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Sugar-Sweetened Beverage Consumption by Adult Caregivers and Their Children: The Role of Drink Features and Advertising Exposure

Michael Hennessy, PhD[1], Amy Bleakley, PhD[1], Jessica Taylor Piotrowski, PhD[2], Giridhar Mallya, MD, MSHP[3], and Amy Jordan, PhD[1]

Abstract

Objective. To examine how parents' beliefs about beverage attributes and exposure to sugar-sweetened beverage (SSB) advertising are associated with parents' and their children's SSB consumption. *Design*. Cross-sectional representative telephone survey of Philadelphia parents in households with children between the ages of 3 and 16 years. *Participants*. Three hundred and seventy-one randomly selected survey respondents. The response rate was 27% using the American Association for Public Opinion Research RR3 formula. *Main Outcome Measures*. SSB consumption, health ratings of SSBs, exposure to SSB ads, and exposure to anti-SSB public service advertisements. *Analysis*. Seemingly unrelated regression was used to correct for Type I error and significance levels were set at .05 or less. *Results*. Assessment of SSB "healthiness" was associated with the increased adult consumption of SSBs for three of the five SSBs and associated with children's consumption for all four SSBs with child consumption data. For both groups, ratings of SSB sugar and caloric content were not related to consumption. Adult exposure to SSB-specific advertising was related to consumption for three of five SSBs and two of four SSBs consumed by children. *Conclusions and Implications*. These results suggest that sugar and calories are not relevant to consumption, absent an explicit connection to a healthiness evaluation of SSBs.

Keywords

SSB advertising, SSB consumption, sugar-sweetened beverages (SSBs)

Consumption of sugar-sweetened beverages (SSBs) has increased in the United States (Bleich, Wang, Wang, Gortmaker, 2009; French, Lin, & Guthrie, 2003; Malik & Hu, 2011). SSBs, which include nondiet soda, fruit flavored drinks, energy drinks, sweetened teas, and sports drinks, account for an average of additional 205 calories per day (Briefel, Wilson, Cabili, & Hedley, 2013) among children and adolescents and are a leading contributor to added sugar among children of all age, racial/ethnic, and income subgroups (Reedy & Krebs-Smith, 2010). Research suggests that compared with other forms of calories, SSBs do not lead to feelings of satiety, but rather increases hunger levels, prompting food consumption after drinking SSBs (De Castro, 1993; Harrington, 2008). The association between the consumption of SSBs and obesity is an important research topic because temporal trends in childhood obesity correlate with increased consumption (De Castro, 1993; Rennie, Johnson, & Jebb, 2005), and prospective studies confirm a positive association between SSB consumption, weight gain (Berkey, Rockett, Field, Gillman, & Colditz, 2004; Ludwig, Peterson, & Gortmaker, 2001; Malik, Pan, Willett, & Hu, 2013), and health outcomes such as diabetes (Apovian, 2004; The InterAct consortium, 2013; Malik et al., 2010; Palmer et al., 2008). However, not all studies show an SSB–obesity association (Johnson, Mander, Jones, Emmett, & Jebb, 2007; Sun & Empie, 2007).

SSB research often takes an epidemiological approach, comparing consumption patterns across social and demographic categories such as race, gender, income category, and age of the consumer, which are variables that distinguish

[1]University of Pennsylvania, Philadelphia, PA, USA
[2]University of Amsterdam, Amsterdam, Netherlands
[3]Philadelphia Department of Public Health, Philadelphia, PA, USA

Corresponding Author:
Michael Hennessy, Annenberg Public Policy Center, University of Pennsylvania, 202 South 36th Street, Philadelphia, PA 19104, USA.
Email: mhennessy@asc.upenn.edu

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between individuals' SSB intake (Han & Powell, 2013; Hu, 2013; Storey, Forshee, & Anderson, 2006). Equally important is to identify modifiable factors that are useful for designing interventions to reduce family SSB consumption (Ebbeling et al., 2006; Kamath et al., 2008) and/or promote the consumption of more healthful beverages. As such, two potentially modifiable factors are parents' beliefs about beverage attributes and exposure to SSB-specific advertisements. Despite some research identifying beliefs associated with SSB reduction behaviors (Jordan, Piotrowski, Bleakley, & Mallya, 2012; Kassem & Lee, 2004; Zoellner, Estabrooks, Davy, Chen, & You, 2012), little is known about how parents perceive SSBs with regard to specific beverage attributes. However, there has been qualitative research that shows most Latino parents believe soda to be unhealthy, while some believe sports drinks like Gatorade to be healthy (Bogart et al., 2013). Although beverage attributes like taste and cost are important themes in understanding SSB consumption (Zoellner, Krzeski, et al., 2012), it is not clear how beverage attribute assessments are related to SSB consumption.

Compared with beliefs about SSB attributes, exposure to SSB advertisements is well-studied. Exposure to televised food and beverage advertising has been linked to children's food preferences and behavior (Dixon, Scully, Wakefield, White, & Crawford, 2007), and a cross-sectional study showed that children worldwide are exposed to intense television advertising of unhealthy foods (including SSBs) that feature child-focused persuasive techniques (Kelly et al., 2010). But past research has focused largely on children's exposure to SSB advertising (Dembek, Harris, & Schwatrz, 2013), while parents' exposure to advertising is rarely considered in analyses of children's consumption. From a public health perspective, it is important to understand the effect of advertising on parents because they often make the food and beverage decisions for their families (Grier, Mensinger, Shirley, Kumanyika, & Stettler, 2007). It is also necessary to assess parents' exposure to public service announcements/advertisements (PSAs) that encourage healthier beverage consumption practices (e.g., water, low-fat milk) because they have been shown to be effective (Reger et al., 1998). Here we use cross-sectional survey data to examine how beliefs about beverage attributes and exposure to SSB advertising are associated with SSB consumption. We also compare African American and non–African American respondents as past research that shows different patterns of SSB consumption between the two groups (Han & Powell, 2013; Storey, Forshee, & Anderson, 2006) as is the case here as well.

Method

The SSB Telephone Survey

The telephone survey targeted a representative sample of Philadelphia's households with children aged 3 to 16 years (N = 371). The survey company Social Science Research Solutions piloted the study with 25 respondents before implementation (these respondents were not included in the sample), which is standard practice for telephone surveys. The survey was fielded from February 13 through March 12, 2012. The survey included items on consumption of SSBs, which were self-reports for parents/caregivers and their reports for the selected child, assessments of beverage attributes for both SSBs and non-SSBs, measures of exposure to SSB and non-SSB media advertisements and SSB PSAs, items on behavioral intention to perform different behaviors to reduce or eliminate SSB consumption, and beliefs items about positive and negative outcomes of beverage marketing. The survey was approved by the institutional review boards of the University of Pennsylvania and the Philadelphia Department of Public Health.

The survey used a dual-frame (e.g., one for landlines and the other for cell phones) random digit dialing design. Potential respondents were asked for their county of residence and whether they were the parent or caregiver of a child between 3 and 16 years who lived in the household at least 4 days in an average week. In eligible households, one "target child" was selected using the following rules: If only one child met the age criteria that child was the target child. If two children met the criteria, the system randomly prompted the interviewer to select the younger or the older of the two as the target child. If there were three or more qualifying children, the target child was the child who had the most recent birthday. To maximize responses, Social Science Research Solutions did the following: (a) each nonresponsive number was contacted multiple times, varying the times of day and days of the week; (b) respondents were offered the option to set a schedule for a callback; and (c) trained interviewers recontacted households where initial interview attempts were met with refusals to convert them into completed interviews. The response rate was 27% calculated using the American Association for Public Opinion Research (2011) Response Rate 3 formula. The different response rates formulas used by the American Association for Public Opinion Research are available online (http://www.aapor.org/AAPORKentico/Education-Resources/For-Researchers/Poll-Survey-FAQ/Response-Rates-An-Overview.aspx).

Sample weights were constructed to adjust for differences in the probability of selection between listed households and the regular random digit dialing sampling frame, to adjust for any difference in nonresponse between the two landline frames, to adjust for the greater probability of selection for dual-frame users (households with both landlines and cell phones), and to balance the sample to known household estimates for the city. To adjust for demographic sampling differences in the two frames, the weights also reflected the household distribution for number of children and adults in the household, presence of an African American or Hispanic child in the household, and homeownership (owned vs. rented).

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Measures

SSB Consumption (Parent and Child). Adult SSB consumption was measured with the following item:

> I am going to read you a list of different beverages. For each one, I would like you to tell me how many servings—that is, cups, cans, or bottles—you have on an average day.

The item for the child was the following:

> I am going to read you the same list again. I would like you to tell me how many servings, that is, cups, cans, or bottles [Child's Name] has on an average day.

For both questions, the list of the following SSBs was randomly presented: soda not including diet soda, fruit drinks like Kool Aid, sweetened iced tea like Arizona iced tea, sports drinks like Gatorade, and energy drinks like Red Bull. This item was used in an earlier study done by the project team (Jordan, Piotrowski, et al., 2012) and retrospective daily or weekly recall measures like this are often used (Bere, Glomnes, te Velde, & Klepp, 2007; de Bruijn & van den Putte, 2009; Grimm, Harnack, & Story, 2004; Nelson, Neumark-Sztainer, Hannan, & Story, 2009; Rampersaud, Bailey, & Kauwell, 2003) when 1- or 2-day food diaries (e.g., as used in the NHANES; Bleich et al., 2009; Han & Powell, 2013) are not practical (as in the case of telephone surveys).

Beverage Attribute Perceptions. Beverage attribute perceptions were assessed using three questions. Using the same list of beverage items above, caregivers assessed each beverage on a scale from 1 to 10 on the extent to which they perceived it as *Very unhealthy* (1) to *Very healthy* (10), *Having no calories* (1) to *Having a lot of calories* (10), and *Having no sugar* (1) to *Having a lot of sugar* (10). These items were developed for the current project.

SSB Advertisement Exposure. To measure exposure to SSB advertisements, respondents were asked,

> How often have you seen or heard any advertisements for the following different kinds of beverages [the list of five SSBs were regular soda not including diet soda, fruit drinks, sports drinks, energy drinks, and sweetened iced tea] in the past week? This includes any ads you might have seen, heard or read on TV, radio, in print, on billboards, or the Internet [this second sentence was read only if necessary for clarification].

These items were identical to those used for an earlier project also funded by the Philadelphia Department of Health use to evaluate a 2-year media campaign (Jordan, Hennessy, Bleakley, Piotrowski, & Kydd, 2012). For analysis purposes, the percentage of respondents who saw at least one or more ad per week for each SSB type and also one or more ad per week for *any* SSB was calculated as well as dichotomous exposure to the five specific SSB ads listed above in the past week. This unprompted (Boles, Adelle, & Manhas, 2014; see their Table A2) exposure variable ranged from 0 for adults who reported seeing none of the specific SSB ads in the past week to 5 for those who saw all five SSB ads in the past week.

SSB Countermarketing PSAs. To measure exposure to SSB countermarketing PSAs, respondents were asked,

> How often have you seen or heard any public service announcements—or PSAs—that discourage people from drinking sugary beverages in the past week? This includes any PSAs you might have seen, heard or read on TV, radio, in print, on billboards, or the Internet.

If necessary, PSA was defined as "a health-related message that does not sell anything." The percent who saw one or more anti-SSB PSA per week was used.

Analytic Approach

A seemingly unrelated regression approach that estimates all equations for the caregiver and then the child sample simultaneously (Kennedy, 2003; Zellner, 1962) was used to predict consumption of SSBs. This controls Type I error given the sample size and the large number of regression analyses, that is, five consumption outcomes for parents and four consumption outcomes for target children (energy drinks had insufficient variation to include as an outcome for children). The predictors for adult consumption include beverage ratings, the number of specific SSB ads seen in the past week, exposure in the past week to a SSB countermarketing PSA, and race of the caregiver (African American vs. others). For child consumption, the child's age was an additional covariate. Analyses were conducted with Stata (StataCorp, 2013).

Results

Survey Respondents

Table 1 shows that 77% of parents were female and the average age was 40.5 years. The majority of the sample was African American (58%), and 47% of the respondents were married. Sixty-five percent of the respondents were mothers/stepmothers, and 32% of the target children were 3 to 6 years old, 31% were 7 to 11 years, and 38% were 12 to 16 years. Fifty percent of the target children were female.

SSB Consumption of Caregivers and Children

Table 2 shows the average daily consumption of each SSB. For adults, consumption of soda is highest and energy drinks the lowest. For children, fruit drinks have the highest consumption and sports drinks the lowest. Defining total SSB consumption as the sum of the five SSB values for adults and

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Table 1. Characteristics of Parents and Their Target Child.

Parents				
Female: 77%	Average age: 40.5 years [39.1, 41.2]	European American: 38%	African American: 58%	Asian American, Pacific Islander, or Native American: 4%
Marital status				
Married: 47%	Single: 33%	Widowed: 3%	Living together: 6%	Separated: 4%
Family role/position				
Mother/stepmother: 65%	Father/stepfather: 22%	Grandparents: 10%	Guardian, aunt/uncle, sister/brother, or "other": all 2% or less	
Target child				
Female: 50%	Average age: 9.4 [8.86, 9.98]	3-6 Years: 32%	7-11 Years: 31%	12-16 Years: 38%

Note. 95% confidence interval around the average age value in brackets.

Table 2. Average Servings per Day of Specific SSBs and Total SSBs by Parents and Target Child.

Group	Soda	Sweetened tea	Fruit	Sports	Energy	Total
Parents	0.89 [0.70, 1.08]	0.72 [0.56, 0.89]	0.59 [0.40, 0.78]	0.34 [0.21, 0.47]	0.06 [0.02, 0.10]	3.20 [2.74, 3.65]
Target child	0.57 [0.43, 0.71]	0.64 [0.48, 0.81]	0.83 [0.64, 1.03]	0.35 [0.25, 0.44]	[a]	3.27 [2.85, 3.70]

Note. SSBs = sugar-sweetened beverages. $N = 363$. 95% confidence intervals in brackets.
[a]Insufficient energy drink consumption data for target child.

the four SSB values for children, caregivers consumed an average of 3.2 SSBs per day, CI [2.7, 3.7], and their average report of target child consumption was 3.3 SSBs per day, CI [2.9, 3.7]. The polychoric correlation between soda consumption for adults and child was $\rho = .44$; for sweetened tea, $\rho = .71$; for fruit drinks, $\rho = .71$; and for sports drinks, $\rho = .46$ (all are statistically significant at <.05).

Figure 1 shows the averages of the three drink attributes for the five SSBs of interest and their ±1 *SD* range as an indicator of variability (with the distribution of these variables, this is more informative than the standard error of the averages, which are all quite small). With the exception of sports drinks, all of the patterns show low perceived healthiness ratings and high perceived sugar and calorie ratings. Caregivers' beliefs about sports drinks were more neutral. The polychoric correlations (ρ) between these three variables for soda were the following: healthiness and calories, $\rho = -.23$; healthiness and sugar, $\rho = -.32$; and calories and sugar, $\rho = .45$ (all are statistically significant at <.05). The correlations between the three ratings of the other SSBs were similar.

Figure 2 shows that 55% of adults reported at least one exposure per week to SSB countermarketing PSAs. In contrast, almost all adults saw at least one SSB ad in the past week.

Relationship Between SSB Perceived Attributes, SSB Ad Exposure, Respondent Characteristics, and Consumption

Regression analyses for caregiver and child are in Table 3. Perceived healthiness is associated with greater consumption of sweetened tea, fruit drinks, and sports drinks for adults and for consumption of *all* SSBs for children. In contrast, calorie and sugar ratings are not associated with consumption of SSBs for caregivers or children. Given the lack of variability in these two predictors (see Figure 1), this is not particularly surprising. The regression coefficients relating health ratings and consumption are substantial considering that each unit of positive health rating increases daily consumption by the coefficient scale factor (e.g., a health rating of 10 for fruit drinks would increase adult consumption by 2 servings per day and by 2.4 drinks per day for children).

Table 3 shows that SSB ad exposure is associated with SSB consumption for adults and children for some drinks. Exposure to SSB advertisements is associated with increased caregiver SSB consumption of soda, sweetened tea, and fruit drinks. For children's consumption, caregivers' SSB ad exposure is associated with greater consumption of sweetened tea and sports drinks. Exposure to countermarketing SSB PSAs is not related with consumption of SSBs for either group. After these results were estimated, interactions between SSB ad exposure and health ratings for the four outcomes, where both SSB exposure and SSB ratings were statistically significant, were estimated. As noted in Table 3, none of these interactions were discernible from zero. Finally, African American caregivers report greater consumption (from a quarter to half a serving) of soda, fruit drinks, and sports drinks for themselves and sweetened tea and fruit drinks for their children compared with non–African Americans. Age of the target child shows a positive relationship between soda and sports drinks.

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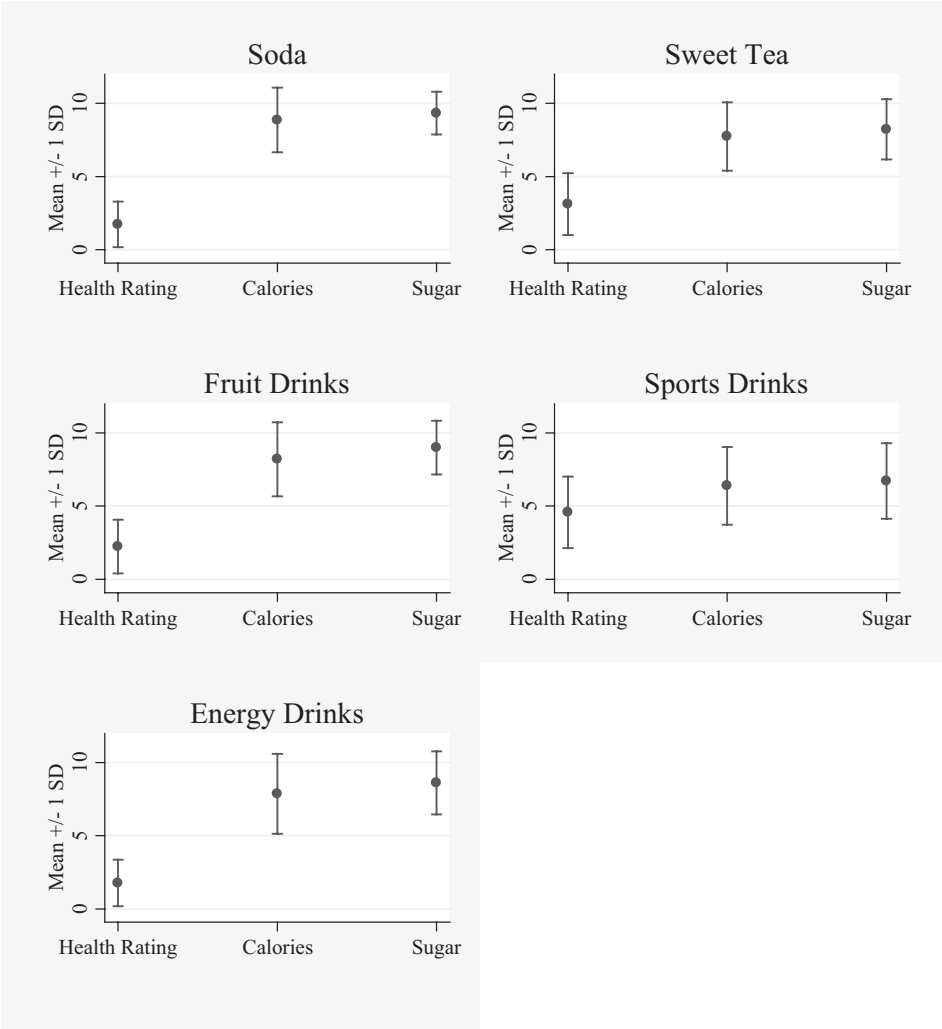

Figure 1. Average parent attribute evaluations healthiness, caloric content, and sugar content of specific SSBs.
Note. SSBs = sugar-sweetened beverages. All ratings coded 0 to 10.

Discussion

Evaluations of SSB beverages are generally accurate: Parents perceived SSBs as unhealthy and high in sugar and calories. The exception is sports drinks. While non–sports drink SSB advertising generally ignores the sugar and calorie content (except for diet soda), sports and energy drinks are promoted though sporting imagery and exemplars of successful competitive advantage (Chiou, Wu, & Lee, 2012; Miller, 2008; Roberson, 2005; Wimer & Levant, 2013). Thus, these drinks are linked with athletics and physical activity that may convince parents that they have positive effects on health and physical endurance. Intervention and health communication initiatives should specifically target the healthfulness of sports drinks, especially because consumption of sport drinks among adolescents tripled between 1999 and 2008 (Han & Powell, 2013).

Assessments of SSB beverages were associated with consumption by both the parent and child. In particular, perceiving SSBs as healthy drinks was associated with the increased parental SSB consumption for three of the five SSBs and with children's consumption for all four SSBs. While 55% of parents in our sample reported seeing or hearing a PSA for healthy drinks, 96% recall seeing an SSB ad. However, there is no evidence to show if any of the 55% changed their preference or behavior to a more healthy drink after seeing or hearing the PSA.

These results suggest that SSB reduction campaigns should work to reduce the belief that SSBs are a healthy drink and/or part of a healthy lifestyle. Although the average ratings of healthfulness were low, health ratings were related to SSB consumption, while the ratings of sugar and caloric content were unrelated. This result is important to note

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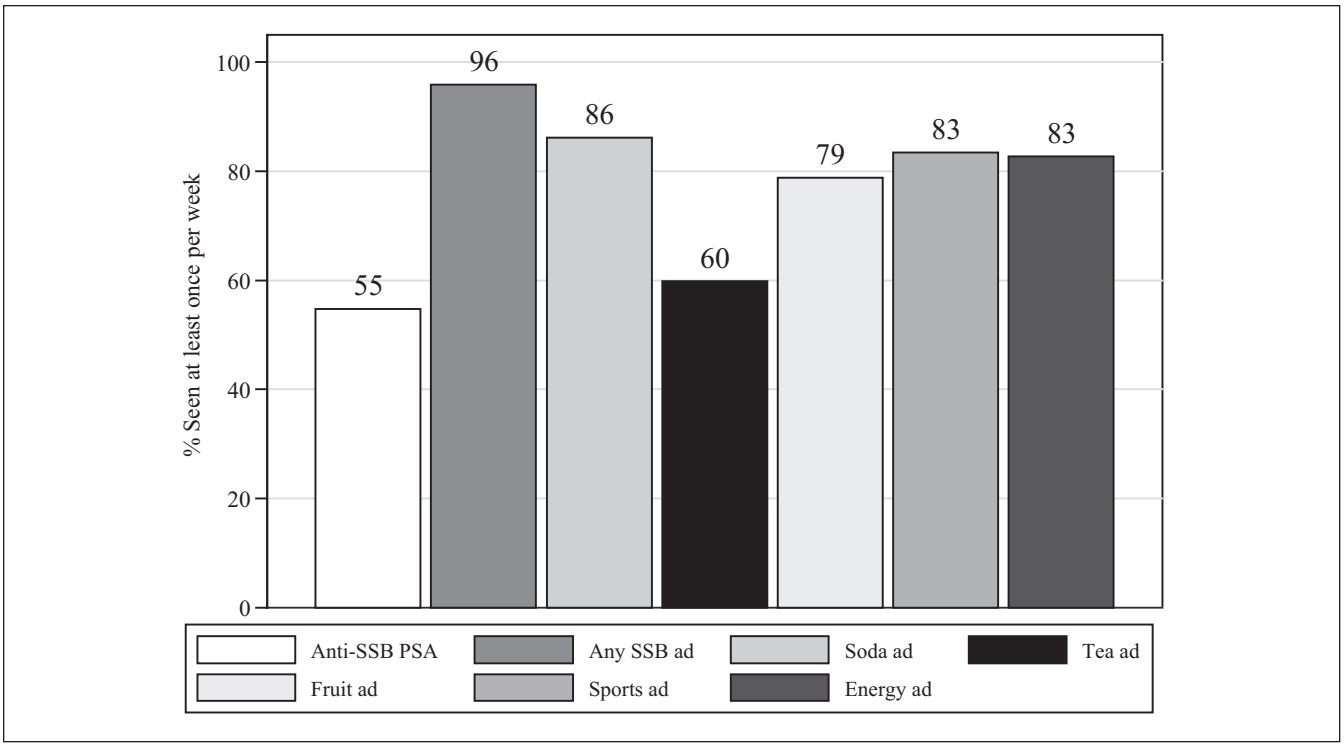

Figure 2. Parents' exposure in a week to anti-SSB PSAs and SSB advertising.
Note. SSB = sugar-sweetened beverage; PSAs = public service announcements/advertisements.

because many anti-SSB messages emphasize the amount of sugar in these drinks. Our results suggest that calories and sugar alone are not that relevant to consumption, absent an explicit connection to a healthfulness evaluation of different SSBs. As Figure 1 shows, Philadelphia parents know that SSBs are filled with sugar and calories.

Although most adults recognize the persuasive intent behind SSB advertising, exposure is nevertheless associated with their own behavior and their children's behavior. Educating caregivers about how advertisers can affect their behavior as well as their child's behavior may be a useful direction for reducing the effects of advertising. Exposure to countermarketing SSB advertisements, on the other hand, was not associated with decreased SSB consumption for either parents or their children. This is perhaps due to the volume of SSBs ads compared with the relatively few countermarketing ads. In addition, the anti-SSB exposure responses may be significant overestimates of usual exposure because at the time of the survey, the Philadelphia Department of Public Health was implementing the final month of a 16-month mass media campaign highlighting the health risks of SSBs that targeted Philadelphia parents of young children.

Study Limitations

Although health rating and advertising exposure is associated with consumption, we are unable to determine the causal direction of this relationship: It may be that those who consume more SSBs pay greater attention to SSB advertisements (Hamilton & Nickerson, 2003) and vice versa because of the process of selective exposure (Slater, 2007, 2014). Our drink measure is not size standardized and we were unable to calculate the metric quantity ingested, so "servings" might be underestimated but the effect of this bias is to underestimate total SSBs. In addition, other researchers might include a different list of SSBs, but lengthening the SSB list increases respondent burden. For example, in our earlier studies (Jordan, Hennessy, et al., 2012; Jordan, Hennessy, Bleakley, Piotrowski, & Kydd, 2011-2012; Jordan, Piotrowski, et al., 2012) we included flavored milk as an SSB, but it was very rarely reported.

We know that caregivers underreport SSB consumption by their children outside the home (Briefel, Wilson, & Gleason, 2009) but nonreactive measures of SSB consumption (e.g., analysis of household garbage, collection of sales receipts to track purchasing) also have their obvious limitations. It is also possible that other adults/caregivers in the household would report differently for the target child, but collecting responses from more than a single respondent is not feasible using telephone surveys. Last, the sampling design does not allow generalizability to the larger population of American parents as it is focused on African American and non–African American caregivers with children, but may apply to other urban areas that have similar racial/ethnic compositions.

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Table 3. Predicting Consumption From SSB Attributes, Recent SSB Ad Exposure, Recent Anti-SSB PSA Exposure, and Caregiver and Target Child Characteristics.

Dependent variable: SSB consumption per day for parents (N = 342)					
Predictor	Soda	Sweetened tea	Fruit	Sports	Energy
Health rating	.06	**.11**	**.20**	**.09**	.04
Calorie rating	−.11	.02	−.04	.03	.00
Sugar rating	−.06	−.06	−.04	−.04	.007
Weekly SSB ad exposure	**.24**	**.13**	**.13**	−.05	.02
Anti-SSB PSA exposure	.03	−.21	.07	.05	−.03
African American caregiver	**.52**	.24	**.41**	**.24**	−.03
R^2	.16	.16	.17	.08	.02
Dependent variable: SSB consumption per day for target child (N = 347)					
Predictor	Soda	Sweetened tea	Fruit	Sports	Energy[a]
Health rating	**.10**	**.11**	**.24**	**.05**	—
Calorie rating	−.05	.003	−.02	−.03	—
Sugar rating	.02	−.09	−.10	−.004	—
Weekly SSB ad exposure	.08	**.09**	.09	**.06**	—
Anti-SSB PSA exposure	.04	−.18	−.18	−.16	—
African American caregiver	.23	**.48**	**.39**	.03	—
TC age[b]	**.05**	.03	−.001	**.04**	—
R^2	.14	.16	.22	.13	—

Note. SSB = sugar-sweetened beverage; PSA = public service announcement/advertisement; TC = target child. Bold coefficients significant at the .05 level or less, two-tailed test. All five equations for parents and the four equations for target children estimated simultaneously. R^2 estimated from single equation, ordinary least squares estimation for each outcome.
[a]Insufficient energy drink consumption data for target child. [b]Only included in regressions for target child's SSB consumption.

Implications for Practice

There is now strong, empirical evidence linking SSB consumption to overweight in both adults and children (Woodward-Lopez, Kao, & Ritchie, 2011). Studies like this one help move beyond the epidemiological to begin to identify the behavioral and psychosocial determinants of consumption, especially for children (Bere et al., 2007). Our focus here was on parental beliefs and exposure to SSB advertising because like SSB consumption in general, trends in advertising to children (for both SSB and non-SSB produces) positively track the historical increase in obesity rates (Harris & Sarda, 2011). Our survey of caregivers and their children suggests that SSB consumption levels are highly correlated, caregivers' health assessments of SSBs are generally accurate, and higher perceived health ratings and SSB ad exposure are associated with consumption.

What is not well understood is how parental beliefs (Tipton, 2013; Zoellner, Krzeski, et al., 2012) operate through the appropriate mediators (Holbert & Stephenson, 2003) to determine child consumption. Empirical studies suggest a number of potential mediators including parenting practices (De Coen et al., 2012), descriptive norms concerning perceived SSB consumption by others (Perkins, Perkins, & Craig, 2010), the family food environment (Wijtzes et al., 2013), parental nutritional knowledge (Vereecken & Maes, 2010), and parenting style (van der Horst et al., 2007). A smaller set of studies (Kassem & Lee, 2004; Zoellner, Estabrooks, et al., 2012) begin with a well-established theory (the reasoned action approach; see Ajzen, 2012) and then model proposed mediational variables such as parenting influence (de Bruijn, Kremers, de Vries, van Mechelen, & Brug, 2007; Hewitt & Stephens, 2007) and habit strength (Tak et al., 2011) within this theoretical context. Findings from this study provide directions for interventions by identifying important parental beliefs—highlighting the unhealthiness of SSBs instead of caloric or sugar content—in countermarketing campaigns to reduce SSB consumption by adults and children.

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