

## Eastern Illinois University The Keep

---

Masters Theses

Student Theses & Publications

---

1-1-2011

# Diet, Physical Activity, And Lifestyle Factors That Influence Weight Change The First Year Of College

Sarah R. Gaines

*Eastern Illinois University*

This research is a product of the graduate program in [Family and Consumer Sciences](#) at Eastern Illinois University. [Find out more](#) about the program.

---

### Recommended Citation

Gaines, Sarah R., "Diet, Physical Activity, And Lifestyle Factors That Influence Weight Change The First Year Of College" (2011). *Masters Theses*. 402.  
<http://thekeep.eiu.edu/theses/402>

This Thesis is brought to you for free and open access by the Student Theses & Publications at The Keep. It has been accepted for inclusion in Masters Theses by an authorized administrator of The Keep. For more information, please contact [tabruns@eiu.edu](mailto:tabruns@eiu.edu).

**\*\*\*\*\*US Copyright Notice\*\*\*\*\***

**No further reproduction or distribution of this copy is permitted by electronic transmission or any other means.**

**The user should review the copyright notice on the following scanned image(s) contained in the original work from which this electronic copy was made.**

**Section 108: United States Copyright Law**

**The copyright law of the United States [Title 17, United States Code] governs the making of photocopies or other reproductions of copyrighted materials.**

**Under certain conditions specified in the law, libraries and archives are authorized to furnish a photocopy or other reproduction. One of these specified conditions is that the reproduction is not to be used for any purpose other than private study, scholarship, or research. If a user makes a request for, or later uses, a photocopy or reproduction for purposes in excess of "fair use," that use may be liable for copyright infringement.**

**This institution reserves the right to refuse to accept a copying order if, in its judgment, fulfillment of the order would involve violation of copyright law. No further reproduction and distribution of this copy is permitted by transmission or any other means.**

### THESIS MAINTENANCE AND REPRODUCTION CERTIFICATE

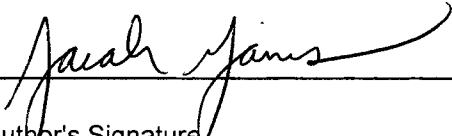
TO: Graduate Degree Candidates (who have written formal theses)

SUBJECT: Permission to Reproduce Theses

The University Library is receiving a number of request from other institutions asking permission to reproduce dissertations for inclusion in their library holdings. Although no copyright laws are involved, we feel that professional courtesy demands that permission be obtained from the author before we allow these to be copied.

PLEASE SIGN ONE OF THE FOLLOWING STATEMENTS:

Booth Library of Eastern Illinois University has my permission to lend my thesis to a reputable college or university for the purpose of copying it for inclusion in that institution's library or research holdings.

  
\_\_\_\_\_  
Author's Signature

4-7-11  
\_\_\_\_\_  
Date

I respectfully request Booth Library of Eastern Illinois University **NOT** allow my thesis to be reproduced because:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Author's Signature

\_\_\_\_\_  
Date

**This form must be submitted in duplicate.**

Diet, Physical Activity, and Lifestyle Factors that Influence

Weight Change the First Year of College

(TITLE)

BY

Sarah R. Gaines

**THESIS**

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF

Master's of Science in Family and Consumer Sciences: Dietetics

IN THE GRADUATE SCHOOL, EASTERN ILLINOIS UNIVERSITY  
CHARLESTON, ILLINOIS

2011

YEAR

I HEREBY RECOMMEND THAT THIS THESIS BE ACCEPTED AS FULFILLING  
THIS PART OF THE GRADUATE DEGREE CITED ABOVE

Kerlea Kennedy-Hagan 3/25/2011  
THESIS COMMITTEE CHAIR      DATE

[Signature] 3/25/11  
DEPARTMENT/SCHOOL CHAIR      DATE  
OR CHAIR'S DESIGNEE

Lisa Brooks 3/29/2011  
THESIS COMMITTEE MEMBER      DATE

Richard Wilkinson 4/7/11  
THESIS COMMITTEE MEMBER      DATE

\_\_\_\_\_  
THESIS COMMITTEE MEMBER      DATE

\_\_\_\_\_  
THESIS COMMITTEE MEMBER      DATE

Copyright 2011 by Sarah R. Gaines

## Abstract

**Diet, Physical Activity, and Lifestyle Factors that Influence Weight Change the First Year of College**

Gaines, S. R.

**Purpose:** To determine diet, physical activity, and lifestyle behaviors that are associated with weight gain the first year of college.

**Text:** First year college students are at an increased risk for weight gain, which could have an effect on the future obesity status in America. Several studies indicate that weight gain does occur the first year of college; however, little research actually studies the population's behaviors prior to college. A literature review was conducted on several factors that relate to the diet, physical activity, and lifestyle changes that students may undergo as they transition from high school to college. It was hypothesized that a change in these factors would be associated with student weight gain and an increased BMI the first year of college. A quantitative approach was taken to examine the diet, physical activity, and lifestyle changes that occurred during the transition from high school to college and how the changes were related to a weight and BMI difference. A total of 199 freshmen students at a Midwestern university voluntarily participated in the study. Based on the results, it was determined that fast food consumption, snack consumption, and computer use were significant ( $p < 0.05$ ) for weight gain and an increased BMI. As fast food consumption increased, snack consumption increased, and computer use increased, weight gain and an increased BMI occurred. By noting such associations, preventive strategies can be enforced to both reduce the rate of college weight gain, and furthermore reduce the onset of American obesity.

**Funding source:** None

## Dedication

I would like to dedicate this publication to my parents, John and Debbie Gaines. If it were not for them and their constant love, support, and prayers over the years, I would not be at this current point in my life. They have stood behind my decisions and have helped in any and every way possible to aid in the development, accomplishment, and establishment of my goals and dreams. Thank you, Mom and Dad. I love you both.

## Acknowledgments

I would like to give a special thanks to a select number of people who have helped assist in the completion of this thesis.

First, I would like to thank my committee members, Dr. Karla Kennedy-Hagan, Dr. Richard Wilkinson, and Dr. Lisa Brooks. Working with each of you has provided its own unique contribution to the development of this publication. Countless hours have been spent in your offices and/or meeting rooms, where we have deciphered data, analyzed the meaning to results, and thought out the most appropriate grammatical wording and structure to the sentences. Not to mention, the incredible amount of time, dedication, and expertise that you each so graciously provided me, which I am extremely grateful for. Many thanks to each of you!

Next, I would like to thank my professors Dr. Karla Kennedy-Hagan and Dr. Jim Painter, who both provided much encouragement and support to complete the thesis process. Both of their educational and work experiences not only helped me conclude that I wanted to complete a thesis, but they have also helped direct my future goals and plans. Thank you, both.

In addition, I would like to thank both Eric Davidson and Ryan Messinger at the Health Education Resource Center, who both helped in the brainstorming process and offered much advice regarding my thesis topic, who were both extremely flexible in my work hours as a graduate assistant, and who granted me access to the Question Pro system, which was the tool used in gathering and organizing the subject data for thesis results. I do not think either of you realized how much I appreciated all that you had done for me. Thank you so much!

Finally, a big “thank you” goes out to all of my family and friends. These people were my sole backbone throughout the writing process of the thesis. They provided me with much needed support and encouragement, allowed me the time to dedicate myself to the thesis itself, were open to any opportunity that I needed a break from the thesis, and they offered much understanding when a “break” was not an option. Thanks, to all of you.

Without the help of those mentioned, this thesis would have been a much more difficult task. Words cannot express how thankful I am to have had the chance to work with each and every one mentioned. I enjoyed every bit of it. Thank you, again.



## TABLE OF CONTENTS

Title Page.....	i
Copyright.....	ii
Abstract.....	iii
Dedication.....	iv
Acknowledgments.....	v
Table of Contents.....	vi
 Chapter 1	
Introduction.....	1
Statement of Problem.....	4
Purpose.....	4
Research Questions.....	4
Significance.....	5
Definition of Terms.....	5
Assumptions.....	7
 Chapter 2	
Introduction.....	8
Overweight/Obesity and Disease.....	8
College Transition.....	9
College Weight Gain.....	11
Dietary Behaviors.....	12
Fast food consumption.....	14
Snack food consumption.....	14
Fruits, vegetables, and fiber.....	15

Other Dietary Factors.....	18
Dairy.....	18
Hydration and caffeine.....	18
Dietary Intake: Senior Year of High School vs. First Year of College.....	19
Physical Activity Behaviors.....	19
Physical activity recommendations.....	20
Physical inactivity and technology use.....	20
Physical Activity: Senior Year of High School vs. First Year of College.....	21
College physical activity.....	22
Physical activity and body weight.....	23
Lifestyle Factors.....	24
Alcohol.....	25
Other Lifestyle Factors.....	26
Access to unhealthful foods.....	26
Monetary cost of food.....	27
Time constraints.....	28
Sleep.....	29
Breakfast consumption.....	29
Social factors.....	29
Nutrition knowledge.....	31
Stress.....	32
Academic performance.....	33
Dietary restraint.....	34
Depression.....	36

Lifestyle Levels of Importance for College Freshmen.....	36
Summary.....	37
Chapter 3	
Introduction.....	38
Description of the Design.....	38
Participants.....	38
Instrument.....	39
Pilot Test.....	39
Data Collection.....	40
Data Analysis.....	41
Summary.....	42
Chapter 4	
Introduction.....	43
Diet, Physical Activity, and Lifestyle Factor Changes.....	43
Research Question Results and Discussion.....	44
Weight Gain and diet, physical activity, and lifestyle factor changes.....	44
Increased BMI and diet, physical activity, and lifestyle factor changes .....	49
Weight gain and on-campus living.....	51
Increased BMI and on-campus living.....	51
Chapter 5	
Summary.....	53
Conclusions.....	53

Limitations.....55

Recommendations for Practitioners.....55

Recommendations for Further Research.....57

References.....59

Appendix A—Questionnaire.....69

## Chapter 1

### Introduction

Almost half of the American population aged 18 to 24 years is enrolled in post-secondary institutions in the United States (Nelson, Kocos, Lytle, & Perry, 2009). There are over 16 million students that are enrolled in more than 4,000 institutions of higher education (Thiagara & Torabi, 2009). Of these, more than 1.5 million students enter their first year of college or university each fall (Malinauskas, Raedeke, Aeby, Smith, & Dallas, 2006).

As students make the transition from high school to college, many believe that weight gain is inevitable (Jung, Bray, & Ginis, 2008). Many people believe that there will be a 15-pound weight gain the first year of college. However, little research actually provides evidence for a 15-pound weight gain amongst college freshmen. Nonetheless, weight gain does occur (Adams & Rini, 2007; Cluskey & Grobe, 2009; Delinsky & Wilson, 2008; Lowe et al., 2006; Nelson et al., 2009; Pullman et al., 2009; Racette, Deusinger, Strube, Highstein, & Deusinger, 2005; Serlachius, Hamer, & Wardle, 2007; Vella-Zarb & Elgar, 2009; Vohs, Heatherton, & Herrin, 2001).

The average age of the traditional college freshman is 18.5 years (Entering Freshmen, 2007). It has been found that people aged 18 to 29 years were the most likely to experience weight gain (Pullman et al., 2009), which accounts for those in their college freshman year. In one particular study, 75% of the college freshman participants increased their body mass index (BMI) from the beginning to the end of the academic year. In this sample, weight gain occurred more in women than in men (Racette et al., 2005). For some students, the weight gain that is experienced during the freshman year

increased their BMI from normal to overweight or obese (Cluskey & Grobe, 2009). In a sample of college freshman women, the proportion classified as overweight increased from 15.6% to 25.2% by the end of the first semester. Within this same sample, the proportion classified as obese increased from 5.2% to 6.7% during the same time period (Delinsky & Wilson, 2008).

From high school to college, Vohs et al. (2001) reported that freshmen gain an average of 3.8 lbs (1.73 kg). This study agreed with Vella-Zarb & Elgar (2009), which reported an average weight gain of 3.86 lbs (1.75 kg). Weight gain has been found to be in the range of 2.86 lbs to 7.26 lbs (1.3 kg to 3.3 kg) in the early terms of the first year of college (Cluskey & Grobe, 2009). However, Nelson et al. (2009) suggests that students gain an average of 2 lbs to 7 lbs in the first three to four months of college. Yet, in 14 other studies, there was an average weight gain of 4.6 lbs over the entire freshman year (Brown, 2008). As these studies suggest, an average weight gain during the first year of college might not properly demonstrate the amount of weight the typical student will gain. Instead, studies should look at the average weight gain of those who actually gained weight (Vella-Zarb & Elgar, 2009). Serlachius et al. (2007) noted that 55% of the students in a study gained weight, while 12% lost weight, and the other 33% maintained their weight. In the studies where students lost significant amounts of weight, this weight loss would factor in with the average weight gain if it were included (Vella-Zarb & Elgar, 2009), skewing the average weight gain towards the negative direction.

Of those who gained weight during the freshman year of college, average weight gain has been found to be anywhere between 1.6 lbs to 8.8 lbs (Vella-Zarb & Elgar, 2009). According to Serlachius et al. (2007), 61% of women gained weight compared to

44% of men. However, Cluskey & Grobe (2009) noted that during the first semester of college, females gained a range of 0.45 kg to 6.82 kg (1 lb to 15 lbs), while males gained a range of 0.23 kg to 12.73 kg (5 lbs to 28 lbs). The largest weight gain, which was >4.5 kg (10 lbs), occurred mostly in males with a healthy BMI at the beginning of the semester (Cluskey & Grobe, 2009). Thus, it is unknown whether males or females are more susceptible to the weight gain.

Research has provided limited data on the causes of weight gain the first year of college, or what factors put the students at risk for weight gain (Pullman et al., 2009). For most freshmen, the transition from home to college is the most dramatic change of environment in their lives (Levitsky, Halbmaier, & Mrdjenovic, 2004). Before they entered college, many students experienced healthful meals and regular exercise as a part of their regular routines. Once in college, though, these health behaviors seem to decline (Strong, Parks, Anderson, Winett, & Davy, 2008). Most college students do not live with their parents and their new living arrangements are found to influence food choices, nutrient intakes, and physical activity patterns (Driskell, Kim, & Goebel, 2005). This transition is often accompanied by a reduction in physical activity and increased consumption of high-fat foods and alcohol (Lowe et al., 2006). The food choices that students were taught throughout childhood do not always carry forth to college as they adapt to a new lifestyle and unfamiliar environment. These factors can then contribute to the adoption of poor dietary practices (Devine, 2006; McArthur, Grady, Rosenberg, & Howard, 2000). The adjustments to new surroundings, workloads, schedules, peer groups, social and role identities, leisure-time activities, health behaviors, and greater lifestyle freedom might make students more vulnerable to weight gain (Cluskey & Grobe,

2009; Greaney et al., 2009; Hicks & Heastie, 2008; Serlachius et al, 2007; Vohs et al., 2001).

### **Statement of Problem**

First year college students are at an increased risk for weight gain, which could have an effect on future obesity. College freshmen undergo major lifestyle changes as they make the transition from high school to college. These lifestyle changes could influence changes in students' dietary habits and levels of physical activity, which could then be related to the experienced weight gain.

### **Purpose**

The purpose of this study was to determine diet, physical activity, and lifestyle behaviors that are associated with weight gain the first year of college. Various factors were assessed and analyzed. Questions were developed on the basis of diet behavior, physical activity level and lifestyle change.

### **Research Questions**

It was hypothesized that a change in diet, physical activity, and lifestyle factors between the last semester of high school and the last semester of the first year of college was associated with student weight gain the first year of college.

The research questions for this study were as follows:

1. Is weight gain related to fast food consumption, snack consumption, soda consumption, fiber intake, physical activity, technology use, and alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college?
2. Is an increase in BMI related to fast food consumption, snack consumption, soda



consumption, fiber intake, physical activity, technology use, and alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college?

3. Is on-campus living related to weight gain for students during the transition from the last semester of high school to the last semester of the first year of college?
4. Is on-campus living related to an increase in BMI for students during the transition from the last semester of high school to the last semester of the first year of college?

### **Significance**

It is important to determine whether the rapid lifestyle changes between high school and college living are associated with weight gain and what specific behaviors cause the change. There is a possibility that college freshmen increase their energy intake and/or decrease their level of physical activity, compared to that of high school. Social and environmental factors are also likely to influence the risk of weight gain (Hoffman, Policastro, Quick, & Lee, 2006). Little research actually examines data prior to the first year of college, when students still live at home in their high school environments (Pullman et al., 2009). It is important for researchers to study not only the diet patterns and physical activity levels of these students, but to also assess other situations that involve lifestyle alterations (Butler, Black, Blue, & Gretebeck, 2004), such as moving away from home and gaining independence.

### **Definition of terms**

The following terms are used within this research study:

“Lifestyle factors” include the students’ alcohol consumption and living

arrangements. Those who live “at home” are the individuals that still live with their parents or legal guardians. Those who live “on-campus” are the individuals that had changed their living arrangement since high school (Jackson, Berry, & Kennedy, 2009).

“Dietary factors” include the students’ accessibility to snack foods, fast foods, and healthful foods. “Snack foods” are defined as foods low in nutrient density. Foods that are “low in nutrient density” are those that supply calories but relatively small amounts of vitamins and minerals, or none at all (US Dept Health and Human Services and US Dept Agriculture, 2005). “Healthful foods” are defined as foods high in nutrient density. “Nutrient-dense” foods are those that provide substantial amounts of vitamins and minerals and relatively few calories (US Dept Health and Human Services and US Dept Agriculture, 2005).

“Physical activity” is defined as the engagement in activities of moderate or vigorous intensity at least four days per week (Kwan, Bray, & Ginis, 2009). “Moderate” activity is physical activity that lasts at least 30 minutes and does not cause one to sweat or accelerate breathing. “Vigorous” activity is physical activity that lasts at least 20 minutes and it causes one to sweat or accelerate breathing (Pullman et al., 2009).

“Physical inactivity” is defined as time spent engaged in the use of technology, such as playing video games, television viewing, and computer use (Strong et al., 2008).

“Traditional” and “first year” students are defined as students who graduated from high school in the spring of 2009 and entered college in the fall of 2009.

Finally, the students’ body mass index (BMIs) were determined by the formula  $BMI = \text{Weight (kg)} / \text{Height (m}^2\text{)}$ , which determined the students’ weight status. “Normal weight” was defined as a BMI equal to  $18.5 \text{ kg/m}^2$  to  $24.9 \text{ kg/m}^2$ ; “Overweight” was

defined as a BMI equal to 25.0 kg/m<sup>2</sup> to 29.9 kg/m<sup>2</sup>; “Obese” was defined as a BMI greater than or equal to 30 kg/m<sup>2</sup> (Charney & Malone, 2004).

### **Assumptions**

The researcher assumed that the participants could correctly recall their lifestyle behaviors from their senior year of high school. It was also assumed that the participants knew their current and past body weights and heights. Finally, the researcher assumed that the participants would honestly complete the questionnaires.

## Chapter 2

### Review of Literature

#### **Introduction**

The purpose of this study was to determine diet, physical activity, and lifestyle behaviors that are associated with weight gain the first year of college. *Healthy Campus 2010* is a campaign which targets physical activity and dietary behaviors. One of its objectives was to increase the proportion of college students that receive information regarding the relationship between dietary practices and disease (Driskell et al., 2006). Along with this, its number one health priority was to increase the amount of physical activity found on college campuses (US Dept Health and Human Services, 2000; Jung et al., 2008). To maintain a normal body weight, it is recommended that individuals partake in at least 60 minutes of daily physical activity (Kasperek et al., 2008).

#### **Overweight/Obesity and Disease**

According to the Centers for Disease Control and Prevention, the United States rate of overweight and obesity has been on the rise over the past three decades (Centers for Disease Control and Prevention, 2009). This is true for all genders, ages, racial and ethnic groups, and educational levels (Hoffman et al., 2006). Obesity is recognized by the World Health Organization as one of the top ten global health problems (Lowe et al., 2006; World Health Organization, 2010), as there are more than 1 billion and 300 million clinically obese adults globally (Adams & Rini, 2007). Within the United States alone, approximately two-third's of the adult population is overweight or obese (Lowe et al., 2006), accounting for about 97 million adults (Schwartz & Byrd-Bredbenner, 2006).

This increased body weight does not affect BMI status alone; it is also

accompanied by social, psychological, and physical consequences (Adams & Rini, 2007). Obesity has caused an increase in chronic and life-threatening diseases, including the three leading causes of death in the United States: heart disease, some types of cancers, and stroke (McArthur et al., 2000; Thiagarajah & Torabi, 2009). Heart disease accounted for 631,636 deaths in the United States in 2006; cancer accounted for 559,888 deaths and stroke accounted for 137,119 deaths (CDC, 2009). Other forms of cardiovascular disease, Type 2 diabetes mellitus, hypertension, and hypercholesterolemia are also affected by obesity (Hoffman et al., Vella-Zarb & Elgar, 2009; Serlachius et al., 2007), which decreases the quality of life and life expectancy and increases health care costs (Pullman et al., 2009). Obesity-related medical costs were \$75 billion in 2003 (Levi, Chan, & Pence, 2006).

Due to the risks associated with this increased weight, many health care professionals have increased public awareness of the disease. Many campaigns exist which promote physical activity and decreased fat intake and encourage weight loss. Because of this, general wellness is of growing importance to society, and there is an increase in dieting “means,” which includes reduced-fat diets, exercise programs, fad diets, and even surgery (Hoffman et al., 2006). Despite the increase of non-caloric, sugar-free, and low fat foods, Americans continue to gain weight (Matvienko, Lewis, & Schafer, 2001).

### **College Transition**

As students make the transition from high school to college, they go through a critical time period when weight gain and changes in body composition are likely to occur (Adams & Rini, 2007; Racette et al., 2005). During this time period, students also

begin to develop life-long behaviors that will influence their future health status (Sax, 1997). For example, this time period is often when students are first solely responsible for their individual caloric intakes and levels of physical activity. This often places the freshman year of college at an increased risk for weight gain (Lowe et al., 2006), as first year college students might be more vulnerable to the onset of obesity (Vella-Zarb & Elgar, 2009).

A national survey revealed that people aged 18 to 29 years were most likely to experience weight gain (Pullman et al., 2009), which covers a portion of the time period that the college transition would occur. Gaining weight during the transition to college might also influence the rate of overweight and obesity among young adults (Serlachius et al., 2007). Between 1991 and 1998, the greatest increases in the prevalence of obesity were among adults aged 18 to 29 years with higher education levels (Huang et al., 2003; Strong et al., 2008). By 2001, the prevalence of obesity increased from 10.6% to 14% for the 18-year-old category and 17.8% to 21% for the 29-year-old category. Students aged >20 years were more likely to be overweight or obese than students aged <19 years (Huang et al., 2003). Again from 1996 to 2006, adults with at least some college education experienced the largest percentage increase in obesity (Levi et al., 2006).

College freshmen show a significant increase in their BMI, fat mass, weight, and rates of obesity compared to those that did not attend college. In one particular study, 11% of female first-year college students versus 2% of similarly aged adolescents that did not attend college developed overweight or obesity during the first year of college (Lowe et al., 2006). The weight change could have been due to disrupted patterns of diet and physical activity behaviors in college (Jung et al., 2008; Poddar et al., 2009; Racette

et al., 2005), which are highly prevalent on university campuses (Nelson et al., 2009). These behaviors can then become lifestyle changes which can develop over the years.

### **College Weight Gain**

Data from the National College Health Risk Behavior Survey suggests that 35% of college students are overweight or obese (Huang et al., 2003; Youth Risk Behavior Surveillance, 1997). According to the 2006 American College Health Assessment, 21.9% of students are overweight and 9.5% are obese (American College Health Association, 2007; Greaney et al., 2009). In one study, almost 75% of students gained weight their first year of college (Hoffman et al., 2006), with an average weight gain ranging from 1.5 to 5.0 pounds over the course of the first semester (Pullman et al., 2009). An increased BMI of  $>2$  over a 15-year time span placed young adults at an increased risk of cardiovascular disease (Strong et al., 2008). Nationwide, 20.5% of college students are overweight and obese (Butler et al., 2004), with more males than females falling within these categories (Pullman et al., 2009).

Within the first six months of college, 51.3% of college freshmen reported weight gain (Mihalopoulos, Auinger, & Klein, 2008). More than 35% of male students and 40% of female students gained at least 5% of their body weight; more than 7% of males and 13% of females gained at least 10% of their weight (Economos, Hildebrandt, & Hyatt, 2008). The rate of weight gain that is observed in college freshmen is much greater than that of the general population (Levitsky et al., 2004). The expected yearly weight gain for American adults is 0.8 pounds (Kasperek et al., 2008). However, the weight gain reported by college freshmen differed substantially. Of those who gained weight during the freshman year of college, average weight gain has been found to be anywhere

between 1.6 lbs to 8.8 lbs (Vella-Zarb & Elgar, 2009). These are significant weight gains, as they ranged between 2 to 11 times the expected averages.

For those who gained weight, there was an increase in the other aspects of body composition, as well (Hoffman et al., 2006). For males, waist circumference increased by 3.0 cm, hip circumference increased by 1.3 cm, the waist-to-hip ratio increased by 0.01, and body fat increased by 0.7% (Pullman et al., 2009). Body composition is a predictive indicator of chronic disease risk (Butler et al., 2004), with body fat being the primary factor associated with chronic disease as fat mass exceeds 25% of body weight. Weight gain caused primarily by increased fat mass increases the risk for metabolic disease (Hoffman et al., 2006). Elevated levels of waist circumference and waist-to-hip ratio predicts cardiovascular disease (Edmonds et al., 2008; Pullman et al., 2009). Research also indicates a significant gain in body weight, body mass index (BMI), body composition, and fat mass and a decrease in fat free mass amongst female college freshmen (Butler et al., 2004).

### **Dietary Behaviors**

Research suggests that weight gain is due to poor dietary choices (Jung et al., 2008), as a positive balance between energy intake and expenditure can lead to an increase in body weight and fat mass (Hoffman et al., 2006). Eating habits tend to worsen during the transition to college and young adulthood (Davy, Benes, & Driskell, 2006). The National Cancer Institute, the American Heart Association, the Dietary Guidelines for Americans, and the Institute of Medicine recommend that saturated fat and trans-fatty acid intakes are limited in the diet (Institute of Medicine, Food and Nutrition Board, 2002; US Dept Health and Human Services and US Dept Agriculture, 2005).



Many college students do not meet these (Racette et al., 2005) and other dietary recommendations and physical activity guidelines, which places them at risk for weight gain and diet- and lifestyle-related chronic diseases later in life (Buckworth & Nigg, 2004; Huang et al., 2003; McArthur et al., 2000; Racette et al., 2005).

Diets that are high in total and saturated fat, cholesterol, and energy and low in fiber are associated with cardiovascular disease and diabetes (McArthur et al., 2000). The typical college student diet is high in fat and sodium and low in fruits and vegetables, with a high consumption of fast food. The dietary knowledge, beliefs, and behaviors that are developed during college may carry over to adulthood and affect the future health status (Driskell et al., 2006). The health status of those in this age group is of concern, because they will soon be entering the age range of high chronic disease burden (Davy et al., 2006). The US Surgeon General suggests that unhealthy dietary habits and sedentary behavior collectively account for approximately 300,000 deaths annually (Adams & Rini, 2007).

Dietary fat is the most energy-dense nutrient, which increases the energy density of the selected food (Rolls, Ello-Martin, & Tohill, 2004). Increased energy intake from fat promotes adiposity, which increases the body fat percentage. The consumption of added fats, along with added sugars, has been identified as a primary factor in the increase of obesity (Davis, Hodges, & Gillham, 2006). In a study of college students, only 4% of the participants reported eating 30% or less of their energy from fat (Huang et al., 2003) and 21.8% reported eating three or more high-fat food items daily (Greaney et al., 2009). More college men than women report a high energy and fat consumption from high-fat foods (Driskell et al., 2006).

**Fast food consumption.**

Foods eaten at fast-food restaurants are a large contributor to the dietary intake of many college students, with 95.1% of lower-level students reporting a consumption of fast-food meals six to eight times per week (Driskell et al., 2005; Driskell et al., 2006). The weekly number of fast food meals is positively associated with total energy intake and percentage of energy from fat (Jeffery & French, 1998). Many students do not limit their consumption of fried and fast foods to the appropriate level (Racette et al., 2005), which is associated with obesity, weight gain, and body fat percentage (Davis et al., 2006; Jeffery & French, 1998). Fast food consumption is negatively associated with intakes of fruits, vegetables, and milk (Driskell et al., 2006). Diets that are high in meat consumption, particularly high-fat meats, and low in fruit were found to have the greatest influence on weight and adiposity (Davis et al., 2006).

According to Driskell et al. (2006), many college students ate at fast food restaurants for lunch and/or dinner at least once a week. More than half of the students in the study typically ate at deli sandwich restaurants, American-burger-and-fries-style restaurants, and Mexican-style restaurants. Students typically ate fast food either because of the low costs of the food, being short on time, the menu choices available and enjoying the taste of those items, social reasons, or a lack in cooking skills. College men were more likely to eat fast food than women and women were more likely to eat fast food because of social reasons (Driskell et al., 2006).

**Snack food consumption.**

Most students indicated that they ate snacks one or more times per day. These snacks typically consisted of chips, crackers, and nuts (Thiagarajah & Torabi, 2009).

These types of foods are often comfort foods for college students (Wansink, Cheney, & Chan, 2003). Other comfort foods include ice cream, cookies, and candy (Thiagarajah & Torabi, 2009). These foods are often energy-dense, which means that a small increase in the consumption of these foods could translate to a large increase in the students' energy intakes (Rolls, Roe, Kral, Meengs, & Wall, 2004).

In addition to snack food consumption, regular soda was the most frequently consumed beverage amongst college students (Driskell et al., 2005). These beverages contain empty, non-nutritious, energy-dense calories (Jackson et al., 2009), which could also lead to increased caloric consumption. The energy consumed in snacks is often poorly regulated. Consumers may purchase larger packages of snacks because they provide a better economic value. Large portions of these snacks are likely associated with an increased energy intake. In recent years, both the energy intake and the proportion of total energy coming from snacks have increased in young adults (Rolls et al., 2004b). There is evidence that the energy consumed as snacks between meals are not usually compensated for at meals. This can then result in an increased energy intake for the day (Levitsky et al., 2004; Rolls et al., 2004b). For those who gained weight the first year of college, there was a higher snack consumption reported between meals (Serlachius et al., 2007).

#### **Fruits, vegetables, and fiber.**

Overweight and obese adults were found to consume a large portion of their daily intake from fat and a small portion from carbohydrates, namely complex carbohydrates and dietary fiber (Davis et al., 2006). Diets that are low in fat content and high in fruits, vegetables, fiber, and dairy products are important for weight maintenance (Poddar et al.,



2009). Alina, Hels, & Tetens (2009) demonstrated that an increased fruit intake was associated with a significant reduction in body weight and a decreased risk of overweight or obesity. The number of servings of fruit was negatively related to percent body fat. In addition, a low vegetable consumption was associated with excessive weight gain (Davis et al., 2006). Tohill et al. (2004) had similar results, as an increased body weight was associated with a decrease in fruit or vegetable consumption.

Most fruits and vegetables have a low caloric value because of their low fat and high water content. Water has the largest impact on the energy density of food because it adds weight to food without increasing the amount of calories, which results in a decreased energy density. Fruits and vegetables are also high in dietary fiber, which contributes to a reduction in food intake (Rolls et al., 2004a). Increased fiber consumption slows the digestion and absorption of nutrients, controls the rapid increase or decrease in blood glucose, and delays gastric emptying, which causes an increase in satiety (Alina et al., 2009; Davis et al., 2006). This increase in satiety reduces hunger, ultimately decreases energy intake, and thus aids in weight management (Rolls et al., 2004a).

There has been a notable association between dietary fiber intake and weight loss. In several studies, an increase of 14-grams of fiber per day was associated with a 10% decrease in overall energy intake. This resulted in an average 4.2-pound weight loss over a four month period, which pinpoints the importance of fruits and vegetables for weight regulation (Kasperek et al., 2008; Rolls et al., 2004a). Total carbohydrates, complex carbohydrates, and dietary fiber have an inverse association with body weight, BMI, and body fat percentage. Normal-weight adults consume approximately 43% more complex

carbohydrates and 33% more dietary fiber daily than those who are overweight or obese (Davis et al., 2006). According to Pullman et al. (2009) a decreased consumption of fruit and vegetables was the only dietary predictor for an increased BMI. However, Kasperek et al. (2008) noted that there was not an association between the consumption of fruit and vegetables and weight change.

Many students do not consume adequate amounts of fruits, vegetables (Racette et al., 2005), and whole grains (Strong et al., 2008). Based on national surveys of college students, only 5.7% report a consumption of five or more servings of fruits and vegetables per day. The majority of respondents, 62%, report only consuming one to two servings per day (Greaney et al., 2009). Huang et al. (2003) had similar results, with two-thirds of college students consuming fewer than five servings of fruits and vegetables per day. In another study conducted by Racette et al. (2005), 69% of participants did not meet the recommended two to four servings of fruit per day and 98.7% did not meet the recommended three to five servings of vegetables per day. This low consumption of fruits and vegetables consequently has an effect on fiber consumption, as two-thirds of students in one study consumed fewer than 20 g of fiber per day. On the national level, the average fiber intake amongst 18- to 24-year olds is 16 g per day (Huang et al., 2003). It is recommended that females consume a minimum of 25 g of fiber per day and males consume a minimum of 38 g (US Dept Health and Human Services and US Dept Agriculture, 2005).

## **Other Dietary Factors**

### **Dairy.**

Dairy consumption is also inversely associated with excessive weight and body fat percentages (Davis et al., 2006). The 2005 Dietary Guidelines for Americans suggest that young adults consume 24 ounces per day of low-fat or fat-free milk or milk products (US Dept Health and Human Services and US Dept Agriculture, 2005). Adequate dairy consumption along with a reduced calorie intake may be associated with weight regulation and reduced adiposity. College-aged students who consume higher amounts of low-fat dairy products are more likely to maintain a lower body weight, body fat percentage, waist circumference, and waist-to-hip ratio (Poddar et al., 2009).

### **Hydration and caffeine.**

Proper hydration is another factor that could explain the weight gain found in college freshmen. Neither male nor female college students consumed the recommended eight servings of water per day. Water is a calorie-free way to respond to thirst, but instead it is often replaced with an increased consumption of caffeinated beverages. Many of these contain empty, non-nutritious, energy-dense calories (Jackson et al., 2009). Regular soda was the most frequently consumed beverage amongst college students, followed by low-calorie/diet beverages (Driskell et al., 2005). Caffeine contributes to insulin resistance and high blood pressure, which could have an effect on weight gain (Adams & Rini, 2007). In addition, caffeinated beverages can act as diuretics, which might further decrease hydration (Jackson et al., 2009). Thirst is often mistaken for hunger, which could lead to increased caloric consumption.

### **Dietary Intake: Senior Year of High School vs. First Year of College**

When comparing male students' dietary behaviors, there was not a significant difference in the consumption of grains, vegetables, meat and alternatives, soft drinks, coffee, or tea between their senior years of high school and first year of college. There was a decrease in fruit and milk consumption, though. In addition, there was not a significant difference in regards to the consumption of energy or nutrients (Pullman et al., 2009; 28). These results were similar to that of female students, as their caloric intake did not increase, but actually decreased, the first year of college. This was true for both those who lost weight and gained weight (Jung et al., 2008). Females were found to be deficient in their intakes of vegetables, fruit, bread, and meat. However, they did consume adequate amounts of milk. The total caloric intake amounted to approximately 350 calories less per day (Butler et al., 2004).

Researchers found that despite the poor eating habits formed in college, the overall caloric intake might actually decrease (Desai, Miller, Staples, & Bravender, 2008; Edwards & Meiselman, 2003). These dietary changes do not explain the changes found in body weight and composition amongst college freshmen. There was not a significant difference in energy or nutrient intake between the two time periods. Thus, energy intake is not a predictive factor for increased body mass (Pullman et al., 2009).

### **Physical Activity Behaviors**

Dietary intake has received more attention than physical activity for the use of weight reduction, but these findings do not support the recommendations, as dietary intake actually decreased (Butler et al., 2004). As weight does tend to increase during the transition to college, physical inactivity might be more of a factor (Desai et al., 2008),



which suggests that physical activity was more responsible for the weight change than dietary intake (Strong et al., 2008). This has led investigators to conclude that “the only available explanation for the paradoxical increase in body weight with a decrease in fat and energy intake is that physical activity declined” (Butler et al., 2004).

#### **Physical activity recommendations.**

The American College of Sports Medicine recommends that adults engage in at least 20 to 30 minutes of moderately intense physical activity most or all days of the week (American College of Sports Medicine Position Stand, 1998; Driskell et al., 2005). In addition to this, the Dietary Guidelines recommends that adults engage in 60 to 90 minutes of moderate to vigorous intensity levels of physical activity per day to prevent weight gain (US Dept Health and Human Services and US Dept Agriculture, 2005). However, more than 60% of American adults do not engage in the recommended amounts of physical activity (Schwartz & Byrd-Bredbenner, 2006). The National Heart, Lung, and Blood Institute along with the National Institutes of Diabetes and Digestive and Kidney Diseases report that an increased level of physical activity is an important component to weight loss and that sustained physical activity helps prevent weight gain (Malinauskas et al., 2006).

#### **Physical inactivity and technology use.**

Weight gain is associated with a reduction in total physical activity (Edmonds et al., 2008). Physical inactivity during college is associated with overweight and obesity. In one study, complete physical inactivity was associated with 37% of normal-weight individuals and 46% of overweight individuals (Desai et al., 2008). According to a study on females, as physical activity increased, BMI, body fat, and waist-to-hip ratio levels

were reduced (Malinauskas et al., 2006).

Technology use, along with advanced transportation, has reduced the need for physical activity, make physical activity seem less attractive, and promote the sedentary lifestyle (Jeffery & French, 1998; Schwartz & Byrd-Bredbenner, 2006). In one study, students spent approximately five hours per day participating in sedentary activities (Strong et al., 2008). For whatever the reason might be, the decline in physical activity could explain why 66% of students gained weight the first year of college (Jung et al., 2008), as levels of physical activity appear to be a stronger indicator for weight gain than an increased caloric intake (Butler et al., 2004).

#### **Physical Activity: Senior Year of High School vs. First Year of College**

According to the 1995 Youth Risk Behavior Survey, 54.9% of high school seniors participated in an adequate amount of vigorous physical activity. Students were active for at least 30 minutes on an average of 3.4 days per week (Youth Risk Behavior Surveillance, 1997). However, despite the recommendations for physical activity, research does demonstrate a sharp decline in physical activity with the transition from high school to college (Kwan et al., 2009). Many students report that they exercise less in college than they did in high school. Their workouts are less intense, less structured, and consist of voluntary activity rather than the required activity associated with organized sports (Strong et al., 2008). Only half of the students who were sufficiently active in high school maintained the recommended levels of physical activity during the first semester of college. The 1995 National College Health Risk Behavior Survey indicated that less than 40% of college students partook in the recommended amounts of vigorous physical activity (Youth Risk Behavior Surveillance, 1997). At the beginning

of the first semester of college, student physical activity level declined to an average of 2.9 days per week for at least 30 minutes per day (Kwan et al., 2009).

There were significant decreases found in total physical activity, work activity, and sports activity for females, while there was an increase in leisure activity (Butler et al., 2004). For males, there was a decrease in fast aerobic activity, while slow aerobic activity, strength training, and flexibility training did not significantly change (Pullman et al., 2009). Along with the transition to college, students also transitioned from labor-intensive high school occupations to the college “student” occupation, which consisted primarily of walking to and from class (Butler et al., 2004; Strong et al., 2008).

#### **College physical activity.**

Research indicates that the majority of college students are inactive (Driskell et al., 2005; Kasparek et al., 2008). Only 20% of college students report participating in moderate physical activity on a regular basis; 30% participate in regular vigorous physical activity (Greaney et al., 2009). According to the 2000 National College Health Assessment, 57% of male and 61% of female college students reported no moderate or vigorous physical activity at least 3 days per week (Buckworth & Nigg, 2004; National College Health Assessment Web Summary, 2002). In a study conducted by Racette et al. (2005), 30% of participants did not engage in any exercise on a regular basis. In another study by Thiagarajah & Torabi (2009), 8.3% of male students and 15.5% of female students reported to never exercise. Numerous studies suggest that anywhere from 20% to 68% of college students do not meet the minimum physical activity recommendations (Desai et al., 2008). College students exercise less than what is recommended to prevent weight gain (Jackson et al., 2009; Strong et al., 2008), despite their strong intentions to be

physically active.

Students often express a concern for their reduction in physical activity, but most still did not implement any changes despite the concern (Strong et al., 2008). It is thought that first-year college students have increased barriers to exercise compared to that of high school students. Students who perceive more barriers than enablers to physical activity tend to be less active (Greaney et al., 2009). Physical activity barriers can include competing demands, expectations, other interests, social life, academics, and stress. As they encountered the barriers, many revert back to their old patterns and did not follow through with their intentions. Since intentions often change, it is thought that past physical activity behavior is a better indicator of physical activity in college. Higher levels of past physical activity were associated with a 1.60-times greater likelihood of being physically active in college (Kwan et al., 2009).

#### **Physical activity and body weight.**

It is important to remember that not all weight gain is associated with an unhealthy behavior, as an increase in muscle mass would lead to weight gain (Hoffman et al., 2006). According to Pullman et al. (2009), men who frequently engaged in physical activity were more likely to gain weight, which suggests that the weight gain was actually due to the increased muscle mass from strength training. This change in body type is not associated with increased risk for disease (Hoffman et al., 2006). However, both male and female college students reported low frequency of strength training, which signifies that the increased body weight was not due to increased muscle, but rather increased fat (Kasperek et al., 2008). This rationalization is confirmed by Butler et al. (2004) that there was an increase in fat mass and a decrease in fat free mass for college freshmen.

Those who lost weight in college experienced a significant decrease in their body fat percentage, suggesting that the pounds lost came from fat. For those who gained weight, there was an increase in percent body fat. During the first year of college, the amount of physical activity varied between those who gained weight and those who lost weight. For those who lost weight, there was not an indicated change in physical activity since high school. For those who gained weight, though, there was a decrease in physical activity (Jung et al., 2008). Desai et al. (2008) suggests that overweight students are more likely to be physically inactive than students who are of a normal weight.

### **Lifestyle Factors**

As many students move away from home for college, living on campus is a major lifestyle change. In a 1984 study, female freshmen who lived on campus gained weight 34 times faster than those who did not live on campus (Kasperek et al., 2008). In another study, female freshmen were 2.6 to 5.2 times more likely to gain 15% or more above their ideal body weight during the first year of college, compared to those who did not live on-campus (Butler et al., 2004).

Lifestyle factors are likely to influence change in dietary behavior and physical activity for college freshmen. Students may be challenged to make healthful decisions when removed from their families' healthful patterns (Cluskey & Grobe, 2009). Students often perceive particular barriers associated with the college environment, and these barriers are likely to enforce behavior change. According to Greaney et al. (2009), barriers include that at the environmental level, the intrapersonal level, and the interpersonal level. Environmental level barriers include the easy access to unhealthful foods, such as fast food; the lack of access to healthful food; unhealthful foods served in

the dining centers; high monetary costs associated with healthful behaviors; and time constraints associated with being a student. Intrapersonal level barriers include that of not exercising due to lack of motivation; not eating healthful foods due to limited time and the limited knowledge of healthful foods; the temptation and lack of discipline associated with overeating; being bored; and levels of stress. Interpersonal level barriers include social factors, which influence overeating, eating unhealthy foods, and alcohol consumption (Greaney et al., 2009).

### **Alcohol.**

An increase in alcohol consumption amongst college freshmen could account for weight gain. Even though most traditional college freshmen are not of the legal age to drink alcohol, 77% of underage students report alcohol consumption (Kasperek et al., 2008). Of all college freshmen, 53% drank alcohol and 9.2% consumed at least 10 drinks per week (Jackson et al., 2009). Of male students alone, 79% reported alcohol consumption and 55% reported binge drinking. There was a significant increase in the number of drinks consumed each week from the beginning of college to the end of the first year, and the frequency of binge drinking increased as well (Pullman et al., 2009). Male students were twice as likely to drink at least four drinks per week in comparison to female students, and this increase in alcohol consumption had a positive effect on the weight change in male freshmen, accounting for an average 4.2-pound weight increase (Economos et al., 2008). Females had an increased consumption of alcohol as well (Butler et al., 2004). In general, those who lived on-campus instead of at home consumed twice the amount of alcohol (Jackson et al., 2009).

Fattening foods, such as fast food or snacks, are often eaten in excess after

consuming alcohol (Greaney et al., 2009; Strong et al., 2008). Much alcohol-related eating occurs late at night when these calorie-dense foods are readily available and healthful options are limited. Students may eat unnecessary amounts of food both during and after alcohol consumption, as well as more before to allow for a greater alcohol tolerance (Nelson et al., 2009).

### **Other Lifestyle Factors**

#### **Access to unhealthful foods.**

Several studies within the United States suggest that the dining centers on college campuses and the availability of high-fat snacks within the dorms and classrooms are contributing to the increase in students' weights (Levitsky et al., 2004; Serlachius et al., 2007). In a study of college freshmen, 20% of the experienced weight gain was associated with the "all-you-can-eat" dining plans and with the students' snack and "junk food" consumption levels (Cluskey & Grobe, 2009). College dining centers present a change to the students' typical food environments. These changes include a greater variety of food available, a choice in the food selection, a decrease in the parental influence on the food selection, and a different social environment associated with eating (Pliner & Saunders, 2008).

The diet of the average college student is inadequate and reflects poor eating behaviors. These behaviors are likely due to the price of healthy food, the easy access to fast food, and the increase in the frequency of snacking. People often consume more food than they need, which could be a result of fatigue, thirst, or increased portions (Kasperek et al., 2008). When students are constantly surrounded by endless food options, as is found in the on-campus dining halls, they are likely subject to fall culprit to

overindulgence. Many college freshmen regularly eat at the “all-you-can-eat” dining halls (Levitsky & Youn, 2004), where there is a greater variety and selection of foods (Pliner & Saunders, 2008). The greater variety of foods that are offered and the ease of obtaining these foods are linked to an increase in energy consumption. In one study students felt as if they ate more in the dining centers and that the portions served were larger (Levitsky et al., 2004). It is also viewed that the foods served by the dining centers are unhealthy, which made it more difficult for students to eat healthfully and maintain a healthful weight (Greaney et al., 2009; Strong et al., 2008).

The amount of food that is served has a direct influence on consumption.

According to a 2006 survey, more than half of American adults decided how much food to eat based on the amount that they were served (Driskell et al., 2006). Many people perceive these larger portion sizes as an appropriate amount to eat (Schwartz & Byrd-Bredbenner, 2006), and 70% of the American adults finished their entrees all or most of the time (Driskell et al., 2006). Another reason given for choosing larger portions was that of hunger (Lowe et al., 2006). According to Waterhouse et al. (2005), the hungrier that a student was before a meal, the more food the student would choose to eat, which would result in larger meals. These larger portions increase caloric consumption, which can then result in weight gain (Schwartz & Byrd-Bredbenner, 2006).

#### **Monetary cost of food.**

Students are often short on money and they become more selective on how they spend their funds. This can often result in an increased expenditure on alcohol and entertainment and less expenditure on food (Edwards & Meiselman, 2003). Some students felt that a limited income made it difficult to eat well. They felt as if healthful



foods were expensive and that it was much cheaper and easier to eat unhealthful options (Greaney et al., 2009). Food choices were most often selected based on the cost, the convenience, and the taste of the food (Driskell et al., 2006) rather than the healthfulness of the food (Misra, 2007).

#### **Time constraints.**

Time constraints associated with being a student made it difficult for students to obtain or prepare healthful meals and to exercise (Greaney et al., 2009). Structured time patterns often posed a barrier for healthful eating (Strong et al., 2008) or it limited the opportunity for students to eat an actual meal when hungry. This could then result in students' decisions to not eat meals and to instead eat snacks. When time pressures were present, satiety was less (Waterhouse et al., 2005), which would then result in increased hunger. When busy, students were also more likely to eliminate planned exercise from their schedules. They mentioned that it became more of a challenge to exercise when other responsibilities were present (Strong et al., 2008).

A decrease in physical activity could be due to an increase in academic workload, an increase in responsibility, a decrease in the participation of organized sports, a decrease in effort to stay active, and an introduction to the students' new sense of independence (Jung et al., 2008). However, students typically have discretionary time within their schedules; it depends on how they spend this time which influences their levels of physical activity (Buckworth & Nigg, 2004). An increase in sedentary activities could include time spent studying, the number of hours spent sleeping, and the use of various technologies (Jung et al., 2008), such as computers, televisions, and video games.

**Sleep.**

Students that lived on campus reported sleeping less than 5.5 hours per day (Thiagara & Torabi, 2009). Students who experienced more sleep difficulties incurred a greater amount of stress (Dusselier et al., 2005). Too little sleep, along with too much sleep, is associated with weight gain. Those who received 5 to 6 hours of sleep per night gained 4.4 lbs more than those who slept 7 to 8 hours per night. However, 3.5 lbs was gained by those who slept 9 to 10 hours per night. One possible explanation for the weight gain, other than the potential physical inactivity, includes the disruption in the production of certain hormones which controls one's appetite. Leptin diminishes the appetite while ghrelin stimulates the appetite; these hormones are affected by the amount of sleep one receives ("Sleep Duration," 2008).

**Breakfast consumption.**

Sleeping fewer hours is associated with irregular breakfast eating (Thiagara & Torabi, 2009). College students reportedly skip meals, especially breakfast (Driskell et al., 2006). Not eating breakfast daily might be an indicator for unhealthful eating behaviors, which make it harder to meet the Recommended Dietary Allowances. Irregular breakfast eating is associated with drinking regular soda or other sugared beverage more than three times per day. In addition, those who did not eat breakfast were more likely to never exercise, as breakfast might provide an energy boost to engage in regular physical activity (Thiagara & Torabi, 2009).

**Social factors.**

Social support from friends, however, encouraged students to be physically active, as exercising with friends was viewed as socially rewarding (Strong et al., 2008)

and easier to be physically active (Greaney et al., 2009). Thus, social support was positively correlated with increased physical activity and negatively correlated with the amount of time spent in sedentary activities, such as television viewing, playing video games, and computer use. With social support, students were more likely to participate in strenuous leisure time physical activity (Strong et al., 2008). Participation in intramural sports resulted in more physical activity exerted by the students (Greaney et al., 2009).

In many cases, social factors were more important than hunger for deciding when to eat a meal during leisure time. Larger meals were often chosen, as they were enjoyed more in this particular setting (Waterhouse et al., 2005). Some environmental elements that were found to increase food consumption were consuming meals outside the home, being exposed to palatable foods, and larger portions of energy-dense foods (Rolls et al., 2004b), which are all likely to be found in the social eating environment. Social events and seeing others eating were also found to be associated with overconsumption (Lowe et al., 2006). Levitsky & Youn (2004) found that college students were more likely to eat more when in the presence of friends than in other environments.

While friends do have the potential to influence negative behaviors, they could also support healthful behaviors (Cluskey & Grobe, 2009; Greaney et al., 2009). Social support for the consumption of fiber, fruits, and vegetables was associated with a higher fiber intake, more whole grain servings, and increased micronutrients, such as folate, calcium, iron, and potassium (Strong et al., 2008). Less social support was associated with a greater likelihood to binge eat (Freeman & Gil, 2004).

### **Nutrition knowledge.**

Nutrition knowledge is of key importance for college students in terms of deciding which foods are more healthful than others. However, approximately half of the students in a study conducted by Misra (2007) had never been taught information regarding the use of food labels. More women than men reported prior exposure to nutrition education. Only about a third of the men had prior exposure. The majority of students perceived the food label to be useful, but a third of the students believed the labels to be inaccurate, two-thirds believed that nutrition claims were not truthful, and a half of the students believed that health claims were not truthful (Misra, 2007).

In the same study, two-thirds of the students utilized the nutrition facts when purchasing a food for the first time. They often compared products and purchased foods with health claims (Misra, 2007). Driskell, Schake, & Detter (2008) found that 44% of college students used the nutrition label when making a first-time purchase, but another 52% did not even look at the food labels. The 2004 Shopping for Health Survey suggests that 83% of consumers use the nutrition facts when purchasing an item for the first time, 48% use it to purchase healthful foods, and 23% use it to lose weight (Misra, 2007). However, Strong et al. (2008) found that many students only look at the nutrition facts out of curiosity or boredom and do not use the information to influence their food purchases.

Women were more likely than men to utilize the food label (Driskell et al., 2008; McArthur et al., 2000; Misra, 2007), and they typically used it to determine the amount of fat and calories found in the food (McArthur et al., 2000). They were also more likely to use the nutrition information for the selection of fast food choices (Driskell et al.,

2006). Healthful eating might be stereotyped as “feminine,” which could explain why men were not as likely to utilize food labels. Health is less of a motivator in men’s food selection decisions. They do agree that healthful eating is important, but not to the same extent as women (Wardle et al., 2004).

Those who read the nutrition labels typically have greater nutrition knowledge on the relationship between diet and disease (Misra, 2007). People who use the nutrition labels usually look to reduce their intakes of calories, fat, and sodium (Driskell et al., 2008) and report diets lower in fat and cholesterol and higher in fruits and vegetables. Label readers were also more likely to pay attention to serving sizes. About 10% of the students in the study were able to correctly describe a serving size (Misra, 2007).

### **Stress.**

The transition from high school to college is often associated with many stressors due to the students’ separation from home and the new demands they face within the college life (Lenz, 2004). Stressors include academic, social, self-imposed, psychological, emotional, anxiety, low self-esteem, and depression (Cilliers, Senekal, & Kunneke, 2006; Hicks & Heastie, 2008; Misra & McKean, 2000; Vohs et al., 2001). Stress can impact how students cope with the new demands. When students view this stress negatively, or it becomes excessive, physical and psychological impairment can develop. Factors which influence increased stress include conflicts and satisfaction with a roommate, levels of procrastination, adjustment issues, time management issues, and financial issues (Dusselier et al., 2005). Students generally experience a higher amount of stress due to pressures and self-imposed stress, rather than the experienced changes in environment, conflicts, and levels of frustration (Misra & McKean, 2000). Excessive

stress can contribute to bad habit development and negative long-term consequences (Dusselier et al., 2005). Females generally experience higher levels of stress than males (Serlachius et al., 2007) and stressful situations are usually associated with both low self-esteem and increased worry (Sassaroli & Ruggiero, 2005).

### **Academic performance.**

Academic performance is a major stressor in the college students' lives (Hicks & Heastie, 2008). Students with more semester hours are reported to experience more frequent stress. Levels of anxiety, time management control, and satisfaction with leisure activities are all associated with the levels of academic stress (Dusselier et al., 2005). Leisure activities were found to significantly reduce academic stressors and behavioral reactions to stress (Misra & McKean, 2000). However, academic pressures may lead to increased time studying, increased computer use, and less participation in exercise and organized sports (Strong et al., 2008), minimizing the levels of leisure activity. Personal high standards are associated with levels of perfectionism (Sassaroli & Ruggiero, 2005), which can then increase the levels of anxiety.

School performance was linked to food consumption in a sample of nonclinical worry-prone dieters (Sassaroli & Ruggiero, 2005). Stress is associated with both increased and decreased amounts of food (Serlachius et al., 2007), as it can disrupt normal eating patterns. This could then cause an increase in fat consumption (Wansink et al., 2003). According to Serlachius et al. (2007), 80% of female students reported that they generally eat healthily, but this amount decreased to 34% when stress was involved. Elevated levels of psychological stress is associated with binge eating (Freeman & Gil, 2004), as disinhibited eating and emotional eating can result in an excessive energy

intake, which can then result in weight gain (Lowe et al., 2006). Women are more susceptible to weight gain induced by stressful eating (Serlachius et al., 2007).

### **Dietary restraint.**

Those who gained the most weight were those low or high in both dietary restraint and self-esteem (Tiggemann, 2004). Restrained eaters have been shown to consume more foods and/or more energy-dense foods when put under stressful situations (Serlachius et al., 2007). When women binge eat, they usually perceive their stressors to be more severe and emotionally disruptive. Women with bulimia or women with subclinical eating disorder symptoms tend to report higher levels of stress impact (Freeman & Gil, 2004). Stress and eating disorder symptoms are positively related (Vohs et al., 2001). Because of this, the transition to college is considered a high-risk period for the development of eating disorders due to the high levels of dieting, body dissatisfaction, and disordered eating and the association between stress and eating disorder symptoms (Delinsky & Wilson, 2008).

During the transition from high school to college, body dissatisfaction increases, particularly among women (Delinsky & Wilson, 2008; Vohs et al., 2001). Along with this, college is associated with high levels of stress and identity changes, which is correlated with disordered eating symptoms. The onset of disordered eating and dieting is often linked with difficulties coping with emotions (Vohs et al., 2001) and levels of perfectionism and low self-esteem (Sassaroli & Ruggiero, 2005). Dieting has been established as one of the best predictors of weight gain for college freshmen (Pliner & Saunders, 2008).

According to Vohs et al. (2001), approximately 80% of women diet and 50%

binge eat during the first year of college. Chronic dieting has been related to the development of abnormal eating attitudes, a decrease in self-esteem and psychological well-being, and an increase in eating disorders (Cilliers et al., 2006). Forms of dieting, especially unhealthful weight-control behaviors such as skipping meals, eating little amounts of food, utilizing diet pills, laxatives, and diuretics, and self-induced vomiting, does not appear to be effective in terms of weight loss and is instead a high predictor of both weight gain and the development of eating disorders (Neumark-Sztainer et al., 2006). Females with a history of severe dieting are 18 times more likely to develop an eating disorder (Malinauskas et al., 2006). Students at risk of developing eating disorders are at an increased risk for overweight or obesity (Desai et al., 2008).

Restrained eaters often ignore signs of hunger (Tomiya, Mann, & Comer, 2009) and refuse to eat “forbidden” foods (Lowe, 1993). They impose caloric restrictions on their diets (Polivy, Coleman, & Herman, 2005), are found with emotional distress (Lowe, 1993), and subsequently resort to giving in to their food cravings and psychological deprivation and binge eating occurs. This might occur in a series of situations, ultimately resulting in weight gain (Polivy et al., 2005). Restrained eaters often eat more when they are anxious (Tomiya et al., 2009) or stressed (Pliner & Saunders, 2008; Lowe, 1993). This can result in a chronic cycle of restricted and non-restricted eating patterns, which can then contribute to appetite deregulation, disordered eating, and weight gain (Lowe et al., 2006). This then leads the dieter to not succeed in weight loss (Tiggemann, 2004) and be at an increased risk for bulimia nervosa and an increased level of dietary restraint (Polivy et al., 2005).



**Depression.**

Students who reported more feelings of depression were more likely to experience an increased amount of stress (Dusselier et al., 2005). Women were more likely to report symptoms of depression and increased levels of stress compared to men (Sax, 1997). Alcohol was a common coping tactic used “to get through it” (Wilson, Pritchard, & Schaffer, 2004) and was used more frequently in those who experienced stress more often (Dusselier et al., 2005). Social support, on the other hand, provided a buffer against the negative effects associated with stress and mental health (Freeman & Gil, 2004). Setting goals and priorities and becoming organized was also effective in reducing negative behavioral reactions to stressors (Misra & McKean, 2000).

**Lifestyle Levels of Importance for College Freshmen**

Strong et al. (2008) explained the importance levels of various lifestyle factors associated with college freshmen. Going to class was rated as the most important, followed by studying, hanging out with friends, sleeping, exercising, dating or meeting partners, eating healthful foods, work, having an ideal body, surfing the internet, and lastly, going to a great party (Strong et al., 2008). These ratings demonstrate that college freshmen view many other lifestyle factors as more important than exercise and healthful eating, which will likely result in fewer students meeting the recommendations. Nelson et al. (2009) suggested that “health demands may become low priorities when compared to other commitments, such as schoolwork, employment, and social obligations.” This statement agrees mostly with the described ratings.

Davy et al. (2006) found that 75% of the participants believed that the nutritional content of foods is important and that there needed to be a proper ratio between

carbohydrates, proteins, and fats to achieve and maintain proper health. Another study discovered that college students goals for the semester ahead often included being more physically active and/or developing a more active social life (Greaney et al., 2009).

Research has suggested that the amount of weekly physical activity is more important than the intensity of the activity, which encourages individuals to participate in more less-demanding activities more often (Kasperek et al., 2008). This is important, so that students might find daily activity which can be enjoyed regularly and developed into lifelong behaviors.

Many students reported that more responsibility for food and meal preparation and a greater independence in the establishment of active lifestyles prior to college resulted in an increased stability of healthful behaviors during college (Cluskey et al., 2009). The data suggests that students should be encouraged to make personal healthful decisions during the high school years. Nutrition education should be the foundation of these behaviors, so that healthful decisions can be made throughout the development of future lifestyle behaviors.

### **Summary**

First year college students are at an increased risk for weight gain, which could have an effect on the future obesity status in America. Factors associated with weight gain include a change in dietary habits, including that of increased fat intakes and decreased fiber intakes, and a decrease in physical activity. College freshmen undergo major lifestyle changes as they make the transition from high school to college. These lifestyle changes could influence changes in students' dietary habits and levels of physical activity, which could then be related to the experienced weight gain.

## Chapter 3

### Methodology

#### **Introduction**

The purpose of this study was to determine diet, physical activity, and lifestyle behaviors that are associated with weight gain the first year of college. The following areas will be discussed: Description of the design, participant selection, instrumentation, pilot testing, data collection, and data analysis.

#### **Description of the Design**

A self-created quantitative questionnaire was designed by the researcher with a cross-sectional descriptive approach. With the use of a cross-sectional design, the researcher was allowed to conduct a single study on one sample of first year college students. These participants were asked to provide their weight and height and answer 12 multiple choice questions regarding diet, physical activity, and lifestyle behaviors for both the last semester of the last year of high school and the last semester of the first year of college. Variable differences were determined and the descriptive approach allowed for the measurement of associations between these variables. Relationships between variable differences and weight gain were then determined based on the single study.

#### **Participants**

Freshman students at a Midwestern university were recruited for this research study. Based on a freshman enrollment of approximately 1705 students, Krejcie and Morgan's (1970) table, "Determining sample sizes for research activities," recommended a sample of 313 participants. In order to gain a representative sample, an email was sent out through QuestionPro, an online database, to all freshmen students at the university.

Since the researcher did not receive an adequate amount of responses through the first email, a second email was distributed.

The students were eligible to participate if they graduated from high school in the spring of 2009 and entered college in the fall of 2009. Participation was completely voluntary. To encourage students to participate, a random drawing was held after the survey closed. Three participants were selected, each receiving a gift card for BP gas stations. Two cards were valued at \$25.00 each and one card was valued at \$50.00.

The email provided the students with information regarding the questionnaire and the purpose of the study. After providing consent, the students were directed to the questionnaire through a link in the email. The questionnaire took approximately 5 minutes to complete. The researcher was granted approval from the university's Institutional Review Board to complete the study.

### **Instrument**

A questionnaire based on the research questions was developed. The content of the questionnaire was reviewed and approved by an expert panel. The questions were entered on QuestionPro, an online data collection system. Utilizing this database, participants were instructed to enter their weights and heights for the last semester of the senior year of high school and for the last semester of the first year of college and to answer multiple choice questions pertaining to their dietary, physical activity, and lifestyle behaviors for the same time periods.

### **Pilot Test**

A pilot test of the questionnaire was conducted as a hard copy. Participants (n=22) were freshman students at a Midwestern university who were enrolled in a

University Foundations class. The pilot test identified a few errors, such as inconsistent question formatting and not assessing the students' BMIs. The instrument was revised to allow for a more accurate statistical analysis. Three professionals reviewed the instrument for content validity.

### **Data Collection**

The variables of the research questions were assessed by the following methods:

1. Fast food consumption was measured by the number of times per week that fast food was consumed. This assessed the number of times that fast food restaurants were visited, not the number of fast food items purchased.
2. Snack consumption was measured by the number of servings of snack foods consumed each day. One serving is equal to one-ounce of potato chips, a half cup of ice cream, one candy bar, a three-inch cookie, or a 3x3-inch piece of cake.
3. Soda consumption was measured by the number of servings of regular soda drunk each day. One serving is equal to 12 ounces of regular soda.
4. Fiber intake was measured by the number of fruit, vegetable, grain, and whole grain servings consumed. One serving of fruit is equal to a half cup of fruit or one medium fruit. One serving of vegetables is equal to a half cup of vegetables or one cup of leafy greens. One serving of grains is equal to one slice of bread, a half of a hamburger bun, a half of a three-inch bagel, a half of an English muffin, one cup of cereal, one tortilla shell, a half cup of cooked pasta, rice, or cereal (such as oatmeal), three cups of popcorn, or five crackers. One serving of whole grains is equal to one slice of whole grain bread, a half

of a whole grain hamburger bun, a half of a three-inch whole grain bagel, a half of a whole grain English muffin, one cup of cereal, one whole grain tortilla shell, a half cup of cooked whole grain pasta, brown rice, or cereal (such as oatmeal), three cups of popcorn, or five whole grain crackers. Each serving of fruit contained 1.75 grams of fiber. Each serving of vegetables contained 1.5 grams of fiber. Each serving of grain products contained 0.5 grams of fiber. Each serving of whole grain products contained 2.5 grams of fiber.

5. Physical activity was measured by the number of days per week that there was at least 30 minutes of physical activity performed.
6. Technology use was measured by the number of hours per day spent engaged with a computer, television, or video game.
7. Alcohol consumption was measured by the number of alcoholic drinks consumed each week. One drink is equal to 12 ounces of beer, 1.5 ounces of liquor, 5 ounces of wine, or 10 ounces of a wine cooler.
8. "On-campus" living was measured by the number of individuals that had changed their living arrangement since high school (Jackson et al., 2009).

Weight gain was validated by an increase in the participants' BMIs. If a student had gained weight but did not increase BMI, then that student's data would not be associated with those who gained weight.

### **Data Analysis**

QuestionPro, the database system used in the current study, collected and organized the data from the questionnaires and entered it into The Statistical Package of

the Social Sciences (SPSS Version 17.0). Statistical analysis included the following tests: Multiple regression for research questions 1 and 2 and t-tests for research questions 3 and 4.

### **Summary**

For the current study, methods were chosen to assess the effects that various diet, physical activity, and lifestyle changes have on weight gain during the transition from the last semester of high school to the last semester of the first year of college. Freshmen students at a Midwestern university completed a questionnaire asking about their past behaviors in high school and on their current behaviors in college. A questionnaire was developed based on the study's hypotheses and was tested in a pilot study. Freshmen students at the university completed the questionnaire. The data was analyzed to determine which diet, physical activity, and lifestyle factors influence weight gain over the first year of college.

## Chapter 4

### Results and Discussion

#### **Introduction**

The purpose of this study was to determine diet, physical activity, and lifestyle behaviors that are associated with weight gain the first year of college. A total of 199 freshmen students completed the questionnaire. Of these, 74.9% (n=149) were female and 25.1% (n=50) were male. The majority of participants (n=159, 79.9%) were Caucasian, followed by African American (n=25, 12.6%). The remaining 7.5% (n=15) of the participants were Asian, Native Hawaiian/Pacific Islander, Hispanic/Latino, or another ethnic group. This sample closely reflects the university's population of 76.5% Caucasian, 11.9% African American, and 11.6% of the remaining ethnic groups. The majority of participants (n=188, 94.5%) lived on campus, while the remaining 5.5% (n=11) lived at home with their families. Participants were either 18 or 19 years of age, with a mean age of 18.67 years. Participants' weight change ranged from a 16-pound loss to a 38-pound gain and a 3.8 decrease in BMI to a 6.4 increase in BMI between the last semester of high school and the last semester of the first year of college.

#### **Diet, Physical Activity, and Lifestyle Factor Changes**

It was hypothesized that a change in diet, physical activity, and lifestyle factors between the last semester of high school and the last semester of the first year of college was associated with student weight gain the first year of college. Participants were instructed to answer multiple choice questions pertaining to their dietary, physical activity, and lifestyle behaviors for the last semester of the senior year of high school and for the last semester of the first year of college. Table 1 reports the participants' mean



responses for the two time periods. Based on the averages, there was an overall decrease in the consumption of fast food (2.78 days/week vs. 1.68 days/week) and soda (1.28 servings/day vs. 0.93 servings/day), a decrease in the amount of time spent in physical activity (4.36 days/week vs. 3.31 days/week), and a decrease in the amount of time spent watching television (2.95 hours/day vs. 1.99 hours/day) or playing video games (0.63 hours/day vs. 0.43 hours/day). In contrast, there was an overall increase in the consumption of snacks (2.51 servings/day vs. 2.68 servings/day), fruits (1.76 servings/day vs. 2.00 servings/day), vegetables (1.79 servings/day vs. 1.95 servings/day), fiber (13.81 grams/day vs. 14.48 grams/day), and alcohol (1.40 drinks/week vs. 3.93 drinks/week), and an increase in the amount of time spent on the computer (2.68 hours/day vs. 4.68 hours/day). Grain consumption (4.57 servings/day) and whole grain consumption (2.88 servings/day) did not change between the two time periods.

### **Research Question Results and Discussion**

#### **Weight gain and diet, physical activity, and lifestyle factor changes.**

The first research question addressed whether weight gain was related to fast food consumption, snack consumption, soda consumption, fiber intake, physical activity, technology use, and alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college. A multiple regression was run on the weight differences and the diet, physical activity, and lifestyle behavior differences between the last semester of the first year of college and the last semester of high school. The Adjusted R Square measured 0.219, which suggested that 21.9% of weight gain during the transition from high school to college was discovered in this test. The test was significant ( $p=0.00$ ) for relating behaviors to weight gain. As

Table 1

Comparison of mean high school and college dietary, physical activity, and lifestyle behavioral responses

	High School	College
Fast Food <sup>a</sup>	2.78	1.68
Snack Food <sup>b</sup>	2.51	2.68
Soda <sup>c</sup>	1.28	0.93
Fruit <sup>d</sup>	1.76	2.00
Vegetables <sup>e</sup>	1.79	1.95
Grain <sup>f</sup>	4.57	4.57
Whole Grain <sup>g</sup>	2.88	2.88
Fiber <sup>h</sup>	13.81	14.48
Physical Activity <sup>i</sup>	4.36	3.31
Computer <sup>j</sup>	2.68	4.68
Television <sup>k</sup>	2.95	1.99
Video Games <sup>l</sup>	0.63	0.43
Alcohol <sup>m</sup>	1.40	3.93

<sup>a</sup> Fast food is measured by the number of days per week that fast food items are consumed.

<sup>b</sup> Snacks are measured by the number of servings of snack foods consumed each day.

<sup>c</sup> Soda is measured by the number of servings of regular soda drunk each day.

<sup>d</sup> Fruit is measured by the number of servings of fruit consumed each day.

<sup>e</sup> Vegetables are measured by the number of servings of vegetables consumed each day.

<sup>f</sup> Grain is measured by the number of servings of grain consumed each day.

<sup>g</sup> Whole grain is measured by the number of servings of grains that are consumed each day that are whole grain.

<sup>h</sup> Fiber is measured by classifying each fruit serving as 1.75 grams of fiber, each vegetable serving as 1.5 grams of fiber, each grain serving as 0.5 grams of fiber, and each whole grain serving as 2.5 grams of fiber.

<sup>i</sup> Physical activity is measured by the number of days per week participating in at least 30 minutes of physical activity per day.

<sup>j</sup> Computer use is measured by the number of hours per day spent on the computer.

<sup>k</sup> Television use is measured by the number of hours per day spent watching television.

<sup>l</sup> Video game use is measured by the number of hours per day spent playing video games.

<sup>m</sup> Alcohol is measured by the number of drinks of alcohol drunk each week.

illustrated in Table 2, fast food consumption ( $p=.010$ ,  $p<0.05$ ), snack consumption ( $p=0.00$ ,  $p<0.05$ ), and computer use ( $p=0.00$ ,  $p<0.05$ ) were significant for weight gain. As fast food consumption increased ( $B= 0.699$ ), snack consumption increased ( $B= 1.649$ ), or computer use increased ( $B= 1.183$ ), weight gain occurred.

The hypotheses that fast food consumption, snack consumption, and computer use are related to weight gain were accepted. However, the hypotheses that soda consumption, fiber intake, physical activity, television and video game use, and alcohol consumption are related to weight gain were rejected.

It is interesting to note that the mean consumption of fast food actually decreased between the last semester of high school and the last semester of the first year of college, yet an increased consumption of fast food was found to be significant for weight gain. This data suggests that while a decreased consumption occurred in the overall population, those who gained weight were more likely to have increased their fast food consumption.

More females ( $n=149$ , 74.9%) than males ( $n=50$ , 25.1%) participated in the study, which could account for the mean decrease in fast food consumption, as Driskell et al. (2006) reported college men to be more likely to eat fast food than women. In addition, Cluskey & Grobe (2009) reported that the largest weight gain during the first year of college occurred mostly in males with a healthy BMI at the beginning of the year. Based on these studies, it is appropriate to assume that the male participants in the study were more likely to have increased their consumption of fast food and also to have gained weight. This could then account for the significant association between weight gain and increased fast food consumption.

Mean snack consumption increased from the last semester of high school to the

last semester of the first year of college. Increased snack consumption was significantly associated with weight gain during the transition from high school to college. These results reflect that of Serlachius et al. (2007), which report that there was higher snack consumption for those who gained weight the first year of college.

Butler et al. (2004) reported that dietary intake actually decreases during the transition from high school to college and Strong et al. (2008) suggested that physical activity has a larger influence on the weight change. However, based on the current study's results, dietary intake was not found to decrease. The mean averages of fast food, snack food, and fruit and vegetable consumptions all increased from the last semester of high school to the last semester of the first year of college, while both grain and whole grain mean consumptions remained the same. In addition, the reported physical activity change was not significantly associated for weight gain ( $p=0.09$ ,  $p>0.05$ ).

While the reported physical activity was not significant, there was a trend towards decreased physical activity and weight gain ( $p=0.09$ ,  $p<0.10$ ;  $B= -0.456$ ). The trend cannot account for the weight gain, but it must be noted that this study only assessed the number of days per week that the participants were involved in at least 30 minutes of physical activity. The intensity and the duration of the physical activity were not assessed. Strong et al. (2008) reported that in college, workouts are less intense, less structured, and consist of voluntary activity rather than the required activity associated with high school organized sports.

In addition, the college "student" occupation primarily consists of walking to and from class, instead of the labor-intensive occupations that the students may have had in high school (Butler et al., 2004; Strong et al., 2008). This "student" occupation could be

associated with increased computer usage, which proved significance for weight gain in the current study. Based on mean computer, television, and video game use, physical inactivity increased from 6.26 hours/day the last semester of high school to 7.10 hours/day the last semester of the first year of college; of these totals, computer use incurred the greatest increase, from a mean 2.68 hours/day to 4.68 hours/day. Both mean television and video game use actually decreased between the two time periods. Based on these findings and suggestions, a change in physical activity could have a greater influence on weight gain than the current study revealed.

Table 2

Diet, physical activity, and lifestyle behavior differences and weight gain significance

	B	p
Fast Food	0.699	0.010
Snacks	1.649	0.000
Soda	0.236	0.547
Fruit	-0.543	0.324
Vegetables	0.219	0.689
Grain	-0.182	0.612
Whole Grain	-0.082	0.839
Physical Activity	-0.456	0.090
Computer	1.183	0.000
Television	-0.183	0.497
Video Games	0.144	0.769
Alcohol	-0.013	0.937

### **Increased BMI and diet, physical activity, and lifestyle factor changes.**

The second research question addressed whether an increase in BMI was related to fast food consumption, snack consumption, soda consumption, fiber intake, physical activity, technology use, and alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college. A multiple regression was run on the BMI differences and the diet, physical activity, and lifestyle behavior differences between the last semester of the first year of college and the last semester of high school. The Adjusted R Square measured 0.228, which suggested that 22.8% of BMI change during the transition from high school to college was discovered in this test. The test was significant ( $p=0.00$ ) for relating behaviors to BMI change. As illustrated in Table 3, fast food consumption ( $p=.007$ ,  $p<0.05$ ), snack consumption ( $p=0.00$ ,  $p<0.05$ ), and computer use ( $p=0.01$ ,  $p<0.05$ ) were significant for BMI change. As fast food consumption increased ( $B= 0.117$ ), snack consumption increased ( $B= 0.252$ ), or computer use increased ( $B= 0.181$ ), an increase in BMI occurred. These results validated that the weight gain was a result of increased body fat, not an increase in muscle mass.

The hypotheses that fast food consumption, snack consumption, and computer use are related to an increased BMI were accepted. However, the hypotheses that soda consumption, fiber intake, physical activity, television and video game use, and alcohol consumption are related to an increased BMI were rejected.

Again, it is important to note that while the reported physical activity was not significant for an increased BMI ( $p=0.052$ ,  $p>0.05$ ), there was a trend towards decreased physical activity and an increased BMI ( $p=0.09$ ,  $p<0.10$ ;  $B= -0.456$ ). The trend cannot

account for the increase in BMI. However, based on the findings and suggestions that were previously discussed for physical activity and weight gain, a change in physical activity could also have a greater influence on an increased BMI than the current study revealed.

Table 3  
Diet, physical activity, and lifestyle behavior differences and an increased BMI significance

	B	p
Fast Food	0.117	0.007
Snacks	0.252	0.000
Soda	0.016	0.802
Fruit	-0.094	0.285
Vegetables	0.042	0.633
Grain	0.011	0.847
Whole Grain	-0.026	0.683
Physical Activity	-0.083	0.052
Computer	0.181	0.001
Television	-0.052	0.227
Video Games	0.051	0.508
Alcohol	0.014	0.596

**Weight gain and on-campus living.**

The third research question addressed whether on-campus living was related to weight gain for students during the transition from the last semester of high school to the last semester of the first year of college. It was hypothesized that on-campus living would be associated with weight gain. An independent samples t-test was run on the weight differences and the participants' residency. The results of the t-test,  $t(197)=0.429$ ,  $p=0.669$ , indicated that the test was not significant for relating residency to weight gain. Thus, on-campus living is not related to weight gain for students during this transitional period, and the hypothesis was rejected.

The current study's finding that living on-campus was not related to weight gain suggests that other factors associated with being a freshman have a greater influence on the weight gain than the place of residency. However, it is important to note that there were only 5.5% of participants in the study that lived off-campus; the remaining 94.5% of participants lived on-campus. If a larger sample size were obtained, it is possible that further results would be revealed.

**Increased BMI and on-campus living.**

The fourth research question addressed whether on-campus living was related to an increase in BMI for students during the transition from the last semester of high school to the last semester of the first year of college. It was hypothesized that on-campus living would be associated with an increased BMI. An independent samples t-test was run on the BMI differences and the participants' residency. The results of the t-test,  $t(197)=0.125$ ,  $p=0.901$ , indicated that the test was not significant for associating residency to BMI change. Thus, on-campus living is not related to an increased BMI for



students during this transitional period; the hypothesis was rejected. This result validated that weight gain is not related to on-campus residency.

## Chapter 5

### Summary, Conclusions, Limitations, and Recommendations

#### **Summary**

First year college students are at an increased risk for weight gain, which could have an effect on the future obesity status in America. Several studies indicate that weight gain does occur the first year of college; however, little research actually studies the population's behaviors prior to college. A literature review was conducted on several factors that relate to the diet, physical activity, and lifestyle changes that students may undergo as they transition from high school to college. These factorial changes could subsequently be associated with the weight gain that occurs during this time period. A quantitative approach was taken to examine the diet, physical activity, and lifestyle changes that occurred during the transition from high school to college and how the changes were related to a weight and BMI difference. It is important to determine whether these changes were associated with weight gain, and if so, the specific behaviors that caused the weight change. By noting such associations, preventive strategies can then be enforced, to both reduce the rate of college weight gain, and furthermore reduce the onset of American obesity.

#### **Conclusions**

It was hypothesized that a change in diet, physical activity, and lifestyle factors between the last semester of high school and the last semester of the first year of college would be associated with student weight gain the first year of college. The first research question addressed whether weight gain was related to fast food consumption, snack consumption, soda consumption, fiber intake, physical activity, technology use, and

alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college. Based on the results, it was determined that fast food consumption, snack consumption, and computer use were significant ( $p < 0.05$ ) for weight gain. As fast food consumption increased, snack consumption increased, or computer use increased, weight gain occurred.

The second research question addressed whether an increase in BMI was related to fast food consumption, snack consumption, soda consumption, fiber intake, physical activity, technology use, and alcohol consumption for students during the transition from the last semester of high school to the last semester of the first year of college. Based on the results, it was determined that fast food consumption, snack consumption, and computer use were significant ( $p < 0.05$ ) for an increased BMI. As fast food consumption increased, snack consumption increased, or computer use increased, an increase in BMI occurred. These results validated that the weight gain was a result of increased body fat, not an increase in muscle mass.

The third research question addressed whether on-campus living was related to weight gain for students during the transition from the last semester of high school to the last semester of the first year of college. There was not a significant relationship between residency and weight gain. Thus, on-campus living was not related to weight gain for students during this transitional period.

The fourth research question addressed whether on-campus living was related to an increase in BMI for students during the transition from the last semester of high school to the last semester of the first year of college. There was not a significant relationship between residency and BMI change. Thus, on-campus living was not related to an

increased BMI for students during this transitional period.

### **Limitations**

This study contained a few limitations which must be disclosed. First, only 199 students completed the questionnaire, which fell short of Krejcie & Morgan's (1970) suggested sample size of 313 participants, based on the table, "Determining sample sizes for research activities." However, this recommendation was based on the freshman enrollment of 1705 students, which included both traditional and non-traditional students. Since the current study focused directly on traditional students, a smaller sample size would be appropriate. In addition, mostly females (n=149, 74.9%) completed the questionnaire, which does not reflect the university's population of 58.0% females and 42.0% males.

Due to a limited time constraint, past and present behaviors were self-reported by the participants and might not accurately reflect their actual behaviors. This method also relied on the participants' memory of their behaviors in high school. It is likely that many did not completely recall their behaviors and their responses could have skewed the actual results. It was also assumed that the participants knew their current and past body weights and heights. If they did not know the exact amounts, then weight change could not accurately be measured and assessed. Finally, the researcher assumed that the participants would honestly complete the questionnaires. If the participants were not honest with their responses, then an accurate analysis could not be fulfilled.

### **Recommendations for Practitioners**

Based on the results, it was determined that fast food consumption, snack consumption, and computer use accounted for 21.9% of the weight gain and 22.8% of the

increased BMI for students during the transition from high school to college. As fast food consumption increased, computer use increased, and/or snack consumption increased, weight gain and an increased BMI occurred. Since both weight and BMI increased, it is suggested that weight gain was a result of increased body fat, not increased muscle mass.

This information is beneficial for all practitioners in the health field, as the weight gain during this transitional period in life can lead to the increased rate of overweight and obesity in America, which then plays a toll on all health aspects of a person's life. By knowing specifically what causes the weight change, practitioners can better direct their efforts to reduce the rapid increase in weight.

To gain control of the weight gain, it would be important for practitioners to focus their efforts towards the area of prevention. Even though this study found that physical activity was not related to weight gain or an increased BMI, an increase in computer use, which is an increase in physical inactivity, was related to both weight gain and an increased BMI. Nutrition education and physical activity courses need to remain in high schools, not eliminated, so that students can better implement these lifestyles into their own lives before they make the transition to college. Along with this, colleges should require an introduction to nutrition course for students, so that nutrition education can make the college transition with them. By implementing such measures, students might be more apt to maintain healthful lifestyles. If they can continue their levels of physical activity, despite the increased amount of time spent on the computer, and reduce their consumption levels of fast food and snacks, students might gain better control of their weight. This could then result in weight maintenance rather than weight gain.

### **Recommendations for Further Research**

Due to limited time, many factors of weight gain mentioned throughout the literature review were not assessed and analyzed in the current study. The researcher only looked at the differences between the last semester of the first year of college and the last semester of high school on the number of days per week spent in at least 30 minutes of physical activity, the number of times per week that fast food was consumed, the number of daily servings of fruits, vegetables, grains, and whole grains, the amount of daily fiber, the amount of time spent on the computer, watching television, or playing video games per day, the number of daily servings of snack foods and regular soda, and the number of alcoholic drinks consumed each week, along with residency status, and the effects that these variables had on weight and BMI change.

However, the literature review also discussed the effects that dairy consumption, hydration status, caffeine intake, access to unhealthful foods, monetary costs of foods, time constraints, the amount of sleep received per night, breakfast consumption, social factors, nutrition knowledge, stress, academic performance, dietary restraint, and depression have on weight change during this transitional period in students' lives. The current study only discovered what caused 21.9% of weight gain and 22.8% of a BMI increase during this time period. While this is a significant amount, there are still approximately 78% of unknown reasons surrounding the experienced weight gain for first year college students.

Further research should be conducted on the given factors that were not assessed in the present study. By doing so, other factors might be found to be significant determinants of weight gain for this particular population. Increasing knowledge on such

factors could then lead health practitioners to further direct their focus on weight maintenance for first year college students, which could then indirectly lead to a better control of the overweight and obesity epidemic found within the United States.

## References

- Adams, T. & Rini, A. (2007). Predicting 1-year change in body mass index among college students. *Journal of American College Health, 55*(6), 361-365.
- Alina, S., Hels, O., & Tetens, I. (2009). The potential association between fruit intake and body weight- A review. *Obesity Reviews, 10*, 639-647. doi: 10.1111/j.1467-789X.2009.00582.x
- American College Health Association. (2007). National College Health Assessment Spring 2006 reference group data report. *Journal of American College Health, 55*, 195-206.
- American College of Sports Medicine Position Stand. (1998). The recommended quantity and quality of exercise for developing and maintaining cardiorespiratory and muscular fitness, and flexibility in healthy adults. *Med Sci Sports Exerc, 30*, 975-991.
- Brown, C. (2008). The information trail of the 'Freshman 15'—A systemic review of a health myth within the research and popular literature. *Health Information and Libraries Journal, 25*, 1-12. doi: 10.1111/j.1471-1842.2007.00762.x
- Butler, S., Black, D., Blue, C., & Gretebeck, R. (2004). Change in diet, physical activity, and body weight in female college freshman. *American Journal of Health Behavior, 28*(1), 24-32.
- Buckworth, J. & Nigg, C. (2004). Physical activity, exercise, and sedentary behavior in college students. *Journal of American College Health, 53*(1), 28-34.
- Centers for Disease Control and Prevention. (2009, December 31). Centers for Disease Control and Prevention. Retrieved from <http://www.cdc.gov/>



Charney, P., & Malone, A. (Eds.). (2004). ADA pocket guide to nutrition assessment.

United States: American Dietetic Association.

Cilliers, J., Senekal, M., & Kunneke, E. (2006). The association between the body mass index of first-year female university students and their weight-related perceptions and practices, psychological health, physical activity and other physical health indicators. *Public Health Nutrition*, *9*(2), 234-243. doi: 10.1079/PHN2005846

Cluskey, M., & Grobe, D. (2009). College weight-gain and behavior transitions: Male and female differences. *Journal of the American Dietetic Association*, *109*, 325-329. doi: 10.1016/j.jada.2008.10.045

Davis, J.N., Hodges, V.A., & Gillham, M.B. (2006). Normal-weight adults consume more fiber and fruit than their age- and height-matched overweight/obese counterparts. *Journal of the American Dietetic Association*, *106*, 833-840. doi:10.1016/j.jada.2006.03.013

Davy, S.R., Benes, B.A., & Driskell, J.A. (2006). Sex differences in dieting trends, eating habits, and nutrition beliefs of a group of Midwestern college students. *Journal of the American Dietetic Association*, *106*, 1673-1677. doi: 10.1016/j.jada.2006.07.017

Delinsky, S.S. & Wilson, G.T. (2008). Weight gain, dietary restraint, and disordered eating in the freshman year of college. *Eating Behaviors*, *9*, 82-90. doi: 10.1016/j.eatbeh.2007.06.001

Desai, M.N., Miller, W.C., Staples, B., & Bravender, T. (2008). Risk factors associated with overweight and obesity in college students. *Journal of American College Health*, *57*(1), 109-114.

- Devine, C.M. (2005). A life course perspective: Understanding food choices in time, social location, and history. *Journal of Nutrition Education and Behavior*, 37(3), 121-128.
- Driskell, J.A., Kim, Y.-N., & Goebel, K.J. (2005). Few differences found in the typical eating and physical activity habits of lower-level and upper-level university students. *Journal of the American Dietetic Association*, 105, 798-801.  
doi: 10.1016/j.jada.2005.02.004
- Driskell, J.A., Meckna, B.R., & Scales, N.E. (2006). Differences exist in the eating habits of university men and women at fast-food restaurants. *Nutrition Research*, 26, 524-530. doi: 10.1016/j.nutres.2006.09.003
- Driskell, J.A., Schake, M.C., & Detter, H.A. (2008). Using nutrition labeling as a potential tool for changing eating habits of university dining hall patrons. *Journal of the American Dietetic Association*, 108, 2071-2076.  
doi: 10.1016/j.jada.2008.09.009
- Dusselier, L., Dunn, B., Wang, Y., Shelley, M.C., & Whalen, D.F. (2005). Personal, health, academic, and environmental predictors of stress for residence hall students. *Journal of American College Health*, 54(1), 15-24.
- Economos, C., Hildebrandt, M., & Hyatt, R. (2008). College freshman stress and weight change: Differences by gender. *American Journal of Health Behavior*, 32(1), 16-25.
- Edmonds, M.J., Ferreira, K.J., Nikiforuk, E.A., Finnie, A.K., Leavey, S.H., Duncan, A.M., & Simpson, J.A.R. (2008). Body weight and percent body fat increase during the transition from high school to university in females. *Journal of the*

- American Dietetic Association*, 108, 1033-1037. doi: 10.1016/j.jada.2008.03.002
- Edwards, J.S.A. & Meiselman, H.L. (2003). Changes in dietary habits during the first year at university. *British Nutrition Foundation Nutrition Bulletin*, 28, 21-34.
- Entering Freshmen. (2007). *Montana State University*. Retrieved from <http://www.montana.edu/opa/facts/quick.html#Frosh>
- Freeman, L.M.Y. & Gil, K.M. (2004). Daily stress, coping, and dietary restraint in binge eating. *International Journal of Eating Disorders*, 36, 204-212.  
doi: 10.1002/eat.20012
- Greaney, M.L., Less, F.D., White, A.A., Dayton, S.F., Riebe, D., Blissmer, B., ...Greene, G.W. (2009). College students' barriers and enablers for healthful weight management: A qualitative study. *Journal of Nutrition Education and Behavior*, 41(4), 281-286. doi: 10.1016/j.jneb.2008.04.354
- Hicks, T. & Heastie, S. (2008). High school to college transition: A profile of the stressors, physical and psychological health issues that affect the first-year on-campus college student. *Journal of Cultural Diversity*, 15(3), 143-147.
- Hoffman, D., Policastro, P., Quick, V., & Lee, S. (2006). Changes in body weight and fat mass of men and women in the first year of college: A study of the "Freshman 15." *Journal of American College Health*, 55(1), 41-45.
- Huang, T. T.-K., Harris, K.J., Lee, R.E., Nazir, N., Born, W., & Kaur, H. (2003). Assessing overweight, obesity, diet, and physical activity in college students. *Journal of American College Health*, 52(2), 83-86.
- Institute of Medicine, Food and Nutrition Board. (2002). *Dietary Reference Intakes for Energy, Carbohydrates, Fiber, Fat, Protein and Amino Acids (Macronutrients)*.

Washington DC: National Academy Press.

- Jackson, R., Berry, T., & Kennedy, M. (2009). The relationship between lifestyle and campus eating behaviours in male and female university students. *College Student Journal, 43*(3), 860-871.
- Jeffery, R.W. & French, S.A. (1998). Epidemic obesity in the United States: Are fast foods and television viewing contributing? *American Journal of Public Health, 88*(2), 277-280.
- Jung, M., Bray, S., & Ginis, K. (2008). Behavior change and the freshman 15: Tracking physical activity and dietary patterns in 1<sup>st</sup>-year university women. *Journal of American College Health, 56*(5), 523-530.
- Kasperek, D., Corwin, S., Valois, R., Sargent, R., & Morris, R. (2008). Selected health behaviors that influence college freshman weight change. *Journal of American College Health, 56*(4), 437-444.
- Krejcie, R. & Morgan, D. (1970). Determining sample sizes for research activities. *Educational and Psychological Measurement, 30*(3), 607-610.
- Kwan, M., W., Bray, S., & Ginis, K. M. (2009). Predicting physical activity of first-year university students: An application of the theory of planned behavior. *Journal of American College Health, 58*(1), 45-55.
- Lenz, B.K. (2004). Tobacco, depression, and lifestyle choices in the pivotal early college years. *Journal of American College Health, 52*(5), 213-219.
- Levi, A., Chan, K.K., & Pence, D. (2006). Real men do not read labels: The effects of masculinity and involvement on college students' food decisions. *Journal of American College Health, 55*(2), 91-98.

- Levitsky, D.A., Halbmaier, C.A., & Mrdjenovic, G. (2004). The freshman weight gain: A model for the study of the epidemic of obesity. *International Journal of Obesity*, 28, 1435-1442. doi: 10.1038/sj.ijo.0802776
- Levitsky, D.A. & Youn, T. (2004). The more food young adults are served, the more they overeat. *The Journal of Nutrition*, 134, 2546-2549.
- Lowe, M.R. (1993). The effects of dieting on eating behavior: A three-factor model. *Psychological Bulletin*, 114(1), 100-121.
- Lowe, M.R., Annunziato, R.A., Markowitz, J.T., Didie, E., Bellace, D.L., Riddell, L., ... Stice, E. (2006). *Appetite*, 47, 83-90. doi: 10.1016/j.appet.2006.03.160
- Malinauskas, B.M., Raedeke, T.D., Aeby, V.G., Smith, J.L., & Dallas, M.B. (2006). Dieting practices, weight perceptions, and body composition: A comparison of normal weight, overweight, and obese college females. *Nutrition Journal*, 5(11). doi: 10.1186/1475-2891-5-11
- Matvienko, O., Lewis, D., & Schafer, E. (2001). A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *Journal of Nutrition Education*, 33(2), 95.
- McArthur, L., Grady, F.M., Rosenberg, R.I., & Howard, A.B. (2000). Knowledge of college students regarding three themes related to dietary recommendations. *American Journal of Health Studies*, 16(4), 177-184.
- Mihalopoulos, N., Auinger, P., & Klein, J. (2008). The freshman 15: Is it real? *Journal of American College Health*, 56(5), 531-534.
- Misra, R. (2007). Knowledge, attitudes, and label use among college students. *Journal of the American Dietetic Association*, 107, 2130-2134.

doi: 10.1016/j.jada.2007.09.001

Misra, R. & McKean, M. (2000). College students' academic stress and its relation to their anxiety, time management, and leisure satisfaction. *American Journal of Health Studies, 16*(1), 41-51.

National College Health Assessment Web Summary. (October 17, 2002). *American College Health Association*. Retrieved from

[http://www.acha.org/projects\\_programs/ncha\\_sampledata\\_public.cfm](http://www.acha.org/projects_programs/ncha_sampledata_public.cfm)

Nelson, M.C., Kocos, R., Lytle, L.A., & Perry, C.L. (2009). Understanding the perceived determinants of weight-related behaviors in late adolescence: A qualitative analysis among college youth. *Journal of Nutrition Education and Behavior, 41*(4), 287-292. doi: 10.1016/j.jneb.2008.05.005

Neumark-Sztainer, D., Wall, M., Guo, J., Story, M., Haines, J., & Eisenberg, M. (2006). Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare 5 years later? *Journal of the American Dietetic Association, 106*, 559-568. doi: 10.1016/j.jada.2006.01.003

Pliner, P. & Saunders, T. (2008). Vulnerability to freshman weight gain as a function of dietary restraint and residence. *Physiology & Behavior, 93*, 76-82.

doi: 10.1016/j.physbeh.2007.07.017

Poddar, K.H., Hosig, K.W., Nickols-Richardson, S.M., Anderson, E.S., Herbert, W.G., & Duncan, S.E. (2009). Low-fat dairy intake and body weight and composition changes in college students, *Journal of the American Dietetic Association, 109*, 1433-1438. doi: 10.1016/j.jada.2009.05.005

Polivy, J., Coleman, J., & Herman, C.P. (2005). The effect of deprivation on food

- cravings and eating behavior in restrained and unrestrained eaters. *International Journal of Eating Disorders*, 38, 301-309. doi: 10.1002/eat.20195
- Pullman, A., Masters, R., Zalot, L., Carde, L., Saraiva, M., Dam, Y., et al. (2009). Effect of the transition from high school to university on anthropometric and lifestyle variables in males. *Applied Physiology, Nutrition & Metabolism*, 34(2), 162-171. doi: 10.1139/H09-007
- Racette, S.B., Deusinger, S.S., Strube, M.J., Highstein, G.R., & Deusinger, R.H. (2005). Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *Journal of American College Health*, 53(6), 245-251.
- Rolls, B.J., Ello-Martin, J.A., & Tohill, B.C. (2004a). What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutrition Reviews*, 62(1), 1-17. doi: 10.1301/nr.2004.jan.1-17
- Rolls, B.J., Roe, L.S., Kral, T.V.E., Meengs, J.S., & Wall, D.E. (2004b). Increasing the portion size of a packaged snack increases energy intake in men and women. *Appetite*, 42, 63-69. doi: 10.1016/S0195-6663(03)
- Sassaroli, S. & Ruggiero, G.M. (2005). The role of stress in the association between low self-esteem, perfectionism, and worry, and eating disorders. *International Journal of Eating Disorders*, 37(2), 135-141. doi: 10.1002/eat.20079
- Sax, L.J. (1997). Health trends among college freshmen. *Journal of American College Health*, 45(6), 252-262.
- Serlachius, A., Hamer, M., & Wardle, J. (2007). Stress and weight change in university students in the United Kingdom. *Physiology & Behavior*, 92, 548-553. doi: 10.1016/j.physbeh.2007.04.032

- Schwartz, J. & Byrd-Bredbenner, C. (2006). Portion distortion: Typical portion sizes selected by young adults. *Journal of the American Dietetic Association, 106*, 1412-1418. doi: 10.1016/j.jada.2006.06.006
- Sleep duration linked to weight gain. (2008, August). *Mayo Clinic Health Letter*. Retrieved from <http://www.HealthLetter.MayoClinic.com/>
- Strong, K.A., Parks, S.L., Anderson, E., Winett, R., & Davy, B.M. (2008). Weight gain prevention: Identifying theory-based targets for health behavior change in young adults. *Journal of the American Dietetic Association, 108*, 1708-1715. doi: 10.1016/j.jada.2008.07.007
- Thiagarajah, K. & Torabi, M. R. (2009). Irregular breakfast eating and associated health behaviors: A pilot study among college students. *The Health Educator, 41*, 4-10.
- Tiggemann, M. (2004). Dietary restraint and self-esteem as predictors of weight gain over an 8-year time period. *Eating Behaviors, 5*, 251-259. doi: 10.1016/j.eatbeh.2004.01.010
- Tohill, B.C., Seymour, J., Serdula, M., Kettel-Khan, L., & Rolls, B.J. (2004). What epidemiologic studies tell us about the relationship between fruit and vegetable consumption and body weight. *Nutrition Reviews, 62*(10), 365-374. doi:10.1301/nr.2004.oct.365-374
- Tomiyama, A.J., Mann, T., & Comer, L. (2009). Triggers of eating in everyday life. *Appetite, 52*, 72-82. doi: 10.1016/j.appet.2008.08.002
- US Dept Health and Human Services. (2000). *Healthy People 2010*. Washington, DC.
- US Dept Health and Human Services and US Dept Agriculture. (2005). *Dietary Guidelines for Americans, 2005*. Washington DC: US Government Printing



Office.

- Vella-Zarb, R.A. & Elgar, F.J. (2009). The ‘freshman 5’: A meta-analysis of weight gain in the freshman year of college. *Journal of American College Health*, *58*, 161-166.
- Vohs, K.D., Heatherton, T.F., & Herrin, M. (2001). Disordered eating and the transition to college: A prospective study. *International Journal of Eating Disorders*, *29*, 280-288.
- Wansink, B., Cheney, M.M., & Chan, N. (2003). Exploring comfort food preferences across age and gender. *Physiology & Behavior*, *79*, 739-747. doi: 10.1016/S0031-9384(03)00203-8
- Wardle, J., Haase, A.M., Steptoe, A., Nillapun, M., Jonwutiwes, K., & Bellisle, F. (2004). Gender differences in food choice: The contribution of health beliefs and dieting. *Annals of Behavioral Medicine*, *27*(2), 107-116.
- Waterhouse, J., Bailey, L., Tomlinson, F., Edwards, B., Atkinson, G., & Reilly, T. (2005). Food intake in healthy young adults: Effects of time pressure and social factors. *Chronobiology International*, *22*(6), 1069-1092.  
doi: 10.1080/07420520500398023
- Wilson, G.S., Pritchard, M.E., & Schaffer, J. (2004). Athletic status and drinking behavior in college students: The influence of gender and coping styles. *Journal of American College Health*, *52*(6), 269-273.
- World Health Organization. (2010). World Health Organization. Retrieved from <http://www.who.int/en/>
- Youth Risk Behavior Surveillance: National College Health Risk Behavior Survey—United States, 1995. (1997). *MMWR CDC Surveill Summ*, *46*, 156.

## Appendix A—Questionnaire

**What is your age in years?**

- 17 or under
- 18
- 19
- 20 or older

**What year did you graduate from high school?**

- Before 2009
- Spring 2009
- Fall 2009

**What year did you begin your first semester of college?**

- Before 2009
- Spring 2009
- Fall 2009
- Spring 2010

**What is your gender?**

- Male
- Female

**What is your ethnicity?**

- White
- African American
- Asian
- Native Hawaiian/Pacific Islander
- Hispanic/Latino
- Other: \_\_\_\_\_

**Where do you live?**

- On campus
- At home with family

**The following questions will first be directed to your behaviors during the last semester of your senior year of high school and will immediately follow with your current behaviors, during the last semester of your first year of college.**

What was/is your **weight** in pounds?

- High school:** \_\_\_\_\_ pounds
- College:** \_\_\_\_\_ pounds

What was/is your **height** in feet and inches?

- High school:** \_\_\_\_\_ feet, \_\_\_\_\_ inches
- College:** \_\_\_\_\_ feet, \_\_\_\_\_ inches

How many **days per week** did/do you perform **physical activity** at least **30 minutes per day**?

**High school:**

- 7
- 6
- 5
- 4
- 3
- 2
- 1
- Less than 1

**College:**

- 7
- 6
- 5
- 4
- 3
- 2
- 1
- Less than 1

How many **times per week** did/do you eat **fast food**?

**High school:**

- Less than 1
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11+

**College:**

- Less than 1
- 1
- 2
- 3
- 4
- 5
- 6
- 7

8  
9  
10  
11+

How many **servings of fruit** did/do you eat **each day**? (1 serving = ½ cup fruit, 1 medium fruit)

**High school:**

Less than 1  
1  
2  
3  
4  
5+

**College:**

Less than 1  
1  
2  
3  
4  
5+

How many **servings of vegetables** did/do you eat **each day**? (1 serving = ½ cup vegetables, 1 cup leafy greens)

**High school:**

Less than 1  
1  
2  
3  
4  
5+

**College:**

Less than 1  
1  
2  
3  
4  
5+

How many **servings of grain products** did/do you eat **each day**? (1 serving = 1 slice bread, ½ hamburger bun, ½ 3-inch bagel, ½ English muffin, 1 cup cereal, 1 tortilla shell, ½ cup cooked pasta, rice, or cereal (such as oatmeal), 3 cups popcorn, 5 crackers)

**High school:**

Less than 1

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11+

**College:**

- Less than 1
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11+

How many of these grain servings were/are **whole grain sources**? (1 serving = 1 slice whole grain bread, ½ whole grain hamburger bun, ½ 3-inch whole grain bagel, ½ whole grain English muffin, 1 cup cereal, 1 whole grain tortilla shell, ½ cup cooked whole grain pasta, brown rice, or cereal (such as oatmeal), 3 cups popcorn, 5 whole grain crackers)

**High school:**

- Less than 1
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11+

**College:**

- Less than 1

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11+

How many **hours per day** was/is spent **on the computer**?

**High school:**

Less than 1

1  
2  
3  
4  
5  
6  
7  
8  
9+

**College:**

Less than 1

1  
2  
3  
4  
5  
6  
7  
8  
9+

How many **hours per day** was/is spent **watching television**?

**High school:**

Less than 1

1  
2  
3  
4  
5  
6

7  
8  
9+

**College:**

Less than 1  
1  
2  
3  
4  
5  
6  
7  
8  
9+

How many **hours per day** was/is spent **playing video games**?

**High school:**

Less than 1  
1  
2  
3  
4  
5  
6  
7  
8  
9+

**College:**

Less than 1  
1  
2  
3  
4  
5  
6  
7  
8  
9+

How many snack food servings were/are consumed each day? (1 serving = 1 oz potato chips (the size purchased in vending machines), ½ cup ice cream, 1 candy bar, 3-inch cookie, 3x3-inch piece of cake)

**High school:**

Less than 1  
1

2  
3  
4  
5  
6  
7  
8  
9+

**College:**

Less than 1  
1  
2  
3  
4  
5  
6  
7  
8  
9+

How many **servings of regular soda** did/do you typically drink **each day**? (1 serving = 12 ounces)

**High school:**

Less than 1  
1  
2  
3  
4  
5  
6  
7+

**College:**

Less than 1  
1  
2  
3  
4  
5  
6  
7+

How many **alcoholic drinks** did/do you drink **per week**? (1 drink = 12 ounces beer, 1 ½ ounces liquor, 5 ounces wine, 10 ounces wine cooler)

**High school:**



- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15+

**College:**

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15+