Developing Media Interventions to Reduce Household Sugar-Sweetened Beverage Consumption

By
AMY JORDAN,
JESSICA TAYLOR PIOTROWSKI,
AMY BLEAKLEY,
and
GIRIDHAR MALLYA

In 2010, the city of Philadelphia launched a media campaign to reduce the consumption of sugar-sweetened beverages (SSBs) in homes with children as a strategy to combat obesity. Using the integrative model (IM) of behavioral change and prediction, a theory-based pre-campaign survey of Philadelphia parents was conducted to determine the most effective message content. Results indicated that intention to eliminate SSB consumption is attitudinally driven and suggested that effective messages should highlight feelings of nurturing and concern about child weight gain. Focus group testing led to the selection of a television ad, transit/print ad, and a radio spot that incorporated aspects of the theory-based results from the baseline survey. An online message testing experiment found that exposure to campaign messages increased intention to reduce SSBs and supported the underlying beliefs in the correct direction. These results illustrate how the IM can be applied to the development of a public health intervention.

Keywords: integrative model; intervention development; reasoned action theory; sugar-sweetened beverages; health communication campaign

Overweight and obesity in America is prevalent. In 2009, only Colorado and the District of Columbia had a prevalence of obesity of less than 20 percent,[1] and rates of childhood obesity are particularly concerning. Approximately 12.5 million children and adolescents (17 percent) are obese (Ogden et al. 2006)—a figure that has tripled since 1980 (Ogden et al. 2010). The increase in obesity has led to increases in diseases that were once rare

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in childhood, including endocrine disorders such as Type 2 diabetes, high blood pressure, and hyperlipidemia (Deckelbaum and Williams 2001).

Soft drink consumption by children and adolescents has increased over the past 40 years (French, Lin, and Guthrie 2003), and this increase has been accompanied by a decreased consumption of beverages lower in added sweeteners, especially for adolescents (Nielsen and Popkin 2004; Berkey et al. 2004). As childhood obesity also rose during the same period, the association between the consumption of sugar-sweetened beverages (SSBs) (which typically include in their definition sports and energy drinks as well as carbonated soda) and obesity has become an important research topic (Rennie, Johnson, and Jebb 2005). Prospective studies confirm this association (Ludwig, Peterson, and Gortmaker 2001; Berkey et al. 2004).

This epidemiological research has motivated efforts to identify and isolate the behavioral and environmental correlates of SSB consumption for adolescents, such as TV viewing (Kremers, van der Horst, and Brug 2007; de Bruijn and van den Putte 2009), family eating patterns and meal context (Taveras et al. 2005; Campbell, Crawford, and Ball 2006), parental behaviors, physical activity, and SSB availability outside the home (Grimm, Harnack, and Story 2004; Bere et al. 2007; Wiecha et al. 2006; Hendel-Paterson, French, and Story 2004). These studies, along with other general reviews of the behavioral causes of obesity (Swinburn 2008), suggest that SSB consumption is correlated with many other health behaviors related to media use, family structure, eating patterns, and environmental and economic circumstances. As such, SSB consumption seems an appropriate target for public health interventions designed to affect both individual behaviors (e.g., altering beverage preferences) and the social/economic environments that promote or discourage the choice of healthy behaviors (e.g., increasing access to healthy beverage alternatives).

Amy Jordan is director of the Media and the Developing Child sector of the Annenberg Public Policy Center at the University of Pennsylvania. Her research focuses on media policy and media effects. She is the coauthor of Children, Adolescents and the Media *(Sage Publications 2009) and coeditor of* Media Messages and Public Health *(Routledge 2009).*

Jessica Taylor Piotrowski is an assistant professor in the School of Communication Research at the University of Amsterdam. Previously, she worked as a research associate at the Annenberg Public Policy Center. Her research focuses on the role of media content, individual differences, and the context of media use.

Amy Bleakley is a senior research analyst at the Annenberg Public Policy Center at the University of Pennsylvania. Her research focuses on evaluating the effects of media on health risk behaviors primarily among adolescents and using theory to create evidence-based health interventions.

Giridhar Mallya is the director of policy and planning for the Philadelphia Department of Public Health, where he coordinates research and data analysis activities and works with key leadership to set policies and develop regulations. He is also principal investigator for Philadelphia's CDC-funded "Communities Putting Prevention to Work" initiatives.

The Philadelphia Healthy Lifestyle Initiative (PHLI)

In 2010, the city of Philadelphia received funding from the Centers for Disease Control and Prevention's "Communities Putting Prevention to Work" program to develop and implement initiatives on multiple levels to address the problem of overweight and obesity among its residents. The Annenberg Public Policy Center (APPC) was a subcontractor with the city of Philadelphia to assist in the development of a media campaign that was theoretically motivated, evidence-based, and responsive to Philadelphia's population. Specifically, the APPC's responsibilities were to conduct formative evaluations prior to the campaign and to assess Philadelphia residents' exposure and reaction to the campaign.

In this article, we present the results of the theory-based survey of Philadelphia residents conducted by the APPC's Philadelphia Healthy Lifestyle Initiative (PHLI) team. We then describe how these survey findings were used to inform the media campaign messages focused on reducing family SSB consumption. Finally, we examine how audience members respond to the campaign using data from a message testing quasi-experiment.

Theoretical framework

The integrative model (IM) of behavioral change and prediction guided our media message design (Ajzen and Albarracín 2007). The model states that one's intention to perform a specific behavior (the "target behavior") is both a dependent variable and a predictor of behavior. That is, the model is concerned with the factors that influence intention formation as well as with the relationship between intention and subsequent performance of the target behavior (Kim and Hunter 1993; Sheppard, Hartwick, and Warshaw 1988). Ajzen (this volume) documents the history, theoretical rationale, and psychological mechanics of the IM in detail. More broadly referred to as a reasoned action perspective, this theory has been applied in hundreds of studies to understand and predict health outcomes, such as condom use (Albarracín et al. 2001), smoking (Van De Ven et al. 2007), exercise and physical activity (Hausenblas, Carron, and Mack 1997), food and beverage consumption (Kassem and Lee 2004; Conner, Norman, and Bell 2002), binge drinking (Cooke, Sniehotta, and Schüz 2007), and many other behaviors (Hardeman et al. 2002).

We know of no published research that uses the reasoned action model to predict SSB reduction. However, Kassem and Lee (2004) used the theory of planned behavior to predict soda consumption in adolescent males between the ages of 13 and 18. They found that all three of the theoretical predictors of intentions (attitude, subjective norms, and perceived behavioral control) were important in predicting intentions to "drink regular soda daily" and that these three predictors explained 61 percent of the variance of intentions. Intentions and perceived behavioral control predicted 15 percent of (retrospective) daily soda consumption. They also identified underlying beliefs of the three main predictors but did not analyze these in regard to intervention development.

The theory-based survey

The goals of the survey were to provide an assessment of general obesity-related beliefs and behaviors, identify patterns of SSB consumption among caregivers and their children, determine the attitudes and beliefs best predicting intentions to eliminate SSB consumption at mealtimes, and provide theoretical and empirical findings necessary for the development of a media campaign focused on reducing SSB consumption in the home. The survey was conducted via telephone, for an average of 30 minutes, and was fielded between June 8 and July 3, 2010, by the private research company Social Science Research Solutions.[2] It was approved by institutional review boards at both the University of Pennsylvania and the Philadelphia Department of Public Health.

Respondents were eligible if they resided in Philadelphia and were the primary caregiver (defined as caring for a child who lives in the household for at least four days out of a week) for one or more children between the ages of 3 and 16. If the caregiver reported more than one child under his or her care, the interviewer selected the child with the most recent birthday as the "target child" for the relevant survey items. The survey was conducted in either English or Spanish as necessary, and the completion rate once an eligible household was contacted was 31 percent. Twenty-three percent of the respondents were interviewed over their cell phones and the remainder on landlines. The achieved sample was of 515 adult caregivers with children 3 to 16 years of age, as described in more detail below. Unless reported otherwise, all results are weighted by race/ethnicity and household income to represent the population of caregivers in Philadelphia.

Survey content

The survey included items on family eating patterns; daily consumption of a range of beverages (both SSBs and non-SSBs, such as milk, water, and diet soda) for both the caregiver and the target child; an inventory of beverages in the home on the day of the survey; awareness of campaigns to reduce SSB consumption; reasoned action items measuring intentions, attitudes, normative pressure, and self-efficacy relevant to SSB reduction; and a range of demographic measures including ethnicity, income, and respondent education.

Caregiver respondents and the target child

The caregiver respondents were 67 percent mothers/stepmothers, 21 percent fathers/stepfathers, and 11 percent other relative. Their average age was 41 years (SD = 9.7). Their race distribution was 51 percent white, 46 percent African American, and 3 percent "other." Nine percent were Hispanic (72 percent white, 20 percent black, and 8 percent "other"). In terms of socioeconomic status, 55 percent of the caregiver households earned less than $60,000 a year, 74 percent worked outside the home, 36 percent reported a high school education or less,

30 percent reported some college, and 34 percent had a college education or more advanced degree. The average age of the target child was 9.76 years (SD = 4); 27 percent were 3 to 6 years old, 43 percent were 7 to 12 years old, and 30 percent were 13 to 16 years old. Fifty-six percent were male. The target children were 44 percent white, 44 percent African American, and 12 percent "other" (12 percent were reported as Hispanic). These percentages are unweighted to accurately describe the achieved sample of caregiver respondents and their specific target child referent.

Measures of the IM constructs

The SSB section of the survey began with the following: "This section of the survey asks about sugar-sweetened drinks and family meals. By sugar-sweetened drinks, I mean regular soda like Coca-Cola, sweetened fruit drinks like Snapple and Hi-C, or sports or energy drinks like Gatorade or Red Bull. I am not including diet soda or 100% fruit juice in this definition. When I say meals, I mean breakfast, lunch—including those that you might pack for your children or other family members—and dinner."

Intention was measured as "How likely is it that you will eliminate—that is, not provide—sugar-sweetened drinks for your family during meals every day?" This was coded on a 1 to 7 metric with 1 being *extremely unlikely* and 7 being *extremely likely* (M = 5.11, SD = 2.00). Persons who responded that they were already performing this behavior (3 percent of all caregiver respondents) were noted and classified accordingly, and the wording of the other theoretical measures was modified for this group automatically, as shown below.

Attitude was a set of five semantic differential items (Simple-Complicated, Bad-Good, Foolish-Wise, Unpleasant-Pleasant, and Harmful-Beneficial) coded using a –3 to +3 metric with *extremely* at each end and *neither* as a 0 midpoint. The item Simple-Complicated was reversed so that higher values consistently indicated more positive evaluations. The polychoric alpha for the attitude scale using all items was .85 (M = 1.53, SD = 1.08).

Injunctive norms were measured with one item: "Do you think that most people who are important to you think you should not or you should (eliminate/continue to eliminate) sugar-sweetened drinks for your family during meals every day?" *Descriptive norms* were measured with two items: "Do you think that most people like you will not or will eliminate sugar-sweetened drinks for their family during meals every day?" and "Do you think that most people like you have not or have eliminated sugar-sweetened drinks for their family during meals every day?" These normative pressure measures were coded on a 1 to 7 metric from *should not/will not* to *should eliminate/will eliminate*. The polychoric alpha for the normative pressure scale using all items was .76 (M = 4.63, SD = 1.72).

Self-efficacy was measured with one item: "If you really wanted to, how certain are you that you could (eliminate/continue to eliminate), that is, not provide, sugar-sweetened drinks for your family during meals every day?" This was coded

on a 1 to 7 metric, with 1 being *certain I could not/cannot eliminate* and 7 being *certain I could/can eliminate* (M = 6.12, SD = 1.49).

The PHLI survey also measured the underlying beliefs of all three theoretical mediators. Interventions based on reasoned action theory depend on identifying first which theoretical determinants are important for predicting intentions and then altering, through intervention, the underlying beliefs that cause the important theoretical determinant(s) (Fishbein and Cappella 2006). However, time constraints prevented the PHLI team from using an elicitation survey to identify the underlying beliefs. Instead, they were identified through a review of the SSB/obesity literature. For *behavioral beliefs*, the item stem was "If you (eliminated/continued to eliminate) sugar-sweetened drinks for your family during meals every day, it would. . . ." The eight outcome expectancies were as follows: help prevent weight gain, make your life more stressful, save money, make eating meals less enjoyable, make it more likely for your family to drink milk or water at mealtime, improve your family members' sleep, make your children unhappy, and make you feel like you were doing something good for your family. All expectancies were evaluated on a 3-point scale, with unlikely (–1), neither (0), and likely (1).

The underlying *injunctive normative beliefs* were evaluated using the stem "What about [REFERENT]? (Do/Does [REFERENT] think you should not [eliminate/continue to eliminate] sugar-sweetened drinks for your family during meals or that you should [eliminate/continue to eliminate] sugar-sweetened drinks for your family during meals?)" The four referents were: [TARGET CHILD]'s teachers, other parents you know, your spouse/your partner/[TARGET CHILD]'s other parent/[TARGET CHILD]'s parents, and [TARGET CHILD]'s doctor. All were coded on a 1 to 7 metric with 1 = *should not eliminate* and 7 = *should eliminate*.

The underlying *descriptive normative beliefs* were evaluated using the stem "Now I want to ask you about whether people you know have eliminated, that is, do not provide, sugar-sweetened drinks for their family during meals every day. About how many [REFERENTS] have eliminated, that is, do not provide, sugar-sweetened drinks for their family during meals every day? Would you say: none, a few, about half, most, or all?" The three referents were as follows: of your close friends, other parents, and of your family members. The responses were coded from 1 to 5 with 1 = *none* and 5 = *all*.

The underlying *self-efficacy belief* items used the stem "Now I am going to describe some situations and ask you about (eliminating/continuing to eliminate), that is, (not providing/continuing to not provide), sugar-sweetened drinks for your family during meals every day under these conditions. The responses again range from 1 being you are certain you could not to 7 being you are certain you could eliminate sugar-sweetened drinks in this situation. How about [BARRIER]?" The self-efficacy barriers inserted were as follows: if they tasted good, if it meant that you had to grocery shop more often, if someone in your family really liked drinking sugar-sweetened drinks, if there were nothing else to drink but tap water, if your children complained about it, if it cost more, and if it were not convenient. These responses were all coded on a 1 to 7 metric with 1 = *certain I could not*

eliminate sugar-sweetened drinks and 7 = *certain I could eliminate sugar-sweetened drinks*.

Measures of SSB consumption

The caregiver survey also collected data on consumption of SSBs as well as other beverages for both the caregiver and the target child. We discuss these measures here because we used them to validate our theoretical typology of caregivers in terms of intentions as described below. To measure SSB consumption of both the caregiver and the target child, three items were used: "How many servings—that is, cups, cans, or bottles—of non-diet soda like Coca-Cola or 7-UP do you have on an average day?" "How many servings of non-diet fruit drinks like Snapple or Hi-C do you have on an average day?" and "How many servings of sports or energy drinks like Gatorade or Red Bull do you have on an average day?" The numerical responses were recorded and limited to values from 0 to 20. The items for the target child's daily consumption were identical with the name of the target child substituted for "you" in the questions. The average number of SSB servings per day for caregivers was 1.81 (confidence interval [CI] = 1.55 to 2.08), and for target children it was 1.90 (CI = 1.68 to 2.11).

Statistical Analysis

The analysis of the survey data was conducted in three steps. First, we validated the self-reports of SSB consumption for the caregiver respondents and the target children by examining SSB servings per day for three types of respondents: caregivers who reported already eliminating SSBs at meals every day (e.g., *performers* of the target behavior), caregivers who had positive intentions to perform the target behavior but did not report performing the behavior (e.g., *intenders*, defined as reporting being extremely, quite, or slightly likely to eliminate SSBs during meals every day), and caregivers who did not report positive intentions to perform the behavior and were not doing so (e.g., *nonintenders*, defined as reporting being extremely, quite, or slightly unlikely or neither likely nor unlikely to eliminate SSBs during meals every day). We should find a gradient of increasing SSB consumption as we investigate the SSB consumption of the performers, the intenders, and the nonintenders (Fishbein and Yzer 2003).

Next, we estimated a path model using Mplus (Muthén and Muthén 2006) with the precursor (e.g., demographic) variables and the three IM mediators predicting intentions to eliminate SSBs at mealtime. This analysis identified which of the three theoretical mediators were important in predicting intentions to eliminate SSBs at family mealtimes and how precursor variables affected these mediators. Because there is no explicit theory about the causal ordering of the direct measures of attitude, normative pressure, and self-efficacy, an appropriate approach is to estimate the correlations between the error terms of the direct measures (Hennessy et al. 2009).

We used a minimal correlation of .10, reflecting a small effect size (Cohen 1998), to identify precursors to include in the analysis (the smallest significant correlation with $N = 515$ is .087, but we considered this substantively trivial even if statistically significant) because there were no a priori expectations about important precursor variables. We investigated the potential precursors of respondent and target child's gender, ethnicity, and age and correlated these demographic variables with the three reasoned action mediators of attitudes, normative pressure, and self-efficacy. For caregivers, age was correlated with attitude, African American was correlated with normative pressure, and no characteristic was correlated with self-efficacy. For target children, gender was associated with attitude, no characteristic was associated with normative pressure, and age was associated with self-efficacy. The final analysis of the direct measures therefore included the caregiver's age and African American status and the target child's gender and age as precursor variables.

Finally, we identified the most important underlying beliefs related to reducing the consumption of sugary beverages. As shown below, *attitudes* toward the behavior were the best predictor of intentions to eliminate SSBs at mealtimes, so we focus only on these behavioral beliefs in the detailed analysis. To analyze these beliefs to inform the construction of media messages, we examined each behavioral belief in terms of its correlation with intentions and two types of respondent (intender versus nonintender). This allowed us to identify which beliefs were associated with an increase in intentions and which beliefs need to be counterargued in a media campaign because they were associated with a decrease in intention to perform the target behavior (Fishbein and Cappella 2006).

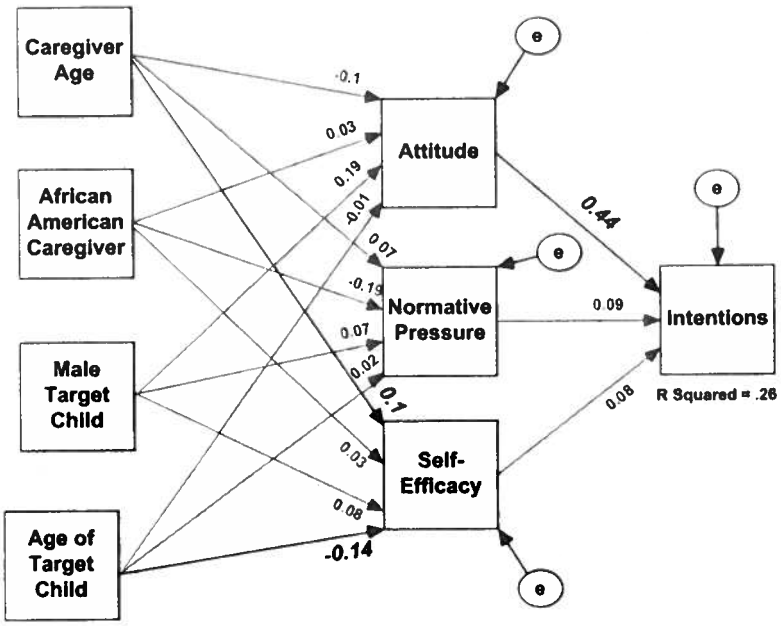
Validating the self-reports of SSB consumption

Three percent of caregivers reported that they had already eliminated SSBs from meals every day (i.e., performers), 61 percent were intenders of the target behavior, and 36 percent were nonintenders of the target behavior ($N = 512$ caregivers total). Average daily servings of SSBs did vary by respondent type. The average daily SSB consumption was 0.33 (CI: 0.04 to 0.62) servings for performing caregivers, 1.76 (CI: 1.41 to 2.22) servings for intending caregivers, and 2.06 (CI: 1.61 to 2.50) for nonintending caregivers. The average daily SSB consumption was 0.18 (CI: –0.02 to 0.38) servings for target children of performing caregivers, 1.90 (CI: 1.60 to 2.20) servings for target children of intending caregivers, and 2.02 (CI: 1.69 to 2.35) servings for target children of nonintending caregivers. Note that the self-reports of consumption were collected on the survey prior to any of the theoretical measures relating to intentions to eliminate SSB consumption to avoid self-report biases.

Path analysis of precursors, mediators, and intentions

Figure 1 shows the path analysis results with the four precursors and the three reasoned action mediators predicting intentions to eliminate SSBs at family mealtimes. Intentions to perform the target behavior are primarily driven by attitudes and not normative pressure or self-efficacy: only attitude shows significant effects

FIGURE 1
Results for Precursors and Direct Measures
Predicting Intentions to Eliminate SSBs at Mealtimes



NOTE: N = 515. Chi-square = 1.87, df = 4, p = .76, root mean square error of approximation (RMSEA) = 0 (RMSEA limits: 0 to .046), Tucker-Lewis index = 1.00. Coefficients of categorical exogenous variables (i.e., African American caregiver and male target child) to reasoned action mediators are partially standardized. All other coefficients are fully standardized. Correlations between exogenous precursor variables are not shown for clarity. Correlation between errors of attitude and normative pressure is .44, between errors of attitude and self-efficacy is .32, and between errors of normative pressure and self-efficacy is .29.

on intentions. The model fit is excellent, and 26 percent of the variance in intentions is explained by the three reasoned action mediators. Nonsignificant paths are estimated and are shown in gray. Only two precursor variables are important. Caregiver age is positively associated with self-efficacy to perform the target behavior, and child age is negatively related to the caregivers' perception of their ability to perform the target behavior. Both of these effects seem reasonable: parental experience enhances self-efficacy while the autonomy of older children decreases self-efficacy.

Analyzing the underlying behavioral beliefs

Table 1 shows the analysis of the behavioral beliefs. For each belief, the table shows the correlation between the belief and intention to eliminate SSBs at

TABLE 1
Summary Statistics on Behavioral Beliefs by Intenders and Nonintenders

Behavioral Beliefs	Correlation between Belief and Intentions[a]	Average for Intenders	Average for Nonintenders	% "Likely" for Intenders	% "Likely" for Nonintenders
Make you feel that you were doing something good for your family	.45	.92*	.71	93	79
Make eating meals less enjoyable	−.36	−.62*	−.21	12	26
Make your children unhappy	−.33	−.40*	−.03	22	35
Help prevent weight gain	.33	.77*	.48	82	67
Improve your family members' sleep	.31	.41*	.19	61	43
Make your life more stressful	−.25	−.53*	−.27	14	22
Save money	.22	.63*	.34	75	55
Make it more likely for your family to drink milk or water at mealtimes	.12	.72	.62	82	72

NOTE: Performers excluded from this analysis. N = 494–484 except for correlations where the listwise N is 477. Beliefs coded as −1 = *unlikely*, 0 = *neither*, 1 = *likely*. Behavioral beliefs are presented in order of their correlation with intentions.
a. Polychoric.
*Difference between intenders and nonintenders statistically significant at .05 or less.

mealtimes, the average value of the underlying belief for respondents who intend to perform the target behavior and those who do not intend to perform the target behavior, and the significance of this difference (the 3 percent of respondents who reported already eliminating SSBs at mealtimes are excluded from this analysis). Table 1 also shows the proportion of each group who said that the specific belief

outcome was "likely." The beliefs that have the strongest association with the intention to eliminate SSBs at family mealtime are that it would "make you feel that you were doing something good for your family"; "help prevent weight gain"; and "make eating meals less enjoyable." The belief with the lowest correlation with intention is that it would "make it more likely for your family to drink milk or water at mealtimes." Note that compared to nonintenders, intenders always have more positive expectations that the favorable outcomes (e.g., help prevent weight gain) will occur if they eliminate SSBs at mealtime and more negative expectations of unfavorable outcomes occurring (e.g., make eating meals less enjoyable). This pattern is replicated in the average differences between the two caregiver groups for all of the underlying beliefs. In other words, intenders find the positive outcomes more likely and the negative outcomes less likely than do the nonintender caregivers.

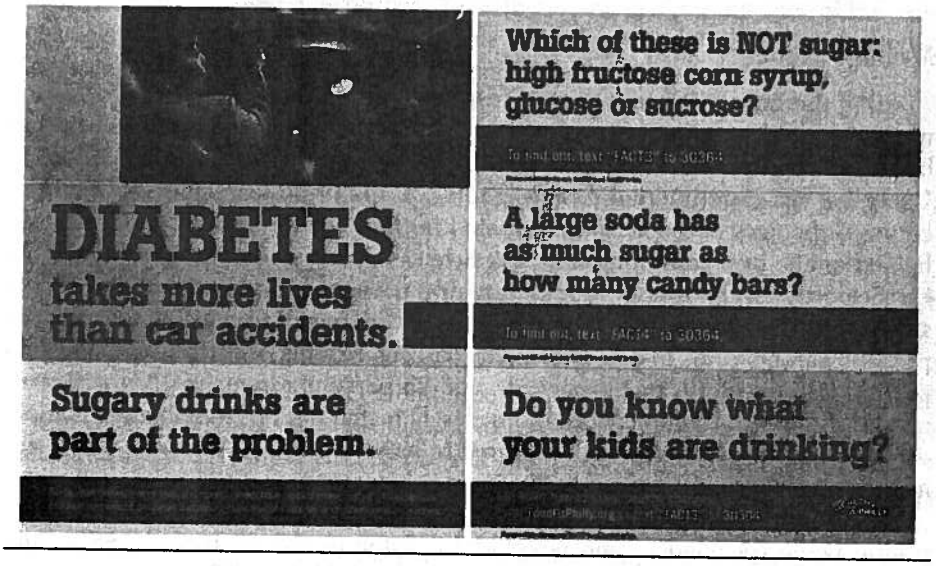
Using the Survey Results to Construct Media Messages

The important underlying beliefs were identified with the intent of incorporating them into media messages that motivate persons to change their behavior. Recall that the analyses above demonstrated that intention to eliminate SSB consumption during meals was primarily driven by attitudes, not normative pressure or self-efficacy. As such, a successful media campaign would either emphasize the behavioral beliefs about the positive things that could occur as a result of eliminating SSBs or counterargue beliefs about the negative things that could occur as a result of eliminating SSBs. In Table 1, there are examples of both positive and negative underlying beliefs relevant to the elimination of SSBs at family mealtimes. The strength of the associations suggests that leveraging the belief that SSB elimination will "make you feel that you [are] doing something good for your family," will be the most effective message strategy, followed by counterarguing the belief that SSB elimination will "make eating meals less enjoyable."

Four potential media messages were developed. Each message targeted low-income female caregivers of children ages 3 to 16 and focused on behavior change more broadly, as opposed to specifically emphasizing SSB elimination at mealtime. Focus groups formatively tested these messages to determine which resonated best with members of the target population. The focus groups favored three messages for the campaign—a television ad, transit ad, and radio spot. The television ad attempted to leverage the "make you feel that you [are] doing something good for your family" belief more than the transit ad and radio spot. All messages attempted to influence the "help prevent weight gain" belief, and all messages highlighted the connection between SSB consumption and diabetes, because formative work suggested that many caregivers did not consider their children to be overweight, and the issue of diabetes resonated well with the priority groups of interest.

In the television ad, the viewer saw an African American mother and son driving home from a doctor's appointment. Thinking to herself, she expressed surprise at

FIGURE 2
Campaign Transit Ads



learning that her son was overweight and at risk for diabetes. She made the connection between these negative health outcomes for her son and SSB consumption by looking at the sugary drinks in her car's cupholders and saying to herself, "That stuff doesn't help." Throughout the message, a narrator provided statistics related to obesity and diabetes in Philadelphia's children, and explained that SSBs are part of the problem, with "one soda [having] as much sugar as two candy bars." The message closed with the mother stating, "We'll fix this [while looking at her son —just wish I'd known sooner" and the tagline "Cut Back on Sugary Drinks" printed onscreen.[3]

The same African American mother and son who were used in the television ad were also used in the transit advertisement. The ad was created in individual tiles that were placed on the inside of buses and subways. As can be seen in Figure 2, the image depicts the mother and son in the car with a sugary drink in the child's hands. Surrounding the image are facts that explain the relationship between SSBs, diabetes, and overweight. Viewers were also invited to engage with a text message component of the campaign to learn additional facts about SSBs.

In the radio ad, listeners heard the sinister voice of "Sugar" talking about how it is hiding everywhere, including in cupholders and children's lunchboxes, because drinks like soda and fruit drinks are filled with sugar. The ad told listeners, "But you don't think I'm all that bad [laughing ominously]. I'll make your kids gain weight and put them at risk for diabetes. How? There's as much of me in one soda as in two candy bars." The narrator then voiced statistics related to diabetes in

obese children and adults, stating that sugary drinks are part of the problem. The message closed by asking listeners, "Do you know what your kids are drinking?"[4]

Message testing

After the advertisements were finalized and began airing, message testing was conducted to assess responses to the messages as well as to evaluate whether behavioral beliefs and intentions were affected by exposure to the campaign. Using a quasi-experimental design, a total of 507 urban caregivers of children between the ages of 3 and 16 participated in the message testing. The study was fielded online by a consulting firm, PlayScience. Participants were recruited from PlayScience's PlayLab panel,[5] a representative panel of American families. A quota sample was used to ensure that target children were equally represented by age (25 percent parents of 3- to 5-year-olds, 25 percent parents of 6- to 9-year-olds, 25 percent parents of 10- to 12-year-olds, and 25 percent parents of 13- to 16-year-olds) and gender. Additionally, to more closely match the Philadelphia population, 40 percent of respondents were required to have an African American child, and all respondents were required to live in an urban area.

Caregivers completed a battery of questions designed to evaluate SSB consumption at home (respondent and target child), intention to cut back on SSBs, and behavioral beliefs associated with cutting back on children's SSBs. Caregivers were then exposed to the three media messages in a random order. Following each message, caregivers completed questions designed to assess emotional response (Dillard and Peck 2000), affective reactance (Quick and Considine 2008), perceived argument strength (Zhao et al. 2011), perceived self-efficacy (Witte and Allen 2000), perceived likeability (Nan and Zhao 2010), and perceived threat to choice (Quick and Considine 2008). After exposure and message response, caregivers again completed items measuring intention to cut back on SSBs and behavioral beliefs associated with cutting back on children's SSBs.

The measures of intention were "In the next month, how likely is it that you will cut back on sugary drinks?" and "In the next month, how likely is it that you will cut back on [TARGET CHILD]'s sugary drinks?" Both items were coded on a 1 to 7 metric with 1 = *extremely unlikely* and 7 = *extremely likely*. Respondents who were already performing the behavior were recoded as *extremely likely*.

For behavioral beliefs, the item stem was "If you cut back on [TARGET CHILD]'s sugary drinks in the next month, it would . . ." Six outcome expectancies were selected. Five were selected from the theory-based survey analyses: the three beliefs that had the strongest positive correlation with intention and the two beliefs with the strongest negative correlation with intention. Additionally, due to the focus of the messages, respondents answered whether cutting back on their child's SSB consumption would "decrease the risk of [their] child developing diabetes." All expectancies were evaluated on a 7-point scale with 1 = *extremely unlikely* and 7 = *extremely likely*.

Results from pre-post analyses related to behavioral intention and behavioral beliefs are presented here. Paired sample *t*-tests were used to compare means before and after campaign exposure. To estimate practical significance of the pre-post changes, the equivalent effect size *r* (ES *r*) was also calculated (Rosnow, Rosenthal, and Rubin 2000) for each mean difference.

Message testing results

Pre-post analyses reveal that exposure to all three messages was associated with a significant increase in intention to cut back caregiver's SSB consumption (M_{Pre}=5.27, SD=1.78; M_{Post}=5.74, SD=1.63; t = –6.99, p < .05, ES r = .30). Similarly, analyses revealed a significant increase in intention to cut back target child's SSB consumption after exposure to all three messages (M_{Pre}=5.26, SD=1.75; M_{Post}=5.86, SD=1.54; t = –9.04, p < .05, ES r = .37).

Because our analyses found that intention was primarily driven by attitudes and not normative pressure or self-efficacy, we expected that changes in behavioral (attitudinal) beliefs would also be present since there were changes in intention after exposure to the three messages. Pre-post analyses on the behavioral beliefs illustrated that, after exposure to all three messages, caregivers were significantly more likely to believe that cutting back on their child's SSB consumption would help to prevent their child from gaining weight (t = –4.59, p < .05, ES r =.20), decrease their child's risk of diabetes (t = –3.51, p < .05, ES r =.15), and improve their child's sleep (t = –2.46, p < .05, ES r =.11). Caregivers were marginally more likely to believe that cutting back on their child's SSB consumption would make them feel like they were doing something good for their family (t = –1.90, p = .06, ES r =.08). For the remaining two beliefs, there was no significant change after exposure to the three messages. Considering that the messages attempted to leverage the beliefs that SSB reduction would prevent child's weight gain, decrease child's risk of diabetes, and make the caregiver feel as though she or he was doing something good for the family, these findings are encouraging. Effect sizes reveal that the most robust change in behavioral beliefs was found for the "weight gain" belief and the weakest was found for the "caregiver feel good" belief. As only one message (television) seemed to strongly leverage the "caregiver feel good" belief, while all worked to evoke the "weight gain" belief, these findings have face validity. Table 2 presents the pretest and posttest means for each behavioral belief.

The last step in these analyses was to evaluate the correlations between the behavioral beliefs at posttest and the behavioral intentions at posttest. Table 2 shows the correlation between each belief and intention to cut back the child's SSBs. The belief with the strongest association with intention was "decrease the risk of your child developing diabetes" followed by "make you feel that you [are] doing something good for your family" and "help prevent your child from gaining weight." These beliefs emerged as the strongest correlates with intention to cut back the target child's SSBs.

TABLE 2
Summary Statistics on Behavioral Beliefs for Message Testing

Behavioral Beliefs	Pretest Mean (*SD*)	Posttest Mean (*SD*)	Polychoric Correlation between Posttest Belief and Intentions for Child
Decrease the risk of your child developing diabetes	5.35 (1.52)	5.56 (1.47)	.71*
Make you feel that you were doing something good for your family	5.73 (1.37)	5.83 (1.38)	.69*
Help prevent your child from gaining weight	5.13 (1.61)	5.42 (1.58)	.65*
Improve your child's sleep	4.83 (1.60)	4.97 (1.71)	.58*
Make eating meals less enjoyable	3.40 (1.81)	3.46 (1.91)	−.08
Make your child unhappy	3.97 (1.83)	3.89 (1.85)	−.01

NOTE: $N = 507$. Beliefs coded as 1 = *extremely unlikely* to 7 = *extremely likely*. Behavioral beliefs are presented in order of their correlation with intentions.
*$p < .05$.

Discussion

Formative evaluation is critical to the design and implementation of effective health-related communication campaigns because it "can enable campaign planners to truly understand their target audience in terms of the problem behavior at hand, their message preferences, and the most promising channels through which they can be reached" (Noar 2006). Additionally, the use of theory has been found to be essential in guiding health campaigns. Though historically mass media campaigns have been atheoretical (Myhre and Flora 2000), more recent mass communication intervention research efforts have used social cognitive theory (Evans et al. 2011), the transtheoretical model (Reger et al. 2002), and the theory of reasoned action (Farrelly et al. 2002) to design and test intervention messages.

The experience of PHLI highlights how theory can be used to design public health messages. Survey data from Philadelphia caregivers provided evidence to develop media messages for use by the Philadelphia Department of Public Health in its campaign to reduce sugary beverage consumption. The theory-based survey data identified specific behavioral beliefs that should be incorporated into a media campaign designed to encourage elimination of SSBs at mealtime. The process from formative evaluation to campaign creation was not always obvious or predictable. As this project involved three partners—the city's health department, university-based scholars, and an advertising agency—the stakeholders approached the

problem of sugary beverage consumption from somewhat different perspectives. As with other social marketing efforts, there were competing visions of what the campaign must look like to break through the "clutter" of competing messages, and there were constraints that shaped what could be reasonably accomplished within a limited time and with a restricted budget (Bellows et al. 2008). As a social marketing campaign, PHLI applied commercial marketing concepts and techniques to promote voluntary behavior change (Grier and Bryant 2005). As Bellows and colleagues (2008, 170) note, "The social marketing process is a continuous, iterative process with a persistent focus on the target audience."

Notes

1. See www.cdc.gov/obesity/data/trends.html.
2. See http://ssrs.com/home.php.
3. To view this ad, visit www.foodfitphilly.org/media.
4. To listen to this spot, visit www.foodfitphilly.org/media.
5. See http://playsciencelab.com/.

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