

DIFFERENCES IN DIETARY BEHAVIORS AND BMI OF ADOLESCENTS BY  
FREQUENCY OF BREAKFAST CONSUMPTION

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BY

GABRIELLE GOODE, B.S.

DENTON, TX

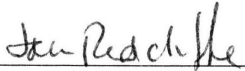
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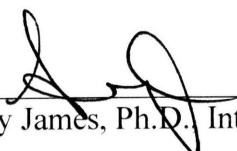
I am submitting here within a thesis written by Gabrielle Goode entitled "Differences in Dietary Behaviors and BMI of Adolescents by Frequency of Breakfast Consumption." I have examined this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science with a major in Nutrition.

  
\_\_\_\_\_  
John Radcliffe, Ph.D., Major Professor

We have read this thesis and recommend its acceptance:

  
\_\_\_\_\_  
Karen Weber Cullen, Ph.D., RD

  
\_\_\_\_\_  
Carolyn Moore, Ph.D., RD, LD

  
\_\_\_\_\_  
Gay James, Ph.D., Interim Department Chair

Accepted:

  
\_\_\_\_\_  
Dean of the Graduate School

## ABSTRACT

GABRIELLE GOODE

### DIFFERENCES IN DIETARY BEHAVIORS AND BMI OF ADOLESCENTS BY FREQUENCY OF BREAKFAST CONSUMPTION

MAY 2014

This study examined the differences in dietary behaviors and body mass index (BMI) by frequency of breakfast consumption. Participants totaled 391 Houston area students between the ages of 12 and 17 years. Participants completed a questionnaire which included demographic and anthropometric data, food frequency questions, and a question on frequency of breakfast consumption. Participants' dietary behaviors based on responses to food frequency questions were compared by frequency of breakfast consumption using analysis of covariance (ANCOVA). Results with  $p < .05$  were considered statistically significant. Participants who reported always eating breakfast reported higher mean intakes of fruit and fruit juice and a lower mean intake of sugar sweetened beverages than participants who sometimes or never ate breakfast. Participants who reported always eating breakfast reported higher mean intakes of milk than participants who sometimes ate breakfast. There was no difference in BMI category by breakfast eating status. Since there are limited data available regarding breakfast intake of adolescents, further research is recommended.

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## CHAPTER I

### INTRODUCTION

Childhood overweight and obesity is a problem that can continue into adulthood, leading to an increased risk for various chronic diseases. Dietary patterns may be a contributing factor to the development and severity of overweight and obesity in children and adolescents (Niemeier, Raynor, Lloyd-Richardson, Rogers, & Wing, 2006). One dietary habit, the consumption of breakfast, is often skipped amongst children and adolescents. Various studies have demonstrated that skipping breakfast is associated with higher BMIs compared with individuals who do eat breakfast. In addition, consumption of breakfast may also lead to an improved intake of various important nutrients.

In spite of promotion of healthy dietary guidelines, such as those outlined by the United States Department of Agriculture's MyPlate, many Americans do not meet the minimum recommended intakes for several food groups. Krebs-Smith, Guenther, Subar, Kirkpatrick, and Dodd noted that young adults were the least likely to meet dietary recommendations (2010). The goal of the present study was to investigate the association between dietary habits, and breakfast intake.

## CHAPTER II

### REVIEW OF LITERATURE

#### **Childhood Overweight and Obesity**

In children, overweight is defined as a BMI at or above the 85<sup>th</sup> percentile for the same age and sex while obesity is defined as a BMI at or above the 95<sup>th</sup> percentile for the same age and sex (Centers for Disease Control, 2012). National data indicate that the prevalence of obesity seen in children and adolescents in 2009-2010 was unchanged when compared with data from 2007-2008, suggesting that rates may be leveling off (Ogden, Carroll, Kit, & Flegal, 2012). It has been projected that by 2030, the prevalence of obesity in children would be approximately 30 percent (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). This report, based on data from the National Health and Nutrition Examination Survey (NHANES) from the 1970s to 2004, also estimates that by 2030, total health care costs related to overweight and obesity would reach approximately 16 to 18 percent of total United States health care costs.

Childhood obesity can cause both immediate and long-term health effects. Obese youth are more likely to suffer from problems such as high cholesterol and hypertension, risk factors for cardiovascular disease (Centers for Disease Control, 2012) and “earlier puberty and menarche in girls, type 2 diabetes, and increased incidence of the metabolic syndrome in youth and adults” (Biro & Wien, 2010). Additionally, they are at higher risk for sleep apnea, bone and joint problems, and social problems (CDC, 2012). In the

long-term, obese children may be at higher risk for various types of cancer, stroke, type 2 diabetes, and osteoarthritis (CDC, 2012). Overweight and obese children have a higher likelihood of being overweight or obese in adulthood (Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001). Childhood obesity may lead to a poorer overall quality of life in addition to shorter life spans (Daniels, 2006). According to the World Health Organization, nutrition is a key component that influences the development of chronic disease throughout the lifespan (2003).

### **Meal Patterns**

Healthy dietary intake and meal patterns are crucial in growth and development, weight status, and overall health among adolescents. Dietary habits that are formed in adolescence are often carried into adulthood (Centers for Disease Control, 2012). Consumption of breakfast is a dietary behavior that has been proposed to play a role in influencing body weight. Regular breakfast intake, along with recommended intakes of fruit, vegetables, whole grains, and dairy products, are a few eating behaviors that are widely accepted as being healthy. In spite of the potential health benefits, few adolescents consume the recommended amounts of these foods (Bruening, Eisenberg, MacLehose, Nanney, Story, & Neumark-Sztainer, 2012).

An important, but often skipped, eating behavior is breakfast consumption. Breakfast skippers have been shown to have a higher BMI than breakfast consumers. In one study amongst African-American and white adolescent girls, “days eating breakfast were predictive of lower BMI” and girls who ate breakfast more often had lower BMI than

those who did not (Affenito et al. 2005). In another study, participants who skipped breakfast during childhood and adulthood had larger waist circumferences than those who ate breakfast at both points (Smith, Gall, McNaughton, Blizzard, Dwyer, & Venn, 2010).

Breakfast consumption has also been associated with an overall improvement in quality of diet in children and adolescents (Barton et al. 2005). Girls who ate breakfast (particularly cereal) had a lower BMI than girls who did not eat cereal (Barton, et al, 2005). One study showed that children who skipped breakfast were more likely to have decreased or inadequate intakes of various nutrients and less likely to meet daily recommendations for food groups like vegetables and fruit than children who ate breakfast (Deshmukh-Taskar, Nicklas, O'Neil, Keast, Radcliffe, & Cho, 2010).

Some studies have shown that breakfast consumption tends to decline throughout adolescence. For example, a 1998 study by Siega-Riz, Popkin and Carson showed that the rate of breakfast consumption in boys and girls decreased from 89.7% and 84.4% respectively in 1965 to 74.9% and 64.7% respectively in 1991.

### **Food Group Consumption**

The United States Department of Health and Human Services (HHS) and the United States Department of Agriculture (USDA) publish updated dietary guidelines every five years. The Dietary Guidelines for Americans 2010 (DGA 2010) present the latest evidence-based information on healthy dietary intake and disease prevention for individuals age two years and older. The Dietary Guidelines for Americans emphasize

balancing calories for weight management, food and food components to reduce, foods and nutrients to increase, and establishing healthy eating patterns. MyPlate and other federal nutrition education programs such as the USDA Food Guidance System are based on the current guidelines (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010).

According to DGA 2010, a healthy dietary pattern is one which includes increased intake of vegetables, fruits, beans and peas, whole grains, fat-free and low-fat milk and milk products, oils and limited amounts of solid fats, added sugars, and sodium. Recommendations include consuming limited or no beverages with high added sugar content that may include soda, energy drinks, and sports drinks. A balanced diet should include foods from all food groups, noted in Table 1 (USDA & HHS, 2010).

A large majority of the United States population does not meet the minimum recommendations of most of the MyPlate food groups. Most groups lacked adequate intake of dark green vegetables, orange vegetables, legumes, and whole grains (Krebs-Smith et al. 2010). In addition, 90 percent of at least half of the sex-age groups evaluated did not meet total vegetable and milk recommendations, and most groups overconsumed added sugars, solid fats, and alcoholic beverages.

Table 1  
*Recommended Food Group Servings per Day for Older Children*

Food Group	Recommended Servings per Day
Fruits	1 ½ - 2 ½ cups
Vegetables	2 - 4 cups
Grains	5 - 10 oz equivalents
Protein foods	5 - 7 oz equivalents
Dairy	3 cup equivalents

Note: Adapted from Dietary Guidelines for Americans, 2010 (USDA & HHS, 2010).

The Youth Risk Behavior Survey (YRBS) is a national study of American high school students that investigates behaviors related to the leading causes of death. The YRBS includes information on dietary behavior from the seven days before the survey. Based on data reported in the 2011 YRBS, 62.3% of students consumed vegetables one or more times per day and 64% of students consumed fruit and/or drank 100% fruit juice one or more times per day (Eaton et al., 2012). A large amount of students (79.1%) reported consumption of soda (Eaton et al., 2012) (Table 2).

Table 2

*Results from Dietary Questions of the Youth Risk Behavior Survey (YRBS) 2011*

Dietary behavior in the past 7 days	Times per day	National YRBS (n=15425)	Texas YRBS (n=4209)	Houston YRBS (n=2182)
		%		
Ate fruit and/or drank 100% fruit juice		95.2	93.8	93.1
	One or more	64	57.9	59.3
	Two or more	34	29.9	31.2
	Three or more	22.4	20.1	21.8
Ate vegetables		94.3	91	88.2
	One or more	62.3	52.5	51.8
	Two or more	28.3	21.4	24.8
	Three or more	15.3	10.7	13.5
Drank milk (per glass)		82.7	NR	NR
	One or more	44.4	NR	NR
	Two or more	29.9	NR	NR
	Three or more	14.9	NR	NR
Drank soda or pop		79.1	80.7	79.9
	One or more	27.8	20.9	26.6
	Two or more	19.0	19.9	18.0
	Three or more	11.3	10.2	9.6

Note: The abbreviation NR denotes values that were not reported. Information adapted from the results of the YRBS 2011 (Eaton et al., 2012).



### **Null Hypothesis**

This study will investigate the association between dietary behaviors (frequency of food group consumption) and BMI and frequency of breakfast consumption of adolescents. The null hypothesis is that there are no differences between dietary intake and BMI of adolescents based on frequency of breakfast consumption.

## CHAPTER III

### MATERIALS AND METHODS

#### **Participants**

Data from 391 students between the ages of 12 and 17 years in the Houston area were used for this study. The International Review Board of Baylor College of Medicine approved this study. There were no exclusion criteria based on ethnicity or gender. Participants were recruited via health fairs and flyers at schools, churches, and community organizations as well as with newspaper and radio advertising. All interested adolescents between the ages of 12 to 17 years with Internet access were provided with consent packets. Adolescents were enrolled in the study upon returning the signed parent consent and student assent form.

#### **Procedure**

Upon receipt of the signed parental consent and student assent, each participant received an email containing a secure password and link to the online study questionnaire. Demographic and anthropometric data, responses from the YRBS food frequency questions, and the question on breakfast intake were used for the study. Previous studies by the CDC on reliability of the YRBS questionnaire concluded that self-reported height and weight measures were reliable.

## Measures

Standard demographic information collected with the consent forms included birth date, gender, ethnic affiliation, parental educational level, household membership, eligibility for free or reduced price meals at school. Participant height and weight were self-reported and used to calculate BMI.

The food frequency questions were taken from the 2009 YRBS questionnaire (Centers for Disease Control, 2009). The questions asked, “During the past 7 days, how many times did you eat or drink: 100% fruit juices such as orange juice, apple juice, or grape juice (do not count punch, Kool-Aid, sports drinks, or other fruit-flavored drinks); fruit (do not count fruit juice); green salad; potatoes (do not count french fries, fried potatoes, or potato chips); carrots; other vegetables (not including green salad, carrots, or potatoes); a can, bottle, or glass of soda or pop, such as Coke, Pepsi, or Sprite (do not include diet soda or diet pop); a can, bottle, or glass of diet soda, diet pop, diet ice tea or other diet beverage; and a can, bottle, or glass of a sports drink, fruit drink, or other sweetened beverage?” Response options were: “0, 1 to 3 times, or 4 to 6 times in the last 7 days; 1 time per day; 2 times per day; or 3 or more times per day.” The questionnaire also asked, “During the past 7 days, how many glasses of milk did you drink (Include the milk you drank in a glass or cup, from a carton, or with cereal. Count the half pint of milk served at school as equal to one glass.)?” Response options were: “I did not drink milk during the past 7 days, 1 to 3 glasses during the past 7 days, 4 to 6 glasses during the past 7 days, 1 glass per day, 2 glasses per day, 3 glasses per day, 4 or more glasses per day.”

For descriptive statistics and comparison to YRBS data, the percentage of students who reported eating fruit and/or drinking 100 % fruit juice two or more times per day, eating vegetables three or more times per day, drinking soda or pop at least one time per day, and drinking three or more glasses of milk per day were calculated. The mean number of servings per day was also calculated for each food category (juice, fruit, vegetables, sugar sweetened beverages, diet beverages, and milk) based on the frequency of consumption in the past 7 days. The median number in the selected response range was used to calculate mean servings per day.

The question pertaining to breakfast consumption asked, “How often do you usually eat or drink something for breakfast?” Response options included: “always, sometimes, almost never, never.” Based on this question, three groups were created: those who always, sometimes, or almost never/never ate or drink something for breakfast.

Analysis of covariance (ANCOVA) was used to compare relative frequency of intake in each food group by categories of breakfast consumption, controlling for demographic data (gender, race/ethnicity, BMI, and eligibility for free or reduced price meals at school). Results with  $p < .05$  were defined as statistically significant.

## CHAPTER IV

### RESULTS

The total number of participants was 391; 176 were male (45%), and 215 were female (55%). Participant demographics are presented in Table 3. The majority of participants were Black (40%) or White (38%); 33% were from low income families based on eligibility for free/reduce price meals (Texas Department of Agriculture, 2012). The percentage of overweight and obese participants in this study was similar to national statistics (Ogden et al., 2012). Missing data were the result of incomplete questionnaires.

Table 3  
*Demographics of Study Participants*

Characteristic		Frequency	Percent (n=391)
Gender			
	Male	176	45
	Female	215	55
Ethnicity			
	Black	158	40
	Hispanic	51	13
	White	148	38
	Other	34	9

(Continued)

Eligible for free/ reduce price meals			
	Yes	130	33
	No	260	67
	Missing	1	-
Weight status			
	Under and healthy weight	261	66.8
	Overweight	65	16.6
	Obese	64	16.4

Note: The Texas Department of Agriculture published guidelines for eligibility for free or reduced price meals (Texas Department of Agriculture, 2012). Weight classifications are based on body mass index calculated from self-reported height and weight.

Based on responses to the frequency of breakfast consumption question, the majority of participants (54%) were classified as always eating breakfast; 32% were classified as sometimes eating breakfast; and 13% were classified as never eating breakfast (Table 4).

Table 4

*Categories of Frequency of Breakfast Consumption*

	Frequency	%
Always eat breakfast	210	54
Sometimes eat breakfast	127	32
Never eat breakfast	52	13
Missing	2	1

The frequency of dietary behavior based on breakfast consumption is presented in Table 5. Comparison of the mean consumption by frequency of breakfast consumption is

presented in Table 6. Participants who always ate breakfast reported significantly higher intakes of fruit ( $p=0.000$ ) and fruit plus fruit juice ( $p=0.02$ ) and significantly lower intakes of sugar sweetened beverages ( $p=0.000$ ) than participants who sometimes or never ate breakfast. Participants who always ate breakfast reported a significantly higher intake of milk when compared to those who sometimes ate breakfast. Finally, participants who always ate breakfast also reported a significantly higher intake of vegetables compared to those who never ate breakfast.

There were no significant differences in BMI category by breakfast eating category.

Table 5

*Comparison of Dietary Behavior by Category of Breakfast Consumption*

Dietary behavior	Category of frequency of breakfast consumption			
	Always (n=210)	Sometimes (n=127)	Never (n=52)	Total (n=391)
	Frequency (% of n)			
Ate fruit and/or drank 100% fruit juice two or more times per day	88 (63.31%)	36 (25.90%)	15 (10.79%)	139
Ate vegetables three or more times per day	38 (63.33%)	15 (25.00%)	7 (11.67%)	60
Drank sweetened beverages at least one time per day	80 (45.71%)	70 (40.00%)	25 (14.29%)	175
Drank three or more glasses of milk per day	31 (64.58%)	9 (18.75%)	8 (16.67%)	48

Table 6

*Analysis of Responses to Frequency of Food Group Consumption in the Past Seven Days by Category of Frequency of Breakfast Consumption*

Food category	Mean number of servings per day			P-value
	Always (n=210)	Sometimes (n=127)	Never (n=52)	
	Mean $\pm$ Standard Error			
Juice	0.743 $\pm$ 0.06	0.631 $\pm$ 0.07	0.755 $\pm$ 0.11	0.440
Fruit	1.080 $\pm$ 0.06 <sup>a</sup>	0.808 $\pm$ 0.08 <sup>b</sup>	0.660 $\pm$ 0.12 <sup>b</sup>	0.00
Fruits and juice	1.823 $\pm$ 0.09 <sup>a</sup>	1.439 $\pm$ 0.12 <sup>b</sup>	1.415 $\pm$ 0.18 <sup>b</sup>	0.02
Vegetables	1.871 $\pm$ 0.11 <sup>a</sup>	1.730 $\pm$ 0.14	1.360 $\pm$ 0.22 <sup>b</sup>	0.13
Sugar sweetened beverages	0.896 $\pm$ 0.08 a	1.293 $\pm$ 0.10 b	1.405 $\pm$ 0.15 b	0.00
Diet beverages	0.213 $\pm$ 0.04	0.262 $\pm$ 0.05	0.378 $\pm$ 0.08	0.19
Milk	1.152 $\pm$ 0.06 <sup>a</sup>	0.834 $\pm$ 0.08 <sup>b</sup>	0.915 $\pm$ 0.13	0.01

Note: Values are given in mean number of servings per day  $\pm$  standard error. Values in each food category with different superscripts are significantly different.



## CHAPTER V

### DISCUSSION

The results of the study did not support the null hypothesis that there was no difference in dietary intake and BMI of adolescents based on frequency of breakfast consumption. Participants who always ate breakfast had higher mean intakes of fruit, and fruit juice, and a lower mean intake of sugar sweetened beverages than participants who sometimes or never ate breakfast. Participants who always ate breakfast had higher mean intakes of milk than participants who sometimes ate breakfast. Participants who always ate breakfast had a higher mean intake of vegetables than those who never ate breakfast.

Table 7 presents the present study data along with the national YRBS and Texas YRBS data (Eaton et al. 2012). The current study found a slightly greater percentage of total participants and a greater percentage of those who always ate breakfast reported consuming fruit or 100% fruit juice two or more times per day than the national YRBS data. In addition, a slightly greater percentage of total participants and a greater percentage of those who always ate breakfast and those who sometimes ate breakfast reported consumption of vegetables three or more times per day. Additionally, a smaller percentage of total participants but a greater percentage of participants who always, sometimes, and never ate breakfast reported drinking three or more glasses of milk per day. The current study also found a greater percentage of total participants reported consuming fruit or 100% fruit juice

two or more times per day as well as vegetables three or more times per day than the Texas YRBS participants.

One previously published study found that students who ate breakfast daily had higher intakes of ready-to-eat cereals, milk, and vegetables than those who did not eat breakfast daily (Evers, Taylor, Manske, & Midgett, 2001). In addition, the same study found that soft drinks were consumed more frequently in students who did not eat breakfast daily (Evers et al. 2001). Using data from the 1994-1996 Continuing Survey of Food Intakes by Individuals (CSFII), researchers found that breakfast consumption improved diet quality in children ages 6 to 18 (Basiotis, Lino, & Anand, 1999). Specifically, students who ate breakfast reported higher intakes of grains, fruit, and milk products (Basiotis, 1999).

Another area of interest is the type of food being consumed for breakfast. In one study that examined data from the NHANES from 1999-2002, researchers found that that intakes of whole fruits, whole grains, and milk were highest in young adults who were ready-to-eat breakfast cereal consumers and higher in young adults consuming other breakfast foods than in those who skipped breakfast (Deshmukh-Taskar et al. 2010). Researchers concluded that those who are ready-to-eat breakfast cereals had more favorable nutrient intake and overall better diet quality than those who ate other breakfast foods and those who skipped breakfast (Deshmukh-Taskar et al. 2010).

Table 7

*Current Study Compared to the National and Texas Youth Risk Behavior Survey (YRBS)*

	YRBS		Current Study			
			Category of breakfast consumption			
Dietary behavior	National (n=15425)	Texas (n=4209)	Always (n=210)	Sometimes (n=127)	Never (n=52)	Total (n=391)
	% of n					
Ate fruit or drank 100% fruit juice two or more times per day	34.0	29.9	63.31	25.90	10.79	35.54
Ate vegetables three or more times per day	15.3	10.7	63.33	25.00	11.67	15.34
Drank three or more glasses of milk per day	14.9	NR	64.58	18.75	16.67	12.27

Note: The abbreviation NR denotes values that were not reported. Information adapted from the results of the YRBS 2011 (Eaton et al., 2012).

There are limited data on breakfast consumption in children and adolescents. The third School Nutrition Dietary Assessment Study (SNDA-III) is a cross sectional study of the National School Lunch and School Breakfast Programs in 2005. This study examined dietary data from 2,314 students in public schools nationwide and found that School Breakfast Program (SBP) participants were more likely to consume milk and 100% fruit juice than nonparticipants (United States Department of Agriculture, 2007). In addition, SBP participants were less likely than nonparticipants to consume beverages other than milk or 100% fruit juice (USDA, 2007).

An international study examined breakfast consumption and lifestyle factors in schoolchildren in 41 different countries. In most countries there was a positive relation between daily breakfast consumption and daily fruit and vegetable consumption (Vereecken et al. 2009). Additionally, this study found that in most countries daily breakfast consumption was negatively associated with soft drink consumption (Vereecken et al. 2009).

### **Limitations**

One limitation is that this study used only one method to collect information on dietary intake. The seven day food frequency questionnaire may not be accurate due to the fact that it relies on memory from self-reports and is based on estimation of intake over 7 days. This study was also conducted in South Texas, which limits its generalizability. Additionally, individuals needed internet access in order to participate in this study, which may limit the population studied. Future studies should use multiple methods for collecting information on dietary intake.

## CHAPTER VI

### CONCLUSION

The majority of participants, approximately 54%, reported always eating breakfast. This study found that participants who always ate breakfast were more likely to consume fruit and milk and less likely to consume sugar-sweetened beverages than participants who sometimes or never ate breakfast. In addition, those who reported always eating breakfast had significantly higher mean intakes of milk than those who reported sometimes eating breakfast. There were no significant differences in BMI based on breakfast consumption.

Future research should include alternative methods for recording dietary intake, as this study only utilized a food frequency questionnaire. Additionally, future studies should include a larger sample size.

## REFERENCES

- Affenito, S.G., Thompson, D.R., Barton, B.A., Franko, D.L., Daniels, S.R., Obarzanek E, Schreiber, G.B., Striegel-Moore, R.H. Breakfast consumption by African-American and white adolescent girls correlates positively with calcium and fiber intake and negatively with body mass index. *Journal of the American Dietetic Association*, 105, 6, 938-945.
- Barton, B.A., Eldridge, A.L., Thompson, D., Affenito, S.G., Striegel-Moore, R.H., Franko, D.L., Albertson, A.M., Crockett, S.J. (2005). The relationship of breakfast and cereal consumption to nutrient intake and body mass index: the National Heart, Lung, and Blood Institute Growth and Health Study. *Journal of the American Dietetic Association*, 105, 9, 1383-1389.
- Basiotis, P., Lino, M., Anand, R. (1999). Eating Breakfast Greatly Improves Schoolchildren's Diet Quality. *Family Economics and Nutrition Review*, 12, 3, 81.
- Biro, F., & Wien, M. (2010). Childhood obesity and adult morbidities. *American Journal Of Clinical Nutrition*, 91, 1499S-1505S. doi:10.3945/ajcn.2010.28701B
- Bruening, M., Eisenberg, M., MacLehose, R., Nannery, M.S., Story, M., Neumark-Sztainer, D. (2012). Relationship between adolescents' and their friends' eating behaviors: breakfast, fruit, vegetable, whole-grain, and dairy intake. *Journal of the Academy of Nutrition and Dietetics*, 112, 10, 1608-1613. doi: 10.1016/j.jand.2012.07.008.

Center for Disease Control. (2012). Basics About Childhood Obesity. Retrieved from:  
<http://www.cdc.gov/obesity/childhood/basics.html>

Center for Disease Control. (2012). Youth risk behavior survey: questionnaires and items rationales. Retrieved from:  
[http://www.cdc.gov/healthyyouth/yrbs/questionnaire\\_rationale.htm](http://www.cdc.gov/healthyyouth/yrbs/questionnaire_rationale.htm)

Daniels, S. (2006). The consequences of childhood overweight and obesity. *Future Of Children*, 16, 47-67.

Deshmukh-Taskar, P.R., Nicklas, T.A., O'Neil, C.E., Keast, D.R., Radcliffe, J.D., Cho, S. (2010). The relationship of breakfast skipping and type of breakfast consumption with nutrient intake and weight status in children and adolescents: the National Health and Nutrition Examination Survey 1999-2006. *Journal of the American Dietetic Association*, 110, 6, 869-878. doi: 10.1016/j.jada.2010.03.023

Deshmukh-Taskar, P.R., Radcliffe, J.D., Liu, Y., Nicklas, T.A. (2010). Do breakfast skipping and breakfast type affect energy intake, nutrient intake, nutrient adequacy, and diet quality in young adults? NHANES 1999-2002. *Journal of the American College of Nutrition*, 29, 4, 407-418.

Eaton, D., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., & ... Wechsler, H. (2012). Youth risk behavior surveillance – United States, 2011. *MMWR Surveillance Summaries*, 59(SS-5), 1-142.

- Evers, S., Taylor, J., Manske, S., Midgett, C. (2001). Eating and smoking behaviours of school children in southwestern Ontario and Charlottetown, PEI. *Canadian Journal of Public Health*, 92, 6, 433-436.
- Freedman, D.S., Khan, L.K., Dietz, W.H., Srinivasan, S.R., Berenson G.S. (2001). Relationship of childhood obesity to coronary heart disease risk factors in adulthood: the Bogalusa Heart Study. *Pediatrics*, 108, 3, 712-718.
- Freedman, D.S., Khan, L.K., Serdula, M.K., Dietz, W.H., Srinivasan, S.R., Berenson, G.S. (2005). The relation of childhood BMI to adult adiposity: the Bogalusa Heart Study. *Pediatrics*, 115, 1, 22-27. doi: 10.1542/peds.2004-0220
- Krebs-Smith, S., Guenther, P., Subar, A., Kirkpatrick, S., & Dodd, K. (2010). Americans do not meet federal dietary recommendations. *Journal of Nutrition*, 140, 1832-1838. Doi:10.3945/jn.110.124826
- Must, A., Spadano, J., Coakley, E., Field, A., Colditz, G., & Dietz, W. (1999). The disease burden associated with overweight and obesity. *JAMA: Journal Of The American Medical Association*, 282, 1523-1529.
- Niemeier, H., Raynor, H., Lloyd-Richardson, E., Rogers, L., Wing, R. (2006). Fast food consumption and breakfast skipping: predictors of weight gain from adolescence to adulthood in a nationally representative sample. *Journal of Adolescent Health*. 39, 6, 842-849.



- Ogden, C., Carroll, M., Kit, B., & Flegal, K. (2012). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *Journal Of The American Medical Association*, 307, 483-490.
- Siege-Riz, A.M., Popkin, B.M., Carson, T. (1998). Trends in breakfast consumption for children in the United States from 1965-1991. *American Journal of Clinical Nutrition*, 67, 4, 748S-756S.
- Smith, K., Gall, S., McNaughton, S., Blizzard, L., Dwyer, T., and Venn, A. (2010). Skipping breakfast: longitudinal associations with cardiometabolic risk factors in the Childhood Determinants of Adult Health Study. *American Journal of Clinical Nutrition*, 92, 6, 1316-1325. doi: 10.3945/ajcn.2010.30101
- Texas Department of Agriculture. (2012). Income Eligibility Guidelines. Retrieved from: <http://www.squaremeals.org/Publications/IncomeEligibilityGuidelines.aspx>
- United States Department of Agriculture and U.S. Department of Health and Human Services. (2010). Dietary guidelines for Americans, 2010. 7th Edition, Washington, DC: U.S. Government Printing Office.
- United States Department of Agriculture. (2007). School Nutrition Dietary Assessment Study—III: Volume II: Student Participation and Dietary Intakes. *Nutrition Assistance Program Support Series*. Washington, DC: U.S. Government Printing Office.
- Vereecken, C., Dupuy, M., Rasmussen, M., Kelly, C., Nansel, T.R., Al Sabbah, H., Baldassari, D., Jordan, M.D., Maes, L., Niclasen, B.V., Ahluwalia, N.; HBSC

Eating & Dieting Focus Group. (2009). Breakfast consumption and its socio-demographic and lifestyle correlates in schoolchildren in 41 countries participating in the HBSC study. *International Journal of Public Health*, 54, 180-190. doi: 10.1007/s00038-009-5409-5

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*, 16, 10, 2323-2330. doi: 10.1038/oby.2008.351

World Health Organization. (2003). Expert consultation on diet, nutrition and the prevention of chronic diseases. Geneva, Switzerland: World Health Organization.

## APPENDIX

### IRB Exemption Letter



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

June 13, 2013

Ms. Gabrielle Goode  
Nutrition and Food Sciences  
6700 Fannin Street  
Houston, TX 77030

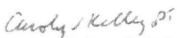
Dear Ms. Goode:

*Re: Differences in dietary behaviors and BMI of adolescents by frequency of breakfast consumption  
(Protocol #: 17385)*

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, DSc, NCS  
Institutional Review Board - Houston

cc. Dr. Rose Bush, Department of Nutrition & Food Sciences - Houston  
John Radcliffe, PhD, RD, Department of Nutrition & Food Sciences - Houston  
Graduate School