

Qualitative Application of the Theory of Planned Behavior to Understand Beverage Consumption Behaviors among Adults

Jamie Zoellner, PhD, RD; Erin Krzeski, MS, RD; Samantha Harden, PhD; Emily Cook, MS; Kacie Allen; Paul A. Estabrooks, PhD

ARTICLE INFORMATION

Article history:

Accepted 18 June 2012

Keywords:

Qualitative research
Health behavior
Beverages
Dietary habits
Health status disparities

Copyright © 2012 by the Academy of Nutrition and Dietetics.
2212-2672/\$36.00
doi: 10.1016/j.jand.2012.06.368

ABSTRACT

Despite strong scientific data indicating associations among sugar-sweetened beverages (SSB) and numerous adverse health outcomes, little is known about culturally specific beliefs and potential individual-level behavioral strategies to reduce SSB intake. The primary objective of this formative study targeting adults residing in rural southwest Virginia was to apply the Theory of Planned Behavior to investigate culturally specific attitudes, subjective norms, and perceived behavioral control constructs related to the consumption of SSB, water, and artificially sweetened beverages. Using a homogenous sampling strategy, eight focus groups were conducted with 54 adult participants who exceeded recommendations of <1 cup of SSB/day. An experienced moderator and co-moderator utilized a semi-structured script, grounded in the Theory of Planned Behavior, to execute the focus group. All focus groups were audiotaped and transcribed verbatim. Three researchers independently coded meaning units to the major themes and subsequently met to gain consensus in coding. Important beverage-specific themes emerged for attitudes, subjective norms, perceived behavioral control, and intentions. Across all beverages, the most notable themes included taste (n=161 meaning units), availability/convenience (n=95 meaning units), habit/addiction (n=57 meaning units), and cost (n=28 meaning units). Health consequences associated with beverages and water-quality issues also surfaced, as well as normative beliefs, including the influence of doctors and peers. The identified themes and subthemes provide critical insight into understanding culturally relevant context and beliefs associated with beverage consumption behaviors and helps inform the development and evaluation of future intervention efforts targeting SSB consumption in the health disparate region of southwest Virginia.

J Acad Nutr Diet. 2012;112:1774-1784.

LARGE INCREASES IN AMERICANS' CONSUMPTION OF sugar-sweetened beverages (SSB) have been a topic of concern. Between 1977 and 2002, the intake of "caloric" beverages doubled in the United States, with most recent data showing that children and adults in the United States consume about 172 and 175 kcal daily, respectively, from SSB.¹ It is estimated that SSB account for about 10% of total energy intake in adults.^{2,3} High intake of SSB has been related to many adverse health outcomes, including type 2 diabetes, obesity, dental caries, and heart disease.⁴⁻⁸

When developing behavioral interventions to address unhealthy dietary behaviors such as SSB consumption, formative and theory-grounded qualitative data can provide information needed to understand cultural perspectives and develop targeted intervention strategies.⁹ The Theory of Planned Behavior (TPB) is an individual-level health behavior theory that has been used to understand a variety of health behaviors,¹⁰⁻¹⁴ including diet-related behaviors and SSB consumption.^{12,13,15-19} The TPB proposes that behavior can be predicted directly by one's intention and perceptions of be-

havioral control.¹⁰ It also proposes that subjective norms, attitude, and perceived behavioral control indirectly influence behavior through intentions.¹⁰

The TPB can be used for all phases of behavioral intervention development, implementation, and evaluation^{10,14,15}; however, few known studies have comprehensively incorporated the TPB. For example, a review of 24 TPB interventions revealed that only about half of the studies used the TPB to develop the intervention and the other half used the TPB to assess intervention effectiveness.¹³ Similarly, as pointed out by Conner and Sparks,¹⁵ researchers rarely conduct formative studies to identify appropriate TPB-grounded targets for intervention efforts. In fact, the majority of TPB studies across all health behaviors are quantitative and cross-sectional in design.^{11-13,15,20-26} Although these quantitative studies illustrate the usefulness of the TPB in predicting behaviors, qualitative studies to better understand the underlying cultural beliefs associated with dietary behaviors are also important.^{10,14,15} Nonetheless, relatively few dietary behaviors studies have qualitatively applied the TPB.^{27,28}

This research targets at-risk rural counties of southwest Virginia that lie in the health disparate Appalachia region, a federally designated medically underserved area.²⁹ When compared with the state of Virginia and national averages, the targeted region has low socioeconomic status and low literacy levels.^{30,31} In addition, the prevalence of diabetes and obesity in this region exceeds that of the state of Virginia,³² and mortality from diabetes is almost twice as high as the state average.³³ Although this region is predominantly white (ie, 95.3% white, 3.4% African American, 1.3% other origin), Appalachia has historically been identified as a distinctive cultural region with unique dialect, music, folklore, religion, education, and social and economic stratification.^{34,35} Of further concern related to beverage consumption behaviors, issues of water quality (eg, metals, siltation, pathogens, and nutrients) and water treatments have been a long-standing concern for residents in this agriculture and mining region.³⁶

In our previous cross-sectional study of southwest Virginia residents, we quantitatively explored the utility of the TPB to explain SSB consumption. SSB intake averaged 457 (standard deviation=430) kcal/day,³⁷ an amount that exceeds recommendations for daily SSB intake by approximately four times.³⁸ The amount of variability (38%) explained by the primary constructs of the TPB indicated that behavioral intentions, perceived behavioral control, subjective norms, and attitudes provided a moderate explanation for SSB intake.³⁷ Although this study reveals promise in the utility of the TPB to explain SSB behaviors, it also highlighted the need for further qualitative investigation of beliefs surrounding SSB consumption.

This current study served as the formative phase to further explore the usefulness of a TPB-guided framework to understand and intervene on SSB behaviors. Using both a deductive and inductive analysis process, the primary purpose of this theory-grounded research was to qualitatively explore the attitudes, subjective norms, and perceived behavioral control related to beverage consumption behaviors, including SSB, water, and artificially sweetened beverages, among residents in southwest Virginia. Regional water-quality issues also prompted the investigation of examining potential differences between individuals with primary access to city vs non-city water. The long-term goal of this work is to apply findings for the development and implementation of culturally specific behavioral strategies and interventions for reducing SSB intake among Appalachian residents.

METHODS

Study Design and Recruitment

The Institutional Review Board at Virginia Polytechnic Institute and State University approved this study, and all participants provided informed signed consent. This study consisted of a screening questionnaire and focus groups. Participants were recruited from five southwest Virginia counties including Scott, Washington, Stuart, Giles, and Floyd. A homogenous sampling protocol was executed.⁹ Eligibility criteria included residency in one of the targeted five counties, English speaking, 18 years of age or older, and consumption of ≥ 1 cup of SSB per day. Because focus groups were planned to evaluate potential differences among residents on city water vs non-city water sources (eg, well, stream), participants also had to meet water source eligibility for the focus

group being planned in their county. Socioeconomic status was not an inclusion criterion; however, the sampling goal was to achieve a broad variation across income and education levels. Three Virginia Cooperative Extension educators and two graduate research assistants helped recruit and screen participants. Flyers and word of mouth were used to recruit participants through a several venues, including Virginia Cooperative Extension programs, churches, and low-income and subsidized housing sites. Focus groups were conducted August 2010 to March 2011. A meal was served at each focus group and individuals were compensated with a \$30 gift card.

Questionnaire

Beverage Consumption and Water Source. Eligibility for consuming ≥ 1 cup SSB per day was determined using three items from the valid and reliable Beverage Questionnaire, including regular soft drinks, sweetened tea, and sweetened juice beverages/drink (eg, Kool-Aid [Kraft Foods, Inc], lemonade, punch, or Sunny Delight [Sunny Delight Beverages Co]).³⁹ For each item, participants indicated frequency of intake and portion size consumed. Participants also reported their primary source of drinking water.

Demographic Variables. Demographic variables included sex, race/ethnicity, age, highest level of education reported across seven categories, and income level reported across 12 categories of \$5,000 increments. Participants also completed a validated health literacy assessment, the Newest Vital Sign, whereby participants view information on a Nutrition Facts label and answer six questions about how they would interpret and act on the information.⁴⁰

Focus Groups

Planning of the focus groups, development of the script, and the moderation of focus groups were implemented according to suggested procedures.⁴¹ Each focus group included five to nine participants, lasted about 90 minutes, and was led by an experienced moderator and comoderator. In total, three individuals assisted in the moderation, including one who moderated or comoderated all eight focus groups. A semi-structured script containing open-ended questions and probes guided data collection. The script was grounded by the TPB constructs (ie, attitudes, subjective norms, perceived behavioral control, and intention) and was formatted with explicit sections to prompt opinions about SSB, water, and artificially sweetened beverages (Figure 1). Evidence from the Beverage Guidance Panel was used as recommended amounts from each beverage category (ie, 0 to 8 fluid oz/day of calorically sweetened beverages without nutrients, 20 to 50 fluid oz/day of water, 0 to 32 fluid oz/day “noncalorically” sweetened beverages).³⁸ Researchers presented a preliminary introduction to types of beverages and recommended amounts were given. The focus groups were audiorecorded and transcribed verbatim. The study was designed to achieve data saturation, which was sufficiently achieved after eight focus groups, including four city water and four non-city water focus groups.

ANALYSIS

The quantitative data were analyzed in PASW Statistics (version 18.0, 2009, SPSS Inc) and included frequencies, means,

Opening Questions, Nonspecific Beverages	
	To get us started, I want you to take a look of the paper in front of you. I would like you to look through the pictures of the different beverages and circle the beverages YOU most commonly drink. You can also add any beverages that are not shown on the paper. Also, please take some time to write down any feelings, thoughts, or draw any pictures that come to mind when thinking of these drinks.
Attitude	Tell me about the feelings or thoughts that you associated with the drinks you consume most often.
Subjective norms	Tell me why it is or is not important that you drink the same amount or type of drinks as your friends and family.
Perceived behavioral control	If you wanted to change the drinks you consume most, tell me what would make that hard or easy.
Sugar-Sweetened Beverage—Specific Questions	
	Now, we are going to turn our focus to only the drinks that have added sugar, or sugar-sweetened beverages. This includes regular sodas; energy or sport drinks; juice drinks such as Sunny Delight, ^a lemonade, punch, and Kool-Aid ^b ; and sweet tea or coffee with sugar. This does NOT include diet drinks or any drinks sweetened with artificial sweeteners.
Attitude	Let's start with soda, tell me about the good things associated with drinking soda.
	Tell me about the bad things associated with drinking soda.
	Now let's move on to energy or sport drinks. Tell me about the good things associated with drinking energy or sport drinks.
	Tell me about the bad things associated with drinking energy or sport drinks.
	How about juice drinks like lemonade, Sunny Delight, Capri Sun, ^b Kool-Aid. Tell me about the good things associated with drinking these juice drinks.
	Tell me about the bad things associated with drinking these juice drinks.
	And finally, how about coffee and/or tea with added table sugar (not sweetener packets). Tell me about the good things associated with drinking coffee and/or tea with added sugar.
Subjective norms	Tell me about the bad things associated with coffee and/or tea with added table sugar.
	Health professionals recommend that people drink 1 cup or less of sugar-sweetened beverages per day [SHOW PARTICIPANTS BEVERAGE MODELS]. Tell me how you feel about this recommendation.
Behavioral intention	What would it take for someone to convince you and/or your family and friends that it is important to drink 1 cup or less of sugar-sweetened beverages per day?
	I want you to tell me about your intentions to meet the drink recommendation of 1 cup or less of sugar-sweetened beverages per day in the next month.
Implementation intentions	If you intend to limit, what would your plan look like? When, where, and what drinks would you limit? (If you already meet the recommendation, talk about your plans to continue to meet this recommendation?)
Perceived behavioral control	What makes it easy to drink 1 cup or less of sugar-sweetened beverages per day?
	What makes it hard drink 1 cup or less of sugar-sweetened beverages per day?
	What would you and/or your family and friends need to help meet this recommendation?

Figure 1. Sample focus group questions^c grounded in the Theory of Planned Behavior. ^aSunny Delight Beverages Co. ^bKraft Foods, Inc. ^cIllustrated questions are meant to be representative of the focus script; they do not represent all the sections or questions within each section.

standard deviations, χ^2 , and one-way analysis of variance. A hybrid deductive and inductive qualitative analysis approach was used.^{42–44} Using a TPB-guided script and a priori coding of the data back to the TPB illustrates a deductive approach, while the generation of themes and subthemes from the

meaning units illustrates an inductive approach. Meaning units are defined as the constellation of words or statements that relate to the same central meaning and can also be referred to as a content unit or coding unit, a keyword and phrase, and a unit of analysis.⁴² With oversight from the pri-

mary investigator and using an inductive approach, two graduate research assistants thoroughly read the transcripts several times and independently generated initial key themes and subthemes throughout the transcripts, and then met to resolve discrepancies and develop a distinct coding system. Then three graduate research assistants independently identified meaning units throughout each transcript that supported the initial themes and met with the primary investigator to gain consensus on coding. Meaning units were assigned by the number of mentions. In an iterative process, the research team further reduced the meaning units into meaningful themes and subthemes and then organized the meaning units back into TPB constructs. Congruent with qualitative content analysis, it is important to note that our analysis was not a linear process.^{43,44} Finally, to illustrate data saturation across each theme, the total number of meaning units were quantified.⁴² Quantification of meaning units do not necessarily reflect the associated value, importance, or emotion across themes and subthemes. To illustrate credibility and trustworthiness of the analysis process,⁴³ sample authentic quotes are provided in Figures 2 through 4. Upon analyzing the data, there were no noteworthy differences among residents on city vs non-city water sources. Therefore, the data were collapsed and results are subsequently reported across all eight focus groups.

RESULTS

Participants

In total, 75 individuals were screened, of which 63 were eligible and 54 participated—an 86% participation rate. Ineligible participants included eight who consumed <1 cup of SSB/day and four who consumed enough SSB to qualify but were not eligible because of their primary water source. Nine eligible individuals chose not to participate (eg, transportation, scheduling). χ^2 and one-way analysis of variance tests revealed no significant differences among the participants and nonparticipants. The Table details the sex, race/ethnicity, educational attainment, income level, and health literacy status of participants. A relatively balanced range of income and education levels were achieved, yet men were somewhat underrepresented in the sample. Because the targeted southwest Virginia region is 95% white,³⁰ the race/ethnicity of the participants was representative of the area. Among participants, SSB consumption averaged 27.3 (standard deviation=23.3) oz per day.

FOCUS-GROUP RESULTS

Sugar-Sweetened Beverages

Attitudes. Numerous positive and negative attitudes were revealed (Figure 2). When asked about the good things associated with SSB (ie, soda, energy drinks, juice drinks), the majority of comments related to positive beverage attributes (n=97 meaning units). Within this category the three most frequently identified subcategories included taste (n=38 meaning units) caffeine/energy (n=31 meaning units), and vitamins (n=12 meaning units). The remaining subcategories consisted of electrolytes, high water content, novelty, not as much sugar, and antioxidants. Two positive health outcomes comprising 19 meaning units were noted; including helps when sick (n=10 meaning units) and quenches thirst

(n=9 meaning units). Cost was discussed as both a positive quality of SSB (n=6 meaning units), especially in reference to juice drinks, as well as a negative aspect (n=3 meaning units).

There were also numerous negative statements that emerged about SSB. Of the identified negative SSB attributes (n=78 meaning units), 22 meaning units were about the sugar content, and this appeared in all eight focus group. Caffeine (n=21 meaning units), taste (n=13 meaning units), and acidity (n=12 meaning units) were also common subcategories. Related to the 25 negative health outcomes, cavities emerged as the top negative health outcome associated with SSB. The remaining 19 meaning units fell under weight, more thirsty, indigestion, kidney problems, diabetes, makes kids hyper, heart trouble, bone loss, and need to use the restroom, which were mentioned in <2 focus groups.

Subjective Norms. When questioned regarding how they felt about the recommendation for drinking ≤ 8 oz/day of SSB, only a few responses (n=4 meaning units) suggested that individuals were likely to follow this recommendation. Seven responses indicated a more neutral view, as participants thought it was a good recommendation but would be hard to follow. A large majority of responses indicated unlikeliness to meet the recommendation (n=16 meaning units). When considering normative beliefs, doctor recommendation (n=meaning units 11) and peers (n=3 meaning units) emerged as important influences on the amount of SSB consumed.

Perceived Behavioral Control. The major obstacles participants identified related to what would make it hard to limit their SSB consumption included the availability and convenience of SSB (n=14 meaning units), the size of cans (n=12 meaning units), and cost (n=12 meaning units). Taste and disliking alternatives provided seven additional meaning units. Although participants provided numerous obstacles for limiting SSB consumption, the only consistent idea when discussing what would make it easy to limit SSB intake included increasing the availability and convenience of other beverages (n=18 meaning units).

Intention. Intentions about meeting the recommendation for SSB over the next month were mixed, as some participants (n=12 meaning units) indicated that it would be impossible and others illustrated plans to meet the recommendation (n=7 meaning units). Some participants held a more neutral view (n=9 meaning units), as one participant said, “I think I would have to attempt it and let you know.” Participants expressed ways to meet this goal, such as to drink more water (n=8 meaning units) and replace SSB with healthier options (n=5 meaning units). The remaining meaning units reflect strategies such as gradually decrease SSB consumption, drink small amounts of SSB throughout the day, limit availability of SSB, quit cold turkey, and buy real fruit juice.

Water

Attitudes. When asked about the good things associated with water, positive health outcomes was the prominent theme (n=47 meaning units) (Figure 3). Subcategories included helps your body, flushes kidneys, keeps you hydrated, refreshing, and helps metabolism. Among the 14 positive beverage attributes, taste was a commonly mentioned beverage

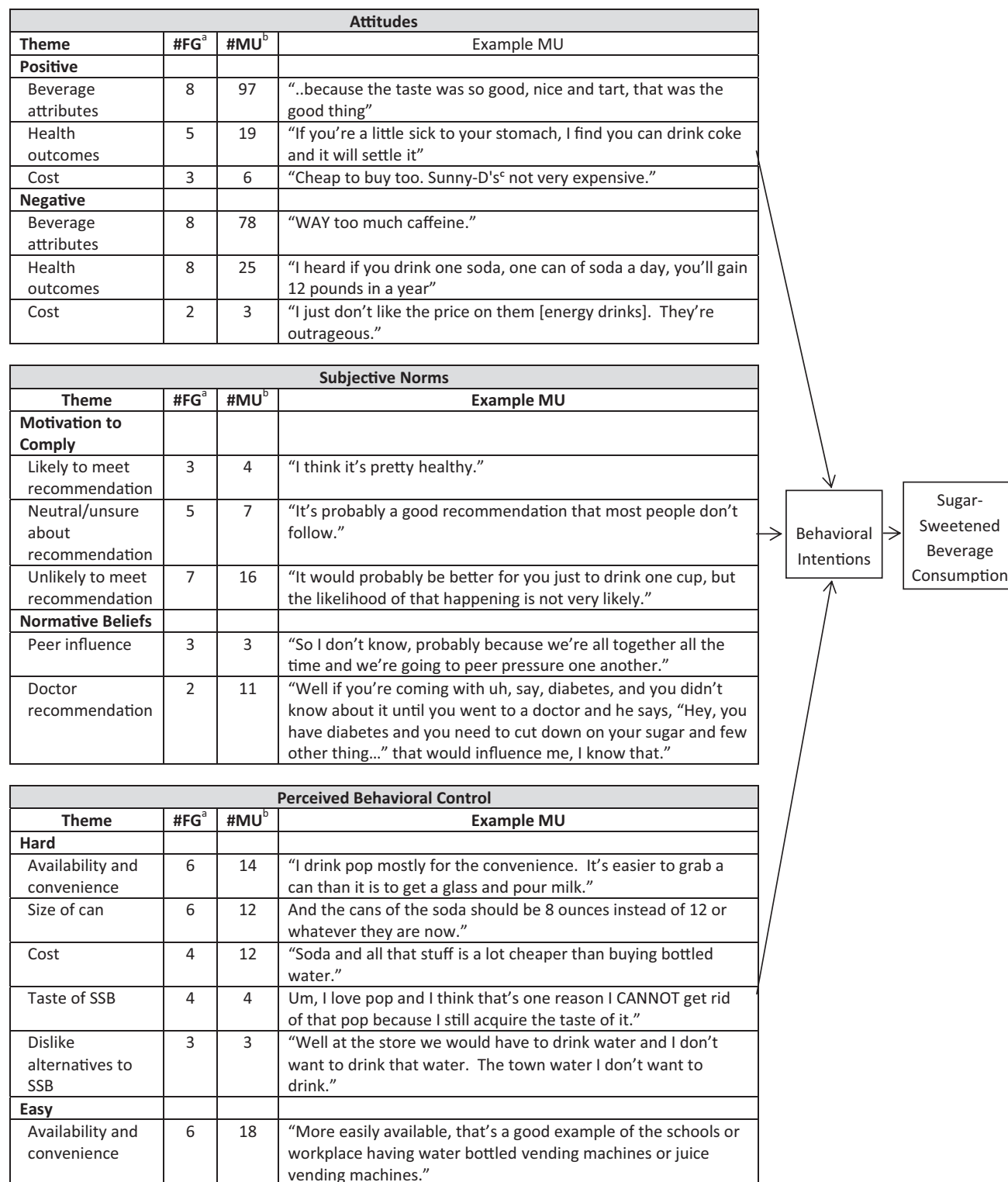


Figure 2. Sugar-sweetened beverage (SSB) consumption. Emergent themes across Theory of Planned Behavior constructs, meaning unit counts, and example quotes. ^aNumber of focus groups that meaning unit appeared. ^bNumber of meaning units represented by theme, counted by the number of mentions. ^cSunny Delight Beverages Co.

attribute, with 8 meaning units. Cost was also mentioned as a positive aspect of water ($n=4$ meaning units). Numerous participants expressed negative issues related to water ($n=41$),

including chemicals or contamination of water sources. One mother on city water mentioned, "Those letters we get from the health department, they're really scary." Taste, a negative

Attitudes			
Theme	#FG ^a	#MU ^b	Example MU
Positive			
Health outcomes	8	47	"I know I always feel better if I notice I drink more water during the day. I always feel better you know..."
Beverage attributes	5	14	"I've always like water. I've just liked the taste of water. I always did."
Cost	3	4	"It's cheap, it's not that expensive."
Negative			
Quality issues	7	41	"I guess you never know if you well's clean or not."
Beverage attributes	6	20	"I've lived in both situations. A cup of coffee made with bleach water [in reference to city water] tastes terrible."
Health outcomes	5	20	"But I've actually heard you can drink too much water. I've heard that too. That it causes electrolytes to go crazy."

Subjective Norms			
Theme	#FG ^a	#MU ^b	Example MU
Motivation to Comply			
Likely to meet recommendation	8	17	"I think it's pretty good. I drink more than that. I drink about 3 of those 32 ounce cups a day."
Neutral/unsure about recommendation	2	7	"Just depends on how I feel."
Unlikely to meet recommendation	5	9	"I say no, most of the time I don't meet it. I uh, I just want to add cool-aid mix to it."

Perceived Behavioral Control			
Theme	#FG ^a	#MU ^b	Example MU
Hard			
Availability of other options	3	7	"Just the option of having the sugar-sweetened beverage I guess."
Negative beverage attributes	3	5	"Yea, as long as it's cold I'll drink it. And if it's warm, I still try and drink it, but I guess I don't drink as much if it's been warm than if it's cold."
Neutral			
Depends on availability of preferred water source	6	9	"Well water, spring water, that's about all I'll drink."
Easy			
Availability and convenience	6	16	"Because it's handy. I always have at least one case of bottled water in the house."

Figure 3. Water consumption. Emergent themes across Theory of Planned Behavior constructs, meaning unit counts, and example quotes. ^aNumber of focus groups that meaning unit appeared. ^bNumber of meaning units represented by theme, counted by the number of mentions.

beverage attribute, was also consistent among focus groups (n=20 meaning units). Negative health consequences also emerged (n=20 meaning units) with frequent responses including health complications associated with drinking too much water and perceptions that cancer is related to water intake. In addition, numerous participants mentioned cost as a negative aspect of water (n=5 meaning units), which frequently related to bottled water.

Subjective Norms. More than half of the meaning units (n=17 meaning units) suggested participants met the recommendations to drink 5 to 8 cups of water per day. Some

participants said they sometimes met the recommendation (n=7 meaning units) and others said they did not meet the recommendation (n=9 meaning units). Unlike SSB, normative beliefs did not emerge in reference to water.

Perceived Behavioral Control. When questioned what would make it hard to increase their water consumption, some responses related to negative beverage attributes (n=5 meaning units). Some participants also stated the availability of other options made it difficult to consume the recommended amount of water (n=7 meaning units). Many individuals expressed a more neutral attitude, saying that it de-

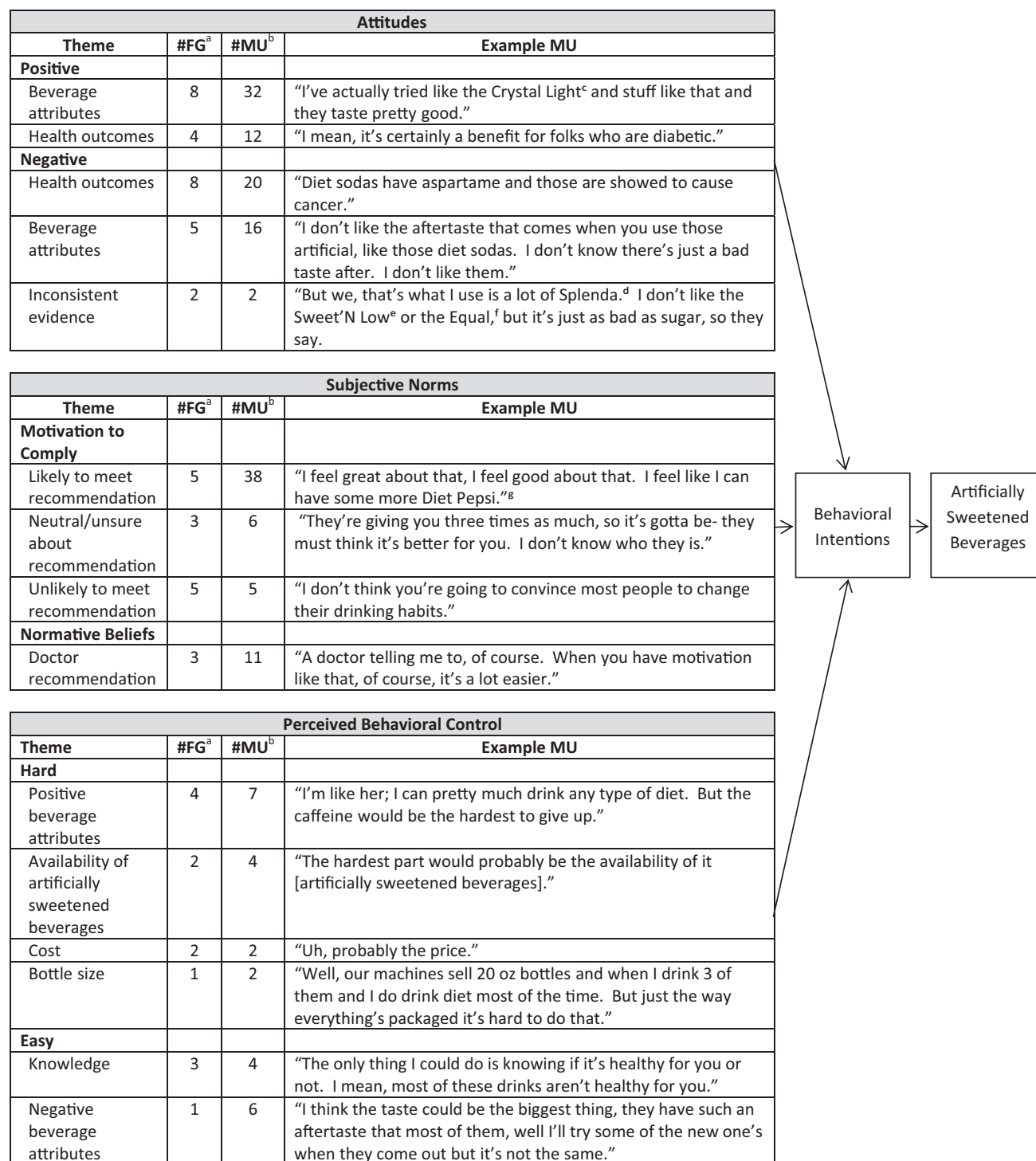


Figure 4. Artificially sweetened beverage consumption. Emergent themes across Theory of Planned Behavior constructs, meaning unit counts, and example quotes. ^aNumber of focus groups that meaning unit appeared. ^bNumber of meaning units represented by theme, counted by the number of mentions. ^cKraft Foods, Inc. ^dMcNeil Nutritionals, LLC. ^eCumberland Packing Group. ^fMerisant. ^gPepsi Co.

pendent on the availability of their preferred water source (n=9 meaning units). In addition, the availability and convenience of water (n=16 meaning units) made it easy for many participants to consume the recommended amount of water.

Intention. Very few participants responded about their intentions to meet the recommendation for water over the next month. Ten meaning units were provided for individuals intending to meet the recommendation, while five people said

Table. Characteristics of the participants (n=54) in a formative study applying the Theory of Planned Behavior to understand beverage consumption behaviors among adults residing in rural southwest Virginia

Demographic variables	n (%)
Sex	
Male	21 (39)
Female	33 (61)
Race	
Non-Hispanic white	52 (96)
African American	2 (4)
Education level	
Less than high school or GED ^a	7 (13)
High school or GED	16 (30)
Some college or specialized training, no degree	11 (20)
College degree	20 (37)
Household income level	
≤\$14,999	22 (41)
\$15,000 to \$34,999	15 (28)
≥\$35,000	17 (31)
Health literacy^b	
High likelihood of limited literacy	10 (19)
Possibility of limited literacy	13 (24)
Adequate literacy	31 (57)

^aGED=general equivalency diploma.

^bAssessed using the Newest Vital Sign with scores ranging from 0 to 6; score of 0 to 1 suggests high likelihood of limited literacy, score of 2 to 3 indicates the possibility of limited literacy, score of 4 to 6 indicates adequate literacy.⁴⁰

they already meet the recommendation. No one voiced that they did not intend to meet this recommendation. Ways to consume more water provided 15 meaning units, including replace SSB with water, increase availability of water, measure water consumption, and limit availability of SSB.

Artificially Sweetened Beverages

Attitudes. When discussing the good things associated with artificially sweetened beverages, participant responses focused on positive beverage attributes (Figure 4). Subcategories included less energy/sugar (n=16 meaning units), taste (n=14 meaning units), and caffeine (n=2 meaning units). Positive health benefits (n=12 meaning units) were also discussed. Related to the bad things associated with artificially sweetened beverages, negative health consequences were reported across all focus groups, with cancer being frequently mentioned (meaning units=15). Taste was a common subcategory of negative beverage attributes, with 13 meaning units.

Subjective Norms. The majority of meaning units confirmed participants would be likely to meet the recommendation to drink ≤32 oz of artificially sweetened beverages per day (n=38 meaning units). However, some meaning units (n=6)

revealed uncertainty about the recommendation, and several comments (n=5 meaning units) displayed that participants were not likely to meet the recommendation. Similar to SSB, doctor's influence emerged as a normative belief (n=11 meaning units), as individuals stated their consumption of artificially sweetened beverages would be determined by their doctor's advice.

Perceived Behavioral Control. Themes such as positive beverage attributes (n=7 meaning units), availability of artificially sweetened beverages (n=4 meaning units), cost (n=2 meaning units), and bottle size (n=2 meaning units) emerged related to difficulty in meeting the recommendations for artificially sweetened beverages. When asked what would make it easy to meet artificially sweetened beverage recommendations, the 10 meaning units were spread across categories, as participants mentioned knowledge, negative beverage attributes—specifically taste—and negative health outcomes.

Intention. There were few responses when inquiries were made about participant's intentions to meet this recommendation in the next month. Four meaning units were provided for participants who already meet the recommendation, with no additional comments from individuals who did not meet the recommendation, although participants noted limiting availability as a way to decrease artificially sweetened beverage intake (n=6 meaning units). A little more than half of the individuals said they would not be willing to replacing regular soda with diet soda (n=16 meaning units), as one participant expressed, "I would just quit all together instead of drinking diet." Of the responses, almost half (n=13 meaning units) indicated that participants would be willing to replace sugary drinks with diet drinks. However, many said not until they felt like they had to. For example, one woman said, "I would, like if I ever became a diabetic or something like that."

Nonspecific Beverage Themes

In addition to themes and meaning units specific to individual beverages, there were other important themes identified that were not directly linked to SSB, water, or artificially sweetened beverages. For example, time of day (n=37 meaning units) was a notable influence on personal beverage choices. Certain foods (n=11 meaning units) and locations (n=5 meaning units) also emerged, as participants noted they were more likely to consume a particular drink depending on what food they were eating and were more likely to consume an SSB when going out to eat. Furthermore, the majority of meaning units indicated that drink patterns were different on the weekends (n=30 meaning units).

When probed about friends and family, the majority of responses (n=27 meaning units) indicated that it was not important to drink the same drinks as their friends and family. However, when asked about who or what influences their drink choices, members of the household (n=19 meaning units) was a very prominent theme. When questioned what influenced the beverage choices of their family and friends, emerging themes included availability or convenience of a drink (n=18 meaning units), taste (n=22 meaning units), caffeine (n=21 meaning units), and health concerns (n=26 meaning units).

Furthermore, habit was a common theme that emerged (n=57 meaning units) across the focus groups. One partici-

pant said, “I just like drinking coffee and soda pop. I drank it ever since I was a kid, so it’s just something, that I’ve gotten used to.”

DISCUSSION

This is the first study, to our knowledge, that qualitatively explores beverage consumption behaviors among adults using the TPB. Collectively, these findings provide unique insight to better understanding the cultural beliefs associated with beverage consumption behaviors. Across all the beverage categories and theory-grounded questions, the most notable themes that emerged included taste ($n=161$ meaning units), availability/convenience ($n=95$ meaning units), habit/addiction ($n=57$ meaning units), and cost ($n=28$ meaning units). Although the number of meaning units varied substantially across these themes, these issues jointly emerged as the most important to address in program planning. Although fewer meaning units were revealed for health consequences, water quality, and normative beliefs among peers and doctors, the value placed on these themes by participants also highlight them as important factors influencing SSB behaviors.

As previously summarized, the TPB has broad utility for all phases of behavioral research across a wide range of health outcomes, yet there are obvious deficits in the empirical literature for qualitatively applying the TPB in the formative phases for the development of nutrition-intervention studies.^{9–28} Of two known nutrition-related TPB qualitative studies in adults, one focused on fruit and vegetable consumption among 29 white Dutch adults and identified six major influences on the consumption of fruits and vegetables, including satisfaction, health consequences, social influences, habit, abilities and barriers, and awareness.²⁷ The other study examined eating and dietary behaviors among 17 overweight and obese Spanish women enrolled in a weight-loss treatment program and found a wide range of TPB beliefs to incorporate in programming planning, including creating a more positive attitude toward dieting, the normative beliefs and perceived pressure in follow-up visits, positive beliefs related to social support, and the need to address willpower to overcome temptations.²⁸ Other qualitative studies exploring beverage consumption behaviors have focused on youth or college-age populations.^{45–48} Our ability to draw distinct comparisons between our qualitative beverage findings to adult populations across other cultures or regions is limited.

It is important to recognize that views and cultural perspectives of medically underserved areas, such as the southwest Virginia region of Appalachia, are less likely to be represented in mainstream industry- or government-funded consumer-group reports focusing on food and beverage consumption behaviors. As one example, although the 2010 Dietary Guidelines for Americans had focus groups to assist in the development of consumer messages, the individuals in these focus groups represented four large urban US cities.⁴⁹ Although these reports are useful in identifying the general beliefs associated with food and beverage consumption behaviors, they often lack specificity on cultural and regional factors that are needed for program planning. Popular media have depicted the unique aspects surrounding sugary beverage consumption behaviors in Appalachia,^{50,51} such as the regional terms coined to describe a prominent health problem in this

area due to unchecked consumption of sugary foods and beverages combined with insufficient dental care and lack of dietary and dental education. These cumulative risk factors have led to considerably higher rates of tooth decay and tooth loss. Combined with alarming rates of obesity and diabetes in this region, the importance of understanding and intervening on modifiable SSB behavior are evident.

Of the earlier TPB studies that have examined SSB consumption, all have been cross-sectional quantitative studies targeting adolescents.^{16–19} Because no known behavioral intervention studies have been designed, *a priori*, to target changes in SSB intake among adult populations,^{52–54} translating our theory-guided formative data into intervention strategies will be important. This formative study capitalizes on the collective body of literature and recommendations urging health educators and researchers to comprehensively and explicitly apply the behavioral theory to all intervention phases.^{13,14} Using this elicitation phase to better understand the attitudinal, normative, and control beliefs associated with beverage consumption behaviors will support our long-term goal to apply these findings for the development and implementation of culturally specific behavioral strategies and interventions for reducing SSB intake among Appalachian residents. For example, our work revealed some very specific strategies that should be incorporated into future program planning, such as providing participants an opportunity to taste different beverages, incorporating strategies aimed at cost savings and cost comparison across different beverage choices, debunking media-driven myths pertaining to beverages, using clear communication strategies to convey convincing evidence-based recommendations regarding the health benefits and consequences across all beverage categories, addressing safe-water strategies, addressing normative beliefs with regard to both doctors and peers, and encouraging gradual reductions in SSB consumption to avoid behavioral relapse and adverse side effects, such as caffeine withdrawals.

Although this study uses a rigorous qualitative approach and fills a gap in the literature on understanding the underlying behavioral beliefs related to beverage consumption, there were several limitations. This study was conceptualized to identify potential differences among residents on city water vs non-city water sources, yet no meaningful differences emerged. We discovered that most participants had exposure to and use of multiple city and non-city water sources (eg, home, work, homes of friends/family, eating away from home) and that participants generally preferred their home source of water, regardless of whether it was city or non-city water. These two findings provide insight into why no noteworthy differences among TPB constructs were found among participants on city vs non-city water sources. Furthermore, due to the focused region in which this study was conducted, it may not be reasonable to generalize the results to other geographical regions.

Although this study has laid the groundwork for future efforts to reduce SSB consumption in southwest Virginia, additional research is needed. As previously mentioned, intervention research is needed to evaluate whether a TPB-guided intervention can achieve sustained reductions in SSB consumption. Future research should also apply a broader socio-ecological model to understand other factors that influence

beverage choices. The socioecological model proposes that behaviors are influenced by the interaction between individuals and their environment, including interpersonal, organizational-, community-, and policy-level factors.⁵⁵ This model has been widely used in health promotion and public health initiatives, including dietary behaviors.⁵⁵ The socioecological model can inform multilevel influences on SSB consumption, such as the family environment,⁵⁶ built environment,⁵⁷ media,⁵⁸ and policy.^{19,59} In concert with individual-level intervention approaches aimed at decreasing the consumption of SSB, it is apparent that initiatives must also consider broader social-, community-, environmental-, and policy-level factors. Related more specifically to qualitative approaches aimed at exploring beverage consumption behaviors, future studies should also consider research designs and analytical approaches to explore differences among demographic characteristics (eg, sex, race/ethnicity, age, income, education), as well as explicitly examine TPB constructs related to other more healthful beverage choices (eg, milk) that could replace SSB.

CONCLUSIONS

The TPB provided a useful framework for exploring major determinants of beverage consumption patterns and identifying key intervention messages to aid in program planning aimed at reducing SSB intake among southwest Virginia residents in the Appalachia region. To better understand culturally specific behavioral strategies and to help guide program planning efforts, dietetics practitioners should consider theory-grounded qualitative approaches in the formative phase of research.

References

- Duffey KJ, Popkin BM. Shifts in patterns and consumption of beverages between 1965 and 2002. *Obesity*. 2007;15(11):2739-2747.
- Nielsen SJ, Popkin BM. Changes in beverage intake between 1977 and 2001. *Am J Prev Med*. 2004;27(3):205-210.
- Drewnowski A, Bellisle F. Liquid calories, sugar, and body weight. *Am J Clin Nutr*. 2007;85(3):651-661.
- Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: A systematic review and meta-analysis. *Am J Public Health*. 2007;97(4):667-675.
- Schulze MB, Manson JE, Ludwig DS, Colditz GA, Stampfer MJ, Hu FB. Sugar-sweetened beverages, weight gain, and incidence of type 2 diabetes in young and middle-aged women. *J Am Med Assoc*. 2004;292(8):927-934.
- Malik VS, Schulze MB, Hu FB. Intake of sugar-sweetened beverages and weight gain: A systematic review. *Am J Clin Nutr*. 2006;84(2):274-288.
- Ismail AI, Sohn W, Lim S, Willem JM. Predictors of dental caries progression in primary teeth. *J Dent Res*. 2009;88(3):270-275.
- Fung TT, Malik V, Rexrode KM, Manson JE, Willett WC, Hu FB. Sweetened beverage consumption and risk of coronary heart disease in women. *Am J Clin Nutr*. 2009;89(4):1037-1042.
- Harris JE, Gleason PM, Sheehan PM, Boushey C, Beto JA, Bruemmer B. An introduction to qualitative research for food and nutrition professionals. *J Am Diet Assoc*. 2009;109(1):80-90.
- Ajzen I. The theory of planned behavior. *Organ Behav Human Decis Process*. 1991;50:179-211.
- Armitage CJ, Conner M. Efficacy of the theory of planned behaviour: A meta-analytic review. *Br J Soc Psychol*. 2001;40:471-499.
- Godin G, Kok G. The theory of planned behavior: A review of its applications to health-related behaviors. *Am J Health Prom*. 1996;11(2):87-98.
- Hardeman W, Johnston M, Johnston DW, Bonetti D, Wareham NJ, Kinmonth AL. Application of the theory of planned behaviour in behaviour change interventions: A systematic review. *Psychol Health*. 2002;17(2):123-158.
- Montano D, Kasprzyk D. Theory of reasoned action, theory of planned behavior, and the integrated behavioral model. In: Glanz K, Rimer BK, Viswanath K, eds. *Health Behavior and Health Education: Theory, Research, and Practice*. 4th ed. San Francisco, CA: Jossey-Bass; 2008:67-96.
- Conner M, Sparks P. Theory of planned behavior and health behaviour. In: Connor M, Norman P, eds. *Predicting Health Behavior: Research and Practice with Social Cognitive Models*. New York, NY: Two Penn Plaza; 2005:170-222.
- de Bruijn GJ, Kremers SPJ, de Vries H, van Mechelen W, Brug J. Associations of social-environmental and individual-level factors with adolescent soft drink consumption: Results from the SMILE study. *Health Educ Res*. 2007;22(2):227-237.
- Kassem NO, Lee JW. Understanding soft drink consumption among male adolescents using the theory of planned behavior. *J Behav Med*. 2004;27(3):273-296.
- Kassem NO, Lee JW, Modeste NN, Johnston PK. Understanding soft drink consumption among female adolescents using the Theory of Planned Behavior. *Health Educ Res*. 2003;18(3):278-291.
- van der Horst K, Timperio A, Crawford D, Roberts R, Brug J, Oenema A. The school food environment: Associations with adolescent soft drink and snack consumption. *Am J Prev Med*. 2008;35(3):217-223.
- Trafimow D, Sheeran P, Conner M, Finlay KA. Evidence that perceived behavioural control is a multidimensional construct: Perceived control and perceived difficulty. *Br J Soc Psychol*. 2002;41:101-121.
- Blue CL. The predictive capacity of the Theory of Reasoned Action and the Theory of Planned Behavior in exercise research: An integrated literature review. *Res Nurs Health*. 1995;18(2):105-121.
- Hausenblas HA, Carron AV, Mack DE. Application of the theories of reasoned action and planned behavior to exercise behavior: A meta-analysis. *J Sport Exerc Psychol*. 1997;19(1):36-51.
- Hagger MS, Chatzisarantis NLD, Biddle SJH. A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *J Sport Exerc Psychol*. 2002;24(1):3-32.
- Sheeran P, Taylor S. Predicting intentions to use condoms: A meta-analysis and comparison of the theories of reasoned action and planned behavior. *J Appl Soc Psychol*. 1999;29(8):1624-1675.
- Albarracín D, Johnson BT, Fishbein M, Muellerleile PA. Theories of reasoned action and planned behavior as models of condom use: A meta-analysis. *Psychol Bull*. 2001;127(1):142-161.
- Conner M, Norman P, Bell R. The theory of planned behavior and healthy eating. *Health Psychol*. 2002;21(2):194-201.
- Brug J, Lechner L, Devries H. Psychosocial determinants of fruit and vegetable consumption. *Appetite*. 1995;25(3):285-295.
- Barberia AM, Attree M, Todd C. Understanding eating behaviours in Spanish women enrolled in a weight-loss treatment. *J Clin Nurs*. 2008;17(7):957-966.
- Virginia Medically Underserved Areas. Virginia Department of Health, Office of Health Policy and Planning. <http://www.vdh.virginia.gov/healthpolicy/primarycare/shortagedesignations/documents/VMUA.pdf>. Accessed April 6, 2012.
- US Census Bureau. <http://www.census.gov/>. Accessed October 25, 2010.
- Adult Literacy Estimates. www.casas.org/lit/litcode/Search.cfm. Accessed November 20, 2011.
- Virginia Department of Health. <http://www.vdh.state.va.us/>. Accessed September 11, 2010.
- Food Environment Atlas. <http://maps.ers.usda.gov/FoodAtlas/>. Accessed September 17, 2010.
- Billings D. Culture and poverty in Appalachia: A theoretical discussion and empirical analysis. *Social Forces*. 1974;53(2):315-23.
- Denham SA, Meyer MG, Toborg MA, Mande MJ. Providing health education to Appalachia populations. *Holist Nurs Pract*. 2004;18(6):293-301.

36. Zipper C, Holtzman G, Rheem S, Evanylo G. *Surface Water Quality Trends in Southwestern Virginia, 1970-1989: I. Seasonal Kendall Analysis*. Blacksburg, VA: Virginia Water Resources Research Center, Virginia Polytechnic Institute and State University; 1992.
37. Zoellner J, Estabrooks P, Davy B, Chen Y, You W. Exploring the Theory of Planned Behavior to explain sugar-sweetened beverage consumption. *J Nutr Educ Behav*. 2012;44(22):172-177.
38. Popkin BM, Armstrong LE, Bray GM, Caballero B, Frei B, Willett WC. A new proposed guidance system for beverage consumption in the United States. *Am J Clin Nutr*. 2006;83(3):529-542.
39. Hendrick V, Comber D, Estabrook P, Savla J, Davy B. The beverage intake questionnaire: Determining initial validity and reliability. *J Am Diet Assoc* 2010;110(8):1227-1232.
40. Weiss B, Mays M, Martz W, et al. Quick assessment of literacy in primary care: The Newest Vital Sign. *Ann Fam Med*. 2005;3:514-522.
41. Krueger RA, Casey MA. *Focus Groups: A Practical Guide for Applied Research*. Thousand Oaks, CA: Sage; 2000.
42. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: Concepts, procedures and measures to achieve trustworthiness. *Nurse Educ Today*. 2004;24(2):105-112.
43. Elo S, Kyngäs H. The qualitative content analysis process. *J Adv Nurs*. 2008;62(1):107-115.
44. Patton M. *Qualitative Research & Evaluation Methods*. 3rd ed. Thousand Oaks, CA: Sage Publication, Inc; 2002.
45. Moise N, Cifuentes E, Orozco E, Willett W. Limiting the consumption of sugar sweetened beverages in Mexico's obesogenic environment: A qualitative policy review and stakeholder analysis. *J Public Health Policy*. 2011;32(4):458-475.
46. Hattersley L, Irwin M, King L, Allman-Farinelli M. Determinants and patterns of soft drink consumption in young adults: A qualitative analysis. *Public Health Nutr*. 2009;12(10):1816-1822.
47. Block JP, Linakis S, Gillman MW, Goldman RE. Water for hydration and sugary beverages for taste: A qualitative study of beverage consumption in colleges. *Obesity*. 2011;19(suppl 1):S216.
48. Theodore F, Bonvecchio A, Blanco I, Irizarry L, Nava A, Carriedo A. Culturally constructed meanings for consumption of sweetened beverages among schoolchildren in Mexico City. *Am J Public Health*. 2011;30(4):327-334.
49. US Department of Agriculture, Center for Nutrition Policy and Promotion. *Development of the 2010 Dietary Guidelines for Americans Consumer Messages and New Food Icon: Executive Summary of Formative Research*. Washington, DC: US Department of Agriculture, Center for Nutrition Policy and Promotion; 2011.
50. Sawyer D. A Hidden America: Children of the Mountains. ABC News. 20/20; 2009.
51. Gray K, Diaz J. Mobile clinic treats "Mountain Dew." ABC News. 20/20; 2009.
52. Chen LW, Appel LJ, Loria C, et al. Reduction in consumption of sugar-sweetened beverages is associated with weight loss: The PREMIER trial. *Am J Clin Nutr*. 2009;89(5):1299-1306.
53. Stookey JD, Constant F, Popkin BM, Gardner CD. Drinking water is associated with weight loss in overweight dieting women independent of diet and activity. *Obesity*. 2008;16(11):2481-2488.
54. Chen L, Caballero B, Mitchell DC, et al. Reducing consumption of sugar-sweetened beverages is associated with reduced blood pressure: A prospective study among United States adults. *Circulation*. 2010;122(4):E408-E408.
55. Sallis JF, Owen N, Fisher EB. Ecological models of health behavior. In: Glanz K, Rimer BK, Viswanath K, eds. *Health Behavior and Health Education: Theory, Research and Practice*. 4th ed. San Francisco, CA: Jossey-Bass; 2008:465-482.
56. Sdrail D, Anisiadou M, Goussia-Rizou M, Costarelli V. Adolescents' soft drinks consumption in family environment: A case study in Northern Greece. *Int J Consum Stud*. 2010;26(6):684-690.
57. Sallis JF, Glanz K. Physical activity and food environments: Solutions to the obesity epidemic. *Milbank Q*. 2009;87(1):123-154.
58. Flora JA, Maibach EW, Maccoby N. The role of media across 4 levels of health promotion intervention. *Annu Rev Public Health*. 1989;10:181-201.
59. Brownell KD, Farley T, Willett WC, Chaloupka FJ, Thompson JW, Ludwig DS. The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med*. 2009;361(16):1599-1605.

AUTHOR INFORMATION

J. Zoellner is an associate professor and E. Cook is a dietetic intern, Department of Human Nutrition, Foods and Exercise, Virginia Polytechnic Institute and State University, Blacksburg. At the time of the study, E. Krzeski was a graduate research assistant, Department of Human Nutrition, Foods and Exercise, Virginia Polytechnic Institute and State University, Blacksburg. S. Harden is a post-doctoral student, K. Allen is a PhD candidate, and P. A. Estabrooks is a professor, Department of Human Nutrition, Foods and Exercise, Virginia Polytechnic Institute and State University, SW Roanoke.

Address correspondence to: Jamie Zoellner, PhD, RD, Department of Human Nutrition, Foods and Exercise, Virginia Polytechnic Institute and State University, Integrated Life Sciences Building 23, Room 1034 (0913), 1981 Kraft Dr, Blacksburg, VA 24061. E-mail: Zoellner@vt.edu

STATEMENT OF POTENTIAL CONFLICT OF INTEREST

No potential conflict of interest was reported by the authors.

FUNDING/SUPPORT

This research was funded, in part, by a grant from the National Institutes of Health-National Cancer Institute (1R03CA136457-01A2).