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## CONSUMPTION PATTERNS OF SUGAR SWEETENED BEVERAGES IN THE UNITED STATES

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### Abstract

**Background**—Few previous studies investigated consumption distributions of sugar sweetened beverages (SSBs) over time and individual-level associations despite recent interest in SSBs regarding obesity control.

**Objective**—To assess consumption patterns and individual-level associations.

**Design**—Trend and cross-sectional analyses of 24-hour dietary recall data and demographic characteristics and socioeconomic status (SES) drawn from the National Health and Nutrition Examination Survey (1999–2000, 2001–2002, 2003–2004, 2005–2006, and 2007–2008).

**Participants/setting**—Children (2–11 years, N=8,627), adolescents (12–19 years, N=8,922), young adults (20–34 years, N=5,933), and middle-aged and elder adults (≥ 35 years, N=16,456).

**Statistical analyses performed**—Age-stratified regression analyses for SSBs overall and by subtypes.

**Results**—The prevalence of heavy total SSB consumption (≥ 500 kcal/day) increased among children (4% to 5%) although it decreased among adolescents (22% to 16%) and young adults (29% to 20%). Soda was the most heavily-consumed SSB in all age groups except for children. Prevalence of soda consumption decreased, whereas heavy sports/energy drink consumption tripled (4% to 12%) among adolescents. Black children and adolescents showed a higher odds of heavy fruit drink consumption (OR=1.71 and 1.67) than whites. Low-income children had a higher odds of heavy total SSB consumption (OR=1.93) and higher caloric intake from total SSBs and fruit drinks (by 23 and 27 kcal/day) than high-income children. Adolescents with low- versus high-educated parents had a higher odds of heavy total SSB consumption (OR=1.28) and higher caloric intake from total SSBs and soda (by 27 and 21 kcal/day). Low- versus high-SES was associated with a higher odds of heavy consumption of total SSBs, soda, and fruit drinks among adults.

**Conclusions**—Prevalence of soda consumption fell but non-traditional SSBs rose. Heterogeneity of heavy consumption by SSB types across racial/ethnic subpopulations and higher odds of heavy SSB consumption among low-SES populations should be considered in targeting policies to encourage healthful beverage consumption.

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## 1. INTRODUCTION

Obesity is a significant public health challenge in the United States. The prevalence of obesity increased by almost three fold between the 1960s and 2010, reaching 35.5% and 36.3% for men and women in 2009–2010, respectively, among U.S. adults<sup>1–2</sup>. For children and adolescents, 12.1%, 18.0%, and 18.4% of individuals aged 2–5, 6–11, and 12–19 years, respectively, were reported to be obese (age- and gender-specific body mass index 95th percentile) in 2009–2010<sup>3</sup>. Recently, sugar sweetened beverages (SSBs) have been at the forefront of obesity-related policy debates as SSB consumption was positively associated with increased body weight and risk of obesity<sup>4–6</sup> and negatively associated with intake of important micronutrients<sup>7</sup>. In particular, a number of jurisdictions have proposed to levy taxes on SSBs, particularly on carbonated regular (non-diet) soft drinks or regular soda with the aim to reduce consumption and generate revenue that could be dedicated to obesity prevention efforts<sup>8,10</sup>. Caloric intake from SSBs increased by 135% between 1977 and 2001 in all age groups<sup>11</sup>. Particularly, adolescents<sup>11–13</sup> and young adults<sup>13–14</sup> were reported to consume more SSBs than younger children and older adults. The majority of children and adolescents (88%) were reported to consume SSBs on a given day to the extent of 271 kcal per day, on average<sup>11</sup>.

However, despite extant previous literature on average consumption of SSBs, to our knowledge, only two studies<sup>15–16</sup> assessed socio-demographic determinants of frequent or heavy SSB consumption and those studies used either geographically<sup>15</sup> or age-restricted<sup>16</sup> samples. Those studies reported that being black<sup>15–16</sup>, low income or low educated<sup>15</sup> were positively associated with frequent SSB<sup>16</sup> or soda<sup>15</sup> consumption. This present study built on the previous literature providing new evidence on SSB consumption, particularly heavy consumption, overall and differential patterns across subcategories of SSBs such as regular soda, fruit drinks, and sports/energy drinks, using nationally representative data for children, adolescents, young adults, and middle-aged and elder adults. This present study also explored individual-level associations of demographic and socioeconomic status (SES) with heavy SSB consumption overall and by type including regular soda, fruit drinks, and sports/energy drinks. Findings from our study regarding SSB consumption patterns over time and individual-level associations with heavy intake are important to help design better targeted policy measures in combating excessive SSB consumption.

## 2. MATERIALS AND METHODS

### 2.1. Data

The study population consisted of children (2–11 years, N=8,627), adolescents (12–19 years, N=8,922), young adults (20–34 years, N=5933), and middle-aged and elder adults (35 years or older, N=16,456, hereafter called adults) included in the National Health and Nutrition Examination Survey (NHANES) over the ten years from 1999 through 2008 (NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, and 2007–2008). The populations for these cross-sectional surveys were selected as multistage probability sampling of the civilian non-institutionalized U.S. population and the results provide nationally representative estimates for nutrition and health status measures. Detailed descriptions of the design and operation of the surveys were published elsewhere<sup>17</sup>.

The most important strength of the NHANES is that it provides extensive data that allow for studying a broad range of nutrition- and health-related research questions. The detailed interview of NHANES includes demographic, SES, dietary, and health-related questions. NHANES undertook two dietary interviews to collect detailed dietary information on all foods and beverages consumed in the previous 24 hours (midnight to midnight). Proxy respondents were used for survey participants younger than 6 years old and assisted

interviews were completed with participants aged 6–11 years old. This present study drew on the Day 1 dietary interview data which was collected via a direct face-to-face interview by trained dietary interviewers in a mobile examination center. The second-day recall data, collected 3–10 days after Day 1, was collected via telephone and due to differences in the interview setting we only used the Day 1 data.

SSBs were defined as any non-diet, non-alcoholic beverage items and beverage concentrates with added sugars. SSBs were grouped into four types: regular soda; regular non-diet non-100% fruit juices (hereafter interchangeably called fruit drinks); non-diet sports and energy drinks (hereafter interchangeably called sports/energy drinks); and, non-diet non-milk based beverage concentrates, non-diet sugar sweetened coffee and tea products, and all other SSBs (hereafter interchangeably called other SSBs). All consumption of SSBs was aggregated for each individual to obtain the total number of occasions and energy intake in kilocalories (kcal) from all SSBs and the specific types of SSBs based on the 24-hour dietary recall data.

Heavy consumption of SSBs was defined as consuming 500 kcal or more from SSBs over 24 hours to capture extreme consumption in the far right tail approximately at the 90<sup>th</sup> percentile of the distribution of calorie intake. These extreme consumers are likely the primary target for any policy measures to encourage healthful beverage consumption. Consuming 500 kcal or more over 24 hours is equivalent to drinking more than one liter (or 34 oz) bottle of regular soda with 400 kcal per bottle or three and a half 12 oz cans of regular soda with 140 kcal per can. Our measurement of heavy consumption is more conservative compared to the previous literature where heavy consumption was defined as either drinking one or more 12-oz servings for adults<sup>15</sup> or three or more servings (e.g., can, bottle, or glass) of SSBs per day for adolescents. At the same time, the cut-off for heavy consumption in this present study, 500kcal/day, is slightly lower than a previous study which used the 95<sup>th</sup> percentile of calorie consumption of SSBs (567 kcal/day) as the cut-off value for heavy consumption<sup>18</sup> This present study applied the same measurement of heavy consumption for all age groups to obtain comparable results across age groups as in a previous study<sup>19</sup>.

Individual factors controlled for in our multivariate regression models included demographic factors (age, gender, and race/ethnicity) and SES (education level and the level of per capita household income) based on self-reports. Race/ethnicity was measured as non-Hispanic black (black, hereafter), non-Hispanic white (white, hereafter), and Hispanic. Education level was measured as low education (high school or less) versus high education (some college or more). Household income was measured as low, middle, and high based on per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level, respectively. For children and adolescents under age 20 their parents' or guardians' SES were used as proxy measures of their own. However, some health variables that were reported to be associated with SSB consumption were not controlled for in this study. Examples of those related health variables included self-reported physical activity, sleep duration, and smoking<sup>20–22</sup>. This study was approved by the University of Illinois at Chicago Institutional Review Board for research involving human subjects.

## 2.2. Analyses

The yearly trends of average calorie intake and the prevalence of heavy consumption were examined for all SSBs and three sub-categories of SSBs, i.e., regular soda, fruit drinks, and sports/energy drinks. The distribution of the prevalence of any consumption (compared to no consumption), heavy consumption (compared to moderate (less than 500 kcal/day) consumption among consumers), and total energy intake among consumers were analyzed

by age group over time for all SSBs, regular soda, fruit drinks, and sports/energy drinks, adjusted for differential individual age, gender, income, and education.

Multivariate models were run for total SSBs and by type with three different outcomes for SSB consumption: 1) a dichotomous variable of any consumption of SSBs (reference: no consumption); 2) a dichotomous variable of heavy consumption of SSBs (reference: moderate consumption among consumers); and, 3) a continuous measure of calorie intake from SSBs among those who obtained more than zero kcal from SSBs. A logistic regression was used for the dichotomous variable outcomes. Ordinary Least Squares (OLS) regression was used for the continuous measure of calorie intake. The complex survey design was addressed to adjust for unequal probabilities of sampling by applying unique weights in each cycle of the survey. Robust standard errors were computed for all estimations. Time trends of SSB consumption were controlled for with nonlinear survey indicators in all estimations. All estimations were run separately by the four age groups of children, adolescents, young adults, and adults. STATA 12.1 (StataCorp, College Station, Texas, copyright 1995–2011) was used for all statistical analyses.

### 3. RESULTS

#### 3.1. Time trend of adjusted SSB consumption patterns

The adjusted prevalence of total SSB consumption decreased between 1999–2000 and 2007–2008, particularly among children (78% to 66%) and adolescents (87% to 77%). Although regular soda was the most prevalent SSB type across all years for all age groups except children (for whom fruit drinks were the most prevalent in some years), its prevalence gradually decreased over time particularly among adolescents. The prevalence of sports/energy drinks tripled (4% to 12%) over the same time period for adolescents although its prevalence remained lower than that for regular soda and fruit drinks (see Table 1).

Turning to the adjusted prevalence of heavy consumption compared to moderate consumption in Table 2, heavy consumption (> 500 kcal from SSBs per day) was most prevalent among adolescents and young adults, particularly for regular soda. The prevalence of the heavy consumption for total SSBs decreased among adolescents (22% to 16%) and young adults (29% to 20%) between 1999 and 2008, whereas it increased among children (4% to 5%) and adults (11% to 12%).

Table 3 shows that fruit drinks were the largest calorie source among SSBs for children, whereas regular soda was the largest for all other age groups among consumers. Average energy intake from total SSBs decreased among children (147 to 129 kcal/day), adolescents (300 to 250 kcal/day), and young adults (374 to 295 kcal/day) between 1999–2000 and 2007–2008. While caloric intake from regular soda and fruit drinks decreased in all age groups, average energy consumption from sports/energy drinks increased with the largest extent among young adults (119 to 229 kcal/day), followed by adolescents (127 to 167 kcal/day) and adults (116 to 147 kcal/day).

#### 3.2. Individual-level determinants of SSB consumption in multivariate analyses

Racial minority, low-educated, and low-income individuals were more likely to consume total SSBs. Blacks and Hispanics were more likely to consume total SSBs than whites among children (blacks only, OR=1.30), adolescents (OR=1.49 and 1.21), young adults (OR=1.88 and 1.39), and adults (OR=1.89 and 1.25). Low- versus high-education education was associated with a higher likelihood of total SSB consumption with the highest association among young adults (OR=1.62). Similarly, low- and middle-income individuals were more likely to consume total SSBs among young adults (OR=1.47 and 1.37) and adults (OR=1.43 and 1.21) than their high-income counterparts.

By SSB types, blacks and Hispanics were more likely to consume fruit drinks among children (OR= 2.31, blacks only), adolescents (OR=3.61 and 1.54), young adults (OR=3.53 and 1.93), and adults (OR=2.73 and 1.62) than whites. However, black children and adolescents were less likely to consume regular soda (OR=0.62 and 0.63) and sports/energy drinks (OR=0.53 and 0.60). Low- versus high-education was associated with a higher odds of regular soda consumption with the highest odds among young adults (OR=1.68). Low- and middle-income also were associated with higher odds of regular soda consumption (OR= 1.29 and 1.43 for children, OR=1.20 for low income only for adolescents, OR=1.52 and 1.37 for young adults, and OR=1.63 and 1.35 for adults) than high-income. However, low-income children and adolescents were less likely to consume sports/energy drinks (OR= 0.56 and 0.65) than their high-income counterparts.

Turning to the likelihood of heavy consumption versus moderate consumption, the odds of heavy consumption of total SSBs was lower among blacks (OR=0.74 and 0.77 for adolescents and young adults) and Hispanics (OR=0.73, 0.40, and 0.53 for adolescents, young adults, and adults) than whites. The odds of heavy regular soda consumption was similarly lower among blacks (OR=0.41, 0.51, 0.44, and 0.73 for children, adolescents, young adults, and adults) and Hispanics (OR=0.16, 0.68, 0.27, 0.46 for children, adolescents, young adults, and adults) than whites. However, blacks showed a higher odds of heavy consumption of fruit drinks (OR=1.71, 1.67, 1.63, and 1.64 for children, adolescents, young adults, and adults) than whites. For education level, the odds of heavy consumption was higher in the low-education group for total SSBs (OR=1.28, 1.37, and 1.47 for adolescents, young adults, and adults), particularly for regular soda (OR=1.48 and 1.38 for young adults and adults) than the high education group. For income level, low-income children were more likely to be heavy consumers of total SSBs (OR=1.93), and low-income young adults and adults were more likely to be heavy consumers of total SSBs (OR=1.56 and 1.42), regular soda (OR=1.41 and 1.65), and fruit drinks (OR=2.17 and 1.61) than their high-income counterparts.

The results based on total daily caloric intake among consumers are presented in Table 6 (estimates for sports/energy drinks are not provided due to small sample sizes for the conditional regression models). The results showed that compared to whites, blacks consumed less regular soda, on average, per day (by 29, 72, 96 kcal for children, adolescents, and young adults, respectively), whereas they consumed more fruit drinks (by 20, 33, and 44 kcal/day among children, adolescents, and adults, respectively). Hispanics consumed less total SSBs than whites (by 18, 43, 140, and 52 kcal/day among children, adolescents, young adults, and adults, respectively). Hispanics particularly consumed less regular soda on average per day than whites (by 27, 58, 160, and 63 kcal/day for children, adolescents, young adults, and adults, respectively). For education level, adolescents with low-educated parents consumed more total SSBs (by 27 kcal/day) and soda (by 21 kcal/day) than those with high-educated parents. Low-educated young adults and adults consumed more total SSBs (by 59 and 38 kcal/day) and regular soda (by 49 and 26 kcal/day) than their high-educated counterparts. Children with low-income parents also consumed more SSBs (by 23 kcal/day), and specifically more fruit drinks (27 kcal/day) than those with high-income parents. Low-income young adults and adults also consumed more total SSBs (by 78 and 38 kcal/day, respectively), regular soda (by 62 and 39 kcal/day, respectively), and fruit drinks (by 63 and 26 kcal/day, respectively) than high-income adults.

#### 4. DISCUSSION

In light of the rapid rise in obesity prevalence, an increasing body of literature has sought to examine consumption patterns of SSBs as one of the major contributors to the increased body weight<sup>6, 10, 14</sup>. Building on the previous studies, this present study focused on



investigating the overall consumption distributions and understanding variations in heavy consumption by individual demographic characteristics and SES. The population average of the magnitude of SSB consumption may or may not reflect subpopulation variations in the distribution patterns particularly for the heavy consumers. Understanding the characteristics of consumption patterns including heavy consumption of SSBs is important given that such heavy consumers are important potential target populations. Those heavy consumers could benefit the most from policy interventions and the potential reductions in consumption among heavy consumers could have the most visible policy impacts on controlling obesity.

Studies reported that regular soda is the major type of SSBs consumed particularly among adolescents<sup>10–11</sup>. This present study also showed that regular soda was the most heavily-consumed ( 500 kcal/day) SSB type among adolescents and young adults and by 2007–08 was the most prevalent SSB type in all age groups. Given that approximately one half of the sample in each age group consumed regular soda, regular soda should be maintained as a key priority for relevant policies. At the same time, however, findings of this present study additionally showed that the prevalence of regular soda consumption decreased over time particularly among adolescents for whom the prevalence of sports/energy drink consumption tripled. For children, average energy intake (kcal) from total SSBs per day among consumers decreased overall and for all three subtypes of SSBs including regular soda, fruit drinks, and sports/energy drinks between 1999–2000 and 2007–2008. For other age groups, caloric intake from total SSBs, regular soda, and fruit drinks decreased for the same time period, while the amount of calories from sports/energy drinks increased to the largest extent among young adults. These results indicate an emerging popularity of non-traditional SSBs, i.e., sports/energy drinks, which may imply the need for extended product coverage of any public policy in the aim of reducing SSB consumption.

It is alarming that 4–5% of children were heavy consumers of SSBs despite the relatively strict definition of heavy consumption in this study compared to the previous literature. Furthermore, the prevalence of heavy consumption of total SSBs slightly increased among children (4% to 5%), driven by an increase in heavy regular soda consumption, although it decreased among adolescents (22% to 16%) and young adults (29% to 20%) between 1999–2000 and 2007–2008. A previous study particularly reported a racial variation in heavy consumption; black adolescents (grade 9–12) were more likely to be frequent SSB consumers consuming SSBs three or more times per day (OR=1.87)<sup>16</sup>. However, results from the present study showed that black children and adolescents were more likely to be heavy consumers only of fruit drinks (OR=1.71 and 1.67), whereas they were less likely to be heavy consumers of total SSBs (OR=0.74, adolescents only) and regular soda (OR=0.41 and 0.51). Further, results of the present study showed that Hispanic children and adolescents were less likely to be heavy consumers of total SSBs (OR=0.73, adolescents only) and regular soda (OR=0.16 and 0.68). Given that the present study found that both black and Hispanic race/ethnicity were positive determinants of greater odds of any consumption of total SSBs in all age groups including children and adolescents, the aforementioned differences mainly may stem from differences in measurement of heavy consumption. Regardless, these results similarly imply that a relevant public policy to modify beverage consumption as a means to control for obesity may need to consider such heterogeneity of the odds of heavy consumption by SSB subtypes across racial and ethnic subpopulations.

The previous literature reported greater odds of heavy consumption of regular soda among low-income adults<sup>14</sup> and larger energy intake among children with low-educated parents<sup>12; 18–20</sup>. Results of the present study also indicated that low SES was a positive determinant of higher odds of heavy SSB consumption and higher caloric intake in all age groups including children. Children and adolescents in low SES showed a greater odds of

heavy consumption of total SSBs (OR=1.93 and 1.28) and higher caloric intake from total SSBs (by 23 and 27 kcal/day), fruit drinks (by 27 kcal/day, children only), and regular soda (by 21 kcal/day, adolescents only). Such results may imply that low-income individuals may access SSBs more easily than other nutrient-dense beverages and/or water because of differences in availability or prices. Differential consumption among adolescents by parents' education level also indicated the importance of the household environment in guiding youths' more healthful beverage choices. Given that those populations in low SES reportedly had a higher prevalence of overweight and obesity<sup>3, 23</sup>, these results imply that those vulnerable populations should be included as important target populations for policy interventions. The study results also indicated that policies targeting the major form of SSBs, i.e., regular soda, can be effective for low-SES populations.

The results from this study were based on the dietary information from NHANES sample persons' recall on each food item consumed and serving sizes for 24 hours in a given survey day and are subject to some limitations. For the 24-hour dietary recall information in NHANES data, previous studies have reported potentially systematic underreporting of portion size with a lesser extent for any packaged beverage items<sup>17</sup>. Given that the majority of SSBs reported in NHANES were in the form of pre-packages, these study results were likely to be less prone to such measurement error<sup>24</sup>. At the same time, it was also reported that people were more likely to underreport portion size for high-calorie foods including regular soda<sup>25</sup>. The prevalence of heavy consumption in this present study is likely to be underestimated considering such underreporting. Further research should investigate whether such measurement error is distributed randomly across different individual characteristics or is rather systematically skewed in certain populations. Further, the 24-hour consumption measure may not represent the general consumption patterns for the respondents (i.e., no consumption of SSBs during the 24 hours might not exactly imply no consumption of SSBs at all). Despite the potential limitations of the 24-hour dietary recall data in NHANES, it is the most comprehensive nationally representative data for studies exploring any nutrition- and health-related research questions. NHANES has collected 24-hour dietary recall data twice, one from an in-person interview with trained staff and another from a phone interview. Although this study used only the first-day interview for parsimony of data, previous studies have used multiple 24-hour recall consumption data to estimate individual food consumption patterns<sup>26</sup>. In particular, multiple observation points would help to better understand habitual food consumption patterns<sup>26</sup>. Therefore, future research should consider exploiting the multiple measures of dietary recall data to potentially gain further insights into individuals' SSB consumption patterns. Finally, it should be noted that the results from this study only reflect associations given that cross-sectional data restrict the application of statistical models to establish causal inferences.

A number of policy and environmental changes may have contributed to the recent decline in SSB consumption. For instance, between 2003 and 2009 there was a significant reduction in exposure to SSB advertising on television among children<sup>27–29</sup>. In addition, recent evidence shows that between 2007 and 2009 there has been a significant reduction in students' access to soda in middle (–46%) and high (–37%) schools but non-soda SSBs such as sports drinks remained widely available<sup>29</sup>. In addition, a recent effort in some cities to discourage overall SSB consumption via substantial public advertisements is a positive sign of government-wide awareness and proactive movement to reduce SSB consumption in general<sup>30</sup>. While the inflation-adjusted price of carbonated soda fell by about 35% from the early 1980s to the mid 2000s, it has increased since then by about 7% on average<sup>31</sup>. These recent increases in average prices of soda may have helped to level off or dampen demand among the US population; indeed, evidence shows that higher soft drink and SSB prices are related to lower consumption<sup>32–33</sup>. However, this present study did not answer why changes in SSB consumption occurred. It is well known that the prevalence of obesity and related

metabolic diseases such as diabetes has increased over the past few decades, although such increases leveled off in some age and gender groups among children<sup>34</sup>. Whether such changes reversely affected SSB consumption still needs to be investigated. Given the cross-sectional nature of the NHANES, it is not feasible to investigate such an important question, and future studies should pursue to advance our understanding with regards to such mechanisms.

With the aim to substantially curtail SSB consumption and reduce negative health-related outcomes such as obesity, taxes that would substantially raise prices, in the order of a penny per ounce, have been proposed<sup>8, 35</sup>. The results from this paper suggest that although regular soda consumption remains the largest contributor to SSB consumption, any such tax should have a broad base to cover all SSB types to ensure that other forms of SSB consumption do not continue to escalate. In fact, all public health oriented beverage policies should be broadly based to cover all forms of SSBs. At the same time, policies to encourage a replacement of SSBs with other energy-free beverages such as water, should be considered given the previous reports that such replacement could result in a substantial reduction of daily caloric intake<sup>36–37</sup>. Given the concerns regarding consumption of added sugars and related disease burdens<sup>38–39</sup>, future research should explore consumption patterns of sweetened processed foods with added sugars in addition to SSBs and individual-level associations with such consumption.

In conclusion, this study showed variations of heavy consumption by SSB types across racial and ethnic subpopulations and higher odds of heavy SSB consumption among low-SES populations. Such heterogeneity should be considered in targeting policies to discourage the consumption of SSBs, particularly heavy consumption and to improve related-health outcomes across the U.S. population. Future studies should continue to monitor SSB consumption patterns, including for those at risk of heavy consumption. Further, studies also should examine the relationships between modifiable contextual determinants of SSB consumption and heavy consumption to provide evidence on the potential effectiveness of various policy interventions aimed at improving public health.

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**Table 1**

Adjusted Prevalence of sugar sweetened beverage (SSB) consumption from 1999–2000 to 2007–2008, by age group and SSB type

Survey Year By Age Group <sup>a</sup>	Total SSB	Regular Soda	Fruit Drinks	Sports/Energy Drinks
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)
Children (N=8,627)				
1999–2000	0.78 (0.08)	0.48 (0.14)	0.47 (0.09)	0.03 (0.02)
2001–2002	0.74 (0.09)	0.43 (0.14)	0.45 (0.09)	0.02 (0.02)
2003–2004	0.76 (0.08)	0.46 (0.14)	0.41 (0.09)	0.05 (0.03)
2005–2006	0.68 (0.09)	0.39 (0.13)	0.41 (0.09)	0.05 (0.03)
2007–2008	0.66 (0.10)	0.39 (0.13)	0.34 (0.09)	0.07 (0.04)
Adolescents (N=8,922)				
1999–2000	0.87 (0.04)	0.70 (0.07)	0.33 (0.11)	0.04 (0.02)
2001–2002	0.84 (0.04)	0.65 (0.07)	0.35 (0.12)	0.04 (0.02)
2003–2004	0.84 (0.04)	0.63 (0.07)	0.34 (0.12)	0.05 (0.03)
2005–2006	0.82 (0.05)	0.59 (0.08)	0.33 (0.12)	0.09 (0.04)
2007–2008	0.77 (0.06)	0.51 (0.08)	0.23 (0.09)	0.12 (0.05)
Young adults (N=5,933)				
1999–2000	0.78 (0.09)	0.64 (0.11)	0.24 (0.09)	0.03 (0.02)
2001–2002	0.75 (0.11)	0.58 (0.12)	0.25 (0.10)	0.03 (0.02)
2003–2004	0.73 (0.11)	0.56 (0.12)	0.24 (0.10)	0.04 (0.02)
2005–2006	0.73 (0.11)	0.51 (0.13)	0.22 (0.09)	0.08 (0.04)
2007–2008	0.73 (0.10)	0.50 (0.12)	0.21 (0.09)	0.08 (0.04)
Adults (N=16,456)				
1999–2000	0.53 (0.14)	0.38 (0.14)	0.14 (0.05)	0.01 (0.01)
2001–2002	0.51 (0.14)	0.34 (0.14)	0.17 (0.06)	0.02 (0.01)
2003–2004	0.53 (0.14)	0.35 (0.15)	0.16 (0.06)	0.01 (0.01)
2005–2006	0.49 (0.13)	0.32 (0.12)	0.14 (0.06)	0.03 (0.02)
2007–2008	0.50 (0.14)	0.31 (0.12)	0.12 (0.06)	0.04 (0.04)

Notes:

<sup>a</sup>Each age group was defined as follows: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older).

<sup>b</sup>The data were from the NHANES, nationally representative sample.

<sup>c</sup>Adjusted prevalence was estimated using logistic regression. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>d</sup>SE stands for standard errors.

<sup>e</sup>All estimates were weighted by sampling probability.

<sup>f</sup>All differences between 99-00 and 07-08 were statistically significant at the 5% level.

**Table 2**

Adjusted prevalence of heavy sugar sweetened beverage (SSB) consumption among consumers from 1999–2000 to 2007–2008, by age group and SSB type

Survey Year By Age Group <sup>c</sup>	Total SSB	Regular Soda	Fruit Drinks
	Mean (SE)	Mean (SE)	Mean (SE)
Children			
1999–2000	0.04 (0.03)	0.01 (0.01)	0.02 (0.01)
2001–2002	0.05 (0.03)	0.02 (0.02)	0.03 (0.01)
2003–2004	0.05 (0.04)	0.02 (0.02)	0.05 (0.02)
2005–2006	0.03 (0.02)	0.01 (0.01)	0.02 (0.01)
2007–2008	0.05 (0.03)	0.02 (0.03)	0.02 (0.01)
	N=6,398	N=3,959	N=3,871
Adolescents			
1999–2000	0.22 (0.10)	0.15 (0.09)	0.09 (0.05)
2001–2002	0.20 (0.10)	0.13 (0.08)	0.09 (0.06)
2003–2004	0.18 (0.09)	0.11 (0.07)	0.10 (0.06)
2005–2006	0.19 (0.09)	0.11 (0.07)	0.09 (0.05)
2007–2008	0.16 (0.08)	0.10 (0.06)	0.06 (0.04)
	N=7,533	N=5,726	N=3,179
Young adults			
1999–2000	0.29 (0.12)	0.23 (0.12)	0.13 (0.07)
2001–2002	0.27 (0.11)	0.18 (0.09)	0.15 (0.07)
2003–2004	0.26 (0.11)	0.20 (0.10)	0.12 (0.06)
2005–2006	0.20 (0.09)	0.14 (0.08)	0.13 (0.06)
2007–2008	0.20 (0.09)	0.16 (0.09)	0.08 (0.04)
	N=4,504	N=3,460	N=1,624
Adults			
1999–2000	0.11 (0.08)	0.09 (0.06)	0.06 (0.04)
2001–2002	0.12 (0.09)	0.10 (0.08)	0.06 (0.04)
2003–2004	0.11 (0.09)	0.09 (0.08)	0.06 (0.06)
2005–2006	0.15 (0.11)	0.11 (0.09)	0.04 (0.03)
2007–2008	0.12 (0.09)	0.08 (0.07)	0.08 (0.05)
Adults	N=8,965	N=6,320	N=3,408

Notes:

<sup>a</sup> Heavy consumption of SSBs was defined as intake of 500 or more kcal per day from SSBs.

<sup>b</sup> The data were from the NHANES, nationally representative sample.

<sup>c</sup> Each age group was defined as follows: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older). Only consumers were used for this table, and thus, sample size varied by SSB type within each age group as presented in the Table.

<sup>d</sup> Adjusted prevalence was estimated using logistic regression. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>e</sup>SE stands for standard errors.

<sup>f</sup>All estimates were weighted by sampling probability.

<sup>g</sup>All differences between 99-00 and 07-08 were statistically significant at the 5% level.



**Table 3**

Adjusted calorie intake from total sugar sweetened beverages (SSBs) and SSB subtypes among consumers by age group from 1999–2000 to 2007–2008

Survey Year By Age Group <sup>a</sup>	Total SSB	Regular Soda	Fruit Drinks	Sports/Energy Drinks
	Mean (SE), kcal/day	Mean (SE), kcal/day	Mean (SE), kcal/day	Mean (SE), kcal/day
Children				
1999–2000	204 (43)	147 (48)	167 (19)	126 (25)
2001–2002	200 (44)	145 (49)	173 (19)	103 (26)
2003–2004	195 (43)	132 (49)	179 (18)	91 (26)
2005–2006	173 (43)	115 (48)	157 (18)	96 (25)
2007–2008	178 (43)	129 (49)	153 (18)	84 (25)
	N=6,398	N=3,959	N=3,871	N=775
Adolescents				
1999–2000	363 (77)	300 (72)	263 (45)	127 (44)
2001–2002	350 (78)	290 (73)	254 (46)	141 (44)
2003–2004	336 (77)	272 (73)	258 (46)	139 (44)
2005–2006	331 (78)	262 (73)	237 (46)	189 (44)
2007–2008	286 (79)	250 (74)	212 (46)	167 (43)
	N=7,533	N=5,726	N=3,179	N=884
Young adults				
1999–2000	421 (93)	374 (86)	279 (60)	119 (59)
2001–2002	389 (94)	322 (85)	309 (62)	176 (59)
2003–2004	391 (94)	342 (84)	285 (63)	223 (60)
2005–2006	333 (93)	278 (85)	265 (59)	158 (59)
2007–2008	338 (99)	295 (92)	231 (60)	229 (63)
	N=4,504	N=3,460	N=1,624	N=601
Adults				
1999–2000	248 (70)	227 (58)	214 (43)	116 (48)
2001–2002	260 (94)	245 (83)	200 (55)	110 (65)
2003–2004	236 (82)	218 (70)	202 (55)	104 (56)
2005–2006	254 (85)	233 (72)	201 (57)	177 (47)
2007–2008	236 (81)	219 (70)	209 (46)	147 (50)
	N=8,965	N=6,320	N=3,408	N=1,529

Notes:

<sup>a</sup>Each age group was defined as follows: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older).

<sup>b</sup>The data were from the NHANES, nationally representative sample.

<sup>c</sup>Only consumers were used for this table, and thus, sample size varied by SSB type within each age group as presented in the Table.

<sup>d</sup>Adjusted calorie intake prevalence was estimated using an OLS regression model. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>e</sup>SE stands for standard errors.

<sup>f</sup>All estimates were weighted by sampling probability.

<sup>g</sup>All differences between 99-00 and 07-08 were statistically significant at the 5% level.

Table 4

Associations of race/ethnicity and socioeconomic status with the likelihood of any sugar sweetened beverage (SSB) consumption

Age Group <sup>a</sup>	Total SSB		Regular Soda		Fruit Drinks		Sports/Energy Drinks	
	OR(SE), [95%CI]		OR(SE), [95%CI]		OR(SE), [95%CI]		OR(SE), [95%CI]	
<b>Children(N=8,676)</b>								
Black	1.30 (0.11)	[1.10,1.55]*	0.62 (0.05)	[0.53,0.74]*	2.31 (0.19)	[1.96,2.73]*	0.53 (0.11)	[0.35,0.80]*
Hispanic	1.06 (0.10)	[0.87,1.28]	1.11 (0.09)	[0.94,1.31]	1.07 (0.09)	[0.90,1.28]	1.14 (0.20)	[0.80,1.62]
Other race	0.86 (0.15)	[0.61,1.23]	0.78 (0.12)	[0.57,1.07]	0.93 (0.15)	[0.68,1.28]	1.00 (0.30)	[0.55,1.82]
Low education	1.39 (0.13)	[1.16,1.67]*	1.48 (0.12)	[1.26,1.74]*	0.97 (0.08)	[0.83,1.14]	1.12 (0.18)	[0.82,1.53]
Low income	1.18 (0.14)	[0.93,1.48]	1.29 (0.13)	[1.07,1.57]*	0.94 (0.10)	[0.76,1.16]	0.56 (0.13)	[0.36,0.88]*
Middle income	1.31 (0.16)	[1.02,1.68]*	1.43 (0.12)	[1.22,1.69]*	1.03 (0.11)	[0.83,1.28]	0.94 (0.15)	[0.68,1.29]
<b>Adolescents(N=8,922)</b>								
Black	1.49 (0.15)	[1.22,1.81]*	0.63 (0.06)	[0.52,0.75]*	3.61 (0.27)	[3.10,4.20]*	0.60 (0.08)	[0.45,0.78]*
Hispanic	1.21 (0.13)	[0.98,1.49]	1.05 (0.11)	[0.86,1.29]	1.54 (0.14)	[1.29,1.83]*	0.90 (0.13)	[0.68,1.18]
Other race	0.92 (0.18)	[0.62,1.37]	0.95 (0.13)	[0.71,1.26]	1.17 (0.21)	[0.83,1.66]	1.09 (0.30)	[0.63,1.89]
Low education	1.31 (0.3)	[1.08,1.58]*	1.24 (0.10)	[1.05,1.46]*	1.09 (0.08)	[0.94,1.27]	0.98 (0.14)	[0.74,1.29]
Low income	1.09 (0.11)	[0.90,1.34]	1.20 (0.10)	[1.01,1.42]*	0.95 (0.09)	[0.79,1.14]	0.65 (0.11)	[0.47,0.91]*
Middle income	1.17 (0.13)	[0.95,1.45]	1.10 (0.09)	[0.94,1.29]	1.07 (0.10)	[0.89,1.28]	0.74 (0.13)	[0.52,1.05]
<b>Young adults(N=5,933)</b>								
Black	1.88 (0.23)	[1.47,2.41]*	0.95 (0.09)	[0.78,1.15]	3.53 (0.32)	[2.95,4.24]*	0.88 (0.14)	[0.65,1.20]
Hispanic	1.39 (0.13)	[1.15,1.68]*	1.13 (0.10)	[0.94,1.35]	1.93 (0.17)	[1.61,2.31]*	0.97 (0.16)	[0.70,1.36]
Other race	0.96 (0.18)	[0.67,1.39]	0.83 (0.14)	[0.59,1.16]	0.98 (0.22)	[0.63,1.54]	0.55 (0.24)	[0.24,1.30]
Low education	1.62 (0.16)	[1.34,1.97]*	1.68 (0.15)	[1.41,2.01]*	0.85 (0.08)	[0.70,1.04]	1.00 (0.13)	[0.76,1.31]
Low income	1.47 (0.16)	[1.18,1.83]*	1.52 (0.16)	[1.23,1.87]*	1.22 (0.15)	[0.96,1.57]	1.00 (0.19)	[0.69,1.45]
Middle income	1.37 (0.13)	[1.13,1.65]*	1.37 (0.12)	[1.15,1.62]*	1.18 (0.13)	[0.94,1.47]	1.29 (0.23)	[0.91,1.83]
<b>Adults(N=16,456)</b>								
Black	1.89 (0.09)	[1.71,2.09]*	1.32 (0.08)	[1.18,1.48]*	2.73 (0.18)	[2.40,3.11]*	0.94 (0.18)	[0.65,1.37]
Hispanic	1.25 (0.06)	[1.13,1.38]*	1.06 (0.07)	[0.93,1.20]	1.62 (0.12)	[1.41,1.87]*	1.26 (0.18)	[0.96,1.67]
Other race	0.89 (0.08)	[0.74,1.07]	0.89 (0.10)	[0.71,1.12]	0.73 (0.13)	[0.51,1.04]	1.08 (0.34)	[0.58,2.02]
Low education	1.34 (0.06)	[1.23,1.47]*	1.52 (0.07)	[1.39,1.67]*	0.97 (0.06)	[0.85,1.10]	0.95 (0.14)	[0.71,1.26]
Low income	1.43 (0.09)	[1.27,1.62]*	1.63 (0.11)	[1.43,1.87]*	0.91 (0.07)	[0.78,1.07]	0.91 (0.15)	[0.65,1.27]

Age Group <sup>d</sup>	Total SSB	Regular Soda	Fruit Drinks	Sports/Energy Drinks
	OR(SE), [95%CI]	OR(SE), [95%CI]	OR(SE), [95%CI]	OR(SE), [95%CI]
Middle income	1.21 (0.07) [1.08,1.35] *	1.35 (0.09) [1.19,1.53] *	0.95 (0.07) [0.82,1.09]	1.03 (0.16) [0.76,1.41]

Notes:

<sup>a</sup>Each age group was defined as follows: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older).

<sup>b</sup>The data were from the NHANES, nationally representative sample.

<sup>c</sup>Odds ratio (OR) was estimated using logistic regression. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>d</sup>For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>e</sup>The reference groups for race/ethnicity, education, and income groups were white, high education, and high income, respectively, household income

<sup>f</sup><sub>\*</sub>  $p < 0.05$ .

<sup>g</sup>SE and CI stand for standard error and confidence interval, respectively.

<sup>h</sup>All estimates were all weighted by sampling probability.

**Table 5**

Associations of race/ethnicity and socioeconomic status with the likelihood of heavy sugar sweetened beverage (SSB) consumption among consumers

Age Group <sup>a</sup>	Total SSB	Regular Soda	Fruit Drinks
	OR(SE), [95%CI]	OR(SE), [95%CI]	OR(SE), [95%CI]
<b>Children</b>			
Black	0.73 (0.14) [0.51,1.07]	0.41 (0.16) [0.19,0.91]*	1.71 (0.43) [1.04,2.80]*
Hispanic	0.45 (0.12) [0.27,0.76]*	0.16 (0.06) [0.08,0.32]*	1.09 (0.36) [0.57,2.09]
Other race	0.51 (0.19) [0.24,1.06]	0.90 (0.65) [0.21,3.78]	1.08 (0.68) [0.31,3.80]
Low education	1.21 (0.23) [0.83,1.77]	1.44 (0.55) [0.67,3.07]	0.69 (0.21) [0.38,1.25]
Low income	1.93 (0.59) [1.05,3.56]*	1.77 (0.97) [0.59,5.27]	1.76 (0.91) [0.63,4.92]
Middle income	1.79 (0.50) [1.03,3.13]*	1.26 (0.68) [0.43,3.67]	2.00 (1.03) [0.71,5.58]
	N=6,398	N=3,959	N=3,871
<b>Adolescents</b>			
Black	0.74 (0.07) [0.62,0.89]*	0.51 (0.07) [0.39,0.67]*	1.67 (0.36) [1.08,2.58]*
Hispanic	0.73 (0.09) [0.57,0.93]*	0.68 (0.11) [0.49,0.94]*	1.38 (0.32) [0.87,2.21]
Other race	0.79 (0.14) [0.56,1.12]	0.76 (0.15) [0.51,1.13]	1.39 (0.56) [0.62,3.12]
Low education	1.28 (0.10) [1.10,1.50]*	1.18 (0.15) [0.91,1.51]	1.20 (0.24) [0.80,1.80]
Low income	1.03 (0.12) [0.81,1.30]	1.15 (0.19) [0.82,1.61]	0.85 (0.26) [0.47,1.55]
Middle income	0.88 (0.10) [0.71,1.10]	0.84 (0.11) [0.65,1.08]	0.75 (0.20) [0.45,1.28]
	N=7,533	N=5,726	N=3,179
<b>Young adults</b>			
Black	0.77 (0.09) [0.60,0.97]*	0.44 (0.07) [0.33,0.60]*	1.63 (0.42) [0.98,2.71]
Hispanic	0.4 (0.06) [0.30,0.55]*	0.27 (0.05) [0.19,0.39]*	1.00 (0.33) [0.52,1.92]
Other race	0.47 (0.12) [0.29,0.77]*	0.43 (0.14) [0.22,0.82]*	1.89 (0.74) [0.86,4.13]
Low education	1.37 (0.15) [1.09,1.71]*	1.48 (0.22) [1.10,1.98]*	0.96 (0.22) [0.61,1.52]
Low income	1.56 (0.20) [1.20,2.02]*	1.41 (0.21) [1.06,1.89]*	2.17 (0.79) [1.05,4.50]*
Middle income	1.35 (0.19) [1.02,1.78]*	1.36 (0.23) [0.97,1.92]	1.50 (0.41) [0.86,2.59]
	N=4,504	N=3,460	N=1,624
<b>Adults</b>			
Black	0.89 (0.10) [0.71,1.11]	0.73 (0.10) [0.56,0.97]*	1.64 (0.46) [0.94,2.86]
Hispanic	0.53 (0.06) [0.41,0.67]*	0.46 (0.07) [0.34,0.64]*	0.99 (0.32) [0.52,1.90]
Other race	0.57 (0.14) [0.35,0.91]*	0.5 (0.17) [0.25,0.98]*	0.77 (0.76) [0.11,5.51]
Low education	1.47 (0.15) [1.20,1.80]*	1.38 (0.17) [1.07,1.77]*	0.73 (0.16) [0.48,1.12]
Low income	1.42 (0.18) [1.11,1.83]*	1.65 (0.26) [1.21,2.25]*	1.61 (0.45) [0.92,2.81]
Middle income	1.36 (0.16) [1.07,1.72]*	1.59 (0.26) [1.15,2.21]*	1.06 (0.32) [0.58,1.94]
	N=8,965	N=6,320	N=3,408

Notes:

<sup>a</sup> Each age group was defined as following: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older).

<sup>b</sup> The data were from the NHANES, nationally representative sample.



<sup>c</sup>Odds ratio (OR) was estimated using logistic regression. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>d</sup>For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>e</sup>The reference groups for race/ethnicity, education, and income groups were white, high education, and high income, respectively. household incomepoverty level, respectively.

<sup>f</sup>\*  $p < 0.05$ .

<sup>g</sup>CI stands for confidence interval.

<sup>h</sup>All estimates were all weighted by sampling probability.

**Table 6**

Associations of race/ethnicity and socioeconomic status with kilocalorie (kcal) intake per day of sugar sweetened beverages (SSBs) among consumers

Age Group <sup>a</sup>	Total SSB Coefficients (SE)	Regular Soda Coefficients (SE)	Fruit Drinks Coefficients (SE)
<b>Children</b>			
Black	−4.1 (7.3)	−28.8 (6.4)***	20.0 (7.1)***
Hispanic	−18.1 (9.8)*	−27.0 (7.6)***	8.2 (7.3)
Other race	−16.9 (11.1)	−10.6 (13.1)	2.5 (14.2)
Low education	7.6 (7.6)	4.4 (7.0)	−4.8 (6.5)
Low income	22.9 (10.3)**	14.8 (9.3)	27.3 (11.2)**
Middle income	17.4 (8.8)*	6.8 (8.9)	18.4 (8.5)**
	N=6,398	N=3,959	N=3,871
<b>Adolescents</b>			
Black	−35.3 (11.3)***	−71.8 (10.9)***	32.7 (12.0)***
Hispanic	−43.3 (11.6)***	−58.3 (11.6)***	14.0 (13.5)
Other race	−22.4 (25.2)	−23.8 (24.2)	−12.6 (23.3)
Low education	27.0 (8.9) ***	21.5 (10.4)**	10.0 (12.1)
Low income	17.6 (13.9)	20.2 (15.0)	−1.3 (17.0)
Middle income	−3.7 (10.8)	0.0 (11.6)	−0.4 (12.2)
	N=7,533	N=5,726	N=3,179
<b>Young adults</b>			
Black	−47.3 (17.0)***	−96.3 (19.0)***	35.4 (23.5)
Hispanic	−139.9 (20.6)***	−160.3 (20.8)***	−22.8 (29.4)
Other race	−110.6 (25.63)***	−131.9 (22.4)***	75.0 (73.1)
Low education	59.2 (15.7)***	48.6 (19.5)**	19.9 (19.9)
Low income	77.9 (17.2)***	61.7 (18.4)***	63.2 (31.0)**
Middle income	43.1 (15.6)***	43.9 (15.1)***	18.4 (20.9)
	N=4,504	N=3,460	N=1,624
<b>Adults</b>			
Black	−1.7 (10.1)	−28.7 (9.9)***	43.0 (13.2)***
Hispanic	−51.7 (11.1)***	−63.1 (12.5)***	5.9 (13.5)
Other race	−56.5 (19.5)***	−51.4 (20.6)**	5.1 (27.2)
Low education	32.2 (8.3)***	26.0 (10.4)**	−3.6 (9.7)
Low income	37.8 (11.0)***	39.1 (11.9)***	25.7 (14.2)*
Middle income	22.6 (8.4) ***	21.2 (10.5)**	14.0 (13.4)
	N=8,965	N=6,320	N=3,408

Notes:

<sup>a</sup> Each age group was defined as follows: children (2–11 years), adolescents (12–19 years), young adults (20–34 years), and adults (35 years or older).

<sup>b</sup> The data were from the NHANES, nationally representative sample.

<sup>c</sup> Estimates for sports/energy drinks were not provided due to small sample sizes for the conditional regression models.

<sup>d</sup> Adjusted calorie intake was estimated using regression analysis. Adjusted factors included age, gender, and race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, and others), household income (per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level), education level (high school or less versus some college or more). For children and adolescents under age 20 we used their parents or guardians' socioeconomic characteristics for proxy measures of their own.

<sup>e</sup> The reference groups for race/ethnicity, education, and income groups were Whites, high education, and high income, respectively. Education level was measured as low education (high school or less) versus high education (some college or more). Household income was measured as low, middle, and high income based on per capita household income less than 135%, between 135% and 300%, and 300% or more of the federal poverty level, respectively.

<sup>f</sup> \*  $p < 0.1$ , \*\*  $p < 0.05$ , \*\*\*  $p < 0.01$ .

<sup>g</sup> SE stands for standard errors.

<sup>h</sup> All estimates were all weighted by sampling probability.