Association between Health Literacy and Sugar-sweetened Beverage Consumption among Filipinos

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ABSTRACT

Background. Sugar-sweetened beverages (SSBs) are a common part of Filipino meals. Increased SSB consumption is linked to weight gain and increased risk of noncommunicable diseases (NCDs). Previous studies have shown that health literacy (HL) is associated with positive health outcomes. However, there are limited studies examining its relationship with specific dietary behavior, including SSB consumption.

Objective. The study aims to investigate the association between HL and SSB consumption among Filipinos aged 15 to 70 years.

Methods. An analytic cross-sectional study using secondary data from the 2018-2019 National Health Literacy Survey (NHLS) was conducted. A total of 1,765 study participants (15 to 70 years old) were included. Socio-demographic information, daily SSB consumption (<1 SSB drink per day or ≥1 SSB drink per day), and HL level (limited or sufficient) were extracted. An HL index score of ≤33 was classified as "limited," while a score >33 was considered "sufficient." Multivariate logistic regression was conducted to estimate adjusted odds ratios and confidence intervals for daily SSB consumption.

Results. Out of the 1,765 study participants, 64.14% reported consuming (≥1 SSB drink per day, of whom majority (57.52%) were adults (31 to 59 years old), females (72.21%), married or in common-law partnership (65.70%), living in the Luzon region (47.23%), urban residents (71.94%), high school graduates (30.52%), have an annual household income of PhP 100,000–249,999 (37.03%), and employed (92.61%). Among those consuming ≥1 SSB drink per day, 51.89% had limited HL. Age, sex, and subnational level (National Capital Region, Luzon, Visayas, and Mindanao) were found to be significantly associated with the consumption of ≥1 SSB drink(s) per day. A weak association was found between HL and SSB consumption (aOR: 0.9591; 95% CI: 0.7832, 1.1747), that is, the adjusted odds of having limited HL were found to be slightly lower among those consuming ≥1 SSB drink(s) per day than those who consume <1 SSB drink/day. However, this association was found to be not statistically significant.

Conclusion. There was a high prevalence of daily SSB consumption among Filipinos. Among the variables considered, only age, sex, and subnational level were found to be significant determinants of SSB consumption. The findings of the study may provide valuable insights for targeted health promotion and education interventions in reducing SSB consumption among Filipinos such as workplace wellness programs, nutrition education, and the provision of healthier beverage alternatives. Priority should be given to younger individuals, males, and residents of the National Capital Region. This research also fills a gap in the literature regarding the role of HL in SSB consumption within the Philippine context. Findings of this study support adopting the Health Literacy Universal Precautions to ensure accessible health information and services for all, regardless of HL level

Keywords: health literacy, sugar-sweetened beverage, sweetened drink

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INTRODUCTION

Sugar-sweetened beverages (SSBs) are a major source of added sugars and contribute to increased energy intake, often displacing more nutritious foods. Daily intake of at least one SSB was shown to be associated with several adverse health outcomes like obesity, development of noncommunicable diseases (NCDs) such as cardiovascular diseases, diabetes, and increased mortality risk.[1,2] The high levels of rapidly absorbable sugars in various SSBs can lead to a high dietary glycemic load, resulting in inflammation, insulin resistance, and impaired β-cell function. These factors may elevate the risk of cardiovascular diseases and diabetes mellitus, independent of obesity, when SSBs are consumed frequently and in large quantities.[3]

One of the 2030 Sustainable Development Goals (SDG) is to ensure healthy lives and promote well-being for all which includes reducing premature mortality from noncommunicable diseases (NCDs) through prevention and treatment by one-third. However, in the Philippines, the prevalence of obesity and NCDs has been steadily increasing in recent years.[4] NCDs now account for 68% of all deaths, with an estimated 29% risk of premature death (death before age 70) attributed to NCDs in the country.[4] Over a decade, from 2005 to 2015, the fraction of daily sugar intake from SSBs in the Philippines rose by 44%.[5] In response to this trend and aiming to mitigate the escalating prevalence of obesity and NCDs, the Philippines enacted the SSB tax in 2017 under Republic Act 10963 Section 47, part of the Tax Reform for Acceleration and Inclusion (TRAIN) Law. This legislation mandated a PhP 6 tax per liter for beverages sweetened with caloric or non-caloric sweeteners (excluding high-fructose corn syrup) and PhP 12 per liter for beverages sweetened with high-fructose corn syrup.[5] Despite these efforts, SSBs continue to be an apparent part of Filipino dietary behaviors.

Enabling healthy choices and behavior through increased health literacy (HL) is listed in the Philippine Development Plan 2023-2028 as one of the key strategies for improving the health of Filipinos.[6] HL, as defined in the study of Sørensen et al. in 2012, involves people's knowledge, motivation, and competencies to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention, and health promotion to maintain or improve quality of life during the life course.[7] This encompasses all core competencies of HL: (1) Accessing or obtaining information relevant to health; (2) Understanding information relevant to health; (3) Processing or appraising information relevant to health; and (4) Applying or using of information to health concerning decision-making in three health contexts: healthcare, disease prevention, and health promotion.

In the first national survey on HL in the Philippines, 51.5% were reported to have limited HL.[8] Despite its recognized importance in health promotion and disease prevention[9], no published studies in the Philippines have yet explored the role of HL in influencing specific dietary behavior or food consumption including SSB consumption. All reviewed past studies on the association of HL and SSB consumption were conducted in other countries[10,11] and the findings of these have shown conflicting results. A systematic review conducted by Buja et al. which investigated the association between HL and dietary sugar intake reported that out of the five studies, only three found a significant association between low levels of HL and sugar intake, and one found this association significant only for males, and two studies showed no evidence of any association.[12] The conflicting results may be attributed to the differences in sample populations and methods used in measuring HL and dietary intake. Moreover, the systematic literature search did not find any local study examining the possible relationship of HL with specific dietary behavior or food consumption such as SSBs.

Considering the crucial role of HL in creating healthier communities, knowledge of its relationship with SSB consumption in the local setting may provide additional evidence-based information that can be used to design and implement effective interventions such as nutrition education programs and nutrition labelling in reducing excessive sugar consumption among Filipinos. The objectives of this study were: 1) to determine the association between HL and SSB consumption; and 2) to determine the prevalence of daily SSB consumption among Filipinos and describe its distribution across HL levels and selected socio-demographic variables.

METHODS

Study Design and Description of Data Source

This study employed an analytic cross-sectional study design utilizing secondary data from the first National Health Literacy Survey (NHLS).[8] The NHLS aimed to assess the HL level of Filipinos aged 15 to 70 years of age on both national and subnational level (National Capital Region, Luzon, Visayas, and Mindanao). Each participant signed a written informed consent form, while those under 18 years of age provided assent in addition to parental consent. Exclusion criteria include adults with cognitive impairments such as problems with memory, language, and thinking based on the Mini-Cog test for participants above 60 years of age and those unable to give their consent were also excluded from the survey. This was carried out from 2018 to 2019 and employed a multistage sampling design.

Sample Size

A total of 2,303 participants were included in the NHLS. The study excluded 538 participants due to missing data on SSB consumption and selected socio-demographic variables, resulting in a final sample of 1,765 participants. Compared to those included participants in the study, the excluded sample had higher proportions of those living in Visayas (30.19%; 95% CI: 25.37, 35.49) and Mindanao (47.48%; 95% CI: 42.02, 53.01) regions, elementary graduates (35.85%; 95%

CI: 30.74, 41.30), and reported annual household income of PhP 40,000–59,999 (30.50%; 95% CI: 25.66, 35.81) and PhP 60,000–99,999 (30.82%; 95% CI: 25.96, 36.14).

Data Collection

Data on the relevant variables including HL level, SSB consumption per day, selected socio-demographic variables including age, sex, civil status, educational attainment, occupational status, annual household income, employment status, subnational level, and type of residence were extracted from the original dataset. Records with missing data on these variables were excluded from the study. A total of 1,765 records were included in the analysis.

Study Variables

The study utilized the following information from the secondary data to assess the outcome measure, SSB consumption: 1) whether or not the study participant reported SSB consumption in the last 30 days ('Have you drunk sweetened beverages in the last 30 days?'); and 2) usual amount consumed in a day ('On a day when you drink sweetened beverages, how much do you usually drink?'). In this study, the participants were categorized as consuming <1 SSB drink per day if they answered 'no' to the first question or reported consuming <1 SSB drink per day in response to the second question. Conversely, participants were categorized as consuming ≥1 SSB drink(s) per day if they answered 'yes' to the first question and reported consuming ≥1 SSB drink(s) per day in response to the second question.

The main exposure measure of interest is HL. It was measured in the NHLS using a modified version of the Health Literacy Survey-Asia Questionnaire (HLS-Asia Q). This is a comprehensive questionnaire survey tool comprised of 47 items that were designed to assess an individual's HL level in terms of the 12 subdomains formed from the four competencies (accessing, understanding, appraising, and applying health information) concerning decision-making in three health contexts (healthcare, disease prevention, and health promotion). The modified version of the HLS-S-Asia Q was translated into eight Philippine languages following the translation–back translation procedure and was validated. HL level of participants was categorized into limited (index score of ≤33) and sufficient (index score of >33).

Mutually exclusive response categories were created for covariates. Socio-demographic variables included were age (in years), sex, civil status (single, married/common-law, divorced/separated, and widowed), educational attainment (no education/elementary level, elementary graduate, high school graduate, senior high school/vocational graduate, and college graduate), employment status (employed and unemployed), annual household income (Less than PhP 40,000, PhP 40,000–59,999, PhP 60,000–99,999, PhP 100,000–249,999, and PhP 250,000 or more), type of residence (urban and rural), and subnational level (National Capital Region, Luzon, Visayas, and Mindanao).

Statistical Analyses

Mean and its corresponding standard deviation were reported for quantitative variables while frequencies and proportions for qualitative variables. Logistic regression analysis was performed to assess the relationship between HL and SSB consumption controlling for age, sex, civil status, educational attainment, occupational status, annual household income, employment status, subnational level, and type of residence. Assessment of significant confounders was conducted using backward elimination. This stepwise approach starts with a full mode and, in each step, sequentially removes variables starting with the highest p-value or lowest z-value in cases that p-values are equal in order to identify a reduced model that best explains the data. A change in estimate (%CIE) was then computed and the value greater than or equal to 10% indicates that the potential confounder has a significant confounding effect and was considered in the final model. A p-value of less than 0.05 was considered statistically significant. All statistical analyses were performed using STATA 14 software.

Ethical Consideration

The study was granted a certificate of exemption from ethical review (UPMREB 2023-0589-EX) by the University of the Philippines Manila Review Ethics Board (UPM-REB).

RESULTS

Among the 1,765 study participants, the mean age was 40.75 years (± 14.45 years). The majority of the respondents were females (75.07%), married or in a domestic partnership (68.27%), living in the Luzon region (52.52%), urban residents (69.86%), finished high school (30.82%), have annual household income of PhP 100,000–249,999 (36.32%), and were employed (93.31%) (Table 1).

Prevalence of Sugar-sweetened Beverage Consumption

More than half (64.41%) reported having sugar-sweetened beverage (SSB) consumption of ≥1 drink(s) per day, of whom 590 (51.89%) have limited HL. Participants who reported intake of ≥1 SSB drink(s) per day were mostly 31 to 59 years of age (57.52%), females (72.21%), married or in a domestic partnership (65.70%), almost half were living in the Luzon region (47.23%), living in urban areas (71.94%), high school graduates (30.52%), have an annual household income of PhP 100,000–249,999 (37.03%), and employed (92.61%) (Table 1).

Association between Sugar-sweetened Beverage Consumption and Health Literacy

The crude odds ratio (cOR) indicates that there is no sufficient evidence to say HL is associated with SSB consumption (cOR: 0.9928; 95% CI: 0.8169, 1.2067) (Table 2).

Assessment of significant confounding variables showed that no variable was found to be a significant confounding variable (%CIE >10%) in the association of HL and daily SSB consumption in this study. Age, sex, and subnational level were forced into the final model since these were found consistently in past studies to be significant confounders in the relationship between HL and SSB consumption.

The adjusted odds ratio (aOR) suggests that there is no sufficient evidence to say that there is an association between HL and SSB consumption (aOR: 0.9591; 95% CI: 0.7832, 1.1747), even after controlling for age, sex, and subnational level (Table 3). Meanwhile, age (aOR: 0.9860; 95% CI: 0.9791, 0.9930), sex (aOR: 0.6496; 95% CI: 0.5107, 0.8262), and subnational level ((Luzon: aOR 0.2946; 95% CI: 0.2113, 0.4107; Visayas: aOR 0.4930; 95% CI: 0.3177, 0.7651; Mindanao: aOR 0.4248; 95% CI: 0.2926, 0.6167)) were shown to be strongly associated with SSB consumption (Table 3).

Table 1. Socio-demographic Characteristics and Health Literacy of Study Participants according to Sugar-sweetened Beverage (SSB) Consumption (n=1,765)

Variable	≥ 1 SSB drink(s)/day (n=1,137)	< 1 SSB drink/day (n=628)	Total
	Mean (SD*)		
Age	39.81 (± 14.55)	42.47 (±14.12)	40.75 (±14.45)
	n (%)		
Age group			
Youth (15 to 30 years old)	349 (30.69)	146 (23.25)	495 (28.05)
Adult (31 to 59 years old)	654 (57.52)	398 (63.38)	1,052 (59.60)
Elderly (60 years old and above)	134 (11.79)	84 (13.38)	218 (12.35)
Sex			
Male	316 (27.79)	124 (19.75)	440 (24.93)
Female	821 (72.21)	504 (80.25)	1,325 (75.07)
Marital Status			
Singe/Never Married	300 (26.39)	109 (17.36)	409 (23.17)
Married/Common-law/Live-in	747 (65.70)	458 (72.93)	1,205 (68.27)
Divorced/Separated	20 (1.76)	11 (1.75)	31 (1.76)
Widowed	70 (6.16)	50 (7.96)	120 (6.80)
Subnational Level			
National Capital Region	233 (20.49)	52 (8.28)	285 (16.15)
Luzon	537 (47.23)	390 (62.10)	927 (52.52)
Visayas	127 (11.17)	56 (8.92)	183 (10.37)
Mindanao	240 (21.11)	130 (20.70)	370 (20.96)
Type of Residence			
Urban	818 (71.94)	415 (66.08)	1,233 (69.86)
Rural	319 (28.06)	213 (33.92)	532 (30.14)
Educational Attainment			
No education to Elementary level	80 (7.04)	45 (7.17)	125 (7.08)
Elementary Graduate	275 (24.19)	157 (25.00)	432 (24.48)
High School Graduate	347 (30.52)	197 (31.37)	544 (30.82)
Senior High School or Vocational Graduate	238 (11.17)	123 (20.70)	361 (20.45)
College Graduate	197 (17.33)	106 (16.88)	303 (17.17)
Annual Household Income			
Less than PhP 40,000	129 (11.35)	101 (16.08)	230 (13.03)
PhP 40,000–59,999	172 (15.13)	86 (13.69)	258 (14.62)
PhP 60,000–99,999	272 (23.92)	147 (23.41)	419 (23.74)
PhP 100,000–249,999	421 (37.03)	220 (35.03)	641 (36.32)
PhP 250,000 or more	143 (12.58)	74 (11.78)	217 (12.29)
Employment Status			
Employed	1,053 (92.61)	594 (94.59)	1,647 (93.31)
Unemployed	84 (7.39)	34 (5.41)	118 (6.69)
Health Literacy Level			
Sufficient	547 (48.11)	301 (47.93)	848 (48.05)
Limited	590 (51.89)	327 (52.07)	917 (51.95)

* *Standard Deviation*

Table 2. Crude Odds Ratios (ORs) between Sugar-sweetened Beverage (SSB) Consumption and Health Literacy (HL) Level and Socio-demographic Variables (n=1,765)

Variable	Crude OR (CI*)	p-value
Health Literacy Level		
Sufficient	1.0 (Reference)	
Limited	0.9928 (0.8169 – 1.2067)	0.943
Age	0.9873 (0.9806 – 0.9940)	<0.001
Sex		
Male	1.0 (Reference)	
Female	0.6392 (0.5051 – 0.8089)	<0.001
Marital Status		
Singe/Never Married	1.0 (Reference)	
Married/Common-law/ Live-in	0.5926 (0.4624 – 0.7595)	<0.001
Divorced/Separated	0.6606 (0.3066 – 1.4235)	0.209
Widowed	0.5087 (0.3329 – 0.7772)	0.002
Subnational Level		
National Capital Region	1.0 (Reference)	
Luzon	0.3073 (0.2214 – 0.4264)	<0.001
Visayas	0.5061 (0.3276 – 0.7819)	0.002
Mindanao	0.4120 (0.2850 – 0.5957)	<0.001
Type of Residence		
Urban	1.0 (Reference)	
Rural	0.7598 (0.6160 – 0.9372)	0.010
Annual Household Income		
PhP 250,000 or more	1.0 (Reference)	
PhP 100,000–249,999	0.9903 (0.7158 – 1.3700)	0.953
PhP 60,000–99,999	0.9575 (0.6781 – 1.3520)	0.805
PhP 40,000–59,999	1.0350 (0.7065 – 1.5162)	0.860
Less than PhP 40,000.00	0.6609 (0.4507 – 0.9693)	0.034
Employment Status		
Employed	1.0 (Reference)	
Unemployed	1.3937 (0.9241 – 2.1019)	0.113
Educational Attainment		
College Graduate	1.0 (Reference)	
Senior High School or Vocational Graduate	1.0411 (0.7552 – 1.4354)	0.806
High School Graduate	0.9478 (0.7065 – 1.2714)	0.720
Elementary Graduate	0.9425 (0.6934 – 1.2810)	0.705
No education to Elementary level	0.9566 (0.6192 – 1.4777)	0.841

* Confidence interval

DISCUSSION

Prevalence of Sugar-sweetened Beverage Consumption

The prevalence of consuming at least one SSB drink per day among Filipino adults aged 15 to 70 years was 64.42%. This is higher compared to the reported prevalence of SSB consumption among different age groups in the 2018-2019 Expanded National Nutrition Survey (ENNS)[13]: 50.5% for adolescents aged 13 to 18, 43.3% for adults aged 19 to 59, and 28.6% for the elderly. This period coincides with the timeframe during which the NHLS was conducted.

Table 3. Adjusted Odds Ratios (aOR) (Final Model) on the Association between Sugar-sweetened Beverage (SSB) Consumption and Health Literacy (HL) Level (n=1,765)

Variable	Adjusted OR (CI*)	p-value
Health Literacy Level		
Sufficient	1.0 (Reference)	
Limited	0.9591 (0.7832 – 1.1747)	0.687
Age	0.9860 (0.9791 – 0.9930)	<0.001
Sex		
Male	1.0 (Reference)	
Female	0.6496 (0.5107 – 0.8262)	<0.001
Subnational Level		
National Capital Region	1.0 (Reference)	
Luzon	0.2946 (0.2113 – 0.4107)	<0.001
Visayas	0.4930 (0.3177 – 0.7651)	0.002
Mindanao	0.4248 (0.2926 – 0.6167)	<0.001

* Confidence interval

In 2018, the Philippines implemented the SSB tax as part of a broader tax reform (Republic Act 10963 Section 47) in response to the escalating rates of obesity.[5] Similarly, Thailand, a neighboring Southeast Asian country to the Philippines, enacted an SSB tax law in 2017.[14] Notably, the nationwide prevalence of daily SSB consumption in both the current study and the 2018-2019 ENNS exceeds that of Thailand for non-alcoholic carbonated drinks (34.2%), non-100% fruit juice drinks (22.8%), and energy drinks (14.9%) among a random sample of 4,736 respondents aged 15 and older in 2019.[14] However, this prevalence is comparable with the reported 63% for daily SSB consumption among adults in the United States based on the combined 2010 and 2015 National Health Interview Survey.[15]

Age, Sex, and Subnational Level and their Association with Sugar-sweetened Beverage Consumption

Some socio-demographic variables were found to be associated with daily sugar-sweetened beverage (SSB) consumption.[14,16,17] The study found age, sex, and subnational level as statistically significant factors associated with consuming ≥1 SSB drink per day, both in the full and final models. Age emerged as a significant determinant of daily consumption, consistent with the findings of previous studies.[14,16,18] This trend can be attributed to the generally lower energy intake and stricter dietary restrictions among older adults, often due to health conditions such as diabetes mellitus.[19] In addition, the higher consumption rates among younger adults may result from the aggressive marketing and advertising of energy-dense, nutrient-poor foods and beverages, including SSBs, targeting younger populations.[20]

Females were found to have lower sugar-sweetened beverage intake compared to males, consistent with the findings of Mendy et al., who studied adults aged 18 years or older in Mississippi[21]; Al-Hanawi et al., who examined individuals aged 15 years and older in Saudi Arabia[16]; and

Phulkerd et al.[14], who focused on individuals aged 15 years and older in Thailand. One possible explanation is that females generally require lower energy intake compared to males due to smaller average body weight and lower resting metabolic rate.[22] Workers in physically demanding jobs are predominantly males. For instance, construction workers who are mostly males are widely believed to be among the workforce most associated with high soda consumption, although this had not been formally documented.[23] These physically demanding jobs also require higher energy consumption.

Furthermore, females play an important role in the food consumption and nutrition of their households through procurement and preparation of food.[24] Females who are responsible for family meals may prioritize healthier choices not only for themselves but for their families. This traditional role of females in households makes them more conscious of their food consumption, reinforcing their tendency towards healthier options. Moreover, females generally have a higher consciousness about their health and appearance, which drives them towards selecting and consuming healthier food choices[25], further contributing to their lower SSB consumption.

The subnational level showed a statistically significant association with SSB consumption. Participants residing in Luzon, Visayas, and Mindanao showed lower consumption compared to those living in the National Capital Region (NCR). This disparity may be attributed to the distinct characteristic of NCR of being 100% urbanized based on the Philippine Statistics Authority (PSA).[26] The rapid urbanization and dense urban environment of NCR facilitate greater availability and accessibility of SSBs through numerous convenience stores, fast food chains, and vending machines.[27] Additionally, the high levels of marketing and advertising targeting residents of these highly urbanized areas further enhance the visibility and appeal of the beverages.

Health Literacy and Sugar-sweetened Beverage Consumption

This study showed that HL was weakly associated with the consumption of ≥1 SSB drink(s) per day. However, this association was not statistically significant contrary to the previous studies[10,11,28] on the relationship between HL and SSB consumption. The variations in the results are primarily due to differences in the measurement of HL and SSB consumption across studies. The NHLS used a modified, version of the HLS-S-Asia Questionnaire to measure HL. This comprehensive and validated instrument consists of 47 items designed to assess an individual's HL across 12 subdomains. These subdomains are derived from four competencies: accessing, understanding, appraising, and applying health information. The questionnaire evaluates these competencies in the context of decision-making within three health domains: healthcare, disease prevention, and health promotion. Meanwhile, other studies used different

HL assessment tools, such as a 3-item module in the study of Lee et al. and the Newest Vital Sign (NVS) tool in the studies of Reid et al.[28] and Zoellner et al.[10] Similarly, SSB consumption was also measured in various ways. Previous studies measured SSB consumption in kilocalories per day using a food frequency questionnaire. Additionally, differences in participant demographics across studies further contribute to the variations in findings.

In addition to variations in exposure and outcome measurements, and participant profile, the lack of statistically significant association between HL and SSB consumption in the study may be attributed to the unmeasured personal, situational, societal, and environmental factors presented in the conceptual framework. Factors including one's health status, attitudes, emotions, motivation, and self-efficacy, which are further affected by ecological influences like culture, social support, and the media can affect the relationship between HL and dietary intake.[29] This highlights the complex and multifaceted relationship between HL and dietary intake. Hence, while this study did not find a direct relationship between HL and SSB consumption, it is possible that HL is strongly associated with overall dietary behavior rather than with specific dietary components like SSB consumption.[30] SSBs may be considered to be a common part of social gatherings and celebrations in Filipino culture and are often paired with dishes high in fat, salt, and sugar. This led the SSB manufacturing companies, particularly soda brands, to employ marketing strategies that position SSBs as essential parts of a typical Filipino meal. The integration of marketing and culture can reinforce SSB consumption regardless of HL levels. Moreover, there are also individuals who may have sufficient HL but experience difficulty with reducing their sugar-sweetened beverage (SSB) consumption because it is a deeply ingrained dietary behavior.[31] This suggests that while HL can influence general dietary behaviors, HL alone may not be sufficient to counteract the strong societal and environmental factors that promote SSB consumption.

Limitations of the Study

The results may not be generalized to all Filipinos aged 15 to 70 due to the exclusion of some participant records from the data source due to missing data on the variables of interest in this study. Only 1,765 out of 2,083 respondents (84.73%) had complete information and sampling weights were not applied. Secondly, there was likely misclassification of SSB consumption, as the survey questions lacked precise volume specifications. This ambiguity could have led to varying interpretations and potential recall issues among participants. Such non-differential misclassification likely resulted in an underestimation of the observed estimates, thereby biasing the results towards the null hypothesis. Further research is recommended to measure SSB consumption using more objective methods such as employing a food frequency questionnaire or conducting 24-hour food recall. Lastly, residual confounding from unmeasured variables may have

affected the results given the inherent limitations of utilizing secondary data.

CONCLUSION

The study found that 64.41% of Filipinos aged 15 to 70 consume ≥1 SSB drink per day with 590 participants exhibiting limited HL. Age, sex, and subnational level were found to be strongly associated with SSB consumption. Although the observed negative association between HL and SSB consumption was not statistically significant, these findings can inform the design and implementation of targeted interventions. Policymakers should prioritize younger age groups, residents of Luzon and urban areas, and employed individuals who exhibit high SSB consumption. Interventions may include integrating SSB reduction campaigns into workplace wellness programs, replacing SSBs in workplace vending machines and public spaces with healthier alternatives, educational programs focusing on teaching adults how to read nutrition labels, and use of social media campaigns. Furthermore, it is also important to provide healthy, safe, and affordable alternatives to Filipinos to aid in the reduction of daily SSB consumption. Achieving this requires collaboration between government and private industries. Key strategies may include having accessible and safe drinking water in public areas, developing beverages with lower sugar content, and exploring the use of natural sweeteners in sugary drinks. Collaboration between government and private sectors is essential for implementing these initiatives. In addition, the result of the study supports the application of the Health Literacy Universal Precautions among healthcare providers by ensuring that health information and services are easily understandable to individuals regardless of HL level. It also enables professionals and community workers to not equate sufficient HL with having healthier dietary choices. Monitoring and evaluation of these interventions are necessary to assess their effectiveness in reducing SSB consumption.

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REFERENCES

1. Malik V, Hu F. Sugar-sweetened beverages and cardiometabolic health: an update of the evidence. Nutrients. 2019 Aug 8;11(8):1840. doi: 10.3390/nu11081840. PMID: 31398911; PMCID: PMC6723421.
2. Malik V, Hu F. The role of sugar-sweetened beverages in the global epidemics of obesity and chronic diseases. Nat Rev Endocrinol. 2022 Apr;18(4):205-218. doi: 10.1038/s41574-021-00627-6. PMID: 35064240; PMCID: PMC8778490.
3. Malik V, Popkin B, Bray G, Després J, Hu F. Sugar-sweetened beverages, obesity, type 2 diabetes mellitus, and cardiovascular disease risk. Circulation. 2010 Mar;121(11):1356-64. doi: 10.1161/CIRCULATIONAHA.109.876185.
4. Ulep V, Uy J, Casas L. Primary Health Care for Noncommunicable Diseases in the Philippines. [Internet]. 2020. [cited 2023 May]. Available from: https://www.pids.gov.ph
5. Onagan F, Ho B, Chua K. Development of a sweetened beverage tax, Philippines. Bull World Health Organ. 2019 Feb;97(2):154-9. doi: 10.2471/BLT.18.220459.
6. National Economic Development Authority. Philippine Development Plan 2023-2028. [Internet]. 2023. [cited 2022 June]. Available from: https://pdp.neda.gov.ph/wp-content/uploads/2023/01/PDP-2023-2028.pdf
7. 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 Jan 25;12:80. doi: 10.1186/1471-2458-12-80. PMID: 22276600; PMCID: PMC3292515.
8. Tolabing M, Co K, Mendoza O, Mira N, Quizon R, Tempongko M, et al. Prevalence of limited health literacy in the Philippines: first national survey. Health Lit Res Pract. 2022 Apr;6(2):e104-e112. doi: 10.3928/24748307-20220419-01. PMID: 35522857; PMCID: PMC9126056.
9. Nutbeam D. Health literacy as a population strategy for health promotion. Jpn J Health Educ Promot. 2017;25(3):210-22. doi: 10.11260/kenkokyoiku.25.210.
10. Zoellner J, You W, Connell C, Smith-Ray RL, Allen K, Tucker K, 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 Jul;111(7):1012-20. doi: 10.1016/j.jada.2011.04.010. PMID: 21703379; PMCID: PMC3160591.
11. Lee S, Zhang L, Rubin D, Park S. Associations of health literacy and menu-labeling usage with sugar-sweetened beverage intake among adults in Mississippi, 2016. Am J Health Promot. 2020 Nov;34(8):923-928. doi: 10.1177/0890117120927302. PMID: 32436417; PMCID: PMC9006158.
12. Buja A, Grotto G, Montecchio L, De Battisti E, Sperotto M, Bertoncello C, et al. Association between health literacy and dietary intake of sugar, fat and salt: a systematic review. Public Health Nutr. 2021 Jun;24(8):2085-2097. doi: 10.1017/S1368980020002311. PMID: 32744216; PMCID: PMC8145460.
13. Dasco M, Platon-Desnacido J, Ducay A, Duante C, Vargas M. Monitoring the consumption of sugar-sweetened beverages: an input to Republic Act No. 10963 (TRAIN Law). Philippine Journal of Science. 2023;152(5):1609-22. doi:10.56899/152.05.08.
14. Phulkerd S, Thongcharoenchupong N, Chamratrithirong A, Pattaravanich U, Sacks G, Prasertsom P. Influence of sociodemographic and lifestyle factors on taxed sugar-sweetened beverage consumption in Thailand. Food Policy. 2022 May;109:102256. doi:10.1016/j.foodpol.2022.102256.
15. Chevinsky J, Lee S, Blanck H, Park S. Prevalence of self-reported intake of sugar-sweetened beverages among us adults in 50 states and the district of Columbia, 2010 and 2015. Prev Chronic Dis. 2021 Apr 15;18:E35. doi: 10.5888/pcd18.200434. PMID: 33856977; PMCID: PMC8051857.

16. Al-Hanawi M, Ahmed M, Alshareef N, Qattan A, Pulok M. Determinants of sugar-sweetened beverage consumption among the Saudi adults: findings from a nationally representative survey. Front Nutr. 2022 Mar 22;9:744116. doi: 10.3389/fnut.2022.744116. PMID: 35392287; PMCID: PMC8981208.

17. Mazarello Paes V, Hesketh K, O'Malley C, Moore H, Summerbell C, Griffin S, et al. Determinants of sugar-sweetened beverage consumption in young children: a systematic review. Obes Rev. 2015 Nov;16(11):903-13. doi: 10.1111/obr.12310. PMID: 26252417; PMCID: PMC4737242.

18. Norman-Burgdolf H, DeWitt E, Cardarelli K, Gillespie R, Slone S, Gustafson A. Sugar-sweetened beverage consumption among adults in rural Appalachia. Prev Med Rep. 2021 Nov 18;24:101642. doi: 10.1016/j.pmedr.2021.101642. PMID: 34976693; PMCID: PMC8684001.

19. Navarro G, Tandang N, Arlan R. Nutritional status among Filipino elderly prevalence and correlates. Acta Med. 2020;51(4):54-65. doi:10.32552/2020.ActaMedica.411.

20. Molenaar A, Saw W, Brennan L, Reid M, Lim M, McCaffrey T. Effects of advertising: a qualitative analysis of young adults' engagement with social media about food. Nutrients. 2021 Jun 4;13(6):1934. doi: 10.3390/nu13061934. PMID: 34199960; PMCID: PMC8226576.

21. Mendy V, Vargas R, Payton M, Cannon-Smith G. Association between consumption of sugar-sweetened beverages and sociodemographic characteristics among Mississippi adults. Prev Chronic Dis. 2017 Dec 21;14:E137. doi: 10.5888/pcd14.170268. PMID: 29267157; PMCID: PMC5743024.

22. Wu B, O'Sullivan A. Sex differences in energy metabolism need to be considered with lifestyle modifications in humans. J Nutr Metab. 2011;2011:391809. doi: 10.1155/2011/391809. PMID: 21773020; PMCID: PMC3136178.

23. Álvarez-Sánchez C, Guillén H, Contento I, Koch P, Théodore F. Soda consumption among Mexican construction workers in the context of the sugar-sweetened beverage tax. Health Educ Behav. 2022 Feb;49(1):107-117. doi: 10.1177/10901981211050031. PMID: 34706574.

24. Langer A, Meleis A, Knaul F, Atun R, Aran M, Arreola-Ornelas H, et al. Women and Health: the key for sustainable development. Lancet. 2015 Sep 19;386(9999):1165-210. doi: 10.1016/S0140-6736(15)60497-4. PMID: 26051370.

25. Beardsworth A, Bryman A, Keil T, Goode J, Haslam C, Lancashire E. Women, men and food: the significance of gender for nutritional attitudes and choices. Br Food J. 2002 Aug;104(7):470-91. doi: 10.1108/00070700210418767.

26. Philippine Statistics Authority. Urban population of the Philippines: 2020 Census of Population and Housing. [Internet]. 2022. [cited 2024 Nov 2]. Available from: https://psa.gov.ph/content/urban-population-philippines-2020-census-population-and-housing

27. Colozza D, Wang YC, Avendano M. Does urbanisation lead to unhealthy diets? Longitudinal evidence from Indonesia. Health Place. 2023 Sep;83:103091. doi: 10.1016/j.healthplace.2023.103091. PMID: 37490794.

28. Reid A, Porter K, You W, Kirkpatrick B, Yuhas M, Vaught S, et al. Low health literacy is associated with energy-balance-related behaviors, quality of life, and BMI among rural Appalachian middle school students: a cross-sectional study. J Sch Health. 2021 Aug;91(8):608-616. doi: 10.1111/josh.13051. PMID: 34096052; PMCID: PMC9660538.

29. Squiers L, Peinado S, Berkman N, Boudewyns V, McCormack L. The health literacy skills framework. J Health Commun. 2012;17 Suppl 3:30-54. doi: 10.1080/10810730.2012.713442. PMID: 23030560.

30. Ma C, Ren Z, Chen Z, Li C. The association between interactive health literacy and dietary behaviors among Chinese college students: a large-scale cross-sectional study. Front Psychol. 2024 May 30;15:1363885. doi: 10.3389/fpsyg.2024.1363885. PMID: 38873517; PMCID: PMC11169687.

31. Tryon M, Stanhope K, Epel E, Mason A, Brown R, Medici V, et al. Excessive sugar consumption may be a difficult habit to break: a view from the brain and body. J Clin Endocrinol Metab. 2015 Jun;100(6):2239-47. doi: 10.1210/jc.2014-4353. PMID: 25879513; PMCID: PMC4454811.