JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
ISSN: 2576-0017
2024, VOL 7, NO S11

Examine school health promotion and students' use of water and sugar-sweetened beverages.

Mohammad Hamd Ali Alharbi[1]
Ibrahim Hamd Aljaser[2]
Mohammad Salih M Alguit[3]
Mohammed Hamoud Aljubayri Alharbi[4]
Fahad Hussain Alammash[5]
Abdulmajeed Sati Alharbi[6]
Abdullah saeed alzahrani[7]
Hamad Ahmed Kumait[8]
Abdulelah Tayi Almutairi[9]
YOSAF AZIZ Mossad Al-MUTIRI[10]
Hassan Taher Alhajouji[11]
Bassam Atallah Almutairi[12]

1. Nutritionist-Malharbhi@moh.gov.sa
2. Public health specialist- ialjaser@moh.gov.sa
3. Public health specialist-Malguit@moh.gov.sa
4. nutrition specialist-malharbi588@moh.gov.as
5. Food and nutrition services- falammash@moh.gov.sa
6. Food and nutrition services -Aaharbi726@moh.gov.sa
7. Nutrition technician -Aalzahrani270@moh.gov.sa
8. Clinical dietitian - hakumait@moh.gov.sa
9. Nutrition-Atalmutairi@moh.gov.sa
10. Nutritionist -yalmutiri@moh.gov.sa
11. Nutritionist-Halhajouji@moh.gov.sa
12. Nutritionist- Balmutairi32@moh.gov.sa

Abstract
Background: Overweight among adolescents is a global health concern, with unhealthy dietary habits, such as the consumption of sugar-sweetened beverages (SSBs), playing a significant role in its prevalence. To address this issue, the World Health Organization's Health Promoting Schools (HPS) framework aims to promote healthier lifestyles in schools. This study examines the impact of school-level factors, including program certification, on adolescents' daily water and SSB consumption, with a focus on how these factors may influence dietary behaviors.
Methods: This study approach was used to analyze data from 30.000 adolescents in secondary schools that participated in a national health survey . The survey collected information on daily water and SSB intake, and school characteristics, including program certification, urbanization, school size, and socio-economic factors. Multilevel modeling techniques were applied to assess the variance in daily consumption across schools and to explore the relationships between school-level factors and individual dietary behaviors.
Results: The study found that 4.53% of the variation in daily water consumption and 2.33% of the variation in SSB consumption were attributable to differences at the school level. Factors such as parental education, educational track, and urbanization explained some of the school-level variation in water and SSB consumption. However, school certification under the Health Promoting Schools program did not significantly influence the daily consumption of water or SSBs.
Conclusion: The findings suggest that school-level factors, including parental education and urbanization, play a significant role in shaping adolescents' daily water and SSB consumption. While the Health Promoting Schools program contributes to health promotion, its direct impact on dietary behaviors may vary depending on contextual factors. Further research is needed to explore how program fidelity and school characteristics interact to influence the success of health interventions.

Introduction

Overweight among adolescents remains a critical global health challenge (1). This is particularly concerning as excess weight during childhood often persists into adulthood (2), leading to serious health issues such as type 2 diabetes, heart disease, and certain types of cancer (3). Furthermore, previous studies highlight the connection between being overweight and reduced mental well-being in adolescents (4). Among the primary contributors to adolescent overweight is the prevalence of unhealthy eating habits (5), including the consumption of sugar-

sweetened beverages (SSBs). These drinks, providing minimal satiety, increase the likelihood of excessive intake (6, 7). Because SSBs are a significant source of added sugars with negligible nutritional benefits, they are linked to weight gain (8, 9). Consequently, replacing SSBs with water is strongly encouraged from a health standpoint, as water contains no calories or sugar (10).

To promote healthier habits among young people, the World Health Organization (WHO) introduced the Health Promoting Schools (HPS) framework, which adopts a whole-school approach (11, 12). This approach addresses various elements of the school environment, such as health-related policies, educational programs, and collaboration with families and local health organizations (13). Schools serve as key platforms for health promotion due to the ability to reach most children and adolescents through mandatory education (11). Many countries have implemented variations of this framework to encourage healthy lifestyles among students (14). These initiatives are particularly relevant in addressing dietary issues, including the high consumption of SSBs and the insufficient intake of water reported among adolescents in multiple studies (15).

Schools participating in such programs often aim for certification by meeting specific criteria related to health themes, such as nutrition. Certification requirements typically involve addressing four main pillars: health education, creating supportive physical and social environments, identifying students needing additional support, and establishing health-promoting policies (14). Some certifications emphasize implementing interventions like healthy canteen policies, nutrition-related curricula, and educational activities designed to encourage healthier eating behaviors (16).

Despite the widespread adoption of school health programs, the degree of implementation and their effects remain unclear. Research on the HPS framework suggests schools often prioritize curriculum and environmental changes over involving families and communities (17). Similarly, studies examining the effects of these programs often focus heavily on health education while underemphasizing the other three pillars (18). A review of nutrition-focused school initiatives indicates that such interventions can reduce SSB consumption and increase water intake, though the evidence varies across different groups and contexts (19, 20, 21, 22). These inconsistencies may be better understood by considering factors like socioeconomic status, urban or rural settings, and cultural differences, which can influence dietary behaviors (23, 24, 25, 26).

Given that these programs are implemented at the school level, it is hypothesized that they contribute to differences in individual dietary behaviors between schools. This research aims to explore the extent to which variations in the daily consumption of water and SSBs among adolescents can be attributed to school-level factors, including program certification, general school characteristics, and student demographics. Additionally, the study examines whether these characteristics influence the relationship between program certification and dietary behaviors, as the effects may differ depending on the school context.

Methods

This research survey is conducted periodically, typically every four years, with the goal of engaging all secondary schools, although participation is optional.Students in grades equivalent to 8 and 10 completed the survey anonymously during school hours. The survey captured outcomes such as daily water consumption and sugar-sweetened beverages (SSBs) intake, along with individual characteristics, as part of the standard questionnaire (28). Data regarding program certification and additional support for specific health topics s were provided by a central health services organization. General school characteristics were obtained from an educational cohort study, which includes data from nearly all publicly funded schools (29). These datasets were linked through encrypted school identifiers.

Adolescents were excluded if they lacked school identifiers, attended special needs schools, were enrolled in unrecognized tracks, or had missing individual data.

Measurements

Daily water and SSB intake were primary outcomes, analyzed at the individual level. Adolescents were classified based on whether they consumed at least one glass of water or one serving of SSBs daily. The survey did not specify quantities of consumption. SSBs were defined broadly, encompassing drinks like soda, energy drinks, and sweetened teas, but excluded beverages with artificial sweeteners.

The health-focused program aims to promote healthier lifestyles through various forms of support, including online resources, funding for behavior-change interventions, and professional development for educators (14). Certification requirements are categorized by health topics such as nutrition, physical activity, and well-being, and are based on four core components: health education, the school environment, identifying students needing extra attention, and health policy (14). Schools meeting these criteria can apply for a certificate, which is reviewed by specialists. Certified schools also receive financial and advisory support to implement the program. The certification serves as an indicator of adherence to program components, though fidelity of implementation may vary across schools.

Program-related variables included certification status, health topic-specific certificates, years of certification, and receipt of financial or advisory support. Certification within a school year remains valid for three additional years, with program adherence considered a proxy for program implementation (14, 30).

School and Student Characteristics

General school characteristics, derived from educational datasets, included urbanicity (low, medium, high), school size, type of school (e.g., public or private), poverty levels, parental education, and the proportion of students with a migration background. Poverty levels were determined by analyzing area-specific socioeconomic indicators. School-level parental education and migration background were estimated from prior datasets due to limitations in individual-level data (31).

Individual variables included age, grade, educational track, household financial difficulties, psychosocial health, happiness, truancy, and school experience. Psychosocial health was measured using the Strengths and Difficulties Questionnaire (SDQ) (33), with scores categorized based on established thresholds (34). Happiness was assessed using a smiley-based scale, and school experience was rated on a 5-point scale, categorized into positive, negative, or average. Data for truancy and school experience were available for a subset of the survey regions.

Statistical analysis

Statistical analyses were conducted using multilevel modeling techniques (35) with R software version 4.1.3 (36). Significant (i.e., p-value < 0.05) interaction effects were examined for relevance by inspecting the effect sizes, expressed as odds ratios. All analyses based on multiple imputation were compared to complete case analyses.

Results

Table 1 highlights the summary statistics for secondary schools, categorized by those with and without the HS program certification. A total of 30000 adolescents from secondary schools participated in the study. Nutrition certification was the most prevalent topic certification, with 55.0% of certified schools holding it. Certified schools had an average certification duration of 3.9 years, compared to 0.2 years for non-certified schools, largely due to the inclusion of previously certified institutions.

Among the certified schools, 56.7% were in highly urbanized areas, while 44.3% of non-certified schools were in similar regions. The proportion of students with at least one parent holding higher education qualifications showed no significant difference between certified and non-certified schools (0.6 vs. 0.5, $p = 0.28$). /Significant differences emerged between certified and non-certified schools concerning urbanization, age, grade, financial challenges, school experiences, and truancy.

Regardless of certification status, more than 26% of adolescents did not consume water daily, and over 31% drank sugar-sweetened beverages (SSBs) daily. Of the adolescents who consumed SSBs daily, 64.0% also drank water daily. The mean number of respondents per school was 272.

For water consumption, 4.53% of the variation was attributable to differences at the school level. None of the variables related to the HS program explained ≥10% of this variation, but three other factors did: higher parental educational attainment, educational track, and urbanization level. Together, these variables accounted for 3.59% (4.53%-0.94%) of the school-level variance. Adolescents attending schools where less than 50% of the student population had at least one highly educated parent were less likely to consume water daily (66.1% vs. 76.9%). Similarly, students in highly urbanized areas reported higher daily water consumption (76.0%) compared to those in medium (72.8%) and low (69.8%) urbanization areas.

Within certified schools, 4.67% of the variation in water consumption was at the school level, but the number of years a school had been certified did not explain ≥10% of this variation. Furthermore, no significant associations were observed between certification duration and water consumption.

For SSB consumption, 2.33% of the variance was attributed to school-level differences. The HS certification itself did not account for ≥10% of the variation, but three factors did: higher parental educational attainment, educational track, and school type. Daily SSB consumption was higher among students in schools where less than 50% of the population had at least one highly educated parent (35.6% vs. 30.6%). Among school types, SSB consumption was most common in Protestant schools (36.1%) and least common in public schools (30.8%).

Due to convergence issues in logistic models, the combined multivariate effect of these factors could not be calculated. Higher parental education explained the largest portion of variance (0.91%, 2.33%-1.42%). Within certified schools, 1.64% of the SSB consumption variance was attributable to school-level differences, and certification duration did not explain ≥10% of this variance.

/

Table 1 Descriptive statistics of sample of secondary schools separately for certified Healthy Schools and non-certified schools

	Consumption of water and SSBs (*N* = 191)	
	Healthy Schools (*N* = 60[a])	**Non-certified schools (*N* = 131[a])**
Adolescents (N)	17,698	34,203
Water (daily) (%)	73.2[b]	73.6[c]
SSBs (daily) (%)	31.7[b]	32.5[c]
Characteristics related to the Healthy School program		
Healthy School topic certificates		
Nutrition (yes)* (%)	55.0	0
Physical activity (yes)* (%)	46.7	0
Well-being (yes)* (%)	16.7	0
Smoking, alcohol and drug prevention (yes)* (%)	16.7	0
Relationships and sexuality (yes)* (%)	10.0	0
Healthy School ever (yes)* (%)	100	6.1
No. of years Healthy School* (Mean (SD))	3.9 (1.1)	0.2 (1.0)
Support* [d] (yes) (%)	28.3	3.1
Total support* [d] (no. of years) (Mean (SD))	1.1 (1.1)	0.2 (0.5)
General school- and school population characteristics		
Urbanicity (%)		
High	56.7	44.3
Medium*	8.3	21.4
Low	35.0	34.4
School size (no. of students) (Mean (SD))	927 (513)	813 (475)
School type (%)		
Public	23.3	23.7
Independent non-denominational	13.3	11.5
Catholic	28.3	30.5
Protestant	21.7	16.0
Collaboration/other	13.3	18.3
Poverty level (%) (Mean (SD))	7.3 (9.9)	7.6 (11.7)
Proportion high parental educational attainment [e] (Mean (SD))	0.6 (0.2)	0.5 (0.2)
Proportion migration background [e] (Mean (SD))	0.2 (0.1)	0.2 (0.1)
Respondents described at the school-level (Mean (SD))[f]		
Age		
Percentage younger than 14 years*	43.6 (13.1)	38.0 (16.2)
Percentage 14–15 years	42.5 (8.6)	43.9 (10.4)
Percentage 16 years and above*	13.9 (7.3)	18.1 (10.5)
Grade		
Percentage grade 8*	55.5 (15.2)	49.4 (19.5)
Percentage grade 10*	44.5 (15.2)	50.6 (19.5)
Percentage financial difficulties* (no)	95.9 (2.0)	95.1 (2.8)
Percentage psychosocial health (normal)	71.1 (6.6)	69.4 (6.4)
Percentage happiness (yes)	85.6 (3.7)	84.8 (4.9)
Percentage truancy* [h] (yes)	10.1 (4.7)	12.2 (5.4)
School experience [i]		
Percentage good	53.6 (7.1)	52.3 (9.4)
Percentage average	36.5 (5.7)	36.4 (7.8)
Percentage bad*	9.8 (2.8)	11.3 (4.6)

Table 2 Multilevel intraclass correlations in secondary schools for the daily consumption of water and SSBs

	Water	**SSBS**
0 model	4.53	2.33
Characteristics related to the Healthy School program		
Healthy School	4.53	2.32
Healthy School topic certificates		
Nutrition	4.50	2.33
Physical activity	4.51	2.32
Well-being	4.49	2.33
Smoking, alcohol and drug prevention	4.53	2.32
Relationships and sexuality	4.52	2.32
Healthy School ever	4.53	2.31
Number of years Healthy School	4.53	2.30
Support	4.52	2.33
Total support	4.45	2.33
General school- and school population characteristics		
Urbanicity	3.77[d]	2.11
School type	4.47	2.07 [d]
Poverty level	4.53	2.33
High parental educational attainment	1.29 [d]	1.42 [d]
Migration background	4.51	2.30
Age[b]	4.62	2.20
Grade[b]	4.58	2.30
Educational track[b]	1.50 [d]	1.70 [d]
Financial difficulties[b]	4.48	2.32
Psychosocial health[b]	4.36	2.28
Happiness[b]	4.56	2.33
Truancy[b]	4.50	2.29
School experience[b]	4.38	2.24
All significant variables[c]	0.94 [d]	-

Discussion

This study aimed to explore the extent to which variations in daily water and sugar-sweetened beverage (SSB) consumption among secondary school students could be attributed to school certification in health programs, general school characteristics, and student demographics. Additionally, the study investigated whether these characteristics influenced the relationship between health program certification and consumption behaviors. Results showed that differences between schools accounted for 4.53% of the variation in daily water intake and 2.33% in daily SSB consumption, suggesting that school-level factors had a minimal impact on these behaviors. Despite the limited variation, further analysis was conducted to examine the potential influence of certification and other school-level factors on individual outcomes.

The socioeconomic and demographic characteristics of schools in the study sample were compared with those in other publicly funded secondary schools offering similar educational tracks, revealing differences in poverty levels and the proportion of students with migration backgrounds. Schools in the study generally had fewer students from high-poverty areas and fewer students with migration backgrounds. Parental education emerged as the most significant predictor of school-level differences in water and SSB consumption, aligning with prior research showing a relationship between parental education levels and these behaviors (43–46). Students in schools where less than half of the population had at least one parent with higher education demonstrated less favorable consumption habits, reflecting broader socioeconomic health disparities (23). Urbanicity and school type also played a role, as students in highly urbanized areas consumed more water, while those in religious schools consumed more SSBs. These findings are consistent with research linking higher education levels to urban living (48) and lower religiosity (49). Educational track further explained some school-level variation, echoing studies highlighting socioeconomic health inequalities from a young age (15, 23).

No significant link was found between health program certification and daily water or SSB consumption. Furthermore, schools with and without certifications exhibited similar behaviors among students, indicating that certification alone may not adequately reflect the implementation of health-promotion measures. The limited variation observed between schools, even after accounting for general school and student population characteristics, left little room for certification to make a substantial difference. This could be attributed to non-certified schools implementing similar health-promotion programs or the lack of strict certification criteria. For instance, some certifications allow up to 40% of available products to be less healthy options, such as soda or small snack portions (51, 52). Stricter policies, such as banning soda sales entirely or providing only water as an available beverage, may create a stronger differentiation between certified and non-certified schools while also promoting healthier behaviors (53–55). Setting water consumption as a social norm within schools could make this behavior easier to sustain (56).

Despite the observed differences, the small variation in water and SSB consumption between schools suggests a limited influence of school-level factors on these behaviors. Home environment factors, which were not included in this study, likely play a more significant role. Literature highlights the importance of parental modeling, attitudes, and the availability of SSBs at home, with most SSB consumption occurring outside the school setting (24, 25, 57–61). While health programs aim to involve parents in school nutrition policies and activities, participation remains optional, leaving the level of parental engagement unclear (16). Addressing home influences more effectively could be key to reducing SSB consumption across both home and school settings. This approach may be particularly impactful for schools serving students in lower academic tracks or those with lower parental education levels, as these groups demonstrated less favorable consumption behaviors.

Strengths and Limitations

This study benefited from the inclusion of a substantial number of secondary schools, which allowed for a comprehensive contribution to the body of research exploring the link between school health programs (SHP) and the consumption of sugar-sweetened beverages (SSBs) and water. Data was collected from multiple public health organizations, ensuring broad representation of adolescents in secondary education. Moreover, anonymous survey responses likely reduced the risk of social desirability bias, enhancing the reliability of the self-reported data (62).

While the extensive dataset is a notable strength, the reliance on existing registry data posed some limitations. First, as previously discussed, certification as a Healthy School may not accurately reflect the actual implementation of the SHP, and direct measures of program implementation could provide a more precise understanding. Additionally, updates to the certification registry—such as those resulting from school mergers or divisions—could introduce information bias. However, since the majority of the data pertained to a specific academic year and was retrieved relatively soon afterward, the likelihood of substantial bias is considered low.

Another limitation was the use of data from final-year students to estimate school-level characteristics like parental education and migration background. These estimates may not perfectly represent the broader school population, potentially leading to minor inaccuracies. Moreover, while we hypothesized that the effect of Healthy School certification could vary based on general school and student population characteristics, no supporting evidence was found. The study was restricted in the types of variables it could analyze, excluding other potentially influential factors such as parental engagement or the fidelity of program implementation.

Future research is required to assess whether SHPs can be impactful and, if so, under which specific conditions they are most effective. For example, further studies could investigate the role of varying levels of implementation or the potential influence of more stringent certification criteria. In this project's broader evaluation, quasi-experimental designs with pre- and post-measurements could better clarify causal relationships (63). Additionally, due to certain constraints in this analysis, random slope estimates were not feasible in all cases with cross-level interaction terms. While this omission might slightly elevate the risk of a Type 1 error (42), no significant p-values were observed, suggesting a minimal impact.

Lastly, some differences were noted between certified and non-certified schools regarding characteristics like student age and grade. However, these factors did not contribute to variation at the school level, nor did they significantly interact with the certification status.

Conclusions

The results demonstrated minimal differences among schools concerning the daily consumption of water and SSBs. This suggests that neither general school-level characteristics nor Healthy School certification significantly influence these behaviors. However, the findings highlight that schools with a higher proportion of adolescents from families with lower levels of parental education may hold the greatest potential for SHP interventions to promote healthier behaviors.

Further studies are necessary to evaluate the effectiveness of SHPs in specific contexts, such as under conditions of robust implementation, more stringent certification standards, or greater engagement of families. Moreover, future

research should extend the investigation to other educational levels, such as primary schools and vocational institutions, where the Healthy School program is also active.

References

1. World Health Organization: Obesity and overweight. https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (2021). Accessed 17 Apr 2023.
2. Singh AS, Mulder C, Twisk JW, van Mechelen W, Chinapaw MJ. Tracking of childhood overweight into adulthood: a systematic review of the literature. Obes Rev. 2008;9(5):474–88.
3. Chu D-T, Nguyet NTM, Dinh TC, Lien NVT, Nguyen K-H, Ngoc VTN, et al. An update on physical health and economic consequences of overweight and obesity. Diabetes Metab Syndr. 2018;12(6):1095–100.
4. van Vuuren CL, Wachter GG, Veenstra R, Rijnhart JJ, van der Wal MF, Chinapaw MJ, et al. Associations between overweight and mental health problems among adolescents, and the mediating role of victimization. BMC Public Health. 2019;19(1):1–10.
5. Güngör NK. Overweight and obesity in children and adolescents. J Clin Res Pediatr Endocrinol. 2014;6(3):129–43.
6. Ludwig DS. Artificially sweetened beverages: cause for concern. JAMA. 2009;302(22):2477–8.
7. Harrington S. The role of sugar-sweetened beverage consumption in adolescent obesity: a review of the literature. J Sch Nurs. 2008;24(1):3–12.
8. Woodward-Lopez G, Kao J, Ritchie L. To what extent have sweetened beverages contributed to the obesity epidemic? Public Health Nutr. 2011;14(3):499–509.
9. Malik VS, Hu FB. Sugar-sweetened beverages and cardiometabolic health: an update of the evidence. Nutrients. 2019;11(8):1840.
10. Popkin BM, D'Anci KE, Rosenberg IH. Water, hydration, and health. Nutr Rev. 2010;68(8):439–58.
11. Langford R, Bonell C, Jones H, Pouliou T, Murphy S, Waters E, et al. The world health organization's health promoting schools framework: a Cochrane systematic review and meta-analysis. BMC Public Health. 2015;15(1):1–15.
12. World Health Organization. Regional guidelines: development of health-promoting schools-a framework for action. Manila: World Health Organization Regional Office for the Western Pacific; 1996.
13. Vilaça T, Darlington E, Rosário R, Bessems K, Velasco MJM, Velasco V. SHE mapping report Lessons learnt from policies and practices of SHE member countries. Haderslev: Schools for Health in Europe Network Foundation (SHE); 2019.
14. van Koperen M, Kruitwagen V, Westhuis A, Sobels M. Gezonde School: landelijke samenwerking voor een gezonde jeugd. Tijdschr Gezondheidsw. 2020;98(2):62–5.
15. Rijksinstituut voor Volksgezondheid en Milieu: Gezondheidsmonitor Jeugd 2019; regio. https://statline.rivm.nl/#/RIVM/nl/dataset/50077NED/table?ts=1653399193919 (2022). Accessed 10 Oct 2022.
16. Gezonde School: Criteria en vragenlijst themacertificaat Voeding VO/VSO. https://mijngezondeschool.nl/?file=200986&m=1675696847&attachment=0&action=file.download (2022). Accessed 10 Oct 2022.
17. Langford R, Bonell CP, Jones HE, Pouliou T, Murphy SM, Waters E, et al. The WHO health promoting school framework for improving the health and well-being of students and their academic achievement. Cochrane Database Syst Rev. 2014;4:1–247.
18. Paulussen T, Buijs G, van Zoonen R. Voorstudie effectonderzoek naar Gezonde School in Nederland. Leiden: TNO; 2017.
19. Wang D, Stewart D. The implementation and effectiveness of school-based nutrition promotion programmes using a health-promoting schools approach: a systematic review. Public Health Nutr. 2013;16(6):1082–100.
20. Bjelland M, Bergh IH, Grydeland M, Klepp K-I, Andersen LF, Anderssen SA, et al. Changes in adolescents' intake of sugar-sweetened beverages and sedentary behaviour: results at 8 month mid-way assessment of the HEIA study-a comprehensive, multi-component school-based randomized trial. Int J Behav Nutr Phys Act. 2011;8(1):1–11.
21. Majumdar D, Koch PA, Lee H, Contento IR, Islas-Ramos ADL, Fu D. "Creature-101": a serious game to promote energy balance-related behaviors among middle school adolescents. Games Health J. 2013;2(5):280–90.

22. Muckelbauer R, Libuda L, Clausen K, Toschke AM, Reinehr T, Kersting M. Promotion and provision of drinking water in schools for overweight prevention: randomized, controlled cluster trial. Pediatrics. 2009;123(4):e661–7.
23. Pillas D, Marmot M, Naicker K, Goldblatt P, Morrison J, Pikhart H. Social inequalities in early childhood health and development: a European-wide systematic review. Pediatr Res. 2014;76(5):418–24.
24. Bere E, Glomnes ES, Te Velde SJ, Klepp K-I. Determinants of adolescents' soft drink consumption. Public Health Nutr. 2008;11(1):49–56.
25. van der Horst K, Timperio A, Crawford D, Roberts R, Brug J, Oenema A. The school food environment: associations with adolescent soft drink and snack consumption. Am J Prev Med. 2008;35(3):217–23.
26. Nicolaou M, Doak CM, van Dam RM, Brug J, Stronks K, Seidell JC. Cultural and social influences on food consumption in Dutch residents of Turkish and Moroccan origin: a qualitative study. J Nutr Educ Behav. 2009;41(4):232–41.
27. Vennegoor G, Vonk L, van Assema P, Huijts T, Eekhout I, Molleman GR, et al. Onderzoeksopzet evaluatie Gezonde School: onder welke condities doet het ertoe? Tijdschr Gezondheidsw. 2020;98(2):25–33.
28. Rijksinstituut voor Volksgezondheid en Milieu: Basisvragenlijst Gezondheidsmonitor Jeugd 2019. https://www.monitorgezondheid.nl/documenten/basisvragenlijst-gezondheidsmonitor-jeugd-2019 (2020). Accessed 18 Feb 2022.
29. Haelermans C, Huijgen T, Jacobs M, Levels M, van der Velden R, van Vugt L, et al. Using data to advance educational research, policy, and practice: design, content, and research potential of the Netherlands cohort study on education. Eur Sociol Rev. 2020;36(4):643–62.
30. Rijksinstituut voor Volksgezondheid en Milieu. Handleiding Gezonde School Toelichting voor gebruikers. 2010. https://sportindebuurt.nl/dA/a18a79d1cb.
31. Centraal Bureau voor de Statistiek. Standaard onderwijsindeling 2021 Editie 2022/'23. Den Haag/Heerlen: CBS; 2022. https://www.cbs.nl/nl-nl/onze-diensten/methoden/classificaties/onderwijs-en-beroepen/standaardonderwijsindeling--soi--/standaard-onderwijsindeling-2021.
32. Inspectie van het Onderwijs. De staat van het onderwijs 2021. Utrecht: Inspectie van het Onderwijs; 2021.
33. Goodman R. The Strengths and Difficulties Questionnaire: A Research Note. J Child Psychol Psychiat. 1997;38(5):581–86.
34. Theunissen M, de Wolff M, Vugteveen J, Timmerman ME, de Bildt A. Handleiding voor het gebruik van de Strengths and Difficulties Questionnaire bij adolescenten (12–17 jaar) binnen de Jeugdgezondheidszorg: Vragenlijst voor het signaleren van psychosociale problemen. Leiden: TNO; 2019. https://repository.tno.nl//islandora/object/uuid:1fb0f904-e2df-40e4-ba02-df57527a82b1.
35. Snijders TAB, Bosker RJ. Multilevel analysis: an introduction to basic and advanced multilevel modeling. London: Sage; 2012.
36. R Core Team. R: A language and environment for statistical computing. Vienna: R Foundation for Statistical Computing; 2022. https://www.R-project.org
37. van Buuren S, Groothuis-Oudshoorn K. mice: Multivariate imputation by chained equations in R. J Stat Softw. 2011;45(3):1–67.
38. Collins LM, Schafer JL, Kam C-M. A comparison of inclusive and restrictive strategies in modern missing data procedures. Psychol Methods. 2001;6(4):330.
39. van Buuren S. Imputation in practice. In: van Buuren S, editor. Flexible imputation of missing data. Boca Raton: CRC press; 2018.
40. Mickey RM, Greenland S. The impact of confounder selection criteria on effect estimation. Am J Epidemiol. 1989;129(1):125–37.
41. Maldonado G, Greenland S. Simulation study of confounder-selection strategies. Am J Epidemiol. 1993;138(11):923–36.
42. Heisig JP, Schaeffer M. Why you should always include a random slope for the lower-level variable involved in a cross-level interaction. Eur Sociol Rev. 2019;35(2):258–79.
43. van Ansem WJ, van Lenthe FJ, Schrijvers CT, Rodenburg G, van de Mheen D. Socio-economic inequalities in children's snack consumption and sugar-sweetened beverage consumption: the contribution of home environmental factors. Br J Nutr. 2014;112(3):467–76.
44. Han E, Powell LM. Consumption patterns of sugar-sweetened beverages in the United States. J Acad Nutr Diet. 2013;113(1):43–53.

45. Fernández-Alvira JM, Mouratidou T, Bammann K, Hebestreit A, Barba G, Sieri S, et al. Parental education and frequency of food consumption in European children: the IDEFICS study. Public Health Nutr. 2013;16(3):487–98.
46. Franse CB, Wang L, Constant F, Fries LR, Raat H. Factors associated with water consumption among children: a systematic review. Int J Behav Nutr Phys Act. 2019;16:64.
47. Shrewsbury VA, Foley BC, Flood VM, Bonnefin A, Hardy LL, Venchiarutti RL, et al. School-level socioeconomic status influences adolescents' health-related lifestyle behaviors and intentions. J Sch Health. 2018;88(8):583–9 (study. Public Health Nutr. 2013;16(3):487-98).
48. De Vries R: Meer dan helft van hoger opgeleiden woont in de stad. https://www.cbs.nl/nl-nl/achtergrond/2009/51/meer-dan-helft-van-hoger-opgeleiden-woont-in-de-stad (2009). Accessed 14 Sep 2022.
49. Centraal Bureau voor de Statistiek: Religie in Nederland. https://www.cbs.nl/nl-nl/longread/statistische-trends/2020/religie-in-nederland?onepage=true#c-1-Inleiding (2020). Accessed 8 June 2022.
50. Loketgezondleven.nl: Interventieoverzicht voortgezet onderwijs. https://interventies.loketgezondleven.nl/interventieoverzicht5/vo/aanbevolengoed?filter_11=1&op=Toon+overzicht. Accessed 10 Oct 2022.
51. Voedingscentrum. Zo kies je een gezonder aanbod. Den Haag: Productenlijst; 2020.
52. Veldhuis LM, Wolvers DF. Guidelines for healthier canteens, fact sheet. The Hague: Netherlands Nutrition Centre; 2017.
53. Park S, Sappenfield WM, Huang Y, Sherry B, Bensyl DM. The impact of the availability of school vending machines on eating behavior during lunch: the youth physical activity and nutrition survey. J Am Diet Assoc. 2010;110(10):1532–6.
54. Shi L. The association between the availability of sugar-sweetened beverage in school vending machines and its consumption among adolescents in California: a propensity score matching approach. J Environ Public Health. 2010;2010: 735613.
55. Craddock AL, McHugh A, Mont-Ferguson H, Grant L, Barrett JL, Wang C. Effect of school district policy change on consumption of sugar-sweetened beverages among high school students, Boston, Massachusetts, 2004–2006. Prev Chronic Dis. 2011;8(4):A74.
56. Rose G. Sick individuals and sick populations. Int J Epidemiol. 2001;30(3):427–32.
57. Watts AW, Miller J, Larson NI, Eisenberg ME, Story MT, Neumark-Sztainer D. Multicontextual correlates of adolescent sugar-sweetened beverage intake. Eat Behav. 2018;30:42–8.
58. Ortega-Avila AG, Papadaki A, Jago R. The role of the home environment in sugar-sweetened beverage intake among northern Mexican adolescents: a qualitative study. J Public Health. 2019;27(6):791–801.
59. Bogart LM, Elliott MN, Ober AJ, Klein DJ, Hawes-Dawson J, Cowgill BO, et al. Home sweet home: parent and home environmental factors in adolescent consumption of sugar-sweetened beverages. Acad Pediatr. 2017;17(5):529–36.
60. Briefel RR, Wilson A, Gleason PM. Consumption of low-nutrient, energy-dense foods and beverages at school, home, and other locations among school lunch participants and nonparticipants. J Am Diet Assoc. 2009;109(2):S79–90.
61. Kit BK, Fakhouri TH, Park S, Nielsen SJ, Ogden CL. Trends in sugar-sweetened beverage consumption among youth and adults in the United States: 1999–2010. Am J Clin Nutr. 2013;98(1):180–8.
62. Grimm P. Social desirability bias. In: Sheth JN, Malhotra NK, editors. Wiley international encyclopedia of marketing. Hoboken: John Wiley & Sons, Ltd; 2010.
63. Bärnighausen T, Tugwell P, Røttingen J-A, Shemilt I, Rockers P, Geldsetzer P, et al. Quasi-experimental study designs series—paper 4: uses and value. J Clin Epidemiol. 2017;89:21–9.
64. Rijksinstituut voor Volksgezondheid en Milieu: Data-aanvraag. https://monitorgezondheid.nl/data-aanvraag. Accessed 2 Sep 2022.
65. Centraal Bureau voor de Statistiek: Microdata: Conducting your own research. https://www.cbs.nl/en-gb/onze-diensten/customised-services-microdata/microdata-conducting-your-own-research. Accessed 10 Oct 2022.
66. Gezonde School: Contact Gezonde School. https://www.gezondeschool.nl/over-ons/contact-gezonde-school. Accessed 2 Sep 2022.