Sugar-Sweetened Beverage Consumption and Taxation

Consumption of sugar-sweetened beverages (SSBs) is rising rapidly, especially in urban areas in low- and middle-income countries (LMICs). Often this change can be observed as part of the nutrition transition, which is particularly pronounced in urban areas in LMICs. The nutrition transition describes a shift from more traditional diets rich in unprocessed cereals, starchy staples and fibre to an increased consumption of processed foods with often higher shares of sugar, salt and fat, including SSBs. SSB consumption increases the risk for overweight and obesity, which are linked to a variety of non-communicable diseases (NCDs), including diabetes, cardiovascular diseases and certain types of cancer. One policy tool targeted at lessening the consumption of SSBs is a SSB tax, which increases the price of sugary drinks in a given area, which could be a single city, states or a country. Evidence on the effectiveness of this tax in changing consumption patterns is encouraging and experiences on the implementation of the tax can be used to inform policy makers.

Sugar-sweetened beverages (SSBs) are beverages that are sweetened with all types of sugar including syrups, honey and other caloric sweeteners. These drinks include, among others, carbonates, fruit drinks, sports drinks, energy drinks, flavoured water or milk, and coffee and tea beverages that contain free sugars. Other terms often used to refer to SSBs are soft drinks and sodas (1,2).

Global consumption of sugar-sweetened beverages

SSBs are widely available and are consumed across all parts of the world. The soft drinks industry is growing and average SSB consumption continues to increase (3,4). While sales and consumption have stabilised or are even declining in high-income countries (HICs), sales and consumption of SSBs in LMICs have increased rapidly over the last 20 years and continue to do so (3,5). SSB consumption (grams per day) globally is 26% higher in urban areas than in rural areas (6). In sub-Saharan Africa, urban intake is more than twice as high as rural intake (6).

gain Global Alliance for Improved Nutrition

This trend of increasing consumption is driven on one hand by a growth in consumer income in these countries (7): higher income is related to relatively lower price elasticity[1] for SSBs. This means that as income of consumers increases, responsiveness to price changes decreases and more money is spent on non-essential food items, such as SSBs (5,7,8). On the other hand, some of the largest SSB producers, such as Coca-Cola and PepsiCo, use advertising to ensure continued popularity of their products (9,10). Globally, in 2018, Coca-Cola had the highest advertising budget of all SSB manufacturers, spending USD 4.1 billion (11, p5). PepsiCo had the second largest advertising budget, spending USD 2.6 billion (12, p88).

At the same time, SSBs are also rapidly becoming more available and affordable in most LMICs (Figure 1). They are sold in many locations, including by street vendors (5). A global comparison of 2016 data on the average price of SSBs and bottled drinking water demonstrated that SSBs are generally cheaper (7). The low price, wide availability and large-scale marketing make SSBs easily accessible to consumers and often preferred over healthier substitutes such as water (5). Reasons for this are the lack of access to clean drinking water, a preference for the taste, perceived safety of SSBs compared to tap water and in some cases a lack of knowledge on the negative health consequences of SSBs (13,14). In LMICs, especially for low-income populations such as people living in urban informal settlements, access to clean water is highly inadequate (15). With the widespread fear of contamination of tap water, limited access to water for some, or cheap and possibly unsafe bottled water, people often consider SSB to be a safer option (16). To make water a viable substitute for SSBs, work needs to be done to improve access to clean drinking water and promote its consumption over that of caloric beverages, hence altering the negative impact of SSBs on health (14,17).

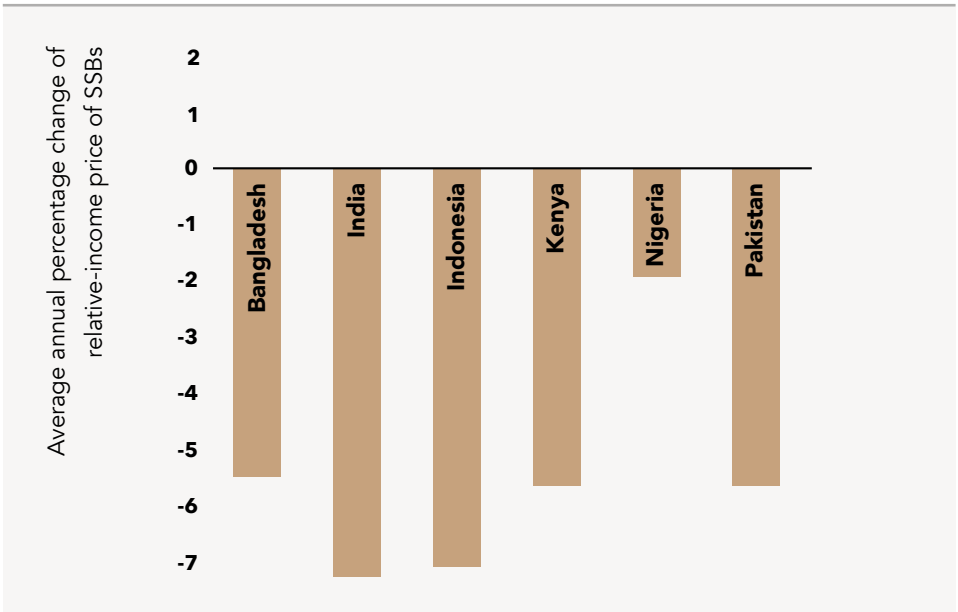

Figure 1: The average annual percentage change in relative-income price[2] (in USD) of sugar-sweetened beverages from 1990 to 2016. Selection based on available data for GAIN countries, modified from (7)

1. ***Price Elasticity*** *is the responsiveness of the consumption of a good to a change in price, where high elasticity implies that demand is very responsive to price change (74).* ***Negative price elasticity*** *means that an increase in prices lead to a decrease in purchases, which is generally assumed for SSBs (2).*

2. *The* ***relative-income price*** *combines the change in real price with the change in consumer income. SSBs become more affordable when either they become cheaper, consumer income increases, or when both happen simultaneously.*

The relationship between the consumption of sugar-sweetened beverages and nutrition and health

Consumption of SSBs does not contribute to a healthy diet in any way, mainly due to the large amounts of sugar the drinks contain (5). On average a can of soda (355 ml) contains 10 to 13 teaspoons, or around 40 grams, of free sugars. Recommendations by the United Nations Children's Fund (UNICEF) state that children between the age of 2 and 18 should consume less than 25 grams of added sugars per day, while children under age 2 should not consume any additional sugars at all (1). However, globally as much as 44% of all school-age children drink SSBs on a daily basis (1,5). For adults with a recommended average energy intake of about 2000 kcal per day, drinking one can (355 ml) makes up for approximately 5% of the total recommended energy intake, without adding any nutritional value. Most people do usually not compensate their intake of SSBs by eating less or healthier (18). The energy added through regular consumption of SSBs therefore most likely contributes to higher energy consumption than needed (5,19).

Free and added sugars

Free sugars are all mono- and disaccharides added to foods by the manufacturer, cook or consumer, plus the sugars that are naturally present in honey, syrups and non-intact (e.g. juiced or pureed) fruits and vegetables (20–22). Added sugars is a sub-category of free sugars and refers to any type of sugar used as an ingredient in processed/prepared foods and sugars eaten separately or added to food at the table (21,22). In contrast to free sugars, it excludes naturally occurring sugars in non-intact fruits or vegetables, honey and syrups (21,22). Both free and added sugars exclude the naturally occurring sugars in dairy products and intact fruits and vegetables (21).

Many studies have examined the relationship between the consumption of SSBs and overweight, obesity and NCDs. There is mounting evidence that confirms a significant correlation between increased or decreased SSB intake and weight gain or loss respectively, both for adults and children (3,23–25). Weight gain can lead to overweight and obesity, which are demonstrated to increase the risk of a wide array of NCDs, such as diabetes, cardiovascular diseases and certain types of cancer. A high consumption of SSBs can thus indirectly increase the risks for NCDs (26). In addition to the indirect association between SSB consumption and NCDs through overweight and obesity, a direct and positive relation between regular SSB consumption and incidences of diabetes[3] is found for adults (25,27). Furthermore, regular SSB consumption is also linked to dental caries and other NCDs such as cardiovascular diseases (24,25,28).

While overweight, obesity and diabetes rates continue to increase globally, the majority of the burden of these health issues falls on LMICs (3,26). Regions that are primarily made up of LMICs, such as South-East Asia, the Middle East and North Africa, have a disproportionally high prevalence of diabetes in the adult population compared to the global average (29). Average annual growth rates for overweight are much higher in LMICs than in high-income countries. If current trends continue, overweight and obesity will rapidly affect increasingly large shares of the population in these countries (Figure 2) (30).

3. *In this factsheet we refer to* ***Type 2 Diabetes (T2D)*** *unless indicated otherwise. T2D makes up 90% of all diabetes cases worldwide. Risk factors include but are not limited to obesity, physical inactivity and poor diets (75).*

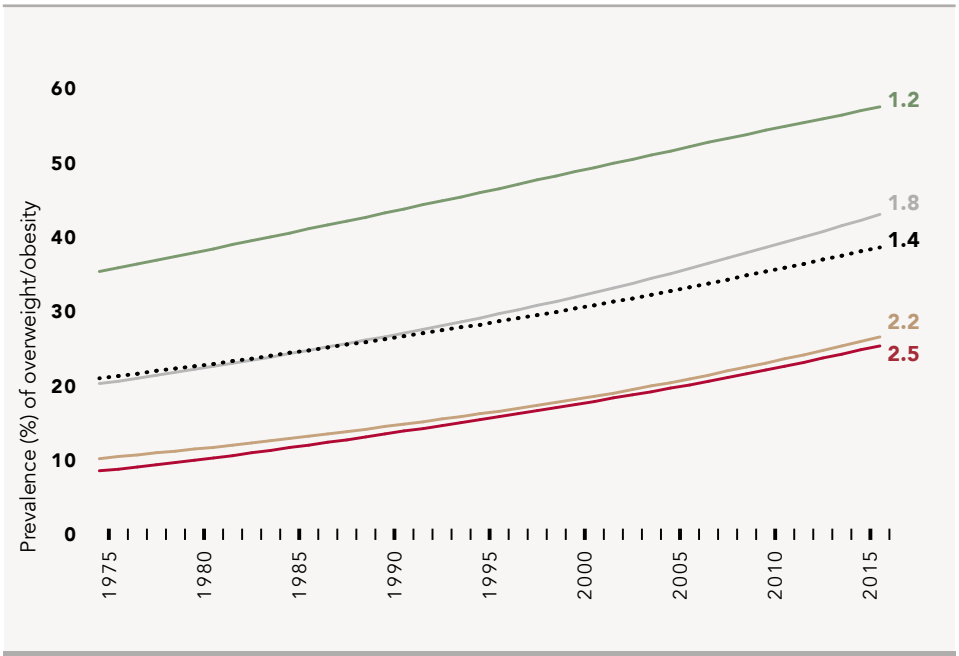

Figure 2: Prevalence (%) of overweight (BMI ≥ 25 kg/m^2) among adults per country income group[4] (age-standardized estimate). Modified from (30).

4. *The country income groups follow the World Bank income groups.*

Nutrition and health outcomes in urban areas in LMICs

While the incidence of nutrition and health problems that correlate with SSB consumption, such as overweight, obesity and diabetes, vary between countries and regions, they are generally more common in urban areas than in rural areas. About 80% of people with diabetes live in LMICs and two out of three people with diabetes reside in urban areas (29). Similarly, overweight is also more common in urban areas than in rural areas (31). One potential explanatory factor is the ongoing nutrition transition in many LMICs, a shift of diets rich in unprocessed cereals, starchy staples and fibre to a diet with often increased consumption of processed foods and higher shares of sugar, salt and fat (32). This transition is particularly pronounced in urban areas and consumption of more sugar in the form of SSBs is commonly seen (33,34).

Another factor driving the consumption of unhealthy foods is advertising in the public space in urban areas, which has over the years developed from simple 2D advertisement to more innovative methods, such as store branding and use of a variety of visuals (35). In Soweto, South-Africa, SSB advertisements were common as part of a shop name and often located close to schools (36). In Accra, Ghana, 73% of the outdoor beverage advertisements displayed SSBs, and 60% of the advertisements were owned by Coca-Cola (37). A study in Louisiana and Los Angeles, both U.S.A., demonstrated that for adults there is a positive relationship between prevalence of overweight and the presence of outdoor advertising of food and non-alcoholic beverages, displaying primarily drinks and snacks but rarely fruits and vegetables (38). Meta-analyses have also shown that children are particularly vulnerable to the effects of marketing. During or shortly after exposure to advertising of unhealthy food and beverages, their food intake increases and there is a stronger preference for unhealthy foods (39,40). Overall, it is therefore likely that children are disproportionally strongly affected by urban marketing of SSBs.

How sugar-sweetened beverage taxes work

In response to adverse nutrition and health outcomes of increasing consumption of SSBs, close to 50 jurisdictions including municipalities, provinces, regions and countries, have introduced SSB taxes (Figure 3). The revenue collected from such taxes can be allocated towards health programmes, prevention efforts (41) or to other government initiatives. Various cases show how the revenue collected has supported health and prevention efforts, while earmarking revenue for health spending has been found to increase both public and political support for implementation of these taxes (42). For example, at the city level, in Philadelphia, the annual amount of tax revenue collected is over USD 70 million, which is used to fund community schools, pre-kindergartens, improvements to parks, recreation centres and libraries (43,44). USD 5 million of revenue collected from Seattle's SSB tax has been reallocated as Covid-19 emergency funds. It will be used to provide food vouchers to low-income individuals and families that are facing food insecurity due to Covid-19 (45). In Mexico, it was estimated that over the first two years after the tax was implemented the revenue generated was USD 2.6 billion. Part of these funds were used to install water fountains in schools across Mexico, to provide children with easy access to a healthy substitute (46).

What is a sugar-sweetened beverage tax?

A SSB tax is designed to reduce the purchase, and therefore consumption, of drinks with added sugar. Based on the assumption of a negative price elasticity of SSBs, an increase in price is expected to lead to reduced consumption, which should lead to positive health and nutrition impacts (2). The drinks which are taxed differ – e.g. some include fruit juices or sweetened milk, whereas others do not. The selection of taxed drinks might therefore include a more narrow or wider range of drinks than the definition of a SSB as given above (41). Depending on the criteria that are set to tax beverages, the tax can also be an incentive for businesses to reformulate their products by lowering the amount of sugar in their drinks (2,5,41).

The intended outcomes of SSB taxes, based on (2).

The World Health Organization (WHO) has included the SSB tax in its Menu of Policy Options recommended in its Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020 (48). The WHO recommends raising the prices of SSBs by at least 20% to ensure reduced consumption (5). Most often excise taxes are used as the design for SSB taxes, where the tax that is imposed is passed onto consumers through the price of the product. There are two types of excise taxes, a specific excise tax and an ad-valorem excise tax (Table 1). The specific excise tax is most commonly used and believed to have the highest chance of success of effective implementation because of

Americas:
Dominica
Barbados
Bermuda
Chile
Mexico
Panama
Peru
U.S.A. (8 local)

Europe:
Belgium
Finland
France
Hungary
Ireland
Latvia
Morocco
Norway
Portugal
Spain (Catalonia)
St Helena
U.K.

Africa, Eastern Mediterranean and Southeast Asia:
Bahrain
India
Malaysia
Maldives
Mauritius
Oman
Saudi Arabia
Seychelles
South Africa
Sri Lanka
Thailand
Qatar
U.A.E.

Western Pacific:
Brunei
Cook Islands
Fiji
French Polynesia
Kiribati
Nauru
Palau
Philippines
Samoa
Tonga
Vanuatu

Figure 3: Countries that have implemented sugar-sweetened beverage taxes. Modified from (47).

its easy administration which also allows governance systems with lower levels of resourcing to implement it. (2,5). In practice the taxes differ by jurisdiction and in most cases stay below the recommended 20% of the total price (47). A meta-analysis identified that local context and the design of the tax can affect its efficacy (49). An important factor for successful implementation of SSB taxes is the sufficient capacity of a country's fiscal regulatory body to ensure compliance. However, more research is needed to better understand the impact of tax design and local context (49).

Table 1 : Types of excise taxes explained.

Type of excise tax	Specific excise tax	Ad-valorem excise tax
Definition	Levied on the basis of the product size or amount	Levied as a percentage of the product value
+ Advantages – Disadvantages	+ The same amount of price increase for all products in the same category, reducing the chance to switch to cheaper alternatives + Stable revenue stream + Easy to administer – Needs to be adjusted for inflation and population income growth	+ Automatically adjusts for inflation – Prices of expensive products increase more, this increases the chance that people switch to cheaper alternatives – Less stable revenue stream, as it depends on the price of the product rather than the quantity, which can be adjusted by the manufacturer
Examples of jurisdictions using this type of excise tax	Seattle and Philadelphia (USA), Mexico, Hungary, France, Malaysia, South Africa, Morocco	Chile, Peru, India, many small island states e.g. Bermuda, Nauru

Modified from (2,5,47,50)

SSB taxes in cities and the role of city governments

To date most SSB taxes have been introduced at national level, apart from several cities[5] in the United States, which have introduced SSB taxes within their city's jurisdiction and been able to reinvest such revenue into local programmes. Whether a city is able to introduce a SSB tax depends on national legislation, which determines which authority cities have in the area of fiscal policies (51). Regardless of whether they can implement a SSB tax, as rates of consumption of SSBs are higher in urban areas, city governments can be actively involved in the debate on this matter. The three largest cities in the Netherlands publicly lobbied for a national SSB tax. They argued that without its implementation, their city's efforts in programming on prevention would lose their effectiveness (52,53). If a city does not have the authority to introduce an SSB tax, it can take alternative measures to discourage the consumption of SSBs. For example, San Francisco does not allow the purchase of SSBs with city funds and prevents their sale and distribution under contracts and grants the city is part of (54).

Most studies demonstrated a positive and significant effect of SSB taxes on SSB sales and consumption within the city's jurisdiction, with only a few results being statistically insignificant (55–58). However, a challenge is cross-border shopping, where people purchase SSBs in a neighbouring jurisdiction without a SSB tax. Research in Berkeley and Philadelphia has uncovered some evidence for cross-border shopping, but it does not cancel out the full reduction of sales of SSBs in a jurisdiction where a SSB tax is implemented (1,59,60).

5. *The cities in the United States that have a SSB tax are: Seattle, San Francisco, Albany, Berkeley, Oakland, Boulder and Philadelphia (47)*

Price changes of SSBs after implementation of a SSB tax

With the implementation of a SSB tax, ideally the price increase in its totality is passed onto the consumer, assuming that the producer does not lower the original price of the product. Thereby, it increases the price of SSBs at points of purchase. In Barbados, the price growth of untaxed and taxed drinks followed the same pattern before the introduction of the tax. With the implementation of the tax, the price growth of the two different categories of drinks diverged. Half a year after the tax was introduced, overall prices of SSBs increased by 5.9%, whereas the price of untaxed drinks remained constant (61). With the introduction of the SSB tax in Chile it was observed that prices for the high-tax category, which includes SSBs, rose immediately after announcement of the tax (62).

Change in purchase and consumption of SSBs after implementation of a SSB tax

It is assumed that the consumption of SSBs follows a pattern of negative price elasticity. Meta-analyses, primarily including studies from HICs, demonstrate compelling evidence for the negative price elasticity of sugary drinks and an association between SSB taxes and decreased purchases and consumption of those drinks (28,49).

In Chile, monthly purchase volume of high-tax soft drinks decreased by 21.6% after introduction of the tax in October 2014 (62). In response to the introduction of the tax in Chile, middle- and high-income groups and high pre-tax soda consumers reduced their consumption significantly (62). In addition to that, several studies have shown that higher prices of SSBs either had no effect on con-

sumption of untaxed alternatives such as milk and fruit juices, or that consumption of alternatives increased (28,49,58,63). The evidence currently available indicates that a SSB tax leads to reduced purchase and consumption of SSBs. Prices of untaxed substitutes stay relatively constant, thus offering an attractive and generally healthier alternative, which is used by consumers (28).

Expected impact on nutrition and health outcomes of a SSB tax

Modelling studies are often used to predict the possible effects of a SSB tax on a population's health, as long-term effects of actual implementation have not (widely) been studied yet. A modelling study focused on South Africa predicted that a 20% SSB tax could reduce obesity by 3.8% for males and 2.4% for females aged 15 and older (64). Those between 15 and 34 years of age consumed the largest amount of SSBs, and therefore are assumed to benefit most from implementation of a SSB tax (64). In India, similar effects were predicted. For those aged 25 and older, a 20% SSB tax could avert 4.2% of overweight/obesity cases, and 2.5% of diabetes cases until 2023 (65). Several studies conducted in the United States also concluded that the introduction of a SSB tax would lead to decreased prevalence of overweight and obesity (28). A study modelling the effects of a 20% SSB tax in Australia found that it could save over 110,000 years of life, the majority in lower income groups. Expected healthcare cost savings were estimated to be as high as AUD 1.73 billion over the lifetime of the population cohort used in the study. For every dollar invested in the tax the first ten years, the return was estimated to be AUD 17 in health care savings (66). Yet, there are no estimates on the indirect health effects and their socio-economic consequences, such as the possible increase in productivity, a decrease in sick-days and other socio-economic effects.

The effects of a SSB tax on price, consumption, nutrition and health: the case of Mexico

In 2012, 70% of Mexican adults and 30% of Mexican children and adolescents were overweight or obese (67). With 12.5% of the total daily energy intake in Mexico coming from added sugars and SSBs accounting for 70% of that, Mexico introduced a SBB tax (68). In 2014, the one peso per litre specific excise tax on any non-alcoholic beverages with added sugar, excluding 100% fruit juices and beverages with added artificial sweeteners, was implemented (69). The one peso per litre tax resulted in a price increase on SSBs of about 10% (69).

The first two years after implementation, purchases of SSBs declined by 7.6% across the country. This is significant, considering that consumption trends predicted an expected increase of 2.1% without the policy change. The reduction was greater in the second year than in the first year, indicating potential for a long-term effect (69). Reductions were highest among households of low socioeconomic level (Figure 4), those living in urban areas and households with children (69,70). The purchase of untaxed substitutes was 4% higher than expected without the tax, largely as the result of an increase in consumption of bottled water. Significant increases in consumption of 100% fruit juices and sodas low in calories were not seen (71). This indicates that the SSB tax led to a shift in consumption away from sugary drink consumption towards healthier alternatives.

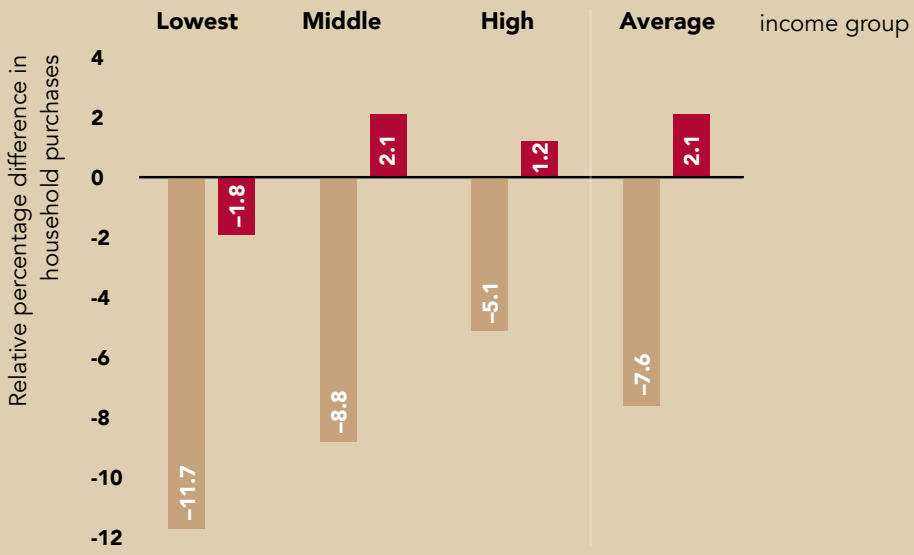

Figure 4: Relative differences in household purchases (in %) of taxed and untaxed beverages by socioeconomic level, Mexico, 2014-2015[6]. Modified from (69) in (5).

Modelling studies demonstrated that the Mexican SSB tax has major potential to reduce levels of obesity and NCDs. A simulation study using the observed percentage change in SSB purchases after introduction of the tax, estimated that the prevalence of obesity would decrease by 2.54% and the number of cases of diabetes would decrease by between 86,000 and 134,000 in 2030 (72). Another study modelled the health effects of the one peso per litre tax between its introduction in 2014 and 2024. It was estimated that close to 240,000 cases of obesity could be avoided, 100,000 of them being children and adolescents. Also, 60,000 cases of diabetes would be prevented, and 918 life years added. Per one dollar spent on implementation, close to 4 dollars are estimated to be saved on health care costs (73).

6. *Relative differences in household purchase volumes were calculated based on the comparison between predicted volumes of taxed and untaxed beverage purchases without tax implementation (based on pre-tax sales data from 2012/13) and sales data of volumes of taxed and untaxed beverage purchases in 2014/15 (69).*

In conclusion: the effectiveness of sugar-sweetened beverage taxes

The growing body of evidence on the effectiveness of SSB taxes is promising. SSB taxes function as predicted and evidence points towards a larger decrease of SSB intake due to the implementation of the tax especially for vulnerable groups, such as low-income households and households with high SSB consumption before implementation of the tax. Research on long-term health effects is still limited and mostly comes from modelling studies. Further research on the actual effects of the implementation of SSB taxes, including differences between tax designs, policy environments and jurisdictions, such as cities, is needed. Overall, SSB taxes are an effective fiscal policy option to consider not just nationally, but also for city jurisdictions. In combination with other policy strategies focused on prevention of overweight, obesity and NCDs and improving availability of healthy foods, SSB taxes have high potential to make a positive contribution to good health and nutrition.

References

1. United Nations Children's Fund. Implementing Taxes on Sugar-Sweetened Beverages: An overview of current aproaches and the potential benefits for children [Internet]. Geneva: UNICEF; 2019. Available from: https://sunpc.org.pk/wp-content/uploads/2019/05/190328_UNICEF_Sugar_Tax_Briefing_R09.pdf
2. World Health Organization. Fiscal Policies for Diet and Prevention of Noncommunicable Diseases [Internet]. Geneva: WHO; 2016. Available from: https://apps.who.int/iris/bitstream/handle/10665/250131/9789241511247-eng.pdf?sequence=1
3. Basu S, Mckee M, Galea G, Stuckler D. Relationship of Soft Drink Consumption to Global Overweight, Obesity, and Diabetes: A Cross-National Analysis of 75 Countries. Am J Public Health. 2013;103(11):2071–7.
4. Collin J, Hill S. Structure and Tactics of the Tobacco, Alcohol and Sugary Beverage Industries [Internet]. Available from: https://www.bbhub.io/dotorg/sites/2/2019/04/Structure-and-Tactics-of-the-Tobacco-Alcohol-and-Sugary-Beverage-Industries.pdf
5. The Task Force on Fiscal Policy For Health. Health Taxes to Save Lives - Employing Effective Excise Taxes on Tobacco, Alcohol and Sugary Beverages [Internet]. 2019. Available from: https://www.bbhub.io/dotorg/sites/2/2019/04/Health-Taxes-to-Save-Lives-Report.pdf
6. GDD 2015 Draft Estimates Download [Internet]. Global Dietary Database. 2020 [cited 2020 Jun 23]. Available from: https://www.globaldietarydatabase.org/download-data/download?token=xLH3CNAjcVJxMkIS3OfJxXgM8JZlZlfBdHWyt1Uljzk
7. Blecher E, Liber AC, Drope JM, Nguyen B, Stoklosa M. Global trends in the affordability of sugar-sweetened beverages, 1990-2016. Prev Chronic Dis. 2017;14(5):1–13.
8. Nakhimovsky SS, Feigl AB, Avila C, O'Sullivan G, Macgregor-Skinner E, Spranca M. Taxes on Sugar-Sweetened Beverages to Reduce Overweight and Obesity in Middle-Income Countries: A Systematic Review. PLoS One. 2016;11(9):e0163358.
9. Lucas A. Pepsi's stock jumps as higher advertising spending fuels sales growth and earnings beat [Internet]. CNBC. 2019. Available from: https://www.cnbc.com/2019/10/03/pepsico-pep-earnings-q3-2019.html
10. Duran HB. Pepsi Increases Marketing Budget To Win Favor Over Coca-Cola In North America [Internet]. A.list. 2018. Available from: https://www.alistdaily.com/lifestyle/pepsi-marketing-north-america/
11. The Coca-Cola Company and Subsidiaries [Internet]. 2018. Available from: http://www.annual-reports.com/HostedData/AnnualReportArchive/c/NYSE_KO_2018.pdf
12. Pepsico. Annual Report 2018 [Internet]. 2018. Available from: https://www.pepsico.com/docs/album/annual-reports/2018-annual-report.pdf?sfvrsn=35d1d2bc_2
13. Hess JM, Lilo EA, Cruz TH, Davis SM. Perceptions of water and sugar-sweetened beverage consumption habits among teens, parents and teachers in the rural Southwestern United States. Public Health Nutr. 2019;22(8):1376–87.
14. Patel AI, Schmidt LA. Water Access in the United States: Health Disparities Abound and Solutions Are Urgently Needed. Am J Public Health. 2017;107(9):1354–6.
15. Prince H, Adams E, Quilliam RS. The difference a day can make: The temporal dynamics of drinking water access and quality in urban slums. Sci Total Environ. 2019;671:818–26.
16. Yang L, Bovet P, Liu Y, Zhao M, Ma C, Liang Y, et al. Consumption of Carbonated Soft Drinks Among Young Adolescents Aged 12 to 15 Years in 53 Low- and Middle-Income Countries. Am J Public Health. 2017;107(7):1095–100.
17. Kenney EL, Long MW, Cradock AL, Gortmaker SL. Prevalence of Inadequate Hydration Among US Children and Disparities by Gender and Race/Ethnicity: National Health and Nutrition Examination Survey, 2009–2012. Am J Public Health. 2015;105(8):e113–8.
18. Pan A, Hu FB. Effects of carbohydrates on satiety: differences between liquid and solid food. Curr Opin Clin Nutr Metab Care. 2011;14(4):385–90.
19. Nugent R. Tobacco, alcohol, and sugary beverages in low- and middle- income countries: harms, consumption and costs [Internet]. 2018. Available from: https://www.bbhub.io/dotorg/sites/2/2019/04/Tobacco-alcohol-and-sugary-beverages-in-low-and-middle-income-countries-harms-consumption-and-costs.pdf
20. Reducing free sugars intake in children and adults [Internet]. World Health Organization. Available from: https://www.who.int/elena/titles/guidance_summaries/sugars_intake/en/
21. Mela DJ, Woolner EM. Perspective: Total, Added, or Free? What Kind of Sugars Should We Be Talking About? Adv Nutr. 2018;9(2):63–9.
22. Fleck F. The science behind the sweetness in our diets. Bull World Health Organ. 2014;92(11):780–2.

23. Te Morenga L, Mallard S, Mann J. Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. BMJ. 2013;346:e7492.

24. Hu FB. Resolved: There is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases. Obes Rev. 2013;14(8):606–19.

25. Malik VS, Popkin BM, Bray GA, Després J-P, Willett WC, Hu FB. Sugar-Sweetened Beverages and Risk of Metabolic Syndrome and Type 2 Diabetes A meta-analysis. Diabetes Care. 2010;33(11):2477–83.

26. Shekar M, Popkin B. Obesity - Health and Economic Consequences of an Impending Global Challenge [Internet]. Washington D.C.: World Bank Group; 2019. Available from: https://openknowledge.worldbank.org/bitstream/handle/10986/32383/211491ov.pdf?sequence=4&isAllowed=y

27. Imamura F, O'connor L, Ye Z, Mursu J, Hayashino Y, Bhupathiraju SN, et al. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction. BMJ. 2015;351:h3576.

28. Escobar MAC, Veerman JL, Tollman SM, Bertram MY, Hofman KJ. Evidence that a tax on sugar sweetened beverages reduces the obesity rate: a meta-analysis. BMC Public Health. 2013;13(1072).

29. International Diabetes Federation. IDF Diabetes Atlas - 9th edition 2019: Demographic and Geographic outline [Internet]. 2019. Available from: https://www.diabetesatlas.org/en/sections/demographic-and-geographic-outline.html

30. Prevalence of overweight among adults, BMI ≥ 25, age-standardized. Estimates by WHO Region [Internet]. World Health Organization. 2017. Available from: https://apps.who.int/gho/data/view.main.GLOBAL2461A?lang=en

31. Global Nutrition Report. Data and metadata [Internet]. 2018. Available from: https://globalnutritionreport.org/reports/global-nutrition-report-2018/dataset-and-metadata/

32. Popkin BM. Nutritional patterns and transitions. Popul Dev Rev. 1993;19(1):138–57.

33. Global Panel on Agriculture and Food Systems for Nutrition. Urban diets and nutrition: Trends, challenges and opportunities for policy action. London, UK: Global Panel on Agriculture and Food Systems for Nutrition; 2017. (Policy Brief No. 9).

34. Hawkes C, Harris J, Gillespie S. Changing Diets: Urbanization and the Nutrition Transition. In: International Food Policy Research Institute, editor. Global Food Policy Report. Washington D.C.: International Food Policy Research Institute; 2017. p. 34–41.

35. Iveson K. Branded cities: outdoor advertising, urban governance, and the outdoor media landscape. Antipode. 2012;44(1):151–74.

36. Moodley G, Christofides N, Norris SA, Achia T, Hofman KJ. Obesogenic Environments: Access to and Advertising of Sugar-Sweetened Beverages in Soweto, South Africa, 2013. Prev Chronic Dis. 2015;12:E186.

37. Bragg MA, Hardoby T, Pandit NG, Raji YR, Ogedegbe G. A content analysis of oudoor non-alcoholic beverage advertisements in Ghana. BMJ Open. 2017;7:e012313.

38. Lesser LI, Zimmerman FJ, Cohen DA. Outdoor advertising, obesity, and soda consumption: a cross-sectional study. BMC Public Health. 2013;13(1):20.

39. Boyland EJ, Nolan S, Kelly B, Tudur-Smith C, Jones A, Halford JC, et al. Advertising as a Cue to Consume: A Systematic Review and Meta-Analysis of the Effects of Acute Exposure to Unhealthy Food and Nonalcoholic Beverage Advertising on Intake in Children and Adults. Am J Clin Nutr. 2016;103(2):519–33.

40. Sadeghirad B, Duhaney T, Motaghipisheh S, Campbell NRC, Johnston BC. Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. Obes Rev. 2016;17(10):945–59.

41. Global Food Research Program UNC. Why Tax Sugary Drinks? [Internet]. University of North Carolina at Chapel Hill; 2020. Available from: http://globalfoodresearchprogram.web.unc.edu/files/2020/02/FACTSHEET_SSBTAX_2020_Feb11_Final.pdf

42. Backholer K, Blake M, Vandevijvere S. Sugar-sweetened beverage taxation: an update on the year that was 2017. Public Health Nutr. 2017;20(18):3219–24.

43. McCrystal L. Philly soda tax: Here's how much money it has raised, and how it's been spent [Internet]. The Philadelphia Inquirer. 2019. Available from: https://www.inquirer.com/news/philly-soda-tax-revenue-spending-20190821.html

44. Japsen B. Philadelphia Soda Tax Cut Consumption By 1.3 Billion Ounces [Internet]. Forbes. 2019. Available from: https://www.forbes.com/sites/brucejapsen/2019/05/14/philadelphia-soda-tax-cut-consumption-by-13-billion-ounces/#7de54e044a51

45. Summary and Fiscal Note [Internet]. Seattle City Council - Office of the City Clerk. 2020. Available from: http://seattle.legistar.com/LegislationDetail.aspx?ID=4399896&GUID=E33BB5D7-6932-4621-9947-E66BD8F58587&Options=ID%7CText%7C&Search=119764&FullText=1 Seattle

46. WHO. Taxes on sugary drinks: Why do it? [Internet]. 2017. Available from: https://apps.who.int/iris/bitstream/handle/10665/260253/WHO-NMH-PND-16.5Rev.1-eng.pdf;jsessionid=42676BCD6F9C05CABFE09F61FDC8146C?sequence=1

47. Global Food Research Program UNC. Sugary Drink Taxes around the World [Internet]. University of North Carolina at Chapel Hill; 2019 [cited 2020 May 20]. Available from: https://www.dropbox.com/s/bqbj501wgocor24/UNCGFRP_SSB_tax_maps.pdf?dl=0

48. Baker P, Jones A, Thow AM. Accelerating the worldwide adoption of sugar-sweetened beverage taxes: Strengthening commitment and capacity: Comment on "The untapped power of soda taxes: Incentivizing consumers, generating revenue, and altering corporate behavior". Int J Heal Policy Manag. 2018;7(5):474–8.

49. Teng AM, Jones AC, Mizdrak A, Signal L, Genç M, Wilson N. Impact of sugar-sweetened beverage taxes on purchases and dietary intake: Systematic review and meta-analysis. Obes Rev. 2019;20(9):1187–204.

50. World Health Organization. Using price policies to promote healthier diets [Internet]. WHO Regional Office for Europe; 2015. Available from: http://www.euro.who.int/__data/assets/pdf_file/0008/273662/Using-price-policies-to-promote-healthier-diets.pdf?ua=1 12 May 2020, 11:30

51. World Cancer Research Fund International. Building momentum: lessons on implementing a robust sugar sweetened beverage tax [Internet]. 2018. Available from: https://www.wcrf.org/sites/default/files/PPA-Building-Momentum-Report-WEB.pdf

52. Langen S de, Kukenheim S, Voortman L. Wethouders grote steden: tijd voor een suikertaks op frisdrank [Internet]. NRC. 2019. Available from: https://www.nrc.nl/nieuws/2019/12/11/wethouders-grote-steden-tijd-voor-een-suikertaks-op-frisdrank-a3983440

53. Kamsma M. Drie grote steden willen een suikertaks op frisdrank [Internet]. NRC. 2019. Available from: https://www.nrc.nl/nieuws/2019/12/11/drie-grote-steden-willen-een-suikertaks-op-frisdrank-a3983457

54. Halliday J, Platenkamp L, Nicolarea Y. A menu of actions to shape urban food environments for improved nutrition [Internet]. GAIN; MUFPP; RUAF Foundation; 2019. Available from: https://www.gainhealth.org/resources/reports-and-publications/menu-actions-shape-urban-food-environments-improved-nutrition

55. Cawley J, Frisvold D, Hill A, Jones D. The impact of the Philadelphia beverage tax on purchases and consumption by adults and children. J Health Econ. 2019;67:102225.

56. Zhong Y, Auchincloss AH, Lee BK, McKenna RM, Langellier BA. Sugar-Sweetened and Diet Beverage Consumption in Philadelphia One Year after the Beverage Tax. Int J Environ Res Public Health. 2020;17(4):1336.

57. Lee MM, Falbe J, Schillinger D, Basu S, McCulloch CE, Madsen KA. Sugar-Sweetend Beverage Consumption 3 Years After the Berkeley, California, Sugar-Sweetened Beverage Tax. Am J Public Health. 2019;109(4):637–9.

58. Silver LD, Ng SW, Ryan-Ibarra S, Smith Taillie L, Induni M, Miles DR, et al. Changes in prices, sales, consumer spending, and beverage consumption one year after a tax on sugar-sweetened beverages in Berkeley, California, US: A before-and-after study. PLoS Med. 2017;14(4):e1002283.

59. Roberto CA, Lawman HG, LeVasseur MT, Mitra N, Peterhans A, Herring B, et al. Association of a Beverage Tax on Sugar-Sweetened and Artificially Sweetened Beverages With Changes in Beverage Prices and Sales at Chain Retailers in a Large Urban Setting. Jama. 2019;321(18):1799–810.

60. Cawley J, Thow AM, Wen K, Frisvold D. The Economics of Taxes on Sugar-Sweetened Beverages: A Review of the Effects on Prices, Sales, Cross-Border Shopping, and Consumption. Annu Rev Nutr. 2019;39:317–38.

61. Alvarado M, Kostova D, Suhrcke M, Hambleton I, Hassell T, Samuels TA, et al. Trends in beverage prices following the introduction of a tax on sugar-sweetened beverages in Barbados. Prev Med (Baltim). 2017;105:S23–5.

62. Nakamura R, Mirelman AJ, Cuadrado C, Silva-Illanes N, Dunstan J, Suhrcke M. Evaluating the 2014 sugar-sweetened beverage tax in Chile: An observational study in urban areas. PLoS Med. 2018;15(7).

63. Barquera S, Hernandez-Barrera L, Tolentino ML, Espinosa J, Ng SW, Rivera JA, et al. Energy intake from beverages is increasing among Mexican adolescents and adults. J Nutr. 2008;138(12):2454–61.

64. Manyema M, Veerman LJ, Chola L, Tugendhaft A, Sartorius B, Labadarios D, et al. The Potential Impact of a 20% Tax on Sugar-Sweetened Beverages on Obesity in South African Adults: A Mathematical Model. PLoS One. 2014;9(8):e105287.

65. Basu S, Vellakkal S, Agrawal S, Stuckler D, Popkin B, Ebrahim S. Averting Obesity and Type 2 Diabetes in India through Sugar-Sweetened Beverage Taxation: An Economic-Epidemiologic Modeling Study. PLoS Med. 2014;1:e1001582.

66. Lal A, Mantilla-Herrera AM, Veerman L, Backholer K, Sacks G, Moodie M, et al. Modelled health benefits of a sugarsweetened beverage tax across different socioeconomic groups in Australia: A cost-effectiveness and equity analysis. PLoS Med. 2017;14(6):e1002326.

67. Colchero MA, Molina M, Guerrero-López CM. After Mexico Implemented a Tax, Purchases of Sugar-Sweetened Beverages Decreased and Water Increased: Difference by Place of Residence, Household Composition, and Income Level. J Nutr. 2017;147(8):1552–7.

68. Colchero MA, Salgado JC, Unar-Munguía M, Molina M, Ng S, Rivera-Dommarco JA. Changes in Prices After an Excise Tax to Sweetened Sugar Beverages Was Implemented in Mexico: Evidence from Urban Areas. PLoS One. 2015;10(12):e0144408.

69. Colchero MA, Rivera-Dommarco J, Popkin BM, Ng SW. In Mexico, evidence of sustained consumer response two years after implementing a sugar-sweetened beverage tax. Health Aff. 2017;36(3):564–71.

70. Colchero MA, Molina M, Guerrero-López CM. After Mexico Implemented a Tax, Purchases of Sugar-Sweetened Beverages Decreased and Water Increased: Difference by Place of Residence, Household Composition, and Income Level. J Nutr. 2017;147(8):1552–7.

71. Colchero MA, Manuel Guerrero-López C, Molina M, Angel Rivera J. Beverages Sales in Mexico before and after Implementation of a Sugar Sweetened Beverage Tax. PLoS One. 2016;11(9):e0163463.

72. Barrientos-Gutierrez T, Zepeda-Tello R, Rodrigues ER, Colchero-Aragones A, Rojas-Martinez R, Lazcano-Ponce E, et al. Expected population weight and diabetes impact of the 1-peso-per-litre tax to sugar sweetened beverages in Mexico. PLoS One. 2017;12(5).

73. Basto-Abreu A, Barrientos-Gutierrez T, Vidana-Perez D, Colchero MA, Hernandez-F M, Hernandez-Avila M, et al. Cost-Effectiveness Of The Sugar-Sweetened Beverage Excise Tax In Mexico. Health Aff. 2019;38(11):1824–31.

74. Price elasticity of demand and price elasticity of supply [Internet]. Khan Academy. Available from: https://www.khanacademy.org/economics-finance-domain/microeconomics/elasticity-tutorial/price-elasticity-tutorial/a/price-elasticity-of-demand-and-price-elasticity-of-supply-cnx

75. Type 2 diabetes [Internet]. International Diabetes Federation. Available from: https://idf.org/about-diabetes/type-2-diabetes.html

Contact

GAIN
The Global Alliance for Improved Nutrition (GAIN)
Rue de Varembé 7
1202 Geneva
Switzerland
T: +41 22 749 18 50
E: info@gainhealth.org

© 2020 The Global Alliance for Improved Nutrition

www.gainhealth.org

gain
Global Alliance for Improved Nutrition