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# An Assessment of Knowledge, Behavior, and Consumption Patterns Surrounding Sugar- Sweetened Beverages Among Young Adults

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An Assessment of Knowledge, Behavior, and Consumption Patterns Surrounding Sugar-

Sweetened Beverages among Young Adults


By

Anne Harguth



A Thesis Submitted in Partial Fulfillment of the

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In

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This thesis has been examined and approved by the following members of the student's committee.

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Dr. Mary Kramer

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Dr. Emily Forsyth

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AN ASSESSMENT OF KNOWLEDGE, BEHAVIOR, AND CONSUMPTION PATTERNS
SURROUNDING SUGAR-SWEETENED BEVERAGES AMONG YOUNG ADULTS

ANNE T. HARGUTH

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF
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MINNESOTA STATE UNIVERSITY, MANKATO
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ABSTRACT

**Background** The obesity epidemic is a growing problem in this country. Many studies have been conducted in effort to unravel and derail the rise in obesity and overweight status among Americans. Strong evidence supports the notion that excessive sugar consumption is largely contributing to an increase in obesity and risk for many chronic diseases and conditions.

**Objective** This study assessed sugar-sweetened beverage consumption, knowledge of sugar-sweetened beverages, disease risk associated with consumption, and correlation between the knowledge and consumption among a sample of students at a large mid-western university. A cross-sectional, retrospective design with random sampling was utilized for this study.

**Results** This study has shown that while participants are aware of the disease risks associated with SSB consumption, no change in consumption was observed. Participants are aware of the links between SSBs and obesity and other chronic diseases. Knowing this information did not change the decision to consume SSBs. No correlation was noted when comparing knowledge to consumption. This study also revealed that while there is knowledge of disease risk, knowledge of SSB content and what constitutes a healthy beverage is unclear. Knowledge levels were low when asked about sugar content of certain SSBs, health benefits of low-sugar or sugar-free beverages, and health benefits of 100% juice. These results indicate that consumers may not be aware of the amount of sugar being consumed.

# Chapter One: Statement of the Problem

## Introduction

Obesity is a growing concern in the United States. Labeled as an epidemic for over two decades, adult obesity continues to rise despite public health interventions (Odgen, Carroll, Kit, & Flegal, 2014). In 2015-2016, the obesity rate was 39.9% among adults (20-60+ years) and 18.5% among youth (2-19 years), an increase compared to 1999-2000 when rates were 30.5% among adults and 13.9% among youth (Centers for Disease Control and Prevention [CDC], 2017b). Since the rise of the obesity epidemic, research has been conducted in effort to better understand obesity. Studies indicate one major contributing factor is excessive sugar consumption. According to the American Heart Association (AHA), Americans steadily consume more and more sugar each year, which contributes to the obesity epidemic (American Heart Association [AHA], 2018). In 1977, daily sugar consumption amounted to approximately 228 calories per day (Obesity Society, 2014). Today, the average American ingests approximately 22 teaspoons of added sugar each day, which is equal to an extra 350 calories (Harvard T. H. Chan School of Public Health, 2019a). Sugar-sweetened beverages (SSBs), such as fruit juices, regular soda, energy drinks, sport drinks, flavored waters, and sweetened coffee and tea account for 47% of added sugar consumed by Americans (U.S. Department of Health and Human Services [USDHHS] & USDA, 2015). Added sugar consumption increases excess calorie consumption which contributes to weight gain and obesity (Obesity Society, 2014). This

paper will evaluate the knowledge, behavior, and consumption patterns of SSBs among young adults.

## Statement of the Problem

There are many ramifications of obesity including risk for chronic diseases and early death, increase in medical expenses, and economic impacts. The most common chronic diseases that develop as a result of being overweight and obese include diabetes, cardiovascular disease, musculoskeletal disorders, and some cancers (WHO, 2018). Obesity can lead to death at an early age. Life expectancies could decrease by as much as seven years due to obesity (Biro & Wien, 2010). According to the CDC, obesity costs the United States healthcare system roughly $147 billion per year (CDC, 2019a). Obesity is also affecting the economy. Loss of productivity is noted in the labor market due to overweight and obese employees (Hammond & Levine, 2010). Overweight and obese employees tend to be more absent from work and less productive while at work, all while employers are paying higher rates for disability benefits. For example, Shell Oil Company reports a loss of $11.2 million annually as a result of absenteeism among obese employees (Hammond & Levine, 2010).

With the rise in obesity, accompanied by an increase in excess sugar consumption, more research needs to be conducted that examines sugar consumption patterns, assesses knowledge of sweetened and unsweetened drinks, and evaluates knowledge of disease risk as it relates to sugar consumption. While research indicates that Americans consume an abundance of sugar, knowing the sources of excess sugar,

reasons for SSB consumption, and assessing knowledge level of consumers will allow researchers to better understand dietary decisions made by Americans. The purpose of the study is to determine the current consumption pattern of sugar-sweetened beverages, assess knowledge of sweetened and unsweetened beverages, and examine knowledge level of disease risk associated with excess sugar consumption among a sample of college students.

## Significance of the Problem

The American diet contains too much added sugar, or sugar that manufacturers add to products (Harvard Medical School, 2017). Added sugar intake is likely to cause high blood pressure, inflammation, weight gain, diabetes and fatty liver disease, which have all shown to increase risk for heart attack and stroke (Harvard Medical School, 2017). College students specifically are at risk for developing poor dietary habits. The transition from home life to college life often provides an array of new foods and beverages to pick from (Abraham, Noriega & Shin, 2018). Access to college dining facilities containing limited healthy options and an abundance of unhealthy options may cause poor dietary habits to develop. Poor nutrition impacts students' health and academic success (Abraham et al., 2018). Any potential gaps in education and knowledge pertaining to negative effects of excessive sugar consumption need to be identified to decrease excess sugar consumption, reduce the risk for multiple chronic diseases, and reverse the obesity epidemic. By knowing consumption patterns, knowledge of sweetened and unsweetened beverages, and awareness of disease risk, researchers will

be able to analyze the results and identify any gaps indicating opportunities for further education and other interventions.  Tools and resources can be offered to organizations, colleges, and communities that can be tailored to a specific population.  Lastly, new policies and new legislation that promote limitations to consumption of SSBs and use of added sugars by manufacturers can be developed and promoted when knowledge and consumption patterns have been identified. Current policies set forth by the World Cancer Research Fund (2015) include nutrition label standards and regulations, accessibility to healthy foods in hospitals and clinics, taxation on sugary beverages, limited advertising, and reforming unhealthy products into healthy products. Many of these policies have proven to be effective in reducing SSB consumption through a decrease in advertising and increase in healthier options in school and foodservice settings (World Cancer Research Fund, 2015).

## Research Questions

1. What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university?

2. What are the demographics of those college students who consume sugar-sweetened beverages?

3. What is the knowledge level of respondents regarding links between sugar-sweetened beverage consumption and risk for certain health conditions and obesity?

4. What is the relationship between knowledge and consumption patterns?

Limitations

1. Voluntary participation may result in incomplete surveys returned or opting out of the study completely, reducing sample size.

2. Less than ideal sample size related to voluntary participation, limited access to high enrollment classes, and limited time to survey participants due to program deadlines.

3. Unequal sample size of male and female participants, number of years in college, and racial and ethnic groups may result in an inaccurate representation of the population.

4. Self-reported data provided cannot be independently verified. Recall biases such as selective memory, telescoping, attribution and exaggeration are all potential limitations that may present with self-reported data.

5. Participants inability to identify sugar content of beverages on product nutrition fact labels may be a limitation due to lack of education surrounding the need to read and understand nutrition fact labels.

6. Under-reporting of SSB consumption as seen in previous research may cause consumption rates to be inaccurate (Rivard et al., 2012).

Delimitations

1. Study sample of students, 18 years of age and older, from one large mid-western university is a delimitation as only students of age from one university will be surveyed.

2. Race and ethnic variety of this population surveyed is a delimitation as only certain races and ethnic groups may be available from this university.

3. Enrollment status of participants is a delimitation as only enrolled students will participate.

## Assumptions

1. Assuming participants will be able to recall SSB consumption history over the past week.

2. Assuming honest answers will be provided on each survey instrument.

3. Assuming participants will know what constitutes a SSB.

## Definition of Terms

1. Consumption pattern – the process of identifying, purchasing, and consuming products and services to fit one's needs (IGI Global, 2019)

2. Health Belief Model – a social psychological health behavior change model that "suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior" (LaMorte, 2019, para. 1)

3. Obesity - body mass index of 30 or higher (CDC, 2016b)

4. Social Ecological Model (SEM) – "a theory-based framework for understanding the multifaceted and interactive effects of personal and environmental factors that determine behaviors" (UNICEF Organization, 2009, para. 2)

5. Sugar-sweetened beverage -- any liquid sweetened with various forms of added sugar including raw sugar, sucrose, honey, lactose, brown sugar, corn sweetener, corn syrup, dextrose, fructose, glucose, high fructose corn syrup, malt syrup, maltose, and molasses (CDC, 2017a)

# Chapter Two: Review of the Literature

## Introduction

This literature review will be organized into four different parts. It will begin with an overview of obesity and the relationship to excessive sugar consumption and caffeine use, followed by the role of the Health Belief Model and the Social Ecological Model. The importance of a well-balanced diet will be discussed. Lastly, possible solutions to decrease sugar sweetened beverage consumption will conclude this chapter.

## Obesity and Excessive Sugar Consumption

Obesity is a serious, costly disease and on the rise in the United States. New statistics from the CDC show that 42.4% of American adults were obese in 2017-2018 (CDC, 2020). This is an increase from 39.9% in 2015-2016, and 30.5% in 1999-2000 (CDC, 2017b). Obesity is linked to many other chronic diseases and conditions, including heart disease, stroke, type II diabetes, certain cancers and even early death (CDC, 2020). The World Health Organization (WHO) reports that approximately 2.6 million individuals die each year as a result of being overweight or obese (WHO, 2018). Scientists report that nearly half (45%) of deaths in 2012 were linked to poor dietary habits (NIH, 2017).

Obesity is an expensive disease that impacts the economy. According to the CDC, the United States spends $147 billion annually on obesity related expenditures and 90% of the $3.3 trillion annual healthcare expenditures go towards chronic disease and mental health (CDC, 2019a). Obese individuals have higher medical costs compared to individuals of normal weight (CDC, 2020). The economic impacts of obesity are broad.

From direct medical expenses to productivity costs and transportation costs, the effects of obesity are noticeable (Hammond & Levine, 2010). An increase in medical expenses is related to the diagnosis and treatment of five major conditions and diseases linked to obesity: hypertension, high cholesterol, stroke, type 2 diabetes mellitus, and coronary heart disease (Hammond & Levine, 2010). Loss of productivity through absenteeism and presenteeism (employees who are present, but less productive) is noted in the labor market due to overweight and obese employees (Hammond & Levine, 2010). With other medical conditions that accompany obesity, more time is spent away from work at doctor appointments. One company reports total lost productive time (LPT) due to obesity at $11.7 billion per year. Total LPT accounts for obese employees who are present at work but less productive and obese employees who are absent from work due to health-related problems (Hammond & Levine, 2010). Employers are paying higher rates for disability benefit payments and disability insurance payments (Hammond & Levine, 2010). Transportation costs are also concerning. Higher body weight means more fuel used, larger vehicles used to transport, and the need for wider seats (Hammond & Levine, 2010). Obesity has grown into a major epidemic, and the effects of this epidemic are costly to the American healthcare system and American economy.

Over the last 3 decades, Americans have steadily increased added sugar consumption which has largely contributed to the obesity epidemic (AHA, 2018). SSBs are a leading source of added sugar in the American diet, and frequent consumption of SSBs is associated with weight gain, obesity, diabetes, heart disease, kidney disease, liver

disease, tooth decay, and gout (CDC, 2017a). Accounting for nearly 13% of total calorie

intake, added sugars come from soft drinks, fruit juices, energy drinks, sweetened teas

and coffees, alcoholic beverages, and flavored waters, as well as sweets and desserts

(USDA, 2015).  Over a 15-year period, those who consumed 17-21% of their calories from

added sugar were more likely to die from cardiovascular disease when compared to

those whose excess sugar intake amounted to 8% of total calories (Harvard Medical

School, 2017). The recommended level of sugar intake remains at less than 10% of

overall calorie intake, and most Americans exceed this amount by nearly 3% (USDA,

2015). This increase in sugar consumption may be largely related to increased marketing

to younger populations. In 2013, companies spent $866 million dollars advertising sugary

drinks to young adults, which is four times the amount spent on advertising 100% juice or

water (Rudd Center, 2014).

According to the NHANES, roughly one half of U.S. adults consumed at least one

SSB per day with young adults having the highest average intake of SSBs as 61% report

daily consumption (Rosinger, Herrick, Gahche & Park, 2017). According to the CDC,

adolescents aged 12-19 and those completing their first or second year of college are the

highest consumers of SSBs (CDC, 2010). When asked, 95% of surveyed college students

report consuming SSBs in the last month, with 65% reporting daily intake (West et al.,

2006). According to the Fall 2019 National College Health Assessment, 70% of responses

indicated at least one SSB per day in the last 7 days (ACHA, 2020). SSB consumption

among this population is substantially high and SSBs are a significant source of added

calories for this population. SSB consumption is a contributing factor towards weight gain as approximately 35% of college students are obese or overweight (West et al., 2006).

SSB consumption among college students is high due to the social and environmental changes that occur among young adults attending college (Hoffman, 2013). For many young adults, college is the first step towards independence. Parents and guardians are no longer around to guide decisions and provide limitations. The transition to college allows for students to explore social settings, expand purchasing capabilities, and therefore independently choose beverages for consumption (Hoffman, 2013). This may be very different compared to a previous living situation where parents or guardians chose and purchased beverages.

Many SSBs contain caffeine, such as coffees, teas, sodas, and energy drinks. Some studies show that college students consume SSBs in an effort to benefit from the effects of caffeine (Olsen, 2013). In juggling classes, clubs, internships, and final exams, college students rely on caffeine to perform their best. When 250 college students in New Hampshire were assessed for caffeine consumption, they report their main reasons for consumption include staying awake, obtaining good grades, and begin better able to socialize (Olsen, 2013). Students also reported inadequate sleep, long distance travel, and intense studying as three examples of situations where caffeine intake is crucial (Olsen, 2013). The most consumed beverages in order of popularity were coffee, espresso, soda, tea, and lastly, energy drinks (Olsen, 2013). When 1248 college students were assessed at 5 universities across the United States, 92% reported consuming some

form of caffeine within the last year, the most commonly consumed caffeinated beverage was coffee, and the reasons for caffeine consumption include feeling awake, good taste, socialization, better concentration, higher energy level, improved mood, and alleviate stress (Mahoney et al., 2019). While the true benefits and risks of caffeine consumption are still being studied, college students today may be consuming certain SSBs in an effort to benefit from caffeine.

To prevent obesity, reduce excess sugar consumption, and reduce caffeine consumption, SSB consumption among this population needs to decrease. Not only does SSB intake cause weight gain, but it is also linked to other unhealthy behaviors including tobacco use, lack of sufficient sleep, lack of exercise, more screen time and inadequate fruit intake (CDC, 2017a).

## Health Belief Model

One theory that could help explain SSB knowledge and consumption patterns is the Health Belief Model (HBM). First developed in the 1950s by social psychologists, the HBM was created to explain and predict health-related behaviors among individuals (Rosenstock, 1974). "The HBM suggests that a person's belief in a personal threat of an illness or disease together with a person's belief in the effectiveness of the recommended health behavior or action will predict the likelihood the person will adopt the behavior" (LaMorte, 2019, para. 1). Theorists believe that an individual's decision to act depends on that person's perceptions of both the benefits and barriers linked to that health behavior (LaMorte, 2019). If one believes that a certain action will reduce the risk

of acquiring a health problem, then one is likely to engage in that behavior. The theoretical constructs of the HBM include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy (LaMorte, 2019). Potential for perceived susceptibility will be evaluated by measuring SSB consumption patterns and knowledge of SSB in relation to risk for chronic diseases and obesity. Potential for perceived benefits will be evaluated throughout the survey indirectly. SSB consumption may appear as a large health risk among participants and consumption may decrease should a participant feel beneficial.

## Social Ecological Model

Another theory that could help explain and reduce SSB consumption patterns is the Social Ecological Model (SEM). SEM fits this topic as dietary changes, specifically SSB consumption, require multiple interventions from different domains to be in place. The SEM can be defined as an adaptable framework that suggests there are distinct, yet interrelated factors that impact human behavior (Brown, 2011). Effective interventions must be in place at all levels to address the multiple levels of influence that the SEM suggests. Knowledge of the fact that SSBs are harmful to one's health is not enough. There must be more support from the individual, interpersonal, organizational, community, and societal levels. The individual level includes knowledge, attitudes, behaviors, skills, and developmental history of an individual. The interpersonal group most often consists of family members, in which support and reinforcement from members is typically informal. Within the organizational level, groups or members of an

organization can offer education, tools, and resources for success. Policies, rules of membership, and the formation of healthy environments may also exist among the organizational level. Lastly, the societal level includes interventions such as national media campaigns, legislation focusing on wellness, and federally and state mandated school wellness programs and policies (Brown, 2011). When multiple changes are implemented from various levels of the SEM, evidence indicates that eating habits as well as physical activity behaviors improve (Office of Disease Prevention and Health Promotion, 2015).

**Importance of Healthy Eating**

There are many good reasons to eat a healthy, well-balanced diet. The CDC reports that a healthy diet can prevent many chronic diseases, such as diabetes, heart disease, sleep apnea, asthma, and joint pain (CDC, 2016a). According to Harvard T. H. Chan School of Public Health (2019b), a diet high in fruits and vegetables can lower blood pressure, reduce risk of heart disease and stroke, prevent certain cancers, reduce risk of digestive problems, and have a positive impact of blood sugar. A diet low in SSB intake can help consumers maintain a healthy body weight and a healthy diet (CDC, 2017a). It is important to make healthy dietary choices each day to promote an overall healthy lifestyle. The dietary choices made each day impact how people feel today, tomorrow, and in the future (USDHHS, 2017).

**Solutions to Decrease Consumption**

Possible solutions to decrease consumption of SSBs include nutrition education

programs, limited access to SSBs, increased access to healthier beverages, and increased

cost of SSBs through taxation. Studies show that nutrition education can be beneficial in

producing dietary changes. According to the USDA, comprehensive nutrition education

programs can lead to healthier food choices among youth and adults (USDA, 2013).

Education provided should include both sugar content of SSBs, as well as risk for certain

diseases and conditions caused by excessive sugar consumption. Research focusing on

how college students choose beverages and the effectiveness of behavioral interventions

has been done. One college-based study discovered that taste is the primary influence,

followed by price when deciding what to purchase. Out of 90 participants, 93% reported

taste as being most important, followed by price (58%), and nutritional content (30%).

Nutritional content of beverages was not a primary interest (Block, Gillman, Linakis, &

Goldman, 2013). Juice appeared to be the healthy beverage, and water is used mainly for

hydration. Nutrition education that specifically focuses on the sugar content of SSBs may

be the most beneficial. Students reported that shocking educational messages and visual

aids may create change in beverage choices, such as images that portray teaspoons of

sugar in common beverages and images that show body fat accumulation as a result of

excessive sugar intake. Providing free or low-cost water was another incentive to

promoting healthy beverage consumption among students (Block et al., 2013).

Limiting access to SSBs may be another effective intervention. A few ways to limit access include removing them from school vending machines, school stores, and public sporting events. Low-sugar or sugar-free options should replace the sale of SSBs at these locations and events.  Rearranging grocery stores and convenience stores to promote the sale of healthier drinks in convenient locations throughout the store may be another effective intervention (CDC, 2019b).

Research shows that changes to school policies are effective. Various California school districts implemented a new school wellness policy that decreased consumption of SSBs after students reported consuming at least one SSB daily (ChangeLab Solutions, 2013). While most SSB consumption happened outside of school, this policy specifically restricted the size and availability of certain SSBs within schools, which caused an overall decrease in consumption among students. SSB consumption among this population decreased (ChangeLab Solutions, 2013). Increasing access to healthier beverages may also be beneficial. West et al. (2012) determined that modifying the point-of-purchase messages in college foodservice settings may promote a change in SSB consumption. More than 70% of respondents stated that they planned to make changes in consumption rates, if not done so already (West et al., 2012)  Changing the college foodservice environment in such a way that sugary beverages were not exposed or visible to consumers may decrease consumption (West et al., 2012). Promoting the sale of water and other low-sugar beverages on college campuses may be beneficial.

Healthier food retail initiatives have the potential to increase access to healthier beverages in underserved areas including grocery stores, convenience stores, farmers markets, food pantries, and mobile food retail (CDC, 2019b). Healthy beverages, such as water or other low-sugar beverages, can be placed at store entrances and convenient checkout locations throughout stores. College campuses also have opportunities to increase consumption of healthy beverages. Providing clean drinking water through easy access to drinking fountains and easy access to water bottle refill stations in school and across campuses may also be beneficial. Handing out free water bottles at health fairs and other promotional events was suggested (Block et al., 2013).

Some research indicates that an increase in cost may deter a consumer from purchasing a SSB. In November of 2014, Berkeley, California implemented the nation's first tax on sugary beverages (Frazee, 2018). Seven cities have now adopted a SSB tax, as a reduction in consumption of SSBs resulted (Frazee, 2018). One particular study showed that a 20% tax on SSB decreased consumption and body mass index in younger individuals between 20-29 years of age, mostly low-income male participants (Schwendicke & Stolpe, 2017). A taxation on SSBs could have a significant effect on overweight and obese individuals (Schwendicke & Stolpe, 2017). Another study conducted in a large urban area revealed that sales volume of taxed SSBs decreased significantly after the price increased, however sales volume changes were offset by purchases in untaxed neighboring areas (Roberto, Lawman, & LeVasseur, 2019). Of the 291 stores that participated, data showed a price increase on SSBs, followed by a

significant decrease in sales from January 1, 2016 to December 31, 2017. Sales volume in surrounding cities increased by $308 million (Roberto et al., 2019). If more cities were participating in the SSB tax initiative, a decrease in SSB consumption may be seen nationwide. Nationwide legislation requiring all SSBs to be taxed may have a significant impact on SSB consumption while eliminating the option to purchase untaxed SSBs from a neighboring community.

In summary, reversing the obesity epidemic and decreasing SSB consumption among college students will require nutrition education on an individual level as well as societal interventions with a multifaceted approach. Individuals need to be educated on both the sugar content of SSBs as well as the disease risk associated with SSB consumption. Shocking nutrition messages with the use of visual aids that highlight added sugar content within beverages may cause a change the decision to consume a SSB. Individuals should also be educated on the disease risks associated with SSB consumption and the medical expenses that may be expected with diagnosis and treatment of chronic diseases.

Societal interventions will require places and practices to support healthy eating and healthy living in many ways (CDC, 2019b). For example, increase access to retail stores that sell quality healthy beverages, expand farm-to-institution programs within schools, hospitals, and workplaces, larger farmer's markets, easy access to fresh fruits and vegetables in dining areas and other foodservice venues, and support community and home gardens (CDC, 2019b). Policies that limit accessibility, availability, and

affordability are needed to decrease sugar consumption (World Cancer Research Fund,

n.d.). Policies that place limits on marketing of SSBs to individuals of specific age groups

may promote change. By increasing nutrition education to individuals of all ages, limiting

access to SSBs while increasing access to healthier sugar-free or low sugar beverages, and

potentially increasing the price of SSBs, a reduction in SSB consumption may become

visible.

# Chapter Three: Research Methodology

## Introduction

The purpose of this study is to determine the current consumption pattern of SSBs, assess knowledge of SSBs, and examine knowledge level of disease risk associated with excess sugar consumption. This chapter will contain the research questions, research design and rationale, subject selection and data collection, instrumentation, and data analysis.

## Research Questions

1. What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university?

2. What are the demographics of those college students who consume sugar-sweetened beverages?

3. What is the knowledge level of respondents regarding links between sugar-sweetened beverage consumption and risk for certain health conditions and obesity?

4. What is the relationship between knowledge and consumption patterns?

## Research Design and Rationale

A cross sectional, retrospective design was used to assess and compare sugar consumption patterns and knowledge of disease risk. A retrospective design fits this topic best as participants will be required to recall consumption of sugar-sweetened beverages in the past week. Retrospective studies are less expensive in nature and can be

conducted immediately (Suchmacher & Geller, 2012). A cross sectional design allowed for a comparison across different populations at a single point in time and assessed multiple variables at one time (Institute for Work and Health, 2015). Variables assessed in this study include excessive sugar consumption patterns and knowledge of disease risk. A correlational design was used to assess for any significance of relationship found between consumption patterns and knowledge of disease risk.

## Subject Selection

Current undergraduate college students attending a large, Midwestern university were assessed for consumption patterns and disease risk knowledge levels. A combination of purposive sampling and convenience sampling was used in this study, as college students are the targeted population for this survey. Large-enrollment general education classes were surveyed. All students in attendance that day had an opportunity to participate in the survey. This allowed researchers to survey a wide variety of students in terms of gender, race, ethnicity, major of study, and years in school. Following IRB approval, the researcher obtained permission from the instructor prior to entering the classroom through email requests (Appendix A). Approximately 375-400 students were needed to be surveyed from a large, Midwestern university with a population size of roughly 15,000 students (DATA USA, 2017). This number was chosen with the goal of obtaining a standard error of 2.5%. By using this number, any findings obtained would be within 2.5% of the actual value in the population. This sample size was also chosen based on similar studies conducted in the past (Tofteland, 2018).

## Data Collection

In-person distribution of the pen and paper questionnaire took place during the fall semester of 2019. The researcher handed out and summarized the consent form and survey instructions. No direct incentives were offered to participants. Once the consent form was explained, a survey was provided to participants by the researcher. Completed surveys were collected by the instructor and provided to the researcher who stood outside the room.

## Instrumentation

A four-part survey was used for this research study. The survey was adapted from Rivard et al (2012) "Taxing sugar-sweetened beverages: a survey of knowledge, attitudes and behaviours" which assesses SSBs consumption patterns. Three questions were taken from Miller et al (2019) "Who drinks sugar-sweetened beverages and juice? An Australian population study of behaviour, awareness and attitudes" which further assessed knowledge of sugar consumption. Section one included a series of four demographic questions, added to assess the relationship between SSB knowledge and consumption as it relates to biological sex, years in college, ethnicity and race. These demographic questions serve the purpose of describing the population. Section two included one question focusing on beverage consumption. This question assessed consumption of common sugar-sweetened beverages on a weekly basis. Participants were asked to record servings per week of six common sugar sweetened beverage groups including: sports drinks, lemonade/Kool-Aid, juices with added sugars, sweetened teas and coffees,

regular soda pop, and energy drinks. Serving sizes were listed next to each group for reference. Available responses included zero servings per week, one to three servings per week, four to six servings per week, seven to nine servings per week, and ten or more servings per week. Section three of the survey tool included three questions which examine knowledge of sugar-sweetened beverages compared to unsweetened beverages in a multiple-choice format. Responses from the multiple-choice questions were coded as one for correct, zero for incorrect. Section four of the survey assessed knowledge of disease risk in a true/false format. True and false responses were coded as one for correct and zero for incorrect. Participants were asked the extent of agreement in which they feel obesity is related to diabetes, heart disease, asthma, high blood pressure and cancer. Respondents were also asked the extent of agreement in which they feel frequency of SSB consumption is related to diabetes, risk of cavities, and risk of obesity.

## Data Analysis

The data from the questionnaires was compiled and analyzed by the program Statistical Package for the Social Sciences (SPSS) version 26 (IBM, 2018). SPSS provided descriptive statistics, frequency distribution and correlation tests to assess SSB consumption patterns, knowledge of SSBs, and any correlation between consumption of SSB and knowledge of disease risk and obesity.

1. What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university?

To answer research question one, raw data were assessed from survey question 5 and analyzed using SPSS to generate frequencies. Interval and ratio data were used to generate a composite score, mean and standard deviation. High scores indicated high consumption patterns.

2. What are the demographics of those college students who consume sugar-sweetened beverages?

   To answer research question two, raw data were assessed from survey questions 1, 2, 3 & 4 and analyzed using SPSS to generate frequency distributions.

3. What is the knowledge level of respondents regarding links between sugar-sweetened beverages consumption and risk for certain health conditions and obesity?

   To answer research question three, raw data were assessed from survey questions 6, 7, 8 & 9 and analyzed using SPSS to generate frequencies. Interval and ratio data were used to generate a composite score, mean and standard deviation. High scores indicated higher knowledge level.

4. What is the relationship between knowledge and consumption patterns?

   To answer research question four, interval and ratio data were created using composite scores from survey questions 5-9 and then analyzed using the Pearson correlation test.

Table 1

*Table of Specifications*

| Research Question (RQ) | Survey items or methods used to assess RQ'S | Level of Data (Nominal, Ordinal, Interval/Ratio) | Analysis needed to assess RQ |
|---|---|---|---|
| What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university? | 5 | Ordinal/Interval/Ratio | Frequency Distribution and Descriptive Statistics |
| What are the demographics of those college students who consume sugar-sweetened beverages? | 1, 2, 3, 4 | Nominal/Ordinal | Frequency Distribution |
| What is the knowledge level of respondents regarding links between sugar-sweetened beverage consumption and risk for certain health conditions and obesity? | 6, 7, 8, 9 | Nominal/Interval/Ratio | Frequency Distribution and Descriptive Statistics |
| What is the relationship between knowledge and consumption patterns? | 5, 6, 7, 8, 9 | Interval and Ratio | Correlation |

## Summary

Participants from a large, Midwestern university took a 9-question survey assessing sugar-sweetened beverage intake, knowledge of sugar-sweetened beverages, risk for diseases and conditions, and demographic questions. The survey results assessed consumption patterns, knowledge of disease risk pertaining to sugar-sweetened beverages, any correlation between knowledge and consumption patterns, and demographic characteristics.

# Chapter Four: Findings and Discussion

The purpose of this research study was to determine the respondent's knowledge, behavior, and consumption patterns surrounding sugar-sweetened beverages. The research questions for this study include:

1. What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university?

2. What are the demographics of those college students who consume sugar-sweetened beverages?

3. What is the knowledge level of participants regarding links between sugar-sweetened beverage consumption and risk for certain health conditions and obesity?

4. What is the relationship between knowledge and consumption patterns?

## Analysis and Interpretation of the Data

The data collected to answer these research questions was collected using a 9-question survey formatted by the student researcher with the help of the thesis committee. A total of 309 surveys were completed for this study. Data for this study was collected from high enrollment, general education courses.

## Findings Related to Research Questions

The following section describes the analysis conducted and the results for each research question.

**Research question one: What are the sugar-sweetened beverage consumption patterns of college students attending a large, Midwestern university?**

In order to analyze the results of these questions, descriptive statistics and frequency distribution were completed. The results can be viewed in Table two. Of the 309 participants, 296 (96%) reported consuming at least one SSB in the last week. Thirteen respondents (4%) reported zero consumption of SSBs in the last week. Lowest consumption rates are noted in the areas of lemonade/Kool-Aid and energy drinks. The highest consumption rates are visible in the areas of sweetened tea/coffee and soda pop. In order to determine the average total SSBs consumed in one week, a composite score was created. The composite score (M=9.6, SD=2.4) indicates that average consumption of SSBs was low. Scores range from 6-30, and a mean of 9.6 indicates low consumption.

Table 2

*Consumption Patterns*

| Item | n | 0 n(%) | 1-3 n(%) | 4-6 n(%) | 7-9 n(%) | 10+ n(%) |
|------|---|--------|----------|----------|----------|----------|
| Sports Drinks(20oz) | 309 | 180(58.6) | 100(32.5) | 16(5.2) | 9(2.9) | 4(1.3) |
| Lemonade/Kool-Aid(8oz) | 307 | 190(61.8) | 101(32.8) | 13(4.2) | 3(0.9) | 0 |
| Juices with Added Sugars(8oz) | 307 | 148(48.2) | 128(41.6) | 27(8.7) | 4(1.3) | 0 |
| Sweetened Tea/Coffee(12oz) | 307 | 130(42.3) | 106(34.5) | 44(14.3) | 17(5.5) | 10(3.2) |
| Regular Soda Pop(12oz) | 309 | 143(46.5) | 100(32.5) | 35(11.4) | 24(7.8) | 7(2.3) |

**Table 2 (continued)**

| | | | | | | |
|---|---|---|---|---|---|---|
| Energy Drinks(16oz) | 308 | 251(81.7) | 47(15.3) | 8(2.6) | 1(0.3) | 1(0.3) |

*Note.* The variation in sample size (n) is due to the variation in the number of participants who reported SSB consumption.

**Research question two: What are the demographics of those college students who consume sugar-sweetened beverages?**

Table three represents the demographic results of this study. Demographic data was analyzed for the purpose of better describing the respondents. All participants were undergraduate students atleast 18 years of age. The majority of respondents were Caucasian, Non-Hispanic female students in their first year of college. Of the 309 respondents, 13 reported zero consumption of SSBs on their survey. These 13 surveys were not included in the table below due to the purpose of this question.

**Table 3**

*Demographic Characteristics of Participants*

| Characteristics | | n | % |
|---|---|---|---|
| Biological Sex | | | |
| | Male | 78 | 25.2 |
| | Female | 218 | 70.5 |
| Years in College | | | |
| | 1 year | 207 | 66.9 |
| | 2 years | 48 | 15.5 |

**Table 3 (continued)**

| | | | |
|---|---|---|---|
| | 3 years | 19 | 6.1 |
| | 4 years | 14 | 4.5 |
| | 5 or more years in college | 8 | 2.6 |
| Ethnicity | | | |
| | Hispanic or Latino | 18 | 5.8 |
| | Non-Hispanic or Latino | 276 | 89.3 |
| Race | | | |
| | American Indian or Alaska Native | 3 | 1 |
| | Asian | 10 | 3.2 |
| | Black or African American | 21 | 6.8 |
| | Native Hawaiian or Other Pacific Islander | 1 | 0.3 |
| | White | 247 | 79.9 |
| | Other | 13 | 4.2 |

**Research question three: What is the knowledge level of participants regarding sugar-sweetened beverages and risk for certain health conditions and diseases?**

Table four reveals each question with percentage of correct and incorrect responses. More respondents scored incorrectly than correctly on the questions

pertaining to knowledge of SSBs. Among each of the three SSB knowledge questions, more than 50% of the responses were incorrect. With the majority of participants missing these questions, there is a lack of accurate knowledge on the amount of sugar in a common soda, what constitutes a healthy beverage, and the sugar content of 100% fruit juice versus other SSBs.

Unlike the SSB knowledge responses, scores for disease risk knowledge questions are high, indicating a high knowledge level of disease risk associated with SSB consumption. When questioned about a link between SSB consumption, obesity, and other chronic disease and conditions, most respondents scored correctly, with one exception that most respondents do not feel there is a link between obesity and asthma. The majority of respondents were well aware of the connection between SSB consumption, obesity, and other chronic diseases. A composite score was created to better analyze this data. The composite score (M=7.6, SD=1.6) indicates that average knowledge level is high as the range of possible scores is 0-11. Greater than 50% of participants had 8 out of 11 knowledge responses correct. Overall, total knowledge level appears high among participants of this study.

Table 4

*Knowledge of Sugar-Sweetened Beverages and Knowledge of Disease Risks*

| Question | n | Correct n(%) | Incorrect n(%) |
|---|---|---|---|
| How many teaspoons of sugar do you think there might be in an average (12oz) can of soft drink like Mountain Dew, Pepsi, or Dr. Pepper? | 309 | 129(42) | 180(58) |
| Compared to sugary drinks like pop, sports drinks, energy drinks, lattes, do you think low sugar, sugar-free, or no sugar added drinks are more healthy choices, less healthy choices or about the same? | 309 | 114(37) | 195(63) |
| Compared to sugary drinks like pop, sports drinks, energy drinks, lattes, etc, do you think 100% fruit juice has more sugar, less sugar or about the same amount of sugar? | 309 | 102(33) | 207(67) |
| Obesity is related to diabetes. | 307 | 215(70) | 92(30) |
| Frequent consumption of SSBs has no direct link to diabetes. | 308 | 287(93) | 21(7) |
| Obesity is linked to heart disease. | 308 | 287(93) | 21(7) |
| Frequent consumption of SSBs increases risk of cavities. | 308 | 300(97) | 8(3) |
| Obesity is not associated with high blood pressure. | 309 | 277(90) | 32(10) |
| Frequent consumption of SSBs increases risk of obesity. | 308 | 278(90) | 30(10) |
| Obesity is related to asthma. | 309 | 146(47) | 163(53) |
| There is no direct link between obesity and cancer. | 308 | 205(67) | 103(33) |

*Note.* The variation in sample size (n) is due to the variation in the number of participants who answered each knowledge question.

**Research question four: What is the relationship between knowledge and consumption patterns?**

To assess the relationship between knowledge and consumption, a Pearson correlation test was completed. This test compared total knowledge to total consumption of SSBs. The results of this test concluded that there is no significant relationship between knowledge and consumption. A correlation for this data revealed an insignificant relationship between knowledge and consumption, r=0.01, n=297, p>0.05, two tails. An *r*-value close to zero indicates no relationship. While average consumption of SSBs is low (M=9.6, SD=2.4), and knowledge scores remain high, no relationship exists when comparing the two variables. Participants have knowledge of sugar-sweetened beverages and disease risks associated with consumption of sugar-sweetened beverages; however, this does not impact their decision to consume SSBs. There is no direct correlation between consumption of sugar-sweetened beverages and knowledge of sugar-sweetened beverages and risk for certain diseases and conditions.

## Chapter Five: Summary, Conclusions, and Recommendations

The results of this study indicate that consumption of SSBs in low. Basic knowledge of SSBs was poor, as more respondents scored incorrectly than correctly when asked about contents of SSBs, characteristics of a healthy beverage, and healthfulness of 100% fruit juice. However, respondents do have knowledge of the links between sugar-sweetened beverages and risks associated with obesity and certain diseases and conditions. There is no relationship between knowledge and consumption as there were no significant findings when testing correlation between knowledge and consumption. The results from this study conclude that most respondents are aware of the diseases and conditions that are linked to SSB consumption and obesity, but unaware of the sugar content of certain beverages and unaware of the characteristics of a healthy beverage. Participants know that SSBs are related to obesity and other chronic diseases. However, this did not cause a change in the decision to consume SSBs.

According to this study, 96% of respondents report consuming at least one SSB in the last week. The type of beverages most consumed beverages included sweetened tea/coffee and soda pop. The findings of this study have been both similar and different in some ways when compared to other similar studies. Rivard et al. (2012) reports an average of seven SSBs per week, while Schafer (2019) reports an average of 14 SSBs per week. Consumption rates from this study appear much lower compared to other studies. Participants may have under-reported consumption in this study. Results from the Fall 2019 National College Health Assessment reveal that 70% of participants reported at

least one SSB per day in the last 7 days (ACHA, 2020). This study reported that 96% of participants consume at least one SSB per week, while other studies show 81% (Schafer, 2019) and 65% daily intake (West et al., 2012). Like this study, West et al. (2012) reported soda pop to be one of the most commonly consumed SSBs. In summary, compared to other studies, this study indicates that average weekly consumption may be low, however a higher percentage of participants report at least one SSB per week.

When knowledge level was assessed, participants of this study scored high, indicating overall knowledge of SSBs remains high. Participants are more aware of disease risk associated with SSB consumption than sugar content of certain SSBs and characteristics of a healthy beverage. Consumers may be unaware of the amount of sugar consumed. One study from University of Minnesota study found that while most consumers did view the nutrition fact label, very few consumers read the entire nutrition fact label and understood it (Graham & Jeffrey, 2011). Only 1% of participants reported looking at each component of the nutrition fact label, while only 24% observed the sugar content of the 64 products displayed (Graham & Jeffrey, 2011). This study shows that consumers may not be observing

The findings of this study are similar to others. Rivard et al. (2012) reported that most respondents were aware that frequent consumption of SSBs increases the risk of obesity, dental cavities, and obesity, however fewer respondents reported a link between obesity and diabetes, heart disease, asthma, hypertension, or cancer. Schafer (2019) found that participants were aware of the disease risks associated with SSB consumption.

In summary, studies show that participants have high knowledge levels of SSBs and disease risk.

When assessing correlation, this study found no correlation between knowledge level and SSB intake. Participants have knowledge of SSBs and risk for certain health conditions and disease. However, this does not correlate with SSBs consumption patterns as no significant correlation was found.  Schafer (2019) also reported no correlation between knowledge and consumption. One recent study, examining 350 college students, assessed for correlation between knowledge and consumption and found that less knowledge was associated with higher consumption, however only among overweight students (Jasti, Rubin, & Doak, 2017).  No association was found among non-overweight students. While some studies may indicate a correlation between knowledge and consumption, this study does not reveal any correlation, nor does it assess student weight status.

This study presents with limitations. Relying on college students' voluntary reporting is a potential limitation, as refusal to participate is a limitation. When using self-reported data, inaccurate reporting is a concern. This study may be limited by memory and honesty of participants. While other studies have discovered that adults under-report SSB consumption, it is suspected that participants of this study may have under-reported SSB consumption (Rivard et al., 2012).

Unequal sample of male and female participants may also be a limitation. Although random sampling was used in this study, the results may not be generalizable

due to the small sample size. Due to time constraints and limited access to large class sizes, the number of participants in this study was less than ideal. The ideal sample size for this study was 375-400 participants based off the population size of this Midwestern university. In reaching this range, an accurate representation of the population would have been drawn, and therefore reliable statistical inferences could have been made. The generalizability and power of the results may be limited due to these limitations.

## Recommendations for Practice

Like the HBM suggests, health-related behaviors can be driven by perceived susceptibility of acquiring an illness, and perceived severity of the illness, and perceived benefits of taking action. If one believes a certain action will decrease the likelihood of acquiring a health problem, then one will likely adopt the recommended behavior or action following a stimulus or cue to action (LaMorte, 2019). Although this study revealed that knowledge level of disease risk was high, knowledge pertaining to sugar content of SSBs and characteristics of healthy beverages was low and students still chose to consume SSBs. While some knowledge is present, the stimulus and/or cue to action is not present. Nutrition education that includes basic knowledge of added sugars, sugar content, and the negative effects of SSB consumption may be needed to produce a change in beverage consumption patterns. The results of this study conclude that the potential for perceived susceptibility was low as participants were aware of the health risks associated with SSB consumption yet chose to continue consuming SSBs.

The HBM also suggests that perceived barriers will impact one's decision to performing a recommended health action. Common barriers to healthy eating habits among college students include time constraints, high prices of healthy foods, stress, convenient high-calorie foods, unhealthy snacking, and easy access to junk food (Sogari, Velez-Argumedo, Gomez & Mora, 2018). This study revealed that commonly consumed SSBs were sweetened tea/coffee and soda pop, which contain high amounts of caffeine. Students may be interested in consuming highly caffeinated beverages to help deal with stress, time constraints, lack of adequate sleep, and simply easy access (Olsen, 2013). If perceived barriers were eliminated, students may be more likely to consume healthier beverages. Education on effective ways to manage stress, obtain adequate sleep, and manage time may be beneficial in reducing SSB consumption. Resources, programs, and handouts available on campus that focus on these challenges may be helpful to students. A visual display that reveals the amount of sugar found in common SSBs may have a lasting effect on students. This display could show the exact amount of sugar added to beverages such as sweetened teas, coffees, and soda pops. Having these resources available may indirectly reduce SSB consumption. Additionally, water and other low-sugar healthy beverages need to be easily accessible, conveniently located, and priced appropriately or provided free of charge at promotional events. These interventions may be the beneficial for future practice and serve as the cues to action needed to cause behavior change among students according to the HBM.

Like the Social Ecological Model suggests, dietary changes across college campuses may require interventions and support from different angles. According to the American College Health Association [ACHA], (2018), this may include considering individual characteristics such as knowledge and attitudes, financial resources, values, expectations, and health literacy. Support from family, roommates, advisors, supervisors and social networking platforms are key in changing eating behaviors. Organizational factors include campus climate, class schedules, financial policies, noise levels, availability of commons areas, and a clean and safe campus. Changes from the community level may be also helpful. Community factors include campus location within the community, on/off campus housing, availability of parking, access to healthy food and beverage options, clean drinking water, health fairs and other educational events provided by local health professionals. Societal interventions may include media campaigns that focus on healthy beverages, legislation that promotes wellness, and school wellness policies such as limited the sale of SSBs in certain instances (American College Health Association, 2018).

Not only should education include negative effects of SSBs, but students should also be provided basic nutrition education based off *The Dietary Guidelines for Americans*. According to the 2015-2020 Dietary Guidelines, the five overarching guidelines to the eighth edition include following a healthy eating pattern, focusing on variety and nutrient dense foods, limiting calories from added sugars to less than 10% of total calories, limiting calories from saturated fats to less than 10% of total calories,

reducing sodium intake to less than 2300mg per day, shift to healthier food and low-sugar beverages options, and lastly, support healthy eating patterns for all (Office of Disease Prevention and Health Promotion, 2015). By implementing these five guidelines, students will hopefully develop a healthy diet, maintain a healthy weight, and promote an overall healthy lifestyle that lasts beyond their college years.

In addition to educating students, parents and guardians of young children also need to be informed of *The Dietary Guidelines for Americans* and implement key recommendations at home that promote healthy habits. Research shows that dietary habits utilized throughout life are developed at a young age (Birch, Savage, & Ventura, 2007). If parents and guardians teach healthy dietary habits to their young children, these habits will likely carry into adulthood.

To conclude, future practices need to be complex and comprehensive. To expect SSB consumption changes among college students, effective interventions may need to start at an early age with the formation of healthy dietary habits at home. A low stress college lifestyle may contribute to less of a need for highly caffeinated beverages, and therefore a decrease in SSB consumption. Easy access to water and other low-sugar beverages across college campuses may increase consumption of these beverages. Health promotion events that remind students of the importance of healthy eating and drinking throughout college life may be effective. Sound nutrition education based off *Dietary Guidelines for Americans* will encourage a healthy diet and healthy lifestyle far beyond college life.

**Recommendations for Future Research**

Further research needs to be conducted on the topic of SSB consumption and obesity. Dietary habits are developed at a young age as children learn what, when and how much to eat by observing others (Birch, Savage, & Ventura, 2007). Researchers could investigate obesity and SSB consumption among toddlers, children, adolescents, students attending middle schools and junior high schools, students living in different parts of the United States. Results from such studies could provide vital information on the level and complexity of SSB consumption among these ages. By knowing this information, effective interventions could be put in place that would promote a healthy lifestyle at an early age. Public health programs could be developed to educate parents on the importance of healthy, low-sugar diets for their children. Conducting more research around low income and minority groups, as well as immigrant populations may also be beneficial. By investigating these populations, potential financial barriers, cultural barriers, or language barriers may be identified. This data could be used to develop effective interventions and programs targeting a reduction in obesity and SSB consumption rates.

While this particular study asked basic demographic questions for the purpose of describing the respondents, no further analysis regarding race, ethnicity, and specific SSB consumption patterns was completed. Future research that assesses for correlations between certain racial/ethnic groups and SSB consumption patterns may be helpful. Future research that assesses knowledge and comprehension of nutrition fact labels may also be beneficial.

Researchers could also study the effects of a sales tax on SSBs. While some research has been done on this topic, a more in-depth look at the effects of a tax on college students, low-income individuals, minority individuals, and rural versus urban consumers may provide important information on the long-term implications surrounding a SSB tax. The economic effects of a sales tax may also interest future researchers.

Health care costs associated with managing chronic diseases remains high. The cost associated with managing chronic diseases may not be apparent to many individuals, including college students. College students may not feel susceptible to acquiring chronic diseases, and therefore may not be aware of the financial burden that comes with a chronic disease diagnosis. In-depth research that assesses knowledge of disease risk as well as knowledge of costs associated with managing chronic diseases may be beneficial as increasing awareness among college students and the public could lead to healthier lifestyle habits. Data from future studies could be used to develop and implement evidence-based health programs aimed at improving beverage choices and overall health of Americans.

## Conclusion

The increasing prevalence of obesity can be largely attributed to sugar-sweetened beverage consumption (AHA, 2018). This study has shown that while participants are aware of the disease risks associated with SSB consumption, no change in consumption was observed. Participants are aware of the links between SSBs and obesity and other

chronic diseases. Knowing this information did not change the decision to consume SSBs. No correlation was noted when comparing knowledge to consumption. This study also revealed that while there is knowledge of disease risk, knowledge of SSB content and what constitutes a healthy beverage is unclear. Knowledge levels were low when asked about sugar content of certain SSBs, health benefits of low-sugar or sugar-free beverages, and health benefits of 100% juice. These results indicate that consumers may not be aware of the amount of sugar being consumed. Through education and healthy eating programs, the health benefits associated with consumption of water and other low sugar beverages can be emphasized. Consumers can be educated on not only how to identify the sugar content of SSBs, but also reasons to eat healthy, the long-term benefits of developing healthy eating habits early in life, and ways to avoid excessive sugar. Interventions such as public policy, health communication campaigns, and nutrition education to individuals of all ages may be the effective tools needed to change SSB consumption patterns among Americans.  Public policy interventions that may be effective include SSB taxation, limitations on marketing SSBs to youth, and access to clear concise nutrition information found on product labels and restaurant menus. SSBs are a major contributor to the obesity epidemic. With the rate of obese and overweight Americans on the rise, a drastic change in SSB consumption patterns is needed to combat the obesity epidemic. SSB consumption needs to be replaced with consumption of water and other low-sugar beverages. A healthy diet that is low in sugar, accompanied by an active lifestyle will help combat the obesity epidemic.

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Appendices

Appendix A

Institutional Review Board Letter of Approval

October 23, 2019

Dear Mary Kramer, PhD:

Re: IRB Proposal   entitled "[1514083-4] An Assessment of Knowledge, Behavior, and Consumption
Patterns Surrounding Sugar-Sweetened Beverages Among Young Adults"
Review Level: Level *[I]*

Your IRB Proposal has been approved as of October 23, 2019. On behalf of the Minnesota State
University, Mankato IRB, we wish you success with your study. Remember that you must seek approval
for any changes in your study, its design, funding source, consent process, or any part of the study that
may affect participants in the study (see https://grad.mnsu.edu/irb/revision.html). Should any of the
participants in your study suffer a research-related injury or other harmful outcome, you are required
to report them to the Associate Vice-President of Research and Dean of Graduate Studies immediately
at 507-389-1242.

When you complete your data collection or should you discontinue your study, you must submit a Closure
request (see https://grad.mnsu.edu/irb/closure.html). All documents related to this research must be
stored for a minimum of three years following the date on your Closure request. Please include your
IRBNet ID number with any correspondence with the IRB.

Cordially,

Bonnie Berg, Ph.D.                     Jeffrey Buchanan, Ph.D.               Mary Hadley, FACN, Ph.D.
IRB Co-Chair                           IRB Co-Chair                          IRB Director