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Characteristics Associated with Consumption of Sports and Energy Drinks among US Adults: National Health Interview Survey, 2010

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Abstract

Sales of sports and energy drinks have increased dramatically, but there is limited information on regular consumers of sports and energy drinks. Characteristics associated with sports and energy drink intake were examined among a sample representing the civilian noninstitutionalized US adult population. The 2010 National Health Interview Survey data for 25,492 adults (18 years of age or older; 48% males) were used. Nationwide, 31.3% of adults were sports and energy drink consumers during the past 7 days, with 21.5% consuming sports and energy drinks one or more times per week and 11.5% consuming sports and energy drinks three or more times per week. Based on multivariable logistic regression, younger adults, males, non-Hispanic blacks and Hispanics, not-married individuals, adults with higher family income, those who lived in the South or West, adults who engaged in leisure-time physical activity, current smokers, and individuals whose satisfaction with their social activities/relationships was excellent had significantly higher odds for drinking sports and energy drinks one or more times per week. In this model, the factor most strongly associated with weekly sports and energy drink consumption was age (odds ratio [OR]=10.70 for 18- to 24-year-olds, OR=6.40 for 25- to 39-year-olds, OR=3.17 for 40- to 59-year-olds vs 60 years or older). Lower odds for consuming sports and energy drinks one or more times per week were associated with other/multiracial (OR=0.80 vs non-Hispanic white) and obesity (OR=0.87 vs underweight/normal weight). Separate modeling of the association between other beverage intake and sports and energy drink intake showed that higher intake of regular soda, sweetened coffee/tea drinks, fruit drinks, milk, 100% fruit juice, and alcohol were significantly associated with greater odds for drinking sports and energy drinks one or more times per week. These findings can help medical care providers and public health officials identify adults most in need of encouragement to reduce sports and energy drink intake and increase healthier beverage intake.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

Keywords

Sports drinks; Energy drinks; Sugar-sweetened beverages; Behaviors; Adults

Most previous research, but not all,[1–3] HAS shown that high consumption of calorically sweetened beverages, including sports and energy drinks, is associated with adverse health consequences, such as obesity,[4,5] type 2 diabetes,[6,7] increased risk for cardiovascular diseases,[8,9] and dental erosion or dental caries.[10,11] Sports and energy drinks are a rapidly growing segment of the beverage industry[12,13]; the average per capita daily volume of sports and energy drinks sold in the United States increased from 3.8 mL in 2000 to 41.1 mL in 2010.[13] Although sports and energy drinks include a variety of products,[14–16] most regular (nondiet) sports and energy drinks contain substantial amounts of added sugars and energy. For example, a 20-oz bottle of regular sports drink contains 32 g of added sugars and 159 kcal, and a 12-oz can of regular energy drink contains 37 g of added sugars and 166 kcal.[14,15] Of note, although there is no upper intake level for added sugars, the Institute of Medicine recommends that added sugars should not exceed 25% of total calories consumed.[17] In addition to their added sugar content, sports drinks usually contain electrolytes, minerals, vitamins, and other nutrients[14,15,18] and are marketed as a means of improving athletic performance by replacing electrolytes and fluid lost in sweat during and after intense physical activity.[15,18]

In contrast to sports drinks, energy drinks typically contain stimulants (eg, caffeine and guarana) and amino acids (eg, taurine), as well as added sugars and often vitamins, minerals, and other nutrients.[14,15,19] Energy drinks are marketed as a means of boosting energy, decreasing feelings of tiredness, and enhancing mental alertness.[15,19] Some cans of energy drinks contain >500 mg of caffeine (the amount in roughly 14 cans of caffeinated soda), which is enough to result in caffeine toxicity (eg, seizures and cardiac arrest) for some consumers.[12,15,20,21] Although the distribution of caffeine intake from these beverages is unknown, some of these beverages contain levels of caffeine similar to those found in a cup of coffee, and others, particularly energy drinks, contain much higher levels. The consumption of energy drinks has been associated with insomnia, nervousness, headache, tachycardia, seizures,[20,22] cardiac arrest,[21] increased platelet aggregation, and decreased endothelial function.[23] In addition, foods, beverages, and dietary supplements that contain caffeine have the potential to interact with certain drugs, including bronchodilators, antibacterials (eg, ciprofloxacin), and antipsychotics (eg, clozapine), and these interactions can change drug metabolism and cause side effects.[24]

Although previous studies have addressed the consumption of sports and/or energy drinks by US adults, these studies were conducted among either college students[25–27] or a sample otherwise not representative of all US adults.[28] For example, results of a cross-sectional study among 253 undergraduate students showed that 40% drank sports drinks and 20% drank energy drinks during the previous 30 days.[27] Because of the numerous adverse health effects associated with consumption of sports and energy drinks, such as dental caries,[11] seizures,[20,22] and cardiac arrest,[21] the increased consumption of sports and energy drinks in the United States has become a public health concern. This study estimated the prevalence

of sports and energy drink consumption and examined associations of sociodemographic characteristics, weight status, behavioral factors, and other beverage intake with sports and energy drink intake among a large nationally representative sample of US adults.

METHODS

Sample and Survey Administration

Publicly available data from the 2010 National Health Interview Survey (NHIS) were used.[29] The NHIS is a household survey conducted continuously since 1957 by the Centers for Disease Control and Prevention's (CDC) National Center for Health Statistics. The Research Ethics Review Board at CDC's National Center for Health Statistics approved conducting NHIS. It uses a multistage sampling design with face-to-face interviews in a sample of households representative of the civilian noninstitutionalized US population. Information on the health and other characteristics of each family member is obtained. Data are collected about all members of the family, then data are collected about one randomly selected child (the "sample child"), and then data are collected from one randomly selected adult (the "sample adult"). Every year, several supplements appear on the NHIS questionnaire. In 2010, a Cancer Control Supplement was administered to sample adults. In the present study, data from the Sample Adult File, Cancer Control File, and Family File were analyzed. The conditional sample adult response rate was 77.3% and the final Sample Adult response rate was 60.8%. A total of 27,157 sample adults aged 18 years or older (11,986 males and 15,171 females) completed the Sample Adult Module in 2010.

For these analyses, 1,665 adults with missing data on sports and energy drink intake were excluded, resulting in a final analytic sample of 25,492 adults. When comparing the analytic sample with adults who were excluded from the study due to missing outcome variable data, the only statistically significant difference was that the analytic sample was younger (mean age=46 years vs 48 years for those who were excluded). Two multivariable logistic regression models were created, one to examine the association between sports and energy drink consumption and sociodemographic characteristics, weight status, and behavioral factors (n=22,703), and the second model (n=24,605) to assess the association between sports and energy drink consumption and other beverages. Both models were adjusted for age, sex, race/ethnicity, and weight status. The analytic sample used in the first model had a slightly higher proportion of younger adults and males, but lower proportion of non-Hispanic whites than the NHIS respondents excluded from the model. The analytic sample used in the second model had a slightly higher proportion of younger adults and males than the NHIS respondents excluded from that model.

Outcome Variable

The main outcome measure, frequency of sports and energy drink consumption, was based on survey participants' responses to the open-ended question, "During the past month how often did you drink sports and energy drinks such as Gatorade [PepsiCo], Red Bull [Red Bull GmbH], and Vitamin Water [Glacéau]?" Using data derived from these responses, the average number of times per week that respondents' consumed sports and energy drinks was calculated (monthly data were divided by 7, and daily data were

multiplied by 7). For χ^2 tests, authors created four mutually exclusive sports and energy drink intake categories of weekly sports and energy drink consumption as zero, more than zero to less than one, one to less than three, or three or more times per week based on mean distributions. For logistic regression analyses, sports and energy drink consumption was categorized as less than one time per week or one or more times per week to identify weekly sports and energy drinks consumers.

Explanatory Variables

Mutually exclusive response categories were created for each explanatory variable. Sociodemographic variables included were age (18 to 24, 25 to 39, 40 to 59, or 60 years and older), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or other/multiracial), and marital status (married/domestic partnership or not married). Not married included widowed, divorced, separated, or never married. For weight status, body mass index (BMI) was calculated from self-reported weight and height (kg/m^2) and categorized as underweight/normal weight (BMI <25), overweight (BMI 25 to <30), or obese (BMI ≥30).[30] Annual family income was categorized as <$35,000, $35,000 to $74,999, $75,000 to $99,999, or ≥$100,000. For geographical characteristics, census region of residence was categorized as Northeast, Midwest, South, or West. For behavioral variables, participation in vigorous and/or light/moderate leisure-time physical activity for at least 10 minutes was categorized as none, more than zero to less than three, three to four, more than four to less than seven, or seven or more times per week (combined the following questions: “How often do you do vigorous leisure-time physical activities for at least 10 minutes that cause heavy sweating or large increases in breathing or heart rate?” and “How often do you do light or moderate leisure-time physical activities for at least 10 minutes that cause only light sweating or a slight to moderate increase in breathing or heart rate?”); sleep duration was categorized as <8 or ≥8 hours/day; smoking status categorized as never smokers, former smokers, or current smokers; and self-rated satisfaction of social activities and relationships were categorized as excellent, very good/good, or fair/poor.

Other beverage intake was based on the following frequency questions. Respondents were asked during the past month how often they drank the following beverages: regular soda or pop (not including diet soda), coffee/tea drinks with added sugars (not including drinks with Splenda [McNeil Nutritionals LLC] or Equal [Merisant]), fruit drinks (such as Kool-Aid [Kraft Foods], cranberry, and lemonade), milk (not counting soy milk or small amounts of milk in coffee or tea), 100% fruit juice, and alcohol. Daily or weekly consumption of these beverages was calculated. Based on frequencies, three mutually exclusive categories were created for regular soda, coffee/tea drinks with added sugars, fruit drinks, milk, and 100% fruit juice: none, more than zero to less than one, or one or more times per day. For alcohol intake, four mutually exclusive categories were created: none, more than zero to less than one, one to two, or more than two times per week. Unknown values or missing data regarding explanatory variables ranged from 0.04% to 4.8%.

Statistical Analysis

χ^2 tests were used to examine the relationship between frequency of sports and energy drink consumption and the variables described. A P value <0.05 was the cut point for statistical

significance. Multivariable logistic regression modeling was used to estimate adjusted odds ratios and 95% CIs for variables associated with drinking sports and energy drinks one or more times per week during the past month. The sample weight variable from the NHIS Sample Adult File was applied to all analyses to produce valid estimates for the civilian noninstitutionalized US population. All statistical analyses were performed using the Statistical Analysis Software (version 9.2, 2009, SAS Institute Inc) and incorporated appropriate procedures to account for the complex sample design by using SURVEYFREQ and SURVEYLOGISTIC with STRATA, CLUSTER, and WEIGHT statements.

RESULTS AND DISCUSSION

Nationally, 31.3% of respondents reported consuming sports and energy drinks during the past 7 days, including 21.5% who reported doing so one ore more times per week and 11.5% who reported doing so three or more times per week (Table 1). In addition, 5.7% of respondents reported consuming sports and energy drinks one or more times per day during the previous month (data not shown). Results also indicated that 21% of adults consumed regular soda one or more times per day, that 43.5% consumed coffee or tea drinks with added sugars one or more times per day, and that 6.6% consumed fruit drinks one or more times per day (Table 2). Sports and energy drink intake differed by all sociodemographic and behavioral characteristics examined and intake of all other beverages examined differed by sports and energy drink intake.

Multivariable logistic regression results from the first model showed that younger adults, males, non-Hispanic blacks and Hispanics (vs white, non-Hispanics), not-married individuals, adults with higher family income, those who lived in the South or West region of the country (vs Northeast), adults who participated in vigorous and/or light/moderate leisure-time physical activity for at least 10 minutes during the past 7 days (vs none), current smokers (vs never smokers), and individuals whose satisfaction with their social activities/relationships was excellent had significantly higher odds for drinking sports and energy drinks one or more times per week (Table 1). In contrast, non-Hispanic other/multiracial individuals and obese adults had significantly lower odds for drinking sports and energy drinks one or more times per week (Table 1). Multivariable logistic regression results from the second model showed that higher consumption of other beverages (eg, regular soda, coffee/tea drinks with added sugars, fruit drinks, milk, 100% fruit juice, and alcohol) was significantly associated with greater odds of drinking sports and energy drinks one or more times per week (Table 2).

The present study showed that the frequency of sports and energy drink consumption was much higher among young adults (eg, 24% of those aged 18 to 24 years consumed sports and energy drinks three or more times per week). Consuming a bottle (20 oz) of regular sports drink three times per week adds an extra 477 kcal/week or 68 kcal/day to a person's total energy intake.[14] For a person whose diet and energy expenditure remains constant otherwise, this increase in energy has been estimated to result in a weight gain of about 3.1 kg, with 50% of the total weight gain (1.5 kg) achieved in roughly 1 year and 95% (2.9 kg) achieved in roughly 3 years.[31]

It is difficult to directly compare findings from the present study with those from other studies because of differences in when the studies were conducted, characteristics of the study populations, and/or the measurement tools used. Results of a study based on 1999–2004 National Health and Nutrition Examination Survey data showed that US adults derived only about <5 kcal/day from consumption of sports drinks, and data on energy drinks were not presented in that study.[32] In the present study, among young adults aged 18 to 24 years, 58.3% consumed any sports and energy drinks (more than zero times per week) in the past month, with almost half (43.7%) consuming sports and energy drinks on a weekly basis (one or more times per week). In 2006, Malinauskas and colleagues found that 51% of college students attending a state university in the Central Atlantic region of the United States reported drinking more than one energy drink per month in a typical month,[26] and in 2008, Berger and colleagues estimated that 26.3% of adults (18 years of age or older) in Milwaukee, WI, had consumed energy drinks in the previous year.[28]

The finding that men were more likely than women to consume sports and energy drinks in the present study was consistent with findings from two previous studies.[27,28] In one of those studies, younger adults, other race/ethnic groups (including Hispanic), not-married individuals, and those with higher family income had significantly higher odds of using energy drinks in the past year compared with their counterparts (older adults, whites, married adults, and lower income individuals, respectively).[28] These findings might be, in part, a result of targeted marketing and/or high prices. Sports drinks have been traditionally marketed primarily to active young men (eg, college and professional sports team players), although in recent years the target market has broadened to include women and recreational athletes.[16] Energy drinks are heavily marketed to younger adults aged 18 to 44 years, to men, and to college students and teens of both sexes.[16] Although consumption of other calorically sweetened beverages has been found to be higher among lower-income adults than among higher-income adults,[33] consumption of sports and energy drinks is greater among higher-income adults compared with lower-income adults. This might be partially attributable to sports and energy drinks being more expensive than other calorically sweetened beverages (eg, soda and fruit drinks).[34]

In the present study, adults whose satisfaction with their social activities and relationships was excellent and current smokers were significantly more likely to drink sports and energy drinks weekly. These findings suggest that sports and energy drinks are commonly consumed at social gatherings, sports events, or at facilities where smoking is allowed. An association between energy drink consumption and social involvement is supported by study results showing that 75% of college students who reported having consumed energy drinks first did so away from home and that 71% first did so with companions.[25] The finding of a positive association between smoking and sports and energy drink intake might be primarily attributable to a relatively high rate of energy drink consumption among smokers, which would be consistent with results of a cross-sectional study showing that energy drink intake was positively associated with cigarette use among US college students.[35] Conversely, sports drink intake has been shown to be associated with healthful behaviors, such as consumption of fruits and vegetable and physical activity, indicating that consumers might perceive sports drinks as healthful beverages.[36]

The finding that consumption of sports and energy drinks at least once a week was positively associated with higher consumption of regular soda, coffee or tea drinks with added sugars, fruit drinks, milk, 100% fruit juice, and alcohol in the present study indicates that sports and energy drink consumers might have a tendency to drink other sweet or caffeinated beverages. The finding that sports and energy drink consumption was associated with consumption of milk and 100% fruit juice in the present study suggests that some adults might perceive sports and energy drinks, particularly sports drinks, as being healthful beverages, a perception encouraged by beverage companies that promote the vitamin and mineral content and energy-boosting properties of sports and energy drinks.[15,18,19] The findings of a positive association between alcohol intake and sports and energy drink intake in the present study might be largely attributable to the popularity of mixing energy drinks with alcohol among young adults.[26,28,37] These results were also consistent with those of a cross-sectional study showing that energy drink intake was positively associated with alcohol use among US college students.[35]

To our knowledge, this is the first study to examine characteristics associated with sports and energy drink intake among a large, nationally representative sample of US adults. However, this study is subject to limitations. First, because the study was cross-sectional, the directionality of the associations between sports and energy drink consumption and other variables could not be determined. Second, because NHIS data for sample adults are based on self-reports, the results were subject to potential reporting bias. However, other studies have shown that estimates of beverage intake derived from responses to a food frequency questionnaire were similar to estimates derived from responses to 24-hour dietary recalls or to food records.[38] Third, it was not possible to assess respondents' plain water intake because the NHIS did not collect this information. Fourth, the sports and energy drink question did not specify whether it was regular or diet, so it is unclear whether respondents counted diet sports and energy drinks when they answered this question. Finally, authors were unable to separate characteristics associated with frequency of sports drink consumption from characteristics associated with frequency of energy drink consumption because the consumption of both was assessed using a single question. In addition, although some examples of sports and energy drinks were provided in the question, it is not possible to verify what beverages respondents included as sports and energy drinks in response to the question asked.

CONCLUSIONS

Almost one in four US adults consumes sports and energy drinks at least one time per week, and about one in nine did so at least three times per week during the past month. In addition, the present study showed that weekly sports and energy drink consumption was particularly higher among younger adults, males, non-Hispanic Blacks and Hispanics, not-married individuals, adults with higher family income, those who lived in the South or West, adults who engaged in leisure-time physical activity, current smokers, individuals whose satisfaction with their social activities and relationships was excellent, and those with higher intake of regular soda, coffee/tea drinks, fruit drinks, milk, 100% fruit juice, and alcohol. Considering possible adverse health consequences of high sports and energy drink intake, including its potential to contribute to excess energy consumption, the findings of various

factors associated with sports and energy drink intake in the present study can be used to inform medical care providers and public health professionals to focus their efforts to reduce sports and energy drink consumption and encourage the consumption of healthier beverages to members of these groups.

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References

1. Gibson S. Salt intake is related to soft drink consumption in children and adolescents: A link to obesity? Hypertension. 2008; 51(6):e54. [PubMed: 18499562]
2. Libuda L, Kersting M. Soft drinks and body weight development in childhood: Is there a relationship? Curr Opin Clin Nutr Metab Care. 2009; 12(6):596–600. [PubMed: 19710610]
3. Burt BA, Pai S. Sugar consumption and caries risk: A systematic review. J Dent Educ. 2001; 65(10): 1017–1023. [PubMed: 11699972]
4. Ebbeling CB, Feldman HA, Osganian SK, Chomitz VR, Ellenbogen SJ, Ludwig DS. Effects of decreasing sugar-sweetened beverage consumption on body weight in adolescents: A randomized, controlled pilot study. Pediatrics. 2006; 117(3):673–680. [PubMed: 16510646]
5. Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: A systematic review. Am J Clin Nutr. 2006; 84(2):274–288. [PubMed: 16895873]
6. Malik VS, Popkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: A meta-analysis. Diabetes Care. 2010; 33(11): 2477–2483. [PubMed: 20693348]
7. de Koning L, Malik VS, Rimm EB, Willett WC, Hu FB. Sugar-sweetened and artificially sweetened beverage consumption and risk of type 2 diabetes in men. Am J Clin Nutr. 2011; 93(6):1321–1327. [PubMed: 21430119]
8. Duffey KJ, Gordon-Larsen P, Steffen LM, Jacobs DR Jr, Popkin BM. Drinking caloric beverages increases the risk of adverse cardiometabolic outcomes in the Coronary Artery Risk Development in Young Adults (CARDIA) Study. Am J Clin Nutr. 2010; 92(4):954–959. [PubMed: 20702604]
9. Stanhope KL, Bremer AA, Medici V, et al. Consumption of fructose and high fructose corn syrup increase postprandial triglycerides, LDL-cholesterol, and apolipoprotein-B in young men and women. J Clin Endocrinol Metab. 2011; 96(10):E1596–E1605. [PubMed: 21849529]
10. Venables MC, Shaw L, Jeukendrup AE, et al. Erosive effect of a new sports drink on dental enamel during exercise. Med Sci Sports Exerc. 2005; 37(1):39–44. [PubMed: 15632665]
11. Burt BA, Kolker JL, Sandretto AM, Yuan Y, Sohn W, Ismail AI. Dietary patterns related to caries in a low-income adult population. Caries Res. 2006; 40(6):473–480. [PubMed: 17063017]
12. Reissig CJ, Strain EC, Griffiths RR. Caffeinated energy drinks—A growing problem. Drug Alcohol Depend. 2009; 99(1–3):1–10. [PubMed: 18809264]
13. Kleiman S, Ng SW, Popkin B. Drinking to our health: Can beverage companies cut calories while maintaining profits? Obes Rev. 2012; 13(3):258–274. [PubMed: 22070346]
14. US Department of Agriculture. Agricultural Research Service. USDA National Nutrient Database for Standard Reference, Release 24. Nutrient Data Laboratory; 2011. http://ndb.nal.usda.gov/ [Accessed November 9, 2012]
15. American Academy of Pediatrics, Committee on Nutrition and the Council on Sports Medicine and Fitness. Clinical Report—Sports drinks and energy drinks for children and adolescents: Are they appropriate? Pediatrics. 2011; 127:1182–1189. [PubMed: 21624882]

16. National Policy and Legal Analysis Network to Prevent Childhood Obesity. [Accessed November 9, 2012] Breaking down the chain: A guide to the soft drink industry. 2011. http://changelabsolutions.org/news/breaking-down-chain-guide-soft-drink-industry
17. Institute of Medicine. Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients). Washington, DC: National Academies Press; 2005.
18. Coombes JS, Hamilton KL. The effectiveness of commercially available sports drinks. Sports Med. 2000; 29(3):181–209. [PubMed: 10739268]
19. Higgins JP, Tuttle TD, Higgins CL. Energy beverages: Content and safety. Mayo Clin Proc. 2010; 85(11):1033–1041. [PubMed: 21037046]
20. Iyadurai SJ, Chung SS. New-onset seizures in adults: Possible association with consumption of popular energy drinks. Epilepsy Behav. 2007; 10(3):504–508. [PubMed: 17349826]
21. Berger AJ, Alford K. Cardiac arrest in a young man following excess consumption of caffeinated "energy drinks". Med J Aust. 2009; 190(1):41–43. [PubMed: 19120009]
22. Clauson KA, Shields KM, McQueen CE, Persad N. Safety issues associated with commercially available energy drinks. J Am Pharm Assoc. 2008; 48(3):e55–e63.
23. Worthley MI, Prabhu A, De Sciscio P, Schultz C, Sanders P, Willoughby SR. Detrimental effects of energy drink consumption on platelet and endothelial function. Am J Med. 2010; 123(2):184–187. [PubMed: 20103032]
24. Carrillo JA, Benitez J. Clinically significant pharmacokinetic interactions between dietary caffeine and medications. Clin Pharmacokinet. 2000; 39(2):127–153. [PubMed: 10976659]
25. Attila S, Cakir B. Energy-drink consumption in college students and associated factors. Nutrition. 2011; 27(3):316–322. [PubMed: 20579846]
26. Malinauskas BM, Aeby VG, Overton RF, Carpenter-Aeby T, Barber-Heidal K. A survey of energy drink consumption patterns among college students. Nutr J. 2007; 6:35. [PubMed: 17974021]
27. Smith West D, Bursac Z, Quimby D, et al. Self-reported sugar-sweetened beverage intake among college students. Obesity. 2006; 14(10):1825–1831. [PubMed: 17062813]
28. Berger LK, Fendrich M, Chen HY, Arria AM, Cisler RA. Sociodemographic correlates of energy drink consumption with and without alcohol: Results of a community survey. Addict Behav. 2011; 36(5):516–519. [PubMed: 21276661]
29. Centers for Disease Control and Prevention. NHIS Survey Description. Hyattsville, MD: National Center for Health Statistics; 2011. 2010 National Health Interview Survey (NHIS) Public Use Data Release. ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2010/srvydesc.pdf [Accessed November 9, 2012]
30. National Heart, Lung, and Blood Institute. NIH Publication No. 98-4083. National Institutes of Health; 1998. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults. The evidence report. http://www.nhlbi.nih.gov/guidelines/obesity/ob_gdlns.pdf [Accessed November 9, 2012]
31. Hall KD, Sacks G, Chandramohan D, et al. Quantification of the effect of energy imbalance on bodyweight. Lancet. 2011; 378(9793):826–837. [PubMed: 21872751]
32. Bleich SN, Wang YC, Wang Y, Gortmaker SL. Increasing consumption of sugar-sweetened beverages among US adults: 1988–1994 to 1999–2004. Am J Clin Nutr. 2009; 89(1):372–381. [PubMed: 19056548]
33. Ogden, CL.; Kit, BK.; Carroll, MD.; Park, S. NCHS Data Brief. Hyattsville, MD: National Center for Health Statistics; 2011. Consumption of Sugar Drinks in the United States, 2005–2008; p. 1-8.
34. Grocery and Gourmet Food. [Accessed November 9, 2012] Beverages from Amazon.com. www.amazon.com
35. Miller KE. Energy drinks, race, and problem behaviors among college students. J Adolesc Health. 2008; 43(5):490–497. [PubMed: 18848678]
36. Ranjit N, Evans M, Byrd-Williams C, Evans A, Hoelscher D. Dietary and activity correlates of sugar-sweetened beverage consumption among adolescents. Pediatrics. 2010; 126(4):e754–e761. [PubMed: 20876172]

37. Price SR, Hilchey CA, Darredeau C, Fulton HG, Barrett SP. Energy drink co-administration is associated with increased reported alcohol ingestion. Drug Alcohol Rev. 2010; 29(3):331–333. [PubMed: 20565526]

38. Hedrick VE, Comber DL, Estabrooks PA, Savla J, Davy BM. The beverage intake questionnaire: Determining initial validity and reliability. J Am Diet Assoc. 2010; 110(8):1227–1232. [PubMed: 20656099]

Table 1

Characteristics of participants and their association with sports and energy drink intake during the past month among US adults: National Health Interview Survey, 2010[a]

		Bivariate Analyses[b]				Multivariable Logistic Regression Analysis[c]	
		Sports and Energy Drink Intake				Sports and Energy Drink Intake ≥1 Times/wk	
Characteristic	**All**	**0 Times/ wk**	**>0 to <1 Times/wk**	**1 to <3 Times/wk**	**≥3 Times/wk**	**Odds ratio**	**95% CI**
		←———*weighted %±SE*[d]——→					
Total sample (N=25,492)	100	68.7±0.4	9.7±0.2	10.0±0.2	11.5±0.3	—	—
Age, y (n=25,492)							
18–24	13.1±0.3	41.7±1.3	14.6±0.9	20.2±0.9	23.5±1.1	10.70[e]	8.93–12.82
25–39	26.4±0.4	55.5±0.7	13.9±0.5	14.6±0.5	16.0±0.5	6.40[e]	5.52–7.41
40–59	36.2±0.4	73.6±0.6	8.9±0.4	8.1±0.4	9.4±0.4	3.17[e]	2.76–3.64
≥60	24.3±0.4	90.3±0.4	3.8±0.3	2.6±0.2	3.3±0.3	Reference	
Sex (n=25,492)							
Male	48.2±0.4	58.5±0.6	11.2±0.4	13.2±0.4	17.0±0.5	2.80[e]	2.56–3.07
Female	51.8±0.4	78.2±0.4	8.3±0.3	7.1±0.2	6.4±0.3	Reference	
Race/ethnicity (n=25,492)							
White, non-Hispanic	68.2±0.5	70.0±0.5	9.8±0.3	9.5±0.3	10.7±0.3	Reference	
Black, non-Hispanic	11.5±0.3	65.9±1.0	9.5±0.6	10.5±0.7	14.1±0.7	1.18[e]	1.04–1.34
Hispanic	14.0±0.3	62.8±0.9	10.0±0.6	12.9±0.6	14.2±0.6	1.28[e]	1.14–1.42
Other/multiracial	6.3±0.2	73.4±1.3	8.6±0.8	9.1±0.8	8.9±0.8	0.80[e]	0.67–0.95
Weight status (n=24,866)							
Underweight/normal weight (BMI[f] <25)	37.2±0.4	66.8±0.7	10.1±0.4	11.1±0.4	12.0±0.4	Reference	
Overweight (BMI 25 to <30)	34.7±0.4	67.8±0.6	9.3±0.4	10.6±0.4	12.2±0.4	1.02	0.92–1.12
Obese (BMI ≥30)	28.1±0.4	71.2±0.7	10.0±0.5	8.3±0.4	10.4±0.5	0.87[e]	0.78–0.97
Marital status (n=25,452)							
Married/domestic partnership	61.3±0.4	71.8±0.5	9.5±0.3	9.0±0.3	9.8±0.3	Reference	
Not married[g]	38.7±0.4	63.9±0.6	10.1±0.4	11.7±0.4	14.3±0.4	1.23[e]	1.13–1.34
Annual family income (n=24,263)							

		Bivariate Analyses[b]				Multivariable Logistic Regression Analysis[c]	
		Sports and Energy Drink Intake				Sports and Energy Drink Intake ≥1 Times/wk	
Characteristic	**All**	**0 Times/ wk**	**>0 to <1 Times/wk**	**1 to <3 Times/wk**	**≥3 Times/wk**	**Odds ratio**	**95% CI**
<$35,000	34.1±0.5	70.2±0.6	8.4±0.4	9.9±0.4	11.5±0.4	Reference	
$35,000–$74,999	32.7±0.4	67.9±0.6	10.2±0.5	9.7±0.4	12.3±0.5	1.08	0.97–1.20
$75,000–$99,999	12.2±0.3	66.5±1.2	11.3±0.8	9.9±0.7	12.3±0.9	1.11	0.97–1.27
≥$100,000	21.0±0.5	68.0±0.9	10.7±0.6	10.8±0.6	10.5±0.6	1.16[e]	1.01–1.32
Region of residence (n=25,492)							
Northeast	17.6±0.5	73.1±0.9	8.2±0.6	8.4±0.6	10.3±0.6	Reference	
Midwest	23.2±0.5	69.2±0.8	10.8±0.5	9.6±0.4	10.4±0.5	1.11	0.94–1.31
South	35.5±0.6	67.2±0.7	9.4±0.4	10.1±0.4	13.2±0.5	1.34[e]	1.15–1.56
West	23.7±0.6	67.3±0.7	10.3±0.4	11.6±0.5	10.9±0.5	1.19[e]	1.01–1.41
Vigorous and/or light/moderate leisure-time physical activity for at least 10 minutes (n=25,152)							
None	32.5±0.5	77.4±0.5	7.2±0.4	6.8±0.3	8.6±0.4	Reference	
>0 to <3 times/wk	14.7±0.3	65.8±0.9	11.4±0.7	11.6±0.6	11.2±0.6	1.32[e]	1.15–1.52
3 to 4 times/wk	14.4±0.3	66.2±1.0	10.9±0.6	12.5±0.7	10.4±0.6	1.41[e]	1.23–1.62
>4 to <7 times/wk	10.4±0.2	63.9±1.2	11.8±0.8	12.3±0.9	11.9±0.9	1.39[e]	1.19–1.62
≥7 times/week	28.1±0.4	63.4±0.8	10.5±0.4	10.9±0.5	15.3±0.6	1.59[e]	1.41–1.78
Sleep duration (n=25,404)							
<8 hours/day	58.9±0.4	67.8±0.5	10.2±0.3	10.2±0.3	11.8±0.3	1.06	0.97–1.15
≥8 hours/day	41.1±0.4	70.0±0.6	9.0±0.4	9.9±0.4	11.1±0.4	Reference	
Smoking status (n=25,462)							
Never smoked	58.9±0.4	68.5±0.5	10.1±0.3	10.4±0.3	11.0±0.3	Reference	
Former smoker	21.8±0.3	76.1±0.7	8.3±0.5	7.0±0.4	8.6±0.5	1.01	0.91–1.13
Current smoker	19.3±0.3	61.1±0.9	10.1±0.6	12.5±0.6	16.3±0.6	1.51[e]	1.36–1.67
Self-perceived quality of social activities and relationships (n=24,716)							
Excellent	27.9±0.4	65.7±0.7	10.1±0.5	11.2±0.4	13.0±0.6	1.22[e]	1.03–1.43
Very good/good	62.7±0.4	69.3±0.5	9.8±0.3	9.9±0.3	11.1±0.3	1.12	0.96–1.29
Fair/poor	9.4±0.2	72.7±1.1	8.7±0.7	8.4±0.6	10.1±0.7	Reference	

[a] Unweighted sample sizes are presented. Because of rounding, weighted percentages may not add up to 100%.

[b] Based on results of χ^2 tests, P values were <0.05 for all variables examined.

[c] Reference category included adults who drank sports and energy drinks less than one time per week during the past month. The model included all characteristics in one model and included a sample of 22,703 adults without missing data.

[d] SE=standard error.

[e] Significant findings based on the 95% CI (ie, the CI does not include 1).

[f] BMI=body mass index.

[g] Widowed, divorced, separated, or never married.

Table 2

Beverage intake of participants and their association with sports and energy drink intake during the past month among US adults: National Health Interview Survey, 2010[a]

		Bivariate Analyses[b]				Multivariable Logistic Regression Analysis[c]	
		Sports and Energy Drink Intake				Sports and Energy Drink Intake ≥1 Time/wk	
Beverage intake	**All**	**0 Times/ wk**	**>0 to <1 Times/wk**	**1 to <3 Times/wk**	**≥3 Times/ wk**	**OR**	**95% CI**
		←———*weighted %±SE*[d]———→					
Regular soda (n=25,468)							
None	41.3±0.4	79.5±0.5	6.6±0.3	6.2±0.3	7.6±0.3	Reference	
>0 to <1 time/day	37.6±0.4	63.0±0.6	12.4±0.4	12.3±0.4	12.3±0.4	1.26[e]	1.14–1.39
≥1 time/day	21.0±0.3	57.9±0.8	11.0±0.6	13.6±0.6	17.5±0.7	1.55[e]	1.40–1.71
Coffee/tea drinks with added sugars (n=25,482)							
None	35.6±0.4	70.3±0.6	9.2±0.4	8.9±0.4	11.6±0.4	Reference	
>0 to <1 time/day	21.0±0.3	58.5±0.8	13.4±0.6	14.2±0.6	14.1±0.6	1.14[e]	1.02–1.28
≥1 time/day	43.5±0.5	72.3±0.6	8.5±0.3	9.0±0.4	10.1±0.4	1.04	0.94–1.16
Fruit drinks (n=25,460)							
None	66.6±0.4	74.8±0.4	7.5±0.3	8.1±0.3	9.6±0.3	Reference	
>0 to <1 time/day	26.8±0.4	56.5±0.8	15.4±0.6	14.4±0.5	13.8±0.5	1.19[e]	1.09–1.30
≥1 time/day	6.6±0.2	57.3±1.5	9.6±0.9	11.7±1.0	21.4±1.3	1.50[e]	1.27–1.78
Milk (n=25,457)							
None	17.5±0.3	75.2±0.7	7.9±0.5	7.6±0.5	9.4±0.5	Reference	
>0 to <1 time/day	41.7±0.4	65.4±0.6	11.4±0.4	11.4±0.4	11.8±0.4	1.21[e]	1.09–1.35
≥1 time/day	40.8±0.4	69.3±0.6	8.8±0.4	9.7±0.4	12.1±0.4	1.20[e]	1.07–1.34
100% Fruit juice (n=25,444)							
None	26.0±0.4	77.9±0.6	6.7±0.4	6.8±0.4	8.6±0.4	Reference	
>0 to <1 time/day	50.7±0.4	63.6±0.6	11.9±0.4	12.1±0.3	12.4±0.4	1.26[e]	1.12–1.41
≥1 time/day	23.3±0.3	69.6±0.8	8.4±0.4	9.3±0.5	12.6±0.5	1.21[e]	1.07–1.36
Alcohol (n=25,323)							
None	34.9±0.4	77.0±0.6	7.3±0.4	6.8±0.3	8.9±0.4	Reference	

		Bivariate Analyses[b]				Multivariable Logistic Regression Analysis[c]	
		Sports and Energy Drink Intake				Sports and Energy Drink Intake ≥1 Time/wk	
Beverage intake	**All**	**0 Times/ wk**	**>0 to <1 Times/wk**	**1 to <3 Times/wk**	**≥3 Times/ wk**	**OR**	**95% CI**
>0 to <1 day/wk	31.8±0.4	66.8±0.7	11.5±0.5	10.6±0.4	11.1±0.4	1.26[e]	1.13–1.41
1 to 2 days/wk	21.1±0.3	59.5±0.9	11.3±0.5	14.0±0.6	15.2±0.7	1.70[e]	1.51–1.91
>2 days/wk	12.2±0.3	65.7±1.1	9.4±0.6	11.2±0.7	13.6±0.8	1.79[e]	1.56–2.07

[a] Unweighted sample sizes are presented. Because of rounding, weighted percentages may not add up to 100%.

[b] Based on results of χ^2 tests, P values were <0.05 for all variables examined.

[c] Reference category included adults who drank sports and energy drinks <1 time/week during the past month. The model included all six beverage variables as well as age, sex, race/ethnicity, and weight status in one model and included a sample of 24,605 adults without missing data.

[d] SE=standard error.

[e] Significant findings based on the 95% CI (ie, the CI does not include 1).