

# Adolescent Consumption of Sports Drinks

Kyla Cordrey, BA,<sup>a</sup> Sarah A. Keim, PhD, MA, MS,<sup>b,c,d</sup> Ruth Milanaik, DO,<sup>a,e</sup> Andrew Adesman, MD<sup>a,e</sup>

abstract

**BACKGROUND:** Sports drinks are aggressively marketed to teenagers to replenish fluids and/or electrolytes. According to the American Academy of Pediatrics, typical adolescent physical activity does not require sports drink rehydration. Given US obesity rates and that sugar-sweetened sports drinks add superfluous calories to the diet, it is important to assess adolescent sports drink consumption and changes over time.

**METHODS:** Researchers in the 2015 Youth Risk Behavior Survey and 2010 National Youth Physical Activity and Nutrition Survey collected nationally representative samples of US high school students about sports drink consumption. Respondent characteristics and health behaviors were examined relative to sports drink consumption by using multivariable survey logistic regression.  $\chi^2$  tests were used to compare the 2 samples and examine changes over time.

**RESULTS:** The 2015 Youth Risk Behavior Survey and 2010 National Youth Physical Activity and Nutrition Survey had national samples of 15 624 and 11 458 respondents, respectively. Sports drink consumption in the previous week increased from 56% (2010) to 57.6% (2015;  $P = .0002$ ). However, comparisons of daily sports drink consumption revealed reductions for all age groups, sexes, race and/or ethnicity categories, and levels of physical activity. The greatest reductions were for non-Hispanic African Americans and for children with overweight. Daily sports drink consumption did not decrease for children with obesity and increased for children who watched >2 hours per day of television. In 2015, boys, non-Hispanic African Americans, Hispanics, and tobacco users exhibited higher odds of consuming sports drinks daily.

**CONCLUSIONS:** Although daily consumption of sports drinks has decreased overall, sugar-sweetened sports drinks remain popular, with the majority of high school students drinking them at least weekly. Of concern, daily consumption increased among teenagers watching television >2 hours per day. Pediatricians should counsel adolescents about the American Academy of Pediatrics' recommendations regarding sports drinks.

FREE

<sup>a</sup>Division of Developmental and Behavioral Pediatrics, Steven and Alexandra Cohen Children's Medical Center of New York, Lake Success, New York; <sup>b</sup>Center for Biobehavioral Health, The Research Institute, Nationwide Children's Hospital, Columbus, Ohio; <sup>c</sup>Division of Epidemiology, College of Public Health, and <sup>d</sup>Department of Pediatrics, College of Medicine, The Ohio State University, Columbus, Ohio; and <sup>e</sup>Department of Pediatrics, Donald and Barbara Zucker School of Medicine, Hofstra University, Hempstead, New York

Ms Cordrey drafted the initial manuscript; Dr Keim analyzed the data; Dr Milanaik conceptualized the idea for this secondary analysis; Dr Adesman conceptualized the idea for this secondary analysis and guided the analysis; and all authors revised the manuscript and approved the final manuscript as submitted.

**DOI:** <https://doi.org/10.1542/peds.2017-2784>

Accepted for publication Mar 21, 2018

**WHAT'S KNOWN ON THIS SUBJECT:** Sports drinks are aggressively marketed to teenagers to replenish fluids and/or electrolytes. However, the American Academy of Pediatrics states that typical adolescent physical activity doesn't require rehydration with sports drinks. Given US obesity rates, there are concerns that sugar-sweetened sports drinks add superfluous calories to the diet.

**WHAT THIS STUDY ADDS:** Comparison of nationally representative samples of US high school students (2010 and 2015) revealed increased weekly sports drink consumption, with the majority of students drinking at least weekly. Daily consumption increased among those watching >2 hours per day of television.

**To cite:** Cordrey K, Keim SA, Milanaik R, et al. Adolescent Consumption of Sports Drinks. *Pediatrics*. 2018;141(6):e20172784

Sports drinks are electrolyte- and carbohydrate-containing soft drinks, often flavored and sugar sweetened, advertised to restore energy and fluids expended in strenuous exercise. For elite athletes involved in prolonged, physically demanding activities, sports drinks may be a quick source of carbohydrates, water, and electrolyte replacement. However, prepubescent youth do not lose electrolytes at the same rate as adult athletes.<sup>1</sup> To this end, the American Academy of Pediatrics (AAP) has concluded that the average child does not partake in a level of physical activity that requires the electrolyte replenishment offered by sports drinks.<sup>2</sup>

Sports drinks add unnecessary calories to children's diets. Like many sugar-sweetened beverages (SSBs), the excessive consumption of sports drinks is associated with weight gain, dental erosion, obesity, poor nutrition, and diabetes.<sup>3-5</sup> A student drinking a daily 20 oz serving of a sports drink for 1 year can gain up to 13 additional pounds.<sup>6</sup> Furthermore, in 2004, Gross et al<sup>7</sup> found a significant association between the consumption of corn syrup found in sports drinks and increased risk of type 2 diabetes.

Calorie intake from SSBs, such as soda, has decreased in the 21st century and is partly attributable to bans on soda in schools nationwide.<sup>8</sup> Despite efforts to eradicate unhealthy beverage options, many schools have left sports drinks widely available. In a 2015 study of a nationally representative population of students, researchers found an increased consumption of sports drinks in students who lived in states that banned soda in school but still allowed the sale of SSBs in vending machines.<sup>9</sup> The continued availability of sports drinks in schools despite their high sugar content is worrisome because their popularity has dramatically increased. Among children ages 6 to 11 years in the

United States, the average energy intake from sports drinks increased from 1 to 9 kcal per day from 1989 to 2008, and the percent who consumed sports drinks daily in this age group increased sixfold, from 2% to 12%.<sup>10</sup> These findings, although striking when published, are likely out of date given the advertising and marketing by sports drinks manufacturers that have been targeted at children and adolescents.<sup>11</sup> Moreover, with our focus on grade-school children, we fail to examine consumption patterns in adolescents, who likely have greater access to sports drinks given their autonomy for purchasing beverages.

Our primary objective in the current study was to analyze and compare 2 large, nationally representative data sets of high school students in the United States to identify recent changes in sports drink consumption over a 5-year time interval. A secondary objective was to generate updated information regarding sociodemographic and lifestyle factors associated with sports drink consumption by teenagers.

## METHODS

### Samples and Surveys

Data from the 2010 National Youth Physical Activity and Nutrition Survey (NYPANS) and the 2015 Youth Risk and Behavior Survey (YRBS) were analyzed. The NYPANS was conducted by the Centers for Disease Control and Prevention (CDC) with a primary objective of assessing the nutrition-related behaviors and physical activity of high school students in the United States. An explicit secondary objective in the NYPANS was to provide "data to help improve the clarity and strengthen the validity of questions on the Youth Risk Behavior Survey (YRBS)," a biannual national survey of high school students in the United States in which researchers examine a broader array of

adolescent health risk and protective behaviors.<sup>12</sup> To that end, in 2015, the CDC added questions related to the consumption of sports drinks and other beverages verbatim from the 2010 NYPANS to the 2015 YRBS.

Both the NYPANS and YRBS are self-administered, paper-and-pencil surveys of students in grades 9 to 12. Both surveys involved a 3-cluster sampling design and include students in public, Catholic, and private high schools in all 50 states and the District of Columbia. The data were weighted to represent all US high school students on the basis of sex, race and/or ethnicity, and grade and account for nonresponse and oversampling of African American and Hispanic students.

The variables analyzed in this present study were taken directly from questions in the 2010 NYPANS and the 2015 YRBS; the surveys had identical wording for these items. Sports drink consumption was assessed with the question, "During the past 7 days, how many times did you drink a can, bottle, or glass of a sports drink such as Gatorade or PowerAde? (Do not count low-calorie sports drinks such as Propel or G2.)" Students who did not answer this question regarding sports drink consumption were excluded from the analysis. Physical activity was assessed with the question, "During the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day? (Add up all the time you spent in any kind of physical activity that increased your heart rate and made you breathe hard some of the time.)" Sports team participation was assessed with the question, "During the past 12 months, on how many sports teams did you play? (Count any teams run by your school or community groups.)" Television (TV) viewing was assessed with the question, "On an average school day, how many hours do you watch TV?"

For the purpose of analysis, high school students were categorized into 2 groups on the basis of daily consumption of sports drinks: 1 or more sports drinks per day versus fewer.

Both surveys were used to collect data on participant age, sex, and race and ethnicity (white non-Hispanic, African American non-Hispanic, Hispanic, and other or multiracial non-Hispanic). Self-reported weight and height were used to calculate BMI and place children into categories of underweight or normal weight (<85th percentile), overweight (≥85th and <95th percentile), and obese (≥95th percentile). Respondents' self-reported physical activity was categorized as either being physically active for ≥60 minutes per day for at least 5 of the previous 7 days or for <5 days. TV watching was categorized as watching >2 hours per day on an average school day versus fewer. Sports team participation was categorized as “no teams” or “1 or more teams.” Current tobacco users in the YRBS were defined as high school students who reported using cigarettes, smokeless tobacco, cigars, or electronic vapor products on at least 1 of the 30 days preceding the survey (the NYPANS did not include general questions about tobacco use).

### Statistical Analysis

SAS (version 9.3; SAS Institute, Inc, Cary, NC) survey procedures and descriptive statistics were used to characterize the study sample. Respondent characteristics and selected health and lifestyle behaviors were examined in relation to sports drink consumption by using multivariable survey logistic regression models that included age, sex, weight status, physical activity, TV watching, and tobacco use as covariates.  $\chi^2$  tests were used to compare weighted proportions between the NYPANS and YRBS

**TABLE 1** Demographics From 2010 NYPANS and 2015 YRBS

	NYPANS (n = 11 113; 2010)		YRBS (n = 11 305; 2015)	
	N	% (Weighted) <sup>a</sup>	N	% (Weighted) <sup>a</sup>
Age, y				
≤15	3661	35.5	3756	36.0
16	2848	26.4	2909	24.7
≥17	4529	38.1	4583	39.3
Sex				
Male	5534	50.4	5577	51.1
Female	5525	49.6	5637	48.9
Race and ethnicity				
African American	2540	14.5	983	11.0
Non-Hispanic white	4291	58.3	5084	57.8
Hispanic	3261	18.7	3900	21.7
Multiracial or other (non-Hispanic)	803	8.5	1120	9.5

Missing data for the NYPANS include sex (54), race and ethnicity (218), and age (75) and for the YRBS include sex (91), race and ethnicity (218), and age (57).

<sup>a</sup> Because the NYPANS and YRBS use a complex sampling approach, sampling weights were applied to derive accurate nationally representative estimates.

samples to examine changes over time.

### RESULTS

Of the 11 458 NYPANS respondents, 345 were missing sports drink data, leaving 11 113 for analysis. Of the 15 624 YRBS respondents, 4319 were missing sports drink data, leaving 11 305 for analysis. Table 1 shows the demographic composition of the final study samples for the 2010 NYPANS and the 2015 YRBS. Missing data for the question about sports drinks in the YRBS were associated with age (specifically, younger children were more likely to be missing data), race (African Americans were more likely to be missing data), and physical activity (less active children were more likely to be missing data) (Rao-Scott  $\chi^2$  *P* all: <.0001); but not sex, BMI category, or TV habits. Most of the missingness was by design because children in 5 of the 54 primary sampling units in the sample were not asked the sports drinks questions, and this accounted for 61% of the missing data.

#### Sports Drink Consumption Comparisons: 2010 NYPANS Versus 2015 YRBS

Overall, the percentage of high school students in the United States who

consumed any sports drinks in the previous week increased from 56.0% in 2010, according to the NYPANS data, to 57.6% in 2015, according to the YRBS data (*P* = .0002).

However, the proportion of teenagers consuming 1 or more sports drinks per day decreased from 16.1% in 2010 to 13.8% in 2015 (*P* < .0001). No change was noted in the percent of youth consuming 4 or more sports drinks daily: 3.0% in 2010 and 3.2% in 2015 (*P* = .12).

Comparisons of the 2 data sets revealed reductions in the prevalence of daily sports drink consumption for all age groups, sexes, race and/or ethnicity categories, and levels of physical activity. Although no difference in sports drink consumption was noted among teenagers who did not participate in any team sports, a significant reduction was noted among those who participated in 1 or more organized sports. Underweight or normal weight and overweight children also displayed reductions. The greatest reductions were for non-Hispanic African American children and children with overweight. However, children with obesity did not exhibit a decrease in daily consumption. The percent of teenagers consuming sports

**TABLE 2** Comparison of Sports Drink Consumption: 2010 NYPANS Versus 2015 YRBS

Characteristics	Consumed $\geq 1$ Sports Drinks Daily				$\chi^2$ P
	NYPANS (2010)		YRBS (2015)		
	n	Weighted % $\pm$ SE	n	Weighted % $\pm$ SE	
Age (y)	11 038		11 248		
$\leq 15$		16.8 $\pm$ 1.1		14.0 $\pm$ 0.9	<.0001
16		16.6 $\pm$ 1.5		14.5 $\pm$ 1.3	.0025
$\geq 17$		15.0 $\pm$ 0.9		13.3 $\pm$ 1.0	.0010
Sex	11 059		11 214		
Female		11.1 $\pm$ 0.9		8.8 $\pm$ 1.0	<.0001
Male		21.1 $\pm$ 0.9		18.7 $\pm$ 0.9	<.0001
Race and ethnicity	10 895		11 087		
White		13.5 $\pm$ 0.8		12.4 $\pm$ 1.1	.0083
African American		25.6 $\pm$ 2.3		19.7 $\pm$ 1.6	<.0001
Hispanic		17.5 $\pm$ 1.0		15.7 $\pm$ 1.0	.0107
Multiracial or other (non-Hispanic) r		15.2 $\pm$ 2.0		11.7 $\pm$ 1.8	.0009
Wt status	9760		10 404		
Underweight or normal wt		16.1 $\pm$ 0.9		13.4 $\pm$ 1.0	<.0001
Overweight		17.9 $\pm$ 1.3		12.9 $\pm$ 1.2	<.0001
Obese		15.0 $\pm$ 1.4		16.1 $\pm$ 1.0	.2282
Physically active $\geq 60$ min per day during previous 7 d, d per week	10 997		11 216		
$< 5$		11.7 $\pm$ 0.9		9.3 $\pm$ 0.9	<.0001
$\geq 5$		21.0 $\pm$ 1.2		18.3 $\pm$ 1.2	<.0001
Play on at least 1 sports team in past 12 mo	11 055		11 187		
No teams		10.1 $\pm$ 0.7		9.7 $\pm$ 0.8	.4081
At least 1 team		20.0 $\pm$ 1.1		16.7 $\pm$ 1.3	<.0001
TV watching on average school d, h per d	11 066		11 213		
$\leq 2$		15.5 $\pm$ 0.8		12.1 $\pm$ 0.8	<.0001
$> 2$		17.6 $\pm$ 1.0		19.3 $\pm$ 1.3	.0152

drinks on a daily basis increased significantly among those who reported watching  $> 2$  hours of TV daily (Table 2).

### 2015 YRBS Associations

Overall, 57.6% of high school students in 2015 reported consuming at least 1 sports drink within the past 7 days: 31.8% consumed 1 to 3 sports drinks, and 11.9% consumed 4 to 6 sports drinks within the past 7 days. Of the students, 13.9% consumed 1 or more sports drinks daily: 5.5% had 1 per day, 3.6% had 2 per day, 1.6% had 3 per day, and 3.2% had 4 or more daily. Demographic and lifestyle factor correlates with sports drink consumption are shown in Table 3.

When compared with girls, boys were almost twice as likely to be daily consumers (rather than less frequent consumers) of sports drinks (adjusted odds ratio [aOR] = 1.97; 95% confidence interval [CI]: 1.62–2.41) when adjusting for age, race and ethnicity, weight status, physical activity, TV watching, and current tobacco use. Race and ethnicity also had a significant association with sports drink consumption. Both non-Hispanic African American students and Hispanic students were more likely than non-Hispanic white students to be daily consumers (aOR for African American students = 1.74; 95% CI: 1.40–2.16; aOR for Hispanic students = 1.29; 95% CI: 1.06–1.56). Tobacco use was moderately associated with daily sports drink consumption (aOR = 1.90; 95% CI:

1.61–2.24). Age was not associated with the frequency of sports drink consumption.

Weight status was not associated with sports drink consumption, but sports team participation, physical activity, and daily hours of TV watched were associated with sports drinks consumption. High school students who participated in 1 or more sports teams were more likely to drink 1 or more sports drinks daily (aOR = 1.51; 95% CI: 1.26–1.82). Interestingly, there was no significant interaction between weight status and team participation. Regardless of the children's weight status, being on sports teams was associated with more sports drink consumption. Similarly, weight status was not associated with sports drink consumption regardless of the children's sports team participation.

Students who were categorized as physically more active ( $\geq 60$  minutes per day on 5 or more of the previous 7 days) were also more likely to consume sports drinks daily compared with those who were physically less active (aOR = 1.72; 95% CI: 1.43–2.07). Relative to high school students who watched  $\leq 2$  hours of TV daily, respondents who reported watching  $> 2$  hours of TV per day were more likely to be daily consumers (aOR = 1.56; 95% CI: 1.31–1.87) than lighter consumers.

### DISCUSSION

From 2010 to 2015, there was a statistically significant increase in the proportion of teenagers who reported consuming sports drinks within the 7 past days; however, this increase was small (from 56% to 57.6%). It is conceivable that this increase in weekly consumption of sports drinks may be an unintended consequence of recent bans on soda in high schools. In an analysis of 2010 NYPANS data in which sports drink consumption with respect to access to soda in high schools was



**TABLE 3** Sports Drink Consumption in Relation to Respondent Characteristics and Health Behaviors in the 2015 YRBS Survey of High School Students in the United States (*n* = 11 305)

Characteristics	<i>n</i>	<1 Sports Drink per Day Weighted % ± SE	≥1 Sports Drinks per Day, Weighted % ± SE	≥1 Sports Drinks per Day Versus <1 Sports Drinks per Day, <sup>a</sup> aOR (95% CI)
Age (y)	11 248			
≤15		86.0 ± 0.9	14.0 ± 0.9	Ref —
16		85.5 ± 1.3	14.5 ± 1.3	1.04 0.82–1.32
≥17		86.7 ± 1.0	13.3 ± 1.0	0.90 0.76–1.08
Sex	11 214			
Female		91.2 ± 1.0	8.8 ± 1.0	Ref —
Male		81.3 ± 0.9	18.7 ± 0.9	1.97 1.62–2.41
Race and ethnicity	11 087			
Non-Hispanic white		87.6 ± 1.1	12.4 ± 1.1	Ref —
Non-Hispanic African American		80.3 ± 1.6	19.7 ± 1.6	1.74 1.40–2.16
Hispanic		84.3 ± 1.0	15.7 ± 1.0	1.29 1.06–1.56
Multiracial or other (non-Hispanic)		88.3 ± 1.8	11.7 ± 1.8	1.02 0.75–1.38
Wt status	10 404			
Underweight or normal wt		86.6 ± 1.0	13.4 ± 1.0	Ref —
Overweight		87.1 ± 1.2	12.9 ± 1.2	0.90 0.74–1.10
Obese		83.9 ± 1.2	16.1 ± 1.2	1.09 0.84–1.41
Physically active ≥60 min per d during previous 7 d, d per wk	11 216			
<5		90.7 ± 0.9	9.3 ± 0.9	Ref —
≥5		81.7 ± 1.2	18.3 ± 1.2	1.72 1.43–2.07
Play on at least 1 sports team in past 12 mo	11 187			
No teams		90.3 ± 0.8	9.7 ± 0.8	Ref —
At least 1 team		83.3 ± 1.3	16.7 ± 1.3	1.51 1.26–1.82
TV watching on average school d, h per d	11 213			
≤2		87.9 ± 0.8	12.1 ± 0.8	Ref —
>2		80.7 ± 1.3	19.2 ± 1.3	1.56 1.31–1.87
Currently uses tobacco	11 115			
No		89.0 ± 0.8	11.0 ± 0.8	Ref —
Yes		80.1 ± 1.3	19.9 ± 1.3	1.90 1.61–2.24

Ref, reference; —, not applicable.

<sup>a</sup> Adjusted models included all other variables in the table.

examined, Taber et al<sup>9</sup> found that students who had access to vending machines in states that banned soda within schools drank 1.25 times as many servings of sports drink within the past week; this association was especially strong for non-Hispanic African Americans, who consumed 1.49 servings of sports drink compared with 1.21 servings for non-Hispanic whites.

Although a slightly larger proportion of high school students report consuming sports drinks at least weekly, the proportion of teenagers consuming these beverages on a daily basis appears to have decreased more significantly. Our

findings are consistent with recent findings regarding soda and juice consumption by high school students in the United States. Using YRBS data, the CDC reported a significant decrease in the daily consumption of nondiet soda (from 33.8% to 20.4%) and 100% fruit juice (from 28.6% to 21.6%) from 2007 to 2015.<sup>13</sup> These findings collectively reveal that teenagers are increasingly recognizing that SSBs may be consumed occasionally but should not be a daily beverage choice.

These reductions in daily consumption were observed in children across most demographic and lifestyle categories, most

prominently for non-Hispanic African Americans and children with overweight. However, children with obesity and those who watched many hours of TV daily did not show favorable decreases. This is of particular concern given the overall increase in the rates of obesity among children and adolescents and national efforts to combat obesity rates by limiting soda consumption.<sup>4,14</sup>

In terms of physical activity, in a 2011 report, the AAP's Committee on Nutrition and Council on Sports Medicine and Fitness stated that the level of physical activity of the average child does not require the electrolyte replenishment offered by sports drinks.<sup>2</sup> This recommendation may help to explain the overall decrease in daily sports drinks consumption by high school students regardless of level of physical activity from 2010 to 2015 and, more specifically, among teenagers who participate on 1 or more sports teams. Although this decrease over time is indeed favorable and encouraging, daily sports drink consumption is more prevalent among teenagers who are more athletic or active, which reveals that marketing efforts continue to have an impact on this population.

Although reductions in the daily consumption of sports drinks were noted for boys and girls when comparing the 2 surveys, cross-sectional analyses of the 2015 YRBS data continue to reveal substantial differences by sex. In fact, in 2015, the proportion of boys drinking 1 or more sports drinks is now more than double that of girls after adjusting for all other demographic and clinical variables (18.7% vs 8.8%). The reasons for this substantial difference are unclear. For example, although these sex-specific findings are adjusted for sports team participation and TV watching, the survey data do

not include information regarding how much of the TV viewing is of sporting events, and thus teenagers' exposure to sports drink marketing. Furthermore, there is likely some inherent sex bias with respect to the marketing campaigns for sports drinks; this is not only the case for male-predominant sports, such as football and ice hockey, but likely also true for sports such as basketball and soccer, in which despite considerable advances in the development of professional women's leagues, the men's leagues are still more likely to be broadcast at prime time and have greater viewership.

Cross-sectional analyses also reveal that non-Hispanic African American children continue to have the highest prevalence of daily sports drink consumption among the race and ethnicity groups studied. Interestingly, although combustible tobacco use has consistently been shown to be less prevalent among high school students who participate on sports teams,<sup>15</sup> daily sports drink consumption was almost twice as prevalent among teenagers who used tobacco after controlling for other demographic and lifestyle factors.

Whereas proper hydration is extremely important, calorie-laden flavored sports drinks have the potential to contribute to the epidemic of childhood obesity. The racial disparities with respect to sports drink consumption are also cause for concern. The higher prevalence of daily sports drink consumption in 2015 among Hispanics and non-Hispanic African Americans, when compared with non-Hispanic whites and even after accounting for other confounding variables, mirrors the heightened obesity rates among non-Hispanic African American and Hispanic populations. This finding may be confounded by other sociodemographic factors<sup>16</sup> that

could not be accounted for in the current analyses because they were not measured in the surveys.

The association between daily consumption of sports drinks and high levels of daily TV viewing, when physical activity level and other demographic variables are controlled for, is worrisome. TV advertisements and product endorsements may be partly to blame. In its 2011 clinical report, the AAP's Committee on Nutrition and Council on Sports Medicine and Fitness<sup>2</sup> expressed concern about the health consequences of frequent or excessive consumption of sports drinks (ie, overweight or obesity and demineralization of dental enamel); nonetheless, sports drinks are still aggressively marketed to children and adolescents. In 2010, Gatorade rebranded itself in an effort to expand its appeal to a larger demographic. The company targeted 13- to 17-year-old athletes and expanded its definition of "athletes" to attract a larger consumer base.<sup>17</sup> The brand also continues to partner with many athletes, teams, leagues, and events that receive significant media attention and screen time; some notable examples include Serena Williams, Michael Jordan, Ironman, and the National Football League.<sup>18,19</sup> This aggressive marketing campaign gives little consideration to the actual level of physical activity that necessitates electrolyte replenishment, focusing instead on the popularity and athleticism of its spokespeople.<sup>20</sup> Our finding that teenagers who watched >2 hours of TV daily were much more likely to consume sports drinks daily is consistent with marketing research; studies have revealed that TV advertisements that promote recognizable food brands are associated with an increased consumption of these foods.<sup>21,22</sup>

This study has several methodologic strengths. The YRBS and NYPANS

data sets are large, nationally representative samples collected by the CDC that have been shown to be reliable regarding the prevalence of behaviors of high school students in the United States.<sup>23</sup> Both data sets provided samples that were large enough to allow for regression analyses that could be controlled for demographic and other lifestyle variables. In terms of limitations, some of the YRBS's primary sampling units did not ask about sports drink consumption, and thus resulted in missing data; nonetheless, complete YRBS data were available for >11 000 high school students nationwide. To the extent that the YRBS does not capture information regarding the type of TV programming viewed, it was impossible to investigate associations between specific TV program content and sports drink consumption.

Pediatricians should educate parents and teenagers about the seductive marketing of sports drinks to children: identifying the "health halo" that surrounds sports drinks despite the hidden sugar and calorie content that lie within. As per AAP recommendations, clinicians should encourage rehydration with water for most sports-related activities; rehydration with sports drinks should be limited to instances when there is "a need for more rapid replenishment of carbohydrates and/or electrolytes in combination with water during periods of prolonged, vigorous sports participation or other intense physical activity."<sup>1</sup>

## CONCLUSIONS

The prevalence of sports drink consumption among high school students in the United States increased slightly between 2010 and 2015. The 2015 YRBS data reveal once again that boys, Hispanics, and non-Hispanic African Americans

are more likely to consume sports drinks. Adolescents with higher levels of physical activity were more likely to consume sports drinks daily compared with teenagers who were less physically active. Of concern, children watching >2 hours of TV daily were also more likely to consume sports drinks daily, a worrisome reflection of the association between TV viewing, commercial advertisements, and obesity. Whereas soda intake has decreased, likely in part because of a national campaign to reduce the consumption of this sugary

beverage, sports drinks receive relatively little condemnation because of their perceived healthfulness and association with elite athletes and role models. The AAP consistently states that water is the better choice for rehydration purposes and that children and adolescents generally do not need supplemental electrolyte replacement. Pediatricians should discuss the AAP's rehydration recommendations with patients and parents with the goal of limiting sports drink consumption.

## ABBREVIATIONS

AAP: American Academy of Pediatrics  
 aOR: adjusted odds ratio  
 CDC: Centers for Disease Control and Prevention  
 CI: confidence interval  
 NYPANS: National Youth Physical Activity and Nutrition Survey  
 SSB: sugar-sweetened beverage  
 YRBS: Youth Risk Behavior Survey

Address correspondence to Andrew Adesman, MD, Division of Developmental and Behavioral Pediatrics, Steven and Alexandra Cohen Children's Medical Center of New York, 1983 Marcus Ave, Suite 130, Lake Success, NY 11042. E-mail: aadesman@northwell.edu

PEDIATRICS (ISSN Numbers: Print, 0031-4005; Online, 1098-4275).

Copyright © 2018 by the American Academy of Pediatrics

**FINANCIAL DISCLOSURE:** The authors have indicated they have no financial relationships relevant to this article to disclose.

**FUNDING:** No external funding.

**POTENTIAL CONFLICT OF INTEREST:** The authors have indicated they have no potential conflicts of interest to disclose.

## REFERENCES

- Meyer F, Bar-Or O, MacDougall D, Heigenhauser GJ. Sweat electrolyte loss during exercise in the heat: effects of gender and maturation. *Med Sci Sports Exerc.* 1992;24(7):776–781
- Committee on Nutrition and the Council on Sports Medicine and Fitness. Sports drinks and energy drinks for children and adolescents: are they appropriate? *Pediatrics.* 2011;127(6):1182–1189
- Shaw L, Smith AJ. Dental erosion—the problem and some practical solutions. *Br Dent J.* 1999;186(3):115–118
- Brownell KD, Frieden TR. Ounces of prevention—the public policy case for taxes on sugared beverages. *N Engl J Med.* 2009;360(18):1805–1808
- Malik VS, Popkin BM, Bray GA, Després 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
- UC Berkeley Center for Weight and Health. Sports drinks. 2007. Available at: <http://ucanr.edu/files/48018.pdf>. Accessed June 21, 2016
- Gross LS, Li L, Ford ES, Liu S. Increased consumption of refined carbohydrates and the epidemic of type 2 diabetes in the United States: an ecologic assessment. *Am J Clin Nutr.* 2004;79(5):774–779
- Kit BK, Fakhouri TH, Park S, Nielsen SJ, Ogden CL. Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999–2010. *Am J Clin Nutr.* 2013;98(1):180–188
- Taber DR, Chriqui JF, Vuillaume R, Kelder SH, Chaloupka FJ. The association between state bans on soda only and adolescent substitution with other sugar-sweetened beverages: a cross-sectional study. *Int J Behav Nutr Phys Act.* 2015; 12(suppl 1):S7
- Lasater G, Piernas C, Popkin BM. Beverage patterns and trends among school-aged children in the US, 1989–2008. *Nutr J.* 2011;10(1):103–112
- Robert Wood Johnson Foundation. *Consumption of Sports Drinks by Children and Adolescents: A Research Review.* Princeton, New Jersey: Robert Wood Johnson Foundation; 2012
- Center for Disease Control and Prevention. National Youth Physical Activity and Nutrition Study (NYPANS). Available at: <https://www.cdc.gov/healthyyouth/data/yrbs/nypans.htm>. Accessed February 7, 2018
- Miller G, Merlo C, Demissie Z, Sliwa S, Park S. Trends in beverage consumption among high school students - United States, 2007–2015. *MMWR Morb Mortal Wkly Rep.* 2017;66(4):112–116
- Sanger-Katz M. More evidence that soda taxes cut soda drinking. *New York Times.* August 25, 2016. Available at: <https://www.nytimes.com/2016/08/25/upshot/more-evidence-that-soda-taxes-cut-soda-drinking.html>. Accessed July 12, 2017
- Agaku IT, Singh T, Jones SE, et al. Combustible and smokeless tobacco use among high school athletes - United States, 2001–2013. *MMWR Morb Mortal Wkly Rep.* 2015;64(34):935–939

16. Flegal KM, Kruszon-Moran D, Carroll MD, Fryar CD, Ogden CL. Trends in obesity among adults in the United States, 2005 to 2014. *JAMA*. 2016;315(21):2284–2291
17. Zmuda N; AdvertisingAge. What’s a sport? Gatorade redefines to broaden target. 2010. Available at: <http://adage.com/article/news/a-sports-drink-pepsi-s-gatorade-broadens-target/143217/>. Accessed June 23, 2016
18. Gatorade. Teams, partners and athletes. Available at: [www.gatorade.co.uk/athletes](http://www.gatorade.co.uk/athletes). Accessed July 21, 2016
19. IRONMAN.com. Gatorade and IRONMAN announce multi-year partnership. 2014. Available at: [www.ironman.com/triathlon-news/articles/2014/09/gatorade-announcement.aspx#axzz4F3JSFIG2](http://www.ironman.com/triathlon-news/articles/2014/09/gatorade-announcement.aspx#axzz4F3JSFIG2). Accessed July 21, 2016
20. Pallotta F. Super Bowl XLIX posts the largest audience in TV history. *CNN*. February 2, 2015. Available at: <http://money.cnn.com/2015/02/02/media/super-bowl-ratings/>. Accessed July 19, 2016
21. Gortmaker SL, Must A, Sobol AM, Peterson K, Colditz GA, Dietz WH. Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Arch Pediatr Adolesc Med*. 1996;150(4):356–362
22. Halford JC, Gillespie J, Brown V, Pontin EE, Dovey TM. Effect of television advertisements for foods on food consumption in children. *Appetite*. 2004;42(2):221–225
23. Brener ND, Collins JL, Kann L, Warren CW, Williams BI. Reliability of the Youth Risk Behavior Survey questionnaire. *Am J Epidemiol*. 1995;141(6):575–580



## Adolescent Consumption of Sports Drinks

Kyla Cordrey, Sarah A. Keim, Ruth Milanaik and Andrew Adesman

*Pediatrics* 2018;141;

DOI: 10.1542/peds.2017-2784 originally published online May 7, 2018;

### Updated Information & Services

including high resolution figures, can be found at:  
<http://pediatrics.aappublications.org/content/141/6/e20172784>

### References

This article cites 15 articles, 4 of which you can access for free at:  
<http://pediatrics.aappublications.org/content/141/6/e20172784#BIBL>

### Subspecialty Collections

This article, along with others on similar topics, appears in the following collection(s):

#### **Nutrition**

[http://www.aappublications.org/cgi/collection/nutrition\\_sub](http://www.aappublications.org/cgi/collection/nutrition_sub)

#### **Sports Medicine/Physical Fitness**

[http://www.aappublications.org/cgi/collection/sports\\_medicine:physical\\_fitness\\_sub](http://www.aappublications.org/cgi/collection/sports_medicine:physical_fitness_sub)

### Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:

<http://www.aappublications.org/site/misc/Permissions.xhtml>

### Reprints

Information about ordering reprints can be found online:

<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



# PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

## Adolescent Consumption of Sports Drinks

Kyla Cordrey, Sarah A. Keim, Ruth Milanaik and Andrew Adesman

*Pediatrics* 2018;141;

DOI: 10.1542/peds.2017-2784 originally published online May 7, 2018;

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/141/6/e20172784>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2018 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

