EFFECT OF DAILY TEXT MESSAGES ON BEVERAGE CONSUMPTION OF COLLEGE STUDENTS

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EFFECT OF DAILY TEXT MESSAGES ON BEVERAGE CONSUMPTION OF COLLEGE STUDENTS (149 pp.)

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The purpose of this pilot study was to determine if a 30-day period of delivering beverage related daily text messages via SMS had an effect on the beverage consumption of college students (N=8). An email invitation to participate in the study was sent to 3,527 undergraduate students at a Midwestern university; recruitment flyers were also posted on the university’s campus encouraging students to participate. Students were instructed to complete an online survey prior to the study that consisted of demographic information and a 24-hour beverage recall. Participants received one text message per day for 30-days through an app called Remind, which displayed nutrition information, tips, facts, and debunked myths of various non-alcoholic beverages. After the intervention, participants completed a post-study survey that consisted of the same demographic information and 24-hour beverage recall as the pre-study survey. A satisfaction questionnaire was added to this post-study survey. Data was analyzed using descriptive statistics and paired samples t-test.

There was no significant difference found in all beverage consumption between pre- and post-study except for milk intake. Participants reported drinking a significantly
greater amount of milk at the time of the pre-study period than at the time of the post-study period. Results also indicated that participants favor text messaging above all other modes of communication when receiving health related information. Data showed that college students had a positive attitude towards text messaging interventions and thought the messages presented in this study were effective motivators for influencing beverage choices.
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CHAPTER I
INTRODUCTION

Diet-related chronic diseases including obesity, type 2 diabetes, cardiovascular disease, hypertension, and some types of cancer are the most common cause of death worldwide and pose a significant financial burden on society, costing more than $659 billion in medical expenses (Thrall, 2005; World Health Organization, 2003). Nutrition is a major modifiable determinant of these conditions and therefore, focusing on the primary prevention of them is a cost effective, affordable, and sustainable approach to decreasing the epidemic levels (World Health Organization, 2003).

The average American diet exceeds the recommended intake levels for calories from solid fats and added sugars, refined grains, sodium, and saturated fat (Aubrey, 2011). In addition, the typical diet is low in fruits and vegetables, whole grains, low-fat dairy, and lean protein sources (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008; Lutifyya, Change, & Lipsky, 2012). These patterns are also seen in the college student population (Brunt & Rhee, 2008; Ha & Caine-Bish, 2009; Huang et al., 1994).

On average, college students consume approximately 543 calories per day from sugar sweetened beverages alone (West et al., 2006). Research also shows that approximately two-thirds of caffeine consumed by men and women have caloric additives, such as sugar and cream. On average, 53% of men and 41% of women consume regular soda each day (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). Approximately only one third of college student drink milk daily and their
average daily consumption of water is about four cups (Driskell, Kim, & Goebel, 2005; LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011).

Due to the advancement of technology, specifically cell phones, health care professionals have the opportunity to communicate with patients in a more accessible manner. Interventions utilizing Short Message Service (SMS) to communicate nutrition and health related information have been successful in regards to the effectiveness of implementing behavior change among overweight, obese, diabetic, and hypertensive individuals due to the convenient nature of the messages (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013; Wei & Lo, 2006). Current research shows that college students prefer to communicate through SMS due to its inexpensive, instant, and widely available qualities (Cole-Lewis & Kershaw, 2010; Napolitano, Hayes, Bennett, Ives, & Foster, 2013). In addition, SMS is less intrusive than a mobile phone call and more immediate than an email (Leung, 2007). Research utilizing SMS as an intervention tool is expanding and highlights the effectiveness of a cell phone as being a simple learning instrument in the healthcare field (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013).

**Statement of the Problem**

The typical diet seen in college students consists of energy-dense foods and fast food items, along with minimal sources of fruits, vegetables, whole grains, low-fat dairy, and lean protein (Levitsky, Halbmaier, & Mrdjenovic, 2004). Males and females aged 18 to 30 years consume 15-17% of calories per day from added sugar, which is higher than the recommended daily amount of 10% of calories from added sugars that was
established by the Dietary Guidelines for Americans (2015-2020 Dietary Guidelines for Americans). Research shows that college students consume an excess of 543 calories per day from sugar sweetened beverages alone (West et al., 2006). These extra calories mainly come from soda, gourmet coffee drinks, and fruit drinks. Furthermore, the average daily intake of water is lower than the recommended amount and is approximately 3.9 cups for both males and females (Sebastian, Wilkinson Enns, & Goldman, 2011). Poor dietary habits and increased intake of empty calories can be a contributing factor to the 34.6% of college students who are overweight or obese, 1.9 million students with type 2 diabetes, and 66% (of males) and 50% (of females) with at least one risk factor for metabolic syndrome (ACHA-NCHA-II; Morrell & Burke; 2007; Reyes-Velazquez & Hoffman, 2011).

College students rely on a variety of resources, ranging from family members, friends, television programs and academic courses to obtain health information (International Food Information Council Foundation, Food and Health Survey 2015). Furthermore, nearly 50% of students search the Internet for fitness, exercise and diet facts, which may not provide the most accurate and credible information (Escoffery, Milner, Adame, Butler, McCormick, & Mendell, 2005). Due to technologic advancements, the utilization of text messaging interventions by healthcare professionals have been successful in influencing behavior changes amongst overweight, obese, hypertensive, and diabetic individuals (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013). However, research focusing on the utilization of text messaging to deliver non-alcoholic beverage related information to specifically
college students is limited. Recent studies have not included this population as participants for receiving text messages as a means of communication.

**Purpose Statement**

The purpose of this pilot study was to determine if a 30-day period of delivering beverage related daily text messages via SMS had an effect on the beverage intake of undergraduate college students.

**Hypothesis**

H1: The beverage intake of college students will change after a 30-day period of receiving daily text messages of beverage related information via SMS.

H0: The beverage intake of college students will not change after a 30-day period of receiving daily text messages of beverage related information via SMS.

**Operational Definitions**

College students: individuals attending Kent State University to obtain an undergraduate degree.

Short Message Service (SMS): a form of instant messaging that allow users to send and receive brief text messages of up to 160 alphanumeric characters in length to any suitable global system for mobiles (GSM) phone.

Beverages: any non-alcoholic drink; including water, diet and regular soda, fruit and/or vegetable juice, fruit drink, sports drink, energy drink, milk, coffee, and tea.

Beverage consumption: consumption of any type of liquid drink, such as water, soda, energy drinks, sports drinks, fruit and/or vegetable juice, smoothies, coffee, tea, milk; excludes alcohol.
Variables

Independent variable: daily text messages consisting of beverage related nutrition information.

Dependent variable: beverage consumption of participants.
CHAPTER II
LITERATURE REVIEW

Current Dietary Pattern of U.S. Population

Dietary habits of the U.S. population have evolved into unhealthful behaviors that do not meet the recommended guidelines for the general population.

Dietary Habits of U.S. Adults

According to the International Food Information Council Foundation 2013 *Food & Health Survey*, nine out of ten Americans describe their health as good or better and 62% report their health is excellent or very good. In comparison, 9% report that their health is fair or poor. Given the current statistics for diet-related chronic disease prevalence, it is evident that there is a disconnection between Americans’ perception of their health and the current status of it (International Food Information Council Foundation, 2013).

The federal government provides recommendations for the general population in effort to improve the overall health of Americans. These guidelines are referred to as the Dietary Guidelines for Americans (DGA) and benchmark specific recommendations through the Healthy People objectives (Wilson, Reedy, & Krebs-Smith, 2015). Healthy People 2010 set overarching goals of “increasing the quality and years of healthy life” and “eliminating health disparities” among the public. The Department of Health and Human Services developed ten leading health indicator measures, two of which focus strictly on physical activity, overweight and obesity (Koh, 2010; Sondik, Huang, Klein, & Satch, 2010). A review of these ten leading health factors found that Americans are
not following the benchmarked goals as evidenced by an increase in obesity prevalence by 45.6% and a decrease in moderate or vigorous physical activity by 2.8% (Sondik, Huang, Klein, & Satch, 2010). Furthermore, the rate of obesity is much greater than the target prevalence of 25 cases per 1,000. Healthy People 2020 reaffirms the two overarching goals of Healthy People 2010 and adds two more goals: promoting quality of life, healthy development, and healthy behaviors across life stages; and creating social and physical environments that promote good health (Koh, 2010).

**2015-2020 Dietary Guidelines for Americans**

The Department of Health and Human Services (HHS) in conjunction with the United States Department of Agriculture (USDA) publish Dietary Guidelines for Americans (DGA) every five years to provide advice about dietary habits, health, and chronic diseases for individuals two years and older. The most recent guidelines, the 2015-2020 Dietary Guidelines for Americans, focus on making shifts that emphasize substituting less healthy choices with nutrient-dense food and beverages. Five specific guidelines have been established to encourage healthy eating patterns: 1.) follow a healthy eating pattern across the lifespan, 2.) focus on variety, nutrient density, and amount, 3.) limit calories from added sugars and saturated fats and reduce sodium intake, 4.) shift to healthier food and beverage choices, 5.) support healthy eating patterns for all (Dietary Guidelines for Americans 2015-2020).

A healthy eating pattern consists of consuming all foods and beverages within an appropriate calorie level. This includes: a variety of vegetables ranging from dark green, red and orange, legumes, and starchy; fruit, especially whole fruits; grains, at least half of
which are whole grains; fat free or low-fat dairy, including milk, yogurt, cheese, and/or fortified soy beverages; a variety of protein foods, including seafood, lean meats and poultry, eggs, legumes, nuts, seeds and soy products; and oils. In additions, the guidelines advise Americans to limit saturated fats, trans fats, added sugar, and sodium. It is recommended that individuals consume less than 10% of calories per day from added sugars, less than 10% of calories per day from saturated fats, and less than 2,300 mg per day of sodium (Dietary Guidelines for Americans 2015-2020 Key Elements of Healthy Eating Patterns).

Water is essential to the human body for its many functions. It maintains homeostasis in the body and allows for transport of nutrients to cells. It also removes and excretes waste products as a result of metabolism. The Institute of Medicine and Food has determined an Adequate Intake (AI) level for water intake. It is recommended that males consume approximately 13 cups (3 liters) and women consume approximately 9 cups (2.2 liters) of water per. Specific recommendations depend on physical activity level, health status, and location of residency (Institute of Medicine and Food and Nutrition Board, 2004).

Based on the 2015-2020 DGA, calcium, potassium, dietary fiber, and vitamin D are identified as “nutrients of public health concern” due to their overall decreased intake (Dietary Guidelines for Americans 2015-2020). The same nutrients were classified as “nutrients of public concern” in the previous 2010 DGA edition due to their association with health concerns (Johnson et al., 2009). Vitamins A, D, E, and C, magnesium, and choline are also under consumed by the U.S. population as evidenced by low intakes of
fruits, vegetables, whole grains, and dairy (Dietary Guidelines for Americans 2015-2020). Based on NHANES data from 2003-2008, 70% to 94% of the population is below the estimated average requirement (EAR) for vitamin D and 38% to 50% are below the EAR for calcium. Average potassium intake for adults 20 years and older is between 51% to 67% the adequate intake (AI) level of 4,700 mg per day (Demydas, 2011).

According to the USDA, the average American consumes roughly 2,700 calories per day and approximately 1,996 pounds of food each year, equaling to 630 pounds of milk, yogurt, cheese and ice cream; 185 pounds of chicken, turkey, pork and beef; 197 pounds of wheat and other grains; 273 pounds of fruit; 415 pounds of vegetables (mostly corn and potatoes); 141 pounds of sweeteners; 85 pounds of fats and oils (Aubrey, 2011). Nearly one in six adults (16%) consumes more than 40% of their total daily calories from foods and beverages considered snacks, such as chips and other various salty foods. Although snacking frequency is seen amongst normal-weight, overweight, and obese individuals, the quality of snacking compared to the quantity has an overall impact on weight (Webb, Donovan, & Meydani, 2014).

In the 1999-2000 National Health Interview Survey (NHIS), American adults reported consuming 2.77 commercially prepared meals per week compared to 4.2 meals recorded by the National Restaurant Association (NRA) 2000 survey (Kant, & Graubard, 2004). In 1996, approximately 32% of total calories consumed by Americans aged 2 years and older were consumed away from home, specifically foods that were high in sodium and cholesterol (Gurhtie, Lin, & Frazao, 2002). During the years 2007-2010, adults consumed approximately 11.3% of total daily calories from fast food, equaling to
about one tenth of their percentage of total calories (Fryar & Ervin, 2013). Overall, the greatest increase in energy dense foods comes from items such as salty snacks, sweetened soft-drinks, pizza, Mexican food, French fries, and cheeseburgers. Because of these high intakes amongst Americans, there is a decrease in fruit and vegetable consumption (Popkin, Duffey, & Gordon-Larsen, 2005).

The typical American diet exceeds the recommended intake levels for calories from solid fats and added sugars, refined grains, sodium, and saturated fat (Aubrey, 2011). It is advised to consume a variety of vegetables, including dark green, red and orange, legumes, and starchy; whole fruits; at least 50% of total whole grains; fat-free or low-fat dairy; oils; and a variety of protein foods including seafood, lean meats and poultry, eggs, nuts, seeds, and soy products. Added sugar as well as saturated fats should not be consumed as more than 10% of total daily calories (Dietary Guidelines for Americans, 2015-2020). On average, adults consume 3,400 mg of sodium per day, exceeding the established Upper Limit (UL) of 2,300 mg per day (President’s Council on Fitness, Sports & Nutrition, n.d.). According to data from the U.S. Department of Agriculture’s Economic Research Service, sugars and sweeteners available for consumption increased from 25 teaspoons (400 calories) in 1970 to 29.8 teaspoons (476 calories) in 2005, equaling a 19% increase. Due to the readily available sources, the average intake for adults is approximately 22.2 teaspoons per day (355 calories). The main source of added sugar comes from soft drinks and other sugar-sweetened beverages (Johnson et al., 2009).
The average daily fruit and vegetable intake of adults is approximately 359 g per day, which is less than the recommended WHO amount of 400 g per day (Demydas, 2011). One in four U.S. adults living in rural areas, approximately 24.7%, consume the recommended dietary allowance (RDA) of five or more servings of fruits and vegetables per day (Blanck, Gillespie, Kimmons, Seymour, & Serdula, 2008; Lutifyya, Change, & Lipsky, 2012). However, 20% of adults consume their daily fruit in the form of juice (Demydas, 2011). Approximately 25% of adults do not eat any vegetables per day and 35% consume three or more servings, which meets the Healthy People 2010 goal of consuming at least three servings of vegetables. However, those who do meet the recommendation for vegetables tend to consume the same vegetable, resulting in a lack of balance and variety. Furthermore, 26% of individuals who consume at least one vegetable serving consume fried potatoes (Casagrande, Wang, Anderson, & Gary, 2007).

Data from NHANES 2003-2004 indicates that adults aged 19-30 years consume 69-113 grams of protein per day, with an average percentage of 13.5% of calories from protein. Although the average is within the recommended range of 10% to 35% of total daily calories from protein, adolescent females and older women tend to have a decreased intake compared to most men who typically meet the EAR (Fulgoni, 2008). The main sources of total protein intake consumed consist of animal (46%), dairy (16%), and plant (30%) sources (Pasiakos, Agarwal, Lieberman, & Fulgoni, 2015). The typical American consumes 1.54 servings of dairy (0.90 in fluid milk and 0.60 in cheese) per day, with an average intake of 247.3 g. Overall, 18% of men and 10% of women consume the recommended three servings per day of more of dairy products (Beydoun et al., 2008).
Factors Influencing Food Choices

Dietary habits among Americans vary from person to person and are determined by a variety of factors. Convenience, taste, food preference, cost, socioeconomic status, environmental barriers, marital status, health, weight control (gain, loss, maintenance), family and friends, gender, ethnicity, and level of nutrition education level, and menu (Casagrande, Wang, Anderson, & Gary, 2007; Deshmukh-Taskar et al., 2007; Driskell, Kim, & Goebel, 2005).

Data from the 2015 Food and Health Survey regarding the most impactful factors on food and beverage choices are consistent with data from various studies. Eighty-five percent of participants from the Food and Health Survey ranked taste as having the greatest impact (International Food Information Council Foundation, Food and Health Survey 2015). Glantz et al. also found that taste is the most important factor when it comes to food consumption (1998). Fifty-two percent of participants in the Food and Health Survey ranked convenience as the most important factor which is most valued amongst younger respondents demonstrated by Glantz et al. (1998). Sixty percent of participants in the Food and Health Survey ranked healthfulness as the most important factor (International Food Information Council Foundation, Food and Health Survey 2015). Glantz et al. also found that individuals who are more concerned about the nutritional impact of food are more likely consume a healthful option. In addition, Kamphuis, Bekker-Grob, & van Lenthe found that perceived healthiness of an item is another important factor when choosing food items and meals (2015). However, in contrast, Raghunathan, Walker Naylor, and Hoyer found that healthiness and tastiness are
inversely related to each other. They found that individuals who perceive foods as unhealthy automatically assume it will taste better, gravitating towards the unhealthy items (2006).

**Diet Related Chronic Diseases**

Diet related chronic diseases are the most common cause of death worldwide and result from poor dietary habits and physical inactivity (Thrall, 2005).

**Obesity**

Obesity is a multifactorial chronic disease that is defined as an excessive or abnormal accumulation of body fat. Individuals who are obese have a body mass index (BMI), calculated based on weight and height of ≥30 (Centers for Disease Control and Prevention, 2015; World Health Organization, 2015; Ortiz, 2015). The World Health Organization (WHO) identifies categories of overweight as a BMI of 25-29.9, grade I obesity as a BMI of 30-34.9, grade II obesity as a BMI of 35-39.9, and grade III obesity as a BMI ≥ 40 (WHO, 2015). Body fat can be determined through various methods such as underwater weighing, skinfold thickness measurements, or dual energy X-ray absorptiometry. Male adults with a body fat percentage greater than 25% and female adults with a body fat percentage greater than 35% are considered obese (Deurenberg, Yap, & Van Staveren, 1998).

An increased number and size of adipocytes, cells that store fat and are found in connective tissue, is also used to determine obesity through waist circumference measurements (Jequier, 2002). Waist circumference is most appropriately used to assess intra-abdominal fat and is an imperative tool in determining obesity-related health risks.
When coupled with BMI, waist circumference is a stronger marker of health risks than BMI alone (Janssen, Katzmarzyk, & Ross, 2004). Classification standards for waist circumference adopted by the WHO include: low risk (≤79 cm in women, ≤93 in men), increased risk (80-87 cm in women, 94-101 cm in men), and substantially increased risk (≥ 88 cm in women, >102 cm in men) (Janssen, Heymsfield, Allision, Kotler, & Ross, 2002).

**Prevalence.** According to data gathered by the 2011-2012 NHANES survey, more than one-third (34.9% or 78.6 million) of adults living in the United States are obese (CDC, 2015). In 2014, more than 1.9 billion adults, 18 years and older, are overweight; 600 million (13%) of these individuals are classified as obese (World Health Organization, 2015). Worldwide, the obesity rate has increased from 28.8% in men and 29.8% in women in 1980 to 36.9% in men and 38% in women in 2013 (Ng et al., 2014). The United States accounts for approximately 13% of the world’s 671 million obese individuals (Ortiz, 2015).

Although obesity levels have reached a plateau, obesity and chronic diseases stemming from obesity are of major concern. In 2014, no state met the Healthy People 2010 obesity target prevalence rate of 15% (WHO, 2015). Data collected through the Behavioral Risk Factor Surveillance System (BRFSS) with assistance from the CDC demonstrates that the Midwest has the highest rate of obesity at 30.7%; the South 30.6%; the Northeast 27.3%; the West 25.7% (CDC, 2015).

Furthermore, obesity rates in the U.S. vary depending on race and ethnicity. Approximately 1 in 3 Hispanics (39.1%) and 34.3% of Caucasians are considered obese.
Forty-nine percent of African Americans are classified as obese and more than 1 in 10 blacks (13.1%) are considered extremely obese, compared to 1 in 20 whites (5.7%) and 5% of Hispanics. Asian Americans have a much lower rate of 11.6% compared to 39.9% of American Indians and Alaska Natives and 43.5% of Native Hawaiians or Other Pacific Islanders (CDC, 2015).

**Morbidity and mortality.** In 2010, overweight and obesity were estimated to cause 3.4 million deaths worldwide (Ng et al., 2014). Furthermore, obesity is associated with 111,909 excess deaths each year in America, with a majority of these deaths occurring in individuals with a BMI ≥ 35 (Flegal, Graubard, Williamson, & Gail, 2005). In the U.S., approximately 300,000 American adults die of causes related to obesity annually (Mokdad et al., 2003). A study done by Borrell and Samuel found that obese adults have a 20% higher mortality rate compared with their normal-weight counterparts. Moreover, grade II and grade III obese individuals have a greater mortality risk for cardiovascular disease (CVD) and an overall greater risk for premature death compared to overweight individuals (2014). A review done by Flegal, Kit, Orpana, and Graubard looked at data from PubMed and EMBASE electronic databases and concluded that grade I obesity is not significantly associated with increased mortality, suggesting that the main factor leading to obesity related deaths is a result of higher levels of BMI. Therefore, stating that a BMI ≥ 35 significantly increases the risk for premature death (2013).

Morbidity rates associated with obesity increase as BMI increases and are directly related to morbidity rates for hypertension, type 2 diabetes, coronary heart disease, stroke, sleep apnea, osteoarthritis, respiratory problems, and some types of cancer such as
breast, prostate, and colon (Nagai et al., 2012; Pi-Sunyer et al., 1998). Must et al. found that type 2 diabetes significantly increases as prevalence of overweight increases in both younger and older individuals. Presence of hypertension, gallbladder disease, and osteoarthritis significantly increase as overweight and obesity increase. Overweight men and women have higher blood cholesterol levels compared to normal-weight persons. Furthermore, their data demonstrates that at least two comorbidities are present in overweight and obese individuals among non-Hispanic White males and females, non-Hispanic Black males and females, and Mexican American males and females (1999).

**Financial burden.** Obese individuals have higher demands for medical care and spend more money on healthcare services throughout their lifetime compared to their normal-weight counterparts (Borrell & Samuel, 2013; Nagai et al., 2012). Health care costs associated with obesity are determined by preventative, diagnostic, and treatment services. Morbidity costs are determined based on decreased income from increased job absenteeism, decreased productivity, and restricted activity (Wang, Beydoun, Liang, Caballero, & Kumanyika, 2008). A 13-year study conducted by Nagai et al. found that obese men have approximately 14.7% higher lifetime medical expenditure compared to normal weight men; obese females have a 21.6% higher lifetime medical expenditure compared to normal-weight females (2012). Increased hospital and doctor visits, costly medications, and other expensive treatments are termed ‘direct costs’ and account for half of total health care costs (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

Data collected from the National Medical Expenditure Survey (NMES) and the Medical Expenditure Panel Survey, Household Component (MEPS-HC) discussed in *The
Impact of Obesity on Rising Medical Spending found that health care expenses were 37% higher in obese individuals compared to normal-weight persons. In addition, obese individuals spend 38% more of health care costs on treating diabetes, 22% on hyperlipidemia, and 41% on heart disease (Thorpe, Florence, Howard, & Joski, 2004). In total, obesity costs health care plans and employers more than $75 billion per year (Cohen, Finch, Bower, & Sastry, 2006).

In 2006, obese individuals spent $1,429, or 42% more on medical costs across all payers compared to normal-weight people. Based on total payments, 8.5% of Medicare spending, 11.8% of Medicaid spending, and 12.9% of private payer spending was attributable to obesity costs. The financial burden of obesity increased from 6.5% in 1998 to 9.1% of annual medical spending. Although private payers suffer from the majority of health care costs as a result of obesity, public-sectors suffer a significant amount as well (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

**Contributing factors.** Obesity is a multifactorial disease with numerous components leading to its condition. Social, behavioral, environmental, physiological, metabolic, cellular, and molecular influences each contribute to the national public health concern (Pi-Sunyer et al., 1998).

Individuals’ lifestyle behaviors are a large contributor of the now termed ‘obesogenic’ environment (Bell, Walley, & Froguel, 2005). A positive energy balance occurs when caloric intake far exceeds energy expenditure, leading to weight gain (Bell, Walley, & Froguel, 2005; Jequier, 2002). According to the U.S. Department of Health and Human Services, a diet high in trans fat, cholesterol, sugar, and refined grains and
low in fiber, fruits, vegetables, whole grains, lean protein, and low fat dairy coupled with a sedentary lifestyle is detrimental to the health of Americans (USDA National Heart, Lung, and Blood Institute, 2012). A diet based on processed food products promotes obesity and other diet-related chronic diseases due to the high-energy dense nature of such items (Ludwig, 2011). High intensity flavoring mixed with artificial ingredients, high glycemic index foods that increase blood glucose levels rapidly, and poor sources of dietary fat, such as trans or saturated fat all contribute to the growing epidemic as well. Additional research has continued to find that as portion sizes increase, the ability for individuals to recognize internal satiety cues decreases, leading to overconsumption and therefore weight gain as a long-term effect (Ludwig, 2011).

With more than 40% of Americans purchasing meals away from home, it is possible that “supersized” portions have an impact on obesity rates (Ledikwe, Ello-Martin, & Rolls, 2005). As early as five years old, individuals are stimulated to eat more due to increased portion sizes, especially those offered at restaurants and fast food chains (Gurhtie, Lin, & Frazao, 2002) concluding that larger portion sizes may cause an overconsumption of food items (Rolls, Morris, & Roe, 2002). Sizes are estimated to be two to five times larger today than they were 20 years ago (Ledikwe, Ello-Martin, & Rolls, 2005) and it is not always likely that individuals consider portion size when ordering their meal (Rolls, Morris, & Roe, 2002). More than 50% of Americans consume their entire entrée all or most of the time when dining out, leading to an excess intake of total calories and ultimately weight gain (American Institute for Cancer Research, 2004).
Physical activity is imperative to meeting and maintaining a healthy weight. It reduces the risk of premature death and disability from chronic conditions such as coronary heart disease, diabetes, colon cancer, osteoarthritis, and osteoporosis (Brownson, Boehmer, & Luke, 2004). The American College of Sports Medicine, the Centers for Disease Control and Prevention, and the United States Department of Health and Human Services publish national guidelines on physical activity and public health. It is recommended that healthy adults aged 18 to 65 years engage in a minimum of 30 minutes of moderate-intensity aerobic (endurance) physical activity five days per week, for a total of 150 minutes or 20 minutes of vigorous-intensity aerobic physical activity three days per week, for a total of 75 minutes (Haskell et al., 2007; Tucker, Welk, & Beyler, 2011). However, an average of 26.2% U.S. adults meet the recommended levels of physical activity, with a higher prevalence in men (27.1%) than women (25.5%), non-Hispanic whites than non-Hispanic blacks, and normal-weight adults than overweight and obese adults (Brownson, Boehmer, & Luke, 2005; Tucker, Welk, Betler, 2011).

Individuals tend to report higher levels of moderate physical activity; demonstrated by Tucker, Welk, and Beyler whose 62% of subjects reported meeting the recommendations compared to the 9.6% who had actually met the guidelines (2011).

The physical environment in which individuals reside has an important influence on the opportunities for physical activity and exercise. Environmental factors that have a direct influence on physical activity and therefore lead to obesity include: the layout of a city and its physical elements, use of land and buildings, availability of transportation, and the physical infrastructure of sidewalks, bike paths, and roads. A recent review of
the effects of environmental factors on physical activity levels shows that individuals walk and cycle more in neighborhoods that have a higher residential density, mixture of land uses, and connected streets (Saelens, Sallis, & Frank, 2002). With more than 33% of households owning at least one vehicle, utilization of the automobile for transportation has become a popular commodity amongst Americans. Numerous individuals use their personal vehicle or public transportation for commuting to job sites, shopping, and socialization. This type of travel behavior has decreased other modes of transportation such as walking and biking, and ultimately promotes sedentary behaviors (Brownson, Boehmer, & Luke, 2005). Sedentary behaviors consist of behaviors undertaken while awake that involve sitting or reclining and result in little to no physical activity energy expenditure. Common behaviors of Americans include driving, watching television, and using the computer. The average sitting time per day for men is 8.5 hours compared to 8.35 hours for women, which increases with age, particularly in adults aged 60 years and older (Healy et al., 2011).

Food cost plays a significant role in determining food choices and eating patterns. High food cost is directly related to a reduced number of fruit, vegetable, and low fat dairy products consumed by lower income families (Popkin, Duffey, & Gordon-Larsen, 2005). Increased prices of produce, poultry, dairy, and whole grains along with decreased prices of high fat, high sodium, and refined grain items provide easier accessibility of energy dense foods. A study examining price reduction effects on lower fat vending machine snacks found an increased percentage of sales by 9%, 39% and 93% when prices were reduced by 10%, 25%, and 50% (French, 2003). Furthermore, when
two secondary school cafeterias reduced their prices of fruits and vegetables by 50%, sales of fresh fruits increased from 14 items per week to 63 items per week (French, 2003). This proves that reducing the price of healthier food options can encourage consumers to purchase more nutritious items, and ultimately decrease obesity rates.

Food items offered at convenience stores, grocery stores, and supermarkets also have a significant impact on food choices and eating patterns, and therefore influence disease risk. Convenience stores located in rural areas have a limited range of food items and tend to stock less healthful options such as low-fiber breads, whole milk, and canned tuna in oil. Supermarkets and grocery stores offer a wider variety of options such as low-fat/nonfat milk, apples, oranges, tomatoes, cucumbers, high-fiber bread, eggs, smoked turkey, lean ground beef, fresh and frozen seafood, and boneless, skinless chicken breast (Liese, Weis, Pluto, Smith, & Lawson, 2007).

Trust, commitment, civic participation in associations, and self-rated health status are a few elements of social capital that have been linked to health within the past decade (Veenstra, 2000). The Alameda County study discussed by researchers demonstrates that individuals with fewer social interactions are more likely to be obese and therefore have higher rates of premature mortality. Neighborhood socioeconomic status affects the level of social resources and social interactions and can pose negative social problems on the individuals living in such places. As feelings of security and belongingness decrease, quality of life also decreases and premature mortality increases (Choen, Finch, Bower, & Sastry, 2006)
Genetic makeup has a significant role in the pathogenesis of monogenic and syndromic obesity (Bell, Walley, & Froguel, 2005). In the 1960s, the ‘thrifty gene’ hypothesis proposed that certain genes that are predisposed to obesity have a selective advantage in populations that frequently experience starvation. Individuals who carry these genes today may not just be overweight, but extremely obese, especially Pima Indians and Pacific Islanders populations (Walley, Blakemore, & Froguel, 2006). The function of leptin, an adipocyte-derived hormone, is essential for inhibiting obesity and insulin-resistant diabetes because it reduces body weight and stimulates energy expenditure. It regulates appetite by binding to the hypothalamus in the brain and signals satiety which then decreases hunger. It also increases the body’s ability to use fat stores as energy (Girard, 1997). Its levels are increased in the majority of obese individuals; drawing truth to the fact that obesity is leptin resistant (Flier & Maratos-Flier, 1998).

Ghrelin, a hormone secreted by the stomach and small intestine, has a significant effect on appetite regulation and gastrointestinal function and is associated with obesity (Walley, Blakemore, & Froguel, 2006).

Markwald et al. adds to the current research that lack of sleep is directly related to obesity. They found that five days of insufficient sleep increases total daily energy intake by approximately 5% with a greater intake of carbohydrates during sleep loss periods. Not only was there an increase in carbohydrate intake, calories from protein and fiber were 42% higher after dinner time in sleep deprived individuals (2013).

**Health implications.** As stated previously, obesity is associated with various chronic diseases, including type 2 diabetes, hypertension, cardiovascular disease, asthma,
sleep apnea, osteoarthritis, and cancers of the cervix, endometrium, colon, and gallbladder (Mokdad et al., 2003; Ortiz & Kwo, 2015; Demark-Wahnefried et al., 2015). Other obesity related co-morbidities include chronic kidney disease, depression, and stroke. Each condition results from a hormone imbalance, increased metabolic demands, electrolyte disturbances, decreased energy, insulin resistance, and/or decreased lung volumes (Ortiz & Kwo, 2015). Persons with android obesity, characterized by fat accumulation mainly in the abdomen and upper body, have an increased chance of suffering from diabetes, hypertension, and CVD due to the excess fat near vital organs (DeAngelo, Kalumuck, & Adlin, 2015).

**Type 2 Diabetes**

Diabetes mellitus is described as a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with a disturbance of carbohydrate, fat, and protein metabolism. There are two different types of diabetes: Type 1 and Type 2. Type 1 diabetes (T1D) has a strong genetic component that results from an autoimmune attack on the beta cell cells produced by the pancreas, resulting in insulin deficiency. Over time, beta cells in the pancreas become impaired and cannot make enough insulin (Daneman, 2006). T1D is mainly seen in children, but can be diagnosed at any age (Atkinson, Eisenbarth, & Michels, 2014). Type 2 diabetes (T2D), previously called non-insulin dependent diabetes mellitus or adult-onset diabetes, is a chronic disease that affects the way the body metabolizes sugar (glucose). In the initial stages of T2D, the pancreas is able to make necessary insulin, but over time it cannot keep up with the demands to maintain normal blood glucose levels (American Diabetes Association, 2005;
Lebovitz, 1999). T2D results from a genetic predisposition, behavioral, and environmental risk factors and is directly associated with obesity and physical inactivity manifestations (Tuomilehto et al., 2001).

In normal conditions, glucose is stored in the liver as glycogen and broken down to single molecules during a period of fasting in effort to keep levels within a normal range. In diabetics, glycogen is still broken down, but glucose builds up in the bloodstream instead of being delivered to the cells. An individual with diabetes may show common symptoms of increased thirst, increased urination, increased hunger, weight loss, fatigue, blurred vision, slow-healing sores or frequent infections, and areas of darkened skin. In severe cases of T1D, ketoacidosis may occur and lead to coma or death (Alberti & Zimmet, 1998; Atkinson, Eisenbarth, & Michels, 2014; Mayo Clinic, 2014).

Diagnostic criteria for diabetes includes a fasting blood glucose level of ≥126 mg/dL; blood glucose level of <110 mg/dL is considered normal. A glycated hemoglobin level of 6.5% or more confirms diabetes; normal range is between 5.7% to 6.4%. Oral glucose tolerance test (OGTT) is used to determine the body’s ability to tolerate glucose and therefore measures glucose levels two hours after a 75-gram oral glucose load. An individual is said to have impaired glucose tolerance when the results from the OGTT are between 140 and 200 mg/dL (Alberti & Zimmet, 1998; Atkinson, Eisenbarth, & Michels, 2014; Inzucchi, 2012; Tuomilehto, 2001).

Prevalence. In 2012, 29.1 million Americans had diabetes (American Diabetes Association, 2014). T2D accounts for approximately 90 to 95% of all diagnosed cases
Centers for Disease Control and Prevention, 2012; Engelgau, Narayan, & Herman, 2000). Just like obesity, T2D rates vary among different ethnic groups, specifically demonstrating a higher prevalence in African Americans, Alaska Natives, Hispanics, and Asian Americans. African Americans have a 77% greater risk and Hispanic/Latino have a 66% greater risk than non-Hispanic with Americans. Diabetes is the fifth leading cause of death for Asian Americans and affects approximately 52% of men and 42% of women aged 25-64 years (Chow, 2012). Approximately 79 million Americans are considered prediabetic, an asymptomatic stage characterized by mild hyperglycemia, insulin resistance, and an early reduction in insulin secretion (Inzucchi, 2012). By the year 2030, the prevalence of diabetes is expected to nearly double (Vijan, 2010).

**Morbidity and mortality.** In 2010, diabetes was the seventh leading cause of death in the United States, equaling to approximately 234,051 total deaths (American Diabetes Association, 2014). Diabetes is the leading cause of kidney failure, nontraumatic lower limb amputations, blindness, heart disease and stroke (Centers for Disease Control and Prevention, 2012). In diabetic individuals, coronary heart disease accounts for more than 50% of all deaths and stroke is responsible for an additional 15% (Hu et al., 2002).

**Financial burden.** The estimated cost of diagnosed diabetes in 2012 was $245 billion, with $176 billion from direct medical costs and $69 billion in reduced productivity and work loss (American Diabetes Association, 2014). Overall, medical expenses for people with diabetes are 2.3 times higher than those without diabetes (Centers for Disease Control and Prevention, 2012; Engelgau, Narayan, & Herman, 2000).
A study done by Brandle et al. looked at the relationship between direct medical costs of T2D among the employed, elderly, poor, and disabled populations and found that the median direct annual cost for white males with diet-controlled T2D and no further medical complications is $1,684 compared to $2,105 for white females. The annual cost for African American males is 82% the cost of white males (2003).

**Contributing factors.** The main cause of type 2 diabetes is a result of poor lifestyle choices that can be avoided through behavior modification. Obesity and weight gain paired with physical inactivity and a low-fiber diet in combination with high glycemic foods significantly increase the risk (Barroso, 2005; Hue et al., 2001). Hu et al. found that 61% of participants with type 2 diabetes had a BMI ≥ 25 (2001). Individuals who do not fall within the traditional weight criteria for obesity may have an increased percentage of body fat distribution in the abdominal area, therefore increasing their risk for T2D (American Diabetes Association, 2004).

Increased age, obesity, physical inactivity, family history, history of gestational diabetes, and impaired glucose metabolism all contribute to the increased risk for T2D (Inzucchi, 2012). The likelihood of T2D is more predominant in individuals who have a first-degree relative with the disease. The lifetime risk of developing the illness is approximately 40% in offspring of one diabetic parent and 70% in offspring of both diabetic parents (Barroso, 2005). Furthermore, race and ethnicity also increase the risk, specifically in African American, Hispanic/Latino Americans, American Indians, Asian Americans, Native Hawaiians, and any other Pacific Islanders populations (Centers for Disease Control and Prevention, 2012). The vast spectrum of diabetes prevalence among
various ethnic groups shows that this disease may be a result of underlying differences in genes (Barroso, 2005).

**Health implications.** Hyperglycemia (high blood sugar) occurs in type 2 diabetics when the body has enough insulin but cannot use it effectively (American Diabetes Association, 2014). Exercising, altering the amount and/or schedule of food intake, or changing the amount of medication or insulin along with the timing of insulin can treat this condition. If hyperglycemia is not treated, ketoacidosis, also known as a diabetic coma, can occur. This happens when the body cannot use glucose as fuel, so it breaks down fat for energy, producing ketones. The body can only release small amounts of ketones and the rest build up in the blood causing shortness of breath, fruity-smelling breath, nausea and vomiting, and dry mouth (American Diabetes Association, 2014).

Diabetic foot ulcers (DFU) are a very serious complication of T2D and are prevalent in 4% to 10% of diabetics. DFU occur as a result from nerve damage that affects peripheral sensation. Loss of protective sensation leads to lack of awareness of incident or ulceration. Ischaemic necrosis of tissue beneath a formed callus ultimately leads to the breakdown of skin and subcutaneous tissue (Jeffcoate & Harding, 2003). Furthermore, such conditions can worsen nerve damage and lead to DFU: immobilization resulting from other diseases such as heart failure or stroke; accidental self-inflicted trauma occurring in broken skin; pressure from footwear as a result of nonspecific rubbing or wearing of too tight of socks; dry skin, ingrown toenails, gout, psoriasis; and accidents including falls, scratches, or dropping something on the foot (Macfarlane & Jeffcoate, 1997). Delayed wound healing often leads to lower limb amputations,
particularly in the elderly population. Multiple risk factors associated with DFU development include age, gender, duration of diabetes, BMI, co-morbidities of retinopathy and nephropathy, glycated hemoglobin levels, macro-cascular complications, foot deformity, and edema (Monteiro-Soares et al., 2012). Yotsu et al. found that retinopathy, reduction in eGFR, and history of ulcer were commonly associated with neuropathic, ischemic, and neuro-ischemic diabetic foot ulcers. Furthermore, approximately 70% of subjects with ischemic and neuro-ischemic ulcers were affected in their toes due to limited blood supply (2014).

Diabetic retinopathy, a retinal vascular disorder, is another common complication associated with T2D (Kempen et al., 2004). It affects approximately one third of diabetics and more than 4.1 million U.S. adults 40 years and older (Engelgau, Narayan, & Herman, 2000; Kempen et al., 2004). An additional one third of individuals with diabetic retinopathy may develop proliferative retinopathy or macula oedema, a sight-threatening progression of diabetic retinopathy. Due to the rapid progression of this condition, the rate of diabetic retinopathy in persons over the age of 40 is predicted to triple by the year 2050. Duration of diabetes, severity of hyperglycemia, hypertension, and dyslipidaemia are the most common risk factors (Echouffo-Tcheugui et al., 2013).

Cardiovascular disease is the primary cause of death among individuals with insulin-treated diabetes. A recent study conducted in February 2015 found that hypoglycemia is associated with an increased risk of cardiovascular events and mortality in insulin-treated individuals with type 2 diabetes. Because of the impact of intensive insulin therapy on lowering blood glucose levels, individuals who experienced at least
one episode of hypoglycemia had a 50% greater risk of cardiovascular events. Potential mechanisms linking hypoglycemia and CVD include QT prolongation, hemodynamic changes arising from catecholamine release, inflammation, and endothelial dysfunction (Khunti et al., 2015). Due to the predominance of type 2 diabetes in older populations, the absolute number of heart disease deaths is greater than those with type 1. In a study done by Laing et al., 536 of 1,437 deaths were caused by cardiovascular disease and 369 were from ischemic heart disease (2003).

**Cardiovascular Disease**

Cardiovascular disease (CVD), commonly known as heart disease, refers to any disease of the heart and blood vessels. The main types of CVD include heart failure, arrhythmia, heart valve problems, stroke, and heart attack (Thrall, 2005). Heart attack and stroke occur as a result of atherosclerosis, the buildup of plaque in the arteries, in which the walls of the arteries become narrow, making it harder for blood to flow through. If blood flow to the heart is blocked by a blood clot, then a heart attack occurs. A stroke occurs when a blood clot blocks a blood vessel that feeds the brain or if a blood vessel in the brain bursts. Heart failure, also known as congestive heart failure, is a condition in which the heart cannot pump blood as well as it should. Arrhythmia is a condition that occurs when there is an abnormal rhythm of the heart, most commonly seen as a slow, fast, or irregular heartbeat. Heart valve problems occur when the heart valves do not open wide enough to let blood flow through (stenosis), when the heart valve do not close properly allowing blood to leak through (regurgitation), or when the
valve leaflets bulge or prolapse back into the upper chamber (mitral valve prolapse) (American Heart Association, 2014).

The Framingham risk score (FRS) is most commonly used in the clinical setting to predict CHD risk using factors such as age, sex, BMI, systolic blood pressure, treatment of hypertension, total and high-density lipoprotein cholesterol levels, use of lipid-lowering medication, smoking, and diabetes mellitus. Kavousi et al. further studied additional risk markers to determine if they were more effective in classifying CHD. Such markers included cIMT, ankle-brachial index, pulse wave velocity, and NT-proBNP and were found to be mild to strong predictors of coronary events and death. They were also shown to have a significant effect on classifying CHD (2012).

**Prevalence.** It is estimated that approximately 64.4 million Americans have one or more types of CVD (Thrall, 2005). Based on data from the 2003-2006 NHANES, approximately 14.9% of males and 8.7% of females between the ages 20-39 years, 39.6% of males and 39.6% of females ages 40-59 years, 73.5% of males and 73.1% of females, 78.8% of males and 84.7% of females ages 80 years and older have cardiovascular disease (Lloyd-Jones et al., 2010).

**Morbidity and mortality.** Heart disease is the most common cause of death in the U.S. population and is predicted to continue to rise as obesity maintains at an epidemic level (Koh, 2010; McCullough, 2007). Each year, approximately 795,000 people experience a stroke; 610,000 of which are first events and 185,000 are recurrent. In 2011, stroke caused one in every 20 deaths in the U.S and approximately 209,000 people are treated for in-hospital cardiac arrest each year. Coronary heart disease caused
one of every seven deaths and heart failure caused one in nine deaths, resulting to 58,309 deaths in 2011 (Mozaffarian et al., 2015). Heart disease is especially prevalent in individuals with chronic kidney disease (CKD), causing more than half of deaths in individuals with end stage renal disease. Furthermore, patients who have milder cases of CKD are more likely to die of cardiovascular causes than develop kidney failure (McCullough, 2007). Modifiable risk factors most commonly associated with CHD include hypertension, diabetes mellitus, obesity, and dyslipoproteinaemia, which can be influenced by changes in nutrition (Boeing et al., 2012).

**Financial burden.** The cost of inpatient cardiovascular operations and procedures is approximately 7.5 billion dollars each year. In 2011, annual costs for CVD and stroke were $320.1 billion, $195.6 billion from direct costs from hospital services, physicians and other professionals, prescribed medications, and home health care, and $124.5 billion from indirect costs from productivity loss (Mozaffarian et al., 2015).  

**Hypertension**

Hypertension is a condition determined by the amount of blood the heart pumps and the amount of resistance to blood flowing into the arteries. Blood pressure is measured in two numbers: 1.) systolic pressure, the pressure of blood as it flows out of the heart when the heart contracts and 2.) diastolic pressure, the pressure of blood within the artery as it flows into the heart when it is at rest. Normal blood pressure levels are considered 120/80 mm Hg, whereas a hypertensive blood pressure is considered 140/90 mm Hg or higher. The higher the level of pressure, the harder the heart works to pump blood to and from the heart and arteries. Over time, if the force of blood flow is too high,
the tissue in the walls of the arteries stretches beyond its healthy limit and becomes damaged, causing vascular weakness and scarring, increased risk of blood clots, increased plaque build-up, increased workload on the circulatory system, and tissue and organ damage from narrowed arteries (American Heart Association, 2014).

Two general types of HTN include primary (essential) and secondary. Primary HTN develops gradually over many years due to environmental, genetic, metabolic, vascular, or endothelial causes and accounts for 90-95% of all adult cases (Madhur, 2014). Secondary HTN accounts for 2-10% of all cases is caused by an underlying condition such as obstructive sleep apnea, kidney problems, adrenal gland tumors, thyroid problems, certain defects in blood vessels you’re born with (congenital), certain medications, illegal drugs, and alcohol abuse or chronic alcohol use (Madhur, 2014; Mayo Clinic, 2015).

Individuals with high blood pressure typically do not experience any signs or symptoms and therefore approximately 30% of adults are unaware of their HTN (Madhur, 2014). Because of the absence of symptoms, HTN is commonly referred to as the “silent killer” (American Heart Association, 2014). In very rare life-threatening and severe conditions, some may experience headaches, shortness of breath, or nosebleeds (Mayo Clinic, 2015).

**Prevalence.** High blood pressure affects approximately 76 million adults in the U.S., equaling to nearly one in three people over the age of 18 (Landsberg et al., 2013). Prevalence is higher in older adults, non-Hispanic blacks, and females (Rafey, 2013). Between 2006 and 2011, HTN has increased by 25% in regards to the number of
individuals visiting the emergency room due to essential HTN. The number of emergency room visits due to secondary HTN has also increased from 71.2 per 100,000 population in 2006 to 84.7 per 100,000 per population in 2011 (Madhur, 2014). The disease is more predominant in non-Hispanic black adults, with a prevalence of 42.1% compared to 28% in Hispanic white, 26% in Hispanic, and 24.7% in non-Hispanic Asian adults according to data from the 2011-2012 Nutrition Examination Survey (Nwankow et al., 2013). By the year 2025, it is projected that approximately 29% of individuals will develop HTN (Boeing et al., 2012).

**Morbidity and mortality.** In 2013, more than 360,000 U.S. adults died from HTN as a primary or contributing cause, equaling to almost 1,000 deaths per day (Centers for Disease Control and Prevention, 2015). Research shows that even the slightest elevation in blood pressure is a major risk factor for heart disease, contributing to approximately 1.4 million CHD events and 700,000 strokes in the U.S. each year. About 80% of individuals who experience a stroke and 75-91% of individuals who develop heart failure have been previously diagnosed with HTN (Landsberg et al., 2013).

**Financial burden.** High blood pressure costs the U.S. more than $46 billion each year, a total which includes the cost of health care services, medications to treat the condition, and missed days of work. From 2011-2012, approximately 38.9 million adults with a primary diagnosis of essential HTN visited a physician office and approximately 3.7 million adults visited a hospital outpatient department (Centers for Disease Control and Prevention, 2015). In 2010, the average healthcare expenditure for HTN was $636 for ages 18-44, $715 for ages 45-64, and $778 for ages 65 and older. The mean
expenditure per person for HTN treatment was higher for Hispanics, costing $981 compared to $887 for non-Hispanic blacks, $670 for non-Hispanic whites, and $661 for non-Hispanic others. A total of $42.9 billion was spent on HTN treatment for adults for all medical services. Furthermore, $30.4 billion was spent on prescription drugs, equaling to $368 per person, $13 billion on ambulatory visits, and $9.5 billion on other services (Davis, 2013).

Cancer

Establishing a relationship between diet and cancer is complex due to the many factors that contribute to the chronic disease. However, numerous studies have shown a significant influence of food intake on cancer in regards to its preventative contribution, leading to the fact that approximately 35% of cancer deaths may be related to dietary factors (Lundstrom, 2012).

Prevalence. It is well established that diets high in fruits and vegetables play a role in cancer prevention and treatment due to the protective effect of antioxidants found in these food items (Liu, 2003). Sodium, nitrates, nitrites, chloride, aphyatossin, lipids, proteins, and processes such as salting, smoking, and broiling have been linked to the progression of cancer. Cancerogenesis, the loss of cellular differentiation that causes cancer, is inhibited by retinoids, vitamins E, D, and C, polyphenols, fiber, calcium, soya, selenium, and polyunsaturated fatty acids such as omega-3 (Divisi, Di Tommaso, & Salvemini, 2006).

Research demonstrates that increases in relative body weight are associated with several types of cancer, including cancers of the colon, prostate, and breast (Rapp et al.,
2005). A meta-analysis of 82 studies looking at 213,075 women with breast cancer found that for every 5 kg/m² increase in BMI, there was a 14% to 29% increased risk of disease-specific mortality and an 8% to 17% increased risk of total mortality. Further data suggests that the risk for breast cancer is greatest in underweight or obese individuals, compared to normal weight and overweight individuals (Demark-Wahnefried et al., 2015). Rapp et al., found that breast cancer incidence is greatest in women older than 65 years with a BMI greater than 35 kg/m². BMI greater than 35 kg/m² is also associated with colon cancer, specifically in men (2005). Another meta-analysis looked at 18,203 men with prostate cancer and also found that for every 5 kg/m² increase in BMI, there was a 20% higher risk of prostate cancer-specific mortality. (Demark-Wahnefried et al., 2015).

Each year, the American Cancer Society estimates the numbers of new cancer cases. For the year 2015, it was estimated that there would be 1,658,370 new cases of cancer, including 234,190 cases of breast cancer and 220,800 cases of prostate cancer. It was estimated that there would be 291,150 cases of cancer of the digestive system, including 93,090 cases of colon and 24,590 cases of stomach cancer (Siegel, Miller, & Jemal, 2015). Within the next two decades, the number of new cases is expected to rise by 70% (World Health Organization, 2015). Colorectal cancer is the third most common cancer in men and the second in women, with 1.2 million new cases each year worldwide (Jemal, Center, DeSantis, & Ward, 2010). Breast cancer is the most commonly diagnosed cancer, with approximately 1.4 million new cases in 2008 (Jemal, Center, DeSantis, & Ward, 2010). Switzerland, Italy, and the United States have the highest
incidence rates compared to Africa, Asia, and South Africa, which have the lowest. Stomach cancer is the second leading cause of cancer worldwide (Jemal, Center, DeSantis, & Ward, 2010).

**Morbidity and mortality.** To date, one in four deaths in the U.S. is a result of cancer (Jemal et al., 2008) and approximately one third of cancer deaths are a result from high BMI, low fruit and vegetable intake, lack of physical activity, and/or alcohol use (World Health Organization, 2015). Breast cancer causes more than 458,000 deaths globally in females; prostate cancer caused about than 27,540 deaths in U.S. males in 2015 (American Cancer Society, 2015). The number of deaths caused by stomach cancer in 2008 equaled 738,000 (Jemal, Center, DeSantis, & Ward, 2010).

**Financial burden.** According to the National Institutes of Health, the cost of cancer will accelerate due to expensive treatments and the increase in number of cancer patients. Increasing costs are a result of technologic advances in imaging, robotics, and therapeutic radiology. Currently, cancer treatment accounts for approximately 5% of health care spending and is expected to increase to nearly 20% by 2017 (Meropol et al., 2009). By the year 2020, the cost of cancer care will be approximately $157.77 billion with a 42% increase in prostate cancer care and 32% increase in breast cancer care (Mariotto et al., 2011). Due to intensive interventions, cancer is one of the most expensive diseases to treat in the U.S. and patients with cancer pay more out of pocket than any other chronic disease, despite having insurance. “Financial toxicity” something many cancer patients experience due to the depletion of their retirement savings and treatment nonadherence, which may force them to file personal bankruptcy (Meropol et
A study by Finkelstein et al. found that individuals actively treated for cancer spent an average $1,170 out of pocket on medical expenditures compared to those without cancer. Those undergoing cancer treatment missed 22.3 more workdays per year than those without cancer (2009).

**Dietary Interventions for Chronic Diseases**

A global goal set by the World Health Organization in 2005 aims to reduce chronic disease death rates by an additional 2% per year through small interventions directed towards whole populations and high-risk individuals in hopes of decreasing chronic disease related deaths (Lim, 2007).

**Obesity.** The Academy of Nutrition and Dietetics emphasizes the adoption and maintenance of dietary behaviors and physical activity as a means of lifestyle modification for obesity treatment. An appropriate reduction in weight is the main focus and should be sustained over time. Physical activity should be in compliance with the 2008 Physical Activity Guidelines for Americans, recommending 150 minutes per week of moderate-intensity, or 75 minutes per week of vigorous-intensity physical activity. An individualized diet should be prescribed by a registered dietitian nutritionist (RDN), which should incorporate the individual’s food preferences. Restriction of high-carbohydrate, low-fiber, and high-fat foods should be implemented (Raynor & Champagne, 2016). Reducing energy dense foods while increasing fruits and vegetables is a significant predictor in determining weight loss due to the improved diet quality (Rolls, 2009).
Type 2 diabetes. The results from several randomized controlled intervention studies demonstrate that lifestyle changes resulting in weight loss through dietary changes reduces the conversion of impaired glucose tolerance in T2D (Boeing et al., 2012). The incidence of T2D decreases by 58% for those considered high risk by making lifestyle changes in effort to prevent the disease. Furthermore, individuals who receive individualized detailed advice about losing weight through diet and exercise have a greater chance of decreasing their risk for developing diabetes (Tuomilehto, 2001). A diet high in fiber and polyunsaturated fat, low in saturated and trans fats, and maintaining a BMI ≤ 25 while living an active lifestyle is imperative to preventing type 2 diabetes (Hue et al., 2001).

Diabetes education focusing on the intake of meals and medications, self-monitoring of blood glucose, keeping hard candies at hand for emergency situations, and avoiding excessive exercise is especially important in decreasing hypoglycemic episodes (Bhutani et al., 2015). Look AHEAD (Action for Health in Diabetes), a clinical trial funded by the National Institute of Health, shows that significant weight loss and improved cardiovascular risk factors are achievable among overweight and obese adults with type 2 diabetes through an intensive weight loss intervention. After one year the intervention, the average reduction in participants’ weight was 8.6%, cardiovascular fitness improved by 21% and mean HbA1c levels decreased from 7.2% to 6.6%, all of which contributing to the reversal of the disease (Espeland, 2007).

Cardiovascular disease. The goals of heart disease management are to modify the natural history of the disease and improve symptoms of angina (McCullough, 2007).
In low-income and middle-income populations, a multidrug regimen of aspirin, blood pressure-lowering drugs, and cholesterol lowering drugs for individuals at high risk for CVD may be beneficial (Lim, 2007). Following a heart-healthy diet with regular physical activity is shown to have a beneficial impact on CVD risk factors such as serum lipids, BMI, and blood pressure (Mochari-Greenberger, 2012). The American Heart Association established the following goals to reduce the risk of CVD: consume an overall healthy diet, aim for a healthy body weight, aim for a desirable lipid profile, aim for a normal blood pressure, aim for a normal blood glucose level, be physically active, and avoid use of and exposure to tobacco products. These guidelines are set to provide maximum flexibility and should be followed as a lifestyle prescription rather than an exact “diet plan” (Lichtenstein et al., 2006).

The Coronary Artery Risk Development in Young Adults (CARDIA) study found that young adults who maintained a stable BMI within 2 kg/m² at baseline at six examinations over the course of 15 years did not have a significant change in systolic or diastolic blood pressure. Individuals who had an increase in BMI of 2 kg/m² or more had a significant increase in BMI concluding that age related weight gain has a greater effect on blood pressure than aging itself (Landsberg et al., 2013).

**Hypertension.** A study done by Wang & Wang measured people’s awareness and management of hypertension (HTN) based on data collected from NHANES. They found that only two thirds (66%) of people living with HTN were told by their health care professional to adopt a healthier lifestyle in effort to modify their condition. Furthermore, only 31% were taking corrective action to control their HTN (2004). Prior
to the implementation of the DASH (Dietary Approaches to Stop Hypertension) diet, the only non-drug options for controlling HTN were salt reduction, weight control, and moderation in alcohol consumption. Individuals were non-compliant with such methods and had trouble keeping weight off (Karanja, Erlinger, Pao-Hwa, Miller, & Bray, 2004).

Currently, a DASH (Dietary Approaches to Stop Hypertension) diet is recommended for hypertensive individuals, in which behavior modification is the main focus. It emphasizes weight loss, limiting alcohol consumption, cessation of smoking, reducing sodium, saturated fat, and cholesterol intake, maintaining adequate amounts of potassium, calcium, and magnesium, and engaging in at least 30 minutes of moderate intensity physical exercise each day. A diet rich in fruits, vegetables, low-fat dairy, whole grains, poultry, fish and nuts and low in sodium, saturated and total fats, such as red meats, sweets, and sugar-containing beverages is also recommended. Additionally, it is recommended that healthy people without risk for hypertension should reduce sodium intake to less than 2,300 mg per day; individuals 51 years and who have high blood pressure, chronic kidney disease, and/or diabetes should reduce intake to 1,500 mg per day (Rafey, 2013; Svetkey et al., 1999). The DASH diet is based on the DASH Study, which is a randomized 8-week intervention including 459 hypertensive patients that found a diet rich in fruits, vegetables, and fiber and low in fat is effective in lowering blood pressure levels (Boeing et al., 2012).

Pharmacological therapies may be necessary for treating and managing HTN along with the stated behavior modifications. The most common drug class
recommendations include diuretics, beta-blockers, angiotensin-converting-enzyme inhibitors, and aldosterone antagonists (Madhur, 2014).

**Cancer.** The National Cancer Institute has established dietetic guidelines for preventing cancer based on the beneficial effects of various foods: maintain a healthful body weight, consume a varied diet with moderate quantities of different food items, include fruits and vegetables in the diet to maximize their vitamin and mineral content, consume a larger quantity of foods high in fiber such as whole wheat products, cereals, and legumes, reduce total consumption of fats, limit alcohol consumption, and restrict foods preserved with nitrite (Divisi, Di Tommaso, & Salvemini, 2006).

**College Students**

College is a time for students to live independently and gain a sense of self-sufficiency. Many students are faced with making independent life choices for the first time. Some of these choices include their physical activity involvement and dietary patterns (Morrell & Burke, 2007). However, independent living often leads to unhealthful behaviors which can affect students’ current health and their risk for developing chronic diseases in the future (Brown, Larsen, Nyland, & Eggett, 2013).

**Health Status**

Obesity, hypertension, high cholesterol, and physical inactivity are common conditions seen in college students (Morrell & Burke, 2007). The most recent data collected by the American College Health Association via the National College Health Assessment (ACHA-NCHA-II) conducted in Spring 2014, demonstrates that 34.6% of American college students are overweight or obese (ACHA, 2014; Napolitano, Hayes,
Bennett, Ives, & Foster, 2013). Specifically, 22.5% are overweight with a BMI between 25-29.9. Seven and a half percent have a BMI of 30-34.9, 2.8% have a BMI between 35-39.9 and 1.8% have a BMI ≥40 (ACHA, 2014). A study examining 800 undergraduate students found that 66% of males have at least one risk factor for metabolic syndrome compared to 50% of females. Also, 60% of males reported having high blood pressure (Morrell & Burke, 2007). Comparatively, another study found that 7.2% students have a systolic blood pressure ≥140 mm Hg and/or diastolic pressure ≥90 mm Hg. Of this sample, 25.8% of students have a family history of HTN (Williams, Iravani, Richard, Luengnareumitchai, & Shulman, 1978). In 2010, approximately 1.9 million people aged 20 years and older were newly diagnosed with type 2 diabetes, with an estimated 79 million pre-diabetic individuals. Sixty-one percent of students from a 600 sample population reported having a family history of type 2 diabetes in a first or second-degree relative (Reyes-Velazquez & Hoffman, 2011).

Hoffman et al. found that the average weight gain seen in college freshmen is approximately seven pounds (3.1 kg) due to the positive energy balance of approximately 112 kilocalories per day. Comparatively, Levitsky, Halbmaier, and Mrdjenovic found an average weight gain of 1.9 kg per day or 158.3 grams per week (2010; 2004). Students living in dorms gained an average of 4.1 kg and those living in an apartment, house, or at home with their family gained an average of 1.2 kg or less over the academic year (Pliner & Saunders, 2008). Delinsky and Wilson found that amongst female college freshmen, an average weight gain of three pounds was reported, increasing the frequency of overweight by 2.4% (2008). Clusky and Grobe found that 62% of their participants
showed a weight increase of $\geq 2.3$ kg during October to December (2009). Overall, it has been found that 70% of students will gain weight their first year of school regardless of living arrangements and gender (Reyes-Velazquez & Hoffman, 2011).

**Eating Patterns**

Much research investigates the relationship between eating habits among college students and their transition to independent living. As previously stated, unhealthful lifestyle choices increase students’ risk for serious health problems such as obesity, HTN, type 2 diabetes, CVD, cancer, and other diet related chronic diseases. Such behaviors have a long-lasting impact on their health and often carry into their adult years, ultimately affecting the health of their future families (Brunt & Rhee, 2008; Ha & Caine-Bish, 2009).

On average, two-thirds of lower and upper-level students typically eat their meals in their homes or dormitory room at least six to eight times per week (Driskell, Kim, & Goebel, 2005). Approximately 45% of college students purchase food and beverages from at least one campus area venue more than three times per week (Pelletier & Laska, 2013). Overall, a small percentage (15%) of students living off campus typically eat lunch and dinner at a sit down restaurant (Davy, Benes, & Driskell, 2006). Approximately 93.5% of students eat their meals at a fast-food restaurant six to eight times per week, mainly due to the convenience that these establishments are located on or near university campuses (Driskell, Kim, & Goebel, 2005; Driskell, Meckna, & Scales, 2006).
Students frequently snack on energy-dense foods, skip meals, and have an increased consumption of fast food and alcohol (Levitsky, Halbmaier, & Mrdjenovic, 2004). Additionally, students consume a diet that is typically high in fat, saturated fat, cholesterol, sugar, and sodium. Consequently, these habits influence their diet to be low in important nutrients such as fiber, iron, folate, calcium, and vitamins A, C, and E (Brunt & Rhee, 2008; Ha & Caine-Bish, 2009; Huang et al., 1994). Food items most popular amongst this population include: skim and 2% milk; turkey, chicken; spaghetti and meatballs, pizza, hamburgers, ham and cheese sandwiches, fast-food type combination foods; tossed salad, corn, and various forms of potatoes including fried, mashed, and baked; apples, bananas, and oranges; bagels, white and Italian bread spread with butter, margarine, or peanut butter; cookies, candy bars, chips, popcorn, crackers, frozen yogurt; fruit punch, orange juice, diet and regular soda (Huang et al., 1994). Cost and taste of items also have a great impact on food choices, influencing students to frequently purchase hamburgers, ham and cheese sandwiches, pizza, French fries, and soft drinks. Although healthier options are offered, 14% of males never purchase those items, whereas 5% of females always do (Driskell, Meckna, & Scales, 2006).

Regular soda has been reported as the most frequently consumed beverage among the college student population as evidenced by 33% of students who reported drinking regular soda one to two times daily (Huang et al., 1994). In comparison, 25.4% reported drinking low-calorie/diet beverages (Driskell, Kim, & Goebel, 2005). Although students are becoming more aware of the benefits of water consumption, only 20.8% reported drinking water one to two times per day and 3.9% never drink it (Driskell, Kim, &
Goebel, 2005). Research shows that milk consumption decreases from childhood to young adulthood and therefore the average total dairy intake of students is 1.4 servings per day, equaling to 815 mg of calcium. This average is less than half of the recommended dietary allowance of 1,000 to 1,300 mg per day. In total, approximately 17% of students consume two to three servings of dairy per day (Demory-Luce et al., 2004; Poddar et al., 2009) and 23.9% do not consume one glass of milk daily (Driskell, Kim, & Goebel, 2005).

Based on the 2005 Dietary Guidelines for Americans, more than one third of students eat the recommended amounts for the five major groups of fruits, vegetables, whole grains, dairy, and protein (Kolodinsky et al., 2007). According to the most recent data from the American College Health Association National College Health Assessment II (ACHA-NCHA II), 5.8% of college students reported eating zero servings of fruits and vegetables per day, 57.5% reported 1-2 per day, 30.2% reported 3-4 per day, and 6.5% reported 5 or more per day (2014).

The majority of college students do not meet the recommendations for fruits, vegetables, whole grains, low-fat dairy, lean protein, and sodium. A study assessing dietary habits and body weight in female college freshmen demonstrates that the average intake of fruits, vegetables, bread, milk, meat, fats and oils of participants are 1.52, 2.30, 2.78, 3.06, 1.85, and 2.36. The average cholesterol level is 240.65 mg per day, a level much higher than the recommended <200 mg/dL (Butler, Black, Blue, & Gretebeck, 2004). In comparison, Huang et al. found that the average fruit and vegetable intake of students is approximately 4.2 servings per day and the average fiber intake is 18 grams
per day. Males consumed more fruits and vegetables per day at 4.3 servings compared to females of 4.0 servings. Males also have a higher consumption of fiber at 19.9 grams per day compared to females at 16.1 grams per day; however, these levels are below the recommended amounts for males and females, 38 grams per day and 25 grams per day (2003). On average, 95% of women and 82% of men are not meeting the nutrient recommendations for fiber (Morrell & Burke, 2007). In total, the percentage of students who consume one or less servings of fruits, meat, dairy, grains, and vegetables are: 33%, 17%, 10%, 9%, and 9%. Ninety-five percent of students consume at least two servings of discretionary sweets or fats per day (Brunt, Rhee, & Zhong, 2008).

Sources of Nutrition Education

The most sought out sources for nutrition education by college students include family members and friends, health care professionals, television cooking shows, magazines, the Internet, radio, and news, and academic courses (International Food Information Council Foundation, Food and Health Survey 2015).

Participants of the 2015 Food and Health Survey were asked to determine which source he/she trusts the most to provide accurate information about the types of food he/she should be eating. Seventy percent ranked their personal healthcare professional as being most trustworthy, 34% ranked a family member or friend, 26% ranked U.S. government agencies, 24% ranked a food expert on television, 24% ranked health, food and nutrition bloggers, 18% ranked farmers, and 7% ranked food companies and manufacturers. A woman surveyor reported that although she reads the nutrition facts
label, she does not trust the information completely (International Food Information Council Foundation, Food and Health Survey 2015).

Data from the American Dietetic Association’s Nutrition & You: Trends Survey demonstrates that respondents 25 years and older obtain 72% of their nutrition knowledge from television, 58% from magazines, 33% from newspapers, 18% from the radio, 17% from their family and friends, 13% from the Internet, 12% from physicians, 4% from work, and 4% from school. Forty-six percent of students received most of their knowledge from an introductory nutrition course (Davy, Benes, & Driskell, 2006).

Due to technologic advancements in recent years, 74% of students search the web for overall health related information. Nearly half report searching the Internet for fitness and exercise information and 47% browse for tips on diet and nutrition. The most commonly searched websites include WebMD, Yahoo! Health, Ask Jeeves, Centers for Disease Control and Prevention, FitDay, Health.com, Mayo Clinic, MensHealth, Planned Parenthood, and Shape.com (Escoffery, Miner, Adame, Butler, McCormick, & Mendell, 2013).

**Cell Phone Use**

The cell phone is one of the most rapidly growing new technologies in the world and is an essential communication tool for individuals across the globe (Hakoama & Hakoama, 2011). Approximately 95% of countries throughout the world have mobile phone networks (Cole-Lewis & Kershaw, 2010). Today, there are 4.43 billion mobile phone users in the world, a number that is estimated to reach 5.07 billion by the year 2019 (Cole-Lewis & Kershaw, 2010; Statista, 2015). Cell phones have evolved from
being a luxury for businesspeople into a vital component of connectedness that is used by almost every age group, especially college students. It is integrated into individuals’ daily lives and allows for two-way communication via text messages, phone calls, Internet access, and other various media outlets. Cell phones also serve as a one-way information source by granting immediate access to endless information in a split of a second (Wei & Lo, 2006). Mobile phones are almost always with the individual, providing access to their calendar, contacts and photos, making them an extremely personal source of information (Klasnja & Pratt, 2012).

Approximately 94% of college students own a cell phone and 89% have their phone with them at all times (Napolitano, Hayes, Bennett, Ives, & Foster, 2013). The Millennial generation, ages 18-34 years, seeks to be more socially connected compared to college students of previous generations. Students today are more focused on immediate interactions with friends, family, professors, peers, and strangers via mobile phones, chat rooms, email, and computer games (Wei & Lo, 2006). Furthermore, 93% of college students use their phone to text message, sending approximately 120-200 texts per day (Hanson, Drumheller, Mallard, McKee, & Schlegel, 2010; Napolitano, Hayes, Bennett, Ives, & Foster, 2013). Therefore, texting is considered the most preferred method of communication amongst this population (Napolitano, Hayes, Bennett, Ives, & Foster, 2013). Its popularity is due to the widely available, inexpensive, and instant communication that is transmitted from person to person (Cole-Lewis & Kershaw, 2010). A study conducted by Hanson, Drumheller, Mallard, McKee, & Schlegel, found that students spend a significant amount of time on technologies associated with personal
communication, averaging to a total of 14.35 hours per week texting, 6.49 hours on the phone, 5.43 hours on social networking sites such as Facebook, and 1.58 hours using email (2010).

Mobile Health (mHealth) is the use of mobile phone technology to deliver health care information via text messaging, voice calling, and Internet connectivity (Cole-Lewis & Kershaw, 2010). Recent studies show the effectiveness of cell phones as being a simple learning instrument used in the healthcare field. For example, physicians, dietitians, and other healthcare professionals have explored text-messaging interventions to influence behavior change among overweight, obese, diabetic, and hypertensive individuals. Researchers have communicated with participants via Short Message Service (SMS), a form of instant messaging that allow users to send and receive brief text messages of up to 160 alphanumeric characters in length to any suitable GSM phone (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013). SMS is supported by the most basic mobile phone and is a universal form of communication in the first world and developing countries (Klasnja & Pratt, 2012). Physician offices also utilize SMS to remind patients of scheduled appointments, coordinate medical staff, deliver medical test results, and monitor patient side effects following treatment (Fjeldsoe, Marshall, & Miller, 2008). Messages can be sent and received instantly in SMS form through mobile phones, fixed line phones, and via the Internet (Leung, 2007). Messages can also be accessed at a time that best suits the individual (Fjeldsoe, Marshall, & Miller, 2008).
Results from previously conducted studies demonstrate that the use of text messaging is a successful method to influence and support individual health goals. Individuals who participated in SMS text message interventions accepted the messages in a positive manner and were enthusiastic about the intervention due to the convenient nature of the messages. Moreover, they viewed the messages as a helpful reminder and more than half reported working toward their health goal during the duration of each study (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013). Overall, the use of mobile phones in the health care field improve convenience, monitor chronic conditions, promote medication adherence, provide instant appointment reminders, deliver medical test results and improve patient-provider communication. It also offers instantaneous two-way communication that can be accessed at any time (Cole-Lewis & Kershaw, 2010).

Text messaging is an alternative electronic mode of communicating health information to a wide variety of individuals. SMS interventions are less intrusive than a mobile phone call and more immediate than an email (Leung, 2007). They can be affordably and easily delivered to a large number of individuals (Napolitano, Hayes, Bennett, Ives, & Foster, 2013). The acceptability of such interventions may be due to the powerful technological capabilities and convenient exchange of communication between the sender and receiver (Leung, 2007). Although text messaging interventions have been researched among various populations, research focusing specifically on the college student population in regards to beverage consumption is lacking.
Cognitive Behavioral Therapy

Cognitive-behavioral therapy (CBT) is a form of psychotherapy that emphasizes the important role of thinking in how we feel and what we do (National Association of Cognitive-Behavioral Therapists, 2008). It is based on the idea that thoughts, feelings, and behaviors all interact together; ultimately thoughts determine feelings and behavior (McLeod, 2015). CBT is a short-term, goal-oriented and hands-on treatment to problem-solving. Treatment typically combines techniques of psychotherapy and behavioral therapy (Martin, 2016). CBT also has an educational approach in which individuals learn new ways of reacting to situations in hopes of having long term results (National Association of Cognitive-Behavioral Therapists, 2008).

CBT was invented in the 1960s by a psychiatrist named Aaron Beck who noticed that his patients would report only a fraction of their thoughts. Beck realized it may be due to the fact that some individuals may not be completely aware of all of their thoughts. He then recognized the important relationship between thoughts and feelings. The term "automatic thoughts" was invented; it is defined as emotion-filled thoughts that pop-up in the mind. Beck learned that identifying these thoughts allows the individual to understand and overcome difficulties (Martin, 2016).
CHAPTER III

METHODOLOGY

The purpose of this pilot study was to determine if a 30-day period of delivering beverage related daily text messages via SMS had an effect on the beverage consumption of undergraduate college students. Participants received one text message per day for 30 days that contained information of various non-alcoholic beverages. They were instructed to complete a pre- and post-study survey that included demographic questions, a 24-hour beverage recall, and satisfaction questions about the study. Participant’s pre-study beverage intake was compared to their post-study beverage intake. The independent variable was the daily text messages and the dependent variable was the beverage consumption of participants.

Sample

Upon approval from Kent State University’s (KSU) Institutional Review Board (IRB), the researcher received a convenience sample of 3,527 email addresses form undergraduate students who were enrolled in the Spring 2016 semester. Student email addresses were obtained from the Kent State University Registrar office. Students were sent an invitation to participate in the study via email (Appendix A) along with two reminder emails (Appendix B). In addition, recruitment flyers were posted in the dining halls, dormitories, academic buildings and the library, student center, and recreation center on the university’s campus (Appendix C). Inclusion criteria required participants to be enrolled as a full-time or part-time undergraduate student. Additionally, they were required to own a personal cell phone with text messaging capabilities. Involvement in
the study was voluntary and participants were given the opportunity to opt out from receiving daily messages at any time during the course of the study.

**Instruments**

**Remind**

Remind is a text messaging app that was used by the researcher to deliver daily text messages to participants of the study. Remind is a quick, efficient, and free communication tool that is commonly used by teachers, students, and parents. This app allows messages to be sent in real time to various group sizes. Additionally, messages can be scheduled ahead of time to enhance convenience. Contact information of Remind users is completely confidential and the app does not require users to indicate his or her personal phone number or email address. Remind was founded in 2011 and its headquarters is located in San Francisco, CA.

**Qualtrics**

The pre- and post-study surveys were generated using Qualtrics software, Version (May, 2016). Qualtrics is an online platform for creating and distributing web-based surveys and is widely used for academic research. Data collected from Qualtrics surveys are able to be exported as an SPSS data file and further analyzed.

**Survey**

**Pre-study survey.** The first two questions of the pre-study survey (Appendix D) indicated that the participant gave consent to participate in the study and admitted to owning a cell phone with text messaging capabilities. The next section consisted of questions pertaining to the demographic background of the participants, such as age, sex,
weight, height, ethnicity, living arrangements, class standing, and full-time of part-time classification. Participants were also instructed to complete a 24-hour beverage recall. They were asked to indicate the total number of ounces of water they consumed within the past 24-hours of completing the survey. In addition, they were asked to list each non-water, non-alcoholic beverage consumed, along with the time of day it was consumed, where it was consumed (at home, in dining hall on campus, at restaurant, etc.), if it was consumed with a meal, details/ingredients about the beverage, and the total number of ounces drank. Participants were given one week to complete the study and two reminder emails (Appendix B) were sent throughout the survey period.

**Post-study survey.** The post-study survey (Appendix F) asked the same demographic questions and 24-hour beverage recall that were presented in the pre-study survey. It also contained a section pertaining to the effectiveness of the study and the participants’ attitude towards the daily text messages. They were asked to indicate their motivate for participating in the study and to rate the overall execution of the study. Majority of the questions were based on an adjusted five-point Likert scale. Participants were allotted 11 days to complete the post-study survey, and five reminder messages were sent via Remind throughout the survey period.

**Daily Text Messages**

Participants were sent one text message each day for a period of 30 days. Messages were sent at 11 a.m. in hopes of influencing participants’ beverage choices during the lunch hour. The messages were limited to 140 characters and required words to be abbreviated to allow for enough space to fit the full message. They consisted of
various tips, facts, debunked myths, and nutrition information of multiple non-alcoholic beverages (Appendix E). The messages were comprised of information from the 2015-2020 Dietary Guidelines for Americans, ChooseMyPlate, the Centers for Disease Control and Prevention, and the Food and Drug Administration. Nutrition information of beverages was obtained from the nutrition facts label for that beverage. Participants were not required to respond to the text messages.

**Procedures**

Students received a recruitment email (Appendix A) inviting them to participate in a study that focuses on beverage consumption. The email contained information about the study and instructions for signing up. Students were instructed to sign up to Remind by texting the key word “@KentStateU” to the number 81010. The researcher received a notification when each participant joined the study; the participant was then sent a unique link to an online Qualtrics survey (Appendix D). Participants were given one week to complete the survey and received two reminder messages (Appendix B) to complete the survey before the study began. After the recruitment period, the researcher changed the key word to disable any further participants from joining the study at any time during the 30-day duration. Participants received one text message per day for a total of 30 days. After the 30 days, participants were sent an online link to the post-study survey (Appendix F) and were allotted 11 days to complete it.

**Statistical Analysis**

Analysis of the results was completed using the Statistical Package for Social Sciences (SPSS) version 23. Descriptive statistics (mean, standard deviation, frequency
distribution) was used to analyze demographic data including age, sex, weight, height, ethnicity, living arrangements, class standing, and full-time or part-time classification. The independent variable includes daily text messages consisting of nutrition related information and the dependent variable includes the dietary intake of participants.

Beverages were grouped into the following categories: soda, 100% fruit and/or vegetable juice, milk, coffee/tea, hot chocolate, fruit drinks, and sports drinks. Demographic data was used to match participants’ pre-study 24-hour recall to their post-study 24-hour recall. Based on this information, paired samples t-test was used to compare participant’s total water intake (in ounces) pre-study to total water intake (in ounces) post-study. The same was done for the non-water beverages.
 CHAPTER IV

JOURNAL ARTICLE

Introduction

On average, college students consume approximately 543 calories per day from sugar sweetened beverages alone (West et al., 2006). Research also shows that approximately two-thirds of caffeine consumed by men and women have caloric additives, such as sugar and cream. On average, 53% of men and 41% of women consume regular soda each day (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). Approximately only one third of college student drink milk daily and their average daily consumption of water is about four cups (Driskell, Kim, & Goebel, 2005; LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). These unhealthful beverage habits demonstrated by this population can contribute to weight gain and therefore increase the risk for being overweight or obese and developing hypertension, type 2 diabetes, cardiovascular disease, and some types of cancer later in life (Ludwig, 2011).

Due to the advancement of technology, specifically cell phones, health care professionals have the opportunity to communicate with patients in a more accessible manner. Interventions utilizing Short Message Service (SMS) to communicate nutrition and health related information have been successful in regards to the effectiveness of implementing behavior change among overweight, obese, diabetic, and hypertensive individuals due to the convenient nature of the messages (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013; Wei & Lo, 2006). Current research shows that college students prefer to communicate through SMS due to
its inexpensive, instant, and widely available qualities (Cole-Lewis & Kershaw, 2010; Napolitano, Hayes, Bennett, Ives, & Foster, 2013). In addition, SMS is less intrusive than a mobile phone call and more immediate than an email (Leung, 2007). Research utilizing SMS as an intervention tool is expanding and highlights the effectiveness of a cell phone as being a simple learning instrument in the healthcare field (Bobrow et al., 2014; Markowitz et al., 2014; Sharifi et al., 2013; Steinberg et al., 2013).

The purpose of this pilot study was to determine if a 30-day period of delivering beverage related daily text messages via SMS had an effect on the beverage consumption of college students.

**Methodology**

**Participants**

Upon approval from Kent State University’s Institutional Review Board, a convenience sample of 3,527 email address from Kent State University undergraduate students was obtained from the Registrar office. In addition, flyers were posted around the university’s campus inviting students to participate in the study. Any undergraduate student who owned a cell phone with text messaging capabilities was able to participate in this study. Involvement in the study was voluntary and participants were given the opportunity to opt out from receiving the daily messages at any time during the course of the study.

**Survey**

Questions presented in the survey were created by the researcher and was distributed by an online survey system, Qualtrics. The pre- and post-study surveys
consisted of two sections: (1) demographic questions, (2) 24-hour beverage recall. The post-study survey included an additional section with questions pertaining to participant satisfaction and effectiveness of the study.

**Pre-study survey (Appendix D).** The pre-study survey contains two sections.

*Section 1: background and demographics.* This section consisted of questions pertaining to the demographic background of the participants. Demographic information included: age, sex, weight, height, ethnicity, living arrangements, class standing, and full-time or part-time classification.

*Section 2: 24-hour beverage recall.* This section asked participants to document the total number of ounces of water that they consumed within the past 24 hours of taking the survey. They were also asked to record each non-water, non-alcoholic beverage consumed, along with the time of day it was consumed, where it was consumed, if it was consumed with a meal, details and/or ingredients about the beverage, and the number of ounces drank.

**Post-study survey (Appendix F).** The post-study survey contains three sections.

*Section 1: background and demographics.* This section asked the same demographic questions that were presented in the pre-study survey.

*Section 2: 24-hour beverage recall.* This section asked the same beverage questions that were presented in the pre-study 24-hour beverage recall.

*Section 3: satisfaction questions.* The final section of the post-study survey consisted of questions pertaining to the effectiveness of the study and the participants’ attitude towards the daily text messages. Majority of the questions were based on an
adjusted 5-point Likert scale, where 1 indicated that the participant strongly disagreed and 5 indicated that the participant strongly agreed. Other questions asked respondents to rate the overall execution of the study and to indicate their motive for participating. They were also asked to choose which mode of communication they thought was best for college students given various methods, such as email, social media, text messaging, classroom setting, and mailed brochure.

**Procedures**

Participants received a recruitment email (Appendix A) inviting them to participate in the study. They were instructed to sign up for the study via Remind, an online communication tool that was used by the research to deliver the text messages. Once participants signed up for the study, they were sent a link to the online pre-study survey and were allotted one week to complete it. In addition to the recruitment email, flyers were posted in the dining halls, dormitories, academic buildings, the library, student center, and recreation center on the university’s campus (Appendix C). The random sample of email addresses was obtained from the university and included 3,527 undergraduate students.

The duration of the study was 30 days in length. Remind was utilized by the researcher to send text messages to the participants at 11 a.m. each day, in hopes of reaching students before choosing beverage options during lunch time. They consisted of various tips, facts, debunked myths, and nutrition information of non-alcoholic beverages, such as water, soda, fruit juice and fruit drinks, coffee and tea, and energy drinks.
After 30 days of receiving the text messages, participants were sent an online link to the post-study survey and were allotted 11 days to complete it.

**Data Analysis**

Data analysis was completed using the Statistical Package for Social Sciences (SPSS) version 23. Mean, standard deviation and frequency distribution were used to analyze demographic data. The researcher matched the participants based on their demographic data. Results from analysis of pre- and post-study 24-hour recall were compared using paired samples t-test to assess any statistical significant changes in beverage consumption. Statistical significance was based on a P-value of $\leq 0.05$. The only statistically significant difference in beverage consumption from pre- to post-study was demonstrated in milk consumption. Participants reported drinking a significantly greater amount of milk at the time of the pre-study survey, an average of 5 ounces, than they reported drinking at the time of the post-study survey, an average of 0.5 ounces ($p=.038$).

**Results**

A randomized listserv of 3,527 undergraduate students received an invitation to participate in the study. In addition, recruitment flyers were posted in academic buildings, dormitories, dining halls, the library, student center, and recreation center around the university’s campus. Full participation required participants to follow two steps: 1) sign up for the study via Remind, 2) complete the pre-study survey, including a 24-hour beverage recall and questions pertaining to demographic information. Forty-six students responded to the invitation and signed up for the study via Remind. Of the 46
respondents, seven (15.2%) were removed from the analysis because they did not answer any further questions other than the first two, which gave consent to participate in the study and admitted to owning a cell phone that allowed for incoming text messages. In addition, 13 respondents (28.3%) answered the nine demographic questions but did not provide data in the 24-hour beverage recall. They were also removed from the analysis, which resulted in a sample size of 26 participants for the pre-study survey.

Fourteen of the 26 students (53.8%) who completed the pre-study survey also completed the post-study survey. From the 14 students who completed the post-study survey, the researcher was able to match eight students (57.1%) based on the following demographic data: age, gender, ethnicity, weight, height, class standing, and living arrangements. Information from these eight participants was used in the data analyses and are represented in the results.

**Demographic Data of Participants**

Table 1 highlights the demographic breakdown of the eight matched participants. Two the participants were male (25%) and six were female (75%). All participants (100%) identified their race as Caucasian. One participant was a freshman (12.5%), four were sophomores (50%), two were juniors (25%), and one was a senior (12.5%). Three participants lived on campus in a dormitory (37.5%), three lived off campus in an apartment or house (37.5%), and two lived at home with their parent(s) and/or guardian(s) (25%). The mean age was 20.4±1.5 years. The average weight was 137±27.9 pounds, the average height was 5 feet 5.25 inches, and the average body mass index (BMI) was 22.6, which is considered normal range.
Table 1

*General Characteristics of College Students Receiving Daily Text Messages on Beverage Consumption (N=8)*

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>75</td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>8</td>
<td>100</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>20</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>21</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>22</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>23</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Class Standing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Sophomore</td>
<td>4</td>
<td>50</td>
</tr>
<tr>
<td>Junior</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>Senior</td>
<td>1</td>
<td>12.5</td>
</tr>
<tr>
<td>Living Arrangements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-campus</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>Off-campus</td>
<td>3</td>
<td>37.5</td>
</tr>
<tr>
<td>At home with parent(s)/guardian(s)</td>
<td>2</td>
<td>25</td>
</tr>
</tbody>
</table>

**Comparison of Pre- and Post-Study Beverage Consumption**

Table 2 compares mean fluid ounces of pre- and post-study beverage consumption among the eight matched participants. Statistical significance was based on a P-value of ≤0.05. The only significant difference in beverage consumption was demonstrated in milk consumption. Students reported drinking a significantly greater amount of milk at the time of the pre-study survey, 5 ounces, than their reported intake at the time of the post-study survey, 0.5 ounces (P = .038).
Table 2

Comparison of Pre- and Post-Study Beverage Consumption Among Participants who Completed 30-day Text Messaging Study (Mean±SD)*

<table>
<thead>
<tr>
<th>Beverage</th>
<th>Pre-Study</th>
<th>Post-Study</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>48±25.1</td>
<td>51.5±30.5</td>
<td>.677</td>
</tr>
<tr>
<td>Soda</td>
<td>1±2.8</td>
<td>0±0</td>
<td>.351</td>
</tr>
<tr>
<td>100% Juice</td>
<td>3±8.5</td>
<td>1.5±4.2</td>
<td>.685</td>
</tr>
<tr>
<td>Milk</td>
<td>5±5.9</td>
<td>0.5±1.4</td>
<td>.038***</td>
</tr>
<tr>
<td>Coffee/Tea</td>
<td>19.5±39.1</td>
<td>3±5.9</td>
<td>.216</td>
</tr>
<tr>
<td>Energy Drink</td>
<td>1±2.8</td>
<td>0±0</td>
<td>.351</td>
</tr>
<tr>
<td>Hot Chocolate</td>
<td>1±2.8</td>
<td>0±0</td>
<td>.351</td>
</tr>
<tr>
<td>Fruit Drink</td>
<td>3±8.5</td>
<td>0.5±1.4</td>
<td>.448</td>
</tr>
<tr>
<td>Sport Drink</td>
<td>0±0</td>
<td>0±0</td>
<td>N/A</td>
</tr>
<tr>
<td>Total Fluid</td>
<td>74±49.9</td>
<td>44.13±37.3</td>
<td></td>
</tr>
</tbody>
</table>

*Mean±SD displayed in fluid ounces based on participants’ self reported 24-hour recalls
**Pre-study intake reflects beverages consumed prior to 30-day study; post-study intake reflects beverages consumed after 30-day study
***Show t-test statistical significance, where statistical significance was set at P≤0.05

Post-study Satisfaction Questions

The post-study contained a section that pertained the effectiveness of the daily messages and the students’ satisfaction with the content provided. Fourteen participants answered the 11 questions.

Questions one and two specifically asked about the effectiveness of the daily text message. Chi-Square test was used to analyze the responses, which are shown in Table 3. Distribution of the responses from questions one and two was not significantly different based on the data analysis. Majority of respondents (57.1%) thought the daily text messages were effective in influencing their beverage choices. Furthermore, they
thought the timing and number of messages also had an effect on their choices. One respondent (7.1%) did not think the messages were effective and five (35.7%) remained neutral in their opinion.

Table 3

Response from Participants who Completed 30-day Text Messaging Study Post-Study

Satisfaction Questionnaire: Effectiveness of Daily Text Messages (N=14)

<table>
<thead>
<tr>
<th></th>
<th>Not Effective % (n)</th>
<th>Neutral n (%)</th>
<th>Effective n (%)</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1: How effective were the daily text messages in influencing your beverage choices?</td>
<td>7.1 (1)</td>
<td>35.7 (5)</td>
<td>57.1 (8)</td>
<td>14</td>
<td>.071</td>
</tr>
<tr>
<td>Q2: How effective were the timing and amount of text messages in influencing your beverage choices?</td>
<td>7.1 (1)</td>
<td>35.7 (5)</td>
<td>57.1 (8)</td>
<td>14</td>
<td>.071</td>
</tr>
</tbody>
</table>

Questions three, four, and five asked the participants questions pertaining to their behavior. Chi-Square test was used to analyze responses, which are highlighted in Table 4. Statistical significance was based on a P-value of ≤0.05. Significantly more respondents reported “likely” than expected for questions three (P= .033), four (P= .010), and five (P= .046). Eleven participants (78.6%) reported that they would be likely to use the information they learned during the 30-days in their future beverage choices. Three (21.4%) remained neutral in their opinion and no respondents reported “not at all likely.”
In addition, 71.4% stated that they are likely to changes their choices because of the information that was presented in the messages. Two participants (14.2%) are not likely to change their choices and two (14.2%) did not feel strongly, negatively or positively, about their behavior change. Nine participants (64.3%) would encourage a friend or family member to participate in this study, while two (14.3%) reported a neutral opinion.

Table 4

Response from Participants who Completed 30-day Text Messaging Study Post-Study

Satisfaction Questionnaire: Likeliness of Participants to Alter Behavior based on Daily Text Messages (N=14)

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all likely</th>
<th>Neutral</th>
<th>Likely</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q3: How likely will you be to use the information you learned in your future beverage choices?</td>
<td>0 % (0)</td>
<td>21.4 (3)</td>
<td>78.6 (11)</td>
<td>14</td>
<td>.003*</td>
</tr>
<tr>
<td>Q4: How likely are you to change your beverage choices based on the information presented in the daily text message?</td>
<td>14.3 (2)</td>
<td>14.3 (2)</td>
<td>71.4 (10)</td>
<td>14</td>
<td>.010*</td>
</tr>
<tr>
<td>Q5: How likely would you be to encourage a friend or family member to participate in this study?</td>
<td>14.3 (2)</td>
<td>21.4 (3)</td>
<td>64.3 (9)</td>
<td>14</td>
<td>.046*</td>
</tr>
</tbody>
</table>

*Show chi-square statistical significance, where statistical significance was set at P≤0.05
Question six explored how motivating the messages were in helping the participants adopt healthy/healthier beverage choices. All respondents thought the messages were motivating. When asked if they learned new information from the messages in question seven, majority of students (92.9%) answered “yes” and one answered “no.”

Question eight surveyed which mode of communication college students most prefer. Ten participants (71.4%) stated that text messaging is the best way to communicate with students. One (7.1%) reported email, and three (21.4%) reported social media (Facebook, Twitter, Instagram, etc.). Zero respondents reported classroom setting or mailed brochure as being an effective communication tool.

Question nine asked the participants to rate the overall execution of this study. No respondents thought the study was terrible or not at all helpful, four (28.6%) thought the study was “ok, but needs improvement,” two (14.3%) answered neutral and therefore did not feel strongly one way or the other about the study. Five (35.7%) thought the study was good with needing few improvements and three participants (21.4%) stated that the study was excellent and did not need any improvements.

Question 10 asked “what was your major motive for participating in this study?”. Respondents were able to choose all answers that apply. Six (42.8%) answered “learn more about nutrition information of different beverages,” one (7.1%) answered “decrease sugar intake,” seven (50%) answered “increase water intake,” and two (14.3%) answered “choose healthier beverage options.” No respondents answered “decrease caloric intake.”
The last question allowed respondents to free text any additional comments they may have had regarding the study. No responses were displayed in this section upon completion of the survey.

**Discussion**

For decades, technology has been evolving. The telephone has rapidly transformed and is possibly the most demanding mode of communication. It is considered an essential component of everyday life and is used by individuals all over the world. Cell phones are commonly used for more than just making phone calls. They provide constant connectedness and immediate access to the Internet through features like text messaging, social media apps, FaceTime, etc. (Fjelsdoe, Marshall, & Miller, 2008). Recently, they have also been utilized by health care providers in presenting a wide range of services, which are now being explored in emerging research (Cole-Lewis & Kershaw, 2010). However, very few studies provide insight on the use of text messaging to provide beverage related information to specifically college students. The aim of this study was to determine if daily text messages of beverage related information had an effect on the beverage consumption of college students.

Results of this study showed that beverage consumption in this population did not significantly change after the 30-day period, therefore, the research hypothesis was rejected. Regardless, important findings have emerged from this study. One specific finding was the population’s preference for using text messaging as a communication tool for health related information.
Fluid Recommendations for Adults

Fluid intake is essential to the human body and is required for all tissues. Fluids fill almost every space in and between cells and are needed for all reactions in the body (Balaghi, Faramarzi, Mahdavi, & Ghaemmaghami, 2011). Fluid needs vary from individuals and are based on multiple factors, including activity level, chronic conditions, illness, pregnancy and breastfeeding, age, body weight, environmental factors, and hydration status. Daily fluid requirements can be calculated based on caloric intake (1 ml/kcal) and body weight (25-35 ml/kg of usual body weight) for adults living under average conditions of energy expenditure and environmental exposure (Charney, 2008; Kleiner, 1999).

Thirst, taste, beverage choice, and environmental factors such as temperature, altitude, and humidity can affect hydration status (Kleiner, 1999). Dehydration occurs when there is a 1% or greater loss of body weight as a result of fluid loss from the intracellular compartments (Thomas et al., 2008). Mild dehydration can lead to impaired several physiological and performance responses. Furthermore, dehydration of 3% to 5% of body weight can have a negative effect on endurance and strength and most commonly causes heat exhaustion (Kleiner, 1999). Other common consequences of dehydration include constipation, delirium, delayed wound healing, renal failure, myocardial infarction, seizures, and infections (Thomas et al., 2008).

Research dating back to 1977-1978 when the Nationwide Food Consumption Survey was conducted, found that Americans consume 674 ml of drinking water and 1,022 ml of other beverages per day, equaling to a total fluid intake of 1,696 ml per day.
Furthermore, 47% of the total drinking fluid came from coffee (396 ml), tea (152 ml), soft drinks (179 ml), and alcohol (70 ml) (Valtin, 2002). Previous research has found that the total mean intake of drinking fluids in undergraduate college students is 818±29 ml for females and 1147±57 ml for males (Balaghi, Faramarzi, Mahdavi, & Ghaemmaghami, 2011). Data from the current study shows that participants’ total mean drinking fluid intake is 74±49.9 ounces at the time of the pre-study and 44.13±37.3 ounces at the time of the post-study. Both of these averages are less than the average college student intake.

**Beverage Consumption Among College Students**

For the purpose of this study, beverage consumption focused on water, soda, 100% fruit and/or vegetable juice, milk, coffee and tea, energy drinks, sports drinks, and fruit drinks.

**Water.** Water makes up 55% to 65% of body mass and is essential for maintaining multiple physiological functions (Thomas et al., 2008). It is an essential nutrient because it is needed in amounts that are greater than the body is able to produce. In normal adults, the average daily turnover of water is approximately 4% of total body weight, which is lost through perspiration, the lungs and skin, urine and stool (Thomas et al., 2008).

The Beverage Guidance Panel provides guidance on the nutritional benefits and risks of various beverages. It ranks beverages into six different categories, ranging from ones that should be consumed most frequently to ones that should be consumed in limited quantities (Popkin, Armstrong, Bray, Caballero, Frei, & Willett, 2006). Water is listed as
the number one beverage; it is recommended that males drink 13 cups and women drink nine cups daily in the form of noncaffeinated and nonalcoholic beverages (Institute of Medicine and Food and Nutrition Board, 2004; Kleiner, 1999). However, research shows that college students drink an average of four cups per day (Diskell, Kim, & Goebel, 2005; LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). The total intake of water of the participants of the preset study at the times of the pre-study and post-study survey was greater than the intake of the average American, although they do not meet the recommended daily amount (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011).

Researchers from a previous studies found that participants most commonly preferred to drink water above all other beverage options (Attila & Cakir, 2011). This conclusion is in conjunction with the students from the present study. Furthermore, their major motive for enrolling in this study was to increase their water intake. From this data alone, it can be suggested that college students desire to adopt healthier beverage habits, beginning with increasing their water consumption.

**Milk.** With the steady increase of SSB consumption, it is no surprise that milk intake has decreased in Americans by 38% between the years 1977 and 2001 (Sharkey, Johnson, & Dean, 2011). Research shows that 24% of men and 23% of women 20 years and older drink milk at least once daily (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). In the present study, approximately half of college students drank at least one serving of milk at the time of the pre-study survey. This statistic is greater than the national average. In comparison, milk consumption decreased at the time of the post-study survey and only one participant (12.5%) reported drinking less than one serving of
milk. This statistic is more consistent with data that shows approximately one quarter of college students drink milk daily (Driskell, Kim, & Goebel, 2005).

One possibility for the demonstrated decrease in milk consumption from pre- to post-study may be due to drinking patterns. It is unknown which day of the week participants completed their 24-hour beverage recall. Some individuals may have different drinking patterns on the weekday compared to the weekend and therefore conclusions cannot be drawn from the absence of this data.

Sugar sweetened beverages. Sugar sweetened beverages (SSBs) are defined as drinks that contain caloric sweeteners. Examples include non-diet soft drinks/soda, flavored juice drinks, sports drinks, sweetened tea, coffee drinks, energy drinks, and electrolyte replacement drinks. These beverages provide little to no nutritional value and lack strong satiety properties (Huffman & Smith West, 2007). From the years 1977 to 2011, intake of SSBs has increased by 135% (Sharkey, Johnson, & Dean, 2011). On average, college students consume an additional 543±671 calories per day from sugar sweetened beverages (West et al., 2006). In addition, a high intake of these beverages is linked to increased consumption of energy from added sugars and carbohydrates along with a decreased intake of fiber, water, and low-fat milk (Bermudez & Gao, 2010).

Soda. Regular soft drinks are among the top five sources of calories for individuals 19 years and older (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). They are the most frequently consumed beverage by college students and are the main source of sugar sweetened beverages (Huang et al., 1994; West et al., 2006). The average can of soda contains 40 to 50 grams of added sugar, equaling to approximately 150
calories (Apovian, 2004). The added calories from these beverages can increase the risk for metabolic syndrome, hypertension, diabetes, some types of cancer, heart disease, and obesity (Lustig, Schmidt, & Brandis, 2012). For each additional sugar-sweetened beverage consumed per day, the risk of becoming obese is increased by 1.6 times (Ludwig, Peterson, & gortmaker, 2001).

In the current investigation, one student reported drinking eight ounces of soda at the time of the pre-study survey. However, it is not indicated whether this soda was regular or diet. In comparison, at the time of the post-study, no students reported drinking any soda. These numbers are much lower than the 19% of men and 23% of women who drink diet soda each day and the 53% of men and 41% of women who drink regular soda each day (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). Participants from the present study may have had a lower intake of soda because they may be aware of the health risks associated with soda consumption.

**Coffee/tea.** Scientific data of coffee and tea are somewhat conflicting. Much research highlights that the caffeine found in coffee acts as a cardiac stimulant, especially to those who are prone to arrhythmias. It is also associated with reflux and may raise cholesterol levels if unfiltered. On the other hand, coffee has been found to prevent type 2 diabetes and protect against chronic liver disease (Peterson, 2007). Research on the health benefits of tea show that it may reduce the risk of type 2 diabetes, lower LDL cholesterol and triglycerides and therefore reduce the risk of CAD. However, majority of studies concluded that these protective qualities were found when 4 or more cups are
consumed each day (Silva Pinto, 2013). Nonetheless, the health benefits of coffee and tea decrease when sugar and cream are added due to the addition of calories and fat.

In total, half of participants in the present study recorded drinking coffee and/or tea at the time of the pre-study survey and only a quarter drank coffee/tea at the time of the post-study survey. These quantities are slightly greater than previous data that states an estimated 40% of men and women drink coffee and/or tea each day (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). Although the participants of the present study were not asked to document their motive for consuming coffee and tea, it is possible that they had a greater intake of coffee than the national average due to the nature of the college setting. Perhaps the participants consumed coffee to increase focus on studying and classwork, or to provide a morning jolt, to relieve stress, or because they simply enjoyed the taste of it. It is also possible that participants chose to obtain caffeine from coffee and tea rather than soda or energy drinks in effort to offset their soda and energy drink consumption.

Less than half (38%) of the documented coffee and tea beverages contained an unknown amount of sugar and/or half and half creamer and less than a quarter (15%) of beverages were unsweetened. These results are not consistent with previous research that stated two-thirds of caffeine consumed by men and women have caloric additives and one-third do not (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). However, it is unknown to the researcher if the other 46% of coffee and/or tea drinks that were consumed did or did not have sugar or creamer added to them.
Specialty coffee drinks, such as lattes, macchiatos, mochas, cappuccinos, and frappes provide a significant amount of calories, fat, and sugar. A small serving topped with whipped cream and caramel drizzle is packed with 420 calories, 17 grams of fat, and 53 grams of sugar. Although only one female participant in the present study reported a consumption of a specialty coffee drink, a Caramel Frappe at the time of the pre-study survey, consumption of these beverages has been dramatically increased in the college student population. One particular study conducted by Shieldd, Corrales, and Metallinos-Katsaras found that specifically college women consume 206 more calories per day from specialty coffee drinks compared to non-specialty coffee drinkers (2004).

In effort to prevent excess caloric intake from these beverages, it is important to provide proper education on the nutrition information of these beverages. It is possible that consumers may not be aware of the sugar and fat content hidden within them. If they are aware of the nutritional content, it is possible that they may not fully understand the health risks associated with them. Therefore, it is likely that consumer awareness may alter the drinking trends of specialty coffee beverages.

**Energy drink.** Energy drinks are commonly consumed by college students most likely because of their influential advertising and marketing strategies. They are promoted for their stimulating effects, which claim to increase attention, endurance and performance and even assist in weight loss (Reissig, Strain, & Griffiths, 2009). Specifically, college students consume energy drinks to feel more energetic while studying, to compensate for insufficient sleep, and to treat a hangover (Attila & Cakir, 2011). The caffeine content in these drinks range from 80 mg to 505 mg per ounces of a
bottle or can. Because of the high caffeine content found in some of these beverages, there is an increased risk of caffeine intoxication. Negative side effects associated with energy drinks include jolt and crash episodes, sleep disturbance, caffeine dependence, caffeine withdrawal symptoms, and dehydration (Reissig, Strain, & Griffiths, 2009).

Results from the present study are similar with previous research regarding energy drink consumption in college students. Researchers have found that majority of individuals drank less than or equal to one bottle of energy drink per day and only a small percentage drank more than two bottles per day (Attila & Cakir, 2011). Another study by West et al., found that only 6% of participants reported daily consumption of energy drinks (2006). Majority of participants from the present study did not drink any type of energy drink except for one participant who consumed an eight ounce serving of sugar free Redbull at the time of the pre-study survey. At the time of the post-study, no participants reported drinking any type of energy drink and therefore the mean ounces consumed was zero.

**Sport drink.** Sports drinks are beverages that contain a combination of water and electrolytes, such as sodium and potassium. These beverages are specifically targeted to athletes, ranging from 18 to 35 years, because of their fluid replacement capabilities. They also claim to boost sports performance and endurance (Nesli, Selen, & Gulgun, 2010). Research focusing on sports drinks is tailored towards athletes and therefore, little is focused on the general population. One research study conducted by Nesli, Selen, and Gulgun found that majority of participants rarely consumed sports drinks and only a small percentage reported drinking them every day. Their main reason for sports drink
usage was to replenish fluid deprivation (2010). Data from the present study found that no participants reported drinking any type of sports drink at the times of both the pre-study and post-study survey. It is unknown if this result is consistent with other research since there is minimal data focusing on sports drink consumption in the non-athletic college student population.

**Fruit drink/100% fruit and/or vegetable juice.** Fruits drinks and 100% fruit and/or vegetable juice are greatly different based on ingredients and nutrients. Juice that is labeled as 100% contains only the fruit and/or vegetable that it is made from; it does not contain any added sugar, sweeteners, or calories. Fruit drinks contain added sugar, calories, and preservatives and contain little nutritional value for the amount of calories that they provide (Duffey & Popkin, 2007). Regardless, they are commonly marketed as healthy beverages and are often perceived as such (West et al., 2006). Popular brands include Hawaiian Punch, Hi-C, Kool-Aid, Snapple, Country Time Lemonade, Sunny Delight, etc. Only one student from the present study reported drinking any type of fruit drink at the time of the pre-study and at the time of the post-study survey. This result is lower compared to previous research that states more than a quarter of college students consumed fruit drinks daily, contributing to an additional 250 calories (West et al., 2006).

Approximately a quarter of men and women drink 100% fruit and/or vegetable juice per day, with the average intake being about one-half cup (LaComb, Sebastian, Wilkinson Enns, & Goldman, 2011). One student from the current study drank six times the average amount of 100% at the time of the pre-study and three times the average amount at the time of the post-study. Although 100% juice is considered a serving of
fruit and/or vegetable, research suggests that moderate amounts should be consumed (Dietary Guidelines for Americans, 2015).

**Text Message Related Studies**

Given the rise of technology, much research has used SMS to execute health related interventions. One specific smoking cessation study used text messaging to send smoking cessation advice, support, and coping mechanisms. Messages contained information that was relevant to quitting, such as expected symptoms, weight maintenance tips, avoidance of smoking triggers, breathing exercises, motivational support, and success stories. Researchers found that more participants who were placed in the intervention group had quit smoking at six weeks of the intervention compared to their counterparts in the control group. As a final result, the researchers concluded that a smoking cessation program using text messages can double individuals’ quit rate after six short weeks (Rodgers et al., 2005).

A diabetes self-management study found an improvement in hemoglobin A1C levels and an overall improvement in lipid levels (Kwon et al., 2004). Another study that used SMS to deliver blood pressure related information found that SMS clinically and statistically reduced blood pressure after eight weeks (Shaw & Bosworth, 2012). Results from these studies conclude that SMS interventions can influence positive behavior changes.

The duration of the present study was similar to several studies that utilized text message interventions. One study focusing on diabetes management in teens and young adults sent daily motivational messages for 30 days and requested responses by the
participants to 14 additional messages (Markowitz et al., 2014). Another study sent two texts per week for seven weeks to promote better dietary choices in college students (Brown, O’Connor, & Savaiano, 2014). In comparison, another study focusing on weight control in women aged 25 to 50 years sent four messages each day for 12 months (Steinberg, Levine, Askew, Foley, & Bennett, 2013).

Most studies, except for one that included 10 participants, had larger sample sizes than the current investigation. A review of 14 studies show that the average population size for text messaging interventions is approximately 250 participants and may be as large as 1,705 (Fjeldsoe, Marshall, & Miller, 2009). Researchers found statistically significant results in majority of these studies, likely due to their larger sample sizes. If the present study had a sample size that was consistent with current research, rather than eight participants, the results from this study may have had statistical power to show significance.

**Satisfaction Survey**

Although beverage consumption did not change from pre- to post-study, most participants agreed that the text messages were effective motivators for influencing their beverage choices. They also stated that their main motive for participating in the study was to develop health beverage habits. Additionally, they would recommend this study to a family member or friend. The discrepancy between the lack of statistical power in the results and the participants’ positive statements is likely due to the small sample size of the study. The second set of data collection occurred during finals week, which may be the main reason for the low response rate. It is possible that students may have been
distracted with final exams and projects and may not have wanted to take their time away from studying to complete the survey. If the sample size had been larger, the results may have shown statistical significance and further conclusions about their beverage choices could be made.

The positive attitudes from the participants in the present study are similar to responses in current research. Researchers from previous studies show that majority of participants felt motivated by the text messages and were influenced to make positive behavior changes based on the information provided (Brown, O’Connor, & Savaiano, 2014; Markowitz et al., 2014). Furthermore, almost all of participants agreed that text messages were most effective in communicating health related information (Brown, O’Connor & Savaiano, 2014). Sharifi et al., concluded that their participants preferred text messaging over all other forms of communication due to its immediacy and convenience (2013). Participants of the present study also chose this method of communication when given the option to choose between email, social media, classroom setting, and mailed brochure. Overall, college students have a positive attitude towards text messaging and consider it the best method for delivering health related information.

When asked to rate the overall success and motivation of the study, participants were pleased with the overall execution of it. Most thought the study needed only few improvements and gave it an overall “good” rating. These findings are consistent with responses from a study conducted by Brown, O’Connor & Savaiano where majority of their participants stated that the design of the study needed few to no improvements (2014).
Limitations

There are a number of limitations to this study. First, the study was limited by the sample. A convenience sample of undergraduate students from one Midwestern university was used. Majority of the sample identified themselves as female (75%) and all participants identified themselves as Caucasian (100%). Because of the specific demographics of this sample, the findings may not be generalizable to college students across the United States. Additionally, lack of motivation by participants to complete the pre- and post-study surveys may have also affected the sample size since students were given only a short period of time to complete both surveys. Future studies should try to reach a population with a wide range of demographic backgrounds and allow more time for survey periods.

Secondly, the study was limited by participants’ self-reported 24-hour beverage recalls. Majority of respondents did not fully complete the beverage recall and left most questions blank, and therefore had to be removed from the data set. It is possible that respondents did not document their beverage intake correctly or may have misjudged their total consumption. Details pertaining to beverage ingredients and total amount consumed were often omitted, which made it challenging for the researcher to correctly place the beverages into categories for analysis. Future studies should explore different techniques for administering surveys to ensure accuracy of the data.

Lastly, the questionnaire used to survey participants was not validated. Questions were modified from multiple surveys and were also developed by the researcher. Additionally, the survey was not pre-tested prior to administering and therefore was not
tested for errors. Researchers in future studies should use a validated survey to obtain information on beverage consumption of college students.

Applications

The current study provides information regarding the use of text messaging to deliver health related information to college students. Important implications for registered dietitians and other health care professionals are derived from this study. This study, along with previous research, supports the fact that college students prefer to communicate health related information via SMS (i.e. text messaging). They are in favor of text messaging over other modes of communication, such as searching the Internet, receiving email communication, and through social media. Therefore, it would be wise for health care professionals, especially dietitians, to use text messaging when communicating with the college student population.

In addition to health care professionals utilizing SMS interventions, dietetic professors on college campuses can use this method of communication to conduct their own research studies. They could incorporate a semester long study into their class objectives and collect data based on students’ beverage intake at the beginning of the semester and compare it to their beverage intake at the end of the semester. Utilizing SMS to communicate with students outside the classroom would be an immediate and convenient method for influencing behavior change.

Collecting information on the beverage intake of college students can be especially important of this population. It could give insight to health care professionals and universities about the types of beverages students drink and if they meet their
recommended fluid needs. Programs and informational handouts, posters, announcements, etc. can be tailored towards the types of beverages college students do and do not consume. In addition, professors, coaches, and health care professionals can teach about the effects of dehydration in everyday life. It can also be used with student athletes as a reminder to stay hydrated throughout the day.

Conclusion

The current study provides much information on the beverage choices of college students. Additionally, it gives insight to nutrition professionals regarding the attitudes of this population towards using text messaging as a form of communication to deliver health related information. Although the results did not show statistical significance in influencing beverage consumption, except for milk consumption, it does highlight the positive attitude of college students towards text messaging.

This is one of the first studies to facilitate change in beverage consumption amongst college students using text messaging. Previous research utilizing this form of communication support the fact that these types of interventions can have long lasting effects. However, further research is needed to investigate the effect of text messaging on beverage consumption of college students.
APPENDICES
APPENDIX A

RECRUITMENT EMAIL
Appendix A

Recruitment Email

Dear Kent State University student,

My name is Amy Coyle and I am a graduate student here at Kent State University, working towards my master’s degree in nutrition and dietetics. I am researching information on beverage consumption of college students. I am inviting you to participate in a research study that will utilize current technology to prevent diet-related chronic diseases later in life.

The purpose of this experimental study is to determine if daily text messages displaying information of various non-alcoholic beverages has an effect on the beverage consumption of college students. This 30-day study will give you immediate access to tips, facts, debunked myths and nutrition information of various beverages. Each day you will receive 1-2 text messages; the first message will be sent at 11 a.m. and the second at 8 p.m. The messages will be no more than 140 characters in length.

If you want to join the study, please text the key word “@KentStateU” to 81010 using your mobile phone. By doing so, you will be further a link to a short (10-12 minutes) online survey. The online survey will ask 10 basic demographic questions followed by a short 24-hour recall focusing on just beverage consumption. After completion of the survey and 24-hour recall, you will be enrolled in the 30-day study. Text messages will be sent through a free communication tool called Remind. Remind allows users to safely and efficiently communicate. Personal information will be kept completely confidential to ensure privacy and safety of all participants. Please note it is
not required that you own a smartphone to participate in this study. However, it is necessary that you are able to receive incoming texts. You will not be required to reply to the messages. Standard data fees and text messaging rates may apply based on your plan with your mobile phone carrier.

Your participation is voluntary and you have the choice to stop the survey and/or 24-hour recall any time you wish. You also have the choice to opt out of the daily text messages any time during the 30-day period. This questionnaire is completely confidential and your name will not be associated with any of the results.

Thank you in advance for your participation and cooperation. Your time and efforts are greatly appreciated and extremely helpful in the completion of this study. If you have any questions, please email me (acoyle1@kent.edu).

By continuing this survey, you are hereby implying consent.

Thank you,

Amy Coyle
Dear student,

My name is Amy Coyle and I am a graduate student and dietetic intern at Kent State University, working towards my master’s degree in Nutrition and Dietetics. This is a friendly reminder if you have not already done so, please take a moment to join my research study regarding beverage consumption amongst college students. **If you have already completed the survey/24-hour recall and joined this study, please disregard this email and no further involvement is necessary.** Please text the key word “@KentStateU” to the number 81010. By doing so, you will be further sent a like to a short (10-12 minutes) online survey. The online survey will ask 10 basic demographic questions followed by a 24-hour recall focusing on just beverage consumption.

Participation in this study is completely voluntary and **fully confidential.** There is no personal identifiable information associated with your responses to any of the questions in the survey or 24-hour recall. Your participation is necessary to further research this area. Thank you in advance for your time and participation in this study. Thank you in advance for your time and participation in this study. If you have any questions, please email me (acoyle1@kent.edu).

Thank you,

Amy Coyle
APPENDIX C

RECRUITMENT FLYER
Every Sip Counts!

Trying to cut back on sugar consumption? Looking to decrease excess calories? Free information is right at your finger tips!

Researchers at Kent State are looking for undergraduate KSU students to participate in a study that is related to non-alcoholic beverage consumption.

What is the purpose? To provide students with tips, facts, debunked myths and nutrition information of various non-alcoholic beverages.

Who is eligible to participate? Undergraduate KSU students, 18 years and older.

What is required? Participants must own a cell phone that allows for incoming text messages. It is not required that you own a smart phone.

Details about the study: Participants will receive 1-2 text messages each day that relate to non-alcoholic beverages. Each message will be no more than 140 characters in length and will display tips, facts, debunked myths and nutrition information of various beverages. You will not be required to reply to the messages.

For more information
Text the key word "@KentStateU" to 81010.
Once you have contacted this number, you will be sent further instructions about the study.
APPENDIX D

PRE-STUDY SURVEY
Appendix D

Pre-Study Survey

Part 1: Consent Form

Thank you for participating in my research study regarding beverage consumption amongst KSU students. The purpose of this study is to determine if daily text messages displaying information of various non-alcoholic beverages has an effect on the beverage consumption of college students. The following survey will ask basic demographic questions followed by a short 24-hour recall focusing on just beverage consumption. After completion of the survey and 24-hour recall you will receive daily text messages beginning April 3 through May 2, 2016. Text messages will be sent through a free communication tool called Remind. Remind allows users to safely and efficiently communicate. Personal information will be kept completely confidential to ensure privacy and safety of all participants.

Please note it is not required that you own a smartphone to participate in this study. However, it is necessary that you are able to receive incoming texts. You will not be required to reply to the messages. Standard data fees and text messaging rates may apply based on your plan with your mobile phone carrier. Your participation is voluntary and you have the choice to stop the survey and/or 24-hour recall any time you wish. You also have the choice to opt out of the daily text messages any time during the 30-day period. This questionnaire is completely confidential and your name will not be associated with any of the results.
1. Do you agree to participate in this study?
   a. Yes
   b. No \( \rightarrow \) go to end of survey

Part 2: Demographic Characteristics

1. Do you own a cell phone that allows for incoming text messages?
   a. Yes
   b. No \( \rightarrow \) go to end of survey

2. What is your current class standing?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior
   e. Graduate \( \rightarrow \) go to end of survey

3. What is your age? ______

4. Sex:
   a. Male
   b. Female
   c. Other

5. What is your height in feet and inches? ______

6. What is your weight in pounds? ______

7. Ethnicity:
   a. Caucasian (non-Hispanic)
   b. African American (non-Hispanic)
   c. Asian
   d. Latino or Hispanic
   e. Native American
   f. Other: ______
   g. Choose not to answer

8. What is your current living arrangements?
   a. On-campus
   b. Off-campus
   c. At home with parent (s)

9. Are you a full-time (12 or more credits) or part-time student?
   a. Full-time
b. Part-time

Part 3: 24-hour Beverage Recall

1. How many ounces of water (plain and flavored) did you drink within the past 24 hours? 1 cup = 8 ounces: _______

2. The following is a sample description of another student’s 24-hours recall. Following this sample, you will be asked a series of questions of which you will list each non-alcoholic beverage you drank within the past 24 hours. Please refer to this sample if you need guidance.

<table>
<thead>
<tr>
<th>Time</th>
<th>Place</th>
<th>Meal</th>
<th>Beverage</th>
<th>Details/Ingredients</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 am</td>
<td>Home</td>
<td>Breakfast</td>
<td>Milk</td>
<td>1% low-fat</td>
<td>8 oz</td>
</tr>
<tr>
<td>11 am</td>
<td>Campus</td>
<td>Snack</td>
<td>Fruit Smoothie</td>
<td>Made with frozen strawberries and blueberries, 1 banana and frozen yogurt</td>
<td>16 oz</td>
</tr>
<tr>
<td>2 pm</td>
<td>Home</td>
<td>Snack</td>
<td>Fruit and Vegetable Juice</td>
<td>Naked, 100%, Green Machine</td>
<td>10 oz</td>
</tr>
<tr>
<td>4 pm</td>
<td>Wendy's</td>
<td>Lunch</td>
<td>Regular Pepsi</td>
<td>Fountain Drink</td>
<td>12 oz</td>
</tr>
<tr>
<td>6 pm</td>
<td>Vending machine</td>
<td>Dinner</td>
<td>Gatorade</td>
<td>Lemon Lime</td>
<td>20 oz</td>
</tr>
<tr>
<td>9 pm</td>
<td>Home</td>
<td>Snack</td>
<td>Iced tea</td>
<td>Sweetened with 2 teaspoons sugar</td>
<td>8 oz</td>
</tr>
</tbody>
</table>

Total Water for the day: 40 oz
Please list the first non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<tr>
<th>Beverage #1</th>
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<tbody>
<tr>
<td><strong>Time of Day</strong></td>
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<td><strong>Place</strong></td>
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<td><strong>Meal</strong></td>
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<tr>
<td><strong>Beverage</strong></td>
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<tr>
<td><strong>Details/Ingredients</strong></td>
</tr>
<tr>
<td><strong>Amount in ounces (1 cup = 8 ounces)</strong></td>
</tr>
</tbody>
</table>

Please list the second non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #2</th>
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<td><strong>Time of Day</strong></td>
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<td><strong>Place</strong></td>
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<td><strong>Meal</strong></td>
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<tr>
<td><strong>Beverage</strong></td>
</tr>
<tr>
<td><strong>Details/Ingredients</strong></td>
</tr>
<tr>
<td><strong>Amount in ounces (1 cup = 8 ounces)</strong></td>
</tr>
</tbody>
</table>
Please list the third non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #3</th>
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<td>Time of Day</td>
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<td>Meal</td>
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<tr>
<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</tbody>
</table>

Please list the fourth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #4</th>
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<td>Time of Day</td>
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<td>Place</td>
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<td>Meal</td>
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<tr>
<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
</tr>
</tbody>
</table>
Please list the fifth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #5</th>
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<td>Meal</td>
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<tr>
<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup = 8 ounces)</td>
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</tbody>
</table>

Please list the sixth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup = 8 ounces)</td>
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</table>
Please list the seventh non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup=8 ounces)</td>
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Please list the eighth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup=8 ounces)</td>
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</table>
Please list the ninth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td><strong>Beverage</strong></td>
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<td><strong>Details/Ingredients</strong></td>
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<td><strong>Amount in ounces (1 cup=8 ounces)</strong></td>
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</table>
Please list the tenth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup= 8 ounces)</td>
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Please list the eleventh non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup= 8 ounces)</td>
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</table>
Please list the twelfth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup=8 ounces)</td>
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Please list the thirteenth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #13</th>
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<td>Meal</td>
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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</table>
Please list the fourteenth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</tbody>
</table>

Please list the fifteenth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<thead>
<tr>
<th>Beverage #15</th>
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<tbody>
<tr>
<td>Time of Day</td>
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<tr>
<td>Place</td>
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<tr>
<td>Meal</td>
</tr>
<tr>
<td>Beverage</td>
</tr>
<tr>
<td>Details/ingredients</td>
</tr>
<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</tbody>
</table>
APPENDIX E

DAILY TEXT MESSAGES
Appendix E

Daily Text Messages

Day 1. (4/3): Limit sugary beverages (soda, fruit drinks, swtnd coffee/tea) to special occasions or enjoy as a treat- avoid making them part of your daily intake.

Day 2. (4/4): Water has many health benefits & contains 0 calories. Utilize the water fountains on campus to refill a water bottle. Keep hydrated!

Day 3. (4/5): Skip the heavy cream and add milk to your AM coffee or tea. Saves approx 47 calories!! (1 T heavy cream= 52 calories vs. 1 T skim milk= 5 calories)

Day 4. (4/6): Always choose fruit juices that read "100% fruit juice" on the label! They don't have added sugars compared to fruit drinks.

Day 5. (4/7): Fact: It would take the average adult approximately 1 hour of walking to burn off the 240 calories in a 20-ounce Coke. Rethink your drink!

Day 6. (4/8): Choose the smallest sized portion you can buy when choosing any beverage other than water- moderation is key!

Day 7. (4/9): Read nutrition facts labels & choose drinks with no more than 25 calories per 8-ounce serving.

Day 8. (4/10): Try these combos to add flavor to your water w/o added calories: orange-kiwi, blueberry-lime, cucumber-lemon or raspberry-mint.


Day 10. (4/12): Look for (& avd) these names in ur drink that mean added sugar: cane sugar, evaporated cane juice, brown rice syrup, high fructose corn syrup

Day 11. (4/13): Fact: The most consumed beverage by Americans is carbonated soft drinks- an average of 44.7 gallons are consumed per person per year.

Day 12. (4/14): Did you know???. Vitamin Water contains the same amount of sugar as a Milkyway candy bar (31g or 7.75 teaspoons)!

Day 13. (4/15): Debunked myth: drink water only when you’re thirsty & you’ll get all the fluids you need. You should consume at least 8 8-oz glasses of water each day.

Day 15. (4/17): Drink nutrient rich, low fat milk 3x/day. Milk is an excellent source of protein, calcium and vitamin D!

Day 16. (4/18): Needing a caffeine jolt on this Monday morning? Drink 8 oz black coffee instead of an energy drink or soda to avoid added sugar and calories.

Day 17. (4/19): 1 teaspoon of sugar (4g) equals about 15 calories. How many grams of sugar have you drank today?

Day 18. (4/20): Soda can be as addicting as alcohol, drugs & cigarettes. Increased soda consumption can trigger weight gain, diabetes & osteoporosis later in life.

Day 19. (4/21): Add ½ cup of 100% fruit or vegetable juice to sparkling/seltzer water for added flavor without added (artificial) sugar.


Day 21. (4/23): Daily reminder to drink a glass of water!

Day 22. (4/24): Fact: It would take the avg adult approx. 53 mins of walking or 28 mins of running to burn off the 290 calories in a medium mocha coffee.


Day 24. (4/26): Energy drinks not only contain megadoses of caffeine, but they also contain high amounts of sugar and pack on empty calories.

Day 25. (4/27): Research shows that drinking 1-2 sugar swtnd bvgs/day increases the risk for type 2 diabetes by 25%. It also promotes heart disease & stroke.

Day 26. (4/28): Skip the popular "juice cleanse" or "detox" & naturally detoxify your body by maintaining adequate hydration w/ water.

Day 27. (4/29): DYK? Drinking fluid cals w/ lil nutritional value often leads to overeating b/c they don't have strong satiety properties, causing wt gain.

Day 28. (4/30): Most Americans consume ~38 pounds of sugar from sugar sweetened beverages each year. That's equal to 9.5 bags of the stnd 4-lb bag of sugar.
Day 29. (5/1): Majority of sugary drinks contain lil to no vits/mins, protein, or fiber. Instead, they contain empty calories. Choose smart, choose water.

Day 30. (5/2): Stop Think Drink! Nxt time u choose a drink, Stop & re-Think ur decision. Is it hydrating & will it fuel ur body w/ vits&mins? If so, Drink!
Appendix F

Post-Study Survey

Part 1: Demographic Characteristics

1. What is your current class standing?
   a. Freshman
   b. Sophomore
   c. Junior
   d. Senior

2. What is your age? ______

3. Sex:
   a. Male
   b. Female
   c. Other

4. What is your height in feet and inches? ______

5. What is your weight in pounds? ____________

6. Ethnicity:
   a. Caucasian (non-Hispanic)
   b. African American
   c. Asian
   d. Latino or Hispanic
   e. Native American
   f. Other
   g. Choose not to answer

7. What is your current living arrangements?
   a. On-campus
   b. Off-campus
   c. At home with parent(s)/guardian(s)

8. Are you a full-time (12 or more credits) or part-time student?
   a. Full-time
   b. Part-time
Part 2: Satisfaction Questions

1. On a scale of 1-5 (1 being not at all effective and 5 being extremely effective) how effective were the daily text messages in influencing your beverage choices?
   a. 1- not at all effective
   b. 2- slightly effective
   c. 3- neutral
   d. 4- effective
   e. 5- extremely effective

2. On a scale of 1-5 (1 being not at all effective and 5 being extremely effective) how effective were the timing and amount of text messages in influencing your beverage choices?
   a. 1- not at all effective
   b. 2- slightly effective
   c. 3- neutral
   d. 4- effective
   e. 5- extremely effective

3. On a scale of 1-5, (1 being not at all likely and 5 being extremely likely), how likely will you be to use the information you learned in your future beverage choices?
   a. 1- not at all likely
   b. 2- unlikely
   c. 3- neutral
   d. 4- likely
   e. 5- extremely likely

4. On a scale of 1-5 (1 being not at all likely and 5 being extremely likely) how likely are you to change your beverage choices based on the information presented in the daily text messages?
   a. 1- not at all likely
   b. 2- unlikely
   c. 3- neutral
   d. 4- likely
   e. 5- extremely likely

5. On a scale of 1-5 (1 being not at all likely and 5 being extremely likely) how likely would you be to encourage a friend or family member to participate in this study?
   a. 1- not at all likely
   b. 2- unlikely
   c. 3- neutral
   d. 4- likely
   e. 5- extremely likely
6. On a scale of 1-5 (1 being not at all motivating and 5 being extremely motivating), how motivating were the daily text messages to help you adopt healthy/healthier beverage choices?
   a. 1 - not at all motivating
   b. 2 - slightly motivating
   c. 3 - neutral
   d. 4 - motivating
   e. 5 - extremely motivating

7. Did you learn new information from the daily text messages?
   a. Yes
   b. No
   c. Unsure

8. What mode of communication is best for college students to receive information about beverage consumption?
   a. Email
   b. Text messages
   c. Social media (Facebook, Twitter, Instagram, etc.)
   d. Classroom setting
   e. Mailed brochure

9. How would you rate the overall execution of this study?
   a. Terrible/Was not helpful at all
   b. OK/Needs improvement
   c. Neutral/I don’t have an opinion
   d. Good/Very few improvements need to be made
   e. Excellent/Does not need any improvement

10. What was your major motive for participating in this study? Please check all that apply.
    a. Learn more about nutrition information of different beverages
    b. Decrease sugar intake
    c. Decrease caloric intake
    d. Increase water intake
    e. Choose healthier beverage options

11. Please add any additional comments you have for this study.

Part 3: 24-hour Beverage Recall

1. How many ounces of water (plain and flavored) did you drink within the past 24 hours? 1 cup= 8 ounces:_______
2. The following is a sample description of another student’s 24-hours recall. Following this sample, you will be asked a series of questions of which you will list each non-alcoholic beverage you drank within the past 24 hours. Please refer to this sample if you need guidance.

<table>
<thead>
<tr>
<th>Time</th>
<th>Place</th>
<th>Meal</th>
<th>Beverage</th>
<th>Details/Ingredients</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 am</td>
<td>Home</td>
<td>Breakfast</td>
<td>Milk</td>
<td>1% low-fat</td>
<td>8 oz</td>
</tr>
<tr>
<td>11 am</td>
<td>Campus</td>
<td>Snack</td>
<td>Fruit Smoothie</td>
<td>Made with frozen strawberries and blueberries, 1 banana and frozen yogurt</td>
<td>16 oz</td>
</tr>
<tr>
<td>2 pm</td>
<td>Home</td>
<td>Snack</td>
<td>Fruit and Vegetable Juice</td>
<td>Naked, 100%, Green Machine</td>
<td>10 oz</td>
</tr>
<tr>
<td>4 pm</td>
<td>Wendy’s</td>
<td>Lunch</td>
<td>Regular Pepsi</td>
<td>Fountain Drink</td>
<td>12 oz</td>
</tr>
<tr>
<td>6 pm</td>
<td>Vending machine</td>
<td>Dinner</td>
<td>Gatorade</td>
<td>Lemon Lime</td>
<td>20 oz</td>
</tr>
<tr>
<td>9 pm</td>
<td>Home</td>
<td>Snack</td>
<td>Iced tea</td>
<td>Sweetened with 2 teaspoons sugar</td>
<td>8 oz</td>
</tr>
</tbody>
</table>

*Total Water for the day: 40 oz*

Please list the first non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).
Please list the second non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<tbody>
<tr>
<td>Time of Day</td>
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<td>Place</td>
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<tr>
<td>Meal</td>
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<tr>
<td>Beverage</td>
</tr>
<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</tbody>
</table>

Please list the third non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #3</th>
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<tbody>
<tr>
<td>Time of Day</td>
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<tr>
<td>Place</td>
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<tr>
<td>Meal</td>
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<tr>
<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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</tbody>
</table>
Please list the fourth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<tr>
<th>Time of Day</th>
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<tr>
<td>Place</td>
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<tr>
<td>Meal</td>
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<tr>
<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup = 8 ounces)</td>
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</table>

Please list the fifth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<tr>
<th>Time of Day</th>
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<td>Meal</td>
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<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup = 8 ounces)</td>
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</tbody>
</table>
Please list the sixth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Time of Day</th>
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<td>Place</td>
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<td>Meal</td>
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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup= 8 ounces)</td>
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</table>

Please list the seventh non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Time of Day</th>
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<td>Meal</td>
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<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=</td>
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</tbody>
</table>
Please list the eighth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #8</th>
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<tr>
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<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup = 8 ounces)</td>
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</table>

Please list the ninth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<th>Beverage #9</th>
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<td>Beverage</td>
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<tr>
<td>Details/Ingredients</td>
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<td>Amount in ounces (1 cup = 8 ounces)</td>
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</table>
Please list the tenth non-alcoholic beverage you drank within the past 24 hours (other than water). Non-alcoholic beverages include soda (diet and regular), coffee (decaf and regular), tea (decaf and regular), fruit juice (please specify the % of juice as labeled on the bottle), vegetable juice (please specify the % of juice as labeled on the bottle), fruit smoothie, energy drinks (sugar free, zero calorie, regular), sports drinks (Gatorade, Propel, Vitamin Water, etc.).

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<tr>
<td>Meal</td>
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<td>Beverage</td>
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<td>Details/Ingredients</td>
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<tr>
<td>Amount in ounces (1 cup=8 ounces)</td>
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REFERENCES
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