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Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999–2010

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Abstract

Background: Reducing sugar-sweetened beverage (SSB) consumption is a recommended strategy to promote optimal health.

Objective: The objective was to describe trends in SSB consumption among youth and adults in the United States.

Design: We analyzed energy intake from SSBs among 22,367 youth aged 2–19 y and 29,133 adults aged ≥20 y who participated in a 24-h dietary recall as part of NHANES, a nationally representative sample of the US population with a cross-sectional design, between 1999 and 2010. SSBs included soda, fruit drinks, sports and energy drinks, sweetened coffee and tea, and other sweetened beverages. Patterns of SSB consumption, including location of consumption and meal occasion associated with consumption, were also examined.

Results: In 2009–2010, youth consumed a mean (±SE) of 155 ± 7 kcal/d from SSBs, and adults consumed an age-adjusted mean (±SE) of 151 ± 5 kcal/d from SSBs—a decrease from 1999 to 2000 of 68 kcal/d and 45 kcal/d, respectively (P-trend < 0.001 for each). In 2009–2010, SSBs contributed 8.0% ± 0.4% and 6.9% ± 0.2% of daily energy intake among youth and adults, respectively, which reflected a decrease compared with 1999–2000 (P-trend < 0.001 for both). Decreases in SSB consumption, both in the home and away from home and also with both meals and snacks, occurred over the 12-y study duration (P-trend < 0.01 for each).

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The findings and conclusions in this report are those of the authors and not necessarily those of the Centers for Disease Control and Prevention.

Conclusion: A decrease in SSB consumption among youth and adults in the United States was observed between 1999 and 2010.

INTRODUCTION

Consumption of sugar-sweetened beverages (SSBs) is associated with dental caries and risk factors for cardiovascular disease (1–7). There is a large body of research that has examined the association between SSB consumption and both excessive weight gain and obesity, and this association has been systematically reviewed in several studies (8–11). Because SSBs are high in added sugars and calories but have few, if any, nutrients, reducing SSB consumption is a recommended strategy to promote optimal health and is a component of healthy dietary habits described in the 2010 *Dietary Guidelines for Americans* (12–15). SSBs include but are not limited to sodas, fruit drinks, and sports and energy drinks.

Between the late 1960s and early 2000s, the consumption of SSBs increased in the United States (16–19). Although a previous study of SSB consumption showed an overall decline in its consumption between 1999–2000 and 2007–2008 (20), the current analysis uses the most recent national data from NHANES to describe trends in SSB consumption between 1999–2000 and 2009–2010. In addition, we conducted stratified analyses to examine whether the overall trends in SSB consumption occurred across sex, age, and race-ethnicity groups. Moreover, in our study, patterns of SSB consumption, including location of consumption, meal occasion associated with consumption, and frequency of consumption, are also examined because knowledge of these characteristics may inform public health and clinical interventions designed to reduce SSB consumption.

SUBJECTS AND METHODS

Study design

NHANES is a series of complex, stratified, multistage probability surveys of the US civilian, noninstitutionalized population conducted by the National Center for Health Statistics, CDC. Participants in the NHANES surveys receive a detailed home interview followed by a physical examination and a dietary interview at a mobile examination center. The surveys were approved by the National Center for Health Statistics's Ethics Review Board. Informed consent was obtained for persons aged ≥18 y. For those younger than 18 y, written parental consent was obtained and child assent was obtained for those 7–17 y. Data from NHANES 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010 were included in this analysis. Unweighted total examination response rates during the survey years ranged from 75% to 80% (21).

Dietary interview

The type and quantity of all foods and beverages consumed in one 24-h period, specifically the 24-h period before the dietary-recall interview (midnight to midnight), were collected by trained interviewers with the use of a computer-assisted dietary interview system that included a multiple-pass format with standardized probes (22, 23). Since 2003–2004, two 24-h dietary recalls are publicly available in NHANES, but only one 24-h dietary recall was included in this analysis to maximize comparability between surveys. Furthermore, one

24-h recall is sufficient to estimate population means because the effects of random errors associated with dietary recall, including day-to-day variability, can be generally assumed to cancel out if days of the week are evenly represented (24). Estimates for frequency of consumption are also reported; however, because these estimates are calculated at the individual level using one 24-h recall, they are referred to as intake "on a given day." Proxies, most commonly a parent, reported dietary intake for children aged ≤5 y and assisted with the dietary interview for children aged 6–11 y; dietary intake was self-reported for participants aged ≥12 y. The dietary intakes of each reported participant were assessed for reliability; dietary recalls deemed as unreliable, on the basis of criteria described elsewhere (25), are denoted as such on the public data files. Nutrient intakes, including calories, from all reported foods and beverages were calculated by using the USDA food-composition databases. In 1999–2000, the USDA 1994–1998 Survey Nutrient Database was the food-composition database used; in subsequent surveys, the USDA Food and Nutrient Database for Dietary Studies was used (26). In addition to changes in the food-composition database, between 1999 and 2002, there were other design changes incorporated to improve data quality, including changes to the automated data collection system and coding system (26). In 2002, the USDA and the National Center for Health Statistics integrated their dietary data collection efforts, and the dietary recall data are now collected in a joint effort.

Definition of sugar-sweetened beverages

The 2010 *Dietary Guidelines for Americans* define SSBs as those beverages that are sweetened with sugars that can add calories (13), including but not limited to sucrose, high-fructose corn syrup, and glucose. For the purposes of this report, the definition of SSBs includes soda, fruit drinks (including sweetened bottled waters and fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other SSBs (including *horchata* and sugar cane beverages), consistent with previous reports (18, 19). In this report, SSBs do not include diet drinks [defined as approximately <40 kcal/240 mL (8 oz) of the beverage (27)]; 100% fruit juice; beverages sweetened by the participant, including coffee and teas; alcohol; or flavored milks. These beverage categories were also excluded from previous analyses of SSB consumption (18, 19). Sports and energy drinks were combined into a single category, because, in several instances, the estimate for energy drinks was not statistically reliable. All reported beverages consistent with SSBs were identified by one author (BKK), and the classification strategy was reviewed by each of the other authors. Differences in classification were resolved by discussion. The focus of this analysis is on SSB consumption overall, but trends by SSB type are also assessed.

Location and eating occasion

During the dietary interview, respondents were asked to identify both the location and eating occasion of each reported item. For this analysis, location of consumption was dichotomized as home and away from home, and eating occasion was categorized as meal (breakfast, lunch, or dinner) and snack, consistent with previous reports (28). Data for location of consumption was missing in <1% of SSB records; because a large portion of all food calories are consumed at home [~67% in 2009–2010 (29)], beverages missing a location of consumption were assumed to be consumed at home. In <1% of SSB records, the assigned eating occasion was not consistent with either meal or snack, most commonly recorded as

"other," and these beverages were excluded from the eating occasion analyses. The response options for location and eating occasion were coded slightly differently in 1999–2000 compared with subsequent surveys, but comparable categories were constructed.

Frequency of SSB consumption

Approximately one-third of participants reported consuming an SSB more than once during their 24-h recall. To examine whether the frequency of SSB consumption has changed, the number of SSBs reported for an individual was categorized as 0, 1, or ≥2.

Demographic variables

Age was categorized as 2–5, 6–11, 12–19, 20–39, 40–59, or ≥60 y, consistent with NHANES sample-selection methods (30). Race-ethnicity was categorized as non-Hispanic white, non-Hispanic black, Mexican American, and other, based on self-reported race and ethnicity. Participants with a race-ethnicity categorized as other are included in overall estimates but are not separately reported.

Analytic population

All persons aged ≥2 y who participated in the examination component of NHANES were eligible for the dietary interview. In each of the surveys, between 4% and 6% of the participants were excluded because their recall did not meet standards of reliability (25). Pregnant or lactating women were not excluded. The final analytic sample, after the exclusion of persons with unreliable dietary data, consisted of 8074, 9033, 8273, 8549, 8529, and 9042 persons aged ≥2 y in 1999–2002, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010. Detailed sample sizes are provided elsewhere (*see* Supplemental Tables 1 and 2 under "Supplemental data" in the online issue).

Data analysis

Statistical analyses were conducted by using SAS version 9.2 (SAS Institute Inc) and SUDAAN version 10.0 (RTI). Energy intake in this analysis is expressed as kcal; the conversion factor for converting kilocalories to kilojoules is 4.184. Mean kcal/d from SSBs were estimated and percentage of energy intake from SSB were calculated by using the PROC RATIO procedure in SUDAAN (31, 32). Percentage of energy intake from SSBs adjusts for differences in total energy intake, which facilitates comparisons across sex and age groups. Additional analyses examined mean SSB consumption among those who reported consuming a SSB. The percentages of persons reporting 0, 1, or ≥2 SSBs are reported. Dietary sample weights, which account for differential probabilities of selection, nonresponse, noncoverage, and sample design, were used to obtain estimates representative of the noninstitutionalized US population. The publicly available dietary sample weights include a poststratification step to balance recalls across days of the week. SEs were estimated by using Taylor series linearization. Statistical hypotheses were tested by using Student's t statistic and an α level of 0.05. The hypothesis of no linear trend across the survey periods was tested by using orthogonal contrast matrices. No adjustments were made for multiple comparisons. Estimates for adults were age-adjusted to the 2000 Census

population estimates by using the direct method and the following age groups: 20–39, 40–59, ≥60 y.

RESULTS

Overall trends in SSB consumption and trends by type of SSB

In 2009–2010, youth consumed a mean (±SE) of 155 ± 7 kcal/d from SSB, and adults consumed an age-adjusted mean (±SE) of 151 ± 5 kcal/d from SSBs—a decrease from 1999 to 2000 of 68 ± 14 and 45 ± 11 kcal/d, respectively (*P*-trend <0.001 for each) (Figure 1, A and B).

Over the 12-y study period, there were relatively large declines in soda consumption. Among youth and adults, soda consumption was 67 ± 11 and 58 ± 10 kcal/d lower in 2009–2010 than in 1999–2000 (*P*-trend <0.001 for both). Among youth and adults, fruit drink consumption was 16 ± 6.4 and 8 ± 3 kcal/d lower in 2009–2010 than in 1999–2000 (*P*-trend <0.001 for both). Consumption of sports and energy drinks increased over the 12-y period, but in 2009–2010 it continued to contribute a relatively small amount of energy intake from SSBs (12 ± 1.8 and 10 ± 0.9 kcal/d for youth and adults, respectively; *P*-trend <0.001 for both). Energy intake from sweetened coffee and teas increased over the study period (*P*-trend <0.05 and <0.001 for youth and adults, respectively). Beverages classified as "other" sweetened beverages were included in the overall estimates but are not displayed in Figure 1 (A and B) because they made only a small contribution to SSB intake, ranging from 0.7 ± 0.3 to 1.7 ± 0.4 kcal/d.

Trends in SSB consumption by age, sex, and race-ethnicity

Among youth, energy intake from SSB decreased between 1999–2000 and 2009–2010 for each age group (*P*-trend ≤ 0.01 for each) (Table 1). The decreases in SSB were 37 ± 12, 71 ± 13, and 84 ± 23 kcal/d for youth aged 2–5, 6–11, and 12–19 y, respectively. Within age-specific groups, there was a decrease in energy intake from SSB over the 12 y for each sex and race-ethnicity, except among non-Hispanic black children aged 2–5 y. The percentage of energy intake from SSBs decreased among youth overall and in each age group across the study period (*P*-trend < 0.05 for each). Among non-Hispanic black youth aged 2–5 and 6–11 y and Mexican American youth aged 6–11 y, the change in percentage of energy intake from SSBs was not significant (*P*-trend ≥ 0.05).

Among adults, energy intake from SSBs decreased over the 12-y study period for those aged 20–39 and ≥60 y (*P* < 0.01 for both), but not for adults aged 40–59 y (Table 2). Among adults aged 20–39 y, energy intake from SSBs decreased among men and women and in each race-ethnicity group; however, among adults aged 40–59 y, only non-Hispanic blacks had a significant linear decrease over the 12-y study period. Among men aged 40–59 y, there was an increase in energy intake over the study period from SSB followed by a decrease (*P*-quadratic trend < 0.01). Among adults aged ≥60 y, men and non-Hispanic whites had a significant linear decrease in energy intake from SSBs.

Among adults, as observed for youth, the percentage of energy intake from SSBs decreased across the study period overall (*P*-trend < 0.001). Among adults aged 20–39 y, there was

an overall decrease, and a decrease for both sexes and each examined race-ethnicity group, in the percentage of energy intake from SSBs. Among adults aged 40–59 y, the changes in percentage of energy intake from SSB were not significant except for a decrease in percentage of energy intake from SSB among non-Hispanic blacks ($P < 0.001$). Among adults aged ≥60 y, there was an overall decrease, and a decrease for men and each examined race-ethnicity group, in the percentage of energy intake from SSBs. The decrease in percentage of energy intake from SSBs among adults ≥60 y was generally smaller than that among adults aged 20–39 y.

Trends in SSB consumption by location of consumption and eating occasion

Declines SSB consumption both at home and away from home contributed to the overall declines in energy intake from SSBs (Table 3). Among youth, energy intake from SSBs consumed at home and away from home were 35 ± 8 and 33 ± 8 kcal/d lower in 2009–2010 than in 1999–2000 (P-trend < 0.001 for both); among adults, age-adjusted energy intakes from SSBs consumed at home and away from home were 16 ± 9 and 29 ± 7 kcal/d lower in 2009–2010 than in 1999–2000 (P-trend < 0.01 for both). For both youth and adults, energy intake from SSBs consumed at lunch, at dinner, and as a snack decreased across the study period (P-trend < 0.01 for each), but no significant change in energy intake consumed at breakfast was observed.

Trends in SSB consumption among individuals reporting an SSB

In analyses restricted to those who reported consuming an SSB in the previous 24 h, mean energy intakes from SSBs were 288 ± 13, 268 ± 8, 278 ± 9, 271 ± 11, 234 ± 8, and 241 ± 10 kcal/d in 1999–2000, 2001–2002, 2003–2004, 2005–2006, 2007–2008, and 2009–2010 for youth, respectively; mean age-adjusted energy intakes from SSBs were 325 ± 9, 321 ± 9, 306 ± 8, 296 ± 8, 276 ± 14, and 283 ± 5 kcal/d for adults during these time periods, respectively. For both youth and adults, the decrease in mean energy intake from SSBs (kcal/d) among individuals reporting SSB consumption was significant (P-trend, < 0.0.01 for both) (data not tabulated).

Trends in frequency of SSB consumption

Among youth, in 2009–2010, more than one-third reported no SSB consumption (35.8% ± 1.3%), whereas 33.1% ± 1.3% and 31.2% ± 0.8% reported consumption of 1 SSB and ≥2 SSBs on a given day (Figure 2A). The percentage of youth reporting no SSB consumption increased (P-trend < 0.001) and of those reporting 1 SSB and ≥2 SSBs decreased (P-trend < 0.05 and < 0.001, respectively) between 1999–2000 and 2009–2010. An increase in the percentage of adults reporting no SSB consumption and a decrease in adults reporting consumption of ≥2 SSBs on a given day was observed (P-trend < 0.01 for both) (Figure 2B). Among adults, no significant change was observed over the 12-y study period in consumption of 1 SSB on a given day. For both youth and adults, a linear decrease in the consumption of one or more SSBs was observed (youth: 77.4% in 1999–2000 compared with 64.2% in 2009–2010; adults: 57.6% in 1999–2000 compared with 50.6% in 2009–2010; $P < 0.001$ for both, data not tabulated).

DISCUSSION

Among youth and adults in the United States, a decreased consumption of SSBs was observed over the 12-y period from 1999 to 2000 to 2009–2010. Decreases in SSB consumption were observed across a wide range of sex, age, and race-ethnicity groups. Furthermore, the decrease in SSB consumption occurred both at home and away from home and was also associated with both meal-time and snack-time consumption. Despite this decreasing trend, on average, American youth and adults consumed 155 and 151 kcal energy/d from SSBs in 2009–2010, which equates to slightly more than one 12-fluid oz (355-mL) can of cola (33).

Efforts in both public health and clinical medicine have been made to reduce SSB consumption. National guidelines and initiatives have educated the public on the benefits of a healthy diet, including reducing SSB consumption (13, 34, 35). Health-related professional organizations, including the American Academy of Pediatrics and the American Heart Association, have also endorsed efforts to reduce the consumption of SSBs (14, 36). Furthermore, state and local jurisdictions have supported programs to reduce SSB consumption (37–39). For example, in Boston (MA) public schools, 1 y after initiation of a policy that “precluded” the sale of soft drinks, fruit drinks, and sports drinks anywhere in school buildings or on school campuses, a decrease in servings of SSB consumed was observed (39). In addition, Wescott et al (40) recently reported a 90% reduction in calories shipped to schools by 3 large beverage industry companies following industry self-regulation. The extent to which these previously reported interventions contributed to the observed trends reported in this analysis is not known.

Previous studies have described differences in SSB consumption by location of consumption and have noted higher SSB consumption in the home than away from home (16), but our description of consumption of SSBs with meals (breakfast, lunch, and dinner combined) has not been as well described in the literature. High consumption of soda, relative to the other components of SSBs, has also been previously described (18, 19). However, to our knowledge, an increasing trend in sports and energy drink and in sweetened coffee and tea consumption has not been described, although an increase in sales of energy and sports drinks during our study duration was reported previously (41, 42), and a recent study of US high school students reported that the relative contribution of sports and energy drinks was similar to that of sodas (43). Furthermore, we reported a decrease in the frequency of SSB consumption on a given day—a finding not observed in previous trend analyses of SSB consumption with the use of NHANES data (18, 19).

We used a large nationally representative sample of the US population, and our analysis provides the most current national estimates for SSB consumption in the US population. Despite these strengths, our study was not without weakness. During our study period, there were several changes in the methods of dietary collection, which may have improved reporting of dietary intake (26) and may have affected our findings. Our findings may not be generalizable to other countries. Furthermore, despite the attempt to reduce SSB misclassification by using 5 independent reviews of the categorization, this potential remains. There was also a small amount of missing data on the location of consumption and

eating occasion. Finally, our analysis of frequency of SSB consumption does not consider the intraperson variability in SSB consumption; thus, the results should be interpreted as representing intake on a given day rather than as usual intake over a longer time of reference.

In conclusion, our analysis describes a declining trend in SSB consumption among youth and adults in the United States; however, on average, American youth and adults consumed 155 and 151 kcal energy/d from SSBs in 2009–2010. Continued surveillance and monitoring of dietary intake, including intake of SSB, with the use of NHANES data may provide additional perspective on the trends in SSB we have reported.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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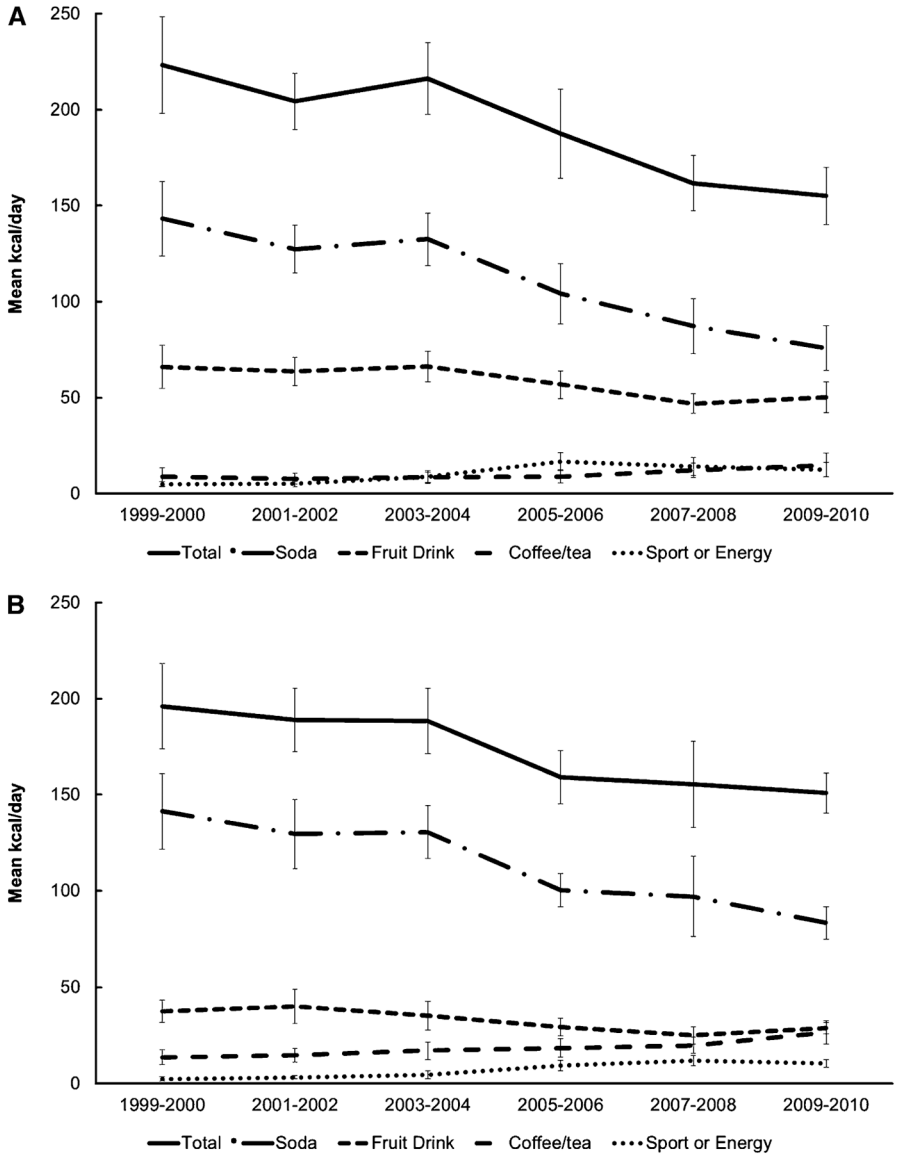

FIGURE 1.

Trends over time in energy intake from SSBs and type of SSB consumed in youth aged 2–19 y (A) and in adults aged ≥20 y (B). Data are from NHANES; n = 22,367 youth aged 2–19 y and 29,133 adults aged ≥20 y. SSBs include soda, fruit drinks (including fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other sugar-sweetened beverages (including *horchata* and sugar cane beverages). Other SSBs are not shown because of their low overall consumption. P-linear trend < 0.001 (1999–2000 to 2009–2010) by t statistic for total, soda, fruit drink, and sports or energy drink and <0.05 for coffee/tea among youth aged 2–19 y, and P < 0.001 for all types of SSBs in adults aged ≥20 y. Estimates for adults were age-adjusted by the direct method to the year 2000 Census population using 20–39, 40–59, ≥60 y. SSB, sugar-sweetened beverage.

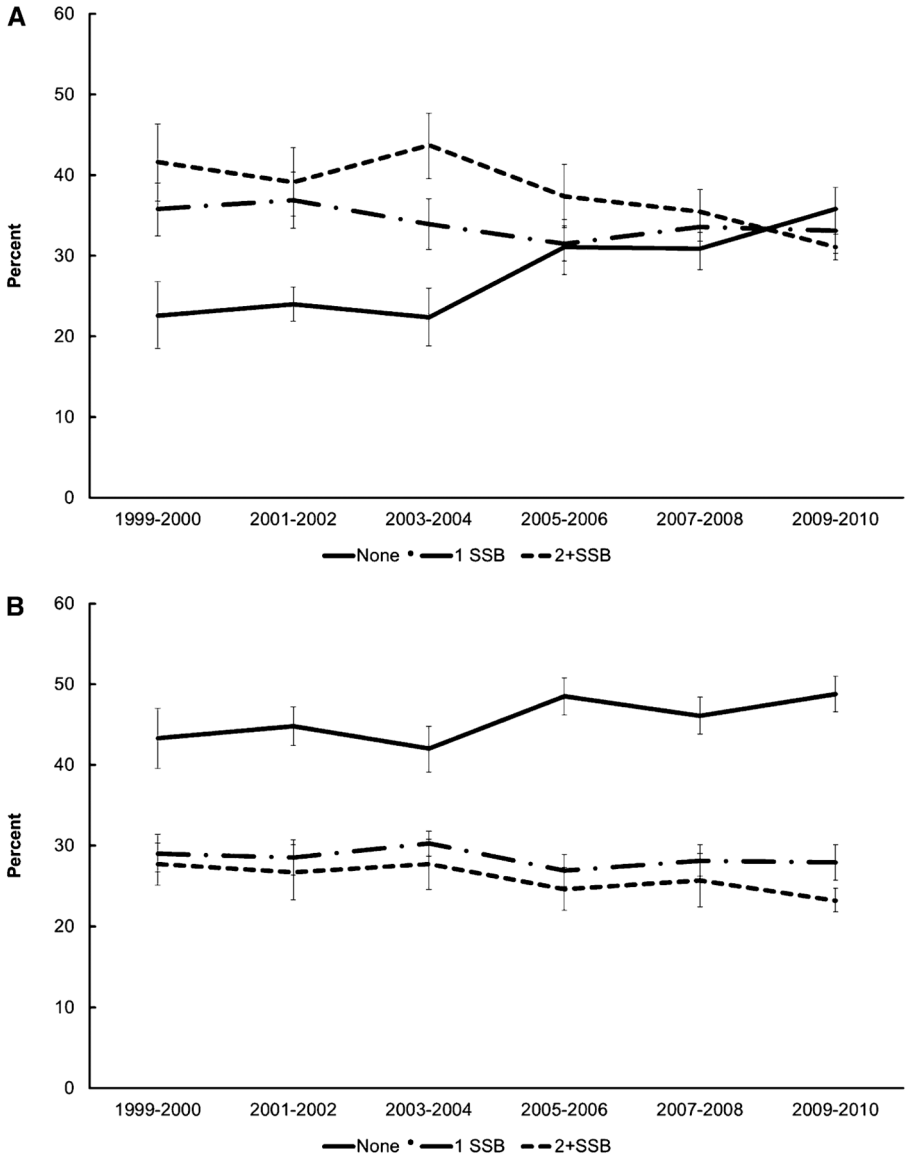

FIGURE 2.

Trends over time in frequency of SSBs consumed on a given day [ie, the 24-h period (midnight to midnight) before the NHANES dietary interview] in youth aged 2–19 y (A) and in adults aged ≥20 y (B). Data are from NHANES; n = 22,367 youth aged 2–19 y and 29,133 adults aged ≥20 y. SSBs include soda, fruit drinks (including fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other sugar-sweetened beverages (including *horchata* and sugar cane beverages). P-linear trend < 0.001 (1999–2000 to 2009–2010) by t statistic for 0 SSBs and ≥2 SSBs and $P < 0.05$ for 1 SSB in youth aged 2–19 y, and $P < 0.01$ for 0 SSBs and ≥2 SSB and $P. > 0.05$ for 1 SSB in adults aged s≥20 y. Estimates for adults were age -adjusted by the direct method to the year 2000 Census population using 20–39, 40–59, ≥60 y. SSB, sugar-sweetened beverage.

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TABLE 1

Trends over time in energy intake from SSBs and percentage of daily energy intake from SSBs in youth aged 2–19 y in the United States[1]

	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	*P* value[2]
Energy intake from SSBs (kcal/d)							
Total	223 ± 12	204 ± 7	216 ± 9	188 ± 11	162 ± 7	155 ± 7	<0.001
2–5 y	106 ± 10	116 ± 7	111 ± 8	85 ± 6	74 ± 4	69 ± 5	<0.001
Boys	111 ± 10	131 ± 11	115 ± 13	88 ± 10	77 ± 4	75 ± 9	<0.001
Girls	102 ± 15	103 ± 12	107 ± 11	83 ± 9	71 ± 7	63 ± 5	<0.01
Non-Hispanic white	96 ± 16	111 ± 8	111 ± 13	74 ± 9	74 ± 7	61 ± 4	<0.001
Non-Hispanic black	116 ± 11	148 ± 18	116 ± 10	107 ± 16	84 ± 13	114 ± 22	NS
Mexican American	139 ± 19	93 ± 11	119 ± 9	107 ± 17	80 ± 8	72 ± 6	<0.01
6–11 y	189 ± 12	155 ± 8	186 ± 12	130 ± 7	145 ± 6	118 ± 6	<0.001
Boys	209 ± 21	172 ± 8	215 ± 23	141 ± 12	162 ± 11	128 ± 7	<0.001
Girls	167 ± 8	137 ± 11	156 ± 10	118 ± 8	129 ± 7	108 ± 7	<0.001
Non-Hispanic white	203 ± 17	147 ± 12	192 ± 17	127 ± 13	149 ± 11	110 ± 5	<0.001
Non-Hispanic black	190 ± 14	165 ± 7	188 ± 13	136 ± 10	164 ± 16	137 ± 15	<0.01
Mexican American	150 ± 9	177 ± 16	206 ± 25	141 ± 11	140 ± 13	128 ± 10	<0.01
12–19 y	309 ± 17	284 ± 12	287 ± 11	276 ± 19	216 ± 12	225 ± 14	<0.001
Boys	361 ± 23	336 ± 18	333 ± 14	341 ± 30	246 ± 15	278 ± 22	<0.001
Girls	254 ± 17	232 ± 9	237 ± 15	206 ± 13	186 ± 14	175 ± 13	<0.001
Non-Hispanic white	302 ± 16	291 ± 16	289 ± 14	284 ± 28	222 ± 20	229 ± 24	<0.01
Non-Hispanic black	314 ± 14	272 ± 8	310 ± 21	285 ± 28	212 ± 16	228 ± 15	<0.001
Mexican American	288 ± 16	299 ± 10	293 ± 22	244 ± 10	212 ± 14	249 ± 25	<0.01
Energy intake from SSBs (%)							
Total	10.9 ± 0.5	9.9 ± 0.3	10.1 ± 0.4	9.1 ± 0.5	8.3 ± 0.4	8.0 ± 0.4	<0.001
2–5 y	6.7 ± 0.5	7.0 ± 0.4	6.5 ± 0.5	5.5 ± 0.4	4.9 ± 0.3	4.5 ± 0.3	<0.001
Boys	6.5 ± 0.5	7.5 ± 0.6	6.8 ± 0.8	5.4 ± 0.6	4.9 ± 0.2	4.8 ± 0.5	<0.001
Girls	6.8 ± 0.9	6.5 ± 0.7	6.1 ± 0.6	5.6 ± 0.6	4.8 ± 0.4	4.1 ± 0.3	<0.01
Non-Hispanic white	6.0 ± 0.9	7.0 ± 0.5	6.5 ± 0.7	4.7 ± 0.6	5.0 ± 0.4	4.0 ± 0.3	<0.01
Non-Hispanic black	7.5 ± 0.7	8.3 ± 1.0	6.6 ± 0.7	6.7 ± 0.9	5.4 ± 0.8	7.0 ± 1.2	NS
Mexican American	8.7 ± 1.1	5.6 ± 0.7	6.9 ± 0.5	6.9 ± 1.1	5.1 ± 0.5	4.7 ± 0.4	<0.01

	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	*P* value[2]
6–11 y	9.3 ± 0.4	7.8 ± 0.3	8.8 ± 0.5	6.5 ± 0.3	7.5 ± 0.3	6.3 ± 0.3	<0.001
Boys	9.8 ± 0.7	8.1 ± 0.3	9.5 ± 0.9	6.7 ± 0.5	7.9 ± 0.5	6.7 ± 0.3	<0.001
Girls	8.7 ± 0.3	7.5 ± 0.5	7.9 ± 0.5	6.3 ± 0.5	7.1 ± 0.5	5.9 ± 0.4	<0.001
Non-Hispanic white	9.7 ± 0.6	7.6 ± 0.6	9.0 ± 0.7	6.2 ± 0.6	7.5 ± 0.5	6.0 ± 0.2	<0.001
Non-Hispanic black	9.6 ± 0.7	8.0 ± 0.4	9.1 ± 0.7	7.3 ± 0.5	8.4 ± 0.9	7.1 ± 0.9	NS
Mexican American	7.9 ± 0.4	8.7 ± 0.8	9.4 ± 0.8	7.1 ± 0.6	7.8 ± 0.8	7.0 ± 0.5	NS
12–19 y	13.5 ± 0.8	12.3 ± 0.5	12.2 ± 0.5	11.9 ± 0.7	10.1 ± 0.6	10.4 ± 0.7	<0.001
Boys	13.8 ± 0.8	12.6 ± 0.7	12.5 ± 0.6	12.6 ± 0.9	10.1 ± 0.7	10.9 ± 1.0	<0.01
Girls	13.1 ± 0.8	12.0 ± 0.5	11.8 ± 0.7	10.8 ± 0.7	10.0 ± 0.8	9.6 ± 0.6	<0.001
Non-Hispanic white	12.9 ± 0.7	12.6 ± 0.6	12.3 ± 0.7	11.8 ± 1.0	10.0 ± 0.9	10.5 ± 1.2	<0.05
Non-Hispanic black	14.1 ± 0.7	12.4 ± 0.5	13.2 ± 0.7	12.7 ± 0.9	10.7 ± 0.6	10.6 ± 0.8	<0.001
Mexican American	14.4 ± 0.8	13.1 ± 0.5	12.6 ± 0.8	11.1 ± 0.4	10.2 ± 0.7	11.6 ± 0.9	<0.001

[1] All values are means ± SEs. The data are from NHANES; $n = 22{,}367$. NS, $P \geq 0.05$. SSBs include soda, fruit drinks (including fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other SSBs (including *horchata* and sugar cane beverages). SSB, sugar-sweetened beverage.

[2] Test of significance for a linear trend (1999–2000 to 2009–2010) with the use of a *t* statistic.

TABLE 2

Trends over time in energy intake from SSBs and percentage of daily energy intake from SSBs in adults aged ≥20 y in the United States[1]

	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	*P* value[2]
Energy intake from SSBs (kcal/d)							
Total[3]	196 ± 10	189 ± 8	188 ± 8	159 ± 7	155 ± 11	151 ± 5	<0.001
20–39 y	306 ± 19	280 ± 14	278 ± 15	230 ± 11	215 ± 16	213 ± 11	<0.001
Men	362 ± 17	337 ± 18	348 ± 24	297 ± 14	267 ± 19	254 ± 17	<0.001
Women	252 ± 26	228 ± 15	210 ± 12	161 ± 13	165 ± 15	172 ± 11	<0.001
Non-Hispanic white	308 ± 29	274 ± 19	278 ± 22	220 ± 12	222 ± 24	212 ± 14	<0.001
Non-Hispanic black	323 ± 17	318 ± 21	310 ± 21	290 ± 25	226 ± 19	248 ± 11	<0.001
Mexican American	281 ± 14	274 ± 23	304 ± 22	261 ± 12	245 ± 18	222 ± 21	<0.01
40–59 y	149 ± 11	165 ± 9	166 ± 10	139 ± 8	151 ± 12	136 ± 8	NS
Men	165 ± 12	205 ± 17	206 ± 14	189 ± 14	184 ± 15	165 ± 11	NS
Women	134 ± 13	123 ± 8	128 ± 14	93 ± 6	121 ± 11	108 ± 8	NS
Non-Hispanic white	143 ± 12	153 ± 12	161 ± 12	133 ± 10	145 ± 18	130 ± 10	NS
Non-Hispanic black	219 ± 18	243 ± 7	214 ± 20	193 ± 24	209 ± 16	165 ± 10	<0.01
Mexican American	180 ± 8	186 ± 18	186 ± 19	189 ± 14	165 ± 16	186 ± 8	NS
≥60 y	84 ± 5	71 ± 4	70 ± 3	70 ± 4	61 ± 4	68 ± 4	<0.01
Men	103 ± 10	96 ± 7	75 ± 5	91 ± 9	75 ± 5	80 ± 6	<0.05
Women	68 ± 10	52 ± 5	67 ± 3	54 ± 5	50 ± 4	58 ± 4	NS
Non-Hispanic white	81 ± 7	65 ± 6	64 ± 3	65 ± 5	56 ± 5	64 ± 5	<0.05
Non-Hispanic black	116 ± 10	121 ± 12	121 ± 9	109 ± 6	103 ± 11	108 ± 9	NS
Mexican American	106 ± 11	99 ± 11	81 ± 8	99 ± 18	84 ± 6	83 ± 5	NS
Energy intake from SSBs (%)							
Total[3]	8.7 ± 0.5	8.3 ± 0.3	8.1 ± 0.3	7.0 ± 0.3	7.1 ± 0.5	6.9 ± 0.2	<0.001
20–39 y	12.8 ± 0.8	11.5 ± 0.6	11.2 ± 0.6	9.5 ± 0.4	9.5 ± 0.7	9.3 ± 0.4	<0.001
Men	12.9 ± 0.6	11.7 ± 0.7	11.9 ± 0.7	10.2 ± 0.4	9.9 ± 0.7	9.5 ± 0.6	<0.001
Women	12.7 ± 1.3	11.2 ± 0.7	10.4 ± 0.7	8.3 ± 0.8	9.0 ± 0.9	9.1 ± 0.6	<0.01
Non-Hispanic white	12.7 ± 1.1	11.0 ± 0.8	11.1 ± 0.8	8.9 ± 0.5	9.6 ± 1.1	9.1 ± 0.6	<0.01
Non-Hispanic black	13.7 ± 0.6	12.7 ± 0.8	13.2 ± 0.9	12.3 ± 0.9	9.8 ± 0.9	11.1 ± 0.4	<0.001
Mexican American	12.5 ± 0.6	11.5 ± 1.2	11.6 ± 0.8	11.1 ± 0.4	10.9 ± 0.8	9.8 ± 0.8	<0.05

	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	*P* value[2]
40–59 y	6.8 ± 0.5	7.5 ± 0.5	7.4 ± 0.4	6.3 ± 0.4	6.9 ± 0.6	6.2 ± 0.4	NS
Men	6.4 ± 0.5	8.0 ± 0.6	7.8 ± 0.5	7.1 ± 0.5	7.1 ± 0.6	6.3 ± 0.5	NS
Women	7.4 ± 0.7	6.8 ± 0.5	7.0 ± 0.7	5.1 ± 0.3	6.6 ± 0.6	6.1 ± 0.4	NS
Non-Hispanic white	6.3 ± 0.6	6.8 ± 0.5	7.1 ± 0.5	5.8 ± 0.5	6.5 ± 0.8	5.9 ± 0.5	NS
Non-Hispanic black	10.8 ± 0.9	11.7 ± 0.3	10.2 ± 0.9	9.0 ± 1.0	10.0 ± 0.7	7.7 ± 0.6	<0.001
Mexican American	9.2 ± 0.6	8.7 ± 0.9	8.6 ± 0.9	8.9 ± 0.6	7.7 ± 0.7	8.8 ± 0.3	NS
≥60 y	4.7 ± 0.3	4.0 ± 0.2	4.0 ± 0.2	3.9 ± 0.2	3.5 ± 0.2	3.7 ± 0.2	<0.01
Men	5.0 ± 0.5	4.6 ± 0.3	3.7 ± 0.3	4.4 ± 0.4	3.7 ± 0.3	3.9 ± 0.3	<0.05
Women	4.4 ± 0.6	3.4 ± 0.3	4.2 ± 0.2	3.5 ± 0.3	3.3 ± 0.3	3.6 ± 0.3	NS
Non-Hispanic white	4.5 ± 0.4	3.6 ± 0.3	3.6 ± 0.2	3.6 ± 0.2	3.1 ± 0.3	3.4 ± 0.3	<0.05
Non-Hispanic black	7.8 ± 0.7	7.5 ± 0.7	7.6 ± 0.6	6.6 ± 0.5	6.6 ± 0.7	6.2 ± 0.6	<0.05
Mexican American	6.6 ± 0.6	5.9 ± 0.7	4.8 ± 0.5	5.8 ± 1.0	5.3 ± 0.3	4.8 ± 0.4	<0.05

[1] All values are means ± SEs. The data are from NHANES; $n = 29{,}133$. NS, $P \geq 0.05$. SSBs include soda, fruit drinks (including fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other SSBs (including *horchata* and sugar cane beverages). SSB, sugar-sweetened beverage.

[2] Test of significance for a linear trend (1999–2000 to 2009–2010) with the use of a *t* statistic.

[3] Age-adjusted by the direct method to the year 2000 Census population using 20–39, 40–59, ≥60 y.

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TABLE 3

Trends over time in energy intake from SSBs by location of consumption and eating occasion, youth and adults aged ≥2 y[1]

	1999–2000	2001–2002	2003–2004	2005–2006	2007–2008	2009–2010	*P* value[2]
Energy intake from SSBs, by location of consumption (kcal/d)							
Youth 2–19 y							
Home	123 ± 7	111 ± 6	127 ± 7	98 ± 5	90 ± 6	88 ± 4	<0.001
Away from home	101 ± 6[3]	93 ± 4	89 ± 4	90 ± 7	72 ± 3	68 ± 5[3]	<0.001
Adults ≥20 y[4]							
Home	101 ± 8	101 ± 4	99 ± 5	78 ± 4	87 ± 6	85 ± 3	<0.01
Away from home	95 ± 6	87 ± 6[3]	89 ± 5	81 ± 3	69 ± 5[3]	66 ± 3	<0.001
Energy intake from SSBs, by eating occasion (kcal/d)							
Youth 2–19 y							
Meal	124 ± 7	116 ± 5	120 ± 5	106 ± 5	99 ± 4	84 ± 2	<0.001
Breakfast	13 ± 1	11 ± 1	13 ± 1	12 ± 1	12 ± 1	10 ± 1	NS
Lunch	48 ± 2	50 ± 3	47 ± 2	45 ± 2	39 ± 2	30 ± 1	<0.001
Dinner	64 ± 6[5]	55 ± 3	60 ± 3	50 ± 3[5]	48 ± 3	44 ± 2	<0.001
Snack	99 ± 11	88 ± 4	96 ± 6	82 ± 7	62 ± 5[3]	71 ± 7	<0.01
Adults ≥20 y[4]							
Meal	105 ± 5	106 ± 5	107 ± 6	91 ± 4	88 ± 5	85 ± 2	<0.001
Breakfast	13 ± 1	12 ± 1	14 ± 1	15 ± 1	13 ± 1	15 ± 1	NS
Lunch	45 ± 2	47 ± 2	47 ± 4	39 ± 2	38 ± 2	34 ± 2	<0.001
Dinner	47 ± 3	46 ± 3[5]	46 ± 2	37 ± 2	38 ± 3[5]	36 ± 2	<0.001
Snack	91 ± 7	83 ± 4	82 ± 6[3]	68 ± 4	67 ± 7[3]	66 ± 4	<0.001

[1] All values are means ± SEs. The data are from NHANES; n = 22,367 youth aged 2–19 y and 29,133 adults aged ≥20 y. NS, $P \geq 0.05$. SSBs include soda, fruit drinks (including fruit juices and nectars with added sugars), sports and energy drinks, sweetened coffees and teas, and other SSBs (including *horchata* and sugar cane beverages). SSB, sugar-sweetened beverage.

[2] Test of significance for a linear trend (1999–2000 to 2009–2010) with the use of a t statistic.

[3] Sum of energy intakes at home and away from home does not equal the totals presented in Tables 1 and 2 because of rounding; sum of energy intakes from meals and snacks does not equal the totals presented in Tables 1 and 2 because of rounding and small amounts of missing data for meal occasion.

[4] Age-adjusted by the direct method to the year 2000 Census population using 20–39, 40–59, ≥60 y.

[5]Sum of energy intakes from breakfast, lunch, and dinner do not equal the sum for meals because of rounding.