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Beverage Advertisement Receptivity Associated with Sugary Drink Intake and Harm Perceptions among California Adolescents

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Abstract

Purpose: Evaluate associations of adolescents' beverage marketing receptivity with sugar-sweetened beverage (SSB) perceived harm and intake.

Design: School-based cross-sectional health behavior survey

Setting: Seven rural schools in California, 2019-2020

Subjects: 815 student participants in grades 9 or 10

Measures: Participants viewed 6 beverage advertisement images with brand obscured, randomly selected from a larger pool. Ads for telecommunications products were an internal control. Receptivity was a composite of recognizing, liking, and identifying the displayed brand (later categorized: low, moderate, high). Weekly SSB servings were measured with a quantitative food frequency questionnaire and perceived SSB harm as 4 levels ("no harm" to "a lot").

Analysis: Outcomes SSB intake (binomial regression) and perceived harm (ordered logistic regression) were modeled according to advertisement receptivity (independent variable), with multiple imputation, school-level clustering, and adjustment for presumed confounders (gender, age, screen time, etc.).

Results: In covariable-adjusted models, greater beverage advertisement receptivity independently predicted higher SSB intake (ratio of SSB servings, high vs. low receptivity: 1.48 [95% CI: 1.15, 1.89]) and lower perceived SSB harm (odds ratio, high vs. low receptivity: 0.59 [0.40, 0.88]). Perceived SSB harm was inversely associated with SSB intake.

Conclusion: Beverage advertisement receptivity was associated with less perceived SSB harm and greater SSB consumption in this population. Policy strategies, including marketing restrictions or counter-marketing campaigns could potentially reduce SSB consumption and improve health.

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All authors report that there are no conflicts of interest related to this research.

Keywords

Adolescent Health; Sugar-Sweetened Beverages; Marketing; Risk Perceptions; Nutrition; Health Behaviors; Adolescent Nutritional Physiological Phenomena; Marketing; Sugar-Sweetened Beverages

Purpose

Avoiding sugar-sweetened beverages (SSBs), such as regular (i.e., non-diet) carbonated soft drinks, fruit drinks, and sports or energy drinks, has clear health benefits. High SSB consumption is a common risk factor for obesity, diabetes, dental caries, and cardiovascular disease.[1-3] Globally, SSB consumption follows an inverse age gradient, with consumption declining throughout adulthood,[4] but leaving adolescents uniquely vulnerable. For example, US adolescents consume the highest levels of SSBs of any age group,[5] while also being the most heavily targeted demographic in food and beverage marketing.[6,7]

US food companies spend $1.8 billion annually to market products to youth and adolescents,[6,8] mostly to advertise unhealthy foods and drinks.[9] Advertising targeted to low-income and racial/ethnic-minority youth may contribute to observed health inequalities.[10] Adolescents display particular cognitive, emotional, and social characteristics that increase the likelihood of engaging in high-risk behavior. Despite these vulnerabilities, marketing regulations often focus on children under age 13,[11] and limited research exists on the exposure and influence of food marketing specifically to older adolescent populations.[12]

Adolescent's receptivity to SSB marketing, like tobacco marketing, spans from the initial message exposure, to noticing and remembering, to having positive affective responses and identification with particular brands.[13,14] For adolescents, particularly those most exposed to food and beverage advertisements, this marketing likely serves to promote and normalize unhealthy consumption.[15,16] Among adolescents, greater receptivity to advertisements has been demonstrated to predict subsequent behaviors,[13,14,17,18] and health outcomes.[15] Several tested instruments exist to measure tobacco, alcohol, and fast-food advertising receptivity, but to our knowledge, analogous advertising receptivity measures have not been applied specifically to non-alcoholic beverages.

The present study aims to implement a novel measure of adolescents' beverage marketing receptivity and investigate its association with SSB consumption and perceived harm. The hypotheses to be tested include that 1) greater receptivity to beverage advertising is associated with less perceived harm from SSBs; 2) greater receptivity to beverage advertising is associated with greater SSB consumption; and 3) greater perceived harm from SSBs is associated with lower SSB consumption (Figure 1). Findings have implications for informing policies and interventions appropriately tailored to adolescents, such as counter-marketing pro-health communication or restrictions on marketing unhealthy beverages.

Methods

Ethical Review

An Institutional Review Board at the University of California San Francisco reviewed and approved all study procedures. Participation required active, written parent/guardian informed consent and written student assent. Participating students received $10 credit to an online retailer. Schools received $300. Study reporting followed standard guidelines.[19]

Design and Sample

The present cross-sectional assessment features a subset of respondents who participated in the baseline wave of an ongoing cohort study of tobacco-related perceptions and behaviors among high school students in rural California, USA. The nesting study enrolled 1423 participants from 8 schools in central and northern California for in-school, computer-based surveys from March 2019 to February 2020. Eligible schools were located in municipalities with fewer than 50,000 residents and in counties below 1000 persons/square-mile in density. Schools were recruited purposefully based on expected levels of tobacco use and existing collaborative research relationships. All students in grades 9 or 10 at participating schools were eligible. At each school, survey administration occurred during sessions of a required ninth and tenth grade course. To shorten survey length due to limited classroom time, some survey sections, including items related to beverage advertising receptivity, were presented only to a subset of participants. In total, 815 participants from 7 schools completed the beverage advertising receptivity items and were included in this analysis.

Measures

Novel beverage ad receptivity measures were designed to quantify cued response to television and online advertisements airing at the time of the study. Items were based on prior instruments for alcohol and fast-food marketing receptivity.[15,17,18] Unlike uncued receptivity measures, in which respondents name their favorite advertisement without a visual prompt, cued instruments collect responses to existing advertisements. Here, relevant ads were identified using data from an advertising analysis company (MediaRadar) to catalog non-alcoholic beverage ads (television and online, including social media) that were classified as airing during adolescent-centric television programming or websites in the 6 months before the survey. From the 25 highest-spending non-alcoholic beverage brands, a pool of 32 still images from advertisements was created with brand names obscured. The image pool was refreshed with more recent ads in August 2019. Marketing receptivity score was averaged over 6 ads that were randomly displayed to each participant. For each ad, score consisted of having seen the ad (1 point), liking the ad (1 point), and correctly identifying the brand (free text-entry, 2 points), following previously used scoring methods.[15,17] As an internal control to decipher the specificity of ad receptivity for beverages, another pool of 14 telecommunications advertisements (i.e., cellular phones and service carriers) was analogously created from which participants were randomly shown 4 images. Telecommunications was chosen as a control category not for any specific aspect of telecommunications products or services, other than being widely familiar to adolescents and no expectation that receptivity to telecommunication advertising would influence beverage choices. We theorized that any observed associations of SSB intake or harm

perceptions with beverage ad receptivity (but not telecom ad receptivity) would provide stronger evidence (i.e., specificity) than associations holding for both advertising types, which could indicate only a link between advertisements and consumption, generally.

For analysis, beverage and telecom ad receptivity scores were placed in three categories via visual inspection of histogram plots for natural breaks. In this sample, for beverage ad receptivity (mean: 1.08, standard deviation: 0.69, range: 0-3.83, median: 1), category boundaries were 0-0.82 points (low), 0.83-1.82 points (moderate), and >1.83 points (high). There was internal consistency in receptivity scores for the beverage (Cronbach's alpha: 0.84) and telecom (Cronbach's alpha: 0.77) advertisements, and beverage and telecom ad receptivity scores were correlated (Spearman's rho: 0.31).

To assess perceived SSB harm, participants were asked "How much do you think people harm themselves when they have sugary drinks and sodas?" with options: no harm, a little harm, some harm, a lot of harm, and don't know (don't know excluded from analysis; 2.2% of responses). The 15-item Beverage Intake Questionnaire (BEVQ-15), a quantitative food frequency questionnaire, was used to measure routine consumption of 15 types of sweetened and unsweetened items and has been validated against 24-hour dietary recalls for adolescents.[20] Two modifications for age and geographic relevance were adding sweetened boba tapioca drinks in place of regular coffee or tea and placing sports drinks and energy drinks in separate categories. Appendix Table 1 shows the beverages included.

Covariables included in analysis were theorized as possible shared predictors of both advertising exposure and SSB intake. Investigators' judgement informed variable selection if supporting literature was not available. Covariables were gender, race/ethnicity, school grade (ninth or tenth), school performance (grades), maternal education attainment, reduced-price school lunch program participation (a marker of socioeconomic position, SEP), physical activity (days in the past week "physically active for at least 20 minutes that made you sweat or breathe hard"), screen time (daily hours of television and computer, phone, or gaming added from separate items), a combined score (range: 1-4) of sensation-seeking and impulsivity,[21] and current use (within past 30 days) of tobacco (including e-cigarettes), alcohol, and cannabis. Table 1 shows the specification of categorical variables. To reduce measurement bias, participants were reminded of the confidential nature of the study, and all items were pilot-tested at a separate school prior to study implementation. Two outlier beverage consumption observations (>4 SD above the next-highest observation) were excluded.

Study Size

The overall cohort was designed to have sufficient power to detect differences in tobacco-product perceptions, not specifically to address advertisement receptivity. As a post-hoc assessment, the present analytical sample, with n=296 classified as "low" beverage ad receptivity and n=147 classified as "high," would have 80% power at alpha=5% to detect a difference in weekly SSB consumption of 2.8 serving/week (SD=10), prior to accounting for intra-school clustering and multivariable analyses.

Analysis

Three models were used to test the three corresponding hypotheses, following our conceptual model (Figure 1). The objective 1 dependent variable, perceived SSB harm, was modeled using ordered logistic regression with main independent variables beverage and telecom ad receptivity. No violation of the parallel odds assumption was detected (Brandt test). SSB consumption (in servings/week), the objectives 2 and 3 dependent variable, was modeled using negative binomial regression for count data while allowing the mean and variance to differ. The objective 2 main independent variables were beverage and telecom ad receptivity. The objective 3 main independent variable was perceived SSB harm (4-level category). Adjusted models included all covariables listed above; objective 3 models additionally adjusted for ad receptivity (plausible shared antecedent of perceived SSB harm and consumption, Figure 1). Given the cross-sectional design of this study, we present results as associations, not necessarily causal effects or direct and indirect effects. Missing covariable data (3.2% of covariable values) were multiply imputed by chained equations (20 imputations) using the mi command suite in Stata 16.1. Only participants who reported which of the 12 beverages they typically consumed were analyzed, but missing values for days/week and times/day were imputed (0.4% of beverage values). Confidence intervals (95%) were adjusted for intra-school clustering using the clustered sandwich estimator.

Two sensitivity analyses were completed to check robustness of the findings related to SSB consumption and ad receptivity. A complete case analysis excluded observations with any missing values (listwise deletion). In an alternative specification, 100% fruit juice was reclassified as a SSB.

Results

Descriptive Findings

On average, participants consumed 8.4 SSB servings/week (SD=9.9; median=5); 80% of participants consumed ≥1 weekly SSB serving. After plain water (consumed by 78%), the most commonly consumed beverages overall were 100% fruit juice (47%), soda (45%), and sports drinks (40%) (Appendix Table 1). A majority of participants were in ninth grade, identified as female, as Hispanic/Latinx, and received free or reduced-price school lunch (Table 1).

Participants' sociodemographic characteristics, physical activity, and substance use behaviors were individually not statistically significantly different across categories of beverage advertising receptivity (Appendix Table 2). Although not statistically significant, numerically, participants with high beverage ad receptivity were more likely to have mothers with a college degree and report achieving mostly A's in school (Appendix Table 2).

Ad Receptivity and Perceived SSB Harm

Greater receptivity to beverage advertisements, but not telecom advertisements, was associated with lower perceived harm of sugar-sweetened beverages (Table 2). Adjusted for plausible confounders, participants with moderate beverage ad receptivity were at 0.7-times the odds of reporting a greater perceived harm category (95% confidence interval, CI: 0.7,

0.8) and participants with high beverage ad receptivity were at 0.6-times the odds (95% CI: 0.4, 0.9), compared to low-receptivity participants (Table 2).

Ad Receptivity and SSB Consumption

Greater receptivity to beverage advertisements, but not telecom advertisements, was associated with more SSB consumption (Table 3). Mean SSB consumption was higher with each rising category of beverage ad receptivity, from low (7.5 servings/week) to moderate (8.5) to high (10.0). Adjusted for plausible confounders, participants with moderate beverage ad receptivity reported consuming 1.2-times the number of weekly SSB servings (95% CI: 1.1, 1.4) and participants with high beverage ad receptivity consumed 1.5-times the number of servings (95% CI: 1.2, 1.9), compared to low-receptivity participants (Table 3). Numeric results were largely unchanged in sensitivity analyses (Appendix Table 3).

Perceived SSB Harm and SSB Consumption

Perceived SSB harm was inversely associated with SSB consumption (Table 4). Mean SSB consumption was lower with each rising category of perceived SSB harm, from no harm (11.1 servings/week) to a little (8.8) to some (7.9) to a lot (6.4). Adjusted for plausible confounders, including ad receptivity, participants in the highest category of perceived harm consumed 0.6-times the weekly servings of SSBs (95% CI: 0.5, 0.7) as those in the lowest perceived harm category (Table 4).

Discussion

This study found that beverage advertising receptivity was associated with less perceived SSB harm and greater SSB consumption. Results were specific to beverage advertising (vs. telecom ads), robust to sensitivity checks, and followed a stepwise pattern from low to moderate to high receptivity. In turn, lower perceived SSB harm was independently associated with greater SSB intake, consistent with a logical sequence in which advertising influences perceptions, which then influence behavior. These findings are significant given the severity of health consequences connected to consumption of added sugar, including increased risk of heart disease, diabetes, obesity, and tooth decay.[1-3]

Findings were consistent with previous research examining adolescents' consumption behaviors in relation to cued receptivity to marketing for alcohol and fast-food.[15,17] Advertising receptivity studies often build on the persuasive communication theoretical framework, positing that having a favorite ad indicates receptivity.[22] The present study measured responses to displayed images: further capturing elements of marketing (e.g., brand recognition and response) that likely drive consumer behavior. Total ad exposure was not directly measured but captured partly in asking respondents whether they had seen a particular advertisement. Future corroboratory studies may look for consistency using other measures of marketing receptivity and/or exposure.

The present study features adolescents in rural California. Results may not necessarily generalize to all adolescents. Studies from outside the United States suggest possible differences in how advertising exposure impacts health outcomes; for example, parents' television advertisement exposure was associated with child overweight status in rural, but

not urban, Vietnam.[23] We are unaware of similar differences in wealthy countries, where rural-urban economic and health disparities are less pronounced. Nonetheless, rural populations merit attention as understudied and generally under-resourced geographies. Urban-rural inequalities in obesity and chronic disease could be partially attributable to regional differences in food marketing[24] and limited access to supermarkets and healthy food options.[25] The generally worse socioeconomic context found in rural regions may also play a role in beverage consumption. In school-based data from 28 countries, lower school-level SEP was associated with consuming more soda and less fruit, independent of individual family-level SEP.[26] Geographically targeted television advertising for unhealthy foods has allowed for inequalities in marketing exposure, plausibly to the health detriment of low-income and racial/ethnic-minority youth.[10]

Urban-rural inequalities in youth SSB consumption have also been previously documented in California.[27] That same report demonstrated increasing SSB intake among adolescents, contrary to more promising trends among younger children.[27] In the present sample, 80% of participants consumed SSBs weekly, averaging more than one serving per day. This level of consumption would be sufficient for most adults to exceed World Health Organization guidelines for free-sugar intake.[28] Greatly reducing SSB among children and adolescents is a worthy policy goal for achieving recommended intake levels. Any such policy would run counter to extensive food and beverage industry marketing expenditures,[6,8] with wide-ranging evidence positively linking marketing to children's food and beverage preferences and consumption.[29,30]

California is also a setting of particular policy interest. In June 2018, the beverage industry successfully lobbied for statewide preemption of SSB taxes, placing a 12-year moratorium on any sweetened beverage taxes beyond those already enacted in a small number of urban communities.[31] With taxation a locally unavailable policy lever, other options are arguably of greater priority. The present findings that perceived SSB harm is both a predictor of SSB consumption and inversely associated with advertising receptivity gives credence to a public messaging approach.

Tobacco control strategies have successfully incorporated persuasive communication to increase adolescents' concern about the negative consequences of tobacco use and enhance public anger about misleading tobacco industry marketing tactics.[32] Similarly increasing adolescents' perceived harm of SSBs may influence adolescents' consumption intentions and behaviors. The marketing campaign "Pouring on the Pounds" in New York City and potential warning labels on SSB packaging and advertisements are two example approaches to increase public concern.[33,34] More social-justice oriented appeals to adolescents that incorporate critical appraisal of industry marketing tactics have shown promise in engaging minority youth in diabetes awareness and prevention.[35] These communications-oriented approaches can be combined with additional policy options, including taxation, restricting SSB availability in schools, content-labeling requirements, limiting government procurement, and marketing restrictions.[36]

Among study limitations, the cross-sectional design impedes definitive causal attribution of SSB perceptions and behaviors to marketing receptivity. Without an established temporal

sequence, it is possible that high SSB consumption led adolescents to like and recognize ads of the SSB brands they already consumed. Future work should examine longitudinal outcomes, as the present cohort is poised to do in upcoming survey waves. As another limitation, although analogous instruments have been implemented in this age group, the cognitive skill and attention required to complete the survey task may have underestimated receptivity among participants with limited reading proficiency. Finally, while social media advertisements were among the pool of potentially displayed images, the contracted advertising analysis company did not compile data across all social media platforms, including popular sites Facebook and Instagram.

Study strengths include the use of a telecom ad receptivity measure as an internal control for advertising receptivity, generally. In-person recruitment and survey administration likely enhanced representation of the schools enrolled. Findings were logically consistent, followed a gradient response, and were robust to sensitivity checks, increasing confidence in there being true underlying associations. Inclusion of both television and online ads increased the probability of displaying brands relevant to the adolescent population of interest.

To conclude, in this study of adolescents, beverage advertising receptivity was associated with less perceived SSB harm and greater SSB consumption. While the regional and cross-sectional features of this study limit generalizability and causal inference, respectively, the results nonetheless align with calls to view SSB marketing as a commercial determinant of chronic disease and health inequalities.[37,38] Policies to restrict SSB marketing, particular toward youth and adolescents, in addition to potential public messaging and counter-marketing campaigns, have potential to reduce adolescents' SSB consumption with subsequent improvements in health. Further engagement from the health professional, research, and public health communities could limit the influence of food and beverage industries on adolescent health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

US adolescents consume more sugar-sweetened beverages (SSBs) than any age group. Adolescents' receptivity to marketing for alcohol, tobacco, and fast-food is positively associated with their consumption of those products.

What does this article add?

This study presents a novel measure of cued receptivity to beverage advertisements, showing robust associations between greater advertising receptivity and greater SSB consumption and lower perceived SSB harm among adolescents in rural California.

What are the implications for health promotion practice or research?

With the caveats that the present findings are cross-sectional and from one geographic region, these results suggest that marketing influences SSB consumption in a manner that is specific to beverage advertisements and plausibly mediated through harm perceptions. These findings add further evidence of the commercial determinants of health and lend support to marketing restrictions and counter-marketing campaigns aiming to reduce SSB consumption and improve adolescent health.

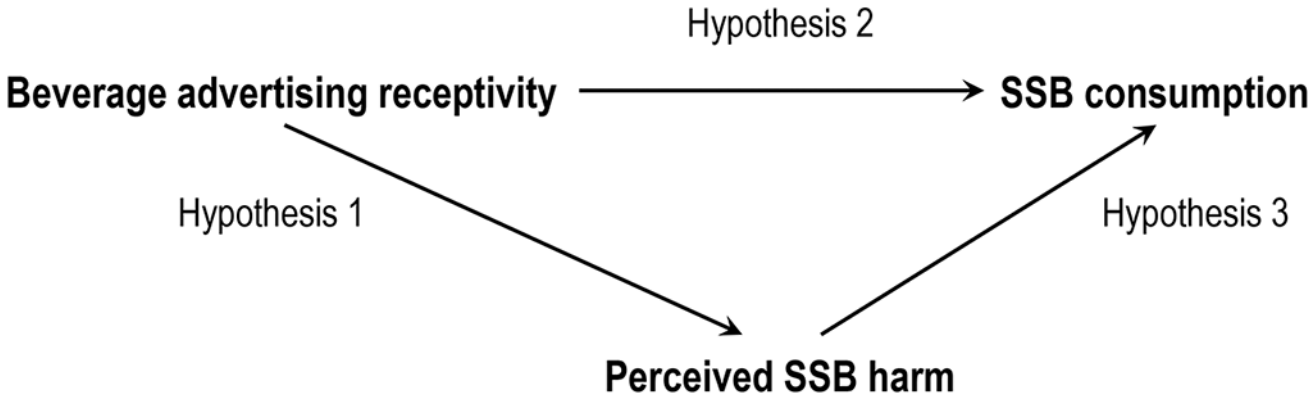

Figure 1. Study Objectives: Conceptual Diagram

The figure shows the assumed relationships between study concepts and the hypotheses to be tested. For hypothesis 1, beverage advertising receptivity is assumed to influence perceived SSB harm. In hypothesis 2, beverage advertising receptivity is similarly assumed to influence SSB consumption. In hypothesis 3, perceived SSB harm is assumed to influence SSB consumption. As a shared antecedent of perceived SSB harm and SSB consumption, beverage advertising receptivity is included in adjusted models to test hypothesis 3 as a plausible confounder of the SSB harm-consumption relationship.

Table 1.

Characteristics of the Study Sample

	Number[1] (%)	Mean (SD)
Age, years		15.2 (0.7)
Grade in School		
Ninth	430 (54.3)	
Tenth	362 (45.7)	
Gender		
Female	434 (53.9)	
Male	371 (46.1)	
Race/Ethnicity		
Hispanic/Latinx	463 (56.8)	
Non-Hispanic White	248 (30.4)	
Other	104 (12.8)	
Federal School Lunch Program		
Free or Reduced	408 (53.6)	
Full Price	237 (31.1)	
Don't Know	116 (15.2)	
Maternal Education		
College Graduate	208 (30.3)	
Less Than College Degree	479 (69.7)	
School Performance		
Mostly A's	272 (35.4)	
Mostly B's	326 (42.4)	
Mostly C's or Below	170 (22.1)	
Physical Activity		
0-1 days/week	76 (9.3)	
2-4 days/week	281 (34.5)	
5-7 days/week	457 (56.1)	
Past 30-Day Use:		
Alcohol	161 (19.8)	
Cannabis	145 (17.8)	
Tobacco	170 (20.9)	
Screen Time, hours/day		3.8 (2.2)
Sensation-Seeking/Impulsivity Score		2.4 (0.5)

1. Sample size may be less than the total (N=815) for some variables due to missing values

Abbreviation: SD = standard deviation

Table 2.

Perceived Harm of Sugar Sweetened Beverages According to Advertising Receptivity

	n	Perceived SSB Harm, % None	A Little	Some	A Lot	Unadjusted OR[1] (95% CI)	Adjusted OR[1,2] (95% CI)
Beverage Ad Receptivity							
Low	283	10.2	32.9	44.2	12.7	reference	reference
Moderate	366	9.0	39.9	44.0	7.1	0.78 (0.75, 0.81)	0.74 (0.67, 0.83)
High	147	12.2	43.5	37.4	6.8	0.60 (0.44, 0.83)	0.59 (0.40, 0.88)
Telecom Ad Receptivity							
Low	287	12.5	35.9	41.1	10.5	reference	reference
Moderate	332	6.9	39.8	44.9	8.4	1.11 (0.80, 1.54)	1.31 (0.89, 1.91)
High	177	11.9	38.4	41.8	7.9	0.92 (0.54, 1.55)	1.15 (0.60, 2.22)

[1]. Odds of perceiving a higher level of harm relative to reference (low receptivity) from ordered logistic regression models, variance adjusted for school-level clustering and multiple imputation for missing data

[2]. Adjusted for model covariables: gender, race/ethnicity, school grade, school performance, maternal education attainment, reduced-price school lunch program participation, physical activity, screen time, sensation seeking / impulsivity, and current use of tobacco, alcohol, and cannabis

Abbreviations: CI = confidence interval; OR = odds ratio; SSB = sugar sweetened beverage

Table 3.

Sugar Sweetened Beverage Consumption According to Advertisement Receptivity

		Weekly SSB Servings		Unadjusted Ratio[1] (95% CI)	Adjusted Ratio[1,2] (95% CI)
	n	Mean (SD)	Median (IQR)		
Beverage Ad Receptivity					
Low	296	7.5 (9.8)	4 (1, 10)	reference	reference
Moderate	372	8.5 (9.8)	5.5 (1, 12.5)	1.16 (1.01, 1.34)	1.22 (1.08, 1.38)
High	147	10.0 (10.1)	7 (2, 15)	1.37 (1.13, 1.66)	1.48 (1.15, 1.89)
Telecom Ad Receptivity					
Low	300	8.5 (10.4)	5.5 (1, 11.5)	reference	reference
Moderate	337	8.6 (10.1)	4 (1, 12.5)	1.01 (0.90, 1.14)	0.97 (0.83, 1.13)
High	178	8.0 (8.6)	5.5 (1, 12.5)	1.02 (0.94, 1.10)	0.95 (0.85, 1.06)

[1] Weekly beverage servings relative to reference group (low receptivity) from negative binomial models, variance adjusted for school-level clustering and multiple imputation for missing data

[2] Adjusted for model covariables: gender, race/ethnicity, school grade, school performance, maternal education attainment, reduced-price school lunch program participation, physical activity, screen time, sensation seeking / impulsivity, and current use of tobacco, alcohol, and cannabis

Abbreviations: CI = confidence interval; IQR = interquartile range; SD = standard deviation; SSB = sugar sweetened beverage

Table 4.

Sugar Sweetened Beverage Consumption According to Perceived Harm of Sugar Sweetened Beverages

		Weekly SSB Servings		Unadjusted Ratio[1] (95% CI)	Adjusted Ratio[1,2] (95% CI)
	n	Mean (SD)	Median (IQR)		
Perceived SSB Harm					
No Harm	80	11.1 (11.4)	8.5 (2, 16.5)	reference	reference
A Little	303	8.8 (8.7)	6 (2, 13)	0.82 (0.67, 1.02)	0.88 (0.65, 1.19)
Some	341	7.9 (10.4)	4 (1, 10.5)	0.69 (0.56, 0.84)	0.73 (0.61, 0.88)
A Lot	72	6.4 (8.1)	3 (0, 9)	0.58 (0.46, 0.73)	0.62 (0.54, 0.72)

1. Weekly beverage servings relative to reference group (no harm) from negative binomial models, variance adjusted for school-level clustering and multiple imputation for missing data

2. Adjusted for model covariables: gender, race/ethnicity, school grade, school performance, maternal education attainment, reduced-price school lunch program participation, physical activity, screen time, sensation seeking / impulsivity, current use of tobacco, alcohol, and cannabis, beverage ad receptivity, and telecom ad receptivity

Abbreviations: CI = confidence interval; IQR = interquartile range; SD = standard deviation; SSB = sugar sweetened beverage