HHS Public Access
Author manuscript
Am J Health Promot. Author manuscript; available in PMC 2022 April 13.

Published in final edited form as:
Am J Health Promot. 2020 November ; 34(8): 923–928. doi:10.1177/0890117120927302.

Associations of health literacy and menu-labeling usage with sugar-sweetened beverage intake among adults in Mississippi, 2016

Seung Hee Lee[1], **Lei Zhang**[2], **Donald L Rubin**[3], **Sohyun Park**[1]

[1]Division of Nutrition, Physical Activity, and Obesity, National Center for Chronic Disease Prevention and Health Promotion, CDC, Atlanta, GA, USA.

[2]Office of Health Data & Research, Mississippi State Department of Health, Jackson, MS, USA.

[3]Department of Communication Studies, Franklin College of Arts and Sciences, University of Georgia, Athens, GA, USA.

Abstract

Purpose: Examine association of health literacy (HL) and menu-labeling (ML) usage with sugar-sweetened beverage (SSB) intake among adults in Mississippi.

Design: Quantitative, Cross-sectional study.

Setting: 2016 Mississippi Behavioral Risk Factor Surveillance System data.

Subjects: Adults living in Mississippi (n=4,549).

Measures: Outcome variable was SSB intake (regular soda, fruit drinks, sweet tea, sports/energy drinks). Exposure variables were 3 HL questions (Find information, Understand oral information, Understand written information) and ML usage among adults who eat at fast food/chain restaurants (User, Non-user, Do not notice ML).

Analysis: Multinomial logistic regressions were used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI) for SSB intake ≥1 time/day (reference: 0 times/day) associated with HL and ML.

Results: In Mississippi, 46.8% of adults consumed SSB ≥1 time/day, and 26.9% consumed ≥2 times/day. The odds of consuming SSBs ≥1 time/day were higher among adults with lower HL (aOR=1.7; 95% CI=1.3, 2.2) than those with higher HL. Among adults who ate at fast food/chain restaurants, the odds of consuming SSBs ≥1 time/day were higher among non-users of ML (aOR=2.3; 95% CI=1.7, 3.1) and adults who did not notice ML (aOR=1.8; 95% CI=1.3, 2.6) than ML users.

Conclusion: Adults with lower HL and adults who do not use or notice ML consumed more SSBs in Mississippi. Understanding why lower HL and no ML usage are linked to SSB intake could guide the design of interventions to reduce SSB intake in this population.

Keywords

sugar-sweetened beverages; health literacy; menu labeling; adults

Purpose

Sugar-sweetened beverages (SSBs) are the leading sources of added sugars in the diets of U.S. adults.[1] Frequent consumption of SSBs is associated with weight gain, type 2 diabetes, heart disease, and other chronic diseases.[2–4] In 2011–2014, 49% of U.S. adults drank a SSB on a given day.[5] Additionally, SSB intake varies by geographical regions; the prevalence of daily SSB intake was higher among U.S. adults living in the Northeast (68.4%) and South (66.7%) than among persons living in the Midwest (58.8%) in 2010.[6] The prevalence of daily SSB intake was 46.2% among adults in Mississippi, whereas it was 29.1% among adults in 23 states and DC in 2013.[7]

Individual knowledge, attitude, and health literacy (HL) may influence dietary behaviors, such as SSB intake.[8,9] HL has been conventionally defined as the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.[10] Public health interventions could benefit from information on HL as a predictor of prevention and disease management behaviors,[11] but only a few national population based survey exists that also collect behaviors and chronic diseases prevalence. Numerous analyses link HL with healthful eating in general.[12] A cross-sectional study in the rural Lower Mississippi Delta found that HL significantly predicted SSB intake and every 1 point increase in one HL measure was linked to a 34 kcal reduction per day from SSBs.[9] Thus, it might be possible that those with low HL may be more likely to eat poorly, including consuming daily SSBs.

Another factor that might be associated with SSB intake is menu labeling (ML).[13] Despite the uncertainty whether ML reduces total calories consumed, a previous study showed that frequent ML users had greater odds of being non-daily SSB drinkers compared to daily SSB drinkers.[13] In addition, menu labeling usage may serve as a proxy for HL, given its criticism whether menu labeling is an effective strategy for consumers with limited health literacy skills.[14]

However, no study has looked at its relationship in Mississippi, the state which experience high burden of chronic diseases, such as obesity and type 2 diabetes.[15] Limited information exists on how HL and ML usage relate to SSB intake in this population; thus, we examined the updated prevalence of SSB intake and its association with HL and ML usage.

Methods

Design

This cross-sectional study used data from 2016 Mississippi Behavioral Risk Factor Surveillance System (BRFSS). BRFSS is a state-based, telephone survey conducted annually by CDC and state health departments and is designed to assess a range of respondents' health conditions and behaviors related to public health. It uses a multistage cluster sampling design with random-digit dialing (both landline and cellular telephones) to select a sample that represents the civilian, noninstitutionalized adult population in each of the 50 states, the District of Columbia, and 3 U.S. territories. Since 2011, raking methodology has been used to weight the BRFSS data. It incorporated additional population characteristics such as educational level, marital status, and home ownership status. Detailed information on BRFSS validity is available elsewhere.[16] Every year, several Optional Modules are available on BRFSS, and states decide to include them as part of the survey. In 2016, the Mississippi BRFSS included a SSB and Menu Labeling Optional Module assessing SSB intake and ML usage, as well as the Health Literacy Optional Module that included three questions to assess understanding of oral and written health information.

Center for Disease Control Prevention Institutional Review Board was not needed for this analysis because personal identifiers were not included in the data file. The BRFSS uses a verbal consent process. The response rate for Mississippi BRFSS was 41.2%.

Sample—A total of 5,135 adults (≥18 years) completed the Mississippi BRFSS. We excluded 586 adults with missing data on SSB consumption (regular soda, fruit drinks, sweet tea, sports/energy drinks), resulting in a final analytic sample of 4,549 adults. Compared to the analytic sample, the excluded adults had a higher proportion of adults aged 18–29 years (21.5% vs. 12.5%., $p<0.001$) and men (55.7% vs. 46.6%, $p=0.002$) and had a lower proportion of non-Hispanic whites (50.3% vs. 60.1%, $p<0.001$).

Measures

The outcome measure was SSB intake. Respondents were asked 1) “During the past 30 days, how often did you drink regular soda/pop containing sugar? Do not include diet soda/pop.” and 2) “During the past 30 days, how often did you drink sugar-sweetened fruit drinks (e.g., Kool-Aid/lemonade), sweet tea, and sports or energy drinks (e.g., Gatorade/Red Bull)? Do not include 100% fruit juice, diet drinks, or artificially sweetened drinks.” For each question, respondents reported the number of times per day, per week, or per month they consumed these beverages. Weekly or monthly intake was converted to daily intake (dividing weekly intake by 7 and monthly intake by 30). To calculate total SSB intake frequency, we added the frequency of consumption of regular soda/pop and sugar-sweetened fruit drinks, sweet tea, and sports or energy drunks. Four mutually exclusive categories (0, >0 to <1, 1 to <2, or ≥2 times/day) were created for SSB intake for χ^2 tests. For logistic regression models, SSB intake was grouped into 0, >0 to <1, or ≥1 time/day).

Exposure measures included HL and ML variables. The HL module was comprised of three items: “How difficult is it for you to get advice or information about health or medical topics if you needed it?” (find information); “How difficult is it for you to understand information that doctors, nurses and other health professionals tell you?” (understand oral information); and “You can find written information about health on the Internet, in newspapers and magazines, and in brochures in the doctor’s office and clinic. In general, how difficult is it for you to understand written health information?” (understand written information). The item set was developed first by reviewing existing brief HL self-reports and screening tools,[17], as well as earlier state-specific HL item sets for the BRFSS.[18] Selected questions were subjected to cognitive testing to identify optimal wording and format. Each item could be scored from 0 (‘very difficult’) to 3 (‘very easy’). A total HL score was calculated by summing across the three module items, possible scores ranging from 0 to 9. For purposes of further analysis, a median split was performed on those total scores and created two categories — low-to moderate (0–7) and higher (8–9).

Menu-labeling usage was assessed by the following question: "The next question is about eating out at fast-food and chain restaurants. When calorie information is available in the restaurant, how often does this information help you decide what to order?" Response options were "always," "most of the time," "about half the time," "sometimes," "never," "do not eat at fast food or chain restaurants," "never noticed", "never looked for calorie information," "usually could not find calorie information." For the purposes of this study, we restricted the sample to adults who ate at fast food and chain restaurants, and excluded those who responded "do not eat at fast food or chain restaurants" (n=540) or were missing this information (n=38). Menu-labeling use was categorized into three groups: user (always/most of the time/about half the time/sometimes), non-user, and do not notice ML (never noticed/ never looked for calorie information/usually could not find calorie information)

Mutually exclusive response categories were created for covariates. Sociodemographic variables included were age (18–24, 25–34, 35–54, or ≥55 years), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, or other. Due to small sample size for Hispanic and the other race/ethnicity groups, those data were suppressed.), education level (≤high school, some college, or ≥college graduate), marital status (married, single, divorced/ separated/widowed), and annual household income (<$25,000, $25,000–$49,999, $50,000–$74,999, ≥$75,000, or don't know/refused/missing). Because a relatively large proportion (~17%) of adults responded "don't know/refused/missing" for annual household income, we created an additional category for these adults. Using self-reported weight and height data, weight status was categorized as underweight/normal weight (BMI <25 kg/m^2), overweight (BMI 25 to <30 kg/m^2), or obesity (BMI ≥30 kg/m^2).[19]

Analysis

Chi-square tests were performed to assess the relationships between SSB intake and HL, ML, and other covariates in the analytic sample, with a P-value <0.05 defining statistical significance. We tested for potential moderation between HL and ML and did not find a significant interaction; thus a series of independent multinomial logistic regression models were used to estimate adjusted odds ratios (aOR) and 95% confidence intervals (CI) for consuming SSB >0 to <1 time/day and ≥1 time/day associated with HL (ranged from n=4019 to n=4312 for individual measures and 3842 for the composite measure) and ML usage (n=3781), after controlling for age, sex, race/ethnicity, education level, annual household income, and weight status. The reference group for SSB intake was 0 times/day. All statistical analyses were performed using SAS software (version 9.4, SAS Institute, Cary, NC) using the sample weights and accounting for the complex sample design.

Results

In 2016, 46.8% of Mississippian adults reported consuming SSB ≥1 time/day and 26.9% consumed SSB ≥2 times/day. SSB intake varied by all of sociodemographic factors except for the weight status. Most notable differences were observed by age; 39.3% of young adults aged 18–24 years consumed SSB ≥2 times/day compared to 14.7% of older adults aged ≥55 years (Table 1).

HL concepts and ML variables were significantly associated with daily intake of SSBs, adjusted for age, sex, race/ethnicity, marital status, education, household income, and weight status. The composite HL score showed similar findings that adults with low to moderate HL score (0–7) had higher odds of drinking SSB ≥1 time/day (aOR=1.7), compared to adults with high scores (8–9), and similar patterns were found when looking at the individual HL concepts. In terms of ML, we found that non-users (aOR=2.3) and those who did not notice ML (aOR=1.8) had significantly higher odds of drinking SSB ≥1 time/day compared to ML users, respectively. Similar patterns were observed when looking at the odds of drinking SSB >0 to <1 time/day, with an exception of no difference for HL found among those who responded not very easy to find information, and for ML for those who were non-users and those who do not notice ML (Table 2). Lastly, those with high HL score (8–9) had significantly higher prevalence of using ML compared to those with low to moderate HL score (0–7) (52.4% vs. 45.3%, respectively; data not shown).

Discussion

Summary

Our study found that nearly half of the adults in Mississippi reported consuming SSBs at least once per day, and over 1 in 4 adults consumed SSBs at least twice per day in 2016. This prevalence is similar to BRFSS results from 2013 that found 46.2% of Mississippi adults reported consuming SSBs at least once a day.[7] We also found that adults with low HL and non-ML users had greater odds of consuming SSB at least once per day. A cross-sectional study conducted in 2011, with 376 participants from the rural Lower Mississippi Delta, found that 1 point increase in one measure of HL was associated with 34 fewer kcal/day from SSBs.[9] Zoellner and colleagues assessed the effectiveness of a behavioral intervention targeting SSB consumption (SIPsmartER) using HL-focused strategies. They found that SIPsmartER participants significantly decreased SSB intake by 227 kcal/day from baseline to 6 months and also showed small but significant improvements in BMI.[20]

Findings on associations between health-related knowledge, a form of health literacy, and SSB intake are mixed. One study reported that knowledge about the adverse effects of SSB intake was significantly associated with less SSB intake,[8] suggesting that targeting education on the negative health impact of excess consumption of SSB to high SSB consumers could be beneficial in reducing SSB intake and rates of obesity. However, another study reported that overall, knowledge of SSB-related health conditions was not associated with high SSB intake (≥2 times/day) after controlling for covariates.[21]

Similar to the association between the HL and SSB intake found here, previous studies have shown that those who use menu-labeling usually drink fewer SSBs.[13] The association between menu labelling usage and SSB intake held true in the present study as well. Additionally, we found that associations of HL and ML with weekly SSB intake (>0 to <1 time/day) were somewhat similar to daily SSB intake groups with exceptions of ‘Find information’ and ‘ML’, which there were no significant associations. While the reasons for this non-significant associations are unknown, it is possible that we did not have enough statistical power to detect the difference or weekly SSB consumers might have different level of HL and ML usage than daily SSB consumers.

Limitations

To our knowledge, this was the first study to include both ML and HL as factors that could be linked to SSB intake. However, this study has a few limitations. First, BRFSS is a cross-sectional study and thus cannot imply causation. Second, as this analysis is done for a single state, the study findings may not be generalizable to the entire U.S. adult population. Third, SSB intake was captured as frequency not volume, thus a thus we could not look at association of total amount of SSB consumed with HL or ML. Fourth, BRFSS data are self-reported, thus, findings might be subject to potential reporting bias. Lastly, validity of the HL module has not been established, but it was created using existing measures.

References

1. Drewnowski A, Rehm CD. Consumption of added sugars among US children and adults by food purchase location and food source. Am J Clin Nutr. 2014;100:901–7. [PubMed: 25030785]
2. Malik VS, Hu FB. Fructose and Cardiometabolic Health: What the Evidence From Sugar-Sweetened Beverages Tells Us. J Am Coll Cardiol. 2015;66:1615–24. [PubMed: 26429086]
3. Ruanpeng D, Thongprayoon C, Cheungpastiporn W, Harindhanavudhi T. Sugar and artificially sweetened beverages linked to obesity: a systematic review and meta-analysis|. QJM Int J Med. 2017; 110:513–20.
4. Malik VS, Hu FB. Sweeteners and Risk of Obesity and Type 2 Diabetes: The Role of Sugar-Sweetened Beverages. Curr Diab Rep. 2012;12:195–203.
5. Rosinger A, Herrick K, Gahche J, Park S. Sugar-sweetened beverage consumption among U.S. youth, 2011–2014. NCHS data brief, no 271. Hyattsville, MD: National Center for health Statistics. 2017.
6. Park S, McGuire LC, Galuska DA. Regional Differences in Sugar-Sweetened Beverage Intake among US Adults. J Acad Nutr Diet. 2015;115:1996–2002. [PubMed: 26231057]
7. Park S, Xu F, Town M, Blanck HM. Prevalence of Sugar-Sweetened Beverage Intake Among Adults — 23 States and the District of Columbia, 2013. MMWR Morb Mortal Wkly Rep. 2016;65:169–174. [PubMed: 26914018]
8. Park S, Onufrak S, Sherry B, Blanck HM. The Relationship between Health-Related Knowledge and Sugar-Sweetened Beverage Intake among US Adults. J Acad Nutr Diet. 2014;114:1059–66. [PubMed: 24360502]
9. Zoellner J, You W, Connell C, Smith-Ray RL, Allen K, Tucker KL, et al. Health Literacy Is Associated with Healthy Eating Index Scores and Sugar-Sweetened Beverage Intake: Findings from the Rural Lower Mississippi Delta. J Am Diet Assoc. 2011;111:1012–20. [PubMed: 21703379]
10. Kindig David A., Panzer Allison M., and Nielsen-Bohlman Lynn, eds. Health literacy: a prescription to end confusion. National Academies Press, 2004.
11. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, et al. Health literacy and public health: A systematic review and integration of definitions and models. BMC Public Health. 2012;12:80. [PubMed: 22276600]
12. Carbone ET, Zoellner JM. Nutrition and health literacy: a systematic review to inform nutrition research and practice. J Acad Nutr Diet. 2012;112:254–65. [PubMed: 22732460]
13. Lee-Kwan SH, Pan L, Maynard LM, McGuire LC, Park S. Factors Associated with Self-Reported Menu-Labeling Usage among US Adults. J Acad Nutr Diet. 2016;116:1127–35. [PubMed: 26875022]

14. Sinclair SE, Cooper M, Mansfield ED. The influence of menu labeling on calories selected or consumed: a systematic review and meta-analysis. J Acad Nutr Diet. 2014;114(9):1375–1388. [PubMed: 25037558]

15. Robert Wood Johnson Foundation. The State of Obesity in Mississippi. Available: https://stateofchildhoodobesity.org/states/ms/. Accessed Dec 10, 2019.

16. Pierannunzi C, Hu SS, Balluz L. A systematic review of publications assessing reliability and validity of the Behavioral Risk Factor Surveillance System (BRFSS), 2004–2011. BMC Med Res Methodol. 2013;13:49. [PubMed: 23522349]

17. Chew LD, Griffin JM, Partin MR, Noorbaloochi S, Grill JP, Snyder A, et al. Validation of screening questions for limited health literacy in a large VA outpatient population. J Gen Intern Med. 2008;23:561–6. [PubMed: 18335281]

18. Chesser AK, Reyes J, Keene Woods N. Identifying Health Literacy in Kansas Using the Behavioral Risk Factor Surveillance System. Int Q Community Health Educ. 2019;39:209–16. [PubMed: 30596327]

19. National Heart, Lung, and Blood Institute & National Institute of Diabetes and Digestive and Kidney Diseases (US). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. National Heart, Lung, and Blood Institute in cooperation with the National Institute of Diabetes and Digestive and Kidney Diseases; 1998.

20. Zoellner JM, Hedrick VE, You W, Chen Y, Davy BM, Porter KJ, et al. Effects of a behavioral and health literacy intervention to reduce sugar-sweetened beverages: a randomized-controlled trial. Int J Behav Nutr Phys Act. 2016;13:38. [PubMed: 27000402]

21. Park S, Lundeen EA, Pan L, Blanck HM. Impact of Knowledge of Health Conditions on Sugar-Sweetened Beverage Intake Varies Among US Adults. Am J Health Promot. 2018;32:1402–8. [PubMed: 28664774]

Significance

Overall, nearly half of adults in Mississippi consumed SSBs at least once a day. Our findings that ML usage and HL are associated with SSB intake can be used by public health practitioners to inform efforts to reduce SSB intake and improve health. Moreover, understanding potential mechanisms on how ML and low HL are linked to SSB intake could guide the design and target of interventions to decrease SSB intake in this population.

So What?

- **What is already known on this topic?**

Frequent consumption of SSBs is associated with weight gain, type 2 diabetes, heart disease, and other chronic diseases. Mississippi is one of the states that experience high burden of chronic diseases, such as obesity and type 2 diabetes. Health literacy and menu labeling usage may influence dietary behaviors, including SSB intake.

- **What does this article add?**

In 2016, nearly half of adults in Mississippi consumed SSBs at least once a day, and over 1 in 4 adults consumed SSBs at least twice per day. We also found that adults with low health literacy and non-menu labeling users had greater odds of consuming SSB at least once per day.

- **What are the implications for health promotion practice or research?**

Our findings can be used by public health practitioners to inform efforts to reduce SSB intake and improve health. Moreover, understanding potential mechanisms on how menu labeling and low health literacy are linked to SSB intake could guide the design and target of interventions to decrease SSB intake in this population.

Table 1.

Characteristics of respondents and their associations with sugar-sweetened beverage intake among adults in Mississippi — Behavioral Risk Factor Surveillance System, 2016

Characteristic	All respondents n (%)[c]	Sugar-Sweetened Beverage[a] Intake (times/day)[b]			
		0	>0 to <1	1 to <2	≥2
		% (SE)			
Total sample	4549 (100)	19.1 (0.7)	37.1 (1.0)	19.9 (0.8)	26.9 (0.9)
Sociodemographic factors					
Age, years					
18–24	215 (13.0)	5.6 (1.8)	34.2 (3.8)	21.0 (3.3)	39.3 (3.9)
25–34	472 (17.0)	11.2 (2.0)	31.9 (2.6)	20.9 (2.3)	36.0 (2.7)
35–54	1282 (32.8)	15.0 (1.2)	33.1 (1.6)	20.1 (1.4)	31.8 (1.6)
≥55	2580 (37.1)	30.6 (1.2)	35.8 (1.2)	18.9 (1.0)	14.7 (0.8)
Sex					
Men	1704 (46.6)	18.6 (1.2)	31.3 (1.5)	20.3 (1.2)	29.9 (1.5)
Women	2845 (53.4)	19.6 (0.9)	36.5 (1.3)	19.6 (1.1)	24.4 (1.2)
Race/ethnicity					
White, non-Hispanic	2722 (60.1)	24.0 (1.1)	30.8 (1.2)	20.4 (1.1)	24.7 (1.2)
Black, non-Hispanic	1658 (34.8)	11.4 (1.0)	38.8 (1.6)	18.6 (1.3)	31.1 (1.7)
Hispanic	43 (2.2)	-[d]	-[d]	-[d]	-[d]
Other, non-Hispanic	126 (3.0)	-[d]	-[d]	-[d]	-[d]
Education level (n=4540)					
≤High school	2025 (47.0)	16.9 (1.1)	30.9 (1.4)	21.1 (1.3)	31.1 (1.4)
Some college	1194 (34.1)	19.1 (1.4)	33.4 (1.8)	20.8 (1.5)	26.8 (1.7)
≥College graduate	1321 (18.8)	24.5 (1.5)	43.5 (1.8)	15.2 (1.3)	16.9 (1.3)
Marital status (n=4535)					
Married	2220 (50.7)	22.0 (1.1)	34.7 (1.3)	19.7 (1.1)	23.7 (1.2)
Not Married[e]	2315 (49.3)	16.1 (1.0)	33.3 (1.4)	20.1 (1.2)	30.3 (1.4)
Annual household income					
<$25,000	1521 (32.6)	16.2 (1.2)	31.4 (1.6)	19.6 (1.4)	32.9 (1.8)
$25,000–$49,999	988 (22.8)	15.9 (1.4)	33.0 (2.1)	22.7 (1.9)	28.4 (1.9)
$50,000–$74,999	492 (11.1)	19.6 (2.4)	34.1 (2.9)	18.7 (2.2)	27.6 (2.8)
≥$75,000	735 (16.5)	25.2 (2.1)	40.9 (2.4)	16.0 (1.7)	18.0 (2.0)
Don't Know/Refused/Missing	813 (17.1)	22.8 (1.9)	34.1 (2.4)	21.1 (2.0)	21.9 (2.2)
Weight status[f] (n=4348)					
Underweight/normal weight	1204 (29.1)	17.7 (1.3)	33.8 (1.9)	20.8 (1.6)	27.7 (1.9)
Overweight	1480 (34.5)	19.7 (1.4)	34.0 (1.7)	20.1 (1.5)	26.2 (1.7)
Obesity	1664 (37.4)	19.2 (1.3)	34.4 (1.5)	19.2 (1.3)	27.2 (1.5)
Health Literacy					
Get advice about health (n=4216)					
Very Easy	3284 (78.3)	20.2 (0.9)	35.5 (1.1)	20.5 (1.0)	23.9 (1.1)

Characteristic	All respondents n (%)[c]	Sugar-Sweetened Beverage[a] Intake (times/day)[b]			
		0	>0 to <1	1 to <2	≥2
		% (SE)			
Somewhat Easy	722 (16.2)	15.6 (1.6)	29.9 (2.3)	18.1 (1.9)	36.4 (2.5)
Difficult[g]	210 (5.4)	15.3 (2.9)	30.1 (4.3)	21.0 (3.5)	33.6 (4.9)
Understand health information told by health professionals (n=4522)					
Very Easy	3030 (65.9)	21.6 (1.0)	34.1 (1.3)	20.2 (1.0)	24.1 (1.1)
Somewhat Easy	1210 (27.2)	13.6 (1.3)	36.3 (1.9)	19.1 (1.4)	31.0 (1.9)
Difficult[g]	282 (6.9)	17.1 (2.8)	25.8 (3.2)	20.5 (3.5)	36.6 (3.9)
Understand written health information (n=4292)					
Very Easy	2827 (66.7)	20.5 (1.0)	34.6 (1.2)	19.9 (1.1)	25.0 (1.2)
Somewhat Easy	1136 (25.9)	15.2 (1.4)	34.2 (1.8)	20.2 (1.6)	30.4 (2.0)
Difficult[g]	329 (7.4)	15.9 (2.4)	35.3 (3.4)	19.6 (2.6)	29.3 (3.3)
Menu labeling usage (n=3971)					
User[h]	2018 (48.3)	19.9 (1.2)	38.8 (1.5)	18.4 (1.2)	22.9 (1.3)
Non user	1273 (33.5)	14.8 (1.3)	29.8 (1.7)	24.9 (1.6)	30.5 (1.8)
Do not notice ML	680 (18.2)	14.9 (1.7)	30.8 (2.4)	17.3 (2.1)	36.9 (2.7)

[a] Sugar-sweetened beverages included regular soda, fruit drinks, sweet tea, sports/energy drinks.

[b] P <0.05 based on $\chi 2$ tests for all variables except weight status.

[c] Unweighted sample size and weighted percentage are presented. Weighted percentage may not add up to 100% because of rounding.

[d] Insufficient sample size to calculate the estimate

[e] Include single, divorced, separated, and widowed.

[f] Weight status categories were defined using calculated BMI (kg/m2): underweight/normal weight, BMI<25; overweight, BMI 25−<30; obesity, BMI ≥30.

[g] Difficult included “Somewhat difficult” and “Very difficult.”

[h] User included “Always”, “Most of the time”, “About half of the time”, and “Sometimes”.

Table 2.

Relationship between sugar-sweetened beverage (SSB) intake and health literacy and menu labeling usage among adults in Mississippi — Behavioral Risk Factor Surveillance System, 2016[a]

	SSB intake[b]	
	>0 to <1 time/day AOR (95% CI)	**≥1 time/day AOR (95% CI)**
Composite health literacy score (n=3842)		
High (8–9)	Reference	Reference
Low/Moderate (0–7)	1.6 (1.2, 2.1)	1.7 (1.3, 2.2)
Find information (n=4019)		
Very Easy	Reference	Reference
Not Very Easy	1.2 (0.9, 1.6)	1.5 (1.1, 1.9)
Understand oral information (n=4312)		
Very Easy	Reference	Reference
Not Very Easy	1.7 (1.3, 2.2)	1.8 (1.4, 2.3)
Understand written information (n=4093)		
Very Easy	Reference	Reference
Not Very Easy	1.5 (1.2, 2.0)	1.5 (1.2, 2.0)
Menu labeling (n=3781)		
User	Reference	Reference
Non-user	1.3 (1.0, 1.7)	2.3 (1.7, 3.1)
Do not notice ML	1.2 (0.8, 1.7)	1.8 (1.3, 2.6)

[a]Adjusted for age, sex, race/ethnicity, marital status, education level, family income, and weight status. Individual models were run for each exposure variable.

[b]Reference group for SSB intake was 0 times/day.