DIFFERENCES IN DAILY DIETARY INTAKE BETWEEN STUDENTS WHO EAT AT LEAST ONE MEAL IN RESTAURANTS AND STUDENTS WHO DON'T EAT IN RESTAURANTS

A THESIS

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT

FOR THE DEGREE OF MASTER OF SCIENCE

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

COLLEGE OF HEALTH SCIENCES

BY

SAMAR ABUMAHAIMEED, B.A.

DENTON, TEXAS

DECEMBER 2012

TEXAS WOMAN'S UNIVERSITY

TEXAS WOMAN'S UNIVERSITY
DENTON, TEXAS

October 29, 2012

To the Dean of the Graduate School:

I am submitting herewith a thesis written by Samar Abumahaimeed entitled "Differences in Daily Dietary Intake between Students who Eat at least One Meal in Restaurants and Students who Don't Eat in Restaurants." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science with a major in Nutrition.

John Radcliffe, PhD, RD, Major Professor

We have read this thesis and recommend its acceptance:

Interim Department Chair

Accepted:

Interim Dean of the Graduate School

DEDICATION

I dedicate this work to my parents, for their support, love, patience and many words of encouragement.

To my sister, for her support, love, and care.

To my brothers, for their help and support.

ACKNOWLEDGEMENTS

To Dr. John Radcliffe, thank you for serving as my advisor, for your instructions and time to help me improving my thesis.

To Dr. Karen Cullen, thank you for giving me a chance to work on this thesis, and your support.

To Dr. Carolyn Moore, thank you for your instructions and help.

To the rest of the faculty of the Nutrition department at Texas Woman's University, thank you for your support and help.

ABSTRACT

SAMAR ABUMAHAIMEED

DIFFERENCES IN DAILY DIETARY INTAKE BETWEEN STUDENTS WHO EAT AT LEAST ONE MEAL IN RESTAURANTS AND STUDENTS WHO DON'T EAT IN RESTAURANTS

DECEMBER 2012

Studies indicate that eating away from home is associated with childhood obesity. This study examined the difference between away from home meals and home meals. Students aged 11-14 years old were recruited from four middle schools in the Houston area and completed four 24-hour recalls in 2008. They were divided into 2 groups by meal source: those who ate all meals at home and those who ate at least one meal away from home. Intakes were compared using ANOVA, and χ^2. The level of significance was $P< 0.05$. There were few differences between groups for micronutrient and macronutrient intakes, but students who consumed at least one meal away from home had lower quality intakes than the other group. Limitations include using one retrospective method to collect data, and the majority of students recruited being Hispanics and from low income families. Interventions that help youth select healthy food choices away from home are needed.

TABLE OF CONTENTS

Page

DEDICATION iii

ACKNOWLEDGEMENT iv

ABSTRACT v

TABLE OF CONTENTS vi

LIST OF TABLES viii

Chapter

I. INTRODUCTION 1

II. REVIEW OF LITERATURE 2

Behavioral Factors and Weight Gain 2
Nutrients Recommendations 3
Away From Home and Fast Foods 5
Contributing Factors 8
Null Hypothesis 13

III. MATERIALS AND METHODS 14

Participants 14
Procedure 14

IV. RESULTS 16

V. DISCUSSION 23

Limitations 26

VI. CONCLUSION 27

REFERENCES ..... .29

APPENDIX

IRB Exception Letter 37

LIST OF TABLES

Table Page

1. Estimates of Energy Needs (Kilocalories per Day) Based on Age and Physical Activity 4

2. Recommended Macronutrient Proportions by Age 5

3. Recommended Number of Servings by Age and Gender 6

4. Recommended Daily Selected Micronutrient Intake for Children and Teens by Age 8

5. Demographics of Study Participants 16

6. Frequency of Away Meals Consumption 17

7. Gender, Ethnicity, Eligibility for Free/Reduced Price Meals Frequency for All Meals at Home Group and Any Meal Away from Home Group 18

8. Daily Intake Energy, Fiber, Fat, Carbohydrates, and Protein Intake for All Meals at Home Group and Any Meal Away from Home Group..... 19

9. Daily Intakes of Selected Micronutrients for All Meals at Home Group and Any Meal Away from Home Group 20

10. Daily Intake of Fruit, Vegetables, Grains, Sweet Beverages, Deserts for All Meals at Home Group and Any Meal Away From Home Group..... 21

CHAPTER I

INTRODUCTION

Childhood obesity is becoming epidemic; overweight and obese children tend to become overweight or obese adults, which may bring health challenges (Sekhobo, Edmunds, Reynolds, Dalenius, & Sharma, 2010). Overweight is defined as a body mass index (BMI [kg/m^2]) at or above the 85th percentile for children of the same age and sex. Whereas obesity is defined as a BMI at or above the 95th percentile for the same age and sex (Krebs & Jacobson, 2003). Childhood obesity may lead to the development of metabolic syndrome in the adulthood, which may lead ultimately to diseases such as diabetes type 2 and coronary heart diseases (Sun et al., 2008). Recent data from the National Health and Nutrition Examination Survey (NHANES) reveal that the prevalence of obesity in children and adolescents was 16.9 % in 2009-2010, which is similar to the prevalence in 2007-2008 (Ogden, Carroll, Kit, & Flegal, 2012).

Based upon the prevalence data from the NHANES collected between 1970s and 2004, it has been projected if the trends of increasing obesity rates continue that by 2030, 86.3% of all adults will be overweight or obese and that 51% will be obese, with African American women and Mexican American men being most affected. In children, the prevalence of obesity has been projected to be 30%. It has been also estimated that the health care costs associated with obesity would be substantial (15.8-17.8 % of the total health care costs) (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008).

CHAPTER II

REVIEW OF LITERATURE

Behavioral Factors and Weight Gain

Behavioral, environmental and genetic factors affect one's weight. High calorie intake per day may be related to the high prevalence of obesity among children and adolescents. If more calories are consumed than expended, weight gain would result (Dietary Guidelines for American, 2010). According to Anderson and Butcher (2006) there appears to be no one cause for the increase in the prevalence of obesity in children. Many complementary developments appear to have simultaneously increased energy intake (for example, increasing intakes of energy-dense, high calorie foods and drinks) and decreased energy expenditure (for example, spending more time viewing television and using computers). Other factors include increasing homework load, campus vending machines, larger portion sizes, fast food, and video games (Strum, 2005).

Gillis and Bar-Or (2003) found also that the type of food consumed may be related to childhood obesity. These authors compared obese children (n=91), who were recruited from a hospital- based weight control treatment program, with none obese children (n=90), who were recruited from community advertisements in Canada and found that the obese children consumed more servings of meat, grain products, food away from home (FAFH), sweetened beverages, and potato chips than the none obese children. Increasing

the portion size is also a factor for increasing calorie intake nowadays. According to Piernas and Popkin (2011), portion size had increased between 1977 and 2006. These authors selected data from children between ages 2-18 years old from 4 nationally representative surveys of food intake between 1977-1978 and 2003-2006 and assessed portion sizes for the most common eaten foods by children (for example, pizza, burgers, hot dogs and soft drinks). They found that portion sizes for pizza, soft drinks, hamburgers, and cheeseburgers between 1977 and 2006 had increased, and energy intake from eating occasions including pizzas and soft drinks had increased significantly. Energy intake from pizzas, for example, had increased by 140 kcal.

Nutrient Recommendations

Children and adolescents are encouraged to consume adequate energy to support growth and development without excessive calorie intake to prevent weight gain. The estimated energy needs for young children are 1000-2000 kilocalories per day. The needs of older children and adolescents vary from 1,400 to 3,200 calories per day, depending on the age, weight status, height, gender and physical activity (see Table 1) (Dietary Guidelines for American, 2010). High intakes of fruits, vegetables and whole grains are the main recommendations to maintain good health. Calorie balance is the key to maintain weight, and decreasing calorie intake from food and beverages is the key for weight loss. Balanced proportions of the macronutrients (carbohydrates, protein, and fat) are also recommended for children and adolescents to support growth and provide nutrient needs. It is recommended that a minimum of 2.5 cups of vegetables and 1.5 cups

of fruits should be consumed per day (Dietary Guidelines for American, 2010). Most vegetables and fruits without added fats and sugars are low in calories, and their consumption helps in weight loss. It is also recommended for children and adolescents to do 60 minutes of physical activity per day (Dietary Guidelines for American, 2010).

Table 1

Estimates of Energy Needs (Kilocalories Per Day) Based on Age and Physical Activity

		Physical activity		
Gender	Age (years)	Sedentary	Moderate	Active
Female	9-13	1,400-1,600	1,600-2,000	1,800-2,200
	14-18	1,800	2,000	2,400
Male	9-13	1,600-2,000	1,800-2,200	2000-2,600
	14-18	2000-2,400	2,400-2,800	2,800-3,200

In general, children and adults should not consume more than 35% of calories per day from fat, should consume less than 10 % of calories per day from saturated fatty acids, should consume less than 300 mg of cholesterol per day, and should reduce intake of calories from added sugars and replace refined grains with whole grains. The general recommendations are to consume 2 ½ cups of vegetables, 1 ½ cups of fruits, 6 ounces of grains (of which 3 ounces are whole grains), 3 cups of dairy, 6 teaspoons of oil, and 5 ½ ounces of protein per day (see Tables 2 and 3) (ChooseMyPlate, 2012; Dietary Guidelines for American, 2010).

In addition, it is recommended to consume less than 2,300 milligram (mg) per day of sodium and reduce it to 1,500 mg among persons who are 51 and older and those of

any age who are African American or have hypertension, diabetes, or chronic kidney disease (Dietary Guidelines for American, 2010).

Table 2
Recommended Macronutrient Proportions by Age

	Carbohydrates	Protein	Fat
Children (1-3 years)	45-65% calories	5-20% calories	30-40% calories
Children and adolescents (4-18 years)	45-65% calories	10-30% calories	25-35% calories
Adults (19 years old and older)	45-65% calories	10-35% calories	20-35% calories

Away From Home and Fast Foods

Eating outside home leads to a poor diet and higher energy consumption. From 1977 to 1994-1996, the consumption of foods prepared away from home increased from 18% to 32% of the total daily energy consumption (Guthrie, Lin, & Frazao, 2002). Meals and snacks that were prepared away from home contained more calories per eating occasion and were higher in total fat and saturated fat for a per-calories basis than food eaten at home. Food prepared and eaten away from home contained less dietary fiber, calcium, and iron on a per calorie basis than food eaten at home (Guthrie et al., 2002). This increased prevalence of childhood obesity coincides with a shift in the American diet toward increased

consumption of foods eaten and/or prepared outside the home (Ayala et al., 2008; Thompson et al., 2004).

Table 3
Recommended Number of Servings by Age and Gender

	Girls between 9-13	Girls between 14-18	Boys between 9-13	Boys between 14-18
Food Groups				
Dairy	3 cups	3 cups	3 cups	3 cups
Meat & beans (protein group)	5 oz	5 oz	5 oz	6 ½ oz
Vegetables	2 cups	2 ½ cups	2 ½ cups	3 cups
Fruit	1 ½ cups	1 ½ cups	1 ½ cups	2 cups
Grains	5 oz	6 oz	6 oz	8 oz

Note. Adapted from ChooseMyPlate, 2012

Between 1977 and 2006, energy intake by children increased by 179 kilocalories per day related to increase energy consumption away from home. Sources of this energy were restaurants, fast food, and vending machines (Poti & Popkin, 2011). Poti and Popkin (2011) used data for 29,217 children aged 2 to 18 years old from four nationally representative surveys of food intake for the U.S. These authors found that stores were the main source of energy for children and that energy intake from fast food and restaurants had increased. The results show that the increase in energy intake between 1994 and 2006 is a result of the increased of fast food consumption at home.

Fast food is defined as all food that is prepared and served quickly with little consideration for its nutritional quality (Merriam Webster, 2012). Fast food restaurants are not the only source of fast food; other sources include convenience stores and supermarkets/ grocery stores. St-Onge, Keller, and Heymsfield (2003) found that the percentage of fast food consumption from restaurants and fast food outlets increased by 300% between 1977 and 1996. For a variety of reasons (for example, cost and convenience), individuals and families are relying more on away from home food (Sharkey, Johnson, Dean, & Horel, 2011). According to Rydell et al. (2008), adolescents and adults tend to eat at fast food restaurants for the reasons that it is served quickly, taste preference and for socializing with family and friends.

Bowman, Gortmaker, Ebbeling, Pereitra, and Ludwig (2004) found that children who ate fast food consumed 187 kilocalories per day more than the children who did not eat fast food. The authors analyzed data collected from the 1994 to 1996 United States of Department Agriculture's CSFII and from the Supplemental Children's Survey for the

year 1998 and found that those children who consumed fast food (regardless of the eating location) consumed more total fat, more saturated fat, more total carbohydrate, and more added sugars than children who did not consume fast food. These authors also found that fast food consumption was associated independently with male gender, older age, Non- Hispanic Black race/ethnicity, and residing in the South. In addition, Kids' meals provided at fast food restaurants were found to be an incomplete source of a meal. O'Donnell, Hoerr, Mendoza and Goh (2008) assessed the nutrient quality of kids' meals offered in different fast food restaurants in the Houston area and compared it to the criteria of the National School Lunch Program (NSLP) and found only 3% of these meals met all the NSLP guidelines.

Table 4

Recommended Daily Selected Micronutrient Intake for Children and Teens by Age

	Calcium	Folate	Vitamin A	Vitamin C	Iron
4-8	1000 mg	200 DFE*	400 µg RAE**	25 mg	10 mg
9-13	1,300 mg	300 DFE	600 µg RAE	45 mg	8 mg
14-18	1,300 mg	400 DFE	700-900 µg RAE	65-75 mg	11-15 mg

Note. *DFE: Dietary Folate Equivalent. 1 DFE = 1 µg food folate = 0.6 µg folic acid from supplements and fortified foods. **RAE: Retinol Activity Equivalents
From: Dietary Guidelines for Americans, 2010

Contributing Factors

Peer pressure was found to affect children's food choices and time spent in physical activity. Ali, Amialchuk, and Heiland (2011) investigated the effect of social

and friendship interactions of adolescents in weight related behaviors (for example, exercising, frequency of eating at fast food restaurants, eating five servings of fruits and vegetables a day, and consuming calorie dense snacks) using data from the National Longitudinal Survey of Adolescent Health for adolescents in grades 7 to 12 in 132 schools nationwide in the U.S. The sample consisted of 3,898 adolescents and their friends, and 85% of the friends were from the same school as the respondents. These authors found a strong association between individuals' and friends' behaviors related to exercising, sports and fast food consumption that maybe are connected with increasing the rates of obesity.

Adolescents also are less likely to consider family meals as important as the parents and prefer to spend time with friends. Fulkerson, Neumark-Sztainer, and Story (2006) found that parents in their study had reported more family meals of five or more meals per week and challenges of scheduling family meals more than adolescents. Younger adolescents also reported more family meals than older adolescents; this may be related to the fact that teens are less likely to eat meals with family.

Children learn eating habits, physical activity, and sedentary behaviors that may lead to weight gain and obesity from parents. Children develop habits through exposure and repeated experience, which are usually provided by parents, especially at the early stages of childhood. Parents, as a result, should be a good role model and provide healthy foods to their kids (Lindsay, Sussner, Kim, & Gortmaker, 2006). Work schedule, job hours, and food availability were found to affect food choice coping strategies. Parents in a 2009 study who reported having long job hours and busy schedules relied more on

meals that often came from sources other than home (Devine, Farrell, Jastran, Wethington, & Bisogni, 2009). These authors found that half to three-fourths of parents had one or more fast-food main meals and one or more take-out main meals per week. Moreover, the amount of time spent by children in fast food and full service restaurants is affected by their parents' work schedule, eating habits and the use of such restaurants (Mclntosh et al., 2011). Fisher, Mitchell, Smiciklas-Wright, and Brich (2002) reported that girls' fruits and vegetables intakes were positively affected by their parents' intake of fruit and vegetable. These authors also found that those parents who consumed fewer fruits and vegetables had a greater pressure on their children feeding to consume more fruits and vegetables. In addition, they found that children are more likely to eat what is available and easily accessible and tend to eat bigger amounts when larger portion sizes are provided.

Children's eating habits are also affected by parents' education, ethnicity and income (Fisher et al., 2002). Family income, for example, is found to be a barrier for healthy eating. Patrick and Nicklas (2005) found that children with lower socioeconomic status ate fewer fruits and vegetables. Socioeconomically disadvantaged areas also have easier by proximity (that is, distance by the nearest location) and coverage (that is, number of different locations within a specific area) to both fast food restaurants and small stores (for example, convenience stores) than supermarkets, which can provide greater access to healthy foods (Boone-Heinonen et al., 2011).

Ethnicity and type of food eaten related to a culture, as well, were found to be related to weight status. For example, consuming food from fast-food chains and other

Anglo-oriented restaurants was found to contribute to higher obesity rates linked to acculturation among Mexican Americans (Duerksen et al., 2007). Also, according to many studies, obesity is widely spread among Black and low income populations in the U.S. Block, Scribner, and De Salvo (2004) examined the concentrations of fast food restaurants in the black and low income populations and neighborhood and found it to be linked to the obesity epidemic among these populations.

According to Dumanovsky, Nonas, Huang, Silver, and Bassett (2009) an average of 827 calories is the mean number of calories purchased from fast food restaurants at the New York City if a single item was purchased during the lunch time, and when more than one item was purchased the mean average was 961 calories. These authors used 55 receipts at 78 locations of fast food restaurants in New York City and noticed also that the most popular meal at McDonald's was the Big Mac, medium size of French fries and medium sized of non-diet soda, providing1130 calories for a cost of $5.59.

Exposure to a poor diet food environment was found to have a negative effect on people's lifestyles. According to Bauer, Larson, Nelson and Neumark-Sztainer (2009), the presence of unhealthy food at home, being born in the US and preferring the taste of unhealthy foods increased the trend of fast-food intake after 5 years among both males and females. However, females who were concerned about their weight were less likely to consume fast food, and males who were encouraged by their friends or wives to eat healthy were also less likely to consume fast food.

Li, Harmer, Cardinal, Bosworth, and Johnson-Shelton (2009) also measured the density of fast food restaurants in 120 neighborhoods in Portland, Oregon, and measured

the residents' BMI, frequency of visits to local fast food restaurants, level of physical activity, and self-efficacy of eating fruit and vegetables. Authors in this study found that there is an association between increased density of neighborhood fast food outlets and unhealthy lifestyles with increasing the risk of obesity among older adults.

Austin et al. (2005) and Davis and Carpenter (2009) examined the concentration of fast food restaurants around schools and its effect on weight gain. Austin et al. examined the concentration of fast food restaurants around kindergartens, primary and secondary schools in Chicago and found that the median distance between any school in Chicago and the nearest fast-food restaurant was 0.52 km (0.32 miles), which can be walked in 5 minutes by an adult.

Davis and carpenter (2009) used geocoded data that were obtained from the 2002-2005 California Healthy Kids Survey for over 500000 youths using multivariate regression models, and demonstrated that those students who attend schools near fast-food restaurants (within one half mile), consumed fewer servings of fruit and vegetables, consumed more servings of soda, and were more likely to be overweight or obese. Similar results by Casey et al. (2008) were found using a survey instrument. These authors found that eating out (especially at buffets, cafeterias, and fast food restaurants) and finding the community unpleasant for physical activity were associated with increasing obesity rates in rural communities.

The authors in most previous studies concluded that the consumption of fast food among children in the United States seemed to have an adverse effect on dietary quality in ways that plausibly increase the risk of obesity.

Null Hypothesis

In this study the association between eating away from home and nutrition quality of the food consumed will be furthered investigated. The hypothesis is there is no difference in daily dietary intake (energy, nutrients, and food groups) based on the average of four 24-hour recalls between children who eat at least one meal away from home and those children who eat no meals away from home.

CHAPTER III

MATERIALS AND METHODS

Participants

The data from three hundred and thirty one students between ages 11 to 14 years old from four middle schools in the Houston area were used for this study. There were no exclusion criteria based on ethnicity and gender. Recruitment letters with informed parental consent and student assent forms were available to the students in the cafeteria to take home to their parents. Research staff then collected the signed forms from each school. Eligibility for free or reduced priced meals criteria is based on the income and size of the household of a child (Income Eligibility Guidelines, 2012).

Procedure

Upon receipt of the signed parental consent and student assent, students completed one 24-hour dietary recall per month between January and May, 2008 via telephone call by trained dietitians using NDSR nutrition calculation software program (Nutrition Data System for Research -2008; Nutrient Coordinating Center, University of Minnesota) to obtain consumption of foods and drinks. Interviewers received certification to conduct NDSR dietary intake interviews using the multiple pass method, and probing per NDSR guidelines. Two-dimensional food models were sent to each participant to be used as portion size aids. All recalls were reviewed by a senior dietitian with experience in quality review. An away from home meal was defined as any meal from a restaurant or a

store regardless of the consumption location, excluding school meals. Both the name and the definition of the meal (breakfast, snack, lunch, or dinner) were given by the child. A variable of "0" was given for no meals away from home and "1"for eating one or more away from home.

Intakes of energy, nutrients, and food groups per day were calculated for each student using the NDSR nutrition calculation software program and then averaged over the 4 days of recall using Statistical Package for the Social Sciences SPSS (version 18, SPSS Inc., Chicago, IL, 2009).

Nutrient and food group intake were compared for the two groups, those who consumed "at least one a meal away from home" and those who "consumed all meals prepared at home" using Analysis of Variance (ANOVA) and Chi square (χ^2) using SPSS 19 for Windows (Version 15, 2007, SPSS Inc, Chicago, IL). Results with $P < .05$ were defined as statistically significant.

CHAPTER IV

RESULTS

The total number of participants was 331. One hundred and fifty eight were boys (47.7 %) and 173 (52.3%) were girls. Table 5 shows the demographic baseline characteristics of the participants. Missing data were the result of missing variables.

Table 5
Demographics of Study Participants

Character	Frequency	Percent
Gender		
Boys	158	47.7
Girls	173	52.3
Ethnicity		
Hispanic	230	69.5
Other	100	30.2
Total	330	99.7
Missing	1	0.3
Eligible for free/reduced price meals*		
No	107	32.3
Yes	224	67.7

Note. *Criteria for the eligibility for free/reduced price meals is available at http://www.squaremeals.org/Publications/IncomeEligibilityGuidelines.aspx#CACFP

The majority of the participants was Hispanic (69.5%), and 30.2% of the total sample was from other ethnicities. Also, the majority of the students was from low income families as 67.7% were eligible for free or reduced price meals.

The frequency of consumption of home meals and away from home meals is presented in Table 6. The percentage of students who ate all meals at home (58.9%) was higher than the percentage of students who ate one or more away from home meals (40.5%).

Table 6
Frequency of Away Meals Consumption

	Frequency	Percent
All meals at home	195	58.9
Any meal away from home	134	40.5
Missing	2	0.6
Total	331	100

Only a subset of 329 out of 331 data records were analyzed, and the P value were measured using ANOVA and χ^2. Table 7 shows the difference between genders, ethnicities, and the income status of the participants and the frequency of away from home meals verse all meals at home.

It was found that the percentage of boys who ate all meals at home (65.4%) was significantly higher than the percentage of girls who ate all meals at home (53.8%). There

was not a significant difference between ethnicities in the frequency of eating all meals at home or any meal away from home. Also, a higher percentage of low income students (66.7%) ate all meals at home compared with students who were not low income (43.9%).

Table 8 shows the intakes of energy, fiber, fat, carbohydrates, and protein of the participants. There were no significant differences between the groups for the intake of total energy, carbohydrates, fat, and fiber intake. However, the group who ate all meals from home consumed higher percentage of energy from protein (P=0.01).

Table 7
Gender, Ethnicity, Eligibility for Free/Reduced Price Meals Frequency for All Meals at Home Group and Any Meal Away from Home Group

	Total Number	All meals at home n(%)	Any meal away from home n(%)	P value
Gender				
Boys	156	102(65.4)	54(34.6)	0.032*
Girls	173	93(53.8)	80(46.2)	
Ethnicity				
Hispanics	230	142(61.7)	88(38.3)	0.196
Other**	98	53(54.1)	45(45.9)	
Eligible for free/reduced price meals ***				
Yes	222	148(66.7)	74(33.3)	0.00*
No	107	47(43.9)	60(56.1)	

Note.
* significant difference
** Other ethnicity include white Americans, Asians, Non Hispanic Black
*** Criteria for the eligibility for free/reduced price meals is available at http://www.squaremeals.org/Publications/IncomeEligibilityGuidelines.aspx#CACFP

Table 8
Daily Intake Energy, Fiber, Fat, Carbohydrates, and Protein Intake for All Meals at Home Group and Any Meal Away from Home Group

	All meals at home		Any meal away from home		P value
	Mean	SD*	Mean	SD*	
Total energy (kilocalories/d)	1801.69	483.68	1880.33	486.31	0.15
Fiber (g/d)	12.58	4.63	12.50	4.44	0.89
Total fat (%)	32.81	4.55	33.70	4.07	0.07
Carbohydrates (%)	52.17	5.89	52.19	5.01	0.97
Protein (%)	16.03	2.72	15.18	2.66	0,01**
Saturated fat (%)	11.93	2.03	12.04	1.84	0.62

Note. Total fat , saturated fat, carbohydrates, and protein are the mean percentage of the total mean energy intake * SD: standard deviation ** $P< 0.05$

Also, the group who ate at least one meal away from home consumed slightly higher amount of energy from total fat (P=0.07).

Table 9 compares the data for the consumption of four selected micronutrients. There were significant differences for the two groups for the amount of vitamin A

(3528.22 RAE vs 3033.99 RAE; $P= 0.01$) and folate (386.80 μg vs 351.38 μg; $P= 0.03$) as the group of all meals at home consumed more of both nutrients.

Table 9

Daily Intakes of Selected Micronutrients for All Meals at Home Group and Any Meal Away from Home Group

	All meals at home		Any meal away from home		P value
	Mean	SD*	Mean	SD*	
Vitamin A (RAE)+	3528.22	1861.89	3033.99	1605.79	0.01**
Vitamin C (mg)	75.76	48.04	70.3	37.1	0.27
Folate (μg)++	386.80	145.86	351.38	134.90	0.03**
Calcium (mg)	954.92	372.37	894.73	358.48	0.14
Iron (mg)	13.98	4.98	13.30	4.25	0.20
Sodium (mg)	3035.00	930.71	3204.01	892.50	0.10

Note. * SD: standard deviation. Dietary supplements were not included in the analysis. Selected micronutrients were chosen based on the guidelines for school meals provided by USDA for these micronutrients. ** $P< 0.05$ +Vitamin A is presented in Retinol Activity Equivalents (RAE) ++Folate: represent the total folate intake of naturally folate and synthesized folic acid. Dietary Folate Equivalent :1 DFE = 1 μg food folate = 0.6 μg folic acid from supplements and fortified foods. Recommended intake for ages 9-13 is 600 mcg; for ages 14-18 is 800 mcg

Table 10 compares the data of daily food groups consumption for the two groups. Students who ate all meals at home consumed more milk (11.30 oz vs 8.77 oz; P=0.00) and tended to consume more fruit (1.43 servings vs 1.23 servings; P=0.09), orange vegetables (0.05 servings vs 0.03 servings; P=0.06), and legumes (0.21 servings vs 0.15 servings; P=0.10). Students who ate at least one meal away from home consumed more sweet beverages (10.65oz vs 8.94 oz; P= 0.00).

Table 10

Daily Intake of Fruit, Vegetables, Grains, Sweet Beverages, Deserts for All Meals at Home Group and Any Meal Away From Home Group

	All meals at home	Any meal away from home	
	Mean ± SD	Mean ± SD	P value
Fruit (servings)	1.43±1.09	1.23±0.88	0.09**
Non-fried vegetables (servings)	1.16±0.76	1.12±0.76	0.64
Orange vegetables (servings)	0.05±0.10	0.03±0.07	0.06**
Starch vegetables (servings)	0.45±0.48	0.43±0.42	0.76
Total vegetables (servings)	1.6±0.96	1.5±0.85	0.59
Legumes (servings)	0.21±0.35	0.15±0.29	0.10

Table 10 (continued)

Whole grains (servings)	1.02±0.89	0.96±0.73	0.53
Other grains (servings)	5.09±1.94	5.35±2.06	0.24
Total grains	6. 10±2.08	6.31±2.08	0.38
Sweetened beverages (oz)+	10.65±7.80	14.03±8.94	0.00***
Snack-chips (servings)++	0.47±0.57	0.48±0.54	0.88
desserts (servings)	0.57±0.65	0.61±0.55	0.56
Total milk (oz)	11.30±7.28	8.77±6.95	0.00***

Note. Amounts consumed from each food group are represented in number of servings. One serving of good vegetables: ½ cup. One serving of fruit: ½ cup. One serving of grains is, for example, ½ cup of rice or one slice of bread. +Sweetened beverages and milk are presented in oz. ++Snack chips: any kind of chips. Sweetened beverages: Any beverage with added sugar such as soda, sweetened beverages not 100% fruit juice, coffee or tea with added sugar. * SD: standard deviation ** Marginal significant difference*** significant difference

CHAPTER V

DISCUSSION

The results of this study do support the null hypothesis that there is no difference in daily dietary intake (energy, nutrients, and food groups) based on the average of four 24-hour recalls between children who eat at least one meal away from home and those children who eat no meals away from home. The objective of this study was to examine the difference between "all meals at home" group and "any meal away from home" group of students between ages 11-14 years old.

The results show that overall calorie intake was similar between groups. There were, however, significant differences in the mean intake of protein (P=0.01), vitamin A (P= 0.01) and folate (P= 0.03), total milk (P=0.00), with the intake being higher for the group of "all meals at home." Students in this group also tended to consume more fruit (P=0.09) and orange vegetables (P=0.06) and legumes (P=0.10) than those in the other group, but without significant differences. However, those who ate at least one meal away from home consumed more sweetened beverages (P= 0.00) and tended to consume more fat (P=0.07) and sodium (P=0.10). High intake of sugar sweetened beverages like soda drinks have been found to be related to increase the risk of obesity and type 2 diabetes.

Schulze, Manson, Ludwig, Colditz, Stampfer, Willett, & Hu (2004) in their study found that increasing sweetened beverages intake is related to weight gain. These authors used prospective cohort analyses conducted from 1991 to 1999 among women in the Nurses' Health Study II for diabetes analysis that included 91249 women free from diabetes and chronic diseases at the baseline. Weight changes were assessed for 51603 women related to sweetened beverages consumption and found that the highest weight gain over 4-year period was among those who increased their sugar-sweetened soft drink consumption. In addition, high intake of sweetened beverages with high fructose corn syrup was found to be associated with increasing BMI, waist and hip circumferences (Lin et al. 2012).

No significant differences were found between the group of "all meals eaten at home" and the group of "any meal away from home" in the other selected micronutrients, macronutrients and food groups. Higher intake of vitamin A, folate and total milk among "all meals at home" group was expected as most previous studies concluded that eating at home is better at providing micronutrient needs (Guthrie et al., 2002). Also, according to the Dietary Guidelines for Americans 2010, these two micronutrients (vitamin A and folate) are under-consumed in the U.S. related to under-consuming vegetables and fruits.

Similar intakes in food groups, total calories, fat and carbohydrates were not expected since many previous studies have demonstrated that eating outside home increases calorie, fat, added sugar intakes. Poti and Popkin, for example, showed that there was an increase in energy intake (179 kcal/day) related to increase eating away

from home by food preparation and location between 1977 and 2006. Bowman et al. (2004) also found that students who ate fast food consumed more total fat, total carbohydrates, added sugar and consumed more 187 kcal/day than students who did not eat at fast food restaurants.

The mean calorie intakes in this study per day for both groups were within the recommendations (see Table 1). Total percentages of calories from carbohydrates, fat, proteins were within the recommendations (see Table 3). Both groups also had adequate intakes of vitamin C and iron (see Table 4). However, the total vegetables, fruit, whole grains, total milk intakes in both groups were less than recommended (see Table 2 and Table 10). Both groups also consumed less than the recommended of vitamin A, folate, and calcium (see Table 4). In addition, both groups consumed more of sodium per day than recommended (2,300 mg/d) (Dietary Guidelines for Americans, 2010).

The results of the nutrient analysis were found to be similar to What We Eat in America (WWEIA) Dietary intake of NHANES data 2007-2008 for children between 12-19 years old (Diet quality and Food consumption: Food and Nutrient Intake Tables, 2011). The mean carbohydrates and total fat percentage intakes from the total calories consumed a day by "all meals at home" and "any meal away from home" groups (see Table 8) are similar to the mean carbohydrates (53%) and total fat (33%) percentages of NHANES data 2007-2008.

However, the mean calorie intake by the two groups of "all meals at home" and "any meal away from home" are less than the mean calorie intake of NHANES data 2007-2008 (2142.5 kcal/d). In addition, the mean protein intake percentages consumed per day

by "all meals at home" group and "any meal away from home" group are higher than the percentage of NHANES data 2007-2008 (14.5%).

Although, this study identified few nutrient differences between the two groups, there is a need for nutrition education to improve food selection and increase the intake of vegetables and fruits among children and adolescents both in the home and when eating out at restaurants and fast food establishments. Menu labeling in restaurants is suggested to decrease calorie intake and improve meal selection (Elbel, 2011; Swartz et al., 2011). Some studies have shown that mindful meal selection at a restaurant, type of the restaurant and attention to portion sizes can increase micronutrient intake and decrease calorie intake (Blair, 2011; Timmerman & Brown A, 2012). Also, encouraging children and adolescents to consume food at home is needed.

Limitations

In this study, only one method was used to collect data, which is 24-h recall (a retrospective method for collecting dietary intake). This method may not be accurate due to memory issues and estimating portion size. Future studies should include more than one method to collect data. Diary records also can be used for more accurate data, and parental assistance while recording data may also increases accuracy.

Most of the students were Hispanics (69.5%) and from low income families (67.7% were eligible for free or reduced price meals). This may limit generalizability as result that ethnicity and family income affect food availability and eating habits (Duerksen et al., 2007; Fisher et al., 2002). Larger sample of students and from different areas in the county are also recommended for future studies.

CHAPTER VI

CONCLUSION

In this study, significant differences were found in the mean intake of protein, vitamin A, folate and total milk with values being higher for "all meals at home" group. There was also a significantly higher intake of sweetened beverages by the "any meal away from home" group than "all meals at home" group. There was not a significant difference in the frequency of eating all meals at home or any meal away from home by ethnicity. Also, a higher percentage of low income students (66.7%) ate all meals at home compared with students who were not low income (43.9%).

Based on the Dietary Guidelines for American of 2010, students form both groups consumed the recommended amount of total calories, carbohydrates, protein, and fat. However, the total vegetables, fruit, whole grains, milk intakes in both groups are less than recommended for both groups. Both groups also consumed less than the recommended of vitamin A, folate, calcium. But, students in both groups met the recommendations of vitamin C and iron. Although the study shows that eating at home is associated with higher intake of two micronutrients (folate, vitamin A), most previous studies demonstrated that most meals prepared at home would include higher percentages of fruit, vegetables, fiber and micronutrients than food prepared away from home. This study showed there were not differences in the total carbohydrates, protein, fiber, and fat and the most selected micronutrients intakes between food prepared at home and food

prepared outside home. This study also shows poor diet among young adolescents (11-14 years old) whether food were prepared and eaten at home or prepared outside home.

It is recommended for future studies to include more than one method to collect data, a larger sample size and controlling ethnicity and family income variables.

REFERENCES

Ali, M. M., Amialchuk, A., Heiland, F. W. (2011). Weight-related behavior among adolescents: The role of peer effects. *PloS One, 6*, e21179. doi:10.1371/journal.pone.0021179

Anderson, P.M., & Butcher, K.E. (2006). Childhood obesity: Trends and potential Causes. *The Future of Children / Center for the Future of Children, the David and Lucile Packard Foundation, 16,* 19-45.

Anderson, B., Rafferty, A. P., Lyon-Callo, S., Fussman, C., & Imes, G. (2011). Fast-food consumption and obesity among Michigan adults. *Preventing Chronic Disease, 8*, 1-11.

Ayala, G. X., Rogers, M., Arredondo, E. M., Campbell, N. R., Baquero, B., Duerksen, S. C., & Elder, J. P. (2008). *Obesity, 16*, 1002-1008. doi:10.1038/oby.2008.34

Austin, S.B., Melly, S.J., Sanchez, B.N., Patel, A., Buka, S., & Gortmaker, S.L. (2005). Clustering of fast-food restaurants around schools: A novel application of spatial statistics to the study of food environments. *American Journal of Public Health, 95,* 1575-1581.

Bezerra, I. N., Curioni, C., & Sichieri, R. (2012). Association between eating out of home and body weight. *Nutrition Reviews, 70*, 65-79.

Blair, A.M., Drass, J.A., Stone, M., Rhoades, D., Baldwin, S.A., & Russ KM. (July-August 2011). Restaurant challenge offers healthful meal options and builds diabetes awareness. *The Diabetes Educator*, 37, 581-588.

Block, J. P., Scribner, R. A., & De Salvo, K. B. (2004). Fast food, race/ethnicity, and income: A geographic analysis. *The American Journal of Preventive medicine, 27,* 211-217. doi:10.1016/j.amepre.2004.06.007

Boone-Heinonen, J., Gordon-Larsen, P., Kiefe, C.I., Shikany, J.M., Lewis, C.E., & Popkin, B.M. (2011). Fast food restaurants and food stores: Longitudinal associations with diet in young to middle-aged adults: The CARDIA study. *Archives of Internal Medicine, 171*, 1162-1170. PMID: 21747011

Bowman, S. A., Gortmaker, S. L., Ebbeling, C. B., Pereitra, M. A., & Ludwig, D. S. (2004). Effects of fast-food consumption on energy intake and diet quality among children in a national household survey. *Pediatrics, 113*, 112-118.

Bauer, K. W., Larson, N. I., Nelson, M. C., & Neumark-Sztainer, D. (2009). Socio-environmental, personal and behavioural predictors of fast food intake among adolescents. *Public Health Nutrition, 12*, 1767-1774. doi:10.1017/S136898000 8004394

Casey, A. A., Elliott, M., Glanz, K., Haire-Joshu, D., Lovegreen, S. L., Saelens, B. E., . . . Brownson, R. C. (2008). *Preventive medicine, 47*, 600-604.

Child Nutrition Programs. (2011). *Economic Research Service/United States of A griculture.* Retrieved June 5, 2012 from http://www.ers.usda.gov/Briefing/Child Nutrition/

ChooseMyPlate. U.S. Department of Agriculture. (2012) retrieved May 16, 2012 from www.choosemyplate.gov/SuperTracker/myplan.aspx

Davis, B., & Carpenter, C. (2009). Proximity of fast-food restaurants to schools and adolescent obesity. *American Journal of Public Health, 99*, 505-510.

Devine, C.M., Farrell, T.J., Blake, C.E., Jastran, M., Wethington, E., & Bisogni, C.A. (2009). Work conditions and the food choice coping strategies of employed parents. *Journal of Nutrition Education and behavior*, 41, 365-370. doi:10.1016/j .jneb.2009.01.0 07.

Diet quality and Food consumption: Food and Nutrient Intake Tables. (2011). *United States Department of Agriculture.* Retrieved from http://www.ers.usda.gov/ briefing/dietquality/Data/

Dietary Guidelines for American 2010. U.S. Department of Agriculture. Retrieved May 16, 2012 from http://www.cnpp.usda.gov/Publications/ DietaryGuidelines/ 2010/ PolicyDoc/PolicyDoc.pdf

Duerksen, S.C., Elder, J.P., Arredondo, E.M., Ayala, G.X., Slymen, D.J., Campbell, N.R., & Baquero, B. (2007). Family restaurants choices are associated with child and adult overweight status in Mexican-American families. *Journal of the American Dietetic Association, 107*, 849-853. doi: 10.1016/j.jada.2007.02.012

Dumanovsky, T., Nonas, C. A., Huang, C. Y., Silver, L. D., & Bassett, M. T. (2009). What people buy from fast-food restaurants: Caloric content and menu item selection, New York City 2007. *Obesity (Silver Spring, Md.), 17*, 1369-1374. doi:10.1038/oby.2009.90

Elbel, B. (2011). Consumer estimation of recommended and actual calories at fast food restaurants. *Obesity (Silver Spring, Md.),* 19, 1971-1978. doi: 10.1038/oby. 2011. 214.

Food and Nutrition Services. Pyramid servings: How much? How Many? *U.S. Department of Agriculture.* Retrieved May 16, 2012 from http://www.fns.usda. gov/tn/ Resources/nibbles/pyramid_servings.pdf

Fisher, J. O., Mitchell, D. C., Smiciklas-Wright, H., & Brich, L. L. (2002). Parental influences on young girls' fruit and vegetable, micronutrient, and fat intakes. *Journal of the American Dietetic Association, 102*, 58-64.

Fulkerson, J. A., Neumark-Sztainer, D., & Story, M. (2006). Adolescent and parent views of family meals. *Journal of the American Dietetic Association, 106*, 526-532. doi: 10.1016/j.jada.2006.01.006

Gillis, L. J., & Bar-Or, O. (2003). Food away from home, sugar-sweetened drink consumption and juvenile obesity. *Journal of the American College of Nutrition, 22*, 539-545.

Guthrie, J. F., Lin, B-H., & Frazao, E. (2002). Role of food prepared away from home in the American diet, 1977– 78 versus 1994– 96: Changes and consequences. *Journal of Nutrition Education and Behavior, 34,* 140-150.

Income Eligibility Guidelines. (2012).Texas Department of Agriculture. Retrieved S September 6, 2012 from http://www.squaremeals.org/Publications/ IncomeEligibilityGuidelines.aspx# CACFP

Krebs, N.F., & Jacobson, M.S. American Academy of Pediatrics Committee on Nutrition. (2003). Prevention of pediatric overweight and obesity. *Pediatrics, 112*, 424-430.

Li, F., Harmer, P., Cardinal, B. J., Bosworth, M., & Johnson-Shelton, D. (2009). Obesity and the built environment: Does the density of neighborhood fast-food outlets matter? *American Journal of Health Promotion, 23*, 203-209.

Lin, W. T., Huang, H., L., Huang, M. C., Chan, T. F., Ciou, S. Y., Lee, C., Y., . . . Lee, C. H. (2012). *International Journal of Obesity (2005),* 1-8. doi:10.1038/ijo.2012. 121

Lindsay, A. C., Sussner, K. M., Kim, J., & Gortmaker, S. (2006). The role of parents in preventing childhood obesity. *The Future of Children/ Center for the Future of Children, the David Lucile Packard Foundation, 16*, 169-186.

Mclntosh, A., Kubena, K.S., Tolle, G., Dean W., Kim, M. J., Jan, J. S., & Anding, J. (2011). Determinants of children's use of and time spent in fast-food and full-service restaurants. *Journal of Nutition Education and Behavior, 43,* 142-149. doi:10.1016/j.jn eb.2010.04.002

Merriam Webster. (2012). Fast Food. Retrieved from http://www.merriam-webster.com/dictionary/fast-food

Nutrient Content of the U.S. Food Supply. Developments Between 2000-2006. (2011). *United States Department of Agriculture.* Retrieved from http://www.cnpp.usda. gov /Publications/FoodSupply/Final_FoodSupplyReport_2006.pdf

O'Donnell, S. I., Hoerr, S. L., Mendoza, J. A., & Goh, E. T. (2008). Nutrient quality of fast food kids meals. *The American Journal of Clinical Nutrition, 88*, 1388-1395.

Ogden, C. L, Carroll, M. D., Kit, B. K. & Flegal, K. M. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999- 2010. *The Journal of the American Medical Association (JAMA), 307*,483-490. doi:10.1001 /jama.2012.40

Patrick, H., & Nicklas, T. A. (2005). A review of family and social determinants of children's eating patterns and diet quality. *Journal of the American College of Nutrition, 24,* 83-92

Piernas, C., & Popkin, B. M. (2011). Food portion patterns and trends among U.S. children and the relationship to total eating occasion size, 1977-2006. *The Journal of Nutrition, 141,* 1159-1164,

Poti, J. M., & Popkin, B. M. (2011). Trends in energy intake among US children eating location and food scource, 1977-2006. *Journal of the American Dietetic Association, 111*, 1156-1164. doi: 10.1016/j.jada.2011.05.007

Rydell, S. A., Harnack, L. J., Oakes, J. M., Story, M., Jeffery, R. W., & French, S. A. (2008). Why eat at fast-food restaurants: reported reasons among frequent consumers. *Journal of the American Dietetic Association*, 108, 2066-2070. doi: 10.1016/j.jada.2008 .09.008

Schulze, M. B., Manson, J. E., Ludwig, D. S., Colditz, G. A., Stampfer, M. J., Willet, W. C., & Hu, F. B. (2004). Sugar- sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. *The Journal of the American Medical Association (JAMA),* 292, 927-934.

Sekhobo, J. P., Edmunds, L. S., Reynolds, D. K., Dalenius, K. & Sharma, A. (2010). Trends in prevalence of obesity and overweight among children enrolled in the New York state WIC program, 2002-2007. *Association of Schools of Public Health, 125,* 218-224.

Sharkey, J., Johnson, C. M., Dean, W. R. & Horel, S. A. (2011). Focusing on fast food restaurants alone underestimates the relationship between neighborhood deprivation and exposure. *Nutrition Journal, 10.* doi:10.1186/1475-2891-10-10

St-Onge, M., Keller, K. L. & Heymsfield, S. B. (2003). Changes in childhood food consumption patterns: A cause for concern in light of increasing body weights. *The American Journal Clinical Nutrition, 78,* 1068 –73.

Sturm, R. (2005). Childhood Obesity — What We Can Learn from Existing Data on Societal Trends, Part 1. *Centers for Disease Control and Prevention, 2*, 1-9

Swartz, J.J., Braxton, D., & Viera, A.J. (2011). Calories menu labeling on quick service restaurant menus: an updated systematic review of the literature. *The I International Journal of Behavior Nutrition and Physical Activity, 8,* 135.

Sun, S. S., Liang, R., Huang, T. T., Daniels, S. R., Arslanian, S., Liu, K., . . . Siervogel, R. M. (2008). *Childhood obesity predicts adult metabolic syndrome: The Fels Longitudinal study. The Journal of Pediatrics, 152*, 191-200

Thompson, O. M., Ballew, C., Resnicow, K., Must, A., Bandini, L. G., Cyr, H., & Dietz, W. H. (2004). Food purchased away from home as a predictor of change in BMI z-score among girls. *International Journal of Obesity and Related Metabolic Syndrome, 28*, 282-289. doi:10.1038/sj.ijo.0802538

Timmerman, G. M., & Brown A. (January-February 2012). The effect of a mindful restaurant eating intervention on weight management in women. *Journal of Nutrition Education Behavior*, 44, 22-28.

Todd, J. E., Mancino, L. &, Lin, B-H. (2010). The impact of food away from home on adult diet quality. *Advance In nutrition (Bethesda, Md.)* doi: 10.3945/ an.111.000679

Wang, Y., Beydoun, M.A., Liang, L., Caballero, B., & Kumanyika, S.K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity Journal, 16,* 2323–2330. doi:10.1038/oby.2008 .351

Zoumas-Morse, C., Rock, C.L., Sobo, E.J., & Neuhouser, M.L. (2001). Children's Patterns of macronutrient intake and associations with restaurant and home eating. *Journal of the Journal American Dietetic Association. 10,* 923-925.

APPENDIX

IRB Exemption Letter

TEXAS WOMAN'S UNIVERSITY
DENTON DALLAS HOUSTON

Office of Research
6700 Fannin Street
Houston, TX 77030-2343
713-794-2480 Fax 713-794-2488

November 28, 2011

Ms. Samar Abumahaimeed
Nutrition and Food Sciences
6700 Fannin Street
Houston, TX 77030

Dear Ms. Abumahaimeed:

Re: *"The difference in daily dietary intake between students who eat at least one meal in restaurants and students who don't eat in restaurants" (Protocol #: 16871)*

The above referenced study has been reviewed by the TWU Institutional Review Board (IRB) and was determined to be exempt from further review.

Any modifications to this study must be submitted for review to the IRB using the Modification Request Form. Additionally, the IRB must be notified immediately of any unanticipated incidents. If you have any questions, please contact the TWU IRB.

Sincerely,

Carolyn Kelley, PT

Carolyn Kelley, PT, DSc, NCS
Institutional Review Board - Houston