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Model Parents
Is parental sugar sweetened beverage consumption a risk factor for children's sugar sweetened beverage consumption?

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An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
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Abstract

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Background: Rising rates of obesity, risk factors for diabetes, and other chronic diseases in children have been linked to energy imbalance and sugar sweetened beverage (SSB) overconsumption. Access to SSBs, parenting style, and parental modeling may play a strong role in influencing child SSB consumption.

Methods: A sample of 1,139 parent/child dyads from throughout the U.S. was examined to test the association of parents' and children's SSB intake. The relationship between parent and child consumption was examined in bivariate and multivariate logistic regression models.

Results: This study finds a statistically significant association between parent and child SSB consumption. An unadjusted odds ratio shows that the odds of a child consuming SSBs daily are 2.01 times higher in children that have parents who are themselves daily SSB consumers. This relationship is reduced to an odds ratio of 1.89 when demographic variables and potential interactions are introduced into the analysis, and race/ethnicity proves to be an effect modifier in the relationship between parent and child SSB consumption.

Conclusion: Results suggest that parent SSB consumption is associated with child SSB consumption; however this association was statistically significant only in white parent/child dyads. This association between parent and child SSB consumption can influence public health practices and initiatives aimed at curbing childhood obesity and chronic disease by encouraging policy makers and public health professionals to make parents the focus of interventions.

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Chapters

1. INTRODUCTION

According to the World Health Organization, worldwide obesity rates have more than doubled since 1980. Currently, 33.8% of U.S. adults and 17% of U.S. children and adolescents 2-19 of age years are obese (Ogden, Carroll et al. 2012). The fundamental cause of obesity is energy imbalance due to more energy intake than energy expenditure. Current research draws a correlation between sugar sweetened beverage (SSB) consumption and weight gain (Malik, Schulze et al. 2006) ultimately leading to obesity (Lim, Zoellner et al. 2009) as well as diabetes and cardiovascular disease through inflammation, insulin resistance, and impaired b-cell function (Hu and Malik 2010).

Although national dietary guidelines recommend consuming fewer and smaller servings of sodas and other SSBs (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010), 14.6% of total energy consumed by Americans ages 2 years and older comes from added sugar, with 55-70% of total consumption happening in the home (Welsh and Cunningham 2011). Sugar sweetened beverages account for 46.2% of added sugar consumption in people over 2 years of age (U.S. Department of Agriculture and U.S. Department of Health and Human Services 2010) and SSBs are the largest single contributor of added sugars (Welsh, Sharma et al. 2011). In recent years, there have been significant increases in overall SSB consumption by children and adolescents (Wang, Bleich et al. 2008). The upward trend of SSB consumption parallels increases in childhood obesity (Lasater, Piernas et al. 2011). Increased SSB consumption not only increases the odds of disease but may also negatively impact the intake of other more nutritious beverages such as milk

(Grimm, Harnack et al. 2004), as well as reduced access to essential nutrients (Vartanian, Schwartz et al. 2007).

Parental role modeling has been suggested to be a strong influencer on children's eating behavior (Lim, Zoellner et al. 2009). Parenting style (Spurrier, Magarey et al. 2008), restrictions on food and beverage consumption (Birch, Fisher et al. 2001), parental beverage intake modeling, and parental provision of access to foods and beverages (Davison and Birch 2002) provide a strong environmental influence for children's beverage intake (Fiorito, Marini et al. 2009). Studies have found that the type of food and beverage environment parents create for children (Davison and Birch 2002), as well as their personal consumption of SSBs (Grimm, Harnack et al. 2004) is systematically associated with a number of unhealthy dietary practices in the home as well as with sedentary behaviors of these children (Ranjit, Evans et al. 2010).

The purpose of this study is to examine the relationship between parents' and children's SSB consumption and to investigate if this relationship is modified by various demographic factors. The study will also aim to explore these themes in greater depth to see if differences in SSB consumption correlation exist between parent/child dyads of different races/ethnicities, sexes, marital statuses, ages, household income brackets, and other demographic factors.

A growing body of research demonstrates correlations between parents' and children's food consumption and preference patterns (Patrick and Nicklas 2005), however extensive research has yet to be done on parental influences on SSB consumption, including factors

that may modify this association (Verzeletti, Maes et al. 2010). Some studies associate lower household income and socio-economic status with increased SSB consumption in children (Fiorito, Marini et al. 2009), while others associate higher SSB consumption with certain racial/ethnic groups (Beech, Kumanyika et al. 2004) and males (Jahnke and Warschburger 2008).

This study aims to assess connections between the home food and beverage environment and SSB consumption by asking the question: "Is parental SSB consumption associated with children's SSB consumption?" (Null Hypothesis: parental SSB consumption is not associated with children's SSB consumption.)

By increasing knowledge about the association between parents' and children's SSB consumption this research can inform public health interventions, policy, improve diet quality, and ultimately aid in lowering childhood obesity and other related diseases. If parental SSB consumption is associated with children's SSB consumption, it will be possible to target interventions to populations that are most in need, to potentially prevent further childhood obesity, as well as further highlight the importance of the family in establishing obesity prevention efforts (Davison and Birch 2002).

2. COMPREHENSIVE REVIEW OF THE LITERATURE

In order to adequately review the literature for the study question of "Is parental SSB consumption associated with children's SSB consumption?" this study reviewed current and relevant literature that specifically focused on SSB consumption in the U.S., SSB consumption and its effect on health outcomes, parental modeling and its association with children's SSB consumption, access to SSB in the home environment and its association with children's SSB consumption, parenting style and its association with children's SSB consumption, and finally family characteristics and their association with children's SSB consumption. Fifty four articles were used to evaluate the issue at hand and to provide a proper background to analyze available data and eventually used to create a conceptual framework by which the association could be framed.

2.1 SSB Consumption Trends

SSBs are in the top three of total energy sources for 2-18 year olds, (Reedy and Krebs-Smith 2010) and habitual SSB consumption is linked with a rise in total calorie consumption. Children and adolescents who consume SSBs regularly, consume on average 10% more calories than children who don't consume SSBs regularly (Cara B Ebbeling 2002).

The American Heart Association recommends limiting SSB consumption to 450 calories (or approximately three 12 oz. can servings) per week for all people, with lower limits applied to younger children (AHA 2010). Over the last three decades per capita consumption of SSBs measured in caloric distribution has gone up for children and adolescents across sex, age,

and racial/ethnic groups. Comparing data from NHANES 1988-1994 and 1999-2004, Wang et all report children between ages 6-11 have shown higher rates of SSB kcal consumption, with intake changing from 153 kcal per day to 184 kcal per day (a change of 20.3%). Adolescents between the ages of 12-19 had consumption rates change from 287 kcal per day to 301 kcal per day (a change of 4.7%). Boys, aged 2-11, changed consumption patterns form 161 kcal per day to 208 kcal per day (a change of 29.2%), while male adolescents changed consumption patterns from 333 kcal per day to 357 kcal per day (a change of 7.2%). Girls, aged 2-11, changed their consumption patterns from 145 kcal per day to 159 kcal per day (a change of 9.7%), and female adolescents changed their consumption patterns from 238 kcal per day to 242 kcal per day (a change of 2.1%). Whites have changed their consumption patterns from 154 kcal per day to 184 kcal per day in children (a change of 19.4%), and from 297 kcal to 307 kcal per day in adolescents (a change of 3.4%). Blacks have changed their consumption patterns from 161 kcal to 190 kcal per day in children (a change of 18.0%) and 268 kcal to 297 kcal per day in adolescents (a change of 10.8%). Mexican Americans have seen the greatest changes in consumption in both children and adolescents. Children have changed their consumption patterns from 134 kcal to 181 kcal per day (a change of 35.1%) and adolescents have changed their consumption patterns from 248 kcal per day to 308 kcal per day (an increase of 24.2%) (Wang, Bleich et al. 2008). SSB consumption trends have differed among racial groups and between the sexes over the past two decades, with SSB intake having increased more dramatically in racial minorities during this time than in non- Hispanic whites (Bremer, Byrd et al. 2011). Adolescents drink greater amounts of SSBs than children; however children have seen larger increases in SSB consumption than adolescents.

Several recent studies have analyzed SSB consumption patterns as they relate with the consumption patterns of other beverages, as a rise in SSB consumption can displace intake of more nutritious beverages such as 100% fruit juice and milk (CDC 2010). The CDC recently analyzed data from the 2010 National Youth Physical Activity and Nutrition Study that included a school-based survey measuring physical activity and dietary behaviors among a nationally representative sample of students in grades 9-12. This analysis found that water, milk, and 100% fruit juice were the beverages most commonly consumed by high school students. However, 24.3% of high school students were daily consumers of soda, 16.1% were daily consumers of sports drinks, and 16.9% were daily consumers of other SSBs. For all SSBs, male students were more likely than female students, and black students were more likely than white students and Hispanic students to report being daily consumers of SSBs (CDC 2011).

2.2 SSB Consumption and Health

Various negative health implications are associated with overconsumption of SSBs. Over the past several decades the US has seen an upward trend of SSB consumption that parallels increases in childhood obesity (Lasater, Piernas et al. 2011). Obesigenic home environments encourage children to consume SSBs (Davison and Birch 2002) with 55%-70% of all SSB consumption happening in the home environment (Welsh and Cunningham 2011). High consumption of SSB has been shown to be significantly associated with increased risk of weight gain and obesity (Malik, Schulze et al. 2006), and it has been argued that every additional daily serving of SSBs consumed by children increases their risk of obesity by 60% (Ludwig, Peterson et al. 2001). Consumption of SSBs is systematically associated with

unhealthy dietary practices as well as with sedentary behaviors (Ranjit, Evans et al. 2010). SSB overconsumption has also been linked with developing risk factors for diabetes and cardiovascular disease as excess sugar consumption leads to inflammation, insulin resistance, and impaired b-cell function in children as well as adults (Hu and Malik 2010). The effects of SSB consumption are both immediate and long lasting, and SSB intake at age five has been positively associated with increased adiposity through teenage years and beyond, (Fiorito, Marini et al. 2009) suggesting that early intake of SSBs, as opposed to 100% juice or milk, predicts adiposity and weight status across childhood and adolescence.

Another consequence of overconsumption of SSBs, is the under-consumption of other nutrients that would have been consumed by intake of milk, 100% fruit juice, or other nutritious beverages (Grimm, Harnack et al. 2004). For example, SSB intake has been found to be associated with lower intakes of calcium and other nutrients in children (Vartanian, Schwartz et al. 2007).

2.3 Family Environment

2.3.1 Access to SSBs

Consumption can be a factor of children's access to SSBs, parental modeling of SSB intake, and also parenting style. Focusing first on access to SSBs, current data supports the claim that children will eat and drink high sugar, high fat, and junk foods and beverages if they are available in the home (Rowan 2012). One study(Davison and Birch 2002) establishes that obesigenic home environments put children at a greater risk of being obese themselves, and

that parents have the power to create environments that will influence their children's food consumption patterns and obesity and health status. It has been argued that these patterns and customs have lasting negative effects that are nearly impossible to reverse (Krahnstoever Davison, Francis et al. 2005).

Gillis et al (Gillis and Bar-Or 2003) observed 91 obese children and 90 controls to examine their food intake over a one year period of time. Food records were obtained using food histories from a registered dietician assigned to the children. The study showed that there were significant positive correlations between frequency of SSB intake, total sugar intake, and frequent eating outside of the home. The study explains that restaurants serve larger portions that tend to be higher in fat, calories, and sugar and SSB consumption increases when eating outside of the home compared to meals prepared at home. Those who ate outside the home were more likely to be obese, and consume extra calories. Consumption of food outside the home may have long term effects on individuals. Parents providing their children access to healthy foods versus unhealthy foods is an important factor to consider in determining possible causal pathways that lead to children consuming SSBs. While this study differs from my study in that it is a case control study that followed a small group of individuals over a fixed period of one year, it nevertheless lends an important theoretical background about possible pathways in the association of parental and children's SSB consumption.

In their study (Patel and Hampton 2011), Patel and Hampton discuss increased access to water as a strategy for reducing consumption of SSBs. The researchers provide potential strategies for increasing water access and potability to effectively shift student preferences

from SSBs to water. They also suggest restricting access to SSBs in home and school environments to curb SSB consumption and increase water consumption, for more positive health outcomes. It is important to note that access to SSBs in school rather than the home environment has relatively little effect on total consumption, as most SSB consumption occurs in the home environment, outside of school (Cunningham SA 2011).

2.3.2 Parenting Style

In their study (van der Horst, Kremers et al. 2007), Van der Horst et al aimed to define an association between perceived parenting style and adolescents' consumption of SSBs. This Dutch study examined 383 school age children with a mean age of 13.5 years who completed self-administered questionnaires. Participants answered questions about their consumption of SSBs and attitudes about food-related parenting practices, by measuring their parents' strictness and involvement in their lives. The researchers found that more restrictive parenting led to lower SSB consumption (reduction of 38 ml CI (-48.1 ml to -28 ml). This study shows the power of parental influence and parenting style on SSB consumption. Some limitations of this study include the use of a cross sectional design, and possible selection bias as study participants were not randomly selected and were not nationally representative. I anticipate that my study, with a larger sample will be able to further clarify the relationship parenting style on children's and adolescents SSB intakes.

Verzeletti et al surveyed 14,407 European adolescents between 11 and 16 years of age (Verzeletti, Maes et al. 2010) on lifestyle and environmental behaviors that could influence SSB consumption, including parental influence. Among Belgians, while male adolescents

drank more soft drinks than female adolescents in general. Those who had few household rules were 3.83 times as likely to be daily SSB consumers compared to those that had many household rules. Females with few household rules were 4.16 times as likely to be daily SSB consumers compared with those with many household rules. Italian males with few household rules were 4.84 as likely to be daily SSB consumers compared to Italian males with few household rules, and Italian females with few household rules are 5.22 as likely to be daily SSB consumers as those with many household rules. The researchers concluded that parents could be effective in interventions that aim to reduce SSB consumption, and could do so by discouraging SSB consumption, as well as restricting availability of SSBs in the home. This study surveyed adolescents of a similar age group as my study, although this study was not based on a U.S. population, but instead on a homogeneous European population. While my study does not focus exclusively parental rules and strictness, both studies are similar in that they look at family environment, which can be helpful in the study of parental modeling.

A recent study (Rowan 2012) that focused on parenting style found that children from families with a higher household income consume less than half (42%) as many SSBs as children from lower income families. However, the majority of the difference in SSB consumption between the income groups could be explained by parenting style. Parents, who did not offer their children SSBs at mealtime, did not let their children drink SSBs whenever they wanted to, and restricted access by not keeping SSBs in the house, dramatically decreased the amount of SSBs their children consumed. The parental practice of not offering SSBs at mealtime accounted for about half of the difference in SSB consumption between the high and low income groups, not allowing children to drink SSBs

whenever they wanted to explained about one third of the difference, and restricting access to SSBs explained 16% of the difference.

2.3.3 Parental Modeling

Parental modeling is an important way in which children and adolescents learn about the world and form habits, and has been found to be associated with children's food and beverage consumption by several studies. Parents' healthy behaviors significantly raise the odds of healthy behaviors in children, (Greenberg, Ariza et al. 2010) and lower the odds of consuming unhealthy foods (Spurrier, Magarey et al. 2008).

In their study (Jahnke and Warschburger 2008) Jahnke and Warschburger studied parental modeling in 142 mothers with children aged 3-6 years. More than half of the mothers surveyed were obese, and most were of lower socio economic background. Maternal emotional eating and BMI positively predicted eating habits, however was not related to the eating habits of daughters. Maternal modeling of behavior and transmission of maternal eating behavior was found to be essential in development and onset of obesity. This study shows that parental modeling of eating behavior sets an important example for children and can be a determinant of weight status and eating behavior. My study, with a larger sample size will build on the idea of parental modeling, incorporate sex concordance as a variable just as this study has, and add additional variables that will further explore the relationship of SSB consumption and its effects on health.

In their study (Bauer, Neumark-Sztainer et al. 2011) Bauer et al asked 253 dyads of girls and their parents about food availability, SSB consumption, family meals, parental modeling, TV time, and fruit and vegetable intake to see if these factors were associated with girls' physical activity. The mean age of respondents in this study was with a mean age 15.7 and 71% identified as racial/ethnic minorities. While physical activity as opposed to SSB consumption was the main variable of interest in this study, this study nevertheless confirms the importance of parental modeling of positive behaviors and its influence on girls' positive behaviors. In the analysis of this study, parental intake of SSB in the home, along with SSB availability in the home were independent predictors of girls' intake of SSBs in various models. This relationship shows that dietary behavior can be instilled in adolescents through parental modeling. This cross sectional study took a unique sample of sedentary overweight or obese girls which was not nationally representative. I anticipate that my current study, with a larger sample, and a greater variety of ages of children, including males, focused on both obese and normal weight children, with a greater level of confidence in reporting of parental behaviors as parents themselves filled out surveys, will build on this study's findings.

Tak, Te Velde et al's study (Tak, Te Velde et al. 2011) of 1005 examined parental rules regarding SSBs, SSB availability, and modeling of SSB consumption in Dutch families. This study found that 59-97% of the association between home environmental factors and soft drink consumption were mediated through intention and habit strength, and that habit strength was the strongest indicator. According to the researchers, parental modeling is highly associated with habit strength. This study shows that parents are crucial in shaping the dietary behaviors and patterns of their children.

Focusing their research exclusively on low income families, Pinard et al survey 95 low income parent child/dyads with children between 9-17 years of age (Pinard, Davy et al. 2011). Forty six percent of the dyads surveyed in this study self-identified as African American and 45% self-identified as Caucasian, and each dyad in the study filled out a beverage intake questionnaire. Pinard et al found an association between parent and child SSB intake, supporting the theory of modeling and learning of beverage consumption at home. This study provided a unique assessment of beverage consumption in low-income population, and showed particular considerations that need to be accounted for in studying this population. This study, similar to my current study looks at SSB consumption as a relationship of parent/child dyads, however this study had a small sample size in which SSB consumption was not the area of focus and other beverages were also of great interest. This study was also limited in that it did not use multivariate modeling methods due to small sample size. Using a larger sample size and focusing to a greater extent on SSB consumption in particular, my study aims to produce findings with more statistical power and greater focus on SSB consumption.

In their study (Grimm, Harnack et al. 2004), Grimm, Harnack et al explored SSB consumption in 560 school-aged children (8-13 years) and found that children are more than four times as likely to drink soda five or more times per week if parents drink soda regularly, which was defined in this study as three or more times per week ORa 4.41 (2.92,6.67). Children are more than five times as likely to drink soda five or more times per week if it is available in the home ORa 5.15 (3,8.85). In addition, parents who consume soft drinks on a regular basis may not only be modeling this particular behavior, but also be less apt to restrict children's SSB consumption. This study found parental modeling as the greatest

influencer of child SSB consumption, followed by access to SSBs. This study also proposed that SSB consumption may reduce the intake of other beverages that may be more nutritious (such as milk, water, and 100% juice). Grimm et al believe that parental modeling may influence children both positively and negatively, and parental modeling may be an opportunity to instill healthy habits in children. This study differs from my study in that it exclusively focuses on school-aged children, has a smaller sample size and uses data from 1999. My study will aim to expand these findings to adolescents and a larger sample size, based on data collected in 2010.

2.3.4 Family Characteristics

Families' income, racial/ethnic identity, and socioeconomic status, child's sex and age, sex concordance, and parental education can modify or affect the relationship between parent and child SSB intake. Studies have shown that discretionary calorie consumption in the US differs across subpopulations, with higher consumption levels among African Americans, less educated populations, and lower income groups (Cohen, Sturm et al. 2010). Other studies have shown that greater SSB consumption associated with lower household income (Fiorito, Marini et al. 2009) as the cost of 100% juice and milk is higher than cost of SSBs, and a clear barrier exists for families to choose the healthy alternative. Overweight children from low-income households who consumed at least 1 SSB daily have been shown to be twice as likely to become obese at follow up one year later as those who consumed less (Welsh and Cunningham 2011).

Not all studies have found an association between household income and SSB consumption. Beydoun and Wang (Beydoun and Wang 2009) used nationally representative USDA data on children ages 2-18 and found parent/child dietary resemblance in the US to be very weak. The study showed that family income and parental education played a minimal role in influencing children's dietary patterns. Beydoun and Wang found that Hispanics and other ethnic groups had significantly stronger resemblance than non-Hispanic whites and blacks in SSB consumption. As a result of this study researchers suggest that interventions that target parents to lower children's SSB consumption may be limited. This study's results differ from many others in the literature. Although this study uses a nationally representative sample, it uses data that is over ten years old. More current data from 2010 may be useful in looking at current patterns of consumption. My study will also differ from Beydoun and Wang's by controlling for children's ages.

In their study (Patrick and Nicklas 2005), Patrick and Nicklas report that a growing body of literature demonstrates an association between parents' and children's food preferences, acceptance, and intake, highlighting the importance of parental modeling. According to Patrick and Nicklas, children's consumption behaviors change significanly by the time they are 3 to 4 years old, and eating is no longer deprivation driven, but influenced by their environment. The study finds that higher levels of parental education lead to healthier food choices, and these findings lead the researchers, along with others, to encourage interventions at the parental level. These interventions may include education about dietary quality and health consciousness in making food choices in order to influence children's consumption in a more positive way. My study will build on the idea of parental modeling

and choices in consumption, and focus these ideas more on SSBs than general food consumption.

In their study, Taveras and Gillman (Taveras, Gillman et al. 2010) found that black and Hispanic children were more likely to consume sugar-sweetened beverage compared with white children. After age 2 black and Hispanic children had higher intake of sugar-sweetened beverages (OR: 4.11 for black, 2.48 for Hispanic) than white children.

3. PROJECT CONTENT

3.1 Conceptual framework

Given the association between family environment and children's consumption outcomes, this study examines the research question "Is parental SSB consumption associated with children's SSB consumption?" The figure below shows the pathway through which children's SSB consumption may be associated with parents' consumption. If parents are daily consumers of SSBs, we may expect that: SSBs are available in the home, children regularly see their parents consuming SSBs, and that children are allowed to consume SSBs. Indeed, literature on parental association with children's SSB consumption to date suggests that access, modeling, and parenting style are important influencing factors in children's food intake and SSB consumption. While our data does not permit us to directly test these three proposed pathways individually, we can assess the relationships between parental and child consumption. If we find a positive association this would suggest that parental consumption is in fact associated with children's consumption. If we find no association this would suggest that parental consumption is not associated with children's consumption.

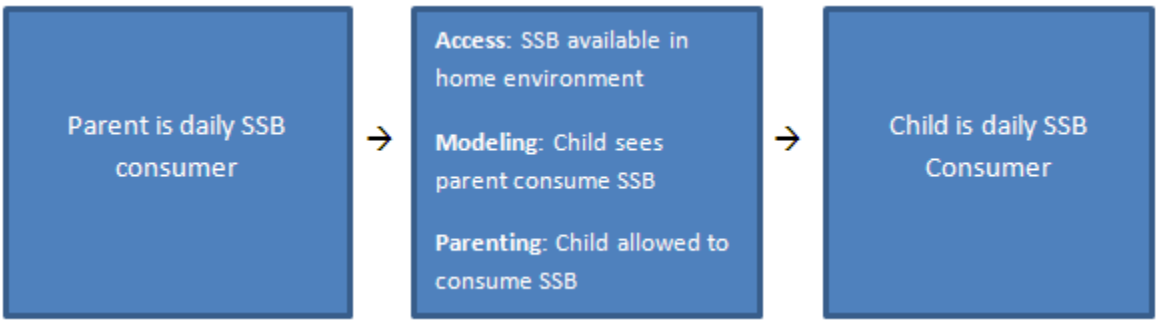

Figure 1: Conceptual Framework: Association of parent and child SSB consumption

Although parental consumption is believed to be especially important and is at the heart of this analysis, other factors may play a role in this relationship. Specifically, in this study's analysis we test household income, region of residence, parents' education, marital status, weight status, race/ethnicity, diabetes status, and children's weight status, sex, and age.

3.2 Methods

Data Description

Data for this study were collected through the 2010 YouthStyles, HealthStyles, and ConsumerStyles mail survey, which were administered by Synovate, Inc., a market research firm. These national surveys were designed to assess health-related attitudes and behaviors among children and adults. Initially ConsumerStyles survey participants were selected from a mail panel of approximately 200,000 individuals. Once ConsumerStyles surveys were returned, Healthstyles surveys were sent out to participants selected from within ConsumeStyles respondents. Ultimately, YouthStyles participant were selected from children of HealthStyles survey respondents, and mailed surveys to complete. ConsumerStyles samples individuals using a sampling design stratified on region, household income, population density, age, and household size, and includes an oversample of low-income/minority participants with children to ensure adequate representation of these groups. In 2010, a total of 10,328 people completed the ConsumerStyles Survey, yielding a response rate of 51.6%. A total of 6,255 HealthStyles surveys and 2,401 YouthStyles surveys were sent to mail panel individuals that returned the ConsumerStyles survey with the instructions that the survey should be completed by a specified individuals in the home. Separate Responses were received from 4,184 HealthStyles participants and 1,197

YouthStyles participants, yielding response rates of 66.9% and 49.9%, respectively. HealthStyles and Youthstyles surveys asked respondents to answer questions in several modules including demographic variables, health behaviors, and social behavioral questions.

YouthStyles survey participants are assigned survey weights for analysis according to the age and sex of the child, household size, household income, head of household age, and race/ethnicity/ethnicity of the adult included in the HealthStyles survey.

Variable Selection and Modification

HealthStyles and ConsumerStyles surveys were used to obtain parents' variables, and YouthStyles surveys were used to obtain children's variables. In order to approach the question of "Is parental SSB consumption associated with children's SSB consumption?" eight variables were selected from each the HealthStyles and YouthStyles datasets, and four variables were selected from the ConsumserStyles dataset.

Outcome variable: YouthStyles asked children about their daily SBB intake: "During the past 7 days, how many times did you drink sodas, fruit drinks, sports or energy drinks, or other sugar-sweetened drinks? Do not include 100% fruit juice, diet drinks, or artificially sweetened drinks." The survey allowed children to choose between the following responses: none, 1-6 times per week, 1 time per day, 2 times per day, 3 times per day, or 4 or more times per day. For this analysis SSB consumption was dichotomized into daily (≥1 SSB/day) consumers and non-daily (< 1 SSB/day) consumers.

Main Predictor Variable: HealthStyles asked parents about their SSB intake, "During the past 7 days, how many times did you drink sodas, fruit drinks, sports or energy drinks, or other sugar-sweetened drinks? Do not include 100% fruit juice, diet drinks, or artificially sweetened drinks." The survey allowed parents to choose between the following responses: none, 1-6 times per week, 1 time per day, 2 times per day, 3 times per day, or 4 or more times per day. For this analysis SSB consumption was dichotomized into daily (≥1 SSB/day) consumers and non-daily (< 1 SSB/day) consumers.

Control/ Confounding variables: Several HealthStyles variables were selected to be control/confounding variables: a variable asking parents' age in years allowed them to identify with one of six categories: 18-24, 25-34, 35-44, 45-54, 55-64 or 65+. Parents' age in years was divided into three groups, 18-34, 35-44 and 45 and above. An income variable question asked respondents to place their household income in one of the following categories: under $15,000, $15,000-$24,999, $25,000-$39,999, $40,000-$59,999, or $60,000+. Household income was collapsed into three categories for analysis: below $25,000, $25,000-$59.999, and $60,000+. A race/ethnicity variable asked respondents to identify their race/ethnicity in one of the following categories: non-Hispanic white, non- Hispanic black, Hispanic, or "other." A sex variable asked parents to identify themselves as either male or female. A question asking parents about their educational background allowed them to choose from following categories: 1 to 7 years of grade school, 8 years of grade school, 1 to 3 years high school, did not attend school, high school graduate, 1 to 3 years college, college graduate, post graduate, or not specified. Education was collapsed into three categories for analysis: less than or equal to high school graduate, some college, and college graduate and above. A question asking about the marital status of the participant, asked caregivers if they

were married, widowed, divorced, separated, never married, or in a domestic partnership. Parental marital status was defined as "married" if a parent responded that he or she was married or in a domestic partnership while those responding that they were widowed, divorced, separated, or never married were defined as "single." Finally, a question was selected for use in the analysis which asked parents about their physician diagnosed diabetes status, and inquired into whether they had been diagnosed with diabetes or not.

Several YouthStyles were included in the analysis to account for children's characteristics. A variable asking the child's age, which allowed for a numeric response between the ages of 9-19 years, was modified into a dichotomous age variable separating children into two groups: 9-12 and 13-19. A question about the child's sex allowed for a response of male or female. A question about a child's weight in pounds and height in feet and inches, allowed for self-reported measures. Children's BMIs were calculated using percentile cutoffs where children between the eighty fifth and ninety fifth percentile were considered overweight, children above the ninety fifth percentile were considered obese, and those below the eighty fifth percentile were considered normal weight as defined by CDC standards (CDC 2011) and a bodyweight status variable was created. A question about the child's geographical region of residence could be defined as New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain, Pacific, or not specified. Regions of residence were collapsed into four larger regions, defined by U.S. Census Bureau designated regions of Northeast, Midwest, South, and West. Finally, a variable used to weight the respondents was used to make the sample more nationally representative in further analysis. A sex concordance variable was created to indicate

whether the parent/child dyads responding to the survey were of the same or different sexes.

The ConsumerStyles dataset was used to obtain self-reported height (in feet and inches) and weight (in pounds) information for parents, and a body weight status variable was created classifying a BMI of less than 25 as normal, a BMI of greater than or equal to 25 and less than 30 as overweight, and a BMI of 30 and above as obese (CDC 2011).

Missing Data Methods

For the present analysis, 29 HealthStyles survey respondents were excluded because they had missing data on education level and 101 were excluded because of missing data on SSB intake. Also, 27 YouthStyles respondents were excluded because they had missing data on SSB intake. Although 132 YouthStyles respondents were missing height or weight data, these participants were not excluded from the study as height and weight were not primary variables in this analysis, and this exclusion would have created a substantial amount of missing data. Once the datasets were combined, this left a final analytic sample of 1139 parent/child dyads. The results of missing data methods can be seen in Table 1.

Combined Dataset

In order to better analyze relationships between parents and children, YouthStyles, ConsumerStyles, and HealthStyles datasets were merged to create a new combined dataset according to MIQ, a variable present in all three datasets. This variable allowed the study to associate the children's information with their parents' information and to create parent/child dyads for further analysis. The variables kept in the new collective dataset were

child's age, sex, height, weight, SSB intake, region of residence, household income, parents' age, race/ethnicity, sex, SSB intake, marital status, diabetes status, weight, height, and education.

Analysis

Data for this study were analyzed using SAS 9.2 (Cary, NC). Frequency procedures were used to obtain descriptive statistics. Chi square tests were performed to test if there were significant differences in children's SSB consumption according to parents' SSB consumption, child's sex, parental marital status, region, parental weight status, parents' race/ethnicity, parents' education, parents' sex, sex concordance, child's weight status, child's age, parents' age, family income, as well as parental diabetes status. Next, a chi square analysis was performed to compare parent SSB consumption according to the same variables that were used in the assessment of child SSB intake. A correlation test was performed between all variables to screen for potential confounders. Variables that were found to be correlated with the primary exposure (parental SSB intake) and the outcome (children's SSB intake) were compared with the findings of the comprehensive review of the literature and considered to be potential confounders. The significance criterion used to identify potential confounders was a correlation coefficient of 0.1 and above. Additionally, the Breslow Day test of heterogeneity was used to screen for potential interactions between the association of parent and child SSB intake and its relationship with additional variables. Those variables found to be significant (at the $p=0.05$ level) that were consistent with previous findings in the literature were considered for further interaction assessment in the logistic models.

Logistic Regression:

A bivariate logistic regression was performed to test the relationship between children's and parents' SSB consumption in a simple bivariate logistic model. Taking into consideration current and relevant literature, and in testing for correlation between variables to screen them as potential confounders in the relationship between parent and child SSB consumption, it became apparent that household income, parent age, parent race/ethnicity, and parent education were significantly correlated to parent SSB intake and identified as potential confounders. A model that included these variables was created to test variables that would be of general interest in the association. Children's weight status was not included in the model as 132 missing entries may have skewed the analysis. Finally a model containing standard demographic variables, as well a possible interaction variable was tested as a logistic regression model. Variables that were identified as potential confounders based on the current literature, and that were found to be potential effect modifiers in the relationship between parent and child SSB intake in the Breslow Day test of heterogeneity were included in this final model. A survey adjusted variable was included in all of the logistic regression analyses in an attempt to make the data more nationally representative.

3.3 Results

Descriptive Statistics

The study sample of 1139 parent/child dyads included 533 (47.3%) children that are daily consumers of SSBs, and 617 (52.7%) that are non-daily consumers. There were 409 (35.9%) school age children compared with 730 (64.1%) adolescent children. More boys 640 (56.2%) than girls 499 (43.8%) answered the survey. A majority of children surveyed were normal

weight 675 (59.3%), while 183(16.1%) were overweight, and 149(13.1%) were obese (132 children had missing height and weight information and weight status could not be determined). Children's region was collapsed into four regions with 288(20.0%) living in the Northeast, 282(24.8%) living in the Midwest, 427(37.5%) living in the South, and 202(17.7%) living in the West. Parents' age was collapsed into three categories and 123(10.8%) of parents were between the ages of 18-34, while 377(33.1%) were between the ages of 35-44, and a majority of the parents 639(56.1%) were 45 and older. A majority of parents self-identified their race/ethnicity as non-Hispanic white 733(67.9%), while 122(10.7%) identified as non-Hispanic black, 161(14.1%) identified as Hispanic, and 83(7.3%) identified as "other". A majority of the parents in the survey were female 741(65.1%), and 398(34.9%) were male. Sex concordance was positive for a majority of the survey participants 630(55.3%), while 509(44.7%) had negative sex concordance. Many of the parents surveyed were non-daily SSB consumers 813(71.4%), while 326(28.6%) reported being daily SSB consumers. Parent weight status categorized by BMI classified 365(32.1%) parents in the normal weight category, 355(31.2%) as overweight, and 419(36.8%) as obese. A small minority of parents were diabetic 103(9.0%), and most had not been diagnosed with diabetes 1036(91.0%). A majority of parents in the study were married or in a domestic partnership 963(84.5%), and 176(15.5%) were single, widowed, or divorced. Parent's education status was collapsed into less than or equal to high school graduates 261(22.9%), some college attendance 419(36.8%), and college graduate and beyond 459(40.3%). Finally, household income was distributed as follows: 170(14.9%) families earned under $40,000 per year, 321(28.2%) earned between $40,000 and $59,999 per year, and 648(56.9%) earned more than $60,000 per year. These results can be seen in Table 2.

Tests of Association

Chi square tests were performed to test if there were significant differences in the child SSB consumption according to parent SSB consumption, child's sex, parental marital status, region of residence, parental body weight status, parent race/ethnicity, parent education, parent sex, sex concordance, child's weight status, child's age, parent age, household income, as well as parent diabetes status. The variables that show significant relationships to child SSB consumption when divided by daily and non-daily consumers are: parental SSB consumption ($p = <0.0001$), signifying that there is a statistically significant difference between children of daily consumers and children of non-daily consumers. A significant result in child sex ($p = 0.0144$) shows a statistically significant difference between boys and girls. A significant result in parents' race/ethnicity ($p=0.0107$) signifies that there is a statistically significant difference between consumption patterns in children based on their parents race/ethnicity. Parents' weight status ($p=0.0061$) also showed a significant result, indicating that children have differing SSB consumption rates based on their parents weight status. Finally a significant result in parents' education ($p=0.0288$) indicates that children have statistically significantly different consumption levels based on their parents' education. The results of these tests can be seen in Table 3.

A similar chi square analysis was performed to compare parent SSB consumption according to the same variables that were used in the assessment of child SSB intake. Eight variables showed significant relationships to parent SSB: child SSB consumption, child weight status, household income, regional location, parent age, parent race/ethnicity, parent sex, and parent education. The results of this test can be seen in Table 4.

Tests for Interaction:

Additionally, the Breslow Day test of heterogeneity was used to assess potential interaction between the variables according to covariates in the association of parent and child SSB intake. This effect modification shows that association of parent and child SSB intake is statistically significantly different according to race/ethnicity strata. The results of this test can be seen in Table 6.

Logistic Regression:

A simple bivariate logistic regression model showed that the odds of children consuming SSBs daily are 2.01 (1.56 2.58) times higher when they have parents who are daily SSB consumers versus parents who do not consume SSBs daily. When other variables of interest that were previously identified as potentially significant through literature review and data analysis were added to the model (child's sex, age, regional location, family income and parental education) the results showed that the odds of children consuming SSBs daily are 1.89 (1.46 2.46) times higher when they have parents who are daily SSB consumers versus parents who do not consume SSBs daily. The results of this test can be seen in Table 7.

Interaction:

Finally, when a third model containing an interaction term was created testing for the interaction of parent SSB consumption and race/ethnicity. The results showed that among African American families, the odds of children consuming SSBs daily are 0.94 (0.52 1.70) when they have parents who are daily SSB consumers versus parents who do not consume SSBs daily. Among non-Hispanic white families, the odds of children consuming SSBs daily are 2.47(1.73 3.52) higher when they have parents who are daily SSB consumers versus

parents who do not consume SSBs daily. Among Hispanic families, the odds of children consuming SSBs daily are 1.44(0.81 2.55) higher when they have parents who are daily SSB consumers versus parents who do not consume SSBs daily. Among families who's race/ethnicity is listed as "Other", the odds of children consuming SSBs daily are 2.44(0.76 7.80) higher when they have parents who are daily SSB consumers versus parents who do not consume SSBs daily. It is important to note that only relationships between White families were statistically significant and did not include the null in the 95% confidence interval. The results of this test can be seen in Table 8.

4. DISCUSSION, CONCLUSION, AND RECOMMENDATIONS

4.1 Discussion

This study set out to examine the relationship between parents' and children's SSB consumption. The study aimed to explore these themes in greater depth to see if differences in SSB consumption correlation exist between parent-child dyads of different household income brackets, races/ethnicities, parental education, and other variables that have been reviewed in the current literature.

The findings of this study are mostly consistent with the current literature on parental modeling and family food environments. In a similar study Beydoun et al show no statistically significant correlation between SSB consumption in black dyads, and only show significant correlations between white, Hispanic and other parent child dyads. In another similar study Fiorito et al show that family income level is associated with children's SSB consumption, which was not consistent with the findings of my current study(Fiorito, Marini et al. 2009).

The result of the logistic regression analysis shows that white parents have a statistically significant association with white children on SSB consumption while black, Hispanic, and "other" parents do not. However, it is important to remember that while these statistics are not significant on their own, this could be a product of the sample size in these racial categories being too small, without the possibility to detect an effect in these racial groups.

Further research with larger cohorts of parent/child dyads of various races and ethnicities would be needed to more thoroughly explore this relationship.

Ultimately, while there are factors that alter the relationship between parent and child SSB consumption, it can be concluded that parent SSB consumption is associated with child SSB consumption. This relationship is important to consider in the creation of programming, interventions, and policies in an attempt to curb the negative effects of SSB overconsumption and a growing obesity epidemic.

Study Strengths and Limitations:

One of the strengths of this study is that it explores the association of parent and child SSB consumption in a dataset, which combines parent and child self-reported data, and creates parent/child dyads which allows for a more accurate test of the relationship. One weakness of this study is that it is not nationally representative; however adjustments were made in the analysis and modeling processes that would make the demographics weighted in order to be more similar to national characteristics. Another weakness of this study is a large number of white dyads as opposed to smaller cohorts of black, Hispanic, and "other" dyads.

4.2 Conclusion

In conclusion, this study shows that in the study population there is an association between parent and child SSB consumption. However it is important to note that this association differs by race/ethnicity. By having the power to associate parent SSB consumption with child SSB consumption, communities, educators, organizations, and governments can

translate these findings into new initiatives, programs, and interventions that target parents and families, rather than children exclusively. These interventions can be implemented to prevent further growth of SSB overconsumption, under consumption of other essential nutrients, and ultimately the development of obesity, diabetes, and cardiovascular disease. By reducing parent SSB consumption, potentially great changes could be seen in children's health outcomes. Future research with a larger, more nationally representative sample would be useful to further test this association. This future research can be used to aid in the generalizability of the relationship of parent/child SSB consumption, and to promote public health practices and initiatives aimed at curbing childhood obesity and chronic disease.

TABLES

Table 1: Inclusion and exclusion criteria of variables

	Parents	Children	
Original Sample	**10,328**	**1,197**	Original Sample
	↓	↓	
29 Missing Education	**10,299**	**1,170**	27 Missing SSB Intake
	↓	↓	
101 Missing SSB Intake	**10,198**	**1,170**	132 Missing Height/
	↘	↙	Weight
Combine Datasets			Combine Datasets
	1,139 Valid Dyads		

*Parents' data taken from ConsumerStyles and HealthStyles 2010
*Children's data taken from Youthstyles 2010

Table 2: Descriptive Statistics of parent /child dyads (n=1139)

	%	SE
Child SSB Intake		
Daily Consumer	47.3	1.8
Non Daily Consumer	52.7	1.8
Child Age (years)		
9-12	35.9	1.8
12-15	64.1	1.8
Child Sex		
Female	43.8	1.8
Male	56.2	1.8
Child Body Weight Status		
Normal	59.3	1.8
Overweight	16.1	1.2
Obese	13.1	1.3
Missing	12.4	1.2
Region		
Northeast	20.0	1.3
Midwest	24.8	1.5
South	37.5	1.7
West	17.7	1.4
Parent SSB Intake		
Non Daily Consumer	71.4	1.7
Daily Consumer	28.6	1.7
Parent Age		
18-34	10.8	1.7
35-44	33.1	1.7
45+	56.1	1.7
Parent Race/Ethnicity		
White	67.9	1.8
Black	10.7	1.5
Hispanic	14.1	1.5
Other	7.3	0.7

Parent Sex		
Female	65.1	1.6
Male	34.9	1.6
Child- Parent Sex Concordance		
Concordance	55.3	1.8
No Concordance	44.7	1.8
Parent Weight Status		
Normal	32.1	1.6
Overweight	31.2	1.5
Obese	36.8	1.8
Parent Diabetes Status		
Yes	9.0	1.0
No	91.0	1.0
Parent Marriage Status		
Divorced/Single/Widowed	15.5	1.5
Married	84.5	1.5
Parent Education		
≤ HS Graduate	22.9	1.6
Some College	36.8	1.7
College Graduate	40.3	1.6
Family Income		
<$40,000	14.9	1.4
$40,000-$59,999	28.2	1.7
>$60,000	56.9	1.8

* Parents' data taken from ConsumerStyles and HealthStyles 2010
* Children's data taken from Youthstyles 2010
* Survey Adjusted Data

Table 3: Prevalence of children's daily SSB consumption according to child and parent characteristics (n=1,139)

		Child SSB Consumption		
	Overall	Non-Daily Consumer	Daily Consumer	P value
n (weighted%)	1139(100)	606(53.2)	533(46.8)	
Parent SSB Intake				<0.0001
Non Daily Consumer	67.7	58.8	41.2	
Daily Consumer	32.3	41.5	58.5	
Child Age (years)				0.1390
9-12	38.7	55.9	44.1	
13-19	61.3	51.5	48.5	
Child Sex				0.0144
Male	51.2	49.7	50.3	
Female	56.9	43.1	40.5	
Child Weight**				0.0528
Normal	59.1	54.0	46.0	
Overweight	15.2	56.3	43.7	
Obese	13.3	43.1	56.9	
Parent Marriage Status				0.9344
Married/Domestic Partnership	81.5	53.3	46.7	
Divorced/Single/Widowed	18.5	52.9	47.1	
Family Income				0.0691
<$40,000	15.4	46.4	53.6	
$40,000-$59,999	32.7	52.0	48.0	
>$60,000	51.8	56.0	44.0	
Region				0.1332
Northeast	18.4	56.3	41.7	
Midwest	36.7	49.0	51.0	
South	40.2	51.7	48.3	
West	17.7	56.9	13.1	
Parent Age				0.0737
18-34	19.0	58.6	41.4	
35-44	37.4	49.4	50.6	
45+	43.6	54.1	45.9	

Parent Race/Ethnicity				0.0107
White	61.2	56.7	43.3	
Black	16.2	43.4	56.6	
Hispanic	18.2	51.1	48.9	
Other	4.5	49.6	50.4	
Parent Sex				0.0699
Male	32.0	49.3	50.7	
Female	68.0	55.0	45.0	
Child- Parent Sex Concordance				0.1193
Concordance	52.6	51.0	49.0	
No Concordance	47.4	55.6	44.4	
Parent Weight Status				0.0061
Normal Weight	31.3	59.2	40.8	
Overweight	28.3	54.0	46.0	
Obese	40.3	48.0	52.0	
Parent Education				0.0288
HS Graduate	25.8	46.7	53.3	
Some College	38.6	54.6	45.4	
College Graduate	35.6	56.5	43.5	
Parent Diabetes Status				0.1014
Negative	91.1	53.9	46.1	
Positive	8.9	45.5	54.5	

**132 Missing

* Parents' data taken from ConsumerStyles and HealthStyles 2010

* Children's data taken from Youthstyles 2010

* Survey adjusted data

Table 4. Prevalence of parents' daily SSB consumption according to child and parent characteristics (n=1,139)

		Parent SSB Consumption		
	Overall	Non-Daily Consumer	Daily Consumer	Chi-square p-value
n (weighted %)	1139 (100)	813(71.4)	326 (28.6)	
Child SSB Intake				<0.0001
Non Daily Consumer	67.7	74.7	25.2	
Daily Consumer	32.3	59.6	40.4	
Child Age (years)				0.3576
9-12	38.7	66.1	33.9	
13-15	61.3	68.7	31.3	
Child Sex				0.1456
Male	51.2	65.7	34.3	
Female	56.9	69.7	30.3	
Child Weight**				<0.0001
Normal	59.1	71.9	28.1	
Overweight	15.2	70.9	29.1	
Obese	13.3	56.7	43.3	
Parent Marriage Status				0.2776
Married/Domestic Partnership	81.5	64.5	35.5	
Divorced/Single/Widowed	18.5	68.4	31.6	
Family Income				<0.0001
<40,000	15.4	53.1	46.9	
40,000-59,999	32.7	63.7	36.3	
>60,000	51.8	74.6	25.4	
Region				0.0150
Northeast	18.4	75.5	24.5	
Midwest	36.7	69.6	30.4	
South	40.2	66.3	36.7	
West	17.7	67.1	32.9	
Parent Age (years)				<0.0001
18-34	19.0	52.7	47.3	
35-44	37.4	65.7	34.3	
45+	43.6	75.9	24.1	

Parent Race/Ethnicity				<0.0001
White	61.2	74.2	25.8	
Black	16.2	54.5	45.5	
Hispanic	18.2	61.0	39.0	
Other	4.5	53.7	46.3	
Parent Sex				0.0005
Male	32.0	60.6	39.4	
Female	68.0	71.0	29.0	
Child-Parent Sex Concordance				0.0579
Concordance	52.6	70.2	29.8	
No Concordance	47.4	64.9	35.1	
Parent Weight Status				0.1122
Normal Weight	31.3	71.6	28.4	
Overweight	28.3	67.6	32.4	
Obese	40.3	64.7	35.3	
Parent Education				<0.0001
HS Graduate	25.8	52.9	47.1	
Some College	38.6	67.1	32.8	
College Graduate	35.6	79.1	20.9	
Parent Diabetes Status				0.3735
Negative	91.1	68.1	31.9	
Positive	8.9	63.7	36.3	

**132 Missing

* Parents' data taken from ConsumerStyles and HealthStyles 2010

* Children's data taken from Youthstyles 2010.

* Survey adjusted data

Table 5: Correlation Between Variables (n=1,139)

	Parent SSB Intake	Child SSB Intake	Child Age	Child Sex	Child Obesity Status	Caretaker Marriage Status	Family Income	Family Region	Parent Age	Parent Race/ ethnicity	Parent Sex	Parent / Child Sex Con.	Parent Obesity Status	Parent Education	Parent Diabetes Status
Parent SSB Intake	1.000	**0.189**	-0.008	-0.038	0.092	-0.079	-0.182	0.047	-0.147	0.120	-0.110	0.056	0.067	-0.214	0.004
Child SSB Intake	**0.189**	1.000	0.050	-0.112	0.066	-0.047	-0.109	-0.035	0.007	0.034	-0.047	-0.047	0.110	-0.108	0.054
Child Age	-0.008	0.050	1.000	-0.039	-0.049	-0.044	0.038	-0.027	0.356	-0.047	-0.004	0.036	0.021	-0.028	0.025
Child Sex	-0.038	-0.112	-0.039	1.000	-0.068	0.069	0.030	-0.032	0.000	-0.007	-0.073	0.292	-0.001	0.010	0.012
Child Weight Status	0.092	0.066	-0.049	-0.068	1.000	-0.104	-0.204	0.055	-0.003	0.087	-0.046	0.018	0.233	-0.129	0.199
Parent Marriage Status	-0.079	-0.047	-0.044	0.069	-0.104	1.000	0.409	-0.024	0.017	-0.077	-0.201	0.028	-0.061	0.108	-0.043
Family Income	**-0.182**	**-0.109**	0.038	0.030	-0.204	0.409	1.000	-0.055	0.218	-0.250	-0.050	0.023	-0.165	0.419	-0.080
Family Region	0.047	-0.035	-0.027	-0.032	0.055	-0.024	-0.055	1.000	-0.026	0.154	0.025	-0.011	0.027	-0.004	0.017
Parent Age	**-0.147**	0.007	0.356	0.000	-0.003	0.017	0.218	-0.026	1.000	-0.087	-0.115	0.017	0.004	0.217	0.024
Parent Race/ethnicity	**0.120**	0.034	-0.047	-0.007	0.087	-0.077	-0.250	0.154	-0.087	1.000	-0.019	0.051	0.035	-0.091	0.045
Parent Sex	**-0.110**	-0.047	-0.004	-0.073	-0.046	-0.201	-0.050	0.025	-0.115	-0.019	1.000	-0.097	-0.134	-0.002	-0.103
Parent/ child Sex Concordance	0.056	-0.047	0.036	0.292	0.018	0.028	0.023	-0.011	0.017	0.051	-0.097	1.000	-0.030	-0.035	-0.006
Parent Weight Status	0.067	**0.110**	0.021	-0.001	0.233	-0.061	-0.165	0.027	0.004	0.035	-0.134	-0.030	1.000	-0.119	0.174
Parent Education	**-0.214**	**-0.108**	-0.028	0.010	-0.129	0.108	0.419	-0.004	0.217	-0.091	-0.002	-0.035	-0.119	1.000	0.000
Parent Diabetes Status	0.004	0.054	0.025	0.012	0.199	-0.043	-0.080	0.017	0.024	0.045	-0.103	-0.006	0.174	0.000	1.000

* Children's data from Youthstyles 2010 * Parents' data from ConsumerStyles and HealthStyles 2010 * Survey adjusted data

Table 6: Bivariate association of parent and child sugar sweetened beverage consumption according to demographic characteristics. (n=1139)

		Child SSB Consumption			
	Parent SSB Consumption	Non-Daily Consumer(%)	Daily Consumer(%)	OR	P Value
Child Age (years)					0.2774
9 to 12	Non Daily	63.2	36.8	2.40	
	Daily	41.7	58.2		
13 to 19	Non Daily	56.1	43.9	1.81	
	Daily	41.4	58.6		
Child Sex					0.9292
Male	Non Daily	55.6	44.4	2.01	
	Daily	38.4	61.6		
Female	Non Daily	61.9	38.1	1.96	
	Daily	45.3	54.7		
Child Weight Status**					0.0748
Normal	Non Daily	59.7	40.3	2.27	
	Daily	39.5	60.5		
Overweight	Non Daily	49.1	50.9	2.92	
	Daily	35.3	64.7		
Obese	Non Daily	63.9	36.1	1.77	
	Daily	37.7	62.3		
Parent Marriage Status					0.2139
Together	Non Daily	59.3	40.7	2.17	
	Daily	40.1	59.9		
Not Together	Non Daily	56.3	43.7	1.46	
	Daily	46.9	53.1		
Family Income					0.6543
<$40,000	Non Daily	51.8	48.2	1.60	
	Daily	40.2	59.8		
$40,000-$59,999	Non Daily	59.2	40.8	2.24	
	Daily	39.3	60.7		
>$60,000	Non Daily	60.0	40.0	1.89	
	Daily	44.2	55.8		

Region					0.4825
Northeast	Non Daily	62.1	37.9	1.90	
	Daily	46.3	53.6		
Midwest	Non Daily	55.2	44.7	2.32	
	Daily	34.8	65.2		
South	Non Daily	56.3	43.7	1.64	
	Daily	43.9	56.1		
West	Non Daily	65.1	34.9	2.78	
	Daily	40.2	59.8		
Parent Age					0.4074
18-34	Non Daily	69.7	30.3	2.69	
	Daily	46.2	53.8		
35-44	Non Daily	54.0	46.0	1.72	
	Daily	40.5	59.5		
45+	Non Daily	59.0	41.0	2.27	
	Daily	38.8	61.2		
Parent Race/Ethnicity					0.0320
White	Non Daily	62.6	37.4	2.54	
	Daily	39.7	60.3		
Black	Non Daily	43.2	56.8	0.98	
	Daily	43.6	56.4		
Hispanic	Non Daily	54.9	45.1	1.49	
	Daily	45.0	55.0		
Other	Non Daily	61.2	38.8	2.79	
	Daily	36.1	63.9		
Parent Sex					0.3174
Male	Non Daily	57.6	42.4	2.36	
	Daily	36.6	63.4		
Female	Non Daily	59.2	40.8	1.80	
	Daily	44.7	55.2		
Child-Parent Sex Concordance					0.9630
Concordance	Non Daily	61.8	38.2	2.05	
	Daily	44.1	55.9		
No Concordance	Non Daily	56.2	43.8	2.03	
	Daily	38.8	61.2		

Parent Weight Status					0.1076
Normal Weight	Non Daily	66.1	33.9	2.74	
	Daily	41.6	58.4		
Overweight	Non Daily	56.4	43.6	1.35	
	Daily	49.0	51.0		
Obese	Non Daily	54.2	45.8	2.04	
	Daily	36.7	63.3		
Parent Education					0.4023
≤ HS Graduate	Non Daily	53.1	46.9	1.73	
	Daily	39.5	60.5		
Some College	Non Daily	61.6	38.4	2.39	
	Daily	40.2	59.8		
College Graduate	Non Daily	58.9	41.1	1.61	
	Daily	41.1	52.9		
Parent Diabetes Status					0.7292
Negative	Non Daily	59.5	40.5	2.03	
	Daily	42.1	57.9		
Positive	Non Daily	50.4	49.6	1.74	
	Daily	36.8	63.2		

**132 Missing
* Parents' data taken from ConsumerStyles and HealthStyles 2010
* Children's data taken from Youthstyles 2010
* Survey adjusted data

Table 7: Results of Logistic Regression Models: Testing association of parent SSB consumption to child SSB consumption alone and in the presence of other variables (n=1,139)

	Variable	Estimate	SE	OR	95% CI
Model	**Parent SSB Consumption**	0.6375	0.1330	1.89	(1.46 2.46)
	Child Sex				
	Female	-0.1361	0.0606	0.76	(0.60 0.97)
	Male	REF	REF	REF	
	Child Age				
	13 to 19	-0.1127	0.0629	0.80	(0.62 1.02)
	9 to 12	REF	REF	REF	
	Family Income				
	<$40,000	0.1293	0.1175	1.25	(0.81 1.71)
	$40,000-$59,999	-0.0352	0.0919	1.06	(0.86 1.82)
	$60,000+	REF	REF	REF	
	Parents Education				
	≤ High School Graduate	0.1224	0.0984	1.18	(0.90 1.67)
	Some College	-0.0803	0.0838	0.96	(0.84 1.66)
	College Graduate	REF	REF	REF	
	Region				
	Northeast	-0.1525	0.1205	0.98	(0.66 1.46)
	Midwest	0.2387	0.1092	1.45	(0.89 1.65)
	South	0.0459	0.0932	1.20	(0.85 1.68)
	West	REF	REF	REF	

Model 2: Demographic Variables of Interest Child Sex, Age, Family Income Parents Education and Region.
* Parents' data taken from ConsumerStyles and HealthStyles 2010
* Children's data taken from Youthstyles 2010
* Survey adjusted data

Table 8: Odds ratio estimates for association of parent and child SSB consumption according to race/ethnicity (n=1,139)

Race/ethnicity	OR	95% CI
White	2.47	(1.73, 3.52)
Black	0.94	(0.52, 1.70)
Hispanic	1.44	(0.81, 2.55)
Other	2.44	(0.76, 7.81)

* Parents' data taken from ConsumerStyles and HealthStyles 2010
* Children's data taken from Youthstyles 2010
* Survey Adjusted Data
** P value 0.0338

APPENDIX

Definitions:

SSB: Sugar sweetened beverages are drinks that contain added caloric sweeteners, they include a large variety of both carbonated and non-carbonated drinks (such as soda, sports drinks, and energy drinks) and excludes 100% fruit juice(Ranjit, Evans et al. 2010)

Parent: Biological parent or primary caretaker of child included in survey.

Child: Individual between the ages of 7 and 19 included in survey

Abbreviations:

CDC: Centers for Disease Control and Prevention

AHA: American Heart Association

NHANES: National Health and Nutrition Examination Survey

WHO: World Health Organization

CHS: Center for Health Statistics

HHS: U.S. Department of Health and Human Services

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