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Total sugar-sweetened beverage intake among U.S. adults lower when measured using a one-question versus four-question screener

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Abstract

Purpose: To compare the performance of one survey screener question measuring total sugar-sweetened beverage (SSB) intake to a screener measuring SSB types separately using four questions.

Design: Cross-sectional.

Setting: Web-based 2014 *SummerStyles* survey.

Subjects: 4,167 U.S. adults (≥18 years).

Measures: Frequency of SSB intake measured using one screener question was compared to frequency using a four-question screener (regular soda, fruit drinks, sports/energy drinks, sweetened coffee/tea). SSB intake (number of times/day) was categorized as 0, >0 to <1, and ≥1 time/day; difference in mean intake was calculated between four questions versus one.

Analysis: Paired t-tests were used, and agreement was evaluated using weighted kappa and Lin's Concordance Correlation Coefficient (CCC).

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Author Contributions:

All authors participated in the design and conceptualization of this study. EAL analyzed the data and wrote the first manuscript draft. All authors interpreted the data and reviewed and commented on subsequent drafts of the manuscript.

Declaration of Conflicting Interests: Authors have no conflicts of interest.

Results: Mean SSB intake was 1.7 (95% CI: 1.65–1.79) times/day using four questions and 0.6 (95% CI: 0.56–0.62) times/day using one question ($p<0.001$). Intake frequency based on four questions vs. one, respectively, was 16.0% vs. 38.5% for 0 times/day, 15.6% vs. 42.5% for >0 to <1 time/day, and 68.4% vs. 18.9% for ≥1 time/day. There was fair agreement for the three SSB intake categories (kappa: 0.27), and poor absolute agreement between the two continuous measures (Lin's CCC: 0.31).

Conclusion: Daily SSB intake was significantly lower using one screener question versus a four-question screener. Researchers should assess SSB types separately or consider that daily SSB intake is likely underestimated with one question.

Keywords

Sugar-sweetened beverages; measuring consumption; screener questions; food frequency questionnaire-style questions; population surveillance; Manuscript format: research; Research purpose: relationship testing; Study design; quantitative; Outcome measure: SSB intake; Setting: national; Health focus: nutrition; Target population: adults; Target population circumstances: measurement

PURPOSE

Sugar-sweetened beverages (SSBs) are drinks with added caloric sweeteners such as sugars or high fructose corn syrup. SSBs can include non-diet soft drinks/soda, fruit drinks that are not 100% fruit juice, sports drinks, energy drinks, and sweetened tea and coffee drinks.[1] Data from the National Health and Nutrition Examination Survey (NHANES) in 2014 showed that 49.3% of U.S. adults consume one or more SSBs per day.[2] SSBs are the largest source of added sugars in the U.S. diet,[3] with adults consuming an average of 151 calories from SSBs on a given day.[4] Frequent consumption of SSBs is an important public health concern, as daily SSB consumption has been linked to an increased risk of obesity, type II diabetes, hypertension, dental caries, and asthma.[5–8]

Given the adverse health consequences of daily SSB consumption, it is important to monitor SSB intake. The gold standard method of measuring usual intake of foods and beverages is to collect multiple food records or 24-hour recalls, in which respondents record, either prospectively (food record) or retrospectively (24-hour recall), all foods and beverages consumed in a one day period.[9] This method, however, can be time consuming for both the respondent and the data collector, and is often prohibitively expensive for large-scale data collection.[9] Due to costs and space limitations on surveys, it is common in SSB research and surveillance to inquire about consumption using screener questions. Screener questions are typically written in the style of Food Frequency Questionnaires (FFQs), which ask respondents to estimate their usual intake of food or beverage items during a specified period of time.[10] A previous study compared beverage intake reported as the number of times/day derived from a 7-question FFQ-style screener to beverage intake calculated as the number of servings/day derived from multiple 24-hour dietary recalls, and found that screener questions are a suitable method for population-level surveillance of beverage intake, including SSBs.[11]

Some screeners have multiple questions to inquire about different beverage types, while others use just one overall screener question, which asks about total consumption of all beverage types combined. However, the performance of a single screener question in assessing total consumption of SSBs is unknown. Therefore, this cross-sectional study aimed to compare the performance of a single screener question measuring total SSB intake to a screener with four questions, which measure the different SSB types separately, to determine whether a single question is sufficient to estimate the prevalence of daily SSB consumption among adults.

METHODS

Design

Data from the summer wave of Porter Novelli's 2014 *Styles* database were used. The *Styles* database is constructed from a series of web-based surveys conducted annually in the U.S. using GfK's Knowledge Panel®, which is established using address-based sampling methods. Respondents are included regardless of whether or not they have landline phones or Internet access, and if needed, households are provided with a laptop computer and access to the Internet. The panel is continuously replenished and maintains approximately 50,000 panelists. *Styles* surveys American consumers about a variety of topics, including knowledge, attitudes, and behaviors pertaining to health issues.

Sample

The summer wave of *Styles* is sent to a random sample of adults (≥18 years) who participated in the spring wave. The spring wave, which was completed by 6,713 of the 11,018 adults who received the survey, had a response rate of 60.9%. The *SummerStyles* survey was sent during June–July 2014 to a random sample of 6,159 adults (≥18 years) who previously completed the spring wave. The *SummerStyles* survey, which took approximately 36 minutes to complete, was returned by 4,269 participants, for a response rate of 69.3%. The final analytic sample included 4,167 respondents who had complete data for all SSB questions (n=102, 2.4%, were excluded due to missing SSB data). The data were weighted to match the U.S. Current Population Survey proportions for sex, age, household income, race/ethnicity, household size, education level, census region, metro status, and whether or not a respondent had internet access prior to joining the panel. The U.S. Centers for Disease Control and Prevention licensed the results of the 2014 *SummerStyles* survey from Porter Novelli, and analyses of these data were exempt from institutional review board approval because personal identifiers were not included in the data file.

Measures

SummerStyles has two food frequency questionnaire-style screeners that ask about respondents' consumption of SSBs during the past month. The survey has a screener with four individual questions, one for each of the beverage types: regular soda, sweetened coffee and tea, sports and energy drinks, and fruit drinks (Table 1). These questions were chosen to match the four questions that comprise the SSB screener in the National Health Interview Survey (NHIS), a nationally representative survey that administers a dietary module every five years and serves as an important source of data for surveillance of SSB intake among

adults in the U.S.[12] *SummerStyles* also contains a screener with one SSB question that asks about combined consumption of different beverage types over the last month (Table 1). This single question screener was placed at the end of the survey, separated by over one hundred questions from the four question screener at the beginning of the survey, to reduce the likelihood of biasing respondents' answers. For each of these five questions, participants are asked to rate the frequency of their consumption over the past month using the following response options: none, 1 to 6 times/week, 1 time/day, 2 times/day, 3 times/day, or ≥4 times/day. Response values were converted to the number of times per day that SSBs were consumed, with 1–6 times/week converted to 0.5 times/day (3.5 divided by 7) and ≥4 times/day converted to 4 times/day.

For the four question screener, a composite consumption variable was then created by adding the responses to the individual SSB questions (referred to hereafter as the 4-question screener). The 4-question screener variable and the 1-question screener were categorized based on the number of times per day that SSBs were consumed. The categories were defined as 0 times/day, >0 to <1 time/day, and ≥1 times/day, to enable an assessment of daily consumption, which is consistent with other literature.[2, 12, 13] The frequency of SSB intake that was calculated based on the 4-question screener was then compared to the frequency calculated from the 1-question screener.

Frequencies were compared overall, and by several sociodemographic factors: age (18–24 years, 25–44 years, 45–64 years, ≥65 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, non-Hispanic other), marital status (married/domestic partnership, not married), education (≤high school, some college, ≥bachelors), annual household income (≤$34,999, $35,000–$74,999, $75,000–$99,999, ≥$100,000), and weight status (has obesity, overweight, and underweight/normal weight, where the latter two categories were combined due to the low prevalence of underweight). Self-reported weight and height data were used to calculate body mass index (BMI) (weight [kg] / height $[m]^2$), and weight status was categorized as underweight/normal weight (BMI<25 kg/m^2), overweight (BMI 25 to <30 kg/m^2), or has obesity (BMI ≥30 kg/m^2).[14]

Analysis

The Rao-Scott chi-square test was used to examine associations between categories of daily SSB consumption and several sociodemographic factors. The weighted kappa statistic (ranging 0 to +1) was calculated, overall and within levels of the sociodemographic factors, to determine the strength of agreement between the two SSB screener types using the three categories of daily consumption. A kappa of +1 indicates perfect agreement, whereas a kappa of 0 indicates agreement equivalent to chance.[15]

The two screeners were also compared using a continuous variable, mean number of times/day, with comparisons made overall and by the specified sociodemographic factors. The mean difference in SSB consumption (times/day) between the 4-question screener and the 1-question screener was calculated, and paired t-tests were used to determine whether there were significant differences in mean SSB intake using 4 questions versus 1 question, overall and by the sociodemographic factor levels. Independent samples t-tests were used to determine whether the mean difference in SSB consumption between the two SSB screener

types differed by levels of the sociodemographic factors. Lin's Concordance Correlation Coefficient (CCC) was calculated to measure the absolute agreement between daily SSB intake (as a continuous measure) using the 4-question screener and intake using the 1-question screener. Using Lin's CCC, agreement is classified as $0.0 \leq CCC < 0.4$ (poor agreement), $0.4 \leq CCC < 0.7$ (moderate agreement), and $0.7 \leq CCC \leq 1.0$ (good agreement).[16] Analyses were conducted using Statistical Analysis Software (SAS) (version 9.3, 2011, SAS Institute Inc., Cary, NC) and were weighted to account for the survey design. Lin's CCC was calculated in STATA 13.0 and was unweighted.

RESULTS

Survey participants were 47.9% male and 52.1% female (Table 2). The majority of participants were non-Hispanic white (66.4%), married or in a domestic partnership (61.1%), and were between the ages of 25–44 years (34.2%) or 45–64 years (35.0%). Based on the 4-question screener, 16.0% of respondents consumed SSBs 0 times/day, 15.6% consumed SSBs >0 to < 1 time/day, and 68.4% consumed SSBs ≥1 time/day. Based on the 1-question screener, 38.5% of respondents consumed SSBs 0 times/day, 42.5% consumed SSBs >0 to < 1 time/day, and 18.9% consumed SSBs ≥1 time/day. Using both screener types, significant differences were found in the frequency of daily SSB intake by age, sex, race/ethnicity, education, and annual household income (all p-values <0.05). The patterns in the distribution of daily SSB consumption categories across levels of the sociodemographic factors were similar to the overall distribution. The reporting of a lower daily SSB intake using 1 question versus 4 questions was largest among Hispanic respondents. Among Hispanics, there was a 57 percentage point difference in the prevalence of respondents who consumed SSBs ≥1 time/day using 4 questions versus 1 question, and this was the largest difference of any sociodemographic group. The overall weighted kappa statistic was 0.27, and ranged from 0.18 among Hispanic respondents to 0.33 among respondents with obesity.

Using the continuous measure of SSB intake, respondents consumed SSBs an average of 1.7 times/day (95% CI: 1.65–1.79) based on the 4-question screener and 0.6 times/day (95% CI: 0.56–0.62) based on the 1-question screener (Table 3). The mean difference in consumption using 4 questions versus 1 was 1.1 times/day, a difference that was statistically significant overall and within all demographic groups. The mean difference in the frequency of SSB intake was significantly higher for males (versus females), blacks and Hispanics (versus whites), and those in the 25–44 years or 45–64 years categories (versus the 65 years and older category). Also, the mean difference was significantly higher for individuals with a high school education or less (versus those with some college education or those who completed college), and among individuals in the lowest household income category (versus all higher income categories). The overall Lin's CCC was 0.31, indicating poor absolute agreement between these two screeners for SSB consumption.[16]

DISCUSSION

In the present study, SSB consumption was significantly lower when measured with a single screener question compared to a screener with four SSB questions; Lin's CCC indicated poor absolute agreement between these two screeners in the number of times per day that

SSBs were consumed. Additionally, the weighted kappa statistics were within the range of only slight to fair agreement.[15] The present study found that one SSB screener question resulted in a lower prevalence of daily SSB consumption by nearly fifty percentage points, whereas it resulted in a higher estimate for those whose daily consumption of SSBs was either none or less than daily. The average difference between these two screeners was more than one time/day that SSBs were consumed. This finding that a single screener question underestimates SSB consumption could be explained by cognitive theory suggesting that respondents have difficulty in recalling consumption of multiple food or beverage items when asked all at once. This theory has been tested with food frequency questionnaires, and the findings demonstrated that asking about several related foods in a single question produced less accurate dietary intake estimates than when those same foods were separated into multiple questions.[17] Previous research comparing 19-item and 1-item fruit and vegetable screeners to multiple 24-hour recalls found that the 1-item screener underestimated intake, while the 19-item screener overestimated intake.[18]

The present study also found that the difference in SSB intake found using four questions vs. one differed by sociodemographic groups. The mean difference between the two screeners in frequency of SSB intake was significantly higher for males, blacks and Hispanics, those between the ages of 25–44 years or 45–64 years, individuals with a high school education or less, and individuals in the lowest household income category. These findings suggest that when assessing disparities in total SSB intake across sociodemographic groups, using a 4-question versus 1-question screener may result in different conclusions being drawn. Previous research has found differences in the performance of FFQ questions across demographic factors like age, sex, education, and occupation.[19] A limitation of FFQs is that they can require complex cognitive estimation, particularly for combined food items,[9] and the ease of this task may vary across subgroups.

The methods used to measure and characterize daily SSB intake can influence the comparability of estimates across surveys. For example, the four question screener in *SummerStyles* produced an estimate of the prevalence of daily SSB consumption among adults (68%) that was similar to that found in the nationally representative 2010 NHIS (64%).[12] However, the S*ummerStyles* estimate is higher than that found among adults participating in the 2011–2014 NHANES (49.3%), which measures SSB intake using a 24-hour dietary recall interview and characterizes daily consumption as having consumed any SSB in the previous 24 hours.[2] The *SummerStyles* estimate is also higher than that found in the 2013 Behavioral Risk Factor Surveillance System (30.1%), which is based on self-reported intake data from 23 states, measured using a two-question screener that does not capture sweetened coffee drinks.[13] To measure total daily SSB intake among adults, our findings suggest that using at least four screener questions, one question for each beverage type (regular soda, sweetened coffee and tea, sports and energy drinks, and fruit drinks), may be more desirable than using a single question that includes multiple types of SSBs. However, future research could validate new screener questions, developed to capture additional sugar-sweetened beverage types that are introduced into the market.

The present study is subject to limitations. The *SummerStyles* survey is based on a sample that may not be nationally representative due to selection and non-response biases. The final

analytic sample included responses from less than half of those who received the first survey wave in the spring. Therefore, the findings of this study might not be generalizable to the entire U.S. adult population. However, the data were weighted using key demographic distributions in the U.S. Current Population Survey, and the four question screener in *SummerStyles* produced an estimate of daily SSB consumption among adults that was similar to that found in the nationally representative 2010 NHIS. Another limitation is that the two screeners used in this study measured times per day that SSBs are consumed. Neither screener measured the ounces of SSBs consumed nor grams of sugar; therefore, the screeners cannot be used to determine the amount of added sugars contributed by the consumption of SSBs. The amount of added sugar can vary greatly based on the amount of SSB consumed and the beverage type; a twelve ounce can of soda contains much more sugar than an equivalent amount of coffee with a teaspoon of sugar added. Furthermore, the present study did not have a true gold standard measurement of the amount of SSBs consumed (i.e. volume) with which to assess the validity of either screener, and to our knowledge, neither screener has been validated against other methods of SSB measurement, such as 24-hour recall or food records. However, screener questions can be a suitable method for population-level surveillance of beverage intake. A previous study examined the validity of beverage screener questions in comparison to the gold standard measurement method of multiple 24-hour dietary recalls, and found that the number of times/day that beverages were consumed, derived from the screener, was significantly, positively correlated with the number of servings/day, derived from the 24-hour dietary recalls.[11] Lastly, the *SummerStyles* survey data are self-reported and subject to recall and social desirability bias, which may have had a differential impact on reporting for the single screener question versus the four question screener being compared in this study.

To our knowledge, the present study is the only one of its kind to compare the performance of a single screener question to a screener with a larger number of questions to measure adult daily SSB intake. An additional strength of the present study is that the *SummerStyles* survey has a large sample and allowed assessment within multiple subgroups of the population.

In this study, estimates of the prevalence of SSB intake at least once per day among adults were significantly lower with one screener question compared to a screener with four questions, and this differed by sociodemographic groups. The impact of lower reporting for daily SSB intake using one screener question could differ depending upon the aim of data collection (e.g., surveillance versus studying the association between SSB intake and clinical outcomes). To improve data quality, researchers and public health professionals may need to measure each SSB type using separate questions, rather than combining all beverage types into one overall intake question, when conducting research or surveillance on SSB consumption. When space or time constraints limit the number of survey questions, researchers and practitioners should consider that one screener question may underestimate daily SSB intake.

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Abbreviations:

CCC	Concordance Correlation Coefficient
FFQ	food frequency questionnaire
SSBs	sugar-sweetened beverages

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SO WHAT? Implications for Health Promotion Practitioners and Researchers

What is already known on this topic?

It is important to monitor sugar-sweetened beverage (SSB) intake, given the adverse health consequences of daily SSB consumption (e.g., obesity and diabetes). While food frequency questionnaire-style screener questions have been found to be a suitable method for population-level surveillance of beverage intake, the performance of a single screener question to measure SSB intake is unknown.

What does this article add?

This study found poor absolute agreement between one screener question measuring total SSB intake and a screener measuring SSB types separately using four questions. Estimates of the prevalence of SSB intake at least once per day among adults were significantly lower with one screener question compared to a screener with four questions (18.9% vs. 68.4%, respectively).

What are the implications for health promotion practice or research?

When conducting research/surveillance on SSB consumption, data quality may be improved by measuring each SSB type using separate questions, rather than combining all beverage types into one overall intake question. When survey space or time is limited, researchers/practitioners should consider that one screener question may underestimate daily SSB intake.

Table 1.

Four-question screener and one-question screener for assessing sugar-sweetened beverage intake: questions, response options, coding, and intake values—*SummerStyles* Survey, 2014

Survey questions	Response Options[a]	Coding	Intake value
Four Sugar-Sweetened Beverage Question Screener			
1. During the past month, how often did you drink **regular soda** or pop that contains sugar? *Do not include diet soda.*	A. None	A=0	0 times/day
2. During the past month, how often did you drink **coffee**, including lattes, and **tea**, including bottled tea, that was sweetened with sugar or honey? *Do not include drinks with things like Splenda or Equal.*	B. 1 to 6 times per week	B=3.5/7	0.5 times/day
3. During the past month, how often did you drink **sports** and **energy** drinks such as Gatorade, Red Bull, and Vitamin water?	C. 1 time per day	C=1	1 time/day
4. During the past month, how often did you drink sweetened **fruit drinks**, such as Kool-aid, cranberry, and lemonade? *Include fruit drinks you made at home and added sugar to.*	D. 2 times per day	D=2	2 times/day
	E. 3 times per day	E=3	3 times/day
	F. 4 or more times per day	F=4	4 times/day
One Sugar-Sweetened Beverage Question Screener			
5. During the past month, how many times did you drink sodas, fruit drinks, sports or energy drinks, and other sugar-sweetened drinks? *Do not include 100% fruit juice, diet drinks, or artificially sweetened drinks.*			

[a]Response options shown applied to all five of the sugar-sweetened beverage questions in the survey.

Table 2.

Prevalence of daily sugar-sweetened beverage (SSB) consumption categories, by SSB screener type and demographic factors—*SummerStyles* Survey, 2014

		Categories of daily SSB intake						
		4-question screener[a] % ± SE[c]			1-question screener[b] % ± SE[c]			
Characteristics	All respondents % ± SE	0 times/day	>0 to <1 time/day	≥1 times/day	0 times/day	>0 to <1 time/day	≥1 times/day	Weighted Kappa[d]
Total (n=4,167)	-	16.0 ± 0.6	15.6 ± 0.7	68.4 ± 0.8	38.5 ± 0.9	42.5 ± 0.9	18.9 ± 0.7	0.27
Age (n=4,167)[e, f]								
18–24 years	12.4 ± 0.8	6.7 ± 1.6	16.6 ± 2.5	76.6 ± 2.8	25.3 ± 2.8	52.1 ± 3.3	22.6 ± 2.8	0.19
25–44 years	34.2 ± 0.9	13.2 ± 1.2	13.4 ± 1.2	73.4 ± 1.5	31.4 ± 1.6	45.9 ± 1.7	22.7 ± 1.5	0.27
45–64 years	35.0 ± 0.8	16.4 ± 1.0	16.3 ± 1.0	67.4 ± 1.2	41.2 ± 1.3	40.6 ± 1.3	18.2 ± 1.1	0.26
≥65 years	18.4 ± 0.6	26.9 ± 1.6	17.7 ± 1.4	55.4 ± 1.8	55.5 ± 1.8	33.5 ± 1.8	11.1 ± 1.1	0.28
Sex (n=4,167)[e, f]								
Male	47.9 ± 0.9	14.5 ± 0.9	14.1 ± 0.9	71.4 ± 1.2	35.5 ± 1.3	43.6 ± 1.3	20.9 ± 1.1	0.27
Female	52.1 ± 0.9	17.4 ± 0.9	16.9 ± 0.9	65.6 ± 1.2	41.3 ± 1.3	41.5 ± 1.3	17.1 ± 1.0	0.27
Race/ethnicity (n=4,167)[e, f]								
Non-Hispanic white	66.4 ± 0.9	18.4 ± 0.8	17.8 ± 0.8	63.8 ± 1.0	41.6 ± 1.0	41.2 ± 1.0	17.2 ± 0.8	0.30
Non-Hispanic black	11.5 ± 0.6	11.1 ± 1.8	11.1 ± 1.8	77.8 ± 2.4	33.8 ± 2.7	40.6 ± 2.8	25.6 ± 2.7	0.23
Hispanic	14.7 ± 0.8	8.9 ± 1.5	10.7 ± 1.7	80.3 ± 2.2	27.5 ± 2.5	49.4 ± 2.9	23.1 ± 2.5	0.18
Non-Hispanic other	7.4 ± 0.6	16.5 ± 3.1	12.3 ± 2.9	71.2 ± 3.8	40.2 ± 4.2	44.0 ± 4.2	15.7 ± 2.8	0.21
Marital Status (n=4,167)[f]								
Married/domestic partnership	61.1 ± 0.9	16.9 ± 0.8	15.9 ± 0.8	67.2 ± 1.0	40.1 ± 1.1	42.7 ± 1.1	17.2 ± 0.9	0.27
Not married	38.9 ± 0.9	14.6 ± 1.1	15.1 ± 1.1	70.3 ± 1.4	36.0 ± 1.5	42.2 ± 1.6	21.8 ± 1.3	0.27
Education (n=4,167)[e, f]								
≤High school	41.9 ± 0.9	14.1 ± 1.0	12.5 ± 1.0	73.3 ± 1.3	36.2 ± 1.4	39.4 ± 1.5	24.3 ± 1.3	0.27
Some college	28.9 ± 0.8	15.0 ± 1.1	17.6 ± 1.3	67.4 ± 1.5	37.4 ± 1.6	44.9 ± 1.7	17.7 ± 1.3	0.26
≥Bachelors	29.2 ± 0.8	19.7 ± 1.2	18.0 ± 1.2	62.2 ± 1.5	42.9 ± 1.6	44.6 ± 1.6	12.5 ± 1.1	0.27
Annual household income								

Characteristics	All respondents % ± SE	Categories of daily SSB intake: 4-question screener[a] % ± SE[c]			1-question screener[b] % ± SE[c]			Weighted Kappa[d]
		0 times/day	>0 to <1 time/day	≥1 times/day	0 times/day	>0 to <1 time/day	≥1 times/day	
(n=4,167)[e, f]								
≤$34,999	27.5 ± 0.8	15.0 ± 1.3	13.7 ± 1.2	71.3 ± 1.6	37.0 ± 1.7	38.1 ± 1.7	24.9 ± 1.6	0.28
$35,000–$74,999	32.4 ± 0.9	14.9 ± 1.1	15.1 ± 1.1	70.0 ± 1.4	35.1 ± 1.5	42.8 ± 1.6	22.0 ± 1.4	0.29
$75,000–$99,999	15.7 ± 0.7	15.6 ± 1.6	16.9 ± 1.7	67.5 ± 2.2	40.5 ± 2.3	45.1 ± 2.4	14.4 ± 1.8	0.24
≥$100,000	24.4 ± 0.8	18.9 ± 1.3	17.6 ± 1.4	63.5 ± 1.8	43.5 ± 1.8	45.4 ± 1.9	11.1 ± 1.2	0.26
Weight status (n=4,029)[g, f]								
Under/normal weight	38.3 ± 0.9	14.6 ± 1.0	16.7 ± 1.2	68.7 ± 1.5	39.1 ± 1.5	44.6 ± 1.6	16.3 ± 1.2	0.24
Overweight	31.2 ± 0.9	15.1 ± 1.1	14.6 ± 1.1	70.3 ± 1.4	37.6 ± 1.6	43.9 ± 1.6	18.5 ± 1.3	0.26
With obesity	30.5 ± 0.9	18.0 ± 1.2	14.9 ± 1.1	67.1 ± 1.5	36.9 ± 1.6	40.2 ± 1.6	22.9 ± 1.4	0.33

[a] Composite consumption based on screener with four questions, which ask about consumption of each SSB type separately: soda, sweetened coffee/tea, sports/energy drinks, fruit drinks.

[b] One question screener which asked about the combined consumption of beverage types: soda, fruit drinks, sports/energy drinks, and other SSBs.

[c] Standard error.

[d] Weighted kappa statistic to determine strength of agreement between the two SSB screeners.

[e] Using the 4-question screener, frequency of daily SSB intake differed significantly across categories of this demographic factor (Rao-Scott chi-square p-value <0.05).

[f] Using the 1-question screener, frequency of daily SSB intake differed significantly across categories of this demographic factor (Rao-Scott chi-square p-value <0.05).

[g] Weight status was based on body mass index: <25.0 is normal or underweight, 25.0 to 29.9 is overweight, and ≥30.0 has obesity.

Table 3.

Comparison of mean daily sugar-sweetened beverage (SSB) consumption (times/day) between SSB screener types, total and by demographic factors—*SummerStyles* Survey, 2014 (n=4,167)

Characteristics	N	4-question screener[a] mean (95% CI[f]) times/day	1-question screener[b] mean (95% CI[f]) times/day	CCC[c]	Difference[d, e] mean times/day
Total	4167	1.72 (1.65, 1.79)	0.59 (0.56, 0.62)	0.31*	1.13*
Age					
18–24 years	258	1.80 (1.53, 2.07)	0.66 (0.56, 0.75)	0.30*	1.14*
25–44 years	1163	1.89 (1.75, 2.03)	0.71 (0.64, 0.77)	0.32*	1.18*†
45–64 years	1839	1.74 (1.65, 1.82)	0.57 (0.52, 0.61)	0.30*	1.17*†
≥65 years (ref)	907	1.31 (1.20, 1.41)	0.37 (0.32, 0.41)	0.29*	0.94*
Sex					
Male (ref)	2032	1.85 (1.75, 1.96)	0.64 (0.59, 0.69)	0.31*	1.21*
Female	2135	1.60 (1.50, 1.69)	0.54 (0.50, 0.58)	0.31*	1.05*†
Race/ethnicity					
Non-Hispanic white (ref)	3140	1.59 (1.52, 1.65)	0.55 (0.52, 0.59)	0.32*	1.03*
Non-Hispanic black	395	2.04 (1.74, 2.33)	0.71 (0.59, 0.83)	0.31*	1.33*†
Hispanic	403	2.13 (1.87, 2.40)	0.71 (0.60, 0.82)	0.25*	1.42*†
Non-Hispanic other	229	1.58 (1.37, 1.80)	0.48 (0.38, 0.58)	0.26*	1.10*
Marital status					
Married/domestic partnership (ref)	2705	1.67 (1.59, 1.75)	0.55 (0.51, 0.59)	0.30*	1.12*
Not married	1462	1.79 (1.67, 1.92)	0.65 (0.60, 0.71)	0.33*	1.14*
Education					
≤High school (ref)	1507	2.02 (1.89, 2.16)	0.71 (0.65, 0.77)	0.32*	1.31*
Some college	1287	1.62 (1.52, 1.73)	0.58 (0.52, 0.63)	0.32*	1.05*†
≥Bachelors	1373	1.38 (1.29, 1.46)	0.43 (0.39, 0.47)	0.23*	0.94*†
Annual household income					
≤$34,999 (ref)	1118	2.05 (1.87, 2.23)	0.74 (0.66, 0.82)	0.34*	1.31*

Characteristics	N	4-question screener[a] mean (95% CI[f]) times/day	1-question screener[b] mean (95% CI[f]) times/day	CCC[c]	Difference[d,e] mean times/day
$35,000–$74,999	1434	1.78 (1.66, 1.89)	0.64 (0.58, 0.69)	0.30 *	1.14 *†
$75,000–$99,999	617	1.48 (1.36, 1.60)	0.50 (0.43, 0.57)	0.26 *	0.98 *†
≥$100,000	998	1.42 (1.32, 1.52)	0.42 (0.37, 0.46)	0.30 *	1.00 *†
Weight status[g]					
Under/normal weight (ref)	1390	1.67 (1.55, 1.79)	0.54 (0.49, 0.59)	0.31 *	1.13 *
Overweight	1342	1.71 (1.60, 1.82)	0.56 (0.51, 0.61)	0.28 *	1.15 *
With obesity	1297	1.79 (1.66, 1.93)	0.71 (0.64, 0.77)	0.35 *	1.09 *

[a] Composite consumption based on a screener with four questions, which ask about consumption of each SSB type separately: soda, sweetened coffee/tea, sports/energy drinks, fruit drinks.

[b] One question screener which asked about the combined consumption of beverage types soda, fruit drinks, sports/energy drinks, and other SSBs.

[c] Lin's Concordance Correlation Coefficient (CCC) measuring the absolute agreement in SSB intake (times/day) between the two screeners.

* p <0.05

[d] Paired t-tests were used to determine whether there were significant differences in mean SSB intake using the 4-question versus 1-question screener.

* p <0.05

[e] Independent samples t-tests used to determine significance of differences between demographic groups in the mean intake difference between the 4-question versus 1-question screener. Reference group indicated.

† Significant difference between groups at p <0.05.

[f] 95% confidence interval.

[g] Weight status was based on body mass index: <25.0 is normal or underweight, 25.0 to 29.9 is overweight, and ≥30.0 has obesity.