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School Soft Drink Availability and Consumption Among U.S. Secondary Students

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Abstract

Background—Consumption of sugar-sweetened beverages (SSBs) such as soft drinks has been associated with significantly increased energy intake and body weight. One strategy used to reduce soft drink consumption among adolescents has been reducing availability in schools; however, research is limited on associations between availability of soft drinks in school and student consumption.

Purpose—This study examines associations between regular and diet soft drink availability in schools and student consumption using data from 329 secondary schools and 9284 students.

Methods—Data were obtained from two sources: (1) nationally representative cross-sectional samples of students in Grades 8, 10, and 12 from U.S. public and private schools in 2010 and 2011 in the Monitoring the Future study; and (2) administrators of the same schools in the Youth, Education, and Society study. Multilevel modeling conducted in 2012 examined associations between school availability and student consumption controlling for student sociodemographics and school characteristics.

Results—In the total sample of more than 9000 students, regular and diet soft drink availability in school was not related to student consumption of these beverages in multivariate models. Yet, among African-American high school students, school regular and diet soft drink availability was significantly related to higher daily consumption (both before and after controlling for student and school factors).

Conclusions—Although removal of soft drinks from schools may not result in significantly lower overall student consumption, such actions may result in significant decreases in soft drink consumption for specific student groups.

Background

In 2009–2010, one third (33%) of U.S. children and adolescents aged 6–19 years were overweight or at risk of overweight¹; minority and low-income youth are especially at risk.^{1,2} Consumption of sugar-sweetened beverages (SSBs), including soft drinks, is associated with increased energy intake and body weight, decreased nutrient intake, and medical conditions such as diabetes.^{3–6} Research indicates a possible increased risk of

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metabolic syndrome associated with diet soft drinks⁷; noncaloric sweeteners in many such beverages may be associated with obesity-related concerns such as regulating energy balance.⁸

Efforts to reduce youth soft drink consumption have included a school environment focus. In single-state studies, bringing lunch to school on a frequent basis related to consuming fewer soft drink servings⁹; purchasing soft drinks from school vending machines related to higher consumption than when beverages were obtained elsewhere¹⁰; and regardless of the presence of healthier options, middle school students commonly purchased less-healthy items from school vending machines including SSBs.¹¹ A nationally representative study found that students making frequent school vending machine purchases, compared to those who did not, consumed more regular soft drinks.¹² Only 7%–15% of SSB calories are consumed by youth on regular weekdays in school,¹³ potentially limiting the effect of school-based interventions.

Few studies have examined overall school soft drink availability and student consumption. A 15-school cross-sectional study found secondary student SSB consumption was not associated with school SSB availability, but was associated with school neighborhood retailers and individual cognitions.¹⁴ One prospective quasi-experimental seven-school study indicated that reducing school SSB availability had little influence on overall student SSB consumption.¹⁵ A larger California-based study found school availability of soft drinks and SSBs other than sports drinks decreased following implementation of state nutrition standards for competitive venues; student at-school soft drink consumption also decreased.¹⁶ The current paper uses 2010 and 2011 data from nationally representative samples of secondary students to examine the following: Do student and/or school characteristics relate to student soft drink consumption? Does school soft drink availability relate to student soft drink consumption, and are the relationships moderated by student or school characteristics?

Methods

Sample

Nationally representative data from cross-sectional samples of students in Grades 8, 10, and 12 were obtained from the 2010–2011 Monitoring the Future (MTF) studies.¹⁷ Schools were invited to participate for 2 years. Surveys were administered in classrooms by University of Michigan personnel; students self-completed questionnaires during a normal class period. School response rates averaged 57% original and 97% with replacement; student response rates averaged 90%, 87%, and 84% Grades 8, 10, and 12, respectively. Absenteeism was the primary reason for missing data; less than 1% of students refused participation.

School administrator data were collected from the half-sample of schools cycling out of the MTF study in 2010–2011 through one component of the Youth, Education, and Society (YES) study.¹⁸ Mailed questionnaires were sent in the spring following student data collection. Data were obtained from 333 schools (82% of the eligible MTF sample). Principals/other administrators completed items on general school characteristics and nutrition policies/programs. It was suggested that food service personnel complete detailed beverage availability questions; this occurred in 53% of schools. The MTF and YES were conducted by the Institute for Social Research at the University of Michigan (ethical approval obtained from the University of Michigan Behavioral Sciences IRB).

Measures

Student beverage consumption—Students were asked: *Regular (non-diet) soft drinks include Coke, Pepsi, Mountain Dew, Dr. Pepper, etc. How many (if any) 12-ounce cans, or*

bottles (or the equivalent) of regular (nondiet) soft drinks do you drink PER DAY, on average? followed by *How many (if any) 12-ounce cans or bottles (or the equivalent) of diet soft drinks (like Diet Coke, Diet Pepsi, etc.) do you drink PER DAY, on average?* Response options included: none, <1, 1–2, 3, 4, 5 or 6, and 7 or more. Three measures each for regular and diet soft drinks were coded: (1) continuous frequency (0, 0.5, 1, 2, 3, 4, 5.5, 7); (2) any consumption (<1 or more vs 0); and (3) daily consumption (1 vs 0 or <1).

School beverage availability—Administrators reported whether students had beverage access in vending machines, school/student stores and/or snack bars/carts, à la carte sales in the cafeteria, and/or the school lunch meal. For the school lunch meal, respondents were asked if *regular soft drinks (such as Coke, Pepsi, or Dr. Pepper)* and *diet soft drinks (such as Diet Coke, Diet Pepsi, or Diet Dr. Pepper)* were each available *never, some days, or most or every day*. For the remaining venues, respondents were asked about any beverage availability. If availability was indicated, respondents were asked to mark the following as appropriate: *before classes begin in the morning; during school hours when meals are not being served; during school lunch periods; and after school*. Four school availability measures were created for both regular and diet soft drinks: (1) any availability; (2) competitive venue availability (vending, stores/snack bars/carts, à la carte sales); (3) cafeteria availability (lunch meal or à la carte sales); and (4) a three-level categorical measure: no availability, non-school-hour availability, availability during school hours.

Control—Soft drink consumption has been shown to vary by gender, race/ethnicity, SES, and geographic location.^{6,19–22} Student-level controls included gender, race/ethnicity (African-American, Hispanic, white, or other), and average parental education (used as a proxy for SES). School-level controls included grade size; population density; SES (a trichotomy of the percentage of students eligible for free or reduced-price lunch); sector (public vs private); and region. Initial exploratory analyses indicated that only SES and region showed relationships with beverage availability and were retained as school-level controls as well as a year indicator.

Data Analysis

Descriptive analyses were conducted in 2012 using SAS and accounted for school clustering in SE estimates. Two-level hierarchic multivariate models were run using HLM. Continuous consumption frequency was modeled using restricted maximum-likelihood and robust SEs. Dichotomous daily consumption was modeled using a Bernoulli distribution log-link function; population average model results with robust SEs are reported. All analyses were weighted to adjust for differential selection probability.

Grade-specific models showed clear differences between Grade-8 students and both Grade-10 and Grade-12 students; overall findings did not differ for Grades 10 and 12. Thus, most results are presented separately for middle school (Grade 8) and high school (Grades 10 and 12). Unweighted sample sizes for cases without missing data on control variables (and requiring valid data for at least one school beverage availability measure and one student beverage consumption measure) were 3855 Grade-8 students (123 schools) and 5429 Grade-10 and Grade-12 students (206 schools).

Results

Soft Drink Consumption and Availability

Fifty-two percent of middle and 45% of high school students reported having, on average, one or more regular soft drinks per day; 23% and 20% reported having one or more diet soft drinks per day (Table 1). The behaviors were related ($p<0.001$): 35% of middle school daily

regular soft drink users consumed diet soft drinks daily; 80% of daily diet soft drink users consumed regular soft drinks daily (high school student associations were 35% and 78%). The between-school proportion of variance in soft drink consumption was 0.075 for regular soft drinks and 0.023 for diet soft drinks for middle school students, and 0.074 and 0.028 for high school students. Thus, 7%–8% of regular soft drink consumption variance and 2%–3% of diet soft drink consumption variance could be explained by school-level factors.

Fifteen percent of middle and 33% of high school students had regular soft drinks available at school; school diet soft drink availability rates were 18% for middle and 56% for high school students. All middle school students with school regular soft drink availability also had diet soft drink availability; 86% of middle school students with diet soft drink availability had regular soft drink availability. High school student percentages were 92% and 54%; although most high schools with regular soft drinks also had diet soft drinks, a sizable number had only diet soft drinks available.

Soft drinks were limited to noncafeteria middle school venues; limited high school cafeteria soft drink availability was observed (7% with regular soft drink cafeteria availability; 10% for diet soft drink availability). Two percent of middle and 18% of high school students attended schools where regular soft drinks were available throughout the day; non-school-hour-only availability was observed for 13% of middle and 15% of high school students. Diet soft drink availability during school hours was observed for 5% of middle and 37% of high school students; availability only during non-school hours was found for 13% and 20% of middle and high school students, respectively.

Factors Associated with Student Soft Drink Consumption

Student- and school-level characteristics—Table 2 presents multivariate relationships between student- and school-level characteristics and soft drink consumption (grades combined). Students in Grade 8 reported higher regular soft drink consumption frequency than students in Grades 10 and 12 ($p<0.05$) and higher diet soft drink consumption frequency than Grade-12 students ($p<0.05$). Boys reported higher regular soft drink consumption frequency than girls ($p<0.05$). African-American students had higher regular soft drink consumption frequency than all other race/ethnicity groups ($p<0.01$), and higher diet soft drink consumption than white and “other” race/ethnicity students ($p<0.05$). As parental education increased, regular and diet soft drink consumption frequency decreased. School SES strongly and negatively related to regular soft drink consumption frequency ($p<0.05$), but showed no relationship with diet soft drink consumption. Regular and diet soft drink consumption frequency was appreciably higher in the South than other regions ($p<0.05$); the Midwest ranked second.

School availability—Tables 3 and 4 present relationships between school availability and student soft drink consumption. Due to low availability, middle school models examined only any availability (Table 3). High school models (Table 4) also examined availability during the school day. No associations were observed between middle school soft drink availability and student consumption. Among high school students, school availability showed no relationships with regular soft drink consumption. High school diet soft drink availability had a positive bivariate association with consumption frequency ($p<0.05$) and a positive, nonsignificant association with daily use. No multivariate significance was observed. Neither bivariate nor multivariate models showed relationships between school-hour availability and student consumption.

Sociodemographic interactions in school availability/soft drink consumption associations—Multivariate models explored possible interactions between school soft

drink availability and student/school characteristics in relation to high school student consumption. No interactions were observed for gender, parental education, school SES, or region. Student race/ethnicity interactions—specifically African-American race/ethnicity—and school diet soft drink availability were observed for diet soft drink continuous use frequency (coefficient 0.296, SE 0.129; $p=0.022$) and daily use (OR 2.39, 95% CI=1.25, 4.55; $p=0.009$).

There was no interaction between African-American race/ethnicity and school regular soft drink availability for regular soft drink daily use (OR 1.56, 95% CI=0.99, 2.43; $p=0.053$). Further analyses showed that among African-American students, school regular soft drink availability was associated with increased odds of daily regular soft drink consumption (multivariate OR 1.46; 95% CI=1.00, 2.13; $p=0.049$). School diet soft drink availability was associated with increased daily diet soft drink consumption frequency (multivariate coefficient 0.36, SE 0.151; $p=0.019$) and odds of daily diet soft drink consumption among African-American high school students (multivariate OR 2.03, 95% CI=1.09, 3.79; $p=0.026$; Figure 1).

Discussion

Approximately half of secondary students reported consuming regular soft drinks daily, and one fifth reported consuming diet soft drinks daily. These estimates are markedly higher than those obtained from the 2010 National Youth Physical Activity and Nutrition Study (NYPANS), where high school daily consumption was reported to be 24% for regular and 7% for diet soft drinks.²⁰ Consumption estimate differences may relate to differences in measures used: NYPANS asked about consumption in the 7 days immediately preceding the survey; MTF asked about average consumption per day. Respondents may report higher average consumption when considering their typical habits than when recalling a specified timeframe.

Beverage consumption trends since the 1970s among children aged 2–18 years indicate significantly increased SSB consumption.^{23,24} Soft drinks are the number one energy source and the number one source of added sugars.²⁵ Policies aimed at reducing school SSB access are increasing.²⁶ A 2006 voluntary agreement between leading U.S. beverage industry members and the Alliance for a Healthier Generation aimed to reduce school beverage caloric content and portion sizes.²⁷ Subsequent evaluations indicate decreases in total beverage calories shipped to schools including soft drink reductions.²⁸ Research supported by the American Beverage Association states that regular soft drinks have been removed from participating schools.²⁹ However, the current study indicates that 15% of middle school students and one third of high school students continue to have access to regular soft drinks at school.

Similar to prior research,¹⁵ the current study found no multivariate relationships between school soft drink availability and consumption among students in general. Youth consume only 7%–15% of total weekday SSB calories at school; changes in school soft drink availability may not substantively affect overall soft drink consumption. In the California-based study previously noted,¹⁶ in-school student soft drink consumption decreased significantly following nutrition standard implementation, but no change in at-home soft drink consumption was observed. This is not to say that efforts to reduce in-school soft drink access should be abandoned. Rather, it may be important to have realistic outcome expectations for school access interventions and recognize the importance of associations between student/school characteristics and soft drink consumption.

The current study found school regular and diet soft drink availability was significantly and positively related to consumption among African-American high school students—a particularly at-risk group for obesity. Results may indicate that African-American high school students: (1) purchase more regular and diet soft drinks at school than students from other race/ethnicity groups; (2) have similar school purchasing rates, but consume fewer regular and diet soft drinks outside of school, thus resulting in school availability having a stronger relationship with consumption; or (3) have both higher school purchasing rates and lower out-of-school soft drink consumption. African-American high school student soft drink consumption may be more sensitive to school environment differences. Two additional studies have found similar relationships; one with state-level taxes and SSB consumption,³⁰ and the other with restrictions on school junk food.³¹

Limitations

These findings should be considered within their limitations. Data are cross-sectional (precluding causal interpretation). Although replacement schools were selected using the same sampling procedures as original schools, the degree to which replacement MTF schools differed from originally sampled schools is unknown. Results are based on student self-report and school administrator responses to self-administered questionnaires, raising the possibility of reporting error and/or social-desirability bias. To minimize social-desirability bias, schools and respondents were guaranteed they would not be identified. To minimize response error, administrator questionnaire directions called for different segments of the questionnaire to be completed by personnel most knowledgeable about the subject matter: principals for policy-related measures; food service managers for food and beverage availability measures. Follow-up calls were made to clarify incomplete or inconsistent administrator questionnaires.^{32,33}

Conclusion

Schools may choose to remove soft drinks and other SSBs not because removal will likely result in significant decreases in overall student SSB consumption, but because such steps support a healthy learning environment and development of good dietary habits. Removal of soft drinks may result in significant decreases in overall consumption over the long-term, and likely for specific student groups.

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Figure 1.

Predicted probability of high school students reporting daily regular and diet soft drink consumption, 2010–2011

Note: Results obtained from multivariate models controlling for gender; average parental education; region (South vs other); school percentage of students eligible for free and reduced-price lunch; year; and grade. Vertical black lines indicate ± 1 SE of the predicted probability.

* $p < 0.05$

Table 1
Soft Drink Secondary School Availability, Student Consumption, and Control Measures, 2010–2011

	MS		HS	
	Range	M (SE) or %	M (SE)	
SCHOOL SODA AVAILABILITY INDEPENDENT PREDICTORS				
Regular soda				
Any availability (MS 3855; HS 5429)	0,1	0.154 (0.037)	0.333 (0.041)	
Competitive venue availability ^a (MS 3855; HS 5429)	0,1	0.154 (0.037)	0.331 (0.041)	
Cafeteria availability ^b (MS 3855; HS 5429)	0,1	0.000 (0.000)	0.068 (0.021)	
Availability by school hours (MS 3798; HS 5330)				
None	0,1	0.845 (0.037)	0.669 (0.041)	
Only during nonschool hours	0,1	0.133 (0.034)	0.153 (0.034)	
During school hours	0,1	0.022 (0.016)	0.178 (0.032)	
Diet soda				
Any availability (MS 3855; HS 5429)	0,1	0.178 (0.041)	0.564 (0.043)	
Competitive venue availability (MS 3855; HS 5429)	0,1	0.178 (0.041)	0.561 (0.043)	
Cafeteria availability (MS 3855; HS 5429)	0,1	0.000 (0.000)	0.101 (0.024)	
Availability by school hours (MS 3566; HS 5101)				
No availability at school	0,1	0.821 (0.042)	0.431 (0.044)	
Available only during nonschool hours	0,1	0.126 (0.034)	0.196 (0.037)	
Available during school hours	0,1	0.052 (0.029)	0.372 (0.042)	
SOFT DRINK CONSUMPTION OUTCOMES				
Regular soft drink consumption (MS 3,845; HS 5,422)				
Continuous frequency scale	0–7	1.306 (0.050)	1.111 (0.037)	
None		22.5	29.2	
< 1 per day		25.2	25.8	
1		21.0	18.6	
2		15.1	13.5	
3		7.9	6.3	
4		4.1	3.2	
5–6		2.0	2.1	

	MS		HS	
	Range	M (SE) or %	M (SE)	
7		2.2	1.3	
Any consumption^c	0.1	0.775 (0.009)	0.708 (0.010)	
Daily consumption^d	0.1	0.523 (0.017)	0.450 (0.013)	
Diet soft drink consumption (%) (MS 3848; HS 5414)				
Continuous frequency scale	0–7	0.561 (0.027)	0.494 (0.021)	
None		59.7	63.6	
<1 per day		17.5	16.1	
1		10.7	9.8	
2		6.4	5.7	
3		2.9	2.5	
4		1.3	1.1	
5–6		0.7	0.9	
7		0.9	0.6	
Any consumption	0.1	0.403 (0.010)	0.364 (0.009)	
Daily consumption	0.1	0.228 (0.011)	0.204 (0.008)	
STUDENT-LEVEL CONTROL MEASURES (MS 3855; HS 5429)				
Gender, male	0.1	0.468 (0.015)	0.496 (0.009)	
Race/ethnicity				
African-American	0.1	0.103 (0.016)	0.093 (0.011)	
Hispanic	0.1	0.144 (0.020)	0.129 (0.016)	
White	0.1	0.582 (0.028)	0.632 (0.024)	
Other	0.1	0.171 (0.013)	0.146 (0.011)	
Average parental education				
Low	0.1	0.128 (0.010)	0.138 (0.010)	
Medium	0.1	0.507 (0.017)	0.545 (0.012)	
High	0.1	0.364 (0.022)	0.317 (0.015)	
SCHOOL-LEVEL CONTROL MEASURES (MS 3855; HS 5429)				
School SES				
Low (40% or students eligible for FRPL)	0.1	0.554 (0.053)	0.434 (0.043)	

	MS		HS	
	Range	M (SE) or %	M (SE)	M (SE)
Medium (15%–39% of students eligible for FRPL)	0,1	0.273 (0.048)	0.369 (0.043)	
High (<15% of students eligible for FRPL)	0,1	0.173 (0.039)	0.197 (0.033)	
Region				
Northeast	0,1	0.153 (0.036)	0.205 (0.033)	
Midwest	0,1	0.273 (0.046)	0.265 (0.038)	
West	0,1	0.197 (0.045)	0.194 (0.037)	
South	0,1	0.377 (0.053)	0.336 (0.041)	
Year				
2010	0,1	0.516 (0.054)	0.515 (0.043)	
2011	0,1	0.484 (0.054)	0.485 (0.043)	

Note: MS indicates Grade 8; HS indicates Grades 10 and 12. Data were obtained from students in 123 middle schools and 206 high schools. Student *n*'s are not weighted.

^aCompetitive venue availability included vending machines, school or student stores or snack bars/carts, or à la carte purchases in the cafeteria.

^bCafeteria availability defined as either in the school lunch meal or as à la carte purchases in the cafeteria.

^cAny consumption defined as <1 or more vs 0.

^dDaily consumption defined as 1 vs 0 or <1

FRPL, free and reduced-price lunch program; HS, high school; MS, middle school

Table 2

Multivariate Relationships between Student- and School-level Characteristics and Student Soft Drink Consumption, 2010–2011

STUDENT-LEVEL CONTROL MEASURES								
Regular Soft Drink Frequency ^a				Diet Soft Drink Frequency				
	M	Est.	(SE)	p	M	Est.	(SE)	p
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Grade								
8	1.31	(ref)			0.56	(ref)		
10	1.11	−0.158	(0.054)	0.004	0.50	−0.042	(0.034)	0.224
12	1.11	−0.146	(0.068)	0.032	0.48	−0.083	(0.036)	0.023
12 vs 10		0.012	(0.067)	0.863		−0.041	(0.036)	0.256
Gender								
Female	1.04	(ref)			0.50	(ref)		
Male	1.33	0.340	(0.035)	0.000	0.53	0.049	(0.027)	0.067
Race/ethnicity								
White	1.12	(ref)			0.49	(ref)		
African-American	1.54	0.222	(0.069)	0.002	0.68	0.113	(0.052)	0.028
Hispanic	1.24	−0.008	(0.059)	0.889	0.56	0.004	(0.049)	0.937
Other	1.14	0.013	(0.048)	0.795	0.47	−0.028	(0.034)	0.411
Hispanic vs African-American		−0.231	(0.076)	0.003		−0.109	(0.062)	0.078
Other vs African-American		−0.210	(0.075)	0.006		−0.141	(0.054)	0.009
Average parental education								
High	0.88	(ref)			0.42	(ref)		
Medium	1.28	0.305	(0.040)	0.000	0.53	0.085	(0.029)	0.005
Low	1.54	0.535	(0.065)	0.000	0.72	0.269	(0.054)	0.000
Low vs Medium		0.230	(0.061)	0.000		0.184	(0.052)	0.001
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SCHOOL-LEVEL CONTROL MEASURES								
School SES ^b								
High	0.83	(ref)			0.42	(ref)		
Medium	1.07	0.131	(0.067)	0.049	0.47	−0.017	(0.040)	0.674
Low	1.40	0.381	(0.078)	0.000	0.59	0.042	(0.045)	0.348
Low vs Medium		0.250	(0.064)	0.000		0.059	(0.032)	0.070

Region	Regular Soft Drink Frequency ^a			Diet Soft Drink Frequency		
	M	Est.	(SE)	M	Est.	(SE)
South	1.42	(ref)		0.64	(ref)	
Northeast	1.05	-0.183	(0.085)	0.48	-0.108	(0.048)
Midwest	1.13	-0.172	(0.074)	0.47	-0.126	(0.040)
West	0.93	-0.403	(0.067)	0.39	-0.225	(0.042)
Northeast vs West		0.220	(0.078)		0.117	(0.042)
Midwest vs West		0.232	(0.070)		0.099	(0.036)
Year						
2010	1.20	(ref)		0.52	(ref)	
2011	1.16	-0.057	(0.052)	0.51	-0.018	(0.029)

Notes: For regular soft drink model, school $n=329$, student $n=9267$. Est. values indicate the average change across secondary students in mean consumption for a corresponding unit change in the student or school characteristic controlling for all other characteristics. For diet soft drink model, school $n=329$, student $n=9262$. All n 's are unweighted.

^aRegular and diet soft drink frequency outcomes indicate average daily consumption, measured on a continuous scale of 0 (none); 0.5 (<1 per day); 1; 2; 3; 4; 5.5 (5-6 per day); 7 (7+ per day).

^bSchool SES based on the percentage of students eligible for the free and reduced-price lunch program: low (<40%); medium (15%-39%); high (>15%).

Est = linear regression estimates from multivariate models;

Table 3

Middle School Associations between School Soft Drink Availability and Student Soft Drink Consumption, 2010–2011

	Student Continuous Consumption Scale				Student Daily vs Other Consumption									
	M	Bivariate		Multivariate		%	Multivariate							
		Est. ^a	(SE)	p ^a	Est. ^b		(SE)	p ^b	OR ^a	(95% CI)	p ^a	OR ^b	(95% CI)	p ^b
SCHOOL SOFT DRINK AVAILABILITY														
Regular														
None	1.31	(ref)		(ref)										
Any	1.30	−0.019	(0.120)	0.872	−0.049	(0.098)	0.616	55.9	1.18	(0.83,1.68)	0.352	1.12	(0.81,1.54)	0.497
Diet														
None	0.57	(ref)		(ref)										
Any	0.53	−0.058	(0.063)	0.356	−0.041	(0.064)	0.522	22.1	0.92	(0.69,1.22)	0.548	0.95	(0.71,1.27)	0.709

Notes: Continuous scale values are 0 (none); 0.5(<1 per day); 1; 2; 3; 4; 5.5 (5–6 per day); 7 (7+ per day). Daily consumption indicates consumption of one or more drinks vs none/less than one per day on average. Est = linear regression estimates; values indicate the average change across the secondary student population in mean value of consumption for a corresponding unit change in the student or school characteristic. The OR shows the ratio of the odds of daily consumption occurring given school availability to the odds of it occurring without school availability for secondary students in general across schools. Model *n*'s (unweighted): regular soft drink consumption, 123 schools and 3845 students; diet soft drink consumption, 123 schools and 3848 students.

^aBivariate model results

^bMultivariate model results controlling simultaneously for gender; student race/ethnicity; average parental education; percentage of students in school eligible for free and reduced-price lunch; region (South vs other); and year.

Table 4
High School Associations between School Soft Drink Availability and Student Soft Drink Consumption, 2010–2011

School	Student <i>n</i>	Student Continuous Consumption Scale				Student Daily vs Other Consumption				
		M	Bivariate Est ^a (SE)	<i>p</i> ^a	Multivariate Est ^b (SE)	<i>p</i> ^b	%	Bivariate OR ^a (95% CI)	Multivariate OR ^b (95% CI)	<i>p</i> ^b
SCHOOL SOFT DRINK AVAILABILITY										
Regular	206	5422								
None		1.10	(ref)		(ref)		44.8	(ref)		
Any		1.13	0.020	0.833	−0.001	0.069	45.5	0.99	(0.75,1.31)	0.947
None	201	5323			(ref)		45.1	(ref)		
NDSH		1.16	−0.002	0.146	−0.040	0.108	45.8	0.88	(0.55,1.40)	0.585
DSH		1.11	0.027	0.107	0.022	0.078	45.2	1.06	(0.79,1.43)	0.696
Diet	206	5414								
None		0.45	(ref)		(ref)		18.7	(ref)		
Any		0.53	0.079	0.040	0.049	0.034	21.6	1.20	(0.98,1.46)	0.072
None	198	5089			(ref)		18.9	(ref)		
NDSH		0.54	0.069	0.057	0.033	0.053	20.6	1.07	(0.83,1.39)	0.592
DSH		0.51	0.063	0.044	0.153	0.042	21.7	1.19	(0.96,1.48)	0.118

Notes: Continuous scale values are 0(none); 0.5(<1 per day); 1; 2; 3; 4; 5.5 (5–6 per day); 7 (7+ per day). Daily consumption indicates consumption of 1 drinks vs none/<1 per day on average. Est. values indicate the average change across the secondary student population in mean value of consumption for a corresponding unit change in the student or school characteristic. OR shows the ratio of the odds of daily consumption occurring given school availability to the odds of it occurring without school availability for secondary students in general across schools.

^aBivariate model results

^bMultivariate model results controlling simultaneously for gender; student race/ethnicity; average parental education; percentage of students in school eligible for free and reduced-price lunch; region (South vs other); year; and grade

Est = linear regression estimates; NDSH = Not during school hours. DSH = During school hours.