32

List of Tables	Page no
Table 1: illustrates demographic characteristics of participants by gender	17
Table 2: Age and anthropometric characteristics of participants by gender	19
Table 3: Dietary consumption patterns among participants by gender	20
Table 4 shows environmental factors that affect food choice (media & proximity)	33

LIST OF ACRONYMS/TERMS

Anthropometry science of measuring the size, weight, and proportions of the human body

Body mass Index (BMI) an index of a person's weight in relation to height; derived from dividing the weight in kilograms by the square of the height in metres.

Chronic diseases diseases that are characterized by a slow progression and long duration e.g. heart disease, diabetes

Normal weight BMI classified as 18.5-24.9

Overweight BMI classified as 25.0-29.9

Obese BMI classified as >30.0

24hr recall a method of dietary assessment in which an individual is asked to remember everything eaten during the previous 24 hours

Food frequency questionnaire a method of dietary assessment in which data collected relate to how often and in what amounts foods are consumed e.g. servings per week, month.

On campus students that reside on the university's halls of residence

Off campus all students that do not reside on any of the university's halls of residence

ABSTRACT

The primary objective of this study was to determine whether the dietary patterns of university students can be characterized as healthy. Dietary patterns 255 students participated in the study, 180 females and 75 males between the ages the participants were conveniently chosen for this cross sectional study. The self administered questionnaires contained information that covered socio demographic data, environmental factors such as proximity to fast food restaurants, the role of the media, physical activity habits, a food frequency questionnaire and a 24hr recall. Data collected was analysed using SPSS version 12.0. Data was analysed by gender and year of entry. The results indicated that students in their first year of entry consumed more snacks, sodas and dietary fat than students in their third year. Proximity of fast food vendors is associated with an increased consumption of fast foods. 61.6% of students' diet is poor, 28.6% of students' diet is sufficient, 9%students' diet is good and only 0.8% can be described as a healthy diet. Nutrition intervention is required for university students. This intervention should include basic knowledge of healthy eating.

INTRODUCTION

In Trinidad and Tobago, obesity and other lifestyle diseases are increasing significantly. This is also occurring at the regional and global level. These chronic diseases such as Diabetes Mellitus, Cardiovascular diseases such as hypertension are major public health concerns. According to CAREC, PAHO/WHO heart diseases are ranked no.1 in males and females and fifth and third respectively. In Trinidad & Tobago, statistics obtained from the annual statistical report 2004-2005, diseases of the heart and diabetes mellitus ranked first and second respectively as major causes of death. These nutrition- related non-communicable diseases (NR-NCD's) are associated with unhealthy dietary practices and physical inactivity.

Emergence of new dietary pattern and its influence on chronic illnesses

What is a healthy diet?

A healthy diet can be defined as a diet which provides nutritional adequacy, caloric control, nutrient density, variety and balance. It can be used both as a preventative measure and a method of treatment for lifestyle diseases. This can be achieved by use

of a principle known as the ***Multi mix principle***. This is a simple method that is used to teach the populace about the elements of a healthy diet. A healthy diet can contribute to normal body mass index (BMI) of 18.5-24.9 and can reduce a person's risks of becoming overweight or obese(Caribbean Home Economists).

The Nutrition Transition in the Caribbean

The diet of the Caribbean population previously consisted of foods rich in polyunsaturated fat, complex carbohydrates, and high fibre. However, recently, there have been major changes in the composition of the diet which are reflected in body composition, stature and nutritional outcomes of individuals today. It is represented by a diet high in saturated fat, refined sugars, salt and low in fibre, complex carbohydrate, vitamin and mineral intake. This pattern is also known as the, '***Western Diet***'. This unhealthy dietary pattern has been closely linked to a person becoming overweight or obese (UNC Carolina Population Center).

According to an article in *Cajanus*, volume 39, No 4, 2006, In 1970 there was an insufficiency of calories. From 1970's onwards average availability of calories per person have increased rapidly from high consumption of fat and sugars. Now, in the region there is available 160% of average requirement for fats and 250% for sugars.

The food industry has significantly contributed to this nutrition transition. In recent times, the demand for fast foods and convenience foods has risen significantly. This is evidenced by the rapid growth of convenience outlets, in Trinidad and Tobago, such as the Tricon Global Restaurants Inc. One popular chain is the Kentucky Fried Chicken. In 1972 in Trinidad, there was one restaurant, today; there are 52 restaurants nationwide(Caribbean poultry Association Market and Broiler Processing Profile. Many of these foods are energy dense and represent lower cost diets for the consumer. These foods are responsible for the epidemic of NR-NCDS (Popkin 2004).

This study is a cross sectional study which aims to determine if the dietary patterns of university students enrolled at the University of the West Indies, St Augustine are healthy. The dietary patterns of university students are important because it can be used as an indicator of the likelihood of the development of nutrition related non-communicable diseases. The results of this study can be to provide nutrition education and to develop nutrition intervention strategies which can aid in the modification of nutrition behaviour.

LITERATURE REVIEW

An overweight or obese child or adolescent is more likely to become an overweight or obese adult. Although diet is related to obesity the aetiology is idiopathic and complex. There are several influences on dietary patterns and food choices. This literature review focuses on the multi-mix principle and its uses, the association between BMI and diet and the environmental factors such as the university life, the media and proximity of fast food establishments which contribute to obesity.

The Food Multi mix Principle

The multi mix concept is used by the WHO, FAO and World Food Programme to meet the food insecurity challenges in the developing world. It utilises traditional food sources and preparation methods and locally available cheap and affordable staples, fruits,

pulses, vegetables and legumes. Recipes can provide $\geq 40\%$ of daily nutritional requirements (F.B. Zotor and P. Amuna 2006).

The multimix principle is also used to illustrate how to combine foods from the six Caribbean food groups. The simplest way to balance meals is to choose a variety of foods from each of the food groups but this process is not regularly done. The multimix concept can be categorised as a two, three until six foods from the groups are utilised. A two-mix consists of food from the staple group and food from the legume or food from animal group. A three mix meal can be as healthy as a six –mix meal if it contains a staple (carbohydrate), a legume or food from animal source (protein) and a green or yellow vegetable or a fruit. (Caribbean home economists)

Today diets are not varied, cereals such as wheat comprise most of energy supply from the staple group, starchy roots are consumed in much smaller quantities. Energy from vegetable oils and sweeteners has increased. Of the meats, chicken is the most commonly consumed. (FAO Nutrition Profiles 2003)

University life& food patterns

THE FRESHMAN 15

The freshman 15 can be defined as weight gain of 15 lbs in the first year of university. This phenomenon is attributed to habits such as skipping meals during the day as a result of erratic class schedules which can lead to overeating later; snacking while studying; late nights studying; take-out/ order in foods, vending machines; lack of

exercise; high calorie fluids and excessive alcoholic intake. Studies show that the weight gain may not be the entire 15pounds and may not occur during the first year but throughout the entire period. Studies show that students gain an average of 3 –10 pounds during the first semester of the first year. Habits that can contribute to weight gain are skipping meals during the day as this may lead to overeating later (The Nemours Foundation).

A study conducted at a north eastern private university studied freshmen living on-campus to determine if the widespread belief that students gained 15lbs during freshman year. An online survey was used to collect information about social behaviours and weight. The results indicated .that the average weight gain was 2.7lbs. Approximately half of the students gained weight while 15% lost weight. Men gained more weight than women. (Mihalopoulos et al 2008)

A longitudinal study assessed weight changes, exercise and diet behaviours of students at the beginning of freshman year and at the end of senior year (138 females and 66 males). Females gained 1.7 +/- 4.5 kg (3.75 +/- 9.92 lb) [mean +/- SD] from freshman to senior year, and males gained 4.2 +/- 6.4 kg (9.26 +/- 14.11 lb) (both $P < .001$). Weight changes were highly variable between students, however, ranging from -13.2 kg to +20.9 kg (-29.10 to +46.08 lb). Weight gain was common but variable among college students. Importantly, exercise and dietary patterns did not meet the recommended guidelines for many college students, which may have long-term health implications (Racette et al 2008).

The media & dietary patterns

Consumers' food choices and dietary behaviour can be affected by communication and information. Uncertainty, knowledge, involvement, health-related motives, trust and message contents are determinants of the effectiveness of advertisements of food items (Verbeke W 2008).

The objective of the review article is to analyse literature on the effect of sales promotions on food consumption. Results of the review are, while sales promotions lead to significant sales increases over the short term; it does not necessarily lead to changes in food consumption patterns. There is evidence that the media influences consumption patterns by influencing the purchasing choices of consumers and encouraging them to eat more (Hawkes C. 2009).

Proximity of fast food outlets and consumption

As a result of the modern working environment of long hours there is less time for family meal preparation time and meals eaten away from home has increased. Increased geographic access to fast food outlets may contribute to higher levels of overweight and obesity especially in persons who rely on these establishments.

A study that examined whether fast food restaurants are associated with BMI and car ownership moderates the association. 2156 adults were sampled from 63 neighbourhoods. Data was used from the 2000 US Census data and information on locations of fast food restaurants with the Los Angeles. Estimate associations between

BMI, fast food restaurants concentration and car ownership after adjustments for socioeconomic factors. The results indicated that individuals who do not own cars have higher BMI's than non-car owners. However, individuals who do not own cars and reside in areas with a high concentration of fast food outlets have higher BMI's than non-car owners who live in areas with no fast food outlets ($p=0.02$). The study revealed that higher restaurant density is associated with higher BMI among local restaurants and that local fast food environment has a stronger association with BMI for local restaurants who do not have access to cars (Inagami et al 2009).

Another study examined the relationship between fast-food restaurants near schools and obesity among middle and high school students in California. The results indicated that students within half mile consumed fewer servings of fruit and vegetables, consumed more soda and were more likely to be overweight.

The objective of another study was to compare the associations of restaurant food and fast food consumption with current and 3-y changes in BMI. 3,994 adults were used from the Coronary Artery Risk Development in Young Adults Study. The results showed that fast-food not restaurant food was positively associated with BMI (Duffey et al 2007).

Another similar study was conducted to examine the associations between fast food consumption, diet and neighborhood fast-food exposure using 2000-2002 Multi-Ethnic Study of Atherosclerosis data. 5633 participants aged 45-84. Healthy defined using the Healthy Eating Index or bottom quintile of a Western-type dietary pattern. Results showed that neighborhood fast-food exposure are associated with poorer diet (Moore et al 2009)

The articles in the literature review indicate that the media influences food choice but not a change in dietary patterns. The articles also reflected that the closer fast food restaurants are, the higher the amount consumed. The freshman 15 changes the dietary pattern temporarily as a result of adjustments made as a result of the transition from the parental home to living away from home.

Methodology

This study assessed whether university students subscribed to healthy dietary patterns. It also determined the proximity to fast foods, university life and the media on the dietary patterns of students. This study was conducted at The University of the West Indies, St Augustine Campus, Trinidad. 255 students participated 180 females and 75 males.

HYPOTHESIS

- **Null Hypothesis:** the dietary patterns of university students are healthy.
- **Alternate Hypothesis:** the dietary patterns of university students are not healthy.

STUDY DESIGN

This study is cross sectional in design. This study design was used because cross sectional studies are used to illustrate associations and can be used as a guide for more in depth studies. Cross sectional studies can be used as a measure of diet/disease relationships as this questionnaire included anthropometric, demographic food frequency and 24hr recall.

The Instrument

The questionnaire was divided into four sections. The first section contained questions about demographic, anthropometric, chronic disease history of immediate family members and food habits. Four researchers enrolled in the BSC. Human Nutrition and Dietetics measured the participants.

The second section of the questionnaire, questions pertained to physical activity. The questions assessed the intensity, frequency and duration of exercise. This section also evaluated the amount of hours spent in physical inactivity.

The third section assessed the location of playing fields, the safety of the area and if members of the community used the fields for exercise. This section also inquired on the proximity of fast food establishments and the frequency of fast food intake.

The fourth section combined a food frequency questionnaire and a 24hr recall. Foods were subdivided using the Caribbean food groups, staples, legumes, food from animals, vegetables, fruits, fats and oils, water and snacks. The food frequency evaluated habitual intake and 24hr recall current intake. There was also an area where participants indicated the servings that they usually consumed.

Sampling Procedure

Questionnaires were distributed and collected within two weeks at different locations at the St Augustine Main Campus by the four researchers. The researchers recruited participants at Canada Hall, Trinity Hall, the environs of Dudley Huggins building, Sir Frank Stockdale building and Social Sciences and Humanities. The four researchers analysed different aspects of the data that was collected. The researchers took the anthropometric measurements first and explained and described the serving sizes of the different food items or any question that participants were uncertain. Participants had the choice of omitting their names from the questionnaire. Participants chosen were eighteen years and over which is the age of consent. Fix this sentence. The questionnaire was a piloted prepared by Mr. Marlon Francis, graduate of The University of the West Indies.

Statistical Analysis

Statistical Package for the Social Sciences (SPSS) version 12.0 was used to analyse data. T tests were used to analyse anthropometric data. The Chi square test was used to analyse categorical variables and data that was grouped such as BMI, sex. Pearson's Correlation was used to demonstrate relationships between food items P values of <0.05 were used to determine statistical significance.

RESULTS

Table 1: illustrates demographic characteristics of participants by gender.

Variables	Females (n=180)	Male (n=75)	P values **
Year of entry • 2005 • 2006 • 2007 • 2008 • 2009	0(0.0) * 14(8.0) 45(25.9) 45(25.9) 70(40.2)	1(1.4) 6(8.5) 19(26.8) 21(29.6) 24(33.8)	<0.512
Address • Off campus • On campus	137(76.1) 43(23.9)	35(46.7) 40(53.3)	<0.001
Religion • Anglican • Baptist • Hindu • Muslim • Presbyterian • Roman Catholic • Seventh Day Adventist • Pentecostal • Methodist • Other	12(6.9) 8(4.6) 26(14.9) 2(1.1) 7(4.0) 43(24.6) 10(5.7) 25(14.3) 1(0.6) 41(23.4)	12(18.2) 5(7.6) 2(3.0) 0(0.0) 4(6.1) 17(25.8) 7(10.6) 7(10.6) 1(1.5) 11(16.7)	<0.040
Ethnicity			

• African	85(47.2)	52(70.3)	<0.002
• Indian	37(20.6)	5(6.8)	
• Mixed	58(32.2)	17(23.0)	

***Numbers in brackets represent the percentage while the other number represents the frequencies of participants.**

****Statistical significant p values are $p \leq 0.05$**

Table 1 illustrates the demographics of participants by gender. The sample population consisted of 254 participants, 70.6% were females and 29.4% were males. 47.2 % female and 70.3% male of participants were of African descent while 20.6% females and 6.8% males were of Indian descent and 32.2 % females and 23.0 males were of mixed descent. In the year, 2005 only 1.4% of the subjects were enrolled at the university while 8% females and 8.5% males were enrolled in 2006. 25.9% females and 26.8% males in 2007, 25.9 % females and 29.6 males in 2008 register and 40.2% females and 33.8 % males in 2009 Most of the female participants lived off-campus (76.1%) while most of the male participants lived on – campus (53.3%) The results showed a significant difference between the number of participants who lived on campus and off campus as indicated by a p-value of **<0.001**.

Table 2: Age and anthropometric characteristics of participants by gender

Variables	Females (n=180)	Male (n=75)	P-values
Age (years)	22.1 ±4.3	22.8 ±4.0	<0.24
Height (inches)	64.1 ± 3.5	70.2±3.1	<0.001
Weight (lbs)	134 ± 34.5	175.37±7	<0.001
BMI (lbs/inches ²)	22.3 ±5.4	24.9 ±4.3	<0.002
Body fat (%)	30.9 ± 9.0	21.8 ± 7.2	<0.001
Waist Circumference (cm)	75 ± 11.8	85 ± 10.7	<0.001

Table 2 illustrates age and anthropometric characteristics of participants by gender. There was no statistically significant difference in age by gender (**p value= 0.24**). Most participants were 22 years old. There was a statistically significant difference in height (**p =<0.001**). Generally, men were 70.2±3.1 inches while females 64.1 ± 3.5 inches. The average weight of males was significantly

higher than females, that is 175lbs and 134 lbs respectively (**p= 0.002**). Men have higher lean body mass or lower body fat percentages than females and this was statistically significant, **p =<0.001**. Waist circumference was also statistically significant, male participants (85 cm) also had significantly larger waist circumference measurements than females (85 cm) as indicated by **p=<0.001**.

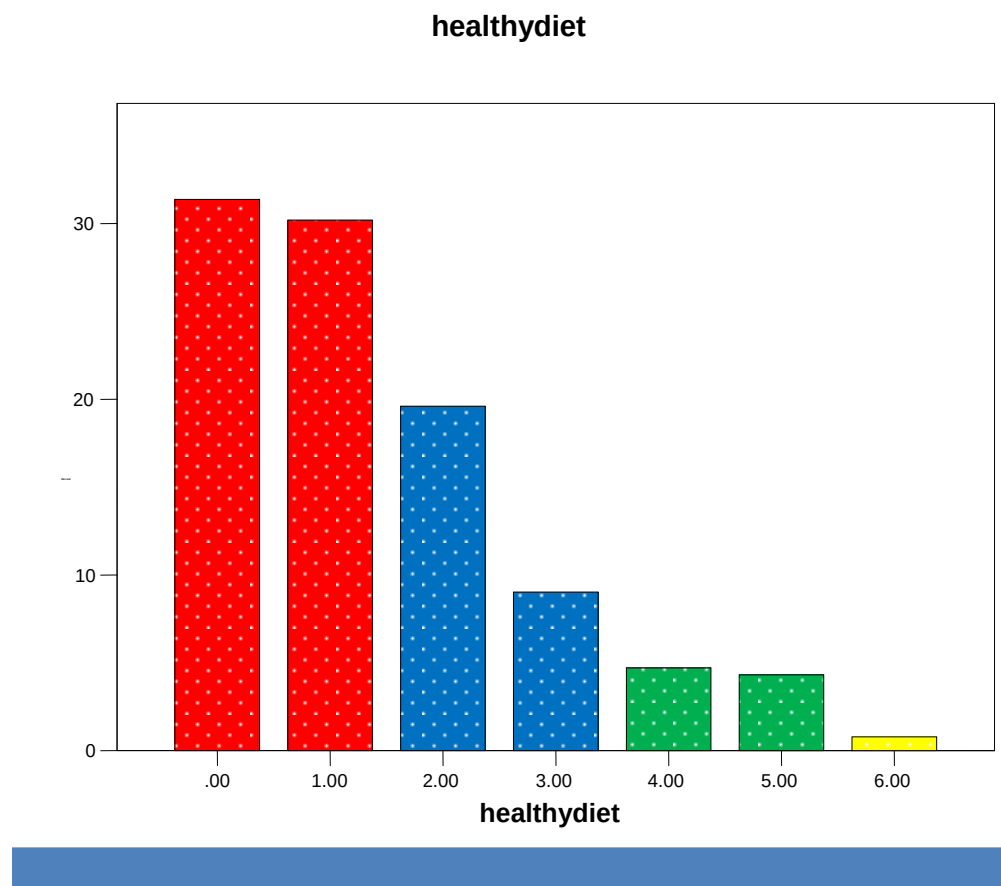
Table 3: Dietary consumption patterns among participants by gender

Variables	Females	Males	P values
Staples	4.0 ± 3	5.7 ± 4.0	.004
Legumes	0.9±0.8	0.9±1.8	0.73
Meats	2.2 ±2.3	3.3±4.1	0.06
Vegetables	1.3±1.3	1.1±1.6	0.29
Fruit	2.5±2.6	3.7±4.4	0.06
Fats	0.7±1.3	0.8±1.0	0.53
Snacks	1.0±2.0	1.0±1.5	0.84
Soda	0.5±1.2	0.7±1.0	0.34
Dairy	1.8±1.8	2.2±2.2	0.17

Table 3 illustrates the dietary consumption patterns among participants by gender. Generally, females (4.0 servings) staples significantly less than males (5.7 servings) as evidenced by **p = 004**. There were no statistically significant by gender

among the meat, vegetables, fruit, fats, snacks, soda and dairy groups. Generally, males consumed more of each group with the exception of the legume group.

Figure 1A illustrates healthy diet using percentages from the food frequency questionnaire (all food groups).



.00 – 1.0 poor diet

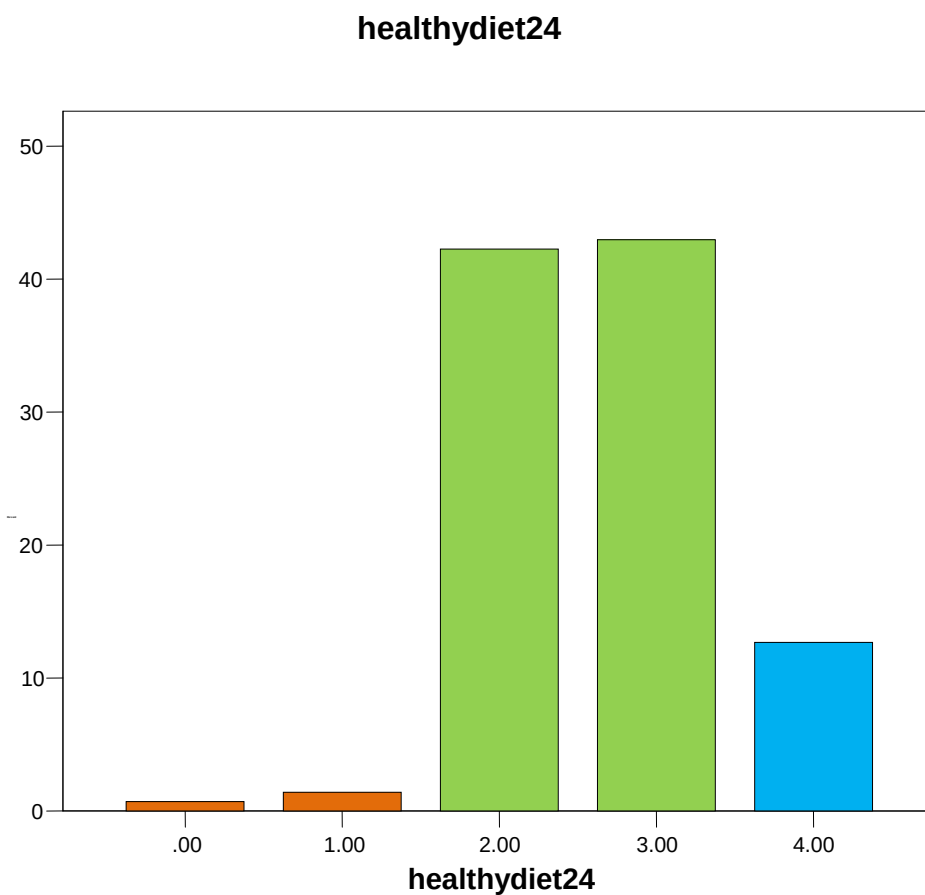
2;00-3.00-sufficient diet

4.0 - 5.0 good diet

6.0 – healthy diet

Figure 1A illustrates healthy diet using percentages from the food frequency questionnaire (all food groups). 61.6% of the participants' diets consumed a poor diet while as poor. 28.6% percent can be classified as sufficient. 9% of the participants diets can be classified as good and 0.8% as a healthy diet.

Figure 1B illustrates an analysis of the 24hr recall



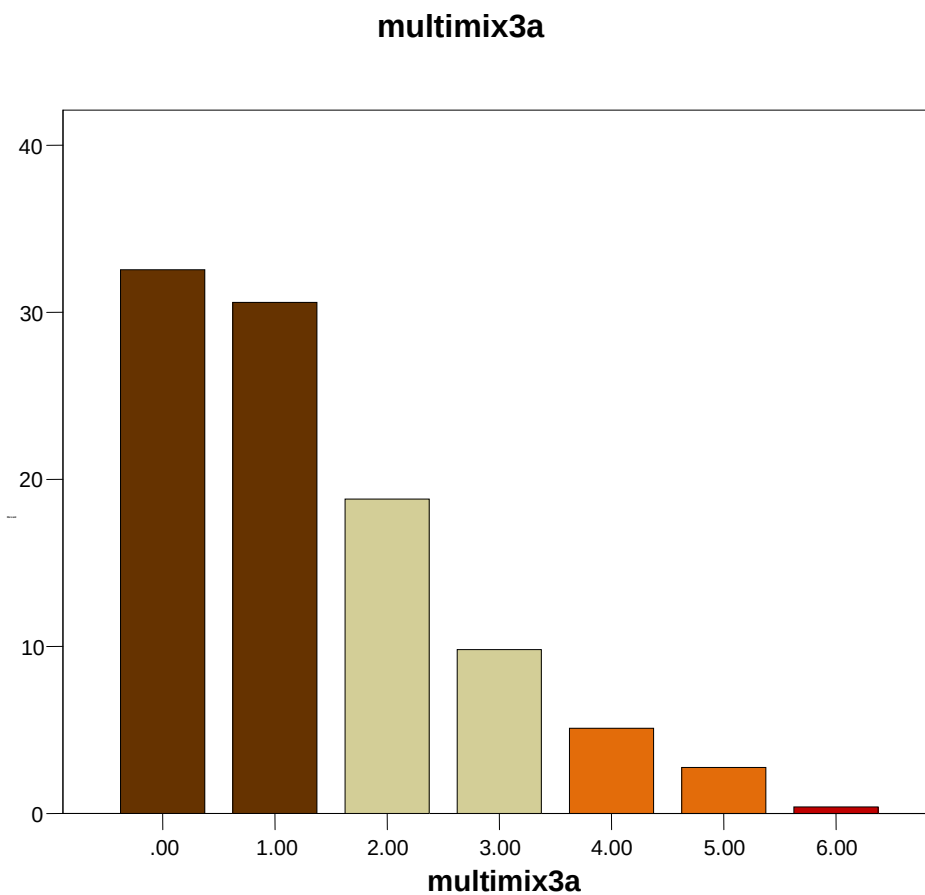
.00 – 1.0- poor diet

2.0– 3.0 sufficient diet

4.0 - 5.0 -good diet

Figure 1B illustrates an analysis of the 24hr recall : The 24 hr recall indicates that 0.12 students diet are poor. 47.4% of participants diet are sufficient. 7.1 % diets are good.

Figure 1C illustrates the three combination multi mix concept (food from animals or legumes, fruit or vegetables, staples)



.00 – 1.0 poor diet

2.0– 3.00 sufficient diet

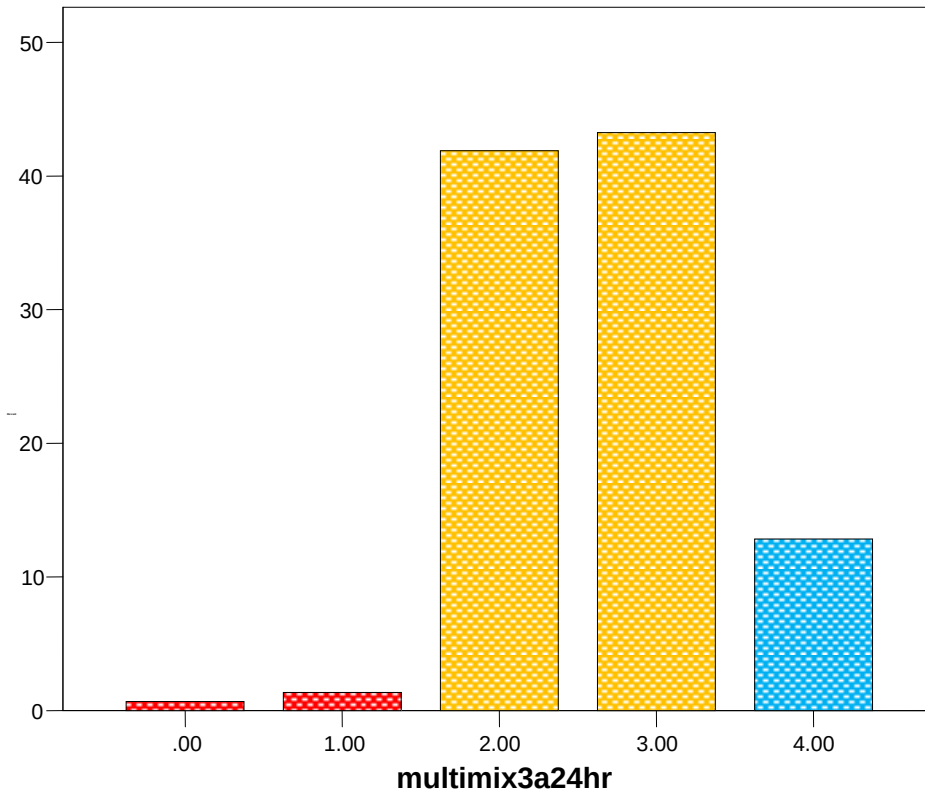
4.0 - 5.0 good diet

6.0 – healthy diet

Figure 1C illustrates the three combination multi mix concept (food from animals or legumes, fruit or vegetables, staples. 63.1% students' diet is poor. 28.6% students' diet is sufficient. 7.8% goodand 0.4% healthy.

Figure 1D illustrates the three comparison multi mix using the data from 24hr recall

multimix3a24hr



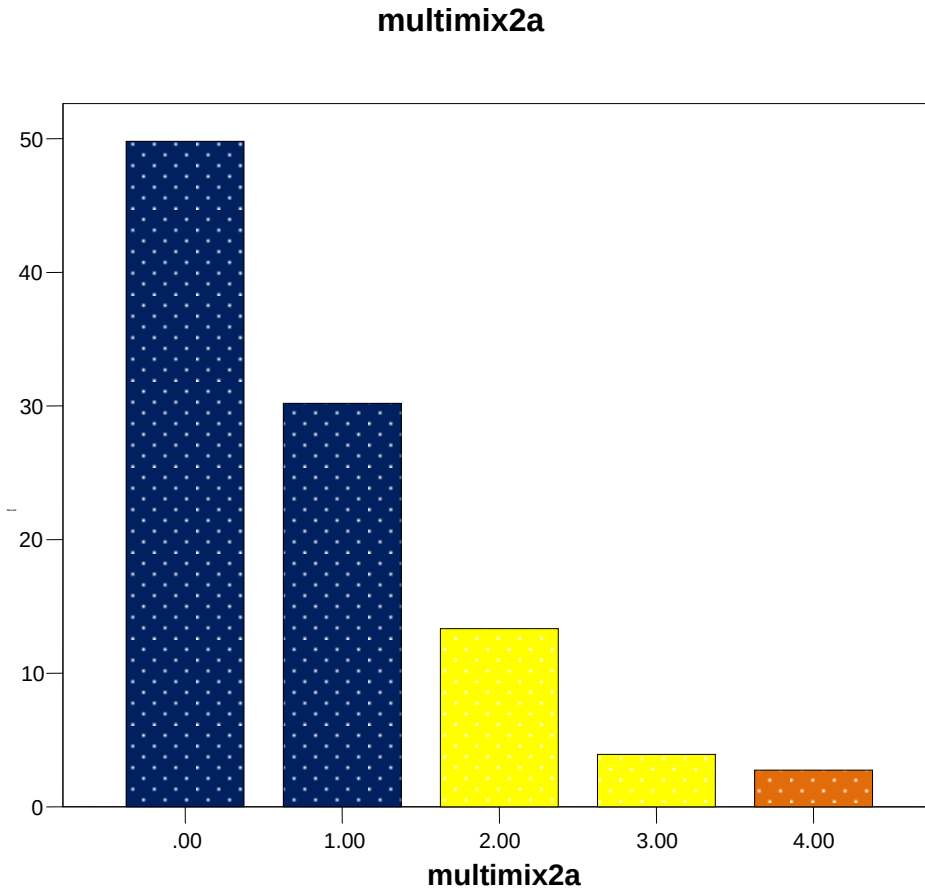
.00 – 1.0 poor diet

2.0- 3.00 sufficient diet

4.0 - 5.0 good diet

Figure 1D illustrates the three comparison multi mix using the data from 24hr recall: 0.12% diets are poor. 49.4% are sufficient. 7.5 % are good.

Figure 1E illustrates the two combination multimix concept FFQ (meats, dairy or legumes and staple)



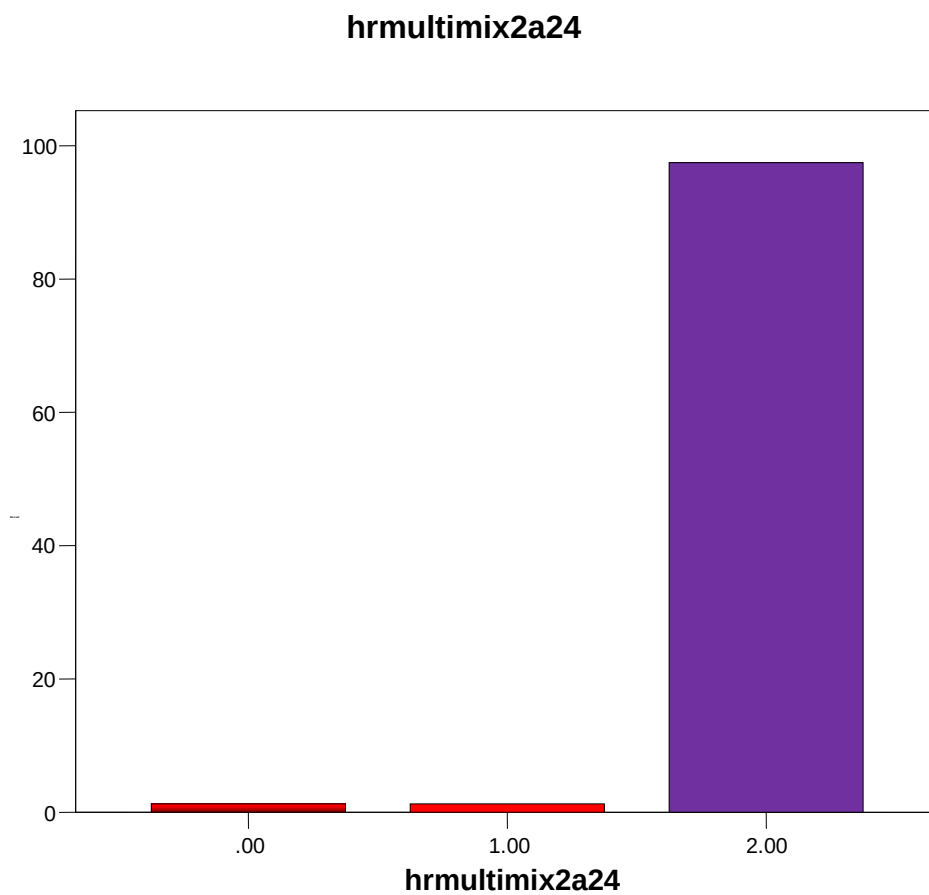
00 – 1.0 poor diet

2.0- 3.00 sufficient diet

3.0- 5.0 good diet

Figure 1E illustrates the two combination multimix concept FFQ (meats, dairy or legumes and staple) 80% diets are poor. 17.2% diets are sufficient. 2.7% diets are good.

Figure 1F illustrates the two combination multimix concept 24hr recall (meats, dairy or legumes and staple)

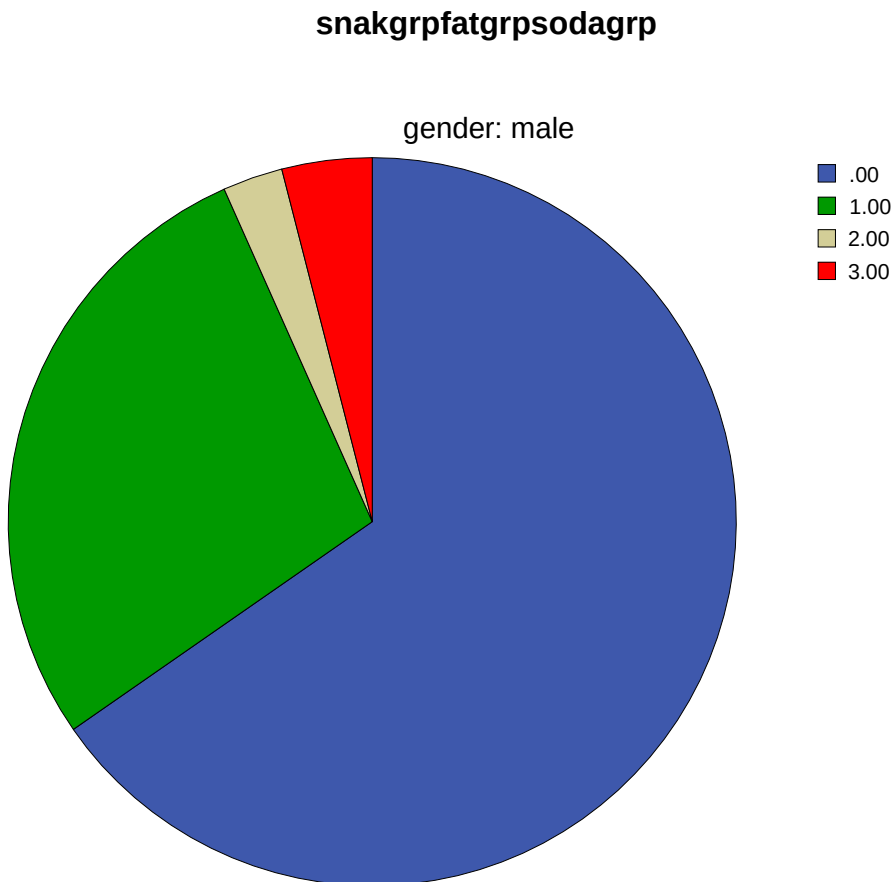


00 – 1.0 poor diet

2.0- 3.00 sufficient diet

Figure 1F illustrates the two combination multimix concept 24hr recall (meats, dairy or legumes and staple) 0.16% of participants' diet was poor. 60.4% of participants' diets are sufficient.

Figure 2A illustrates dietary pattern(snacks, fat & soda) of students by gender



.00 represents 134(65.3%) that

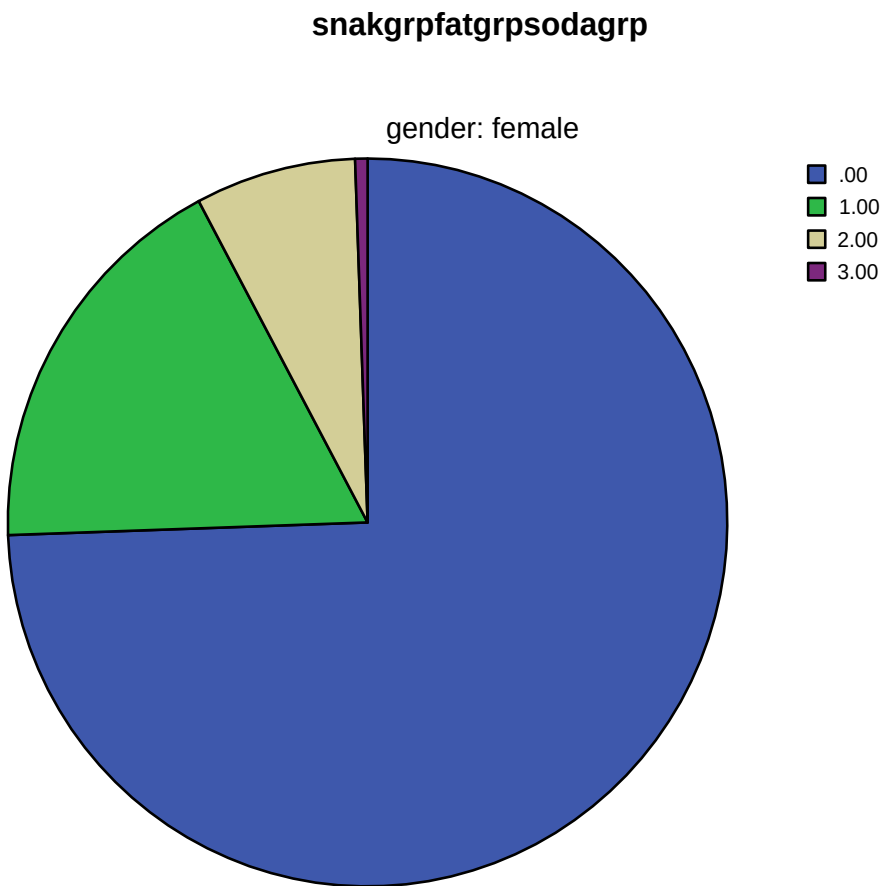
1.00represents 32(28.0%)

2.00represents 2(2.7)%

3.00represents 3(4.0%)

Figure 2A illustrates dietary pattern(snacks, fat & soda) of students by gender. 4.0% of the students consumed standard amounts while 96% consumed less than the standard amount.

Figure 2B illustrates dietary pattern(snacks, fat & soda) of students by gender



.00 represents 134(74.4%)

1.00represents 32(17.8%)

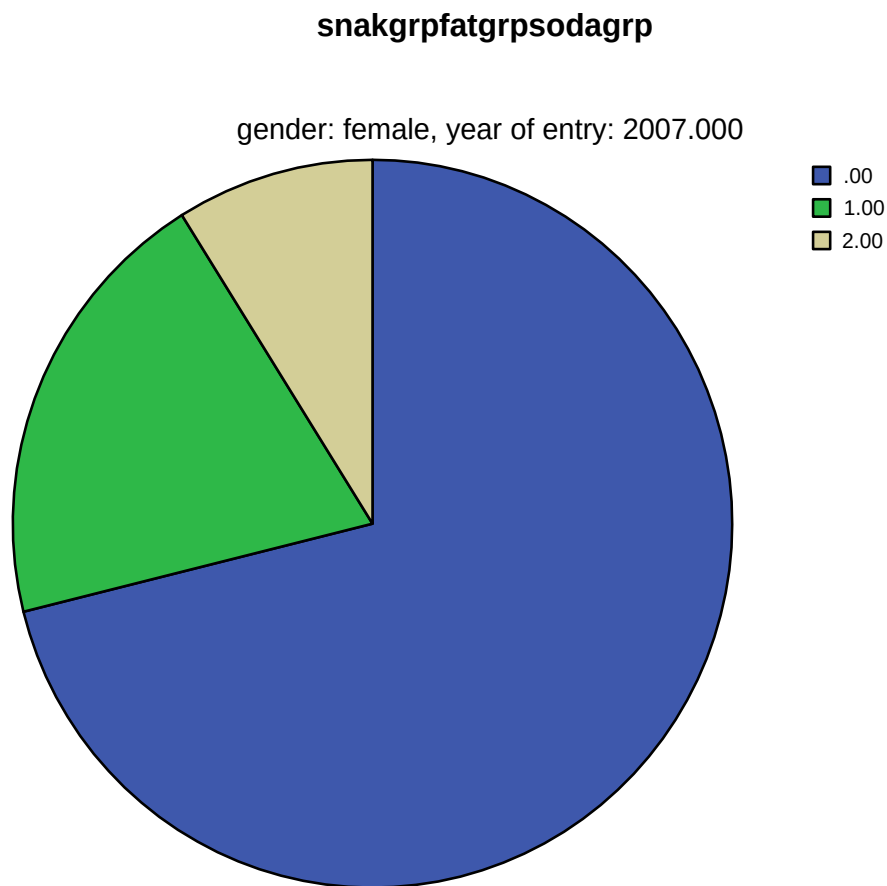
2.0 represents 13(7.2%)

3.0represents 1(0.6%)

Figure 2B illustrates dietary pattern (snacks, fat & soda) of students by gender

Only 0.6% females consumed standard amounts. Intakes are lower than males.

Figure 3A illustrates dietary pattern(snack, fat and soda by gender and year of entry 2007



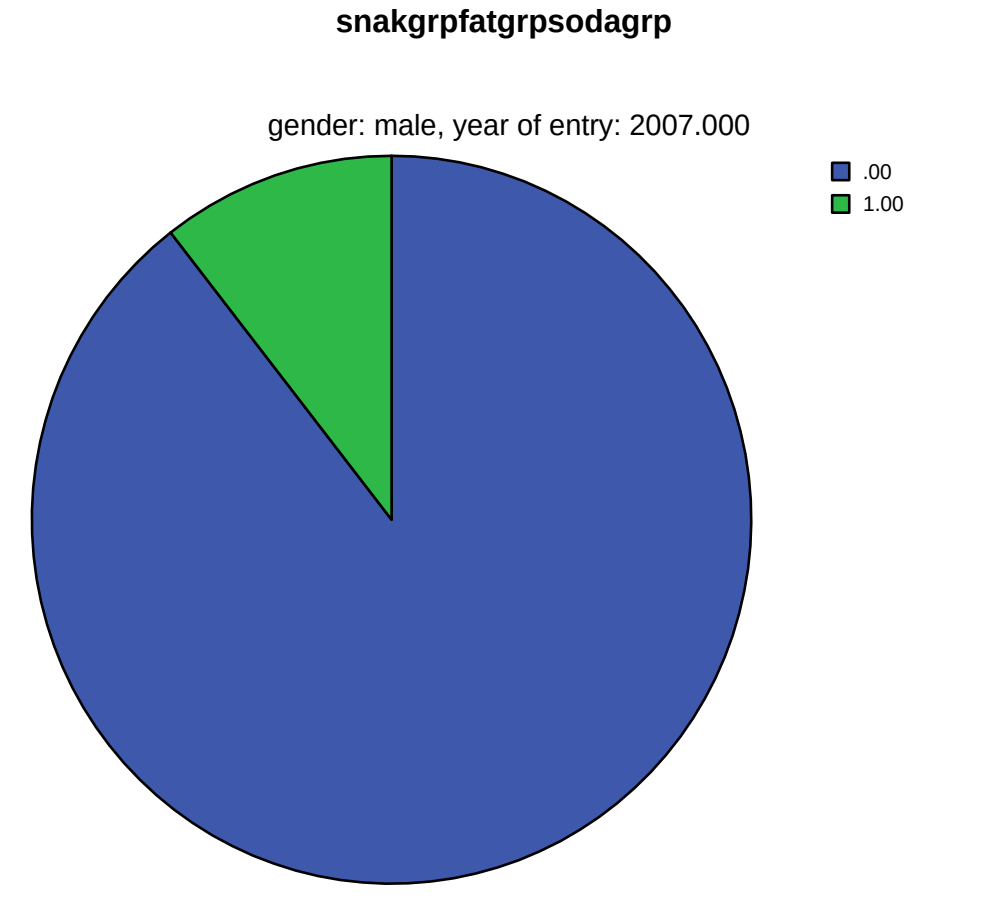
.00 represents 32(71.1%)

1.00represents 9(20.0)

2.0 represents 4(8.9)

Figure 3A illustrates dietary pattern(snack, fat and soda by gender and year of entry 2007. All consumed less than standard amounts of food items.

Figure 3B illustrates dietary pattern(snack, fat and soda by gender and year of entry 2007

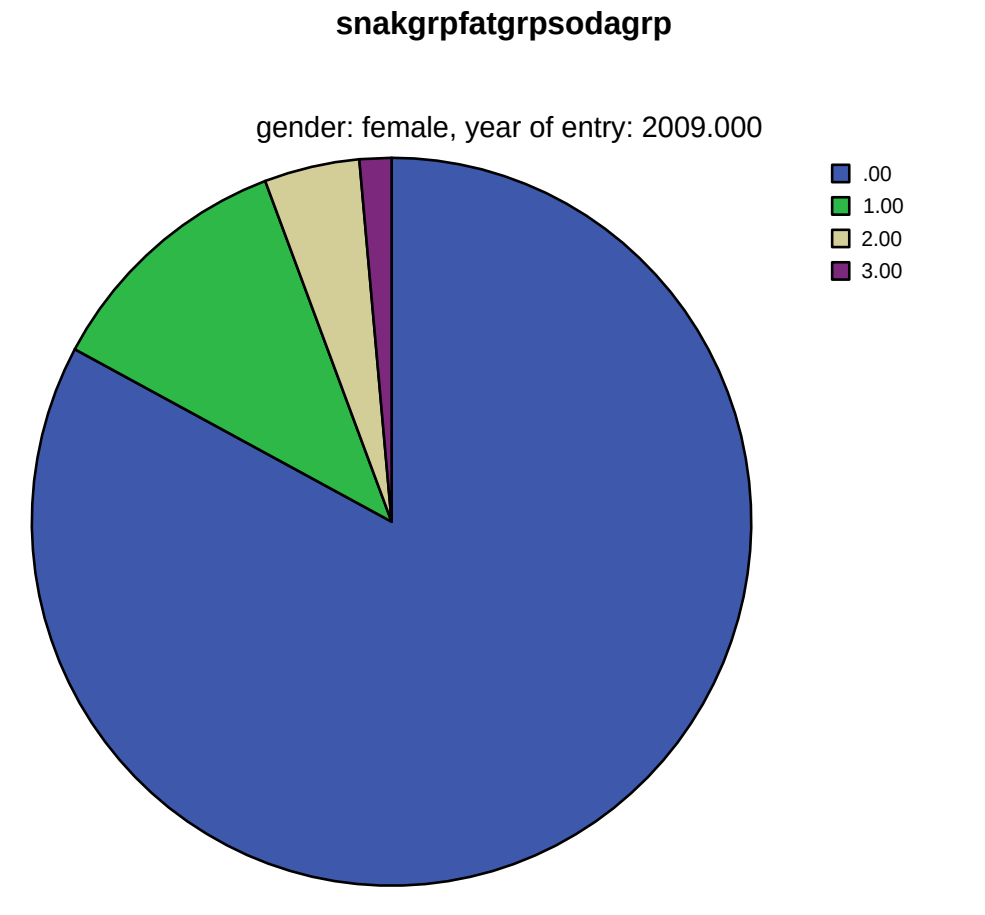


00 represents 17(89.5%).

1.00represents 2(10.5%)

Figure 3A illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009. Intakes of the snack, fat and soda group are between 0-1 servings.

Figure 3B illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009



.00 represents 58(82.9%)

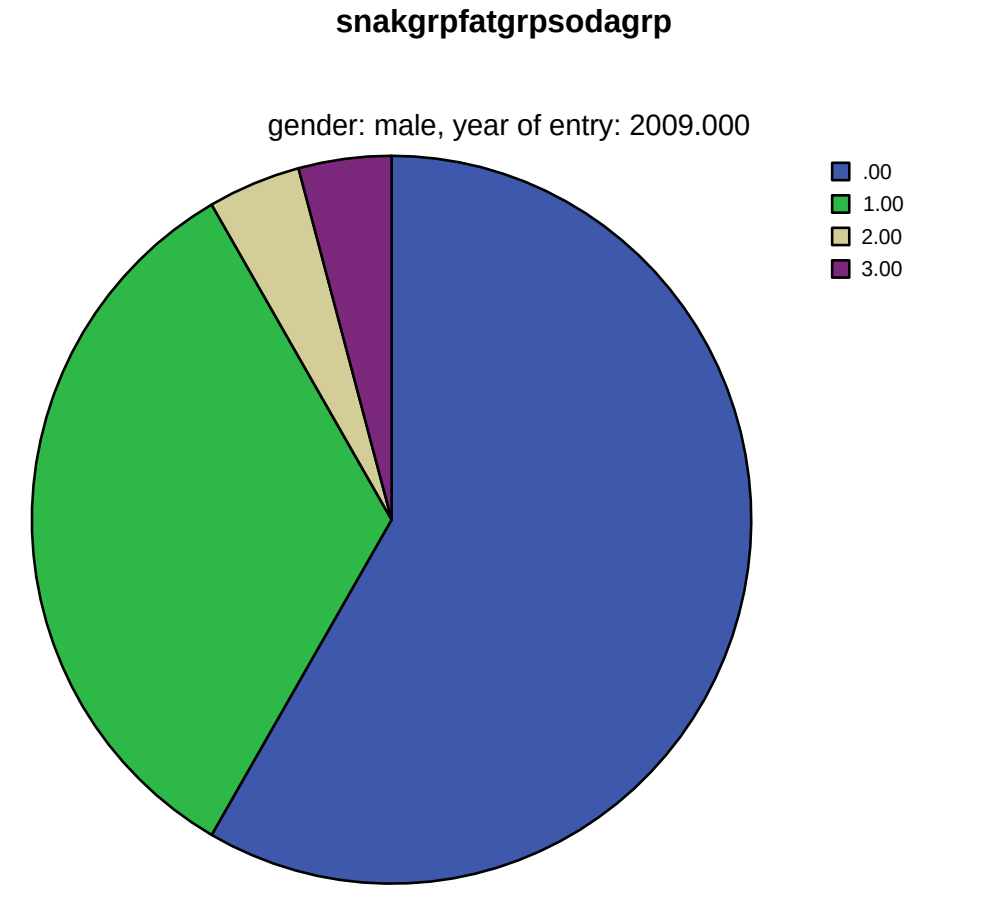
1.00represents 8(11.4%)

2.0-represents 3(4.3%)

3.0 represents 1(1.4%)

Figure 3B illustrates dietary pattern(snack, fat and soda) by gender and year of entry 2009. Students intake is low. 1.4% meet the standards while 98.6 are below the standards.

Figure 3C illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009



00 represents 14(58.3%).

1.00represents 8(33.3%)

2.0-represents 1(4.2)

3.0 represents 1(4.2%)

Figure 3B illustrates dietary pattern(snack, fat and soda by gender and year of entry 2009. 95.8% consume 0-2 servings while 4.2% consume 3 servings of the items.

Table 4 shows environmental factors that affect food choice (media & proximity)

Variables	Female	Male	P value **
Purchased foods seen on television	109(62.3)	41(56.2) *	0.395
Proximity to fast food vendors • <10 min. walk • 10-20 min. walk • 21-30 min. walk • >30 min. walk	93(51.7) 45(25.0) 17(9.4) 25(13.9)	53(70.7) 15(20.0) 4(5.3) 3(4.0)	0.021
Frequency of fast foods purchased • Never • Sometimes • Often • Very often	17(9.4) 133(73.9) 24(13.3) 6(3.3)	7(9.5) 50(67.6) 12(16.2) 5(6.8)	0.569
Frequency of food purchased over last week • 0dy • 1-2dys • 3-4dys • 5-7dys	50(27.9) 94(52.5) 29(16.2) 6(3.4)	22(29.3) 25(33.3) 20(26.7) 8(10.7)	0.006
Purchased fast foods yesterday	49(27.2)	29(42.0)	0.019

*Numbers in brackets represent the percentage while the other represents the number of participants.

**Statistical significant p values are $p \leq 0.05$

Females (62.3%) purchased more food items that were advertised on television than males (56.2%). Males lived closer to fast food vendors than females in the <10 minutes walk category. In the 10-20, 21-30 and more than 30 minute categories; larger percentages of females live further than males. This is statistically significant as the p value is 0.021. 9.4 females and 9.5 males reported that they never consume fast food. 73.9% female and 67.6% male reported purchased fast food infrequently. 13.3 % and 16.2% reported that they bought fast food often and 3.3% and 6.8% of females and males bought fast food very often. 27.9% and 29.3% females and males did not purchase food over the last week. More females (52.5) bought more than males (33.3) 1-2 days per week. Males (26.7) reported higher consumption 3-4 days per week than females (16.2%). Males (10.7%) also consumed fast 5-7 days more than females (3.4%). Statistically significance $p=0.006$. 42.0% of males and 27.20% females bought fast food the previous day.

DISCUSSION

This research paper assessed whether the dietary patterns of university students are healthy. This paper also revealed environmental factors including proximity of fast food businesses changed the dietary patterns of students, the role of the media of food choice and the effect of university life on dietary patterns.

The effect of university life on dietary patterns

The result of this study shows that students in their first year consume more snacks, sodas and fat than students in their third year. This was expected because in the first year of university students must adapt to an environment that is characterized by irregular schedules, stress and the availability of fast foods. It also shows that males consume more snacks, fat and sodas than females. In a cross sectional study that assessed the nutritional knowledge and exercise habits of college students, 453 students completed the nutritional survey. It indicated that students in their first year consume 2-3 snacks per day and 40% of the population surveyed ate healthy snacks (Orza Heather). Another study, longitudinal in design, diet records were used to analyse frequency and selection of foods eaten. Foods consumed more frequently for snacks were carbonated beverages and students snacked at least once per day. Men consumed more high calorie and high fat foods than females (Huang, Y.L.1994).

Proximity of fast food outlets and consumption

Males lived closer to fast food vendors and reported that they purchased fast foods more frequent than females. This result also occurred in a longitudinal study (Huang, Y.L) where men consumed more foods that are high calorie and high fat foods than females. In another cross sectional study (Liebman et al 2002), the objectives of the study were to assess dietary fat reduction/ avoidance behaviours within a sample of college students and to assess the relationship between self reported fat avoidance to BMI, self esteem and responses to the Eating Attitudes Test and other variables. 325 undergraduate students participated. The results indicated that women rely heavily on dietary fat avoidance to reduce caloric intakes (Liebman et al 2002)

The Healthy Diet / the Multi mix Concept

The main objective of this study is to determine whether dietary patterns of this university can be classified as healthy. A healthy diet must be adequate, balance, nutrient dense, variety and energy control (Whitney and Rolfes). In this study the majority of university students ' diet cannot be described as healthy. The results indicate that most students' diet can be described as poor. Most studies indicate that diets of tertiary education students are poor. An example of a study that complemented this view primary objective was to determine whether young adult meal planning, dietary intake and home food availability differed to non- students. The results indicated that few young adults consumed optimal diets and in comparison to 2 and 4 year students consumed fewer meals and poorer diets (Nelson, Melissa. C et al).

Another cross sectional study determined the prevalence of youths that were in line with the Healthy People 2010 objectives for obesity, intake of fat, vegetables, grains. 4746 adolescents participated. Results of the study indicated that there were wide gaps in meeting the daily recommended intakes of fat, fruits, vegetables and grains (Neumark-Sztainer, Dianne 2002).

Limitations

A cross sectional study cannot be used to establish cause and effect relationships.

This study utilized convenience sampling which introduces bias because participants may not be representative of the overall population (Lunsford Thomas and Lunsford, Brenda 1995). 24hr recalls and food frequency are dependent on memory and also introduces recall bias.

Conclusion

In this study the results indicate that dietary patterns of the majority of university students are poor, therefore the null hypothesis cannot be accepted.

Recommendations

The introduction of a compulsory course that includes basic nutrition information on nutrients and food groups, principles of meal planning about healthy diets, and skill, quick and easy methods of meal preparation, understanding food labels, the importance of physical activity such as mandatory exercise 3hrs per week. This will provide students with skills to improve their diet.

REFERENCES

Barr-Anderson, Daheia. , Neumark-Sztainer., Story, Mary.2009. Disparities in Dietary Intake, Meal Planning, and Home Food Environments Among Young Adult Nonstudents and 2- and 4- Year College Students. *American Journal of Public Health*. July 2009, vol99, No.7, 1216 – 1219

<http://ajph.apha.aphapublications.org/cgi/content>

1. Beating the Freshman. October 2009. The Nemours Foundation

http://kidshealth.org/teen/food_fitness/nutrition/freshman_15.html

Caribbean home economists .*Caribbean Home Economics in Action*, book 1 3rd edition Heinman educational.

Nutrition Transition Program

[www.cpc.unc.edu/projects/nutrition transition program](http://www.cpc.unc.edu/projects/nutrition%20transition%20program)

Davis, Brennan and Carpenter, Christopher. 2008. Proximity of Fast Food Restaurants to Schools and Adolescent obesity. *American Journal of Public Health*.505-510

<http://ajph.aphapublications.org/cgi/content>

Duffey, Kiyah., Gordon- Larsen, Penny., Jacobs, David., Williams, Dale., Popkin, Barry.2007. Differential associations of fast food and restaurant food consumption with 3-y change in body mass index: the Coronary Artery Risk Development in Young Adults Study^{1,2,3}. *American Journal of Clinical Nutrition* .Vol, 85,No.1, 202-2008.

<http://www.ajcn.org/cgi>

FAO Nutrition Profiles Trinidad and Tobago
<ftp://ftp.fao.org/es/esn/nutrition/ncp/tri.pdf>

1. Uses of Food Consumption and Anthropometric Surveys in the Caribbean How to Transform Data into Decision-Making Tools. Prepared in collaboration with the FIVIMS Secretariat...
www.fao.org/docrep/008/y5825e/y5825e00.htm

Hawkes. C. 2007. Sales Promotions and Food Consumption. *Journal of Clinical Nutrition*. Vol. 85, No.1,201-208
<http://www.ajcn.org/misc/terms.shtml>.

Huang, Y. L, Song, W.O, Schemmel, R.A., Hoerr, S.M
1994. What do college students eat? Food selection and meal pattern. *Undergraduate Research Journal for the Human Sciences*
www.kon.org/urc/v6/orza.html -

Inagmi, Sanae, Cohen, Deborah., Brown, Arlene., Asch, Steven. 2008.
Body Mass Index, Neighborhood Fast Food Restaurant Concentration and Car
Ownership. *American Journal of Epidemiology*, doi:10.1093/aje/kwp090

<http://aje.oxfordjournals.org/misc/terms.shtml>

Liebman, M., Cameron, B.A., Carson, Brown, D.M., Meyer, S. 2001. Dietary fat reduction behaviors in college students: relationship to dieting status, gender and key psychosocial variables

http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WB2-45BT65C-V&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1119998626&_rerunOrigin=scholar.google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=aeb295a234cb1fc8e80cd60f5bb2db1c

Mihalopoulos, Nicole., Auinger, Peggy., Klein, Jonathan. 2008. The Freshman 15: Is it Real? *American Journal of College Health* 2008;56(5):531-533

www.ncbi.nlm.nih.gov/pubmed/18400665

Moore, Latetia., Diez Roux, Ana., Nettleton, Jennifer., Jacobs, David., Franco, Manuel. 2009. Fast-Food Consumption, Diet Quality, and Neighborhood Exposure to Fast Food. *American Journal of Epidemiology*

<http://aje.oxfordjournals.org/cgi/>

Neumark-Sztainer, Dianne,. Story, Mary.2002. Overweight Status and Eating Patterns Among Adolescents: Where Do Youths Stand in Comparison With the Healthy *People 2010* Objectives? *American Journal of Public Health*. May 2002, Vol 92, No. 5 | 844-851
<http://ajph.aphapublications.org/mic>

Health Situation Analysis and Trends Summary. Global Situations and Trends.

Trinidad and Tobago

http://www.paho.org/English/DD/AIS/cp_780.htm

Popkin, Barry, M. The Nutrition Transition and the Global Shift Towards Obesity. 2004. *Diabetes Voice*, Volume 49, Issue 3

Racette, S.B., Deusinger., Strube, MJ., Highstein, GR., Deusinger, RH.2008. Changes in weight and health behaviors from freshman through senior year of college. *Journal of Nutrition Education Behavior*.

www.ncbi.nlm.nih.gov/pubmed

Story, M., Neumark-Sztainer, D., French,S. 2002. Individual and Environmental Influences on Adolescent Eating Behaviors. *Journal of American Dietetic Association*. Vol 102,issue 3, pages S40-S51

<http://linkinghub.elsevier.com/retrieve/pii/S0002822302904219>

Verbeke, W. Impact of communication on consumers' food choices Paper presented at The Third Congress of Soci  te  Franc  ais de Nutrition 7 December 2007.

http://journals.cambridge.org/download.php?file=%2FPNS%2FPNS67_03%2FS00

[29665108007179a.pdf&code=1fb68b55c494b43bead73b8e039e5e6c](http://journals.cambridge.org/download.php?file=%2FPNS%2FPNS67_03%2FS0029665108007179a.pdf&code=1fb68b55c494b43bead73b8e039e5e6c)

Whichelow, Margaret., Prevost, Toby. 1996. Dietary patterns and their associations with demographic, lifestyle and health variables in a random sample of British adults. *British Journal of Nutrition*76:17-30

<http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=877804>

Whitney, Ellie., Rolfes, Sharon, *Understanding Nutrition* 10th edition. Wadsworth Thomson Learning USA.

Zotor, F., Amuna, P. The food multimix concept : new innovative approach to meeting nutritional challenges in Sub-Saharan Africa *Proceedings of the Nutrition Society*
<http://cat.inist.fr/?aModele=afficheN&cpsidt=20136032>

Appendix

Figure Caribbean Food Groups 4



ACKNOWLEDGEMENTS

I would like to thank my Supervisor, fellow researchers, friends and family for their support through this process.