Background:

Obesity Rates are at Epidemic Proportions

Obesity is an epidemic across the world and especially in the United States. In 2015-2016, the prevalence of obesity was 18.5% in children and 39.8% among adults and it affected about 93.3 million US adults (CDC, 2018). Obesity is an issue that causes several conditions including high blood pressure, elevated blood sugar, and a poor blood lipid profile (Gunnars, 2018). It is also associated with many other serious health complications such as heart disease, stroke, type 2 diabetes, and several types of cancer. In 2008, obesity related costs totaled over $147 billion (CDC,2018). Obesity affects all types of people regardless of socioeconomic status and race. However, recent studies have shown that Hispanics (47%) and non- Hispanic blacks (46.8%) had higher prevalence of obesity compared to non-Hispanic whites (37.9%) (CDC,2018).

Rates of obesity have increased about 4% in children and almost 10% among adults over the last 15 years. Reasons for the sharp increases in obesity rates are not entirely understood, but some factors such as added sugars have received recent attention (State of Obesity, 2018). Obesity is believed to be caused by several factors including genetics and overeating however added sugars are believed to be strong contributors to obesity (Gunnars, 2018). Added sugar is made of half glucose and half fructose. Excess fructose intake can lead to elevated insulin levels and insulin resistance. Sugar sweetened beverages (SSBs) continue to be a major component of the diet of many individuals and consumption has been linked with obesity (Gunnars, 2018). The World Health Organization estimate that at least 19 million yearly deaths are caused by cardiometabolic

disorders and SSBs are believed to be a significant factor (Sandoiu, 2017). It follows that reducing SSBs in the diet could make an impact on obesity rates and improve health.

Sugar Sweetened Beverage Intake is Prevalent and Harmful

Sugar sweetened beverages (SSBs) are a main source of added sugars in the diet among a range of ethnic and racial groups (CDC, 2018). SSBs include any beverages that are sweetened with certain sugars like brown sugar, corn sweetener, corn syrup, dextrose, fructose, glucose, high fructose corn syrup, honey, lactose, malt syrup, maltose, molasses, raw sugar, and sucrose. Drinks such as carbonated soda, sports drinks, energy drinks, and highly sweetened coffees and teas are common types of SSBs (CDC, 2010). Individuals that frequently drink SSBs are at risk for weight gain, type 2 diabetes, heart disease, kidney disease, non-alcoholic liver disease, tooth decay and caries, and gout (CDC,2018). In 2015, worldwide dietary surveys were used in a modeling study and estimated 184,000 deaths per year to be attributable to the consumption of SSBs (Singh, 2015). In 2011-2014, 63% of the youth population and 49% of the adult population drank a sugar-sweetened beverage daily and on average about 145 calories are consumed from SSBs per day (CDC, 2018). Based on a national survey (N = 20,944), adolescents with overweight or obesity consume over 300 kcal on average per day from SSBs. This is equivalent to about 15% of their total daily energy intake (Wang, 2004). Among youth, SSB intake is highest among boys, non-Hispanic blacks and those living in low-income households. Among adults, SSB intake is highest among younger men, non-Hispanic blacks and low-income adults (CDC,2018). It has also been found that those who drink SSBs are more likely to partake in other less healthy behaviors such as smoking, physical inactivity, insufficient sleep, fast food consumption and low fruit consumption (CDC, 2018). Among children, those who are more

frequent SSB consumers have a tendency to spend more time looking at screens (television, phone, computers, video games). As a result, this clustering of other behaviors with SSB consumption could further increase the risk for obesity among these populations.

SSBs are Linked to Obesity

On average, there are 150 calories in one soft drink. According to a study done by Löfvenborg, drinking two sodas every day will increase your chances for diabetes by 2.4 times (Löfvenborg, 2019). There is also growing evidence showing that SSBs are linked to obesity. In a systematic review of 30 prospective or randomized trials, including 242, 352 participants, all but one study showed a significant relationship between SSB consumption and weight gain (Luger, 2017). Those with higher SSB consumption showed increased weight gain. Only 4% of the participants showed no association and there were not any studies which showed a negative association, or weight loss, between SSB consumption and weight measures. It was recommended that public health policies aim to reduce consumption of SSBs and advocate alternatives such as water.

Review of Interventions to Reduce SSB Consumption

In a systematic review investigating interventions that target reduction of SSB consumption in adolescents, it was found that replacing SSBs with alternatives, such as water or diet soda, has a positive effect on reducing body weight (Avery, 2014). Water and diet soda are both zero calorie drinks and replacing calorie rich sodas with zero calorie drinks should reduce body weight by reducing calories consumed. Few studies have purposefully tried to change consumption of SSBs as the sole means to produce weight loss. Ten trials have been conducted, 5 in children or adolescents and 5 in adults (Malik, 2013). Only two of these studies directly examined the effect

of SSB restriction on weight loss in adolescents (Ebbeling et al., 2006; Ebbeling et al., 2012). In the first trial, normal, overweight and obese adolescents were included. The intervention group was given non-caloric beverages to replace SSBs and it was found that, compared to the control group, the intervention was most effective for adolescents entering the study with a high baseline body weight (Ebbeling, 2006). A second trial, which limited participation to overweight and obese individuals, also provided noncaloric beverage replacements for SSBs to the intervention group and resulted in greater weight losses among the intervention group compared to the control group after 1 year (Ebbeling, 2012). In adults, only one intervention (Choosing Healthy OptIons Consciously Everyday, CHOICE) has studied the effect of caloric beverage restriction alone on weight loss (Tate et al., 2012). In the CHOICE study, adults (N =318) were randomized to replace caloric beverages with either diet beverages or water or to a control group. Those assigned to replace caloric beverages with either diet beverages or water were significantly more likely to achieve a clinically meaningful, 5% weight loss, at 6 months compared to controls.

Who Might Benefit Most from Beverage Interventions

According to current literature and weight loss interventions that did not target beverages as the sole weight loss strategy, older individuals have greater weight loss success then younger individuals (Jiandini, 2016). Previous studies have also shown that African American populations often lose less weight than white participants in the same intervention (Carr, 2018). In other weight loss interventions and in an adolescent beverage intervention, a higher BMI has shown to be a predictor of greater weight loss (Ebbeling, 2006). Along with age, race, and BMI, gender and education have also been shown to be predictors of weight loss. In a systematic review of all weight loss interventions comparing men and women, 10 out of 11 studies found

that men lost significantly more weight than women. However, when controlling for baseline weight, only two studies found a significant difference for percent weight loss between males and females (Williams, 2015). Lastly, a higher level of education is often associated with greater weight loss. It is posited that the greater nutritional knowledge one has, the more likely they are to practice healthier behaviors (Laz, 2015). Since reducing intake of calories consumed via beverages is the mechanism through which some interventions have reduced body weight, it follows that those individuals who consume more calories from beverages may be able to create a greater calorie deficit by reducing beverage intake and will lose more weight in a beverage intervention. Among adults, SSB intake is higher among males, young adults, non-Hispanic blacks or Mexican American, or low-income adults (CDC,2018).

The purpose of this study

While predictors of weight loss have been studied in other weight loss interventions and there is evidence from various studies in adolescents that overweight and obese teens benefit the most from replacing beverages, these research questions have not been examined in adults. Using the data from a randomized controlled trial that promoted weight loss in adults through caloric beverage reduction, the CHOICE trial (Tate et al, 2012), I will fill this gap in literature by exploring predictors of weight loss in a beverage intervention for adults. My hypotheses are: males, those with a lower education, in a racial minority group, and younger participants will have higher baseline calories from beverages. Additionally, males, those with a higher education, non-Hispanic white, older participants and participants with a higher baseline will lose more weight from baseline to 6 months. After controlling for significant demographic and anthropometric predictors, those who consumed greater calories from beverages at baseline will

have greater weight loss over the 6 months. Lastly, participants who consume more calories from soda at baseline will lose more weight overall and will fare better in the diet beverage arm than in the water arm. With these findings we may be able to establish a profile of patients who may benefit most from a weight loss strategy that focuses primarily on reducing calories from caloric beverages. These findings might enable providers to make more tailored recommendations for individuals for weight loss.

Methods:

Participants:

Between May 2008 and January 2010, 318 participants were recruited into the CHOICE study. These participants were overweight and obese (BMI (kg/m^2): 25–49.9), aged 18-65, reported consuming more than 280 kcal/d of caloric beverages and were willing to make a dietary substitution for the study. Participants were screened at baseline with the use of a beverage telephone screener based on a standardized food frequency. Their beverage intake over the past week was used to determine the average number of kilocalories they obtained from specific caloric beverages daily.

Study Design:

The study was a 3-arm, single blind randomized clinical trial. Participants were assigned either to the control group or 1 of 2 intervention groups. The two intervention groups included recommendations to replace caloric beverages with artificially sweetened beverages (eg. diet soda group) or to replace with water (eg water group). Beverages were provided to these groups to insure access to the non-caloric alternative beverages.

Interventions:

Both intervention groups received monthly in-person group behavioral counseling to promote adherence to beverage substitution. It was recommended that participants were to replace approximately 2 servings (greater than 200 kcal) per day of caloric beverages with either water or diet soda (based on group assignment). Six 12-16 oz. single serving beverages per day were provided to make sure that the alternative drinks were available. Participants in the water group were able to choose any combination of bottled still and nonsweetened sparkling water. Participants in the diet beverage group could select any combination of noncaloric, artificially sweetened beverages. This included carbonated, noncarbonated, noncaffeinated, and caffeinated beverages. Both groups obtained their beverages at the monthly group meetings. The control group equaled treatment contact time and attention, along with monthly weigh-ins. This group was called “Healthy Choices” and they attended monthly group sessions of identical length to the beverage intervention groups. They were weighed and given healthy diet and activity information however they were not given weight loss calorie reduction or physical activity goals. Additionally, they were not encouraged to change beverage intake and were not provided with beverages. All groups had access to a group specific study website where they recorded

beverages (beverage groups) or healthy choices (control), reported their weekly weight, and received progress feedback and tips.

Measurements:

Objective weight measurements were taken after a 12 hour fast at baseline, 3, and 6 months. Subjects were wearing a hospital gown and no shoes and their weight was measured on calibrated digital scale. Weight and height at baseline was used to calculate baseline BMI, and weight values at baseline and 6 months were used to calculate percent weight loss at 6 months. Beverage data came from a brief beverage intake food frequency questionnaire in the online screening survey. For 10 different beverage types (non-diet beverages, fruit juice/fruit drinks, sweetened iced tea, coffee or tea, sports/energy drinks, flavored or whole milk, beer, wine, liquor or mixed drinks, and water), participants were asked "On average, how often in the last week did you consume (beverage)" and "If you consumed any (beverage) last week, what was the typical serving size you consumed?" The outcome of interest was average daily calories from beverages. To examine whether participants who consumed a large proportion of their calories from Soda, participants were categorized as either consuming at least 40% of their baseline beverage calories from soda or less than 40%. Demographic information, including gender, age, race (categorized as white or non-white), education (categorized as college degree or no college degree), and income, was collected as part of the baseline assessment.

Statistical Analysis:

The analyses in this study were conducted using SPSS. The first aim was to examine the association between demographic (age, race, gender and education) and anthropometric (baseline BMI) variables and baseline calories from beverages. A linear regression was used to analyze the association between age and daily average beverage calories. Separate t-tests were used to estimate the association between race, gender and education, independently, on daily average beverage calories. Similar models were used to determine which variables were associated with 6-month percent weight loss. Since 90% of minority participants were African American, two groups (white, other) were used for the race analysis. Participants without a college degree were compared to participants with a college degree or more. Demographic characteristics significantly associated with percent weight loss were included as covariates in the subsequent models. To measure the effect of daily average calories from beverages on percent weight loss at 6 months, a linear regression was conducted, controlling for race and gender. A univariate analysis was also conducted to examine if consuming at least 40% of their daily beverage calories from sodas was associated with percent weight loss or daily average calories from beverages, and also examined whether this effect varied by treatment group.

Results:

Of the 213 participants that were randomized to one of the two treatment groups, 177 had complete data on the measures included in these analyses; 87 were in the water beverage group while 90 were in the diet beverage group. Characteristics of the study sample and their baseline beverage intake can be seen in Table 1. Age and gender were not significantly associated with baseline beverage intake. This study was predominately made up of female participants (82.5%). Race however, did show an association with beverage intake. This study primarily contained

African American and White participants. The white participants had a significantly lower amount of daily average calories from beverages than the minority participants. College education was also found to be significant as those who graduated with a college degree had a significantly lower amount of daily average calories from beverages compared to those without college.

Variable	Mean (SD)/ N (%)	Daily Average Calories from Beverages at Baseline (Mean/95% CI)	Sig.	PWL at 6 Months (Mean/95% CI)	Sig.
Age	42.27 (11)	N/A	.06	N/A	.149
Baseline BMI	35.98 (5.81)	N/A	.533	N/A	.242
Race					
White	67 (38%)	419.36 (376.86, 461.86)	.02	-3.29 (-4.40, -2.18)	.015
Other	110 (62%)	513.06 (470.68, 555.49)		-2.13 (-2.86, -1.39)	
Education					
College degree or more	100 (56%)	450.26 (416.12, 484.39)	.004	-3.26 (-4.06, -2.46)	.077
No college degree	77 (44%)	526.84 (467.89, 585.79)		-1.66 (-2.62, -0.71)	
Gender					
Male	31 (17.5%)	470.57 (382.36, 558.77)	.839	-4.56 (-6.53, -2.59)	0.003
Female	146 (82.5%)	479.09 (445.49, 512.68)		-2.15 (-2.76, -1.52)	

Table 1: Demographic characteristics of study sample, baseline beverage intake, and Percent Weight Loss at 6 months

When testing to determine which demographic and anthropometric variables were predictors of percent weight loss, race and gender were found to be significant predictors. Race and gender were then controlled for in subsequent analyses to distinguish if daily average calories has a significant effect on percent weight loss. Daily average calories from beverages did not have a

significant effect on percent weight loss after controlling for race and gender (B = -0.002, p = 0.31).

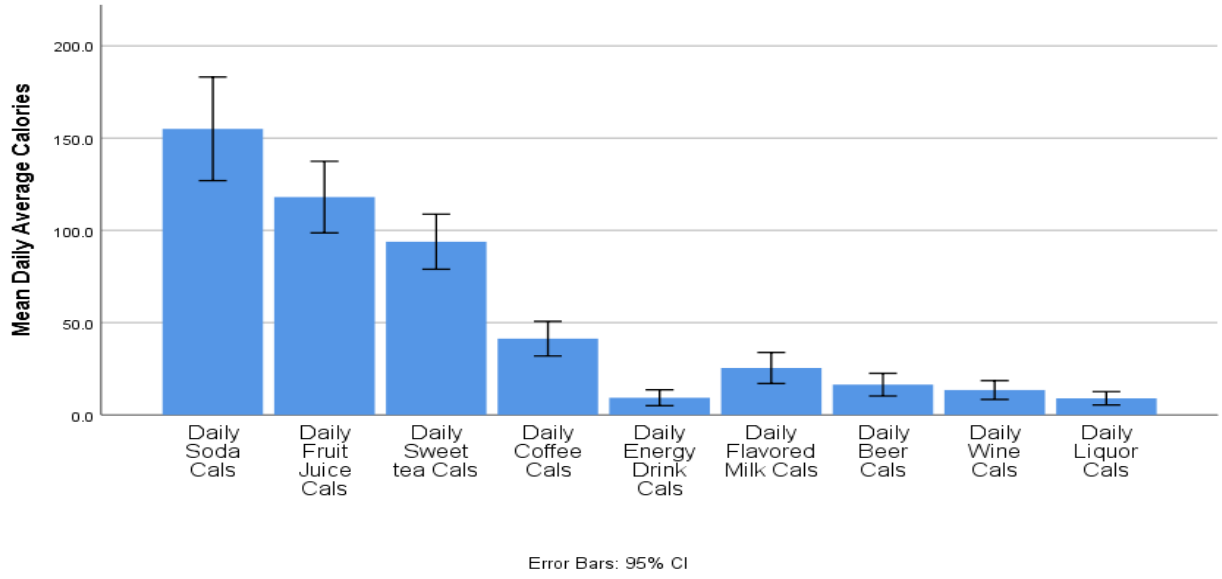

Figure 1: Daily average calories from each type of beverage at baseline

It was then tested to see whether the amount of soda consumption had an effect on daily average calories from beverages and percent weight loss. As seen in figure 1, soda was the source of the most daily beverage calories across all participants with over 150 kcals/day being consumed from soda. For analysis comparing high soda consumers to others, those that consumed more than 40% of their daily beverage calories from soda were considered high soda consumers. Despite soda being the beverage with the highest average daily consumption, the majority of participants (125 of 177) consumed less than 40% of their daily beverage calories from soda (low consumers) and 52 participants consumed more than 40% of their daily beverage calories from soda (high consumers). The soda consumer groups were racially balanced (Table 2). Males only made up 11.5% of the high soda consumption group compared to 20% of the low soda

consumption group (Table 3). While soda consumption groups were based on percent of total beverage calories from soda, low soda consumers also consumed significantly fewer total calories from beverages at 445.6 calories per day from beverages vs. high soda consumers at 554.6 beverage calories per day ($p = 0.002$, Figure 2).

	# of Participants with < 40% of daily beverage calories coming from soda	# Participants with > 40% of daily beverage calories coming from soda (%)
White	49 (39%)	18 (35%)
Minority	76 (61%)	34 (65%)

Table 2: Number of participants based on race in each group in Figure 4

	# of Participants with < 40% of daily beverage calories coming from soda	# Participants with > 40% of daily beverage calories coming from soda (%)
Male	25 (20%)	6 (11.5%)
Female	100 (80%)	46 (88.5%)

Table 3: Number of participants based on gender in each group

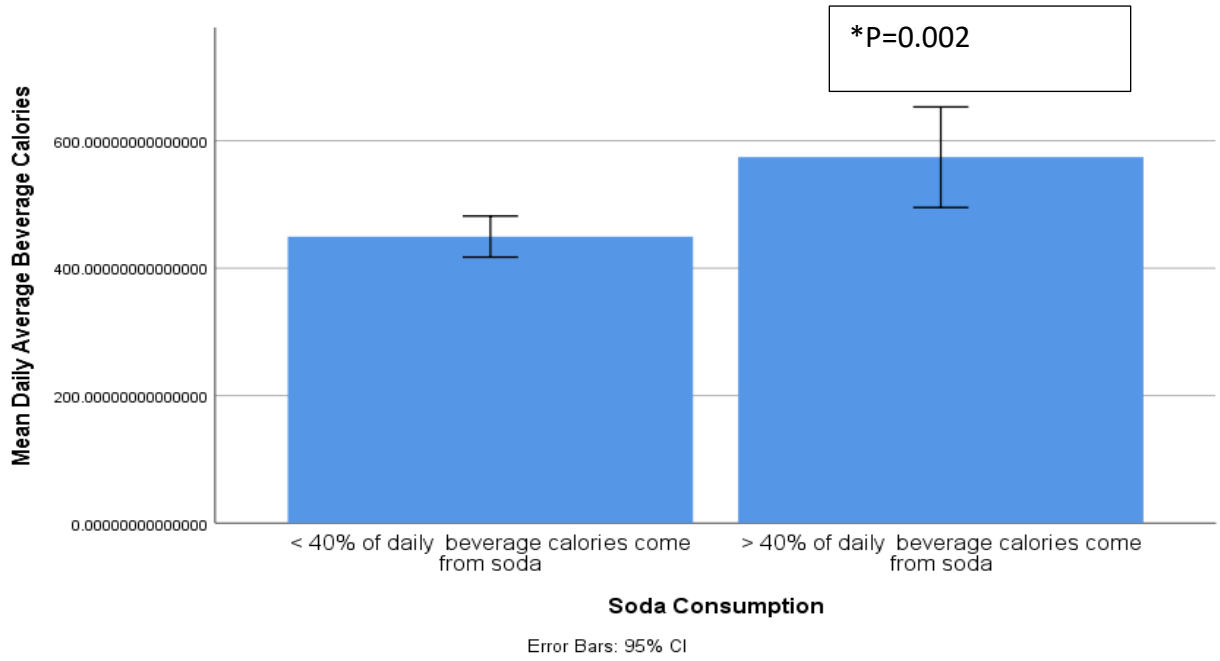

Figure 2: This figure shows the average amount of beverage calories based on soda consumption. * The amount of soda consumption was associated with the mean daily average beverage calories ($p = 0.002$)

Participants that were in the high soda consumption group lost, on average, 1.86% of their weight. This is compared to the low soda consumption group where participants lost, on average, 2.86% of their weight (Figure 3). When analyzed by race, the minority participants in each group appeared to consume a greater amount of daily beverage calories from soda than the white participants, but this difference was not significant. Lastly, I examined if the weight loss of soda consumers varied by treatment group. There was no effect of treatment group ($p = 0.67$) or consuming 40% or more beverage calories from soda at baseline ($p = 0.10$) on percent weight loss at 6 months after controlling for daily average calories from beverages, race, and gender.

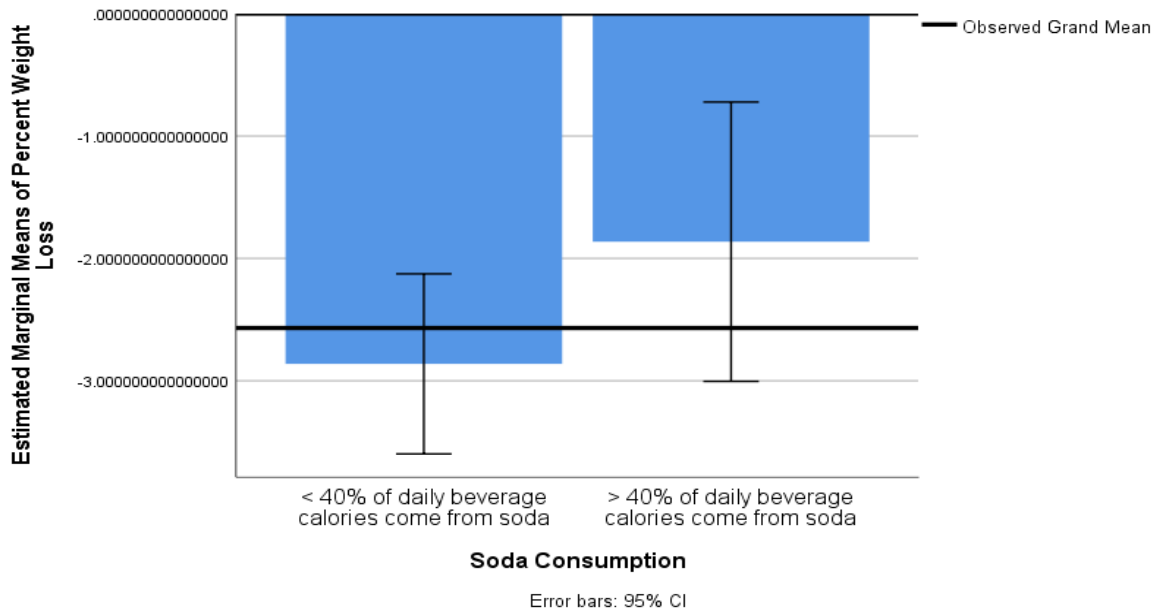

Figure 3: This figure shows the average percent weight loss based on soda consumption

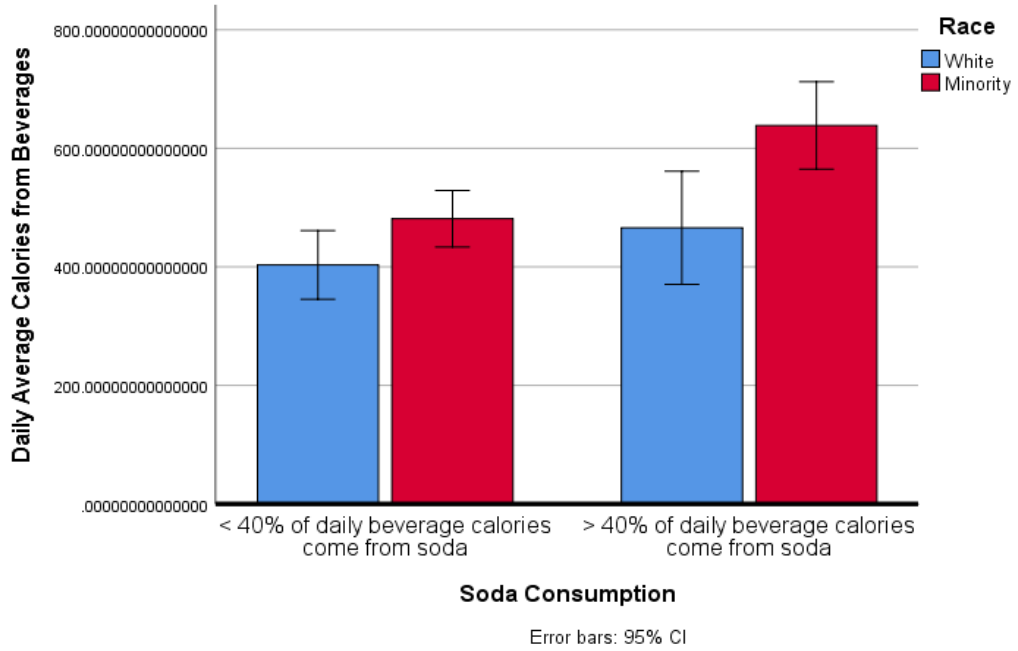

Figure 4: This figure shows the average amount of beverage calories based on soda consumption and race

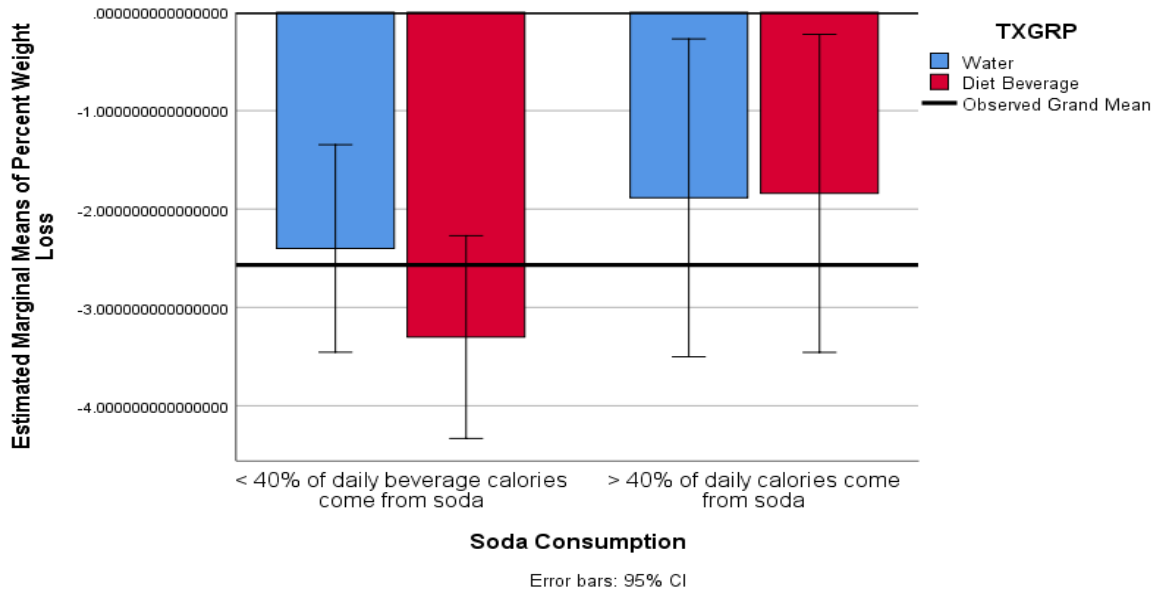

Figure 5: This figure shows weight loss of high and low soda consumers in each treatment group

Discussion

This study examined predictors of baseline beverage intake and weight loss in a beverage intervention among adult participants with overweight or obesity. Based on previous literature we predicted that those with less education, men, minority individuals and younger participants would consume the most calories from beverages at baseline (CDC, 2018). However, the present study showed greater consumption among minorities and lower education, but not among younger people or males. White participants in CHOICE consumed, on average, 110 fewer calories from sugar sweetened beverages than other populations (419.9 calories vs 527.71 calories) at baseline. This finding replicated many other studies of variation in beverage intake by race showing greater SSB consumption among African American participants when compared to non-Hispanic white participants (Han et al., 2013). Education was also associated

with daily average calories from beverages. Those with a college degree consumed 76 fewer calories from beverages at baseline than those without a college level education. Previous studies have shown greater SSB intake among lower income individuals, however, the finding in the present study is consistent as lower education is often associated with a lower income (Han et al., 2013). While it is unclear why this occurs, it may be due to health education about the effects of beverages on health or other environmental factors associated with higher income level such as access to healthier foods and cost of healthier foods. Nationwide, those with lower income often do not have access to healthy foods such as fruits and vegetables and unhealthy snacks, on average, cost less than healthier options (Yang, 2010).

When analyzing predictors of percent weight loss, the only baseline demographic variables that were associated with percent weight loss were race and gender. Men lost, on average, 4.56% of their weight compared to the women (2.15%). Based on previous findings males were hypothesized to lose more weight than women, however, men and women had similar beverage intake at baseline. The strategy of replacing caloric beverages with non-caloric alternatives may have been easy or appealing to men, or either men or women may have underreported beverage calories at baseline. As the males made up less than 20% of the participants in CHOICE, these findings need to be replicated with other samples. Overall, men have made up about 23% of the participants in weight loss trials (Williams, 2015). Due to the small sample size and lack of power these findings are only suggestive, however, it is possible that men, who consume at least 280 calories from caloric beverages might see clinically meaningful weight losses from beverage focused weight loss interventions.

Non Hispanic White participants, on average, lost significantly more weight compared to non-white participants; 3.29 % of their weight compared to 2.19%. This was predicted as white participants have lost more weight than African American participants in numerous other trials (Carr, 2018). While it is not understood exactly why minority participants do not lose as much weight findings are consistent and future investigations should seek to close this gap. BMI was not associated with greater percent weight loss however, this is likely due to the restricted range of this study. Literature has shown high BMI as a successful indicator of weight loss (Ebbeling, 2006).

After controlling for race and gender, it was found that the daily average calories from beverages did not have an effect on percent weight loss. This was unexpected. It was believed that those consuming the highest amount of calories from SSBs would benefit the greatest from a beverage intervention and show the greatest percent weight loss because a greater caloric deficit could be achieved from solely changing beverage intake. In the 2006 Ebbeling study of adolescents, weight losses did differ between the highest and the lowest SSB consumers (Ebbeling, 2006). Each participant in this study obtained at least 280 kcal/day from SSBs at baseline based on study entry criteria. It is possible that the study recommendation to replace at "least" 2 beverages per day was interpreted as replace 2 regardless of baseline servings per day. Thus, the deficit achieved by high and low consumers would be similar.

Lastly, a test was conducted to determine if higher consumers of regular soda fared better in this study than low soda consumers. As seen in Figure 1, the most common source of beverage calories from all participants was soda. It was predicted that the participants whose predominant source of beverage calories was soda would do better in this study. This was predicted because it was believed that replacing soda with diet drinks would be an easier strategy than replacing other

types of caloric beverages. For example, replacing soda with diet soda might be easier than replacing one's morning juice or coffee with a diet soda. Soda consumption was associated with higher baseline calories from beverages. However, there was a trend for high soda consumers in this study to lose less overall percent weight in this study compared to low soda consumers, though the difference was non-significant. This may have been due to other habits of high soda consumers such as consumption of unhealthy foods or compensating for the reduced SSBs with other beverages which weren't included in the current analyses. It was also predicted that the high soda consumers would lose more weight in the diet beverage group compared to the water group. This was hypothesized because the change from regular soda to diet beverages could be a substitution of drinks that they were used to. For example, replacing a carbonated and caffeinated sugar sweetened beverage with a diet beverage of the same carbonation and caffeination might be easier than replacing with water. Water lacks the flavor and caffeine properties of sodas and might be a more drastic switch for those who drink sodas daily. Our results did not confirm this hypothesis. High soda consumers did not do better in the diet soda group compared to the water group.

The findings that men benefitted from changing beverages and lost almost 5% of body weight with this strategy suggest that providers might suggest this to male patients for weight loss.

Strengths and Limitations & Future Directions

This study included objective measuring of weight change in the clinic and a fairly diverse sample population for a behavioral intervention. Limitations may have occurred from

self-reported data of both dietary and beverage intake increasing the chance of bias. Additionally, a larger number of dominantly soda drinkers would have aided this study. The 40% mark for high soda consumers was chosen to allow our sample size to be large enough. However, with a larger number of dominant soda drinkers, different cutpoints could be explored. A greater number of male participants would have also aided this study as males made up less than 20% of the participants.

In future studies qualitative data may supplement the current quantitative data. It would be helpful to study the dietary information during the 6 month period of the participants to determine whether food choices had a significant effect on percent weight loss. This would particularly be useful for the high soda consumption group to learn whether their food choices were the reason as to why this group did not lose as much weight as the low soda consumption group. It would also be helpful to understand the lifestyle choices of the participants in this study. This would allow us to see whether lifestyle choices had an effect on daily average calories and percent weight loss. Additionally, different predictors can be studied in the future to gain more knowledge of those who would succeed in beverage interventions.

Works Cited:

1. Beverage consumption among high school students -- United States, 2010. MMWR Morb Mortal Wkly Rep 2011;60:778-780

2. Reedy J, Krebs-Smith SM. Dietary sources of energy, solid fats, and added sugars among children and adolescents in the United States. J Am Diet Assoc 2010;110:1477-1484

3. Wang YC, Bleich SN, Gortmaker SL. Increasing caloric contribution from sugar-sweetened beverages and 100% fruit juices among US children and adolescents, 1988-2004. Pediatrics2008;121:e1604-e1614

4. Adult Obesity Facts | Overweight & Obesity | CDC. (n.d.). Retrieved from https://www.cdc.gov/obesity/data/adult.html

5. National Obesity Rates & Trends. (n.d.). Retrieved from https://stateofobesity.org/obesity-rates-trends-overview/

6. Get the Facts: Sugar-Sweetened Beverages and Consumption | Nutrition | CDC. (n.d.). Retrieved from https://www.cdc.gov/nutrition/data-statistics/sugar-sweetened-beverages-intake.html

7. Luger, M., Lafontan, M., Bes-Rastrollo, M., Winzer, E., Yumuk, V., & Farpour-Lambert, N. (2017, December 14). Sugar-Sweetened Beverages and Weight Gain in Children and Adults: A Systematic Review from 2013 to 2015 and a Comparison with Previous Studies. Retrieved from https://www.karger.com/Article/FullText/484566

8. World Health Organization: Global Health Observatory. Overweight and Obesity. *www.who.int/gho/ncd/risk_factors/overweight/en/*

9. Welsh JA, Sharma AJ, Grellinger L, Vos MB: Consumption of added sugars is decreasing in the United States. Am J Clin Nutr 2011;94:726-734.

10. Singh GM, Micha R, Khatibzadeh S, Lim S, Ezzati M, Mozaffarian D; Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE): Estimated global, regional, and national disease burdens related to sugar-sweetened beverage consumption in 2010. Circulation 2015;132:639-666.

11. Löfvenborg, J. E., Tomas Andersson, P. C., Dorkhan, M., Groop, L., Martinell, M., Tuomi, T., . . . Carlsson, S. (2019, February 16). Sweetened beverage intake and risk of latent autoimmune diabetes in adults (LADA) and type 2 diabetes in: European Journal of Endocrinology Volume 175 Issue 6 Year 2016. Retrieved from

https://eje.bioscientifica.com/view/journals/eje/175/6/605.xml?sid=aac4a946-bf80-4cd9-a9a9-6eb66f7bb5b4

12. Sandoiu, A. (2017, November 03). Just two sugary drinks per week may raise type 2 diabetes risk. Retrieved from https://www.medicalnewstoday.com/articles/319966.php?sr

13. Deshpande, Mapanga, Essop, & Faadiel. (2017, November 02). Frequent Sugar-Sweetened Beverage Consumption and the Onset of Cardiometabolic Diseases: Cause for Concern? Retrieved from https://academic.oup.com/jes/article/1/11/1372/4587524

14. Tate, Deborah F, T., Gabrielle, Lyons, Elizabeth, Stevens, . . . Barry. (2012, February 01). Replacing caloric beverages with water or diet beverages for weight loss in adults: Main results of the C hoose H ealthy O pt i ons C onsciously E veryday (CHOICE) randomized clinical trial. Retrieved from https://academic.oup.com/ajcn/article/95/3/555/4578292

15. Han, E., & Powell, L. M. (2013, January). Consumption patterns of sugar-sweetened beverages in the United States. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3662243/

16. Vargas-Garcia, E. J., Evans, C. E., Prestwich, A., Sykes-Muskett, B. J., Hooson, J., & Cade, J. E. (2017, November). Interventions to reduce consumption of sugar-sweetened beverages or increase water intake: Evidence from a systematic review and meta-analysis. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/28721697

17. Ebbeling, C. B. (2006). Effects of Decreasing Sugar-Sweetened Beverage Consumption on Body Weight in Adolescents: A Randomized, Controlled Pilot Study. *Pediatrics, 117*(3), 673-680. doi:10.1542/peds.2005-0983

18. Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: A systematic review. *The American Journal of Clinical Nutrition, 84*(2), 274-288. doi:10.1093/ajcn/84.2.274

19. Dhingra R, Sullivan L, Jacques PF, Wang TJ, Fox CS, Meigs JB, D′Agostino RB, Gaziano JM, Vasan RS. Soft drink consumption and risk of developing cardiometabolic risk factors and the metabolic syndrome in middle-aged adults in the community. Circulation 2007;116:480–8

20. Mullie, P., Autier, P., Boniol, M., Boyle, P., Deforche, B., Mertens, E., . . . Clarys, P. (2017). Assessment of sugar-sweetened beverage consumption and weight change: A prospective cohort study. *BMC Nutrition, 3*(1). doi:10.1186/s40795-017-0182-y

21. Avery, A., Bostock, L., & Mccullough, F. (2014). A systematic review investigating interventions that can help reduce consumption of sugar-sweetened beverages in children leading to changes in body fatness. *Journal of Human Nutrition and Dietetics, 28*, 52-64. doi:10.1111/jhn.12267

22. Ebbeling, C. B., Feldman, H. A., Chomitz, V. R., Antonelli, T. A., Gortmaker, S. L., Osganian, S. K., & Ludwig, D. S. (2012). A Randomized Trial of Sugar-Sweetened Beverages and Adolescent Body Weight. *New England Journal of Medicine, 367*(15), 1407-1416. doi:10.1056/nejmoa1203388

23. Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-sweetened beverages and weight gain in children and adults: A systematic review and meta-analysis. *The American Journal of Clinical Nutrition, 98*(4), 1084-1102. doi:10.3945/ajcn.113.058362

24. Bleich, Sara N., and Kelsey A. Vercammen. "The Negative Impact of Sugar-Sweetened Beverages on Children's Health: An Update of the Literature." *BMC Obesity* 5 (February 20, 2018). https://doi.org/10.1186/s40608-017-0178-9.

25. Carr, Loneke T. Blackman, Carmen Samuel-Hodge, Dianne Stanton Ward, Kelly R. Evenson, Shrikant I. Bangdiwala, and Deborah F. Tate. "Racial Differences in Weight Loss Mediated by Engagement and Behavior Change." *Ethnicity & Disease* 28, no. 1 (February 1, 2018): 43–48. https://doi.org/10.18865/ed.28.1.43.

26. Jiandani, Dishay, Sean Wharton, Michael A. Rotondi, Chris I. Ardern, and Jennifer L. Kuk. "Predictors of Early Attrition and Successful Weight Loss in Patients Attending an Obesity Management Program." *BMC Obesity* 3, no. 1 (March 9, 2016): 14. https://doi.org/10.1186/s40608-016-0098-0.

27. Laz, Tabassum H., Mahbubur Rahman, Ali M. Pohlmeier, and Abbey B. Berenson. "Level of Nutrition Knowledge and Its Association with Weight Loss Behaviors among Low-Income Reproductive-Age Women." *Journal of Community Health* 40, no. 3 (June 2015): 542–48. https://doi.org/10.1007/s10900-014-9969-9.

28. Williams, R L, L G Wood, C E Collins, and R Callister. "Effectiveness of Weight Loss Interventions – Is There a Difference between Men and Women: A Systematic Review." *Obesity Reviews* 16, no. 2 (February 2015): 171–86. https://doi.org/10.1111/obr.12241.

29. Yang, Leslie, Richard Beebe, and Bart Sadowski. "PolicyLink Is a National Research and Action Institute Advancing Economic and Social Equity by Lifting Up What Works®.," n.d., 44.