



Temporal trends of carbonated soft-drink consumption among adolescents aged 12-15 years from 18 countries from Africa, Asia, and the Americas

Smith, L., López Sánchez, G. F., Tully, M. A., Rahmati, M., Oh, H., Kostev, K., Butler, L. T., Barnett, Y., Keyes, H., Shin, J. I., & Koyanagi, A. (2024). Temporal trends of carbonated soft-drink consumption among adolescents aged 12-15 years from 18 countries from Africa, Asia, and the Americas. *British Journal of Nutrition*, 131(9), 1633-1640. Advance online publication. <https://doi.org/10.1017/S0007114524000059>

[Link to publication record in Ulster University Research Portal](#)

Published in:
British Journal of Nutrition

Publication Status:
Published online: 16/01/2024

DOI:
[10.1017/S0007114524000059](https://doi.org/10.1017/S0007114524000059)

Document Version
Author Accepted version

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1 **Title:** Temporal trends of carbonated soft-drink consumption among adolescents aged 12-15
2 years from 18 countries from Africa, Asia, and the Americas

3

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28 **Conflict of interest:** None.

29 **Funding:** Dr. Guillermo F. López Sánchez is funded by the European Union – Next Generation

30 EU.

31 **Acknowledgments:** This paper uses data from the Global School-Based Student Health Survey

32 (GSHS). GSHS is supported by the World Health Organization and the US Centers for Disease

33 Control and Prevention.

34 **ABSTRACT**

35 Carbonated soft-drink consumption is detrimental to multiple facets of adolescent health.
36 However, little is known about temporal trends in carbonated soft-drink consumption among
37 adolescents, particularly in non-Western countries. Therefore, we aimed to examine this trend in
38 representative samples of school-going adolescents from 18 countries in Africa, Asia, and the
39 Americas.

40 Cross-sectional data from the Global School-based Student Health Survey 2009-2017 were
41 analyzed. Carbonated soft-drink consumption referred to drinking carbonated soft-drinks at least
42 once per day in the past 30 days. The prevalence of carbonated soft-drink consumption was
43 calculated for each survey, and crude linear trends were assessed by linear regression models.
44 Data on 74,055 students aged 12-15 years were analyzed [mean (SD) age 13.9 (1.0) years; 49.2%
45 boys]. The overall mean prevalence of carbonated soft-drink consumption was 42.1%. Of the 18
46 countries included in the study, significant decreasing, increasing, and stable trends of
47 carbonated soft-drink consumption were observed in seven, two, and nine countries,
48 respectively. The most drastic decrease was observed in Kuwait between 2011 (74.4%) and 2015
49 (51.7%). Even in countries with significant decreasing trends, the decrease was rather modest,
50 while some countries with stable trends had very high prevalence across time (e.g., Suriname
51 80.5% in 2009 and 79.4% in 2016).

52 The prevalence of carbonated soft-drink consumption was high in all countries included in the
53 present analysis, despite decreasing trends being observed in some. Public health initiatives to
54 reduce the consumption of carbonated soft-drink consumption among adolescents are urgently
55 required.

56 **Key words:** Carbonated soft-drinks, Sugar-sweetened beverages, Temporal trends, Adolescents,
57 Multi-country, Epidemiology

58 **INTRODUCTION**

59 Sugar-sweetened beverages are the leading source of added sugars in Western diets (1), while
60 carbonated soft-drinks (e.g., Coke, Pepsi, Sprite, Fanta) are the major contributors of sugar from
61 all sugar-sweetened beverages (2,3). Euromonitor predicts that the global soft-drink market will
62 increase in size in the coming years, with most of the growth expected to occur in low- and
63 middle-income countries (LMICs). It has been forecasted that, in 2024, global sales volume and
64 revenue figures will be 5.0% and 16.1% greater, respectively, than what they were in 2019 (4).
65 Such an increase in carbonated soft-drinks sale is of a global public health concern, as
66 carbonated soft-drink consumption has been associated with a plethora of adverse health
67 outcomes, especially in young people (5). For example, several studies have shown that
68 consumption of soft-drinks with high sugar and acid content can contribute to increasing risk of
69 overweight, obesity, type 2 diabetes, suicidal behavior, dental caries, and dental erosion, among
70 children and adolescents (6–11).

71
72 It is essential to understand the prevalence and temporal trends of carbonated soft-drink
73 consumption among adolescents to aid in the establishment of policies that aim to reduce
74 carbonated soft-drink consumption. Adolescence is an important time to intervene as this is a
75 time when habits are formed that persist into adult life including healthy diets (12). However,
76 despite the known adverse health outcomes in relation to carbonated soft-drink consumption in
77 adolescents, there is limited literature on its temporal trends. In the US, for example, one study
78 using data from the 2011–2018 cycles of the California Health Interview Survey found that soda
79 consumption prevalence declined by 4.24% among adolescents (13). In another US study using
80 repeated cross-sectional data from National Health And Nutrition Examination Survey and

81 including 21,156 children and adolescents aged 2-19 years, it was observed that from 2003-2004
82 to 2017-2018, the prevalence of drinking any amount of sugar-sweetened beverages on a given
83 day declined significantly among all race and/or ethnicity groups (non-Hispanic (NH) White:
84 81.6 % to 72.7 %; NH Black: 83.2 % to 74.8 %, Hispanic: 86.9 % to 77.2 %) (14). In another
85 repeated cross-sectional study from Eastern Europe using data from 2002 to 2018 of the Health
86 Behaviour in School-Aged Children school-based study (n=325,184 adolescents aged 11-15
87 years), it was found that the prevalence of daily sugar-sweetened beverage consumption declined
88 in 10 out of 14 countries. The largest reductions were observed in Slovenia and the Russian
89 Federation (15). It is clear that further research is needed from other settings where no data on
90 trends exist (i.e., non-Western countries, LMICs). In particular, studying this trend in LMICs is
91 of importance as sales of carbonated soft-drink consumption are likely to rise at a rapid rate in
92 this setting owing to carbonated soft-drink companies targeting these regions (4).

93

94 Given this background, the aim of the present study was to examine the temporal trend of
95 carbonated soft-drink consumption in a sample of 74,055 students aged 12-15 years from 18
96 countries in Africa, Asia, and the Americas (predominantly LMICs), which were selected based
97 on data availability.

98

99 **METHODS**

100 *The survey*

101 Secondary data analysis of the Global School-based Student Health Survey (GSHS) was
102 conducted. Details on this survey can be found at [https://www.who.int/teams/noncommunicable-](https://www.who.int/teams/noncommunicable-diseases/surveillance/data)
103 [diseases/surveillance/data](https://www.who.int/teams/noncommunicable-diseases/surveillance/data) and <http://www.cdc.gov/gshs>. In brief, the GSHS was developed by

104 the WHO and the US Centers for Disease Control and Prevention (CDC), and other UN allies.
105 The primary objective of the survey was to identify risk factors of major non-communicable
106 diseases. The survey used a standardized two-stage probability sampling design to select students
107 within each country. For the first stage, schools were selected with probability proportional to
108 size sampling. The second stage consisted of the random selection of classrooms which included
109 students aged 13-15 years within each selected school. All students in the selected classrooms
110 were eligible to participate in the survey regardless of age. Thus, the survey was not restricted to
111 those aged 13-15 years. Data collection was done during one regular class period. The
112 questionnaire was translated into the local language and consisted of multiple-choice response
113 options. Students recorded their responses on computer scannable sheets. All GSHS surveys
114 were approved, in each country, by both a national government administration (most often the
115 Ministry of Health or Education) and an institutional review board or ethics committee. Student
116 privacy was protected through anonymous and voluntary participation, and informed consent
117 was obtained as appropriate from the students, parents and/or school officials. Data were
118 weighted for non-response and probability selection.

119
120 From all publicly available data, we chose all nationally representative datasets that included the
121 variables pertaining to our analysis, and for which comparable data on at least two waves were
122 available from the same country. Based on this inclusion criteria, a total of 18 countries were
123 included in the current study. The characteristics of each country including the region, survey
124 year, country income level, response rate, sample size, and demographics are provided in **Table**
125 **1**. The country income level was based on the World Bank classification at the time of the survey
126 (16). These countries were mainly LMICs and were from five WHO regions: African Region

127 (n=2), Region of the Americas (n=5), Eastern Mediterranean Region (n=5), South-East Asia
128 Region (n=1), and Western Pacific Region (n=5). The surveys included in the current study were
129 conducted between 2009 and 2017.

130

131 *Carbonated soft-drink consumption*

132 Consumption of carbonated soft-drinks was assessed with the question “During the past 30 days,
133 how many times per day did you usually drink carbonated soft-drinks?” Country-specific
134 examples of carbonated soft-drinks were provided, and the student was instructed not to include
135 diet soft-drinks. Response options included ‘I did not drink carbonated soft-drinks during the
136 past 30 days’, ‘less than 1 time per day’, ‘1 time per day’, ‘2 times per day’, ‘3 times per day’, ‘4
137 times per day’, and ‘5 or more times per day’. This variable was dichotomized as ≥ 1 time per day
138 or not (17).

139

140 *Statistical analysis*

141 Only those aged 12-15 years were included in the analysis as most students were within this age
142 group, while information on the exact age outside of this age range was not available (i.e., some
143 ages were provided only in aggregate (e.g., ≤ 11 years)). The prevalence and 95% confidence
144 intervals (95%CI) of carbonated soft-drink consumption was calculated for the overall sample
145 and sex-stratified samples for each survey. Crude linear trends in carbonated soft-drink
146 consumption were assessed by linear regression models across surveys within the same country
147 to estimate regression coefficients (beta) and 95%CI for every one-year change. P for trends
148 were estimated using the survey year as a continuous variable. We also conducted interaction
149 analysis to assess whether there are differing trends among boys and girls by including a product

150 term (survey year X sex) in the model. Sampling weights (that reflect population size of each
151 country) and the clustered sampling design of the surveys were taken into account in all analyses.
152 Statistical analyses were done with Stata 14.2 (Stata Corp LP, College station, Texas).

153

154 **RESULTS**

155 Data were available for a total of 109,347 students, but 34,506 students were deleted as they
156 were not within the age range of 12-15 years, and a further 786 students were omitted as data on
157 age was missing. Thus, 74,055 students aged 12-15 years were included in the final analysis. The
158 mean (SD) age was 13.9 (1.0) years and 49.2% were boys. The overall mean prevalence of
159 carbonated soft-drink consumption (i.e., at least once per day during past 30 days) was 42.1%
160 (once 20.5%, twice 11.4%, 3 times 5.0%, 4 times 1.7%, ≥ 5 times 3.5%). The prevalence of
161 carbonated soft-drink consumption ranged widely between countries with the lowest and the
162 highest being observed in Benin in 2009 (32.1%) and Suriname in 2009 (80.5%), respectively.
163 The trends in the prevalence of carbonated soft-drink consumption are shown in **Table 2** (overall
164 and by sex), **Figure 1** (overall), and **Figure 2** (by sex). Of the 18 countries included in the study,
165 based on the overall sample, significant decreasing trends of carbonated soft-drink consumption
166 were observed in seven countries, while increasing trends were found in two. No significant
167 decreasing or increasing trends were observed in the remaining nine countries in the overall
168 sample. Specifically, significant decreasing trends were found in Anguilla between 2009 (63.9%)
169 and 2016 (55.7%) ($\beta=-1.17$; 95% CI=-1.89,-0.46), Cook Islands between 2011 (60.5%) and
170 2015 (50.9%) ($\beta=-2.41$; 95% CI=-3.50,-1.31), Kuwait between 2011 (74.4%) and 2015
171 (51.7%) ($\beta=-5.66$; 95% CI=-7.73,-3.59), Lebanon between 2011 (59.2%) and 2017 (49.0%)
172 ($\beta=-1.70$; 95% CI=-2.70,-0.70), Morocco between 2010 (46.3%) and 2016 (34.1%) ($\beta=-$

173 2.02; 95%CI=-2.80,-1.25), Trinidad & Tobago between 2011 (73.9%) and 2017 (53.6%) (beta=-
174 3.38; 95%CI=-4.32,-2.45), and United Arab Emirates between 2010 (41.5%) and 2016 (33.3%)
175 (beta=-1.36; 95%CI=-2.38,-0.35). The beta can be interpreted as the average point change in
176 prevalence (%) per year. On the other hand, significant increasing trends were observed in Benin
177 between 2009 (32.1%) and 2016 (43.3%) (beta=1.60; 95%CI=0.63,2.56) and Samoa between
178 2011 (53.9%) and 2017 (61.6%) (beta=1.27; 95%CI=0.42,2.13). In terms of sex-differences, a
179 significant difference was only observed in Samoa. Specifically, a significant increasing trend
180 was only observed among girls in this settings, while the trend for boys was not significant.

181

182 **DISCUSSION**

183 *Main findings*

184 In the present study including nationally representative samples of 74,055 school-going
185 adolescents aged 12-15 years from 18 countries in Africa, Asia, and the Americas
186 (predominantly LMICs), the mean prevalence of carbonated soft-drink consumption was high
187 (i.e., 42.1%), and significant decreasing and increasing trends were observed in seven (Anguilla,
188 Cook Islands, Kuwait, Lebanon, Morocco, Trinidad & Tobago, United Arab Emirates) and two
189 (Benin, Samoa) countries, respectively. Kuwait experienced the largest decreasing trend [2011
190 (74.4%) and 2015 (51.7%)] and Benin the greatest increasing trend [2009 (32.1%) and 2016
191 (43.3%)]. The remaining countries showed stable trends. However, most countries with declining
192 trends still had high prevalence at the most recent survey because the rate of decline was modest
193 and/or due to very high prevalence in earlier years. Furthermore, in some countries with stable
194 trends, a very high prevalence was observed across multiple years (e.g., Suriname 80.5% in 2009

195 and 79.4% in 2016). Finally, significant sex-differences in the trends were observed only in
196 Samoa. Specifically, there was a significant increasing trend only among girls in this country.

197

198 *Interpretation of findings*

199 It is encouraging that decreasing trends in carbonated soft-drink consumption were observed in
200 seven countries with the greatest decrease observed in Kuwait. It may be hypothesized that this
201 decrease is owing to nation-wide initiatives; however, it is important to note that there are no
202 empirical studies in these countries to support this hypothesis. The Kuwait National Programme
203 for Healthy Living was developed in 2013 to predominantly address the high prevalence of
204 obesity in Kuwait. Among other initiatives, the programme introduced knowledge on the
205 pathophysiology of obesity into the school curriculum, and the harmful effects of physical
206 inactivity in conjunction with excessive caloric intake (e.g., carbonated soft-drinks) (18).

207 However, it is important to further highlight that despite the declining trend observed in Kuwait,
208 the prevalence was still high in the latest survey (51.7% in 2015). In 2020, Kuwait introduced a
209 50% excise tax on carbonated soft-drinks, which will hopefully contribute to a continuation of
210 declining trends of carbonated soft-drink consumption among adolescents in Kuwait (19).

211 Importantly, other countries that experienced declining trends also had implemented similar
212 initiatives to Kuwait (20). Importantly, other studies carried out in countries not included in the
213 present paper have also found declining trends, such as in the US and Eastern Europe (with the
214 greatest reductions observed in Slovenia, and the Russian Federation) (13–15). However, direct
215 comparisons in the rate of decline between these countries and those included in the present
216 study are not possible owing to differences in measures used and these measures pertaining to
217 different time periods.

218

219 While decreasing trends were observed in seven countries, increasing trends were observed in
220 two, with the largest increase observed in Benin, which was the only low-income country
221 included in our study. This is of concern as the global soft-drink market is projected to increase
222 in size in the coming years, with most of the growth expected to occur in LMICs and thus
223 potentially further increasing such trends (4). This may be owing to the westernization of diets in
224 LMICs (21). Such increasing trends may also be driven by carbonated soft-drink organizations
225 engaging in powerful and aggressive marketing and advertising that target adolescents (22). For
226 example, in 2015, Coca-Cola launched a pan-African television advertisement called ‘Billion
227 Reasons to Believe’, which aimed to capture the spirit of optimism and perseverance embodied
228 by African youth (23). Moreover, in the African continent, Coca-Cola franchises its bottlers and
229 is thus considered to be a “local brand”, which likely further entices adolescents to consume the
230 product (24). Indeed, this trend continues in Benin with a new bottling partner announced in
231 2022 and receiving US\$30 million in investment (25). Samoa also observed increasing trends in
232 carbonated soft-drink consumption among adolescents. It is likely, although speculative, that this
233 increase is owing to similar reasons as observed in Benin.

234

235 It is important to highlight that sex-differences in trends of carbonated soft-drink consumption
236 was observed in Samoa. Specifically, significant increasing trends were only found in females in
237 this country. The reasons behind sex-specific trends in Samoa are elusive and further research of
238 a qualitative nature is required to shed light on potential mechanisms. However, it may be that in
239 this setting, marketing tactics by carbonated soft-drink organizations may be more targeted
240 towards girls than boys. For example, sponsorship of female sports teams such as the female

241 FIFA/ Coca-Cola football league, for which Samoa participates in, may partially explain an
242 increase in consumption among girls compared to boys (26).

243

244 ***Policy implications***

245 Despite decreasing trends observed in seven countries, the prevalence of carbonated soft-drink
246 consumption remained high in all the countries included in our study. It is thus prudent to
247 introduce nation-wide policy and intervention to combat such a high prevalence. An example of
248 a successful policy likely includes excise tax on carbonated soft-drinks. Evidence of the
249 effectiveness of excise taxes on such drinks is growing fast, with reductions on frequency of
250 consumption being observed in Philadelphia and low-income areas of Berkley, and decreased
251 sales in Mexico, Barbados, and Chile (27–31). Indeed, a recent systematic review of real-word
252 studies concluded that excise taxes on sugar sweetened beverages are effective in reducing their
253 purchases and dietary intake, suggesting a greater effect for volumetric taxes with sugar
254 thresholds (32). However, it is important to note that there is a lack of studies on this topic
255 focusing on adolescents and future research to understand the impact of excise tax on soft-drink
256 purchasing among this population is now required. Moreover, school-based policies may also be
257 effective that focus on the education of the impact of unhealthy diets on health (33). For
258 example, in a recent systematic review, evidence suggests that school-based education
259 programmes focusing on reducing sugar sweetened beverage consumption, but including follow-
260 up modules, offer opportunities for implementing effective, sustainable interventions. Peer
261 support and changing the school environment (e.g., providing water or replacement drinks) to
262 support educational programmes were found to improve their effectiveness. Home delivery of
263 more suitable drinks also had an important impact on reducing consumption (34).

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Strengths and limitations

The analysis using large representative samples of school-going adolescents from 18 countries in Africa, Asia, and the Americas, and the presentation of data from countries where no data on trends of carbonated soft-drink consumption previously existed are clear strengths of the study. However, findings must be interpreted considering the study’s limitations. First, carbonated soft-drink consumption was self-reported, potentially introducing some level of bias (e.g., recall bias) into the findings. Second, our study results are only generalizable to school-going adolescents. Third, the question on carbonated soft-drink consumption used in our study was based on frequency per day rather than the volume of carbonated soft-drink consumed. Thus, our measure can only be considered a proxy of daily volume of carbonated soft-drinks consumed and its associated sugar intake. Furthermore, there were only two data points for each country, and thus, a clear temporal trend was difficult to establish. Future studies on this topic should consider including more data points. In addition, seasonal factors could have also influenced carbonated soft-drink consumption. For example, it is possible for students to consume more carbonated soft-drinks in summer, but there was no data on the season or month in which the survey was conducted. Finally, given that the survey years differed between countries, results should be interpreted together with the years in which the surveys were conducted especially when comparing between countries, since the beta-coefficient could be representing estimates from different periods.

287 **Conclusion**

288 Among school-going adolescents aged 12-15 years from 18 countries, trends in carbonated soft-
289 drink consumption declined in more countries than increased. However, regardless of the
290 direction of trends, the prevalence of carbonated soft-drink consumption was overwhelmingly
291 high in all countries included in the present study. With sales of carbonated soft-drinks
292 increasing via aggressive marketing campaigns by carbonated soft-drink organizations, public
293 health initiatives to reduce the consumption of such products among adolescents are urgently
294 required.

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Table 1 Survey characteristics

Country	Region	Year	Country income level	Response rate (%)	N	Boys (%)	Mean (SD) age (years)
Anguilla	AMR	2009	NA	84	701	49.5	13.7 (1.1)
		2016	NA	88	564	50.3	14.0 (0.8)
Benin	AFR	2009	L	90	1,170	66.1	14.2 (0.9)
		2016	L	78	717	65.6	14.2 (0.9)
Cook Islands	WPR	2011	NA	84	849	52.6	13.7 (1.0)
		2015	NA	65	366	48.7	14.2 (0.7)
Guatemala	AMR	2009	LM	81	4,495	52.2	13.9 (0.9)
		2015	LM	82	3,611	50.9	13.9 (0.9)
Jamaica	AMR	2010	UM	72	1,204	49.7	14.3 (0.8)
		2017	UM	60	1,061	47.9	14.2 (0.8)
Kuwait	EMR	2011	H	85	2,298	51.3	14.1 (0.8)
		2015	H	78	2,034	49.4	14.1 (0.9)
Lebanon	EMR	2011	UM	87	1,982	46.6	13.7 (1.0)
		2017	UM	82	3,347	47.4	13.6 (1.0)
Maldives	SEAR	2009	LM	80	1,981	47.9	14.4 (0.7)
		2014	UM	60	1,781	49.3	14.4 (0.7)
Mauritius	AFR	2011	UM	82	2,074	49.2	13.8 (1.0)
		2017	UM	84	1,955	45.8	13.9 (0.8)
Morocco	EMR	2010	LM	92	2,405	52.9	13.7 (1.0)
		2016	LM	91	3,975	50.9	13.6 (1.1)
Oman	EMR	2010	H	89	1,000	48.0	14.3 (0.7)
		2015	H	92	1,669	47.1	14.2 (0.8)
Philippines	WPR	2011	LM	82	3,845	48.5	13.9 (1.0)
		2015	LM	79	6,162	48.1	13.9 (0.9)
Samoa	WPR	2011	LM	79	2,200	47.4	14.0 (0.8)
		2017	LM	59	1,058	46.4	13.8 (1.0)
Suriname	AMR	2009	UM	89	1,046	45.4	14.0 (1.0)
		2016	UM	83	1,453	46.1	13.8 (1.0)
Tonga	WPR	2010	LM	80	1,946	50.3	14.1 (0.9)
		2017	UM	90	2,067	51.4	13.6 (1.1)
Trinidad & Tobago	AMR	2011	H	90	2,363	49.5	13.6 (1.1)
		2017	H	89	2,763	48.3	13.6 (1.1)
United Arab Emirates	EMR	2010	H	91	2,302	39.9	14.0 (0.9)
		2016	H	80	3,471	48.1	13.9 (1.0)
Vanuatu	WPR	2011	LM	72	852	49.5	13.5 (1.0)
		2016	LM	57	1,288	47.8	14.1 (0.9)

Abbreviation: SD Standard deviation; AFR African Region; AMR Region of the Americas; EMR Eastern Mediterranean Region; SEAR South-East Asia Region; WPR Western Pacific Region; H High income; L Low income; LM Lower middle income; UM Upper middle income. Country income level was not available for Anguilla and Cook Islands.

Table 2 Trends in prevalence of carbonated soft-drink consumption (%) in 18 countries (overall and by sex)

Country	Year	Overall				Boys				Girls			
		%	[95%CI]	beta	[95%CI]	%	[95%CI]	beta	[95%CI]	%	[95%CI]	beta	[95%CI]
Anguilla	2009	63.9	[63.9,63.9]	-1.17**	[-1.89,-0.46]	64.7	[64.7,64.7]	-1.34**	[-2.27,-0.40]	62.9	[62.9,62.9]	-0.99	[-1.99,0.00]
	2016	55.7	[50.8,60.4]			55.3	[48.9,61.5]			55.9	[49.1,62.6]		
Benin	2009	32.1	[28.5,35.9]	1.60**	[0.63,2.56]	28.0	[24.0,32.4]	1.95**	[0.69,3.20]	40.0	[34.8,45.4]	0.90	[-0.34,2.15]
	2016	43.3	[38.0,48.7]			41.6	[34.5,49.2]			46.4	[39.9,52.9]		
Cook Islands	2011	60.5	[60.5,60.5]	-2.41***	[-3.50,-1.31]	58.9	[58.9,58.9]	-1.16	[-3.05,0.73]	62.2	[62.2,62.2]	-3.47***	[-4.76,-2.17]
	2015	50.9	[46.6,55.1]			54.3	[46.9,61.5]			48.4	[43.4,53.4]		
Guatemala	2009	54.6	[50.1,59.0]	1.03	[-0.11,2.17]	55.2	[50.0,60.3]	1.43*	[0.18,2.68]	53.4	[48.3,58.5]	0.82	[-0.55,2.18]
	2015	60.8	[55.6,65.7]			63.8	[58.3,68.9]			58.3	[52.0,64.4]		
Jamaica	2010	72.3	[68.1,76.0]	-0.35	[-1.23,0.54]	74.2	[70.5,77.6]	-0.06	[-1.03,0.91]	70.9	[62.9,77.7]	-0.61	[-2.00,0.77]
	2017	69.8	[65.2,74.1]			73.8	[67.9,78.9]			66.6	[60.7,71.9]		
Kuwait	2011	74.4	[71.4,77.2]	-5.66***	[-7.73,-3.59]	75.2	[70.9,78.9]	-5.28***	[-7.95,-2.60]	73.4	[68.8,77.5]	-6.01***	[-8.26,-3.75]
	2015	51.7	[44.3,59.1]			54.0	[44.6,63.2]			49.4	[42.0,56.7]		
Lebanon	2011	59.2	[54.4,63.9]	-1.70**	[-2.70,-0.70]	63.7	[58.8,68.3]	-1.55**	[-2.59,-0.50]	55.2	[49.7,60.6]	-1.84**	[-2.98,-0.71]
	2017	49.0	[45.7,52.4]			54.4	[50.6,58.2]			44.2	[40.5,47.9]		
Maldives	2009	32.8	[29.3,36.5]	0.10	[-0.83,1.04]	35.8	[31.5,40.4]	0.13	[-1.17,1.43]	30.0	[26.1,34.1]	-0.02	[-1.05,1.01]
	2014	33.3	[30.5,36.3]			36.4	[31.9,41.2]			29.8	[26.7,33.2]		
Mauritius	2011	39.5	[36.8,42.3]	0.72	[-0.03,1.48]	43.1	[37.8,48.6]	-0.13	[-1.45,1.19]	35.9	[31.7,40.4]	1.53*	[0.10,2.96]
	2017	43.9	[40.6,47.2]			42.4	[37.2,47.7]			45.1	[38.3,52.2]		
Morocco	2010	46.3	[42.3,50.3]	-2.02***	[-2.80,-1.25]	43.1	[37.9,48.6]	-1.63**	[-2.68,-0.58]	50.0	[46.1,53.8]	-2.58***	[-3.38,-1.79]
	2016	34.1	[32.0,36.3]			33.4	[30.4,36.4]			34.4	[32.0,37.0]		
Oman	2010	49.2	[44.0,54.4]	-1.03	[-2.39,0.33]	56.1	[47.6,64.3]	-1.38	[-3.37,0.60]	43.5	[38.5,48.7]	-0.80	[-2.24,0.65]
	2015	44.0	[40.0,48.2]			49.2	[44.5,54.0]			39.5	[34.8,44.5]		
Philippines	2011	42.4	[38.4,46.5]	-1.14	[-2.41,0.13]	42.4	[36.0,49.2]	-0.80	[-2.64,1.04]	42.4	[39.5,45.3]	-1.45*	[-2.69,-0.21]
	2015	37.9	[35.0,40.8]			39.2	[36.3,42.2]			36.6	[32.7,40.6]		
Samoa ^a	2011	53.9	[51.4,56.5]	1.27**	[0.42,2.13]	55.1	[51.3,58.9]	0.64	[-0.49,1.77]	52.7	[49.1,56.2]	1.82***	[0.86,2.77]
	2017	61.6	[57.1,65.8]			58.9	[53.4,64.3]			63.6	[59.2,67.8]		
Suriname	2009	80.5	[77.9,82.8]	-0.15	[-0.67,0.36]	80.7	[77.0,83.9]	-0.18	[-0.87,0.52]	80.2	[76.4,83.5]	-0.13	[-0.80,0.54]
	2016	79.4	[76.9,81.7]			79.5	[76.2,82.4]			79.2	[76.4,81.8]		
Tonga	2010	57.3	[54.7,59.8]	0.50	[-0.00,1.00]	56.5	[52.5,60.5]	0.34	[-0.42,1.09]	57.9	[54.7,61.2]	0.70*	[0.05,1.35]
	2017	60.7	[58.3,63.1]			58.9	[55.5,62.2]			62.8	[59.7,65.9]		
Trinidad & Tobago	2011	73.9	[69.8,77.6]	-3.38***	[-4.32,-2.45]	70.8	[64.9,76.2]	-2.67***	[-3.94,-1.41]	76.9	[71.9,81.3]	-4.08***	[-5.34,-2.81]
	2017	53.6	[49.7,57.5]			54.8	[49.9,59.7]			52.5	[46.6,58.3]		
United Arab Emirates	2010	41.5	[37.8,45.3]	-1.36**	[-2.38,-0.35]	49.2	[43.8,54.6]	-1.89**	[-3.08,-0.69]	36.4	[32.7,40.3]	-1.23*	[-2.44,-0.01]
	2016	33.3	[28.9,38.1]			37.9	[33.5,42.4]			29.1	[23.4,35.5]		
Vanuatu	2011	39.8	[32.6,47.6]	0.27	[-1.45,1.99]	40.2	[32.3,48.8]	0.58	[-1.47,2.63]	39.1	[32.0,46.6]	0.00	[-1.75,1.74]
	2016	41.2	[37.5,44.9]			43.1	[37.7,48.8]			39.0	[34.8,43.5]		

Abbreviation: CI Confidence interval.

Carbonated soft-drink consumption referred to drinking carbonated soft-drinks at least once per day in the past 30 days.

The beta are based on linear regression including survey year as a continuous variable. The beta can be interpreted as the average percentage point change in prevalence per year.

* P for trend<0.05, ** P for trend <0.01, *** P for trend <0.001

^a Significant interaction by sex (P<0.05)

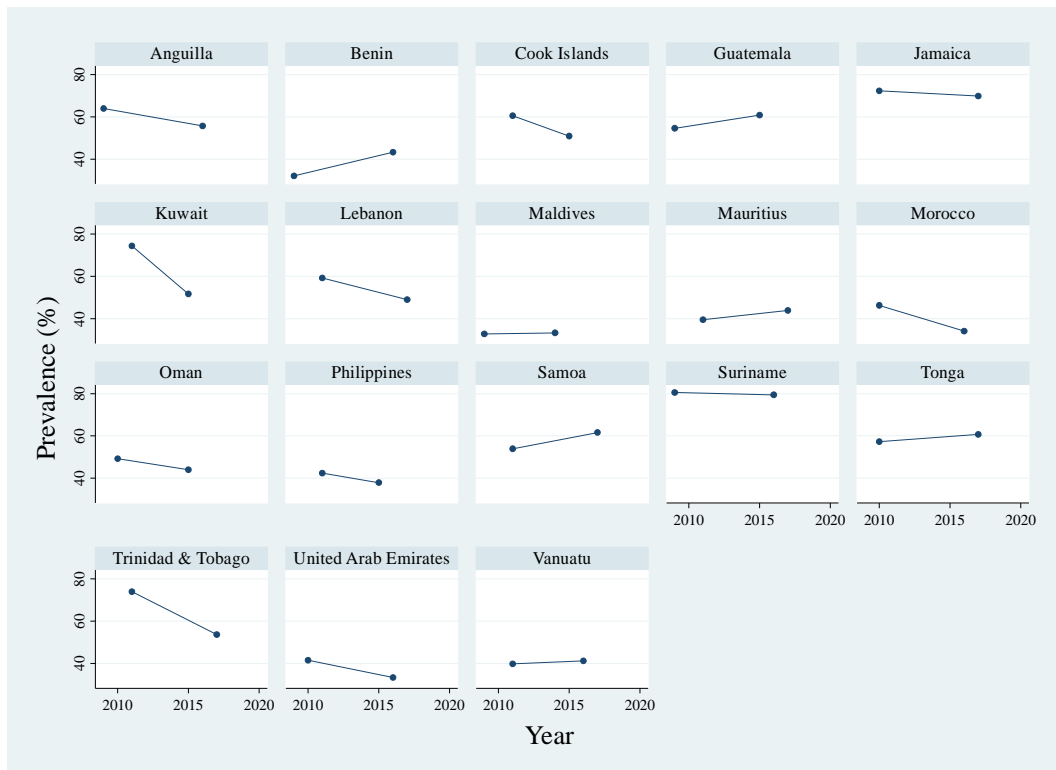


Figure 1 Prevalence of carbonated soft-drink consumption (%) across years by country (overall sample including both boys and girls)
 Carbonated soft-drink consumption referred to drinking carbonated soft-drinks at least once per day in the past 30 days.

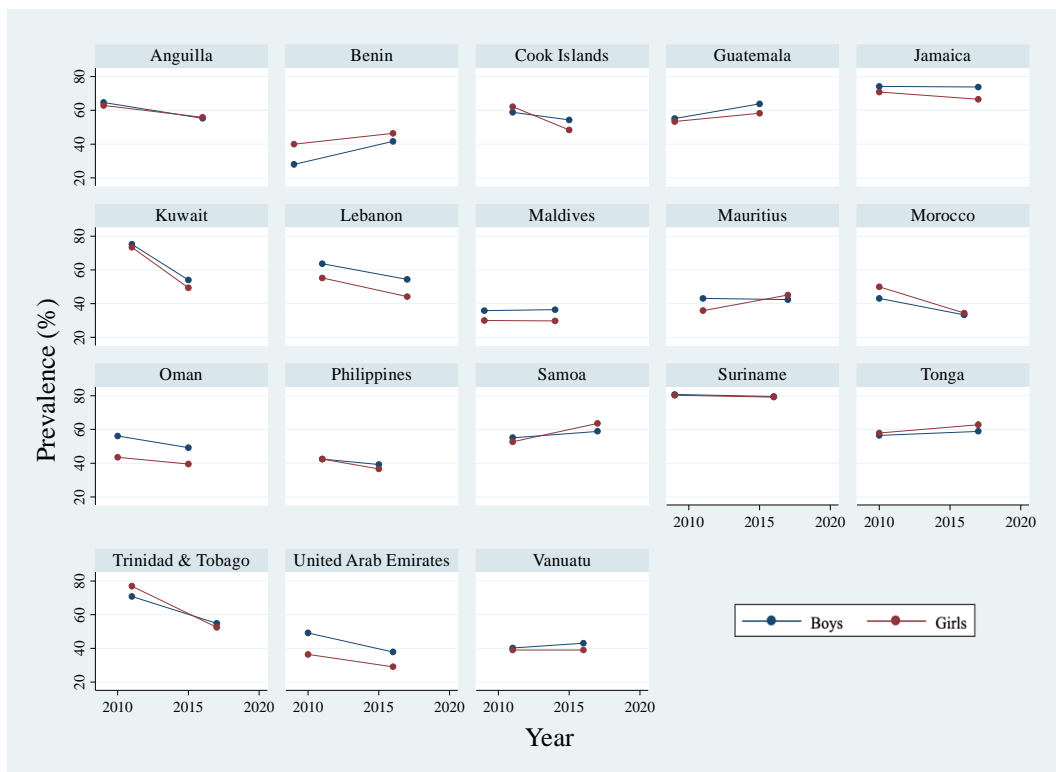


Figure 2 Prevalence of carbonated soft-drink consumption (%) across years by sex and country
 Carbonated soft-drink consumption referred to drinking carbonated soft-drinks at least once per day in the past 30 days.