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EATING AND PHYSICAL ACTIVITY HABITS OF COLLEGE STUDENTS

Thesis submitted in partial fulfillment of Honors

By

Crystal D. West
The Honors College
Midway Honors Scholar Program
East Tennessee State University

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Michelle Lee, Faculty Mentor

CHAPTER ONE

INTRODUCTION

Overweight and obesity are becoming prevalent in all age groups in America. However, obesity rates have increased rapidly among individuals 18 to 29 years of age, from 7.1% in 1991 to 12.1% in 1999.¹ More recent data suggests that the prevalence of obesity and overweight in young adults is increasing rapidly.² This is the common age range for most college students. Studies have shown the average weight gain in the first semester of college ranged from 3.5 to 7.8 pounds.³ Although this weight gain is less than the well-known belief that college students gain the “Freshman 15,” these findings are very alarming because this relatively small weight gain can still place an individual’s Body Mass Index (BMI) in the overweight range. Anderson et al. reports that the percentage of individuals classified as overweight increased from 21% to 32% in the first semester of college.⁴

Many different challenges accompany the transition from high school to college for these young adults. A newfound independence coupled with the social and physical environmental changes that occur may expose students to undesirable eating habits, which will result in poor nutrition and subsequent weight gain.⁵ Most incoming freshman students are not accustomed to the amount of freedom that they are exposed to in their first year of college. They are now able to make their own decisions about when and what they want to eat. Studies suggest that college students are likely to be living away from home for the first time in their lives and are more likely to eat “outside” meals consisting of food that is higher in calories and fat content, and lower in dietary fiber.^{6,7} Many students could become less physically active when entering college because in high school they may have participated in sports and physical education classes that were part of their regular daily routine. Physical inactivity and bad eating habits can lead to weight gain, which could result in individuals becoming overweight and obese. Because overweight and

obesity are associated with several negative health and psychosocial outcomes, it is important to develop prevention programs for college students as they enter this high-risk transition period.⁸

East Tennessee State University (ETSU) is a university located in Johnson City, Tennessee. The student population of this university has grown rapidly over the past decade with a record enrollment of 15,000 students in the fall semester of 2010. ETSU is located in Washington County, and 29.7% of this county population were reported obese in 2008.⁹ Obesity has become a national epidemic with 18 to 29 year-olds experiencing the greatest increase in overweight and obesity.⁵ The purpose of this research is to assess the eating and physical activity habits of college students to determine if they are meeting the Dietary Guidelines for Americans 2010 and to identify if weight status correlates with these habits.

CHAPTER TWO

LITERATURE REVIEW

Obesity/Overweight Statistics

America has experienced an epidemic of overweight and obesity, and the percentage of the country that is obese and overweight continues to rise each year. According to the Center for Disease Control and Prevention (CDC), about one-third of U.S. adults are obese (33.8%). Approximately 17% of children and adolescents are obese⁹ and 17% of women and 11% of men are severely obese.¹⁰ Over the past twenty years, there has been a dramatic rise in obesity rates in the United States. Medical costs associated with obesity were estimated at \$147 billion in 2008.⁹ In 2010, no state had a prevalence of obesity that was less than 20%, and thirty-six states had a prevalence of 25% with twelve states at 30% or more.⁹ The state of Tennessee reports 30.8% of the population as obese.⁹ This prevailing disease is a risk factor for a variety of chronic conditions including diabetes, hypertension, high cholesterol, stroke, heart disease, certain cancers, and arthritis.¹¹ The Tennessee Behavioral Risk Factor Surveillance Survey conducted in 2010 reported 67.1% had a body mass index greater than 25 kg/m² and those at risk for being overweight and obese were 67.8%. In Northeast Tennessee, 67.8% are overweight or obese.¹²

Body Mass Index (BMI) Classifications

The National Institutes of Health (NIH) has defined body mass index as a measure of body fat that is the ratio of the weight of the body in kilograms to the square of its height in meters. Current NIH defines normal BMI as 18.5 to 24.9 kg/m². A BMI of 25.0-29.9 kg/m² is considered overweight and 30.0 kg/m² or more indicates obesity (Table 1).¹³ Body mass index is a valuable tool that provides a standardized definition of obesity for the purposes of national surveillance and international comparisons. The National Health and Nutrition Examination Survey (NHANES) surveys have shown that BMI highly correlates with

the percentage of body fat. A limitation of using a person’s BMI is that this calculation does not distinguish fat and lean tissue or represent adiposity directly.¹⁴ Berrington et al. concluded that a body mass index between 20.0 and 24.9 kg/m² was associated with the lowest risk of death in healthy non-smoking adults.¹⁰

Table 1: Body Mass Index Classifications

BMI Classifications	(kg/m²)
Underweight	< 18.5
Normal	18.5-24.9
Overweight	25.0-29.9
Obesity, Class 1	30.0-34.9
Obesity, Class 2	35.0-39.9
Extreme Obesity, Class 3	40.0 +

Healthy People 2020

The Healthy People 2020 is a federal program providing science-based, national objectives for improving the health of all Americans. Healthy People 2020 continues this tradition that has lasted over the past three decades. The vision for Healthy People 2020 is: “a society in which all people live long, healthy lives.”¹⁵ The mission for Healthy People 2020 strives to: “identify nationwide health improvement priorities; increase public awareness and understanding of the determinants of health, disease, and disability and the opportunities for progress; provide measurable objectives and goals that are applicable at the national, state, and local levels; engage multiple sectors to take actions to strengthen policies and improve practices that are driven by the best available evidence and knowledge; and to identify critical research, evaluation, and data collection needs.”¹⁵ The overarching goals include: “attain high-quality, longer lives free of preventable disease, disability, injury, and premature death; achieve health equity, eliminate disparities, and improve the health of all groups; create social and physical environment that promote good health for all; promote quality of life, healthy development, and healthy behaviors across all life stages.”¹⁵ There are

many people who are not reaching their full health potential because of preventable conditions. The Assistant Secretary for Health, Howard K. Koh, M.D., M.P.D., states, “Healthy People is the nation’s roadmap and compass for better health, providing our society a vision for improving both the quantity and quality of life for all Americans.”¹⁵

Nutrition and weight status objectives for Healthy People 2020 reflect strong science supporting the health benefits of eating a healthy diet and maintaining a healthy body weight. It also emphasizes that efforts to change a person’s diet and weight should address individual behaviors along with the environmental factors. Healthy People 2020 states that Americans with a healthful diet: “consume a variety of nutrient-dense foods within and across the food groups, especially whole grains, fruits, vegetables, low-fat or fat-free milk or milk products, and lean meats and other protein sources; limit the intake of saturated and trans fats, cholesterol, added sugars, sodium (salt), and alcohol; limit caloric intake to meet caloric needs.”¹⁵ The consumption of healthy foods is important to the growth and development of children and also helps Americans reduce their risk for many health conditions. Those who have a nutritious diet and are at a healthy weight are less likely to develop chronic diseases such as type 2 diabetes, heart disease, osteoarthritis, and some cancers.¹⁵ One objective of the Healthy People 2020 is to increase the contribution of fruits to the diets of the population aged two years and older. The baseline for persons aged two years and older in 2001-2004 was half-cup equivalents of fruits per 1,000 calories as the mean daily intake and the target for 2020 is 0.9 cup equivalents per 1,000 calories.¹⁵ An increase in the contribution of total vegetables to the diets of the population aged two years and older is also an objective for Healthy People 2020. The baseline in 2001-2004 was 0.8 cup equivalents of total vegetables per 1,000 calories of the mean daily intake and the target for 2020 is 1.1 cup equivalents per 1,000 calories.¹⁵ (Table 2)

The physical activity objectives for Healthy People 2020 are to reduce the percentage of adults who engage in no leisure-time physical activity; increase the percentage of adults who meet current federal

physical activity guidelines for aerobic physical activity and for muscle-strengthening activity; and increase the proportion of adolescents who meet current federal physical activity guidelines for aerobic physical activity and for muscle-strengthening activity.¹⁵ (Table 2)

Table 2: Healthy People 2020 Objectives Relating to Healthy Eating, Healthy Weight, and Physical Activity

Objective	Baseline	Target
NWS-8: Increase the proportion of adults who are at a healthy weight	30.8%	33.9%
NWS-9: Reduce the proportion of adults who are obese	34.0%	30.6%
NWS-14: Increase the contribution of fruits to the diets of the population aged 2 years and older	0.5 cup equivalents of fruits per 1,000 calories was the mean daily intake	0.9 cup equivalents per 1,000 calories
NWS-15.1: Increase the contribution of total vegetables to the diets of the population aged 2 years and older	0.8 cup equivalents of total vegetables per 1,000 calories was the mean daily intake	1.1 cup equivalents per 1,000 calories
PA-1: Reduce the proportion of adults who engage in no leisure-time physical activity	36.2%	32.6%
PA-2.4: Increase the proportion of adults who meet the objectives for aerobic physical activity and for muscle-strengthening activity	18.2 %	20.1%

Dietary Guidelines for Americans 2010

The United States Department of Health and Human Services (USDHHS) released on January 31, 2011, the Dietary Guidelines for Americans, 2010, which emphasizes three major goals for Americans: 1) balance calories with physical activity to manage weight; 2) consume more of certain foods and nutrients such as fruits, vegetables, whole grains, fat-free and low-fat dairy products, and seafood; and 3) consume fewer foods with sodium (salt), saturated fats, trans fats, cholesterol, added sugars, and refined grains.¹⁶

The Dietary Guidelines for Americans 2010 exemplifies strategies that eating and physical activity habits focused on being physically active, consuming fewer calories in the diet, and making informed food choices can help people to achieve and maintain a healthy weight while reducing their risk of chronic diseases. Dietary Guidelines for Americans are reviewed and published every 5 years (Public Law 101-445, Title III, 7 U.S.C. 5301 et seq.). An epidemic of overweight and obesity affecting men, women, and children is the result of the most important factors of poor diet and physical inactivity. Although a person may not be overweight or obese, unhealthy eating habits and not being physically active are associated with major causes of morbidity and mortality in the United States.¹⁶ Therefore, the Dietary Guidelines for Americans, 2010, are aimed at encouraging all Americans to develop a healthy lifestyle to decrease their risk of chronic diseases.

There are three main reasons to support the recommendations for Americans to consume more fruits and vegetables in their diet. Many nutrients that are under consumed in the United States, such as folate, magnesium, potassium, dietary fiber, and vitamins A, C, and K, are present in most fruits and vegetables. Secondly, the consumption of fruits and vegetables is associated with the reduced risk of many chronic diseases. Moderate evidence indicates that intake of at least two and one-half cups of vegetables and fruits per day is associated with a reduced risk of cardiovascular disease, including heart attack and stroke.¹⁶ Some studies report that vegetables and fruits may be protective against certain types of cancer. And lastly, most fruits and vegetables are low in calories. When prepared, if no sugars or fats are added, eating these nutritious foods instead of higher calorie foods can help adults and children achieve and maintain a healthy weight.¹⁶ Children ages 2 to 18 years, and adults ages 19 to 30 years consume more than half of their fruit intake as juice, and although 100% fruit juice can be part of a healthful diet, it lacks dietary fiber and adds extra calories. Table 3 indicates what consists of one serving of both fruits and vegetables.

Table 3: What Consists of One Serving of Fruits and Vegetables

FRUITS	VEGETABLES
1 medium fruit	1 cup raw leafy vegetables
¼ cup dried fruit	½ cup cut-up raw or cooked vegetables
½ cup fresh, frozen, or canned fruit	½ cup vegetable juice
½ cup fruit juice	

Physical Activity Guidelines

Physical activity is an important factor when trying to attain and maintain a healthy weight. Evidence has shown that regular participation in physical activity will also help to prevent excess weight gain, and when combined with reduced calorie intake, it may aid in weight loss.¹⁶ Those who have sedentary habits such as television and computer viewing are more likely to be overweight or obese.¹⁶ The amount of physical activity that is necessary depends on the caloric intake of each individual. Physical activity recommendations for adults are 150 minutes of moderate-intensity aerobic activity each week.¹⁶ Some adults may need a higher level of physical activity than others to achieve and maintain a healthy body weight. Table 4 illustrates strategies for increasing intake of vegetables and fruits and becoming more physically active from the Dietary Guidelines for Americans 2010.¹⁶

Table 4: Potential Strategies for Increasing Intake of Vegetables and Fruits & Increasing Physical Activity¹⁶

Topic Area	Key Consumer Behaviors	Potential Strategies
<i>Vegetables</i>	Increase vegetable intake. Eat recommended amounts of vegetables, and include a variety of vegetables, especially dark-green vegetables, red and orange vegetables, and beans and peas.	Include vegetables in meals and snacks. All fresh, frozen, and canned vegetables count. When eating canned vegetables, choose those labeled as reduced sodium or no salt-added. Add dark-green, red, and orange vegetables to soups, stews, casseroles, stir-fries, and other main and side dishes. Use dark leafy greens, such as romaine lettuce and spinach, to make salads. Focus on dietary fiber—beans and peas are a great source. Add beans or peas to salads, soups, and side dishes, or serve as a main dish. Keep raw, cut-up vegetables handy for quick snacks. If serving with a dip, choose lower calorie options, such as yogurt-based dressings or hummus, instead of sour cream or cream cheese-based dips. When eating out, choose a vegetable as a side dish. Request cooked vegetables be prepared with little or no fat and salt. Ask for salad dressing on the side so you can decide how much you use. When adding sauces, condiments, or dressings to vegetables, use small amount and look for lower calorie options (e.g., reduced-fat cheese sauce or fat-free dressing). Sauces can make vegetables more appealing, but often add extra calories.
<i>Fruits</i>	Increase fruit intake. Eat recommended amount of fruits and choose a variety of fruits. Choose whole or cut-up fruits more often than fruit juice.	Use fruit as snacks, salads, or desserts. Use fruit to top foods such as cereal and pancakes. Enjoy a wide variety of seasonal fruits. Keep rinsed and cut-up fruit handy for quick snacks. Use canned, frozen, and dried fruits, as well as fresh fruits. Select unsweetened fruit or fruit canned in 100% juice. Select 100% fruit juice when choosing juices
<i>Physical Activity</i>	Limit screen time.	Limit the amount of time you spend watching television or using other media such as video games. Use the time you watch television to be physically active in front of the television.
	Increase physical activity.	Pick activities you like and that fit into your life. For children, activity should be fun and developmentally appropriate. Be active with family and friends. Having a support network can help you stay active. Keep track of your physical activity and gradually increase it to meet the recommendations of the 2008 Physical Activity Guidelines for Americans.
	Choose moderate or vigorous intensity physical activities.	Choose moderate-intensity activities (walking briskly, biking, dancing, general gardening, water aerobics, and canoeing). Replace some or all of your moderate-intensity activity with vigorous activity. Vigorous activities include aerobic dance, jumping rope, race walking, jogging, running, soccer, swimming fast or swimming laps, and riding a bike on hills or riding fast. Adults should include muscle-strengthening activities at least 2 days a week which include lifting weights, push-ups, and sit-ups.
	Avoid inactivity. Some physical activity is better than none	Start with 10-minutes of physical activity a couple of days a week. Every bit counts, and doing something is better than doing nothing. Walking one way to add physical activity to your life. Build up to walking longer and more often. Pick up the pace as you go.
	Slowly build up the amount of physical activity you choose.	Start by being active for longer each time; then do more by being active more often.

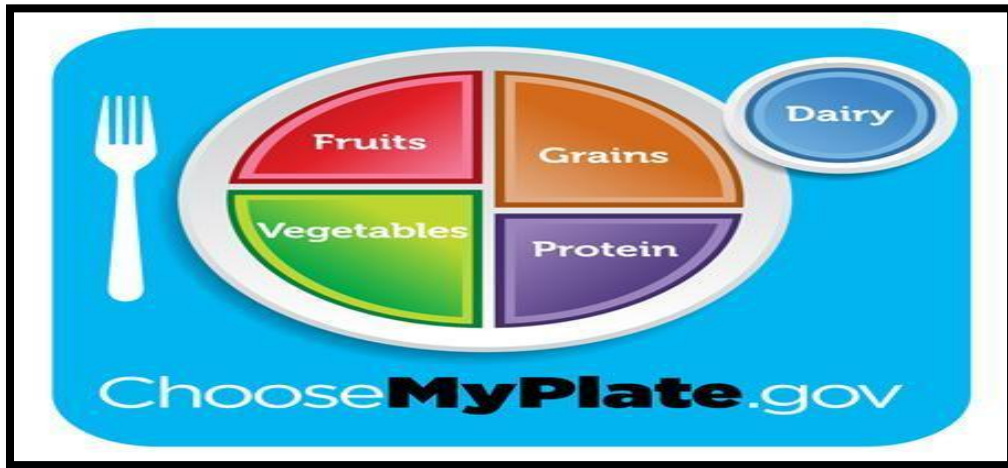
Most Americans are unaware of what the recommendations for physical activity are and what types of exercise are the most important. The CDC defines physical activity as anything that gets the body

moving.¹⁷ There are two types of physical activity that should be done each week to improve health according to the 2008 Physical Activity Guidelines for Americans.¹⁸ Adults need 150 minutes of moderate-intensity aerobic activity every week and muscle-strengthening activities on two or more days a week that work all major muscle groups. Aerobic activity is defined by the CDC as cardio that gets you breathing harder and your heart beating faster. From pushing a lawn mower, taking a dance class, or biking to the store—all types of activities count as long as you are doing them at moderate or vigorous intensity for at least ten minutes at a time. The difference between moderate-intensity and vigorous-intensity aerobic activity is how fast the person is breathing and how high their heart rate has gone up. Cardio is very important, but exercise to strengthen the muscles is crucial to obtaining lean body mass. During muscle training, 8 to 12 repetitions should be done for each activity. One repetition is equal to one set, and to gain even more health benefits and gain lean muscle mass, two to three sets should be completed.¹⁷

MyPlate

The Center for Nutrition Policy and Promotion, an organization of the United States Department of Agriculture (USDA), focuses on improving the nutrition and well-being of Americans with these two primary objectives: 1) advance and promote dietary guidance for all Americans; and 2) to conduct applied research and analyses in nutrition and consumer economics.¹⁹ The following programs support these objectives 1) Dietary Guidelines for Americans; 2) USDA Food Guidance System; 3) Healthy Eating Index; 4) U.S. Food Plans; 5) Nutrient Content of the U.S. Food Supply; and 6) Expenditures on Children by Families.¹⁹ MyPlate was introduced on June 2, 2011 to replace MyPyramid which has been used for years. USDA officials stated that MyPyramid did not give people an easy way to compare their meals to the ideal balance recommended, and it was complex in communicating many different nutrition facts.¹⁹ MyPlate is a picture of an actual plate with an at-a-glance guide to healthful eating that can even be understood by children. The USDA announced MyPlate as the new symbol for proper nutrition.

Figure 1: MyPlate¹⁹



The focus of MyPlate is to make half of your plate fruits and vegetables. One-fourth of MyPlate should include grains and one-fourth protein sources. It is also recommended to include one dairy source with each meal. At least half of the grains consumed should be whole grains. Protein sources and dairy products should be fat-free or low-fat. The vegetable group consists of fresh, frozen, or canned vegetables along with vegetable juice. The amount of vegetables that are needed in a person's diet depends on age, sex, and level of physical activity.¹⁹ The recommended total daily amount of vegetables are reported in Table 5.

Table 5: Recommended Total Daily Amount (RDA) of Vegetables¹⁹

Population	Ages	Daily Recommendation
<i>Children</i>	2-3 years old	1 cup
	4-8 years old	1 ½ cups
<i>Girls</i>	9-13 years old	2 cups
	14-18 years old	2 ½ cups
<i>Boys</i>	9-13 years old	2 ½ cups
	14-18 years old	3 cups
<i>Women</i>	19-30 years old	2 ½ cups
	31-50 years old	2 ½ cups
	51+ years old	2 cups
<i>Men</i>	19-30 years old	3 cups
	31-50 years old	3 cups
	51+ years old	2 ½ cups

*These amounts are appropriate for individuals who get less than 30 minutes per day of moderate physical activity, beyond normal daily activities. Those who are more physically active may be able to consume more while staying within calorie needs.

Fruits should accompany vegetables in filling half of the plate. The fruit group consists of any fruit or 100% fruit juice (counts as part) and the fruits may be fresh, canned, frozen, or dried, and may be whole, cut-up, or pureed. The amount of fruits needed in the diet depends on the individuals age, sex, and level of physical activity.¹⁹ Recommended daily amounts of fruit are reported in Table 6.

Table 6: Recommended Total Daily Amount (RDA) of Fruits¹⁹

Population	Ages	Daily Recommendation
<i>Children</i>	2-3 years old	1 cup
	4-8 years old	1 to 1 ½ cups
<i>Girls</i>	9-13 years old	1 ½ cups
	14-18 years old	1 ½ cups
<i>Boys</i>	9-13 years old	1 ½ cups
	14-18 years old	2 cups
<i>Women</i>	19-30 years old	2 cups
	31-50 years old	1 ½ cups
	51+ years old	1 ½ cups
<i>Men</i>	19-30 years old	2 cups
	31-50 years old	2 cups
	51+ years old	2 cups

*These amounts are appropriate for individuals who get less than 30 minutes per day of moderate physical activity, beyond normal daily activities. Those who are more physically active may be able to consume more while staying within calorie needs.

There are many nutrients in fruits and vegetables that are needed for a healthy diet. Diets rich in fruits and vegetables may reduce the risk of heart disease, obesity, type 2 diabetes, and some types of cancer. Fruits and vegetables rich in potassium may lower blood pressure and may also reduce the risk of developing kidney stones and help decrease bone loss.¹⁹ Consumption of fruits and vegetables, which are low in calories, instead of higher-calorie foods may be useful in helping to lower overall caloric intake. Most vegetables and fruits are naturally low in fat and calories and contain no cholesterol. Essential nutrients that are under consumed in the average diet are present in fruits and vegetables, including potassium, dietary fiber, folate, vitamin C, and vitamin A. Dietary fiber helps reduce blood cholesterol levels and may lower the risk of heart disease. Dietary fiber is important for proper bowel function; therefore, helps to reduce constipation and diverticulosis. Red blood cells are assisted in their formation by the consumption of folate. Vitamin C is important for the growth and repair of all body tissues and is essential for iron absorption. Vitamin A helps to protect against infections as well as keeps the eyes and skin healthy.¹⁹ Thus, a growing body of research shows that fruits and vegetables are critical to promoting good health.²⁰

Benefits of Physical Activity

The USDHHS published the 2008 Physical Activity Guidelines for Americans. As a joint effort of USDHHS and USDA, the Physical Activity Guidelines complements the Dietary Guidelines for Americans.¹⁸ The physical activity guidelines stress the importance of being physically active to promote good health and reduce the risk of chronic diseases. There are many health benefits of physical activity including reducing the risk of cardiovascular diseases, type 2 diabetes, metabolic syndrome, and some cancers. Physical activity helps to strengthen bones and muscles, improve mental health and mood, and increases longevity.¹⁷ Additional benefits occur as the amount of physical activity increases through higher intensity, greater frequency, and/or longer duration. Most health benefits occur with at least 150 minutes (2 hours

and 30 minutes) a week of moderate intensity physical activity, such as brisk walking. Both aerobic (endurance) and muscle-strengthening (resistance) physical activity are beneficial to a person's health.¹⁷

The Tennessee Behavioral Risk Factor Surveillance Survey 2010 asked: "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Of the respondents in Tennessee, 70.1% of the adult population exercised during the past month. In the Northeast region of Tennessee, 66.7% of the adult population reported exercising during the past month.¹²

Eating Habits of 18 to 24 Year Olds

Among upcoming freshman, the "freshman 15" myth may perpetuate an irrational fear of gaining a large amount of weight which could potentially lead to unhealthy eating and lifestyle habits.²¹ Weight gain is very common for college students and studies have yet to predict the reasons for this weight gain. Overweight college students are at-risk of becoming obese adults and prevention efforts targeting college age individuals could be one of the keys to reducing adult obesity rates.²² The "freshman 15" is the popular belief that most students will gain 15 pounds of weight in their first year of college.²² Many studies have been conducted to find the significance of this common belief; however, most research has found a gain of 15 pounds to be an exaggeration with an actual weight gain to be anywhere from 1.6 pounds to 8.8 pounds.²² College students are at risk of weight gain so the first year of college is a period of vulnerability for the development of obesity which is associated with numerous health problems, including cardiovascular disease, type 2 diabetes, hypertension, and some types of cancer.²² Vella-Zarb and Elgar conducted a study to assess the validity of the 'Freshman 15' theory using the available published research and examine potential predictors of weight gain. Among the 17 studies examined, several factors were found to be in association: a decrease in physical activity from the beginning to the end of freshman year,

low physical activity levels throughout the year, high junk food consumption and recent dieting, evening snacking, high baseline weight or baseline BMI, high levels of perceived stress, and a combination of dietary restraint and living residence.²² Vella-Zarb and Elgar concluded that the typical weight gain is closer to 5 pounds versus the dreaded “freshman 15.”²¹ Weight gain may appear to be minor; however, the risks associated with this change in weight are great since overweight and obesity lead to numerous health complications and diseases

The gender of college students and whether there is a difference in relation to their eating habits and nutrient intakes was examined by Li et al.²³ Measures for nutrient intakes were assessed using a 17-item multifactor screener that was designed to estimate the servings of fruits and vegetables, the percentage of energy from fat, and the amount of dietary fiber. Participants were asked to indicate 1) how many times they prepared their own meals in the last week (0-21 times or more); 2) how many times they had fast food in the past week (0-21 times or more); 3) how many times they ate in the campus dining hall (0-21 times or more); 4) how often they read food labels before buying (1=never, 5=always); 5) how many times they had breakfast in the past week (0-7 times or more); and 6) other than breakfast, how many times they skipped a meal in the last week (0-14 times or more). The results indicated female students consumed less fiber and fewer servings of fruits and vegetables than male students. Female students were found to engage in more healthful eating habits compared to male students in terms of behavior; however, female students still consumed less fiber and fewer servings of fruits and vegetables. Although this study did not show any significant effects on the interaction between sex and eating habits, sex-specific intervention strategies may be necessary because eating habits and nutrient intakes are different between sexes.²³

Little research has been conducted regarding weight gain in college students enrolled in four year universities versus two year community and technical colleges. Laska et al. conducted a study to highlight the difference in weight status, physical activity, media use, dietary intake, and weight control behaviors

between students attending two year and four year colleges. The results indicated that students attending two year colleges exhibited less healthful dietary and physical activity patterns than those attending four year colleges.²⁴ However, this difference may relate to the fact that two year colleges better represent racial minorities and low-income groups, who are at greater risk for obesity. Overall, few young people are engaging in healthy lifestyles in both two year and four year colleges. Therefore, health promotion efforts for first year college students are important to prevent weight gain in young adults that could lead to overweight and/or obesity in their later years.

Prevention efforts to target college age individuals have been conducted. Gow et al. evaluated an internet intervention with first year college students randomly assigned to one of four treatment conditions: 1) no treatment, 2) 6-week online intervention, 3) 6-week weight and caloric feedback only (via email), and 4) 6-week combined feedback and online intervention. Participants in the combined intervention group had significantly lower BMI scores at post-testing than those in the Internet intervention, feedback intervention, and control groups. The results suggest the combination of participant monitoring, feedback, and education delivered in the combined intervention method had a stronger effect on healthy lifestyle behaviors than addressing each of these components separately.²² Gow et al. demonstrated the feasibility of an inexpensive Internet-based intervention in the prevention of overweight and obesity among college students in the first semester of college.²² Internet interventions should be utilized more given the high percentage of the college population with Internet access.²⁵ An understanding in the causes of weight gain in college students (usually between the ages of 18-24 years old) and the implementation of preventive programs could result in a decrease in overweight and obesity among young adults.

CHAPTER THREE

METHODS

Participants

This study was conducted on the campus of East Tennessee State University in the spring semester of 2012. Male and female students in a variety of campus organizations were selected to complete the survey. Eligibility criteria included: will be over 18 years of age, will be an enrolled full-time student at ETSU, and will be able to speak/understand English. Participants were asked to complete a survey about their dietary and physical activity behaviors and to self-report their height and weight. The self-reported height and weight was used to calculate body mass index (BMI) using the NIH standard formula [weight (in kilograms)/height (in meters)²].¹³

Survey Design & Data Collection

Data were collected from a 20 question survey. This study uses a quantitative research design with a convenient sample and no control group. The survey was validated for content by a group of dietetic interns at ETSU and revised based on their comments.

Research Questions

The following four research questions were investigated using data obtained from completed surveys:

1. Will participants consume at least 2 ½ cups of fruit (from the Dietary Guidelines for Americans 2010) each day?
2. Will participants consume at least 2 ½ cups of vegetables (from the Dietary Guidelines for Americans 2010) each day?

3. Will participants meet the physical activity recommendations of the Dietary Guidelines for Americans 2010?
4. Will the BMI of participants be classified as overweight or obese that do not consume 2 ½ cups of fruit and vegetables daily?

Measures

The purpose of this research is to assess the eating and physical activity habits of college students to determine if they are meeting the Dietary Guidelines for Americans 2010. Measurements include self-reported fruit and vegetable intakes, time exercised and BMI classifications. The survey will help determine if eating and physical activity habits of the students correlates with their weight status.

Institutional Review Board Approval

On January 1, 2012, an exempt approval was granted by the ETSU Institutional Review Board (IRB) through the Office of Research and Sponsored Programs.

Statistical Analyses

The Statistical Package for Social Sciences (SPSS) was used for all data analyses. Descriptive statistics were reported for demographical information and self-reported levels of number of fruit and vegetable intakes and how many days per week and how many minutes per day exercised. Correlation coefficients measure the strength of the linear relationship between two quantitative variables. Pearson r is the correlation coefficient that was used in this study to find the correlation between BMI and fruit and vegetable intake.

CHAPTER FOUR

RESULTS

Of the 155 individuals who completed the survey, 93% were between the ages of 18 and 23 years old and 7% were older than 23 years of age. There were 54.2% female participants and 44.5% male participants. Racial demographics of the participants were reported as 85.2% white, 8.4% black, 1.3% Hispanic, and 3.9% responded as other. The classification of the student participants were 28.4% freshmen, 27.7% sophomores, 15.5% juniors, and 27.1% seniors. The majority of participants live off campus (60.6%) and 36.8% live on campus. Of the student participants, 44.5% were unemployed and 54.2% were employed. Of the percentage who were employed, 53 individuals worked 5-20 hours per week and 30 individuals worked over 20-50 hours per week. (Table 7)

Table 7: Demographics

<u>Variables</u>	<u>Percent (%)</u>
Gender	.
<i>Male</i>	44.5
<i>Female</i>	54.2
Age	
<i>18-23 y</i>	93.0
<i>24 y ></i>	7.0
Race	
<i>White</i>	85.2
<i>Black</i>	8.4
<i>Hispanic</i>	1.3
<i>Other</i>	3.9
Classification	
<i>Freshman</i>	28.4
<i>Sophomore</i>	27.7
<i>Junior</i>	15.5
<i>Senior</i>	27.1
Resident	
<i>On Campus</i>	36.8
<i>Off Campus</i>	60.6
Employed	
<i>Yes</i>	54.2
<i>No</i>	44.5

Weight & Body Mass Index (BMI)

The weight of the participants varied. However, the majority of individuals reported a weight in the range of 90 to 150 pounds (54%). Thirty-five percent of participants reported a weight in the 151 to 200 pounds range, 6% in the 201 to 250 pounds range, and 5% in the greater than 300 pounds. Participants self-reported height and weight. The BMI of all participants were grouped according to the standard adult BMI classification categories established by the National Institutes of Health. Fifteen individuals (10%) were classified as underweight (BMI=18.4 kg/m² or less) and 92 individuals (59%) were classified as normal weight (BMI= 18.5-24.9 kg/m²). Thirty-three individuals (21%) were classified as overweight (BMI= 25.0-29.9 kg/m²), seven were classified as obese-class 1 (BMI= 30.0-34.9 kg/m²) and eight individuals were classified as obese-class 2 (BMI= 35.0 kg/m² or greater). (Table 8)

Table 8: Body Mass Index (BMI) Classification

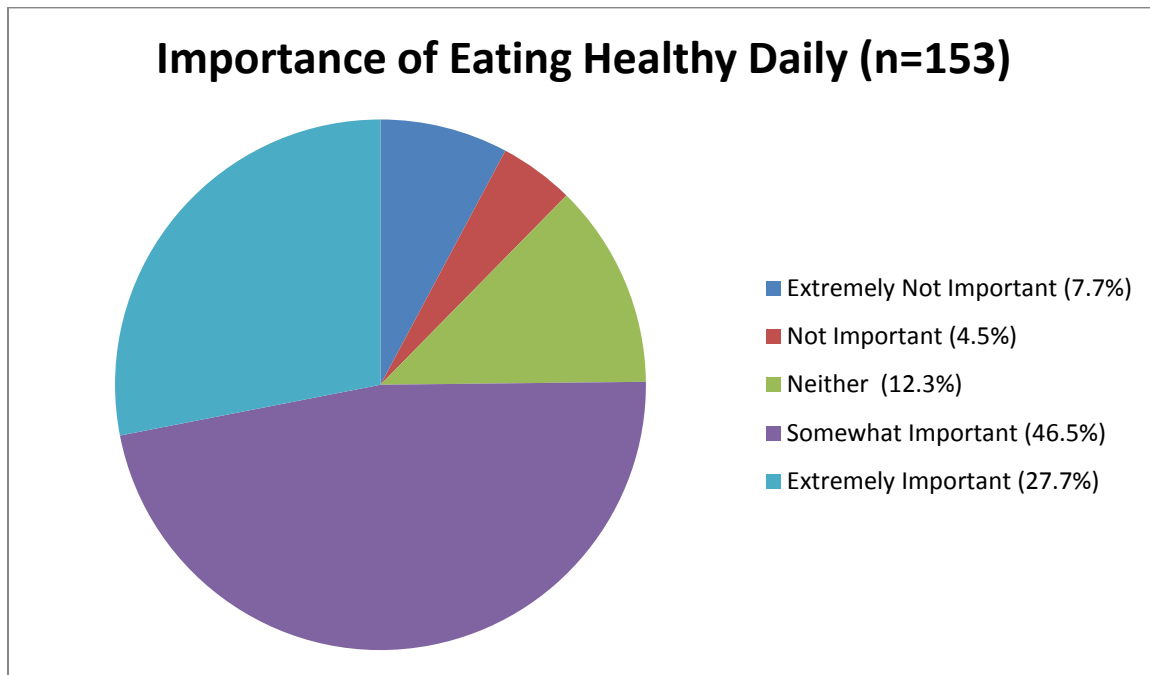
BMI Classification^a	Frequency (n)	Percent (%)
Underweight (18.4 or less)	15	10
Normal Weight (18.5-24.9)	92	59
Overweight (25.0-29.9)	33	21
Obese-Class 1 (30.0-34.9)	7	4.5
Obese-Class 2 (35.0 or greater)	8	5.5

^aBMI= Body mass index, calculated as kg/m², classifications based on the National Institutes of Health BMI Classifications²⁹

Food Consumption & Physical Activity Habits

Participants were asked “How important is it to you to eat healthy each day?” Of the 153 respondents, 7.7% responded it was “extremely not important”, 4.5% “not important”, 12.3% “neither”, 46.5% “somewhat important”, and 27.7% “extremely important.” Therefore, the majority (74.2%) felt that it was important to eat healthy each day. (Figure 2)

Figure 2: “How important is it to you to ‘eat healthy’ each day?”



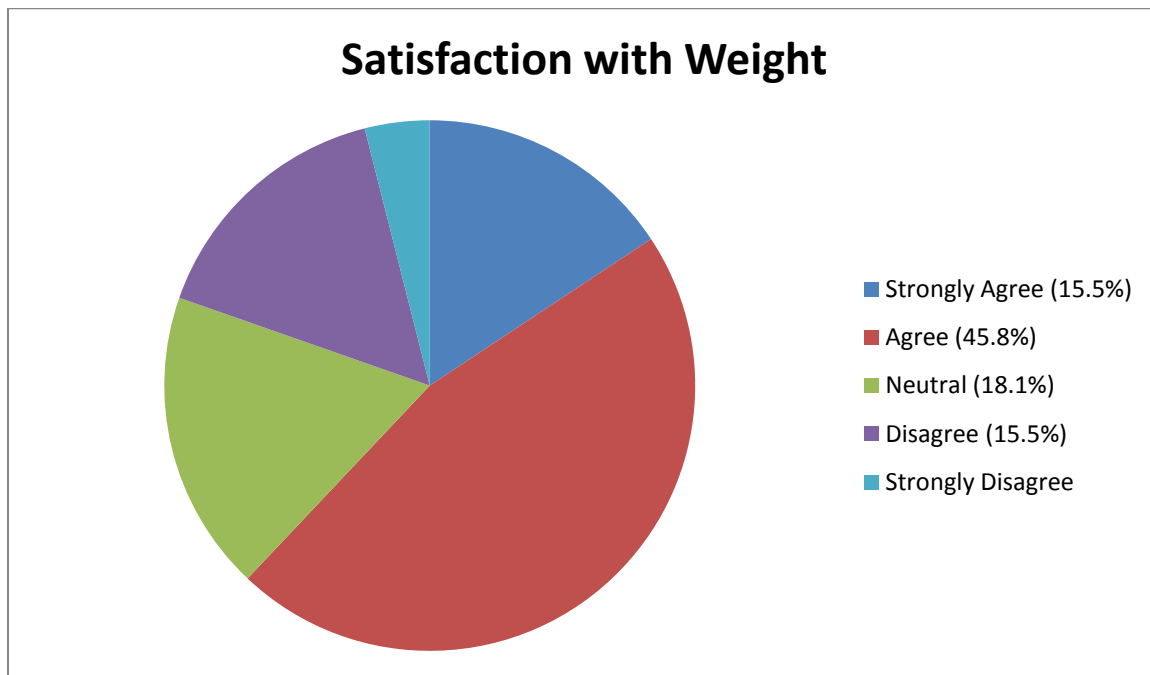
Participants were also asked about fast food consumption: “What is your fast-food consumption weekly?” Only 5.2% of these individuals never consumed fast food. Fast food consumption occurred 4 to 6 times per week for 25 (16.1%) participants, 2 to 3 times per week for 73 (47.1%) participants, and once a week for 36 (23.2%) participants. (Table 9)

Table 9: Fast Food Consumption

Amount	Frequency (n)	Percent (%)
<i>Once a week</i>	36	23.2
<i>2-3 times per week</i>	73	47.1
<i>4-6 times per week</i>	25	16.1
<i>Once a day</i>	6	3.9
<i>More than once each day</i>	5	3.2
<i>None/Never</i>	8	5.2

Participants were asked how satisfied they were with their weight. Ninety-five individuals (61.3%) agreed or strongly agreed that they were satisfied with their weight while 28 individuals (18.1%) were neutral, 24 individuals (15.5%) disagreed, and 6 individuals (3.9%) strongly disagreed. (Figure 3)

Figure 3: “I am satisfied with my weight”



Participants were asked “How important is it to you to ‘be physically active’ each day?” The majority (85.9%) responded it was somewhat important or extremely important to be physically active each day. Seven individuals (4.5%) responded that it was extremely not important, two individuals responded that it was not important (1.3%), and 11 individuals (7.1%) responded that it was neither important nor unimportant to be physically active each day. Participants were asked if they currently exercised (i.e. walking, jogging, aerobics, gym workout, bicycling, swimming, tennis). Of the 153 individuals who responded, 78.1% reported yes and 20.6% reported no. Of the 121 participants who answered yes, they were asked how many days per week they exercised and how many minutes per day. Two individuals (1.3%) reported exercising one day a week, twelve individuals (7.7%) reported two days per week, and 34 individuals (21.9%) reported three days per week. The majority (50.4%) reported exercising four to seven days per week. The majority (68.4%) responded they exercised at least 30 minutes or longer each day.

(Table 10)

Table 10: Importance of Physical Activity & Occurrence of Exercise

<u>Variables</u>	<u>Frequency (n)</u>	<u>Percent (%)</u>
Importance of being physically active		
<i>Extremely not important</i>	7	4.5
<i>Not important</i>	2	1.3
<i>Neither important nor unimportant</i>	11	7.1
<i>Somewhat important</i>	72	46.5
<i>Extremely important</i>	61	39.4
Currently exercise daily		
Yes	121	78.1
No	32	20.6
If yes, how many days per week?		
<i>1 day</i>	2	1.3
<i>2 days</i>	12	7.7
<i>3 days</i>	34	21.9
<i>4 days</i>	27	17.4
<i>5 days</i>	26	16.8
<i>6 days</i>	15	9.7
<i>7 days</i>	10	6.5
How many minutes per day?		
<i>0-15 minutes</i>	1	0.6
<i>16-30 minutes</i>	18	11.6
<i>31-45 minutes</i>	28	18.1
<i>46-60 minutes</i>	44	28.4
<i>Over 60 minutes</i>	34	21.9

Self-Reported Fruit & Vegetable Intake

Participants were asked to answer the following question: “On average, how many servings of fruit do you eat daily?” Eighteen individuals (11.6%) did not consume any fruit, 44 individuals (28.4%) consumed one serving, 50 individuals (32.3%) consumed two servings, 31 individuals (20.0%) consumed three servings, 9 individuals (5.8%) consumed four servings, and 1 individual (0.6%) consumed five servings of fruit daily. Participants were also asked the same question concerning vegetable consumption. Eighteen individuals (11.6%) did not consume any servings of vegetables, 39 individuals (25.2%) consumed one serving, 54 individuals (34.8%) consumed two servings, 25 individuals (16.1%) consumed

three servings, 12 individuals (7.7%) consumed four servings, two individuals (1.3%) consumed five servings, and three individuals (1.9%) consumed six or more servings of vegetables daily (Table 11).

According to the Dietary Guidelines for Americans 2010, one serving of fruit is equivalent to 1 medium fruit, ¼ cup dried fruit, ½ cup fresh, frozen, or canned fruit, or ½ cup fruit juice.¹⁶ One serving of vegetables is equivalent to 1 cup of raw leafy vegetables, ½ cup cut-up raw or cooked vegetables, or ½ cup vegetable juice.¹⁶

Table 11: Fruit and Vegetable Intake

<u>Variables</u>	<u>Frequency (n)</u>	<u>Percent (%)</u>
Fruit intake per day		
<i>0 servings</i>	18	11.6
<i>1 serving</i>	44	28.4
<i>2 servings</i>	50	32.3
<i>3 servings</i>	31	20.0
<i>4 servings</i>	9	5.8
<i>5 servings</i>	1	0.6
Vegetable intake per day		
<i>0 servings</i>	18	11.6
<i>1 serving</i>	39	25.2
<i>2 servings</i>	54	34.8
<i>3 servings</i>	25	16.1
<i>4 servings</i>	12	7.7
<i>5 servings</i>	2	1.3
<i>6 or more servings</i>	3	1.9

Research Question 1: Will participants consume at least 2 ½ cups of fruit (from the Dietary Guidelines for Americans 2010) each day?

As reported in Table 11, 26.4% of participants consumed three or more servings of fruit daily. Therefore, 72.3% of the 155 individuals who participated in this study did not consume the recommended daily amount (RDA) of fruit according to the Dietary Guidelines for Americans 2010.

Research Question 2: Will participants consume at least 2 ½ cups of vegetables (from the Dietary Guidelines for Americans 2010) each day?

As reported in Table 11, 27% of participants consumed three or more servings of vegetables daily. Therefore, 71.6% of the 155 individuals did not consume the recommended daily amount (RDA) of vegetables according to the Dietary Guidelines for Americans 2010.

Research Question 3: Will participants meet the physical activity recommendations of the Dietary Guidelines for Americans 2010?

For substantial health benefits, adults should participate in at least 150 minutes (2 hours and 30 minutes) a week of moderate-intensity, or 75 minutes (1 hour and 15 minutes) a week of vigorous-intensity aerobic physical activity, or an equivalent combination of moderate- and vigorous-intensity aerobic activity.²¹ A majority of the participants (85.9%) responded it was somewhat important or extremely important to be physically active each day. Of the 153 respondents, 78.1% reported they do currently exercise. Of the 121 participants that reported exercising, 50.4% reported exercising four to seven days per week, and 68.4% reported exercising at least 30 minutes or longer each day. Due to the wording of the survey questions, data is not available to accurately answer this research question.

Research Question 4: Will the BMI of participants be classified as overweight or obese that do not consume 2 ½ cups of fruit and vegetables daily?

Pearson *r* correlation coefficient was calculated for the following: BMI status and fruit intake and BMI status and vegetable intake. There is no significant relationship ($r = -.005$) between BMI and fruit intake of the 155 participants in this study. There is a moderate, direct relationship ($r = .041$) between the BMI and vegetable intake of the 155 participants. Therefore, the BMI of participants being classified as overweight or obese that do not consume two and one-half cups of fruits is not proven. However, the BMI of participants

being classified as overweight or obese that do not consume two and one-half cups of vegetables has a direct relationship.

CHAPTER FIVE

CONCLUSION

The purpose of this research was to assess the eating and physical activity habits of college students to determine if they were meeting the Dietary Guidelines for Americans 2010 and to identify if weight status correlates with these habits. By using a 20 question survey, ETSU students self-reported their height and weight, fruit and vegetable intakes, and exercise habits. Statistical analysis was conducted to find the correlation between these participant's dietary and physical activity behaviors and their body mass index classifications. Obesity has become a national epidemic with 18 to 29 year olds experiencing the greatest increase in overweight and obesity.⁵ Therefore, studies such as this one are important to find the underlying causes of this prevalence in order to develop preventative programs for college students.

According to the BMI classifications,¹³ over half of the participants in this study were at a healthy weight. Twenty-one percent of the students were overweight and 10% were classified as obese. More of those surveyed thought it was important to be physically active versus eating healthy which correlates with the high-percentage of participants who claimed to currently exercise. Data was not available to answer the following research question: "Will participants meet the physical activity recommendations of the Dietary Guidelines for Americans 2010?" In order to receive the necessary data to accurately answer this research question, the questioning in the survey should be altered.

The recommended daily amount (RDA) of fruits and vegetables is two and one-half cup.¹⁶ The Pearson *r* correlation coefficient indicated that there was no relationship between the daily intake of fruit and the BMI of participants. However, there was a direct relationship between student's daily intake of vegetables and their BMI. Therefore, the BMI of participants who did not consume the recommended

amount of vegetables was more likely to be higher than those participants who consumed at least two and one-half cups of vegetables each day.

Limitations in this study included the use of BMI as a screening tool and the self-reporting involved in surveys. Since BMI is not an accurate measurement for adiposity, waist circumference and waist-to-hip ratios should be incorporated in future research. The examination of how fat is distributed is important because excess abdominal fat is a risk factor for cardiovascular disease. By using a survey, we were able to study large samples of people fairly easy and examine a large number of variables. However, the major limitation of the survey method is that it relies on a self-report method of data collection. Inaccuracies in the data could be a result of intentional deception, poor memory, or misunderstanding of the question. Due to the sample size, the data from this research could be inaccurate for the entire university.

While eating and physical activity behaviors of many college students are deteriorating during their college years,⁵ universities are in a unique position to develop programs that will promote healthier lifestyle behaviors. Along with this study, research has indicated that healthy eating habits and being physically active is crucial in order to maintain a healthy weight and prevent the development of chronic diseases. For that reason, implementation of intervention programs on college campuses could reduce the incidence of overweight and obesity in Americans ages 18 to 29 years of age.

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APPENDIX

Survey for Eating & Physical Activity Habits of College Students

Thank you for supporting our research by completing this survey. We realize your time is valuable, and we appreciate your participation. The purpose of this research study is to assess the eating and physical activity habits of college students to determine if they are meeting the Dietary Guidelines for Americans 2010. The procedures, which will involve you as a research subject include: completing this survey that will take about five minutes of your time. Participation in this research experiment is voluntary. You may refuse to participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected. You may quit by contacting Crystal West at westcd@goldmail.etsu.edu or Dr. Michelle Lee at 423-439-7524 or leeml2@etsu.edu. For questions, comments or concerns, please contact Crystal West at westcd@goldmail.etsu.edu or Dr. Michelle Lee at 423-439-7524 or leeml2@etsu.edu. You may contact the ETSU Institutional Review Board at 423-439-6054 for any questions you may have about your rights as a research subject. By continuing to answer the questions in the rest of the survey, you confirm that you have read this document.

1. **What is your weight:** _____
2. **What is your height:** _____
3. **Gender:** ___ Female ___ Male
4. **Current Age:** _____
5. **Race:** ___ White ___ Black (African American) ___ Hispanic ___ Other
6. **Classification:** ___ Freshman ___ Sophomore ___ Junior ___ Senior
7. **Where do you live?** ___ On Campus ___ Off Campus
8. **Besides being a full-time ETSU student, are you employed?** ___ Yes ___ No
If yes, how many hours per week do you work? ___ hours/week
9. **I am satisfied with my weight.**
___ strongly agree
___ agree
___ neutral
___ disagree
___ strongly disagree
10. **How important is it to you to “eat healthy” each day?**
___ extremely not important
___ not important
___ neither important nor unimportant
___ somewhat important
___ extremely important
11. **On average, how many servings of fruit do you eat daily (1 serving= 1 whole fresh fruit or ½ cup canned or ½ cup juice)**
___ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 or more
12. **On average, how many servings of vegetables do you eat daily? (1 serving= ½ cup cooked or 1 cup raw)**
___ 0 ___ 1 ___ 2 ___ 3 ___ 4 ___ 5 ___ 6 or more

13. **What is your fast-food consumption weekly?**

- once a week, at most
- 2-3 times per week
- 4-6 times per week
- once a day
- more than once each day
- none/never

14. **How important is it to you to be “be physically active” each day?**

- extremely not important
- not important
- neither important nor unimportant
- somewhat important
- extremely important

15. **Do you currently exercise regularly?** (ex: walking, jogging, aerobics, gym workout, bicycling, swimming, tennis)

- Yes No

16. **If you answered yes to question 15, on average how many days a week do you exercise?**

- 1 day 2 days 3 days 4 days 5 days 6 days 7 days

17. **If you answered yes to question 15, on average how many minutes per day do you exercise?**

- 0-15 minutes 16-30 minutes 31-45 minutes 46-60 minutes over 60 minutes

18. **I enjoy getting regular exercise.**

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

19. **If you do not exercise regularly, which are barriers for you?** (mark all the apply)

- lack of time self-conscious
- not interested environmental conditions (temperature, safety)
- lack of self-discipline physical/medical limitations
- lack of facilities/space lack of knowledge on how to exercise

20. **What is your major?** _____