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Do You Know What Your Kids Are Drinking? Evaluation of a Media Campaign to Reduce Consumption of Sugar-Sweetened Beverages

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Abstract

Objective: This study evaluates a citywide media campaign that targeted reducing sugar-sweetened beverage (SSB) consumption as a strategy for addressing obesity.

Design: Rolling cross-sectional survey data, collected before and during the media campaign, with 1367 parents to assess exposure to and effect of a televised public service advertisement (TV PSA) developed using a reasoned action approach.

Setting: Televised public service advertisement campaign created by the Philadelphia Department of Public Health and disseminated on cable television channels within the Philadelphia market.

Participants: Philadelphia parents/primary caregivers with a child between the ages of 3 and 16.

Results: Linear regression analysis shows that exposure to the TV PSA was significantly associated with intention to substitute nonsugary drinks for SSBs for the parent ($P = .04$) and the child ($P = .02$). The effect of exposure on intention to reduce child's SSB consumption increased the longer the campaign was in the field. Exposure was also significantly associated with the belief that reducing SSB consumption decreases the risk of diabetes ($P = .04$) and was significantly negatively related to the belief that reducing SSB consumption would make mealtimes less enjoyable ($P = .04$).

Conclusion: These findings suggest that a theory-based mass media campaign can achieve positive changes in intention related to SSB consumption by changing relevant and salient underlying beliefs.

Keywords

nutrition, prevention research, sugar-sweetened beverages, childhood obesity, health communication, media campaign

Introduction

Obesity among children aged 6 to 19 years in the United States has tripled in the past 3 decades, with nearly 1 in 5 children and adolescents in this age group obese.[1] Although recent research indicates that obesity levels are beginning to decline among low-income preschoolers (ages 2-5),[2] approximately 9 million children in the United States are overweight or obese.[3] Childhood obesity is often the result of a confluence of factors, including genetics, physical activity, sedentary behavior, and poor nutritional practices,[4,5] and is associated with a host of chronic diseases that were once rare in childhood, including type 2 diabetes, high blood pressure, and hyperlipidemia.

Despite recent declines in some communities,[6,7] sugar-sweetened beverage (SSB) consumption has increased dramatically since 1988, with SSBs contributing 10% to 15% of total calories to the diets of children and adolescents, respectively.[8] These calories add up to an average daily intake of 91 calories for preschoolers, 157 calories for school-age children, and 245 calories for adolescents.[9] For children who are obese, SSBs add as many as 500 calories per day. One study estimates that 20% of the weight gain among the US population over the last 30 years can be attributed to SSB consumption.[10] Sugar-sweetened beverages are particularly pernicious because

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consuming them does not produce a feeling of satiety that would lead to reduced caloric intake,[11] as would consumption of a candy bar or other nonnutritive food. Moreover, studies in which SSB consumption is limited and replaced with noncaloric beverages, such as water, have found a beneficial effect on weight management.[12,13]

The use of media messages aimed at parents in promoting health behaviors has a long history[14-17] and has been shown to be reasonably effective. According to a meta-analysis of 48 health behavior campaigns, on average, approximately 9% more people perform the behavior after campaign exposure (an effect size similar to in-school or clinic-based interventions).[18] The challenge with a behavior like reducing children's sugary drink consumption is that such messages are easily drowned out by the heavy marketing of soda, sports drinks, energy drinks, and juice drinks. A Rudd Center for Food Policy and Obesity report highlights the fact that beverage companies spent $948 million in 2010 to advertise sugary drinks and energy drinks, exposing children and adolescents to hundreds of ads for SSBs.[19] For this reason, experts recommend that health campaign messages be carefully tailored to the concerns of the target audience in order to increase the likelihood that they will be attended to and recalled in such a cluttered environment.[20]

This article presents an evaluation of a US media campaign designed to reducing SSB consumption. This campaign was part of a larger initiative called *Get Healthy Philly*, funded, in part, by the Centers for Disease Control and Prevention. The campaign aimed to decrease children's SSB consumption by raising parents' awareness about the amount of sugar in these drinks and highlighting the health risks/costs associated with consumption of sugary drinks, particularly weight gain and type II diabetes. The campaign messages were targeted to Philadelphia parents of children aged 3 to 16.

The *Get Healthy Philly* campaign messages were designed based on the principles of reasoned action theory.[21,22] The reasoned action approach, widely used in communication, public health, advertising, and psychology, suggests that one's *intention to perform a specific behavior* (the "target behavior") is the best predictor of behavior.[23-25] Intention is a function of one's favorableness toward personally performing the behavior (ie, attitude), perceptions about what others think and do with regard to performing the behavior (ie, normative pressure), and beliefs about the ability to perform the behavior assuming that one wanted to do so (ie, self-efficacy and control).[26] Each of these constructs is influenced by a corresponding set of salient underlying beliefs based on expectancy value theory.[27]

This article examines whether the effects of exposure to the televised public service advertisement (TV PSA) were related to parents' intention to reduce their child's SSB consumption by substituting with nonsugary drinks. Such an evaluation is critical to determining whether and how exposure to the campaign message influenced parents' beliefs about SSBs and can provide important direction for subsequent efforts to create persuasive parent-oriented nutrition-related messages. While the *Get Healthy Philly* initiative had multiple media components (including radio, transit, and web), in this article, we focus on the TV PSA because it was the only medium in which the message remained constant through the entire campaign (ie, the other media used alternating messages throughout the 13-month period).

Research Questions

RQ1: What was the reach of the TV PSA among Philadelphia parents?

RQ2: Was exposure to the TV PSA associated with intention to reduce sugary beverages for the respondent and the target child over time?

RQ3: What changes in relevant underlying beliefs were associated with TV campaign exposure over time?

Methods

We used a series of telephone surveys over a 15-month period in a rolling cross-sectional design to monitor exposure to the campaign and assess SSB-related beliefs and intention to reduce consumption. The telephone survey was fielded by Social Science Research Solutions (SSRS) and was conducted in English using a computer-assisted telephone interviewing system. Respondents were selected using random digit dialing and random selection from a publicly available list of Philadelphia households with a greater likelihood of containing a child within the targeted age of 3 to 16. The list was from the InfoUSA directory, which is sampled for SSRS by Marketing Systems Group. There were 9 waves of data collection at intervals of approximately every 6 weeks between January 2011 and March 2012. Wave 1 was conducted in January, 1 month prior to the implementation of the campaign and the airing of the TV PSA. The average length of the survey was 16.5 minutes, and the average response rate for eligible respondents was 33%. Approximately 151 respondents were interviewed per wave, resulting in a total of 1367 respondents across the 9 waves. Since the vast majority of the respondents identified as a parent or stepparent (see below), we use the term "parent" here to refer to the respondents. We use the term "target child" as the survey asked the parents with more than 1 child in the household to focus their answers on the child with the most recent birthday. All results reported here are weighted for race, ethnicity, home ownership status, and household size to reflect the population of Philadelphians with children aged 3 to 16. All procedures involving human participants for this study were approved by the institutional review boards of The University of Pennsylvania and the Philadelphia Department of Public Health. Verbal consent was obtained from all respondents and was indicated in written records.

Because the survey data were independent samples at each wave, we pooled the data and analyzed the combined data file. To justify the pooling, we evaluated the null hypothesis that all the waves of the data were identical except for sampling error.

The null hypothesis assumes that the waves are not different in terms of certain variables (see below), and a common mean, variance, and covariance *over all the waves* are an adequate substitute for different values of each parameter at each wave. So if the null hypothesis is not rejected, we can pool the data because the data would not be time-dependent. We used 4 demographic variables that could not be affected by the SSB campaign (household income, African American parent, target child age, and female parent) and assumed that the means, variances, and covariances of these variables are the same for each of the 9 waves of data. These 4 variables represent 14 parameters (4 means, 4 variances, and 6 covariances), with 9 waves resulting in 126 possible parameters. The null hypothesis was not rejected: a non-time-dependent mean, variance, and covariance model fit the data well: $\chi^2 = 120$, $df = 112$, $P = .29$, Comparative fit index = .93, Root mean square error of approximation = .023. Thus, the data were pooled into a single file.

Public Service Advertisement Description

Formative evaluation using the theory of reasoned action revealed that, while norms and self-efficacy did not influence intention, several key attitudinal beliefs did influence intention.[22] These beliefs were that cutting back on SSBs could help prevent weight gain, decrease risk of type 2 diabetes, and make the parent feel he/she was doing something good for the family. The televised PSA message was therefore designed to emphasize these beliefs.

In this PSA, a mother is shown driving in a car with her overweight preadolescent son after a checkup with his pediatrician. She says to herself: "Doctor says he's overweight? . . . And at risk of diabetes?" A voice-over announces: "4 in 10 Philadelphia children are overweight or obese, increasing their risk of diabetes." The mother looks at a soda and a sport drink in the cup holder, shakes her head, and says: "That stuff doesn't help." A voice-over states "Sodas and fruit drinks are a big part of the problem. One soda has as much sugar as 2 candy bars." The mother resolves to herself, "We'll fix this. Just wish I'd known sooner." The tag line was, "Do you know what your kids are drinking?"

The 30-second PSA ran on cable television from February 2011 to March 2012 on channels with high viewership among the target audience of low-income and African American caregivers of young children living in Philadelphia. The sponsors had sufficient resources to achieve 700 to 1700 total rating points per quarter, equaling levels recommended by the Centers for Disease Control and Prevention.[28]

Measures

Television PSA exposure. Exposure to the television PSA was evaluated with 2 questions. First, participants were read the following statement "In a television ad, we see a mother and son driving. The mother had just learned from the doctor that her child is overweight and at risk of diabetes. The ad states "1 soda has as much sugar as 2 candy bars". Do you recall ever seeing this ad?" If the respondent answered affirmatively, a follow-up question was asked: "In the past month, how often have you seen this ad? Would you say about every day, several times a week, about once a week, less than once a week, or you haven't seen this ad in the past month." Given concerns about possible recall issues as well as the inconsistent spacing of the 9 waves of data collection, television exposure was reduced to dichotomous response option (yes/no).

Attitude. The *attitude* items[29] used the stem of: "Do you think that (substituting/continuing to substitute) [target child's name] sugary drinks with nonsugary drinks in the next month would be/will be:" The semantic differential items were complicated/simple, bad/good, foolish/wise, and harmful/beneficial. The polychoric α for the index was .93 (mean = 2.75, confidence interval: 2.72 2.78, range: 1-3).

Behavioral beliefs. The underlying behavioral belief (ie, outcome expectancies) items used the stem: "If you (substitute/continue to substitute) [target child's name] sugary drinks with nonsugary drinks in the next month, it would . . . " The outcomes were derived from formative evaluation[22] and included: (1) help prevent your child from gaining weight, (2) make eating meals less enjoyable, (3) improve your child's sleep, (4) make your child unhappy, (5) make you feel like you were doing something good for your family, and (6) decrease the risk of your child developing diabetes. Each of the outcome expectancies was recoded into likely (1) or unlikely/neither likely nor unlikely (0).

Intention to reduce SSB consumption. Intention was measured by asking: "In the next month, how likely is it that you will substitute your sugary drink with nonsugary drinks?" The same question was asked with respect to substituting the target child's sugary drinks with nonsugary drinks. Intention was coded on a 1 to 7 scale (1 = very unlikely; 7 = very likely).

Statistical Analysis

For scale construction, we use the polychoric α because of the ordinal nature of the scale items. We use linear regression analysis and logistic regression with nonlinear time variables and covariates to predict our outcomes. We then plot the conditional effect of exposure adjusted for the covariates using the *marginsplot* command available in STATA. All analyses were conducted with STATA version 13.[30]

Results

Demographics of the sample are found in Table 1.

RQ1: What Was the Reach of the TV PSA Among Philadelphia Parents?

Figure 1 shows self-reported exposure to the TV message over time. Exposure at each wave is significantly different (higher) than exposure measured at baseline. Exposure to the televised

Table 1. Demographic Characteristics of Sample.[a]

Demographic Characteristic	% or Mean (SD)
Parental relationship	
Mother/stepmother	69.0%
Father/stepfather	19.0%
Other family member	12.0%
Respondent race/ethnicity	
African American	54.0%
White	35.0%
Hispanic	9.0%
Other	2.0%
Age of respondent, years	42.5 (9.90, range: 18-77)
Household income $60 000 or less	61%
Gender of target child	50% male
Age of target child, years	9.66 (4.13, range 3-16)

[a]Unweighted; N = 1367.

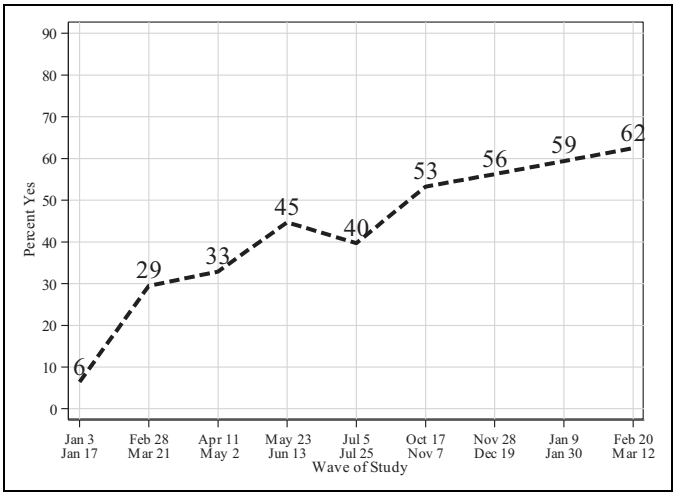

Figure 1. Percentage of survey respondents reporting exposure to TV media message (N = 1367).

PSA consistently increased from wave to wave and was more than 60% at the last data collection point. Respondents reported seeing the PSA an average of 4 days in the past month.

RQ2: Was Exposure to the TV Message Associated With Intention to Substitute Nonsugary Beverages for Sugary Beverages for the Respondent and the Target Child?

To test whether or not being exposed to the campaign was related to intention to substitute SSBs with non-SSBs as the campaign progressed, we conducted regression analyses that estimated the nonlinear interaction between TV exposure and wave of the campaign for both intention outcomes. The nonlinear model is inherently more plausible given the length of the campaign and is consistent with the pattern of exposure shown in Figure 1. The regression also included control variables for parent race, education, and age. The regression predicting intention to reduce the target child's consumption also included the age of the target child.

Figure 2 indicates that there is a significant interaction between PSA exposure and time (ie, study wave) on parent intention to reduce their own consumption of SSBs as well as intention to reduce target child's consumption. As the campaign progressed, parents who were exposed to the anti-SSB PSA in the later study waves had significantly greater intention to substitute SSBs with non-SSBs for their child ($P = .02$) and for themselves ($P = .04$).

RQ3: What Changes in Relevant Underlying Beliefs Were Associated With TV Campaign Exposure Over Time?

As noted earlier, the PSA highlighted 3 kinds of beliefs that formative evaluation showed was associated with intention to limit children's SSB consumption (that it would help prevent weight gain and diabetes risk and that it would make the parent feel like they were doing something good for the family). We also asked about other positive and negative beliefs that were not included in the campaign, including whether substituting with non-SSBs would improve sleep, whether it would make the child unhappy, and whether it would make meals less enjoyable. Thus, we look at these behavioral beliefs individually to determine whether exposure to the TV message is associated with these specific beliefs. To investigate this interaction, we use logistic regression to estimate the predicted probabilities because the outcomes are dichotomies.

Figure 3 shows the results for the specific beliefs across the 9 waves. The 3 beliefs integrated into the PSA message show the expected pattern. Parents who saw the PSA were significantly more likely to believe that reducing their child's SSB consumption would reduce the risk of diabetes ($P = .04$). Though not significant, parents who were exposed to the TV PSA were more likely to agree that substituting SSBs for non-SSBs helps prevent weight gain ($P = .39$) or do good for their family ($P = .08$) when compared to those who were not exposed. For the latter outcome, note that there are certainly ceiling effects operating that would make this behavioral belief very difficult to increase.

Three beliefs that were not addressed in the message were also examined in relation to the PSA exposure. Parents *not* exposed were significantly more likely to think that substituting with non-SSBs would make mealtime less enjoyable ($P = .04$). Though not significant, parents not exposed were also more likely than exposed parents to think that substituting with non-SSBs would make their child unhappy, while exposed parents were more likely to think that substituting with non-SSBs would improve their child's sleep. Full regression results for research questions 2 and 3 are presented in Table 2.

Discussion

The *Get Healthy Philly* campaign was a theory-driven media campaign to raise awareness among parents about the negative health consequences associated with SSB consumption and to influence their intention to substitute SSBs with non-SSBs for themselves and their child. By the end of the

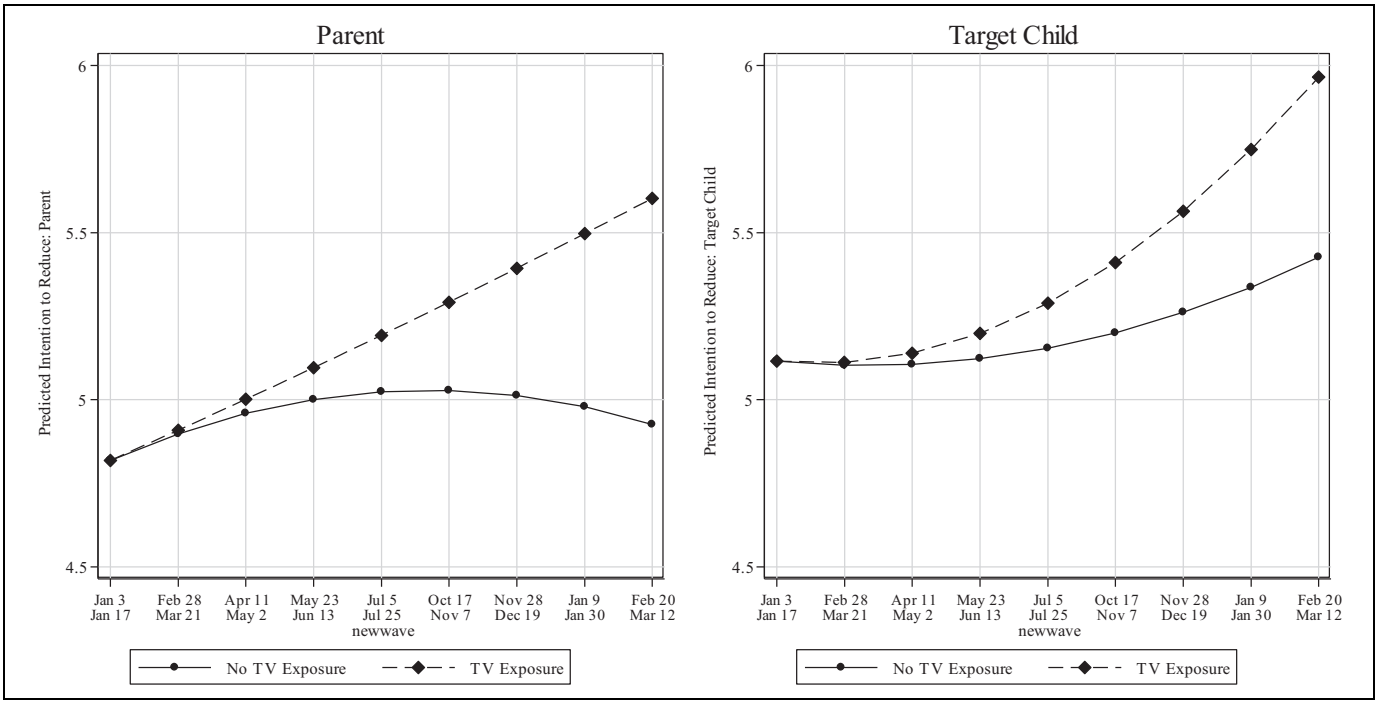

Figure 2. Parent intention to substitute non–sugar-sweetened beverages (SSBs) for SSBs by public service advertisement (PSA) exposure and wave. n = 1328 for parent intention; n = 1325 for target child intention. Nonlinear interaction between time and exposure significant for both parent ($P = .04$) and target child ($P = .02$) intention. Parent results adjusted for education, race, and age. Target child results also adjusted for age of the target child.

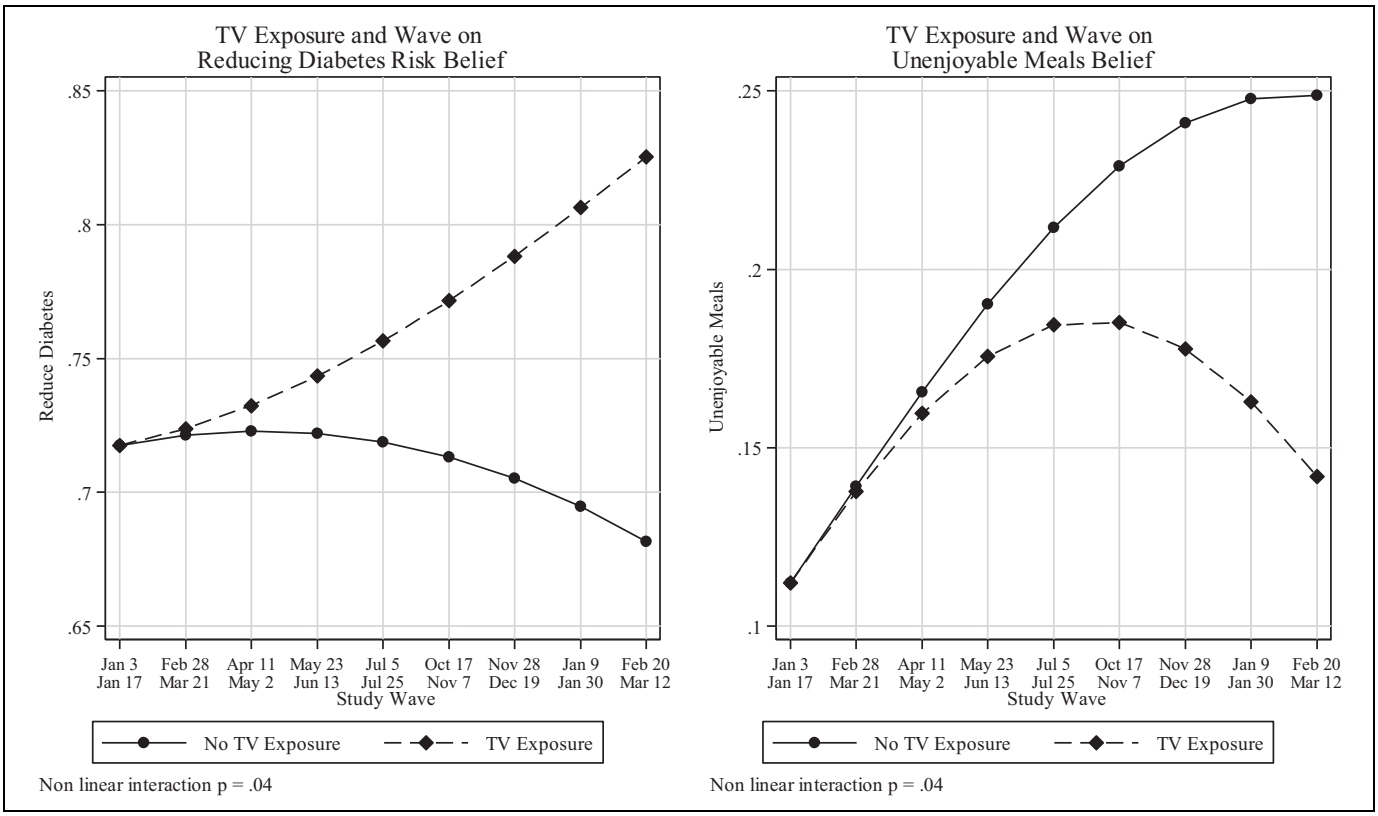

Figure 3. Behavioral beliefs and TV message exposure interactions across survey waves. All results adjusted for parent education, race, and age.

Table 2. Regression Analysis Results.[a,b]

	Dependent Variables			
	Intention to Substitute for Respondent		Intention to Substitute for Target Child	
Predictor	Slope	95% CI	Slope	95% CI
Wave of study	0.089	−.092 to −.27	−0.019	−.192 to .153
Wave 2: No TV exposure	−0.0095	−.032 to −.014	0.007	−.014 to .028
Wave 2: TV exposure	0.001	−.028 to .023	0.016	−.004 to .036
Respondent age	**−0.013**	−.026 to −.0009	−0.012	−.026 to .001
Education	**0.172**	.097 to .247	0.112	.043 to .181
African American	−0.129	−.382 to .123	0.088	−.149 to .326
Age of target child	-	-	**−0.051**	−.081 to −.021
Intercept	4.69	3.94 to 5.44	5.57	4.87 to 6.28
R^2	.040		.051	

[a] n = 1,328.
[b] Regression coefficients are unstandardized. Significant main effects are in bold. No main effect for TV exposure because both groups start at the same level of intention at the baseline (pre-exposure) wave. The nonlinear interaction between TV exposure and study wave is significant for both outcomes. See Figure 2.

13-month campaign, 60% of Philadelphia parents sampled reported being exposed to the TV PSA, and over time, those exposed had greater intention to reduce their own and their child's consumption.

Although the design of the study does not permit individual-level causal inferences (since the respondents were not followed over time), it did allow us to evaluate whether the association between exposure and intention changed during the course of the campaign (across waves). Results indicate that greater length in the field was associated with greater intention to substitute with nonsugary beverages. Individuals who reported exposure to the PSA at wave 9 were 1/2 point higher on a 7-point scale of intention than those exposed to the PSA at wave 2. This finding suggests that campaign duration with a consistent message may be an important factor in increasing intention to alter beverage consumption practices.

Respondents' self-reports of exposure to the PSA increased steadily over the 13-month campaign period. The duration of public health campaigns such as *Get Healthy Philly* can be a critical factor in the effectiveness of a campaign. The meta-analysis of Snyder et al suggests that campaigns have the greatest reach and potential influence when they are in the field for approximately 1 year.[31] We can see from the 9 waves in which we monitored parents' exposure that recall about seeing the PSA "in the last month" continued to rise, and that over the 9 waves, intention to substitute children's SSBs with non-SSBs increased significantly. It is possible that parents' continued exposure to the PSA over a period of many months increased their resolve to make behavioral changes. The reach of the campaign (ie, the number of media placements) may have also contributed to the positive findings.

Beliefs relevant to the behavioral intention of reducing SSB consumption were identified in the formative evaluation, and the message was subsequently designed to address these specific beliefs. The decrease risk of developing diabetes belief, selected through formative evaluation and targeted by the PSA, was significantly associated with campaign exposure over time (as were the other 2 relevant beliefs, but not at the 0.05 level). We also observed that the belief that substituting with non-SSBs would make mealtime less enjoyable was significantly more likely to be held by those *not* exposed to the message.

Reasoned action theory proposes that it is the salient underlying beliefs, like the ones used in the PSA, that are the proximal causes of the attitude, normative pressure, and self-efficacy mediators that form intention. Behavioral interventions and media campaigns should therefore target relevant underlying beliefs[32] because the specific beliefs may be modifiable.[33] When the beliefs are supportive of intention to perform the target behavior, both the theory and empirical findings suggest that messages that emphasize, highlight, and identify these positive beliefs will increase intention to perform the behavior.[34,35] The findings of this study suggest that time invested in identifying the salient beliefs—in this case, that substituting non-SSBs for sweetened beverages would decrease risk of diabetes, prevent weight gain, and instill a feeling of doing "something good for the family"—provided direction for the campaign designers and resulted in effective and persuasive messages.

There are some limitations to the data presented here. The *Get Healthy Philly* media campaign was 1 element of a multicomponent effort to reduce obesity in a city where nearly 40% of children are overweight or obese. Therefore, other components may have influenced our outcomes of interest, including a local legislative proposal to tax SSBs in spring 2010 and 2011, a large healthy corner store initiative, and workplace-based healthy beverage vending policies. Second, while we assessed associations between TV PSA exposure and outcomes, respondents may have also been influenced by PSAs in other media (radio, public transit). Third, while the systematic tracking of Philadelphia parents allowed us to observe whether the presence of the anti-SSB PSA in the community affected intentions over time and was associated with beliefs congruent with the PSA's message, the cross-sectional design

of the survey does not allow us to conclusively understand the cumulative effect of repeated message exposure the way a longitudinal or panel survey would permit. For example, it is possible that parents who hold the belief that SSBs contribute to diabetes risk were more likely to attend to the message and also limit their child's SSB consumption. And, we do not know the weight status of the parents (or their children) who attended to the message. Finally, the study did not assess actual changes in SSB consumption because of the relatively short time frame; however, several meta-analyses based on a reasoned action approach indicate that changes in intention predict changes in behavior.[23,25]

There are several opportunities for future research. Although the *Get Healthy Philly* campaign design was based on the principles of reasoned action theory, there is no longitudinal evidence to illustrate whether or not the campaign was effective in reducing SSB consumption among its target audience. Future campaign evaluations with greater resources may want to assess the effect of exposure on SSB purchasing and subsequent consumption patterns. Evaluations of campaigns of longer duration may also provide an opportunity to determine how long a campaign should be in the field before the return on investment (that is, exposure to the PSA and behavior change) begins to diminish.

SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

Interventions designed to reduce sugar-sweetened beverages (SSBs) have been effective at reducing weight gain. The use of media messages in promoting health behaviors can be effective, but experts recommend that messages be carefully tailored to the target audience's concerns.

What does this article add?

A series of rolling cross-sectional surveys showed that the longer the *Get Healthy Philly* campaign public service advertisement (PSA) was in the field, the greater parents' intention to reduce SSB consumption. Exposure to the PSA was associated with the beliefs that reducing SSBs will help prevent weight gain and diabetes, which were the main themes of the PSA.

What are the implications for health promotion practice or research?

Campaign duration (at least 9 months) and a consistent message developed through theory-based formative research with the target audience are important factors for successful health communication.

Conclusion

Get Healthy Philly's televised PSA was designed to encourage a reduction in children's SSB consumption as a strategy for addressing overweight and obesity among the city's residents. By the 9th wave of data collection, the PSA had been airing for over a year and had been seen by nearly 6 in 10 respondents. Our rolling cross-sectional survey showed that the longer the PSA was in the field, the greater parents' intention to reduce their own and their children's SSB consumption. Additionally, it appears that the PSA influenced parents by positively affecting their expectancy outcomes. That is, parents exposed to the PSA were more likely to believe that if they substitute SSBs with non-SSBs it would help prevent diabetes. And although the trend did not reach significance, they were also more likely to feel that they were doing something good for their family and that the substitution would help prevent weight gain. This pathway to intention is important as it reflects central themes in the PSA itself and these effects can be interpreted using reasoned action theory. This suggests the value of creating messages that are tailored to a clear target audience and developed using the assumption that the path to behavior change is through modifiable behavioral beliefs. Other cities' efforts to address obesity through raising awareness of the health effects of SSBs have had broad reach and suggest they might be effective. Los Angeles County's "Sugar Pack" campaign found that 60% of participants in their street intercept surveys said that they were "likely" or "very likely" to reduce their daily consumption of SSBs as a result of seeing the campaign.[36] New York City's "Pouring on the Pounds" campaign posted similar results, with three-fourths of respondents recalling seeing the campaigns, and about one half of those who recalled seeing them stating that they had reduced their consumption of sugary drinks.[37] Taken together, these studies suggest that public health agencies seeking to implement an anti-SSB media campaign should consider the value of formative, monitoring, and summative evaluation in the development and assessment campaign messages.

Declaration of Conflicting Interests

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