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WORLD BANK GROUP

TAXES ON SUGAR-SWEETENED BEVERAGES:

International Evidence and Experiences

September 2020

HEALTH, NUTRITION, AND POPULATION

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ACRONYMS

ASB	Artificially Sweetened Beverages
BMI	Body Mass Index
CHD	Coronary Heart Disease
CIF	Cost, Insurance, and Freight
CPI	Consumer Price Index
CVD	Cardiovascular Disease
DALY	Disability-Adjusted Life Year
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GI	Glycemic Index
GNI	Gross National Income
GST	Goods and Services Tax
HALY	Health-Adjusted Life Year
HFCS	High-Fructose Corn Syrup
HIC	High-Income Country
IHD	Ischemic Heart Disease
LCSB	Low/Zero-Calorie ('diet') Sweetened Beverages
LIC	Low-Income Country
LMIC	Lower-Middle-Income Country
MI	Myocardial Infarction
MoF	Ministry of Finance
MRP	Maximum Retail Price
NCD	Non-communicable Diseases
NNSB	Non-nutritive Sweetened Beverages
QALY	Quality-Adjusted Life Year
RCT	Randomized Controlled Trial
SDIL	Soft Drinks Industry Levy
SES	Socioeconomic Status
SSB	Sugar-Sweetened Beverages
UMIC	Upper-Middle-Income Country
WHO	World Health Organization

EXECUTIVE SUMMARY

This evidence review is designed to support policy makers seeking to implement a tax on sugar-sweetened beverages (SSB). It synthesizes the latest global evidence of effectiveness of SSB taxes and summarizes international experiences with SSB taxation to-date.

SSBs are non alcoholic beverages that contain added caloric sweeteners, such as sucrose (sugar) or high-fructose corn syrup. The main categories of SSBs are carbonated soft drinks, energy drinks, sports drinks, less than 100 percent fruit or vegetable juices, ready-to-drink teas and coffees, sweetened waters, and milk-based drinks.

SSBs contribute significantly to sugar and energy intakes around the world without adding any nutritional value to diets. There is strong evidence linking excess sugar and SSB consumption to a range of adverse health effects including tooth decay, excess weight gain, and increased risk of developing obesity and type 2 diabetes. The burden of disease attributable to SSBs is considerable given that they are a singular and entirely discretionary (nonessential) component of the diet. From a public health perspective, taxation of SSBs is internationally recommended as a priority component of a comprehensive approach to preventing and controlling obesity and diet-related non-communicable diseases (NCD). Indeed, the World Health Organization recommends that governments impose taxes on SSBs that raise retail prices by at least 20% to reduce consumption and improve population health.

Excess SSB consumption generates both internalities (costs that individual consumers impose on themselves, mainly in the future) and externalities (costs that consumers impose on others, primarily in the form of public health care costs and lost productivity). These real costs are not reflected in the prices charged for SSBs. Taxation is an effective policy lever available to governments to discourage sub-optimally high consumption of SSBs and improve societal welfare.

There is global momentum behind SSB taxes, with more than 30 countries implementing new SSB taxes over the last five years. SSB taxes are now in place in more than 40 countries around the world, covering over 2 billion people, including countries with some of the highest SSB consumption and obesity rates in the world. Yet, while the number continues to grow steadily, many countries with high or rapidly rising SSB consumption rates are yet to introduce SSB taxes.

SSB taxes work to reduce consumption and improve population by:

- **Increasing retail prices.** Evaluation evidence clearly demonstrates that SSB taxes are effective at (a) increasing retail prices and (b) reducing sales and purchases of taxed beverages.
- **Raising public awareness.** The introduction of a tax on SSBs can be a strong signal to the public about the health effects of SSB consumption. This effect is thought to be considerable, even during the period before a proposed tax is passed. However, there is currently limited evaluation evidence available on this mechanism.
- **Incentivizing non-price industry responses.** Well-designed sugar-based and tiered volume-based SSB taxes have been shown to effectively incentivize product reformulation, as well as other industry responses aimed at minimizing tax burden.
- **Generating government revenue (which can be directed toward programs and services that improve population health)**. Revenue generated by SSB taxes can be considerable, although difficult to predict with precision, particularly if a tax successfully incentivizes industry actions (such as reformulation) to minimize tax burden.

Given that the majority of health-focused SSB taxes have only recently been introduced, it is too early to evaluate their impacts on population-level health outcomes. However, modelling studies demonstrate that well-designed SSB taxes have the potential to contribute to significant improvements in population health, provided tax rates are set sufficiently high.

Obesity and diet-related NCDs are complex, multifaceted issues that will not be solved by a single policy measure. SSB taxes should be implemented as part of a comprehensive package of interventions aimed at tackling obesity and diet-related NCDs, based on global best practice recommendations. To maximise their effectiveness, SSB taxes should ideally also be implemented as part of a broad set of fiscal policies aimed at reducing consumption of goods that are harmful for health, and incentivising consumption of those that promote and support health. At the highest, level, these fiscal policies for health should be embedded within a comprehensive, whole-of-government approach to promoting public health and wellbeing.

1. WHY TAX SUGAR-SWEETENED BEVERAGES

1.1. WHAT ARE SUGAR-SWEETENED BEVERAGES

Sugar-sweetened beverages (SSBs) are non alcoholic beverages that contain caloric sweeteners, such as sucrose (sugar) or high-fructose corn syrup (HFCS). These may be added during the manufacturing or preparation process. SSBs include carbonated soft drinks (carbonates), energy drinks, concentrates or syrups, sports drinks, less than 100 percent fruit or vegetable juices such as juice drinks or nectars, ready-to-drink teas and coffees, sweetened waters, and milk-based drinks.

Low/zero-calorie sweetened beverages (LCSBs) are any type of low-calorie (´diet´) versions of SSBs that use intensely sweet, low/zero-calorie sweeteners (such as aspartame, sucralose, saccharin, and stevia) in place of caloric sweeteners. These are sometimes referred to as artificially sweetened beverages (ASBs) or nonnutritive sweetened beverages (NNSBs). Unless explicitly referred to, LCSBs are not a focus of this report.

SSBs are high in readily absorbable free sugars.[1] A single 600ml bottle of carbonated soft drink typically contains 64g (15-16 teaspoons) of sugar (equivalent to 256 calories). This, on its own, exceeds the maximum daily sugar intake of roughly 50g (12 teaspoons) recommended by the World Health Organization (WHO) for an average adult with an average daily energy requirement of 2,000 calories.[2] Other than as a source of energy, SSBs provide little to no nutritional value (Malik and Hu 2019; Popkin and Hawkes 2016).

1.2. SUGAR-SWEETENED BEVERAGES AND HEALTH

SSBs are the main source of added sugars in diets across much of the world (ABS 2016; Aburto et al. 2016; Marriott et al. 2019; Pereira et al. 2015; Public Health England 2018a; Sánchez-Pimienta et al. 2016). They account for an estimated 69 percent of added sugar intakes in Mexico (Aburto

1 Free sugars are all sugars added to foods or drinks by the manufacturer, cook or consumer, as well as sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates.
2 The WHO recommends that adults and children reduce their daily intake of free sugars to less than 10% (and ideally less than 5%) of their total daily energy intake. Based on average adult energy requirement of 2,000 calories per day, a single SSB containing 64g sugar (256 calories) provides 13% of total daily energy intake.

et al. 2016; Sánchez-Pimienta et al. 2016), 39 percent in the United States (Marriott et al. 2019), and 33 percent among U.K. children aged 11 to 18 years (Public Health England 2018a). In Brazil, nonalcoholic beverages (including plain milk and unsweetened fruit/vegetable juices) account for an estimated 37 percent of added sugar intakes (Pereira et al. 2014, 2015).

SSBs also contribute significantly to dietary energy intakes around the world. They contribute an estimated 9–10 percent to total energy intakes in Mexico (Aburto et al. 2016; Sánchez-Pimienta et al. 2016), 6.5 percent in the United States (Rosinger et al. 2017), and 6 percent among adolescents in Spain (Ruiz et al. 2016).

Around the world, SSBs are readily available and heavily marketed, particularly towards young people. They make up a significant proportion of total fluid intakes in children and adolescents (Guelinckx et al. 2015) and tend to displace other healthier beverages (such as milk and water) in the diet (Hsiao and Wang 2013; Vartanian et al. 2007). It is well recognized that taste preferences are established during childhood. Evidence suggests that the intense sweetness of SSBs may condition a preference for sweet foods and beverages over the life course (Malik et al 2010b). There is also growing evidence of the addictive potential of sugar and SSBs (Falbe et al. 2019). Taste preferences, habit strength, and cravings for sweetness are frequently identified as key determinants of SSB consumption, along with environmental factors such as accessibility, climate, and seasonality (Grimm et al. 2004; Onyemelukwe et al 2006; Hector et al. 2009; Tak et al. 2011; Mirasgedis 2013; Ortega-Avila et al. 2017, 2019; Oberländer 2019). SSB consumption also has a strong social component and is often deeply rooted in family and cultural norms (Theodore et al. 2011; Ortega-Avila et al. 2019).

SSB consumption has a number of physiological effects. Due to their high free sugar content, SSBs rapidly increase blood glucose and insulin concentrations (Malik et al. 2010a). When consumed habitually, they contribute to a high dietary glycemic load[3] with links to weight gain, glucose intolerance, and insulin resistance (Malik and Hu 2019). Caloric intake from SSBs is typically poorly compensated for through reduced intake of other caloric foods (Pan and Hu 2011). As a result, SSB consumption is typically associated with a net increase in energy intake (Hsiao and Wang 2013).

Through these physiological mechanisms, SSB consumption is associated with a range of health risks (Table 1). There is strong, consistent evidence linking SSB consumption to weight gain and increased risk of overweight and obesity in children, adolescents, and adults (Bleich and Vercammen 2018; Hu 2013; Malik et al. 2013; Te Morenga, Mallard, and Mann 2012; Trumbo and Rivers 2014). A large body of observational evidence from prospective cohort studies is supported by clinical trial data (de Ruyter et al. 2012; Ebbeling et al. 2012; Luger et al. 2018) and evidence elucidating the underlying physiological mechanisms (Hu and Malik 2010).

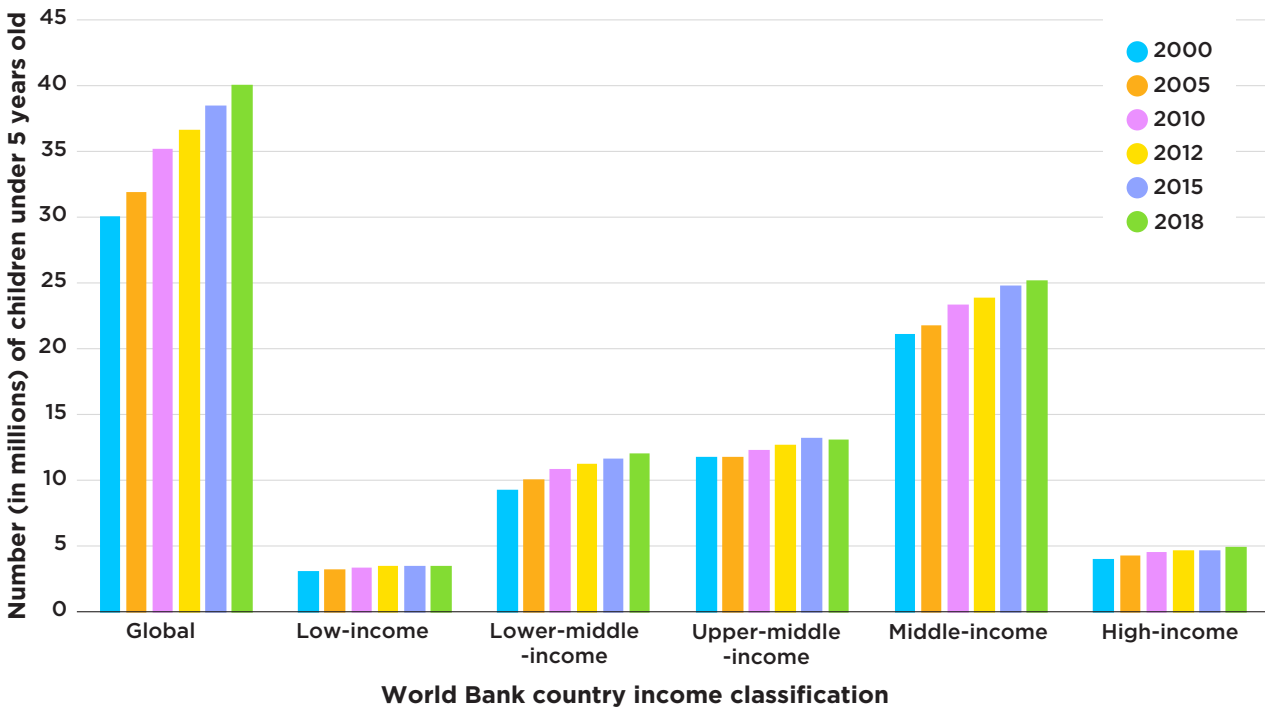
3 A measure that estimates how much a carbohydrate-containing food will raise a person's blood glucose levels after eating it, taking into account both the quantity (in grams) and quality (Glycemic Index [GI] value) of carbohydrate in a serving of food.

Obesity is one of the gravest public health challenges facing the world today. Between 1975 and 2014, global age-standardized prevalence of adult obesity (body mass index [BMI] ≥30 kg/m2) more than tripled from 3.2 percent to 10.8 percent in men and more than doubled from 6.4 percent to 14.9 percent in women (NCD-RisC 2016). In 2014, an estimated 650 million adults (ages 18 years and older) worldwide were obese, compared with 105 million in 1975 (NCD-RisC 2016).

Among children and adolescents (5–19 years), global age-standardized prevalence of obesity rose dramatically from 0.7 percent in girls and 0.9 percent in boys in 1975 to 5.6 percent in girls and 7.8 percent in boys in 2016 (NCD-RisC 2017). In 2016, an estimated 124 million children and adolescents (5–19 years) were obese, compared with 11 million in 1975 (NCD-RisC 2017).

There has also been a rapid rise in overweight children under five years, with the greatest escalation in lower-middle-income countries. Between 2000 and 2018, the number of overweight children (under five years) living in lower-middle-income countries climbed 30 percent, from 9.3 million to 12.1 million (Figure 1) (UNICEF, WHO, and World Bank 2019). In 2018, three-quarters of all overweight children lived in middle-income countries (UNICEF, WHO, and World Bank 2019).

FIGURE 1 • Number of overweight children under 5 years old, by World Bank income group (2000–2018)



Source: UNICEF, WHO, and World Bank 2019.

Overweight and obesity are major risk factors for a number of chronic non-communicable diseases (NCDs), including coronary heart disease (CHD), stroke, diabetes, and at least 12 cancers (cancer of the mouth, pharynx and larynx, esophagus, stomach, pancreas, gallbladder, liver, kidney, prostate, colorectum, endometrium, ovaries, and post-menopausal breast) (Guh et al. 2009; WCRF and AICR 2018).

In addition to these well-established BMI-mediated links, there is strong evidence that SSB consumption independently increases risk of type 2 diabetes (Imamura et al. 2015; Malik et al. 2010a; Schulze et al. 2004). There is also growing evidence linking SSB consumption independently to metabolic syndrome (Malik et al. 2010a; Malik and Hu 2019); diet-related cardiovascular disease (CVD) risk factors, including raised blood pressure and dyslipidemia (de Koning et al. 2012; Fung et al. 2009; Malik et al. 2010b; Malik and Hu 2019; Te Morenga et al. 2014; Xi et al. 2015); nonalcoholic fatty liver disease (Nseir, Nassar, and Assy 2010); and several cancers (Chazelas et al. 2019; Mueller et al. 2010).

There is strong evidence of a positive dose-response relationship between SSB consumption and tooth decay (dental caries) (Bleich and Vercammen 2018)—the most common NCD worldwide (WHO 2017a). Tooth decay is an increasingly common cause of hospitalization in children, is expensive to treat, and can severely impair health and well-being (Moynihan and Kelly 2014).

TABLE 1 • Summary of evidence of health risks linked to SSB consumption

Health risks	Nature of evidence	Key references
Weight gain, overweight, obesity	Strong, consistent evidence of direct, causal relationship	Bleich and Vercammen 2018; Malik et al. 2013; Te Morenga, Mallard, and Mann 2012; Trumbo and Rivers 2014
Type 2 diabetes	Strong positive association (independent and BMI-mediated)	Imamura 2015; Malik 2010a; Schulze et al. 2004
Dental caries	Strong positive dose-response relationship	Bleich and Vercammen 2018
Metabolic syndrome	Positive association (independent and BMI mediated)	Malik et al. 2010a
CVD risk factors and outcomes	Strong positive association with CHD (independent and BMI-mediated); association with stroke less clear	Fung et al. 2009; de Koning et al. 2012; Malik et al. 2010b; Malik and Hu 2019; Te Morenga et al. 2014; Xi 2015
Cancer	Positively associated with increased risk of at least 12 cancers (independent and BMI-mediated)	Chazelas et al. 2019; Guh et al. 2009; Mueller et al. 2010; WCRF and AICR 2018
All-cause and cause-specific mortality	Positively associated with higher risk of death from all causes. Linked to 184,000 deaths worldwide: 76% in low- and middle-income countries and 72% related to type 2 diabetes	Mullee et al. 2019; Singh et al. 2015

Regular SSB consumption is positively associated with higher risk of death from all causes (all-cause mortality) (Mullee et al. 2019). In 2010, an estimated 184,000 deaths and 8.5 million disability-adjusted life years (DALYs) worldwide were attributable to SSB consumption (Singh et al. 2015). Of all SSB-related deaths globally in 2010, 72 percent were from type 2 diabetes. Three in four (76 percent) of all deaths and 85 percent of DALYs linked to SSB consumption occurred in low- and middle-income countries (Singh et al. 2015).

In high-income countries, SSB consumption and the associated health burden are strongly and consistently linked to socioeconomic status (SES) in an inverse relationship. Individuals with lower incomes, lower levels of educational attainment, or who live in more disadvantaged areas tend to consume more SSBs (Han and Powell 2013; Pechey et al. 2013; van Ansem et al. 2014; Backholer et al. 2016; Paraje 2016; Bolt-Evensen et al., 2018; Miller et al. 2020) and are at higher risk of obesity, type 2 diabetes, and other diet-related NCDs (Agardh et al 2011; Newton et al 2017).

Evidence on these relationships in low and middle-income countries is more limited and inconsistent. In low-income and lower-middle-income countries, higher SES groups tend to consume more SSBs, and other highly-processed foods and beverages, and have a higher prevalence of obesity, type 2 diabetes and other diet-related NCDs compared with lower SES groups (Monteiro et al 2004; Dinsa et al 2012; Fruhstorfer et al 2016; Ogunsina et al 2018; Rarau et al. 2019). As national income per capita rises, the burden of unhealthy diets and associated health risks moves towards lower SES groups (Jones-Smith et al 2012; Dinsa et al 2012; Newton et al 2017).

The economic burden imposed by obesity and diet-related NCDs is staggering and is projected to rise dramatically worldwide in the coming decades if no action is taken (Bloom et al. 2011). In addition to substantial direct health care costs, obesity and NCDs reduce labor supply and productivity, human capital, and tax revenues and raise costs to employers (Nikolic, Stanciole, and Zaydman 2011). Obesity currently costs an estimated US$2 trillion annually through direct health care costs and lost economic productivity, representing 2.8 percent of global gross domestic product (GDP) (Swinburn, Kraak, and Allender 2019). Diabetes is projected to cost the global economy at least US$745 billion by 2030, with low- and middle-income countries assuming an increasing share of this burden (Bloom et al. 2011).

Although it is not the only component of diets linked to obesity and NCDs, the burden of disease attributable to SSBs is considerable given that they are a single, entirely discretionary (nonessential) component of the diet. SSBs are a discrete and well-defined category that contributes significantly to sugar and energy intakes without adding any nutritional value. In most countries, a tax on SSBs would be a tax on a significant proportion of discretionary sugar intake (Thow et al. 2018).

From a public health perspective, therefore, there is general consensus that SSBs are a key target for intervention as part of a comprehensive, evidence-based approach to improving diets and

reducing the burden of diet-related NCDs (WHO 2016a). Taxation of SSBs has been identified as an effective intervention to reduce population sugar consumption and is internationally recommended as a priority component of a comprehensive approach to preventing and controlling obesity and diet-related NCDs (WCRF 2018). The WHO added SSB taxation to its menu of recommended policy options for addressing NCDs in 2016 (WHO 2017b) and identified SSB taxes as one of several priority policy measures to address childhood obesity (WHO 2016b). An international Task Force on Fiscal Policy for Health has also recommended taxation on SSBs as a means of incentivizing healthier diets and addressing the growing burden of disease from obesity and diabetes (Task Force on Fiscal Policy for Health 2019).

Obesity and diet-related NCDs are complex, multifaceted issues that will not be solved by a single policy measure. SSB taxes need to be implemented as part of a comprehensive package of interventions aimed at tackling obesity and diet-related NCDs. These intervention packages should be based on global best practice recommendations and include, at a minimum, comprehensive regulatory approaches to food marketing and nutrition labeling – both WHO ´best buys´ for addressing unhealthy diets and preventing and controlling NCDs.

To maximise their effectiveness, SSB taxes should ideally also be implemented as part of a broad set of fiscal policies aimed at reducing consumption of goods that are harmful for health (for example, through taxes on alcohol, tobacco, and fossil fuels), and incentivising consumption of those that promote and support health (for example, through subsidies on fruits and vegetables). At the highest, level, these fiscal policies for health should be embedded within a comprehensive, whole-of-government approach to promoting public health and wellbeing.

1.3. THE ECONOMIC RATIONALE FOR TAXING SUGAR-SWEETENED BEVERAGES

SSBs impose harms on the individual consumer (negative internalities) and on others in society (negative externalities). Internalities are the long-term costs to individual health that people do not account for when making consumption decisions (Griffith, O´Connell, and Smith 2018).

Externalities generally relate to the high health care costs associated with treating obesity and diet-related NCDs, as well as lost productivity. These internal and external costs are not reflected in the prices charged for SSBs.

A person´s ability to weigh up these costs, and to make an informed decision about whether or not to purchase SSBs, is influenced by the information they have available to them (Allcott, Lockwood, and Taubinsky 2019a; Finch, Briggs, and Tallack 2020). Pervasive marketing of SSBs (and other heavily marketed food and beverage products) distorts individual choices by minimizing

the perceived costs and increasing the perceived benefits of consumption, particularly in children and adolescents (Brownell, Farley, and Willett 2009). Children and adolescents are particularly prone to prioritizing immediate satisfaction over future consequences due to individual behavioral biases and time-inconsistent preferences (Brownell, Farley, and Willett 2009). Given the addictive potential of SSBs, habitual consumers may also lack the self-control necessary to avoid them (Lloyd and MacLaren 2018).

Information in the public interest is comparatively under-provided and under-disseminated by governments (Cawley 2004). Government nutrition guidelines can at times be based on inaccurate or out-of-date evidence (Mozaffarian 2020). They have also been shown to be susceptible to industry influence (Nestle 2004), including from industry-sponsored research that sought to downplay the health risks associated with sugar consumption throughout the second half of the 20th Century (Kearns et al. 2016) and, more recently, to soften government recommendations to reduce sugar intake (Stuckler et al 2016).

Individuals may also be unable to interpret or use the information that is available to them. Product labelling, for example, may provide information on the sugar and energy content of SSBs. However, consumer understanding and interpretation of nutrition labelling is notoriously variable and requires knowledge of the role that different nutrients play in the diet, as well as the long-term implications of dietary choices for health (Campos, Doxey, and Hammond 2011; Cowburn and Stockley 2005).

Imperfect information, and negative internalities, and externalities are situations of market failure, in which market forces lead to a reduction in societal welfare. Sugar and SSBs can be considered demerit goods, along with tobacco, alcohol, and recreational drugs. Demerit goods tend to be over-produced and consumed if left to market forces because consumers under-estimate the costs and over-estimate the benefits of their consumption.

SSB taxation is an effective policy lever available to governments to correct for these market failures and raise societal welfare (Allcott, Lockwood, and Taubinsky 2019b; Finch, Briggs, and Tallack 2020; Griffith, O´Connell, and Smith 2018).

2. INTERNATIONAL EXPERIENCES WITH TAXING SUGAR-SWEETENED BEVERAGES

Sweetened, non alcoholic beverages have long been taxed for revenue generation purposes. As early as the late 18th century, in his seminal work on the 'wealth of nations', the pioneering political economist and social philosopher, Adam Smith, deemed sugar, rum, and tobacco to be 'commodities which are nowhere necessaries of life, which are become objects of almost universal consumption, and which are therefore extremely proper subjects of taxation' (Smith 1776).

Although sweetened non alcoholic beverages were already commonly marketed at the time Smith published this recommendation, their consumption rose sharply after the turn of the 20th Century, following the onset of mass production of carbonated SSBs. There has been a particularly marked rise in SSB consumption globally over the last four decades (Malik et al. 2010b).

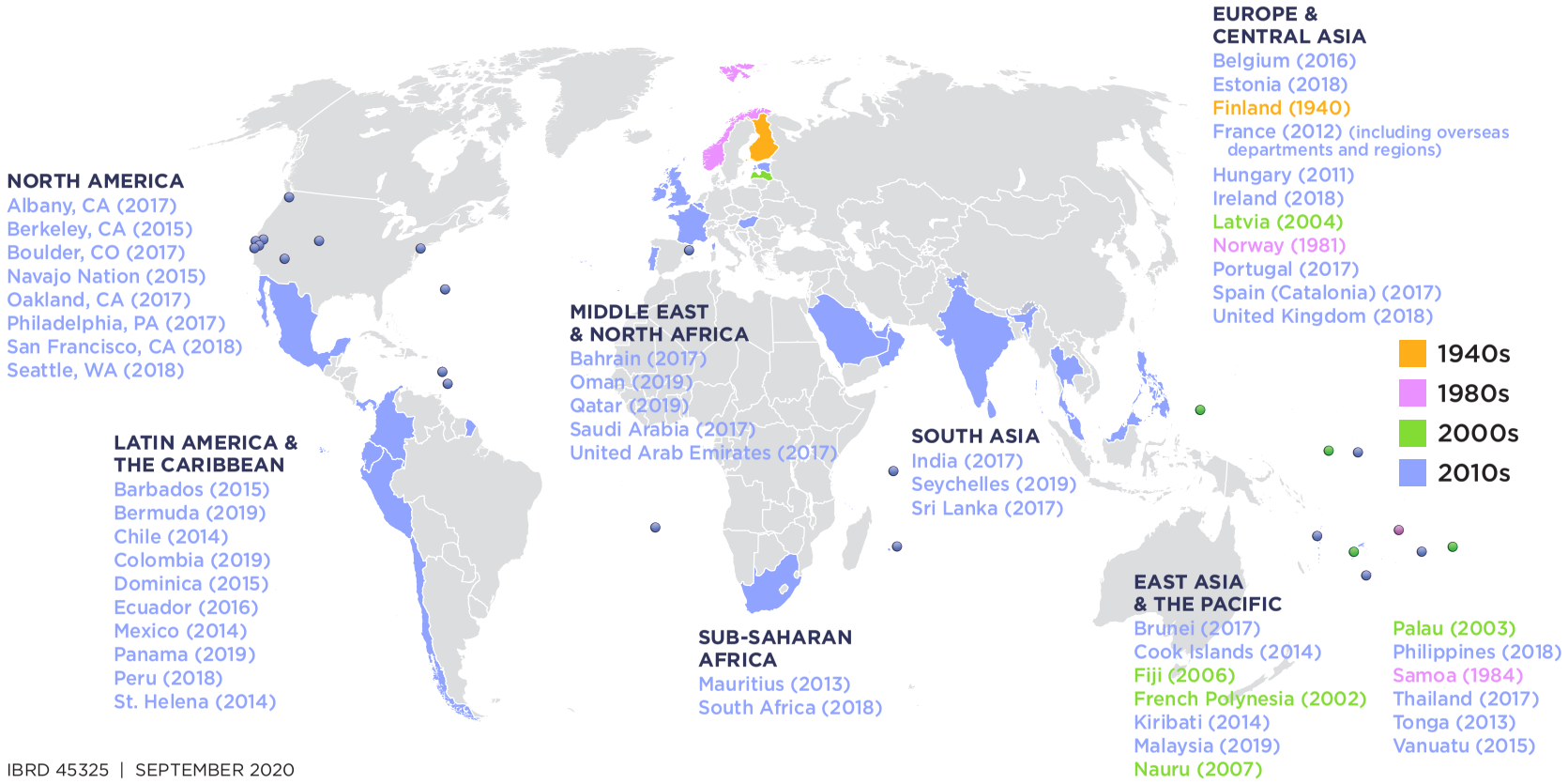
Denmark, Finland and Norway are thought to have been among the first countries to introduce taxes on SSBs for revenue purposes in the 1920s-1930s. The first health-related SSB taxes (over and above tax levels applied to other foods and beverages) were enacted in the early 2000s in several Pacific Island nations (French Polynesia, Nauru, and Samoa) (Thow et al. 2011), followed by Denmark, Finland, Hungary, and France) between 2009 and 2012.

In January 2014, Mexico enacted an excise tax on SSBs of MXN 1 per liter (approximately 10 percent) explicitly aimed at reducing their consumption and addressing the country´s high obesity/NCD burden. Mexico has amongst the highest obesity and SSB consumption rates in the world, and a powerful national SSB industry (James et al. 2019). The successful implementation and subsequent evaluation of this tax, despite fierce opposition, is now seen as a tipping point for global action on SSB taxes (Backholer, Blake, and Vandevijvere 2017; WCRF 2018). In the five years since Mexico's SSB tax came into effect, more than 30 countries have enacted new SSB taxes.

2.1. SUGAR-SWEETENED BEVERAGE TAXES AROUND THE WORLD

As of January 2020, more than 50 SSB taxes are in effect worldwide (see Figure 2 and Appendix 1). More than 40 countries have implemented nationwide taxes. There are also area/regional–level

FIGURE 2 • Countries with SSB taxes in effect by decade of (first) introduction



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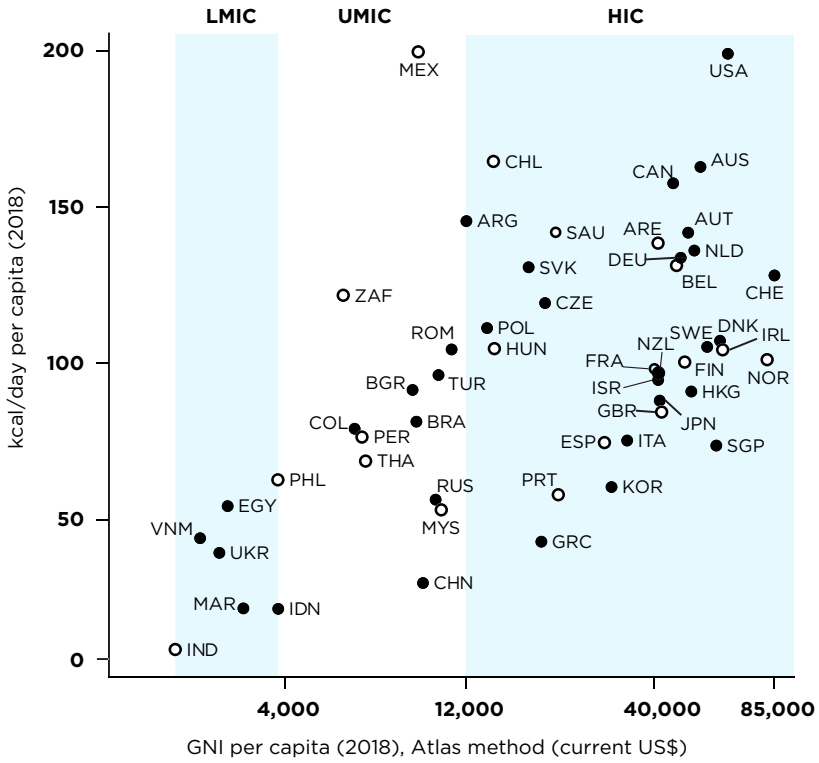
Sources: Cawley et al. 2019 (Supplemental Table 1); UNC 2019; WCRF International Nourishing Database.

taxes in effect in Spain's Catalonia region and the Navajo Nation in the United States and seven city-level taxes in effect in the United States.

The list of jurisdictions with SSB taxes now in place includes countries with some of the highest SSB consumption and obesity rates in the world: Chile, Mexico, Saudi Arabia, and a number of Pacific Island and Caribbean countries (Baker et al. 2017; Popkin and Hawkes 2016).

Yet, while the number of SSB taxes in effect continues to grow steadily, many countries with high SSB consumption rates are yet to introduce SSB taxes (Figure 3). Of the five countries with the highest SSB consumption rates in the world in 2018 (Mexico, the United States, Chile, Australia, Canada), only two—Mexico and Chile—have enacted national-level SSB taxes.

FIGURE 3 • Calories sold per capita per day from SSBs in 2018 versus Gross National Income (GNI) per capita (current US$) in 2018, in countries with an existing nationwide SSB tax or soon to adopt a tax (white), and those without a tax (black)



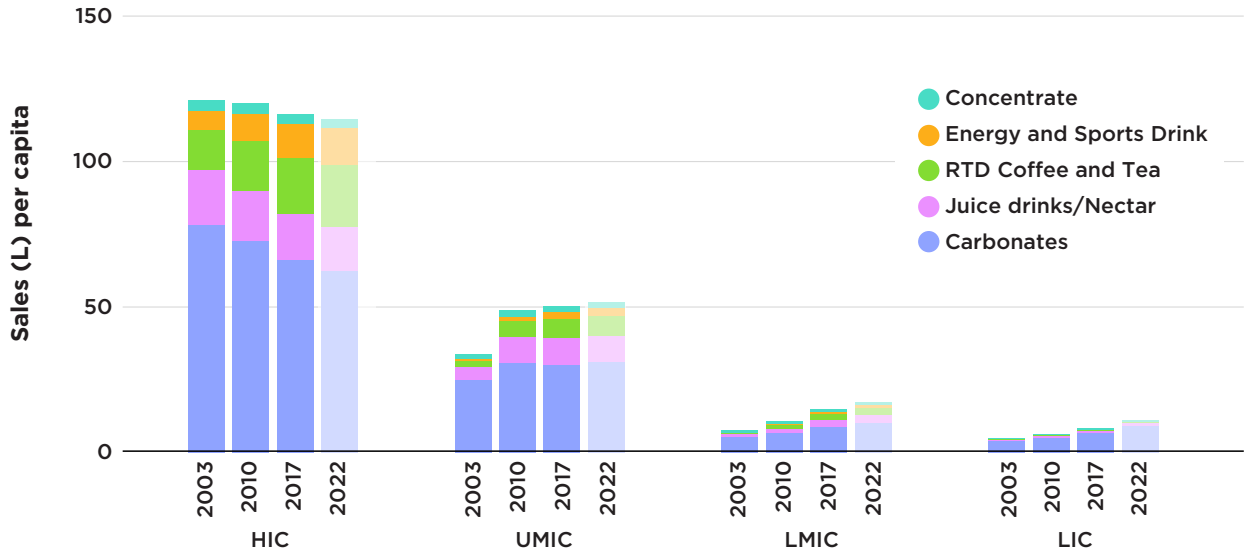
Sources: Euromonitor Passport Global Market Information Database; World Development Indicators (World Bank)

Notes: Blue and white shading indicates World Bank country income groups for 2019-20. Lower-middle-income (LMICs) are those with a GNI per capita between $1,026 and $3,995; upper-middle-income (UMICs) are those with a GNI per capita between $3,996 and $12,375; high-income (HICs) are those with a GNI per capita of $12,376 or more.

Overall, SSB sales volumes have been declining in high-income countries (HICs) in recent decades (albeit slowly and from very high levels). However, SSB sales volumes in low- and middle-income countries are showing a steady upward trend (Figure 4) and calories sold per person per day

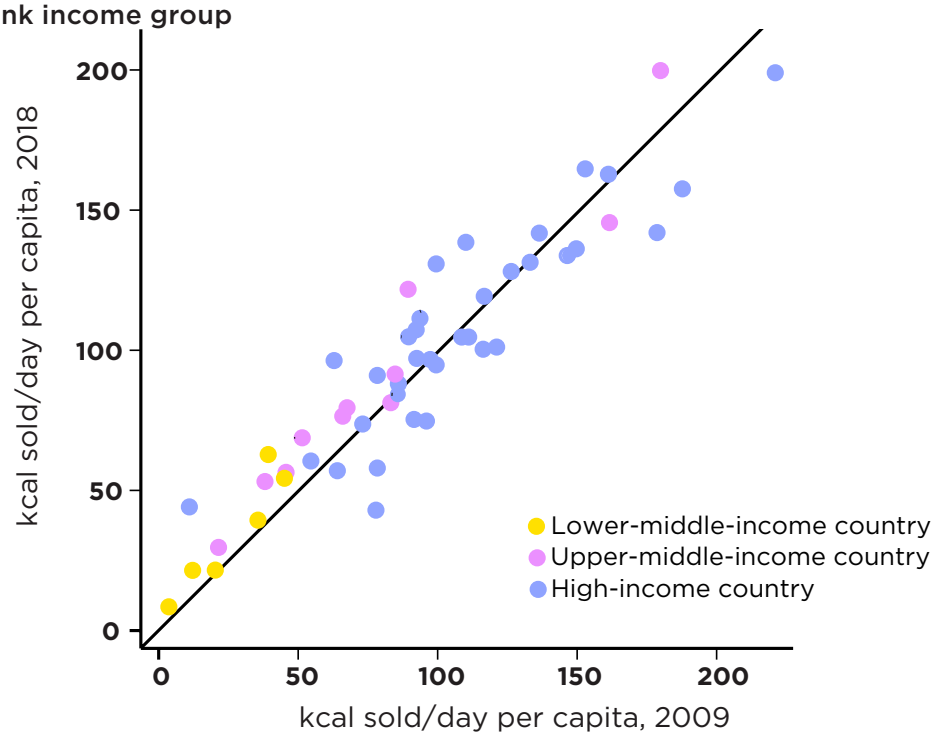
from SSBs increased in most upper- and lower middle-income countries between 2009 and 2018 (Figure 5).

FIGURE 4 • Per capita SSB sales volume (L) by World Bank income group, 2003 to 2017, with projections to 2022



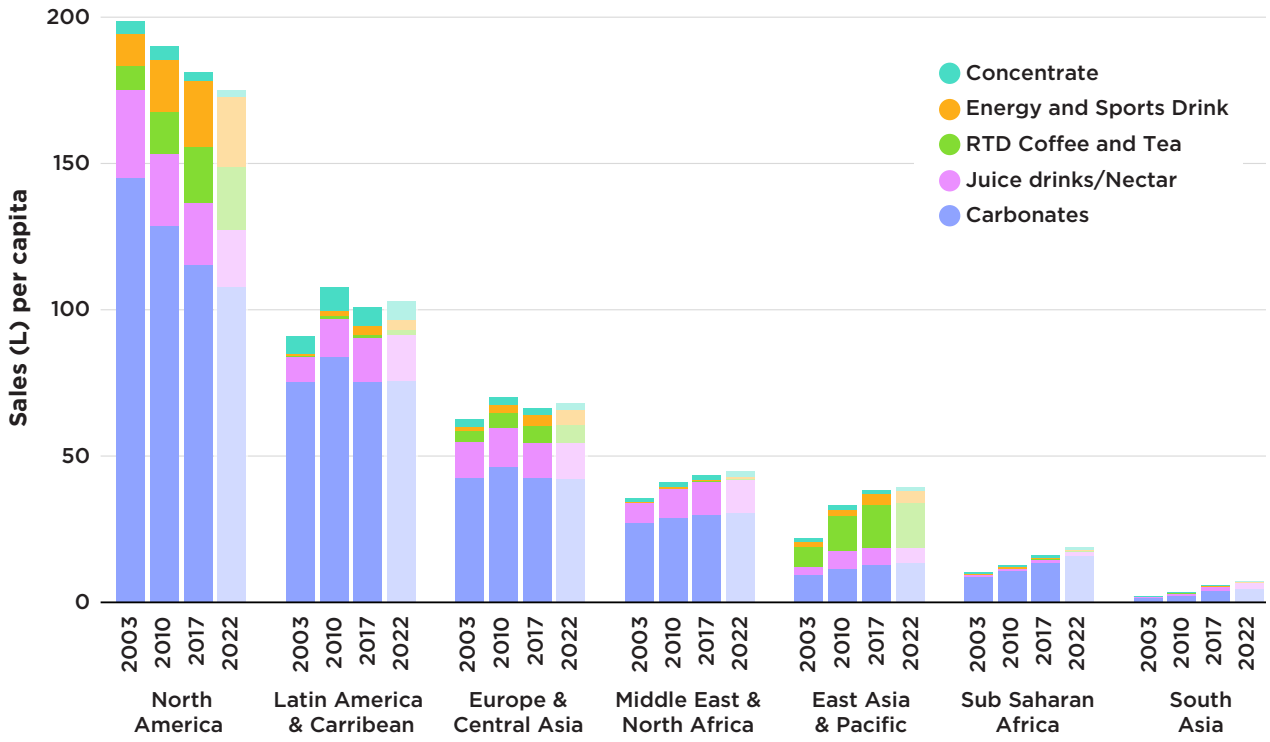
Source: Euromonitor Passport Global Market Information Database.
Note: HIC, High Income Country, UMIC, Upper-Middle Income Country; LMIC, Lower-Middle-Income Country; LIC, Low-Income Country; RTD, Ready to Drink

FIGURE 5 • Calories sold per capita per day from SSBs, 2018 versus 2009, colored by World Bank income group



By region, North America is the largest consumer of SSBs, followed by Latin America and the Caribbean. However, SSB sales volumes have been steadily declining in North America (as well as Western Europe and Australasia) while steadily rising in most other world regions, notably in East Asia, Sub-Saharan Africa, and South Asia (Figure 6).

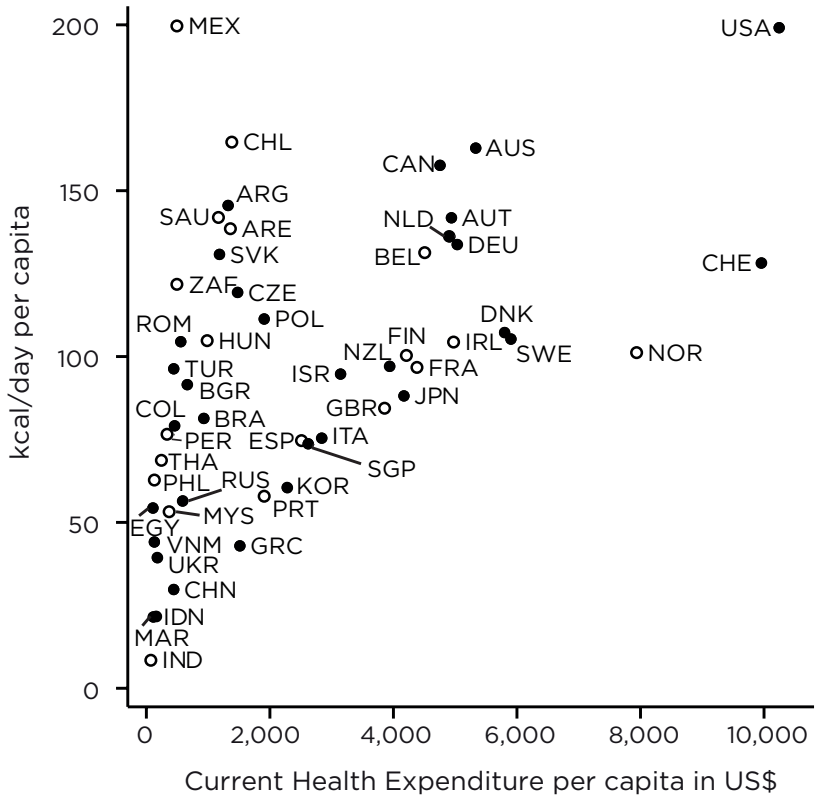
FIGURE 6 • Per capita SSBs sales volume (L) by region, 2003–2017, with projections to 2022



Source: Euromonitor Passport Global Market Information Database. Note: RTD, Ready to Drink

As SSB consumption has stagnated in mature markets in Western Europe, Australasia, and North America, transnational beverage manufacturers are increasingly targeting less saturated emerging markets to push SSB sales (Baker and Friel 2014; Marriott et al. 2019; Popkin and Hawkes 2016; Sievert et al. 2019; Singh et al. 2015; Taylor and Jacobson 2016). Many of these emerging economies are already grappling with high health care spending (Figure 7).

FIGURE 7 • Calories sold per capita per day from SSBs in 2018 versus health expenditure per capita in 2017, in countries with an existing SSB tax or soon to adopt a tax (white), and those without a tax (black)

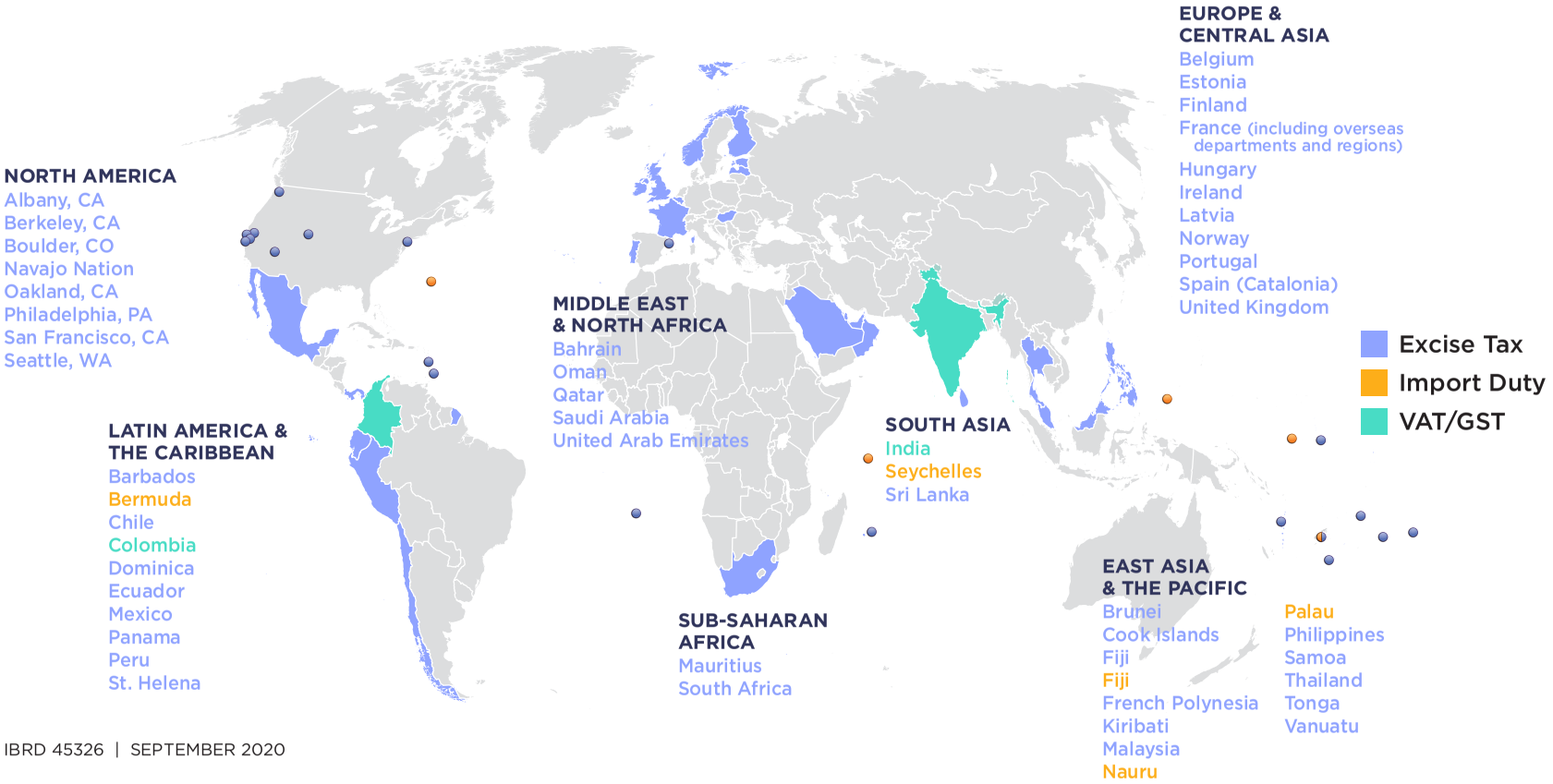


Sources: Euromonitor Passport Global Market Information Database; WHO Global Health Care Expenditure Database.

2.2. TAX INSTRUMENTS AND DESIGNS

Several instruments have been used to tax SSBs (Table 2), with most jurisdictions opting to implement excise taxes (Figure 8). A small number of countries have opted to charge raised import duties or consumption taxes on SSBs, over and above the levels applied to other food and beverage products (Figure 8 and Box 1).

FIGURE 8 • Countries with SSB taxes in effect, by tax type



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Sources: Cawley et al. 2019 (Supplemental Table 1); UNC 2019; WCRF International Nourishing Database.

Table 2 • Tax measures applied to SSBs

Instrument	Description
Excise tax	Tax levied on a particular product, typically at the point of manufacture or distribution. Can be either specific (based on volume or sugar content) or ad valorem (based on percentage of product value). Tiered and sliding-scale designs apply different specific tax rates depending on volume or sugar content.
Import tax (import tariff, import duty, customs duty)	Tax collected on imported products
VAT/GST	A VAT is a broad-based tax assessed incrementally as a percentage of price at each stage in the production and distribution chain. Considered a consumption tax because the ultimate cost of paying the tax is borne by the consumer at the point of purchase. A GST is, in most cases, a type of VAT.

As more countries implement and evaluate the effects of excise taxes on SSBs, and the evidence base grows, more innovative excise tax designs are emerging, including tiered volume-based and sugar-based designs (see Figure 9).

BOX 1 • APPLICATION OF RAISED IMPORT DUTIES OR CONSUMPTION TAXES TO TARGET SSBS

Bermuda. In October 2018, Bermuda introduced a 50 percent tax on the value of imported waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoring, and other nonalcoholic beverages, as well as syrups containing sugar or other sweetening matter. This was raised to 75 percent in April 2019.

Colombia. After a failed attempt to introduce an excise tax on SSBs in 2018, the Colombian government expanded the 19 percent VAT on SSBs to be applied to all stages of the supply chain.

Fiji. In addition to an excise tax on locally manufactured SSBs, Fiji charges a 32 percent duty on imported SSBs (raised from 15 percent in 2018 and from 10 percent in 2011). In addition to ready-to-drink SSBs, the duty is applied to imported powders and preparations to make beverages (other than milk-based drinks). Imported flavored and colored sugar syrups are taxed at 10 percent. The tax is aimed at protecting children's health and tax revenue goes to the general fund.

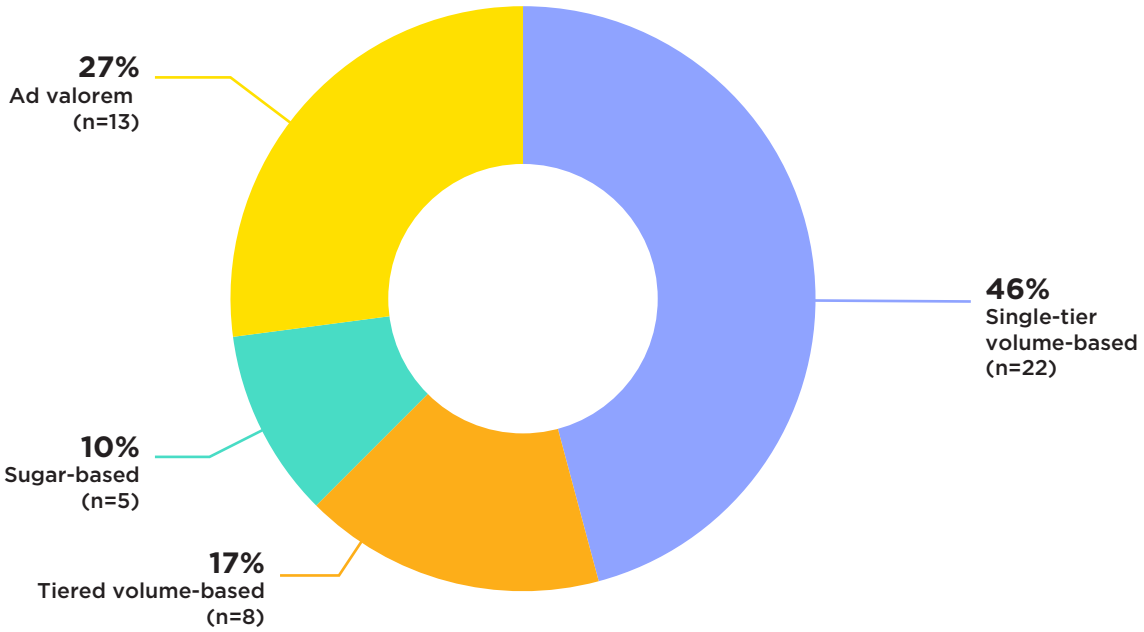
India. Since 2017, India has applied a 28 percent GST on all goods containing added sugar or other sweeteners (including SSBs), with an additional 12 percent 'cess' added to SSBs (for a total of 40 percent on SSBs). This is the highest GST rate on any products in India.

Nauru. Nauru has applied a 30 percent tax on all imported products with added sugars, including SSBs, since 2007.

Palau. Palau has levied an import tax on carbonated SSBs since 2003. It is currently levied at a rate of US$0.28175 per liter.

Sources: Cawley et al. 2019 (Supplemental Table 1); UNC 2019; WCRF International Nourishing Database (updated May 9, 2019).

FIGURE 9 • Currently implemented excise taxes on SSBs



Sources: UNC 2019; WCRF International Nourishing Database.

Almost three quarters of the excise taxes on SSBs currently in effect worldwide are specific taxes. These tend to be preferable to ad valorem taxes because they increase the price of all taxed products in the same way, are not subject to industry price manipulation, are more likely to be reflected in the shelf price of SSBs (in contrast to ad valorem taxes), are generally easier to administer, and provide more stable revenues (because revenue does not fluctuate with the price of the product) (WHO 2016a). Taxes that are visible (salient) to consumers (that is, reflected in the shelf price) are most effective at discouraging consumption. However, specific taxes need to be linked to inflation and income growth and adjusted regularly. This can be done as an annual adjustment in proportion to changes in the Consumer Price Index (CPI). Alternatively, to address increased affordability[4] risks due to per capita income growth (for example, GDP per capita growth) and inflation, international best practice is to impose taxes that are adjusted regularly to account for increases in the retail price level due to inflation and increases in average household incomes.

Ad valorem taxes need not be adjusted for inflation. However, because cheaper SSBs incur less tax (regardless of their sugar or caloric content), there is a risk with ad valorem taxes that they will incentivize consumers to shift down (down-trade) to cheaper options without reducing the volume of SSBs and sugar that they consume. One option is to combine a general volume- or sugar-based tax with an ad valorem tax on specific higher-price products, for example, energy drinks.

4 As a reference, the WHO defines tobacco affordability as the "changes in % of GDP per capita required to purchase 2000 cigarettes of the most popular brand between consecutive editions of who reports on the global tobacco epidemic."

Specific excise taxes on SSBs can be based on volume or sugar content. Single-tier volume-based excise taxes can be more straightforward to implement than sugar-based or tiered volume-based taxes and can be an efficient way to raise revenue. However, they are poorly targeted at the wide variation in sugar content between different SSBs and do not incentivize product reformulation. Almost half (47 percent) of the excise taxes on SSBs currently in effect worldwide are volume based (see Figure 4).

Taxes based on sugar content are preferable from an efficiency perspective because they target the ingredient (sugar) that causes the negative internalities and externalities linked to SSB consumption. They can incentivize consumers to switch to healthier internalities and (lower-sugar) substitutes while simultaneously incentivizing manufacturers to reformulate their products (lowering the sugar content) to avoid a higher tax rate (Grummon et al. 2019). It is recommended that jurisdictions with sufficient administrative capacity consider sugar-based taxes.

Five countries have implemented sugar-based taxes to date: the Cook Islands, France, Mauritius, South Africa, and Sri Lanka. In the Cook Islands, Mauritius, and Sri Lanka, these taxes are applied based on absolute sugar content (that is, per gram of sugar). South Africa has opted for a threshold approach, with the first 4 g sugar per 100 ml exempt from the tax. Above this threshold, the tax is levied at a rate of US¢2.1 per gram of sugar. France replaced its volume-based SSB tax in 2018 with a sliding scale design based on sugar content. The tax starts at 1 g sugar per 100 ml and rises to €0.2 per liter for drinks with more than 11 g per 100 ml.

A third, hybrid design is tiered volume-based taxes. These approximate sugar-based taxes, with a higher tax tier applied to SSBs with a higher sugar content. However, while they can incentivize consumer substitution and product reformulation between tiers, they do not incentivize substitution or reformulation within a tier (Grummon et al. 2019). Tiered taxes require a nutrient profile-based approach to identify the products to be taxed and the thresholds to be applied. As of mid-2019, tiered volume-based taxes are in effect in eight jurisdictions: Brunei, Estonia, Ireland, Malaysia, Portugal, Thailand, the United Kingdom, and Spain's Catalonia region.

2.3. OPPOSITION TO SUGAR-SWEETENED BEVERAGE TAXES

Despite the global momentum behind SSB taxes, they continue to be met with considerable opposition. There have been numerous examples around the world of proposed SSB taxes being blocked, slowed down, or lowered, as well as several cases of implemented taxes being weakened or repealed completely in the face of strong opposition. Table 3 summarizes some of these examples.

TABLE 3 • Examples of challenges faced in implementing and defending SSB taxes

Jurisdiction	SSB tax status	Challenges faced
Colombia	Proposed excise 20% excise tax not passed by Congress in 2016; existing VAT on SSBs raised in January 2019	Industry lobbying and legal challenges (including having a public information campaign supporting the tax banned), lack of congressional support and political will
Denmark	Tax on SSBs in effect since 1930s **repealed** in 2013, along with excise tax on saturated fat content of high fat foods enacted in 2011	Legal action considered by industry, negative media coverage, perception of negative impact on employment and the economy, inadequate consultation process and design. Opponents argued that there was evidence of significant leakage (cross-border shopping into Sweden and Germany).
Portugal	Tiered volume-based excise tax **successfully introduced** Feb 2017	Tax passed despite industry lobbying and threats of legal action under constitutional and international trade law
Slovenia	Bill proposing 10% excise tax **withdrawn** in 2014	Industry lobbying (on grounds that tax would force production to be relocated outside the country); lack of clear policy rationale, and lack of cross-government and public support
South Africa	12% sugar-based excise tax s**uccessfully introduced** in April 2018 after being **delayed** for a year and **lowered** from 20%	Industry lobbying and opposition on grounds that tax would negatively affect employment and economic growth; would be regressive; was not based on sound evidence; would not be as effective as voluntary initiatives and industry self-regulation
Sri Lanka	US¢50 per gram sugar excise tax in effect since November 2017 **lowered** to US¢30 per gram (40%) in December 2018	Industry lobbying, domestic politics
United States (Cook County, Illinois)	One-cent-per-ounce tax levied on sweetened soft drinks, including diet drinks, **repealed** in October 2017 after four months	Industry lobbying and lack of public support (perceived as being revenue driven and hurting small businesses)
United States (Arizona, California, Michigan, and Washington)	New city/local-level SSB taxes **banned** under state preemption laws	Industry lobbying on grounds that SSB taxes harm local businesses and jobs and adversely affect consumers (through higher grocery prices, something that did not, in fact, occur); capture of direct democracy mechanisms to ban cities and countries from introducing SSB taxes through 2030.

Industry opposition has been very effective at blocking new SSB tax proposals (Colombia being a high profile example), slowing the adoption of new taxes (as seen in South Africa), and weakening existing taxes (as seen in Sri Lanka and several Pacific Island nations). Strategies used by the beverage industry to influence policy makers and the public include: casting doubt over and distorting the established scientific evidence; constituency building and lobbying; legal action (or threat of); negative public information campaigns, policy substitution (lobbying for self-regulation and voluntary initiatives); aggressive marketing and pricing strategies; and donations to community groups, local institutions, and policy makers to buy influence (Du et al. 2018). There are many similarities between these strategies and those used by the tobacco industry in opposition to tobacco control measures (George 2019).

Legal challenges to SSB taxation policies under domestic as well as international trade and investment law have been successfully defended by a number of governments (including Portugal and South Africa). Other jurisdictions have not been so successful. Threat of legal action by the beverage industry reportedly contributed to the demise of Denmark's SSB and saturated fat taxes, for example (George 2019).

In Colombia, a public information campaign aired in 2016 to generate public support for a proposed SSB tax was censored after a lawsuit was filed by the country's leading SSB manufacturer alleging misleading advertising (Du et al 2018). Although Colombia's Constitutional Court eventually ruled in favor of consumers' right to information, the drawn-out legal process contributed to the demise of the tax proposal (NCD Alliance 2018).

In the United States, a legal strategy called preemption[5] is increasingly being used by the beverage industry to block the adoption of new city-level SSB taxes. As of 2019, state-level preemption laws were in place banning new local SSB taxes in four U.S. states—Arizona, California, Michigan, and Washington. An industry sponsored ballot initiative[6] was used in California to propose a new law that would have raised the voting threshold for approval of any new local tax: this was withdrawn in exchange for a state law barring cities and countries from introducing any new SSB taxes through 2030.

Low political and public support can also be key barriers to successfully implementing, and defending, an SSB tax. Lack of public support contributed to the repeal of SSB taxes in Cook County, Illinois, and Denmark, while repeated proposals to implement national SSB taxes have failed to gain momentum in Canada, the United States, Australia, and New Zealand—HICs with some of the highest SSB consumption rates in the world. Within the United States alone, there have been dozens of repeated failed attempts to pass SSB tax laws at the city, state, and national levels. In Philadelphia, a combination of strong political will, promised dedication of revenue to a popular goal of early childhood education, a broad and active coalition of support, and timing were fundamental to the passing of a US¢1.5 per ounce soda tax in 2016, after multiple earlier attempts had failed (Kane and Malik 2019). An intentional approach to building broad social and political support for the policy as early as possible with strong, clear messages on the rationale as well as potential use of resources can help counterbalance industry reactions.

These experiences show that governments need to be prepared to face a number of challenges in successfully introducing and defending an SSB tax and provide valuable lessons for other jurisdictions looking to develop robust and effective SSB tax policies.

5 The removal by a higher authority of a lower level of government's authority to take a specific action.
6 Some states in the United States allow voters to initiate laws through a petition process, whereby a proposed law can be submitted to the legislature with sufficient signatures on a petition.

3. EVIDENCE THAT SUGAR-SWEETENED BEVERAGE TAXES WORK

Designing and implementing a successful SSB tax requires a clear understanding of the pathways of effects through which SSB taxes can be expected to lead to specific outcomes. Figure 10 presents a theory of change outlining these pathways and the four key mechanisms through which SSB taxes operate:

1 | Increasing retail prices

2 | Raising public awareness

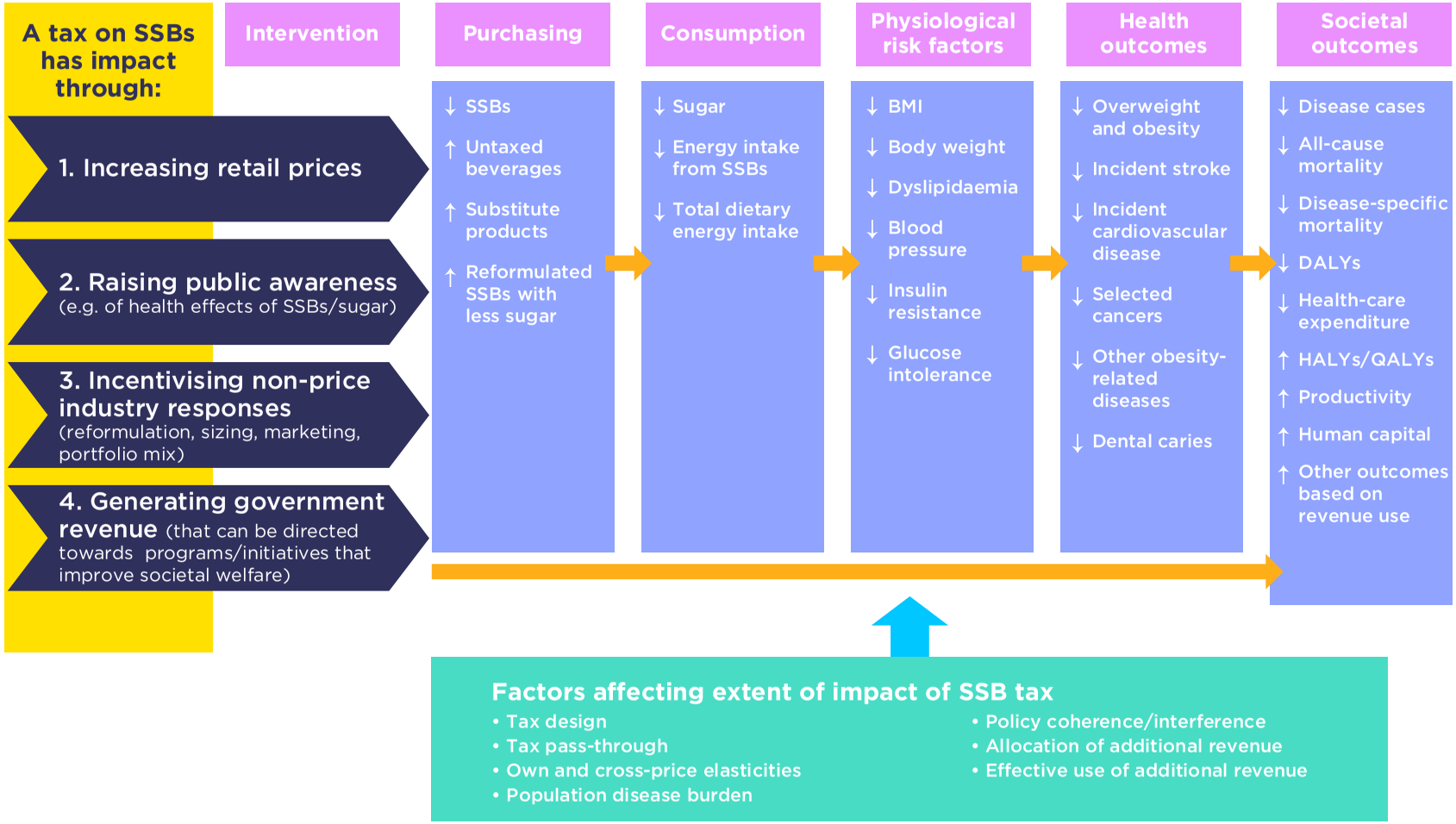
3 | Incentivizing non-price responses (such as product reformulation)

4 | Generating government revenue (that can be directed towards programs/initiatives that improve societal welfare)

Theories of change can be particularly useful for supporting understanding of complex problems such as obesity and diet-related NCDs (Hawkes et al. 2015). They are also essential to guide monitoring and evaluation. Given that the expected long-term health and societal impacts of SSB taxes are influenced by many factors and can develop gradually over extended time frames, it is not appropriate to solely evaluate the effectiveness of an SSB tax based on these impacts (WCRF 2018). Intermediary outcomes should be tracked along the pathways of effects through which SSB taxes operate.

This chapter summarises evidence on the effects of SSB taxes. Section 3.1 overviews the four key mechanisms through which SSB taxes work and the evidence behind them. Section 3.2 reviews international evidence of the effects of SSB taxes on intermediary outcomes along the theory of change presented in Figure 10.

FIGURE 10 • Theory of change and four key mechanisms through which SSB taxes work



Note: DALY, Disability-Adjusted Life Year; HALY, Health-Adjusted Life Year; QALYs, Quality-Adjusted Life Year

3.1. HOW SUGAR-SWEETENED BEVERAGE TAXES WORK

3.1.1. INCREASING RETAIL PRICES

Health-related taxes encourage consumers to reassess their preference for a product (in this case, SSBs) against its cost at the point of purchase (Hawkes et al. 2015). This is achieved by increasing prices of target products while minimizing scope for substitution of equally (or more) unhealthy untaxed products.

These are a number of important concepts that underpin this mechanism of impact (Box 2). The extent to which an SSB tax is passed on to consumers in the form of retail price increases is known as the pass-through rate. It is typically a function of the relative elasticities of supply and demand in a particular context.

Elasticity of supply (the expected proportional change in product supplied for a given percentage change in price) is shaped by the competitiveness of the local manufacturing and retail markets (Cawley et al. 2019). Elasticity of demand (that is, the expected proportional change in product demand for a given percentage change in price) is shaped by a wide range of factors, including local preferences, incomes, advertising, availability of acceptable substitutes, and ease of cross-border shopping (avoiding the tax by shopping outside of the taxing jurisdiction) (Cawley et al. 2019).

Estimated own-price elasticities of demand for SSBs vary widely but are generally within the range of 0.79–1.37, with a mean of approximately −1.0 (Andreyeva, Long, and Brownell 2010; Briggs et al. 2013a; Cabrera Escobar et al. 2013; Eyles et al. 2012; Guerrero-López, Molina, and Colchero 2017; Powell et al. 2013; Teng et al. 2019). This suggests that, in theory, a 10 percent increase in retail price should lead to a reduction in purchases of about 10 percent. That is, demand is sensitive to changes in price and a tax on SSBs can be expected to lead to changes in purchasing behaviors.

The extent of elasticity, however, varies. SSBs are nonessential goods and consumers may consider substituting taxed SSBs for other untaxed drinks (such as bottled water or diet drinks). However, these drinks may not be seen to be sufficiently close (perfect) substitutes. When demand is imperfectly elastic—as tends to be the case with SSBs—a tax is generally partially, but less than fully, passed on to consumers. In other words, retail prices can be expected to rise, but by less than the full amount of the tax.

The extent to which supply chain actors (manufacturers, distributors, and retailers) choose to partially (or fully) absorb the costs of a tax to keep prices competitive is also influenced by the

extent of competition in SSB and retail markets, and existing pricing strategies and profit margins (Cawley and Frisvold 2017). If a tax is fully absorbed by actors within the supply chain, the net effect on retail prices (i.e. on the consumer) will be zero. In some cases, producers and retailers may also opt to cross-subsidize a SSB tax by raising prices on other products (such as LCSBs) and not fully shifting the tax on SSBs on to consumers (Duckett and Swerissen 2016).

BOX 2 • ELASTICITIES OF SUPPLY AND DEMAND

Elasticity of supply is the expected proportional change in product supplied for a given percentage change in price.

A key parameter for consumers' reaction to prices is the **price elasticity of demand**.

Own-price elasticity of demand is a measure of the responsiveness of demand for a product to a change in the price of that product, that is, the percentage change in the consumed quantity of a product resulting from a 1 percent increase in its own price.

- When demand for a product is perfectly elastic, quantity demanded falls to zero if the price rises even slightly.
- When demand is perfectly inelastic, the same quantity will be demanded regardless of the price.
- When demand is imperfectly elastic, sales can be expected to fall somewhat, but less than if demand was perfectly elastic (Cawley et al. 2019).

Cross-price elasticity of demand is a measure of the responsiveness of demand for one product to a change in the price of other products (that is, the percentage change in the consumed quantity of one product resulting from a 1 percent change in the price of another product).

There is strong, consistent evidence that SSB taxes increase retail prices of taxed beverages (Backholer et al. 2016; Cabrera Escobar et al. 2013; Cawley et al. 2019; Colchero et al. 2015; Nakhimovsky et al. 2016; Powell and Leider 2020; Powell, Leider, and Léger 2020a,b; Roberto et al. 2019; Silver et al. 2017; Thow, Downs, and Jan 2014). Variations in the magnitude of this price effect between jurisdictions reflect differences in tax size and structure, range of products covered, and characteristics of the taxed jurisdiction (Griffith et al. 2019), as well industry response strategies.

Table 4 summarizes evidence on the price effects of implemented taxes for which evaluation evidence is available. Overall pass-through of evaluated taxes has ranged from below 50 percent in Berkeley (California), Chile, and the United Kingdom (and in one study of the previous volume-based excise tax on SSBs in France) to almost 100 percent in Philadelphia (Pennsylvania) and Mexico (for certain beverage categories, retailers, and locations).

Some evaluations have identified significant geographic variations in pass-through within taxing jurisdictions—by region, neighborhood, and distance from the border of the taxing jurisdiction. In Mexico, for example, pass-through rates ranged from less than 10 percent in the south of the

country to more than 100 percent in the north of the country (that is, overshifting of the tax) in the first year (Colchero et al. 2015). In Philadelphia, pass-through has been higher in locations farther from the tax boundary (where retailers are less likely to lose business to cross-border shopping) (Cawley and Frisvold 2017).

Pass-through can also vary between retailers, beverage categories, and package sizes. Pass-through has been higher on products in smaller sizes in both Mexico (Colchero et al. 2015) and South Africa (Stacey et al. 2019). In Berkeley and Philadelphia, large chain retailers have opted to pass through more of the taxes than independent stores (Roberto et al. 2019; Silver et al. 2017).

An initial evaluation of South Africa's Health Promotion Levy (effective April 2018) indicates that there has been similar price increases among high-sugar carbonated SSBs and low-sugar carbonates (which are technically subject to the tax but incur an effective tax rate of zero), as well as between non-reformulated and reformulated beverages (Stacey et al. 2019). This is the first sugar-based (as opposed to volume-based) SSB tax for which evaluation evidence is available, and these early results suggest that more complex tax designs may induce less predictable pricing responses from industry across their portfolios.

Evaluation of Saudi Arabia's 50 percent excise tax on carbonated SSBs and 100 percent excise tax on energy drinks (introduced in June 2017, with an additional 5 percent VAT on all goods introduced in 2018), found high but incomplete (76 percent) pass-through rates in the first year, followed by a 121 percent increase following the introduction of VAT (Alsukait 2020). Evaluations are yet to emerge of similar taxes (50 percent excise tax on carbonated SSBs and 100 percent on energy drinks) since adopted in several other countries in the region—the United Arab Emirates in 2017 and Qatar and Oman in 2019.

Evaluation of the U.K. Soft Drink Industry Levy (SDIL) indicates a pass-through rate of 31 percent on SSBs in the high-levy category and negative pass-through (that is, a drop in prices) on SSBs in the low-levy category (Scarborough, Adhikari, and Harrington 2020). The relatively low pass-through may be at least partially explained by the fact that the U.K. SDIL, while essentially an excise tax, is framed as a levy charged on manufacturers (rather than consumers) of SSBs, with an explicit aim to encourage reformulation rather than price changes. The SDIL was announced more than two years before coming into effect, to give manufacturers time to reformulate to reduce the amount of sugar in their portfolios before the tax came into effect.

TABLE 4 • Evidence that SSB taxes are passed through to consumers as higher retail prices

Jurisdiction	Tax design	Effects on prices
Barbados	10% ad valorem tax on all drinks with added sugars	Alvarado, Kostova, and Suhrcke 2017: 59% average pass-through in first 6 months
Catalonia	€0.12 per liter excise tax on high-sugar SSBs with >8 g sugar per 100 ml, €0.08 per liter on SSBs with 5–8 g sugar per 100 ml, paid by the distributor, 100% pass-through mandated	Vall Castelló and Lopez Casanovas 2020: 100% pass-through for most SSBs subject to tax in first 4 months and >100% pass-through (over-shifting) for some larger package sizes (Roughly 5–10% price increase on cans and 20% on 2 liter bottles)
Chile	18% ad valorem tax on high-sugar SSBs with >6.25 g sugar per 100 ml (real tax increase of 5% from existing 13% rate), 10% on SSBs with <6.25 g per 100 ml (real tax decrease of 3% from existing 13% rate)	Caro et al. 2018: 40% pass-through on carbonated high-sugar SSBs (average 2% price increase) and 78% pass-through on noncarbonated high-sugar SSBs (average 3.9% price increase). Price of ready-to-drink low- or no-sugar-sweetened drinks increased 1.5%. Price of low- or no-sugar-sweetened drink concentrates dropped 6.7% Nakamura et al. 2018: 38% pass-through on price of high-sugar drinks (average 1.9% price increase). Price of low sugar drinks increased 1.7%
France	€0.11 (US¢12) per 1.5 L volume-based excise tax (approximately 10%) on all drinks with added sugars or artificial sweeteners. (Replaced January 2018 with sliding scale sugar-based excise tax)	Berardi et al. 2012: 100% pass-through on SSBs, 94% pass-through on fruit drinks, and 62% pass-through on flavored waters in first 6 months Etilé, Lecocq, and Boizot-Szantai 2018: 40% average pass-through on SSBs and low- or zero-calorie sweetened beverages (LCSBs)
Mexico	MXN 1 per liter volume-based excise tax (approximately 10%) on all drinks with added sugars	Colchero et al. 2015: >100% pass-through on SSBs and 30% pass-through on low/zero-calorie beverages—heterogeneity by geography and product size (higher pass-through on smaller packages)
Saudi Arabia	50% excise tax on carbonated SSBs, 100% excise tax on energy drinks implezmented 2017. 5% VAT on all consumption goods added in 2018	Alsukait 2020. 76% pass-through on carbonated SSBs in 2017, rising to 121% after addition of VAT in 2018
South Africa	ZAR 0.021 (US¢0.15) per gram sugar over 4 g per 100 ml (approximately 12%)	Stacey et al. 2019: 68% pass-through on carbonated SSBs. Higher pass-through on smaller package sizes (almost 100%) and 50% pass-through on larger package sizes. No change in price of noncarbonated SSBs or untaxed beverages (bottled water and 100% fruit juice). Similar increase in price of low-sugar carbonates (taxed at an effective rate of zero) and high-sugar carbonates
United Kingdom	£0.24 per liter (US¢34) on drinks with >8 g total sugar per 100 ml; £0.18 per liter (US¢25) for drinks with 5–8 gram total sugar per 100 ml.	Scarborough, Adhikari, and Harrington 2020: 31% pass-through for SSBs in the high-levy category and negative pass-through (-59%) in low-levy category. Very high pass-through for own-brand SSBs (260% in high-levy category and 381% in low-levy category)

Jurisdiction	Tax design	Effects on prices
United States (Berkeley)	US¢1 per ounce volume-based excise tax on SSBs and calorically sweetened syrups or concentrates used to produce them	Variation in pass-through, including by distance from city border, retailer type, and package size: • Falbe et al. 2015: 47% pass-through for SSBs overall in first 3 months post-implementation and higher (69%) for carbonated SSBs • Cawley and Frisvold 2017: 43% pass-through for SSBs overall in first 3 months post-implementation • Silver et al. 2017: 100% pass-through in large chain supermarkets and gas stations, partial pass-through in pharmacies, negative pass-through in independent stores and gas stations in first 12 months
United States (Cook County)	US¢1 per ounce tax on SSBs and LCSBs	Powell, Leider, and Léger 2020a: 119% average pass-through for all taxed beverage, representing average 34% price increase. Higher pass-through (147%) for energy drinks
United States (Oakland)	US¢1 per ounce on SSBs	Marinello et al. 2020: 82% pass-through for bottled SSBs sold through fast-food outlets in first 12 months (8% effective price increase). Lower (29%) pass-through for fountain SSBs (nonsignificant effective price increase) Cawley et al. 2020: Approximately 60% pass-through in retail stores in first 12 months. Higher (100%) pass-through in pharmacies and in chain stores versus independent retailers. Lower pass-through in socioeconomically disadvantaged areas
United States (Philadelphia)	US¢1.5 per ounce volume-based excise tax on SSBs, LCSBs, and syrups and concentrates used to produce them	Roberto et al. 2019: 100% pass-through in large chain pharmacies and partial pass-through in large chain supermarkets and mass merchandise stores in the first year
United States (Seattle)	US¢1.75 per ounce on SSBs with at least 40 calories per 12 oz	Powell and Leider 2020: 59% pass-through (average price rise of US¢1.03 per ounce)

3.1.2. RAISING PUBLIC AWARENESS

A well-designed, and highly visible, SSB tax (or tax proposal) can also discourage excess consumption by raising awareness about the detrimental health effects of sugar and SSBs. This is also referred to as the signaling effect of a tax. In fact, it can be argued that one of the most valuable contributions of taxation on unhealthy products might be the signal that it can give to both the consumer and the entire food system that the government is concerned about the health status of the population (Sassi 2016).

This effect on public awareness can start while an SSB tax proposal is still being considered and debated—often many months, or years, before a tax eventually comes into effect. Even when a tax proposal is ultimately unsuccessful, the process can still have had a measurable effect on public awareness and opinion, or change consumption behavior, which can lay the groundwork for future attempts.

Unfortunately, very little evaluation evidence is available on how implemented SSB taxes (or unsuccessful proposals) have influenced public awareness. In Mexico and Hungary, increased knowledge and awareness resulting from the broad-based health taxes implemented in these countries were identified by consumers as a reason for reducing their consumption of SSBs (Alvarez-Sanchez et al. 2018; WHO and National Institute for Food and Nutrition Science 2015). Research in Northern California found extremely high levels of public awareness of harms from SSBs and desire to reduce consumption, both in a city that has passed an SSB tax (San Francisco) and in a second city (San Jose) near four cities that had passed SSB taxes (Padon et al. 2020).

3.1.3. INCENTIVIZING NON-PRICE INDUSTRY RESPONSES

How industry responds to an SSB tax plays a key role in determining its effectiveness. A well-designed SSB tax can incentivize product reformulation (to reduce volume or sugar content of SSBs) as well as other industry responses aimed at minimizing tax burden, including portfolio renovations to lower share of high-sugar (high-tax) beverages, reduced marketing of high-sugar beverages, reduced high-sugar product sizes, and introduction of new (no- or low-sugar) products (Briggs et al. 2017). Tiered taxes and sugar-based taxes have the greatest potential to incentivize reformulation because they encourage manufacturers to lower the sugar content of their portfolios to avoid higher tax rates.

When the United Kingdom's tiered SDIL was announced in 2016, it was presented as an incentive for the industry to reformulate existing products to remove sugar, reduce portion sizes, and promote new or existing low-sugar alternatives (Briggs et al. 2017). The announcement triggered immediate and significant reformulation in the sector, with an 11 percent reduction in sugar levels (measured in sales weighted average grams per 100 ml) observed in 2016–2017, before the tax was even introduced (Public Health England 2018b; Roache and Gostin 2017). Evidence indicates that the reformulation response has been sustained under the tax, with a 28.8 percent average reduction in sugar content of SSBs over 2015–2018 (Public Health England 2019). This is significantly (tenfold) greater than the 2.9 percent average reduction in sugar content of foods covered by the United Kingdom's voluntary sugar reduction program over the same period and surpasses the voluntary program's target to reduce the sugar content of foods that contribute most to children's sugar intakes by 20 percent by 2020 (from 2015 levels) (Public Health England 2019).

Interrupted time series analysis of the SDIL also found evidence of significant reformulation (to lower sugar content) and portfolio renovation (replacement of drinks with lower-sugar varieties) in the three years following announcement of the tax (Scarborough, Adhikari, and Harrington 2020). The proportion of SSBs with sugar levels above the lower levy threshold (>5 g per 100 ml) fell by 34 percentage points between September 2015 and February 2019, from an expected

level of 49 percent to 15 percent. There was little change in product sizes or the number of SSB products available to consumers.

Briggs et al. (2017) predicted that product reformulation leading to a 30 percent reduction in sugar content of high-sugar drinks sold in the United Kingdom would have significant long-term health benefits, independent of the effects of an SSB tax on retail prices or SSB market share (through changes in product marketing, changing product size, or the introduction of new mid-sugar and low-sugar products). A 30 percent reduction in sugar content of high-sugar drinks would reduce obesity prevalence by roughly 1 percent (144,383 fewer people) and lead to 19,094 fewer cases of type 2 diabetes and 269,375 fewer cases of decayed, missing, or filled teeth per year (Briggs et al. 2017).

Portugal's tiered volume-based tax also appears to have incentivized a significant reformulation response. A preliminary evaluation reported a 41 percent reduction in volume of beverages consumed in the highest tax tier (more than 80 g sugar per liter) and a 15 percent reduction in sugar intakes from beverages covered by the tax, both attributed to reformulation (Goiana-da-Silva et al. 2018a).

An early evaluation of South Africa's Health Promotion Levy on SSBs found significant evidence of reformulation in response to the sugar-based tax, with many brands reformulating their products to contain less than 4 g sugar per 100 ml (the sugar content level above which the tax is applied) (Stacey et al. 2019). Some very large reductions in sugar content were identified, with many products with over 10 g of sugar per 100 mL reformulated to well below 5 g of sugar per 100 ml. The findings from this evaluation suggest that the smaller but constant incentive for marginal reformulation created by per gram sugar-based taxes (as opposed to the large marginal incentives for reformulation associated with tiered tax designs such as in the United Kingdom) can be sufficient to motivate meaningful changes in sugar content (Stacey et al. 2019).

3.1.4. GENERATING GOVERNMENT REVENUE

As a ´fiscal policy for health´, the primary purpose of SSB taxes is to reduce consumption, rather than being a revenue-raising measure. However, SSB taxes are generally predicted to generate revenue and the way in which this additional revenue is used can have an important influence on the welfare-raising potential of a tax. The potential of SSB taxes to raise additional revenue may also be used alongside the public health argument to boost public and political support for a tax.

In theory, it is possible for an SSB tax to reduce government revenue – for example, in a situation where there is high elasticity of demand and a SSB tax is added to high baseline taxes. However, there is no evidence of this from implemented taxes.

Modelling studies have consistently predicted significant revenue-generating potential from SSB taxes (see Table 6). In practice, experiences with implemented SSB taxes have shown that revenue generation is difficult to predict with any precision, particularly when a tax is successful in reducing sales and/or incentivizing product reformulation. Revenue collected from the U.K. SDIL, for example, in the first six months was reportedly less than half what had been forecast due to the extent of reformulation that took place before the tax had even been implemented (Vandevijvere 2019).

Revenue generated by South Africa's SSB tax, on the other hand, exceeded forecasts despite evidence that it has incentivized significant reformulation, generating ZAR 2 billion (US$140 million, or around US$2.5 per capita) in the first year (approximately 0.15 percent of South Africa's total tax revenue for FY19) (Stacey et al. 2019).

Portugal's tiered volume-based tax, which also appears to have incentivized significant reformulation, generated €80 million (US$90 million, or around US$9 per capita) in the first year (Goiana-da-Silva 2018a, 2018b), while Hungary's public health product tax generated a more modest HUF 61.3 billion (US$200 million, or around US$5 per capita per year) over the first four years (WHO and National Institute for Food and Nutrition Science 2015).

In general, in advocacy for an SSB tax, it is prudent to avoid making overly optimistic claims for revenue generation. Failure to generate predicted revenue can be used later by opponents to undermine support for a tax. Although Philadelphia's SSB tax has generated more than US$200 million in its first three years (City of Philadelphia 2019), it failed to meet revenue expectations despite several adjustments to forecasts. The framing of this tax as a primarily revenue-generating, rather than public health, measure has been credited with helping to generate broad public and political support. However, it is has also opened it up to criticism over its revenue-generating performance.

3.2. EVIDENCE OF EFFECTS OF SUGAR-SWEETENED BEVERAGE TAXES

3.2.1. EFFECTS ON SALES/PURCHASES OF SUGAR-SWEETENED BEVERAGES

Taxing SSBs for health purposes is aimed at disincentivising purchasing and consumption. Most evaluations of implemented SSB taxes have assessed effects on either sales or purchases of SSBs as measures of changes in consumption.

SSB sales data measure the volume of SSBs sold from the supplier side and are typically derived from electronic point of sale data. It can be accessed from individual stores, companies, brands,

industry groups, or private market research companies (such as Euromonitor, Nielsen, or Kantar).

Purchase data measure the volume of SSBs purchased by consumers, typically derived from household panels (in which participating households are given a handheld scanner and asked to scan the barcode of every individual product that they purchase) (Bandy et al. 2019). Data are collected on the product name, pack size, price, and location of the retailer where the items were purchased. Household panel data are typically accessed from private market research companies (such as Nielsen).

Neither sales nor purchase data measure exactly what individuals have consumed; however, they are significantly less resource intensive to collect than consumption data and can provide a reasonable picture of population-level changes in consumption, provided the data sets are sufficiently large (Bandy et al. 2019). Because these data can be continuous and capture a larger-scale picture, they may provide more accurate representations of consumption than small-scale studies of intake, most of which do not have sufficient power to detect modest changes. At the same time, commercial data sets are unable to capture changes in consumption of noncommercial substitutes such as tap water and home-brewed tea and coffee.

Available evidence for the effects of implemented SSB taxes on sales and/or purchases is summarized in Table 5. Overall, this evidence demonstrates that, when an SSB tax is passed through, it can reduce sales and purchases of taxed beverages in the taxing jurisdiction. However, the size of this effect varies widely. Observed reductions in sales of taxed beverages after one year range from approximately 4 percent in Barbados (Alvarado et al. 2019) to 39 percent in Philadelphia (Roberto et al. 2019) and 58 percent for energy drinks in Saudi Arabia (Alsukait 2020).

In general, higher taxes (such as those in Philadelphia and Saudi Arabia) have been associated with larger declines in sales. This aligns with evidence from simulation studies, as well as randomized controlled trials (RCTs) investigating the effects of food price changes on consumer behaviors, indicating that price increases of at least 20 percent applied to a broad range of beverages are needed to effectively shift behavior (Afshin et al. 2017; Waterlander, Ni Mhurchu, and Steenhuis 2014, 2019).

There is some evidence that implemented taxes have had differential effects on SSB sales/purchasing in different socioeconomic groups. Again, these effects appear to be context specific. Lower-income groups have been more sensitive to SSB price changes in Mexico (Colchero et al. 2017; Colchero, Molina, and Guerrero-López 2017) and Berkeley (Falbe et al. 2016), while higher-income groups appear to have been more responsive to Chile's new tiered volume-based tax (Caro et al. 2018; Nakamura et al. 2018). In the United Kingdom, total sugar sales from soft drinks in the first two years of the SDIL decreased similarly across all socioeconomic groups (20–29 percent reductions), with the exception being the lowest socioeconomic group (9 percent reduction) (Public Health England 2019). In Mexico, greater reductions in taxed beverage purchases have

been observed among higher SSB consumers (households with higher SSB purchase levels pre-tax) (Ng et al. 2018).

Available evidence suggests that ad valorem taxes applied as a percentage of the retail price may be less effective than specific excise taxes, because they can encourage consumers to switch to cheaper beverages without reducing actual intake (down-trading). This appears to have been the case in Barbados following the introduction of a 10 percent ad valorem excise tax (Alvarado et al. 2019).

There is also some evidence that tiered volume-based designs can be more effective than single-tier designs in influencing consumer sales/purchasing, as well as incentivizing industry reformulation. Early evidence from Chile indicates that the shift to a two-tiered volume-based design (with high-sugar SSBs taxed at 18 percent and low-sugar SSBs taxed at 10 percent) has been effective in shifting purchasing away from high-sugar SSBs toward low-sugar and no-sugar substitutes in the first year (Caro et al. 2018; Nakamura et al. 2018).

The three-tiered volume-based SDIL in the United Kingdom has also been effective at shifting purchasing toward lower-sugar drinks in its first two years. Under this tax, high-sugar SSBs (those with more than 8 g sugar per 100 ml) are subject to a higher tax rate than SSBs with less sugar (those with 5–8 g sugar per 100 ml), and SSBs with the lowest sugar content and diet drinks (those with less than 5 g sugar per 100 ml) are exempt from the tax (Griffith et al. 2019). According to Public Health England (2019), sales of drinks with no tax attached increased by 35.5 percent between 2015 and 2018, while sales of drinks containing 5–8 g sugar per 100 ml dropped by 45.5 percent and sales of high-sugar drinks dropped by 35.1 percent (Public Health England 2019). The proportion of sales of SSBs subject to the tax (that is, >5 g sugar per 100 ml) dropped from 35 percent in 2015 to 20 percent in 2018 (Public Health England 2019).

Another study that linked SSBs sales and nutrient composition data reported a 30 percent drop in volume of sugars sold per capita per day from soft drinks (equivalent to a 4.6 g, or roughly one teaspoon, reduction per capita per day) in the United Kingdom between 2005 and 2018, despite a 5 percent increase in total volume sales of soft drinks in per capita terms over the period (Bandy et al. 2020). The majority of this reduction in sugar sales was due to reformulation rather than changes in purchasing behaviors. Six of the top ten SSB manufacturers in the United Kingdom had reformulated more than half the products in their portfolio between 2015 and 2018, with the mean sugar content of soft drinks declining by 34 percent over the period. There has been a 50 percent decrease in the volume sales of products that are subject to the SDIL. The total volume sales of soft drinks that are subject to the SDIL fell by 50 percent, while volume sales of low- and zero-sugar drinks rose by 40 percent (Bandy et al. 2020).

Given the very recent implementation of most health-related SSB taxes, available evaluation evidence generally does not extend beyond the first 12 months post-tax. However, evaluations

over the first two years of Mexico's MXN 1 per liter (approximately 10 percent) excise tax show that reductions in SSBs sales and purchases, along with concurrent increases in purchases of bottled plain water, were sustained and grew in the second year of the tax (Colchero et al. 2016a, 2016b, 2017; Colchero, Molina, and Guerrero-López 2017).

TABLE 5 • Evidence of effects of implemented SSB taxes on sales/purchases of taxed and untaxed beverages

Jurisdiction	Effective tax rate	Pass-through	Effects on volume sales/purchases of taxed and untaxed beverages
Barbados	10%	59%	Alvarado et al. 2019: Average weekly sales of all SSBs down 4.3% and carbonated SSBs down 3.6% in first year. Sales of expensive SSBs down 7.2% and sales of mid-range SSBs increased 6.5%. Sales of non-SSBs increased 5.2%, with bottled water increasing 7.5%
Catalonia	5–10% on small package sizes (cans) and 20% on large products (2 liter bottles)	100%	Vall Castelló and Lopez Casanovas 2020: 7.7% average reduction in sales of taxed beverages in one major supermarket chain (representing 10% of the Catalan market) in first 4 months. Greater reduction in higher-income regions, in regions with higher obesity rates, and for products with highest sugar content
Chile	10%/18% (two-tier)	10–20%	Nakamura et al. 2018: 22% reduction in monthly per capita purchases of high-sugar SSBs (>6.25 g sugar per 100 ml) by volume over the first year, with no significant changes in purchasing of low-sugar and untaxed drinks Caro et al. 2018: 3.4% reduction in monthly per capita purchases of high-sugar SSBs and 11% increase in sales of low-sugar drinks[a]
Mexico	Approximately 10%	30–100%	Colchero et al. 2016a: Per capita sales of SSBs decreased 7.3%, in first 2 years post-tax (6.2% in first year, 8.7% in second year); plain water increased 5.2%. Colchero et al. 2016b: Purchases of taxed beverages decreased by an average of 6% (−12 ml per capita per day) and decreased at an increasing rate up to a 12% decline by December 2014. Higher reductions in lower SES households (17% decrease at the end of the first year). 4% increase in untaxed beverage purchases, mainly driven by increase in purchases of bottled plain water. Colchero et al. 2017: Purchases of taxed beverages decreased by 8.2% over first two years on average (−5.5% in 2014; −9.7% in 2015). The lowest socioeconomic group had the largest decreases in taxed beverages in both years. Untaxed beverage purchases increased 2.1% in first two years. Colchero, Molina, and Guerrero-López 2017: Purchases of SSBs decreased 6.3% in the first year. Reductions were higher among lower-income households, residents living in urban areas, and households with children. 16.2% increase in water purchases that was higher in low- and middle-income households, in urban areas, and among households with adults only. Ng et al. 2018: Greatest reductions in SSB purchases observed among high-purchasing households, particularly low-SES households. Pedraza et al. 2019: SSB purchases decreased by 19% in the first year post-tax, 14% in the second year, and 2% in the third year. Reductions in purchases in first 2 years post-tax were statistically significant only in supermarkets and traditional stores but not in other store types (including convenience stores, wholesalers, and pharmacies).

Jurisdiction	Effective tax rate	Pass-through	Effects on volume sales/purchases of taxed and untaxed beverages
Saudi Arabia	50% on carbonated SSBs and 100% on energy drinks	76–121%	Alsukait 2020: 41% reduction in sales of carbonated SSBs and 58% reduction in energy drink sales between 2016 and 2018
United Kingdom			Public Health England 2019: 10% increase in sales of all soft drinks but 22% reduction in total sugar sales from soft drinks after 2 years, reflecting shift toward lower sugar drinks—35.1% decrease in sales of high-sugar drinks (>8 g per 100 ml), 45.5% decrease in sales of drinks containing 5–8 g sugar per 100 ml, and 35.5% increase in sales of drinks containing less than 5 g sugar per 100 ml Greatest increase in sales of all soft drinks (22%) and smallest decrease in total sugar sales from soft drinks −7%), in lowest socioeconomic group
United States (Berkeley)	Approximately 10%	69%	Silver et al. 2017: 9.6% reduction in SSB sales in first year and 3.5% increase in untaxed beverage sales with 15.6% increase in plain bottled water
United States (Cook County – repealed)	Approximately 10%	119%	Powell, Leider, and Léger 2020b: 27% reduction in sales of taxed beverages in first 4 months; 21% when corrected for cross-border shopping. Varied by beverage type and package size
United States (Oakland)	Approximately 10%	60–80%	Cawley et al. 2020: Small, nonsignificant decrease in self-reported SSB purchases
United States (Philadelphia)	Approximately 15%	Up to 100%	Roberto et al. 2019: 51% reduction in sales of taxed beverages in first 12 months and 39% when corrected for cross-border shopping
United States (Seattle)	Approximately 15–20%	59%	Powell and Leider 2020: 22% reduction in sales of taxed beverages in first 12 months; higher in family- versus individual-size beverages (31% versus 10%) and for carbonated SSBs (29%) compared to all other beverage types

Note: a. Differences in the magnitude of this effect between the two evaluations available are likely due to differences in the statistical models used (Caro et al. 2018; Nakamura et al. 2018).

3.2.2. EFFECTS ON SALES/PURCHASES OF OTHER PRODUCTS

In addition to shifting demand for targeted beverages, SSB taxes can also influence demand for substitute or complementary products. Sensitivity of demand for one product to a change in the price of other products is known as cross-price elasticity of demand. Evidence on cross-price elasticities of demand with respect to SSBs is generally more limited and less clear than that for own-price demand elasticities, with a high degree of variability.

Available evaluations of implemented SSB taxes have consistently identified increases in sales and purchases of untaxed beverages, particularly for plain bottled water (see Table 5). A particularly significant substitution effect toward plain water has been observed in Mexico (Colchero et al. 2016a, 2016b).

Many jurisdictions with SSB taxes in place have opted to exclude low- or no-calorie ('diet') soft drinks (LCSBs) sweetened with sugar substitutes (such as aspartame, sucralose, and saccharin)

from the tax base, to encourage switching toward these beverages. Other jurisdictions (such as Chile, France, India, Philadelphia, and Portugal) have opted to include LCSBs within the tax base. There is some evidence linking LCSBs to health risks, although it remains limited and suffers from several weaknesses (see Box 2).

Modelling studies have also predicted the compensatory effects of hypothetical SSB taxes. In the United Kingdom, a 20 percent tax on SSBs (excluding LCSBs) is predicted to have pronounced compensatory increases in consumption of multiple beverages, including diet drinks, tea and coffee, milk, and fruit juice (Briggs et al. 2013a). In the United States, simulations of a national SSB tax have predicted that the greatest compensatory effect would be a switch to fruit juices, while LCSB consumption is predicted to decrease along with SSBs (Lin et al. 2011; Dharmasena and Capps 2012).

Determining cross-price elasticities of demand for a range of products with respect to SSBs, in a particular context, is important to predict the potential effects of a SSB tax in shifting demand toward other products. Ideally, SSB taxes will encourage consumers to switch to other healthier beverage options (particularly safe drinking water). However, substitution may be for an equally or more unhealthy product, weakening the overall effectiveness of the tax. For this reason, taxing a broad set of energy-dense, nutrient-poor foods and beverages, including SSBs, may have a greater and more consistent impact on overall diets and health outcomes (Smith et al. 2018; Thow et al. 2018). While they are more challenging to develop and involve a greater administrative burden, broad-based taxes on a range of unhealthy food products alongside SSBs have the potential to make substantially greater impacts on population diets and health.

BOX 2 • EVIDENCE ON LOW/ZERO-CALORIE ('DIET') SWEETENED BEVERAGES AND HEALTH

Replacing SSBs with LCSBs can reduce dietary energy intake and therefore may have weight control benefits in the short term. However, the long-term health effects of these sweeteners remain unclear. There is some limited evidence from prospective cohort studies to suggest that high intake (typically one or more servings a day) of LCSBs is positively associated with waist circumference (Fowler, Williams, and Hazuda 2015), type 2 diabetes risk (de Koning et al. 2011), and CVD-related and all-cause mortality (Mullee et al. 2019; Malik et al. 2019).

Possible biological mechanisms for these adverse health effects include habituation toward sweetness and weakening of learned response (that is, the intense sweetness of artificial sweetness interferes with a person´s ability to regulate his/her food intake and weight), stimulation of insulin response, and alterations in gut microflora linked to insulin resistance (Malik et al. 2019).

However, the current evidence base is limited and the adverse associations may also be at least partly explained by residual confounding and reverse causation (that is, diet drinks are more likely to be consumed by individuals who are already at high risk for health problems). More research in this area is needed. In the meantime, the evidence supports existing public health messages to reduce intake of SSBs and to prioritize substitution with plain water.

Early results from evaluations of broad-based taxes on unhealthy foods implemented in Mexico and Hungary indicate promising reductions in sales and consumption of taxed products (see Box 3). A study that modelled the potential impact on BMI and obesity prevalence of hypothetical 20 percent price increase scenarios on high-sugar snacks and SSBs in the United Kingdom predicted that a 20 percent price increase of SSBs alone would have the lowest impact, while a 20 percent price increase of high-sugar snacks and SSBs combined would have the greatest impact (Scheelbeek et al. 2019).

BOX 3 • BROAD-BASED TAXES ON UNHEALTHY FOOD AND BEVERAGES

Hungary. A public health product tax (effective September 2011) applies to the salt, sugar, and caffeine content of various categories of pre-packaged, ready- to-eat foods as well as SSBs. The tax is applied at varying rates. SSBs are taxed at a rate of 7 forints per liter (around US$0.024), concentrated syrups used to sweeten drinks are taxed at HUF 200 forints (around US$0.70) per liter. Prepackaged sugar-sweetened products are taxed HUF 130 (around US$0.45) per kilogram. The tax also applies to products high in salt, including salty snacks with more than 1 g salt per 100 g, condiments with more than 5 g salt per 100 g, and flavorings more than 15 g salt per 100 g. One year post-tax, taxed and untaxed processed food consumption had dropped 3.4 percent on average (Biró 2015). Three years post-tax, self-reported consumption of taxed products had dropped on average 24 percent for SSBs and 14 percent for taxed foods as a result of increases in both prices and awareness. The tax generated HUF 61.3 billion (US$200 million) in the first four years—a 105 percent realization of estimated revenue (WHO and National Institute for Food and Nutrition Science 2015).

Mexico. In addition to a MXN 1 per liter (approximately 10 percent) excise duty applied to SSBs, Mexico applies an ad valorem tax of 8 percent (effective January 2014) to energy-dense foods (equal to or more than 275 calories per 100 g) classified as nonessential (including potato chips [crisps], confectionery, chocolate and cacao-based products, ice cream, and cereal-based products with high sugar content). Together, these foods accounted for an estimated 20 percent of total energy intakes and 62 percent of added sugar intakes in Mexico pre-tax (Batis et al. 2017). In the first two years post-tax, purchases of taxed food products declined by 5 percent on average, with greater reductions in urban areas (−6.9 percent). Untaxed food purchases increased 2.8 percent on average, suggesting potential substitutions (Hernández et al. 2019).

Source: Adapted from WCRF Nourishing Framework Database.

3.2.3. EFFECTS ON CONSUMPTION

As noted earlier, most evaluations of implemented SSB taxes have used either SSB sales or purchase data to measure consumption. There is limited evidence on the effects of implemented SSB taxes on self-reported consumption. This will be best measured for national taxes with large national studies with consistent measurement of dietary intake trends over time.

In small taxing jurisdictions such as cities, measuring the effects of SSB taxes on actual consumption may diverge from sales because experiences from implemented taxes show that a proportion of

consumers respond to SSB taxes by increasing cross-border shopping (Cawley et al. 2019). With national taxes or larger areas covered, the importance of cross-border shopping is diminished. The extent of cross-border shopping and its impacts on SSB tax effectiveness depends on a range of factors, including geography; local consumers' price elasticity of demand; the opportunity cost of consumers' time; the competitiveness of the local retail market; and even factors such as the public transportation network, extent of vehicle ownership, and density and location of retailers, both inside the taxing jurisdiction and in neighboring areas (Cawley et al. 2019). Consumption surveys can capture intakes from these cross-border purchases, although so too can sales data that include border areas or self-reported or receipt-based purchases. However, the research on effects on consumption of city SSB taxes may be less pertinent for national taxes for which cross-border shopping is less relevant.

The small number of consumption surveys (typically telephone, web-based, or street intercept surveys) that have been conducted to evaluate the effects of SSB taxes on consumption have generally identified positive effects, although the magnitude varies.

In Hungary, self-reported consumption of SSBs dropped by 20 percent, and consumption of energy drinks dropped by 28 percent between 2012 and 2014 (WHO and National Institute for Food and Nutrition Science 2015).

In Barcelona (Catalonia), prevalence of self-reported regular consumers of SSBs fell by 39 percent on average in low-income neighborhoods in the first year post-tax (as compared to control households in Madrid), with a 29 percent fall in the prevalence of consumers of soft drinks, a 70 percent fall in that of fruit drinks, and 77 percent fall in that of energy drinks (Royo-Bordonada et al. 2019). No change was observed in the prevalence of consumers of untaxed beverages. The main reason given for changing consumption patterns was the increase in price, followed by increased awareness of the health effects of SSBs (Royo-Bordonada et al. 2019).

In Berkeley, Falbe et al. (2016) found a 21 percent reduction in self-reported SSB consumption in low-income neighborhoods after four months; Silver et al. (2017) found a nonsignificant reduction in self-reported SSB consumption in a citywide representative sample after one year; and Lee et al. (2019) found a more than 44 percent self-reported reduction in SSB consumption frequency in demographically diverse neighborhoods after three years.

In Philadelphia, self-reported SSB consumption reduced by 40 percent and energy drinks by 64 percent, while water consumption increased 68 percent in the first two months post-tax (Zhong et al. 2018). After one year, however, no significant impacts of the tax on consumption were observed (Zhong et al. 2020).

Similarly, no significant changes in self-reported frequency of consumption of SSBs, or consumption of added sugars, were reported in Oakland one year post-tax (Cawley et al. 2020).

3.2.4. EFFECTS ON LONGER-TERM OUTCOMES

Econometric studies have modelled the potential impacts of SSB taxes on health and disease outcomes by combining price elasticity estimates with data on SSB sales and/or consumption and health outcomes/burden of disease. While these studies are not perfect (the strength of evidence from simulation studies is strongly influenced by the data and assumptions incorporated into the models), they have consistently shown that SSB taxes can lead to significant reductions in DALYs, prevalence and incident rates of obesity and type 2 diabetes, and dental caries, provided the tax rate is sufficiently large (Table 6). Importantly, most estimate that SSB taxes would save significant health care expenditures.

The majority of studies that have modelled the potential distributional impacts of SSB taxes have found that lower-income groups can be expected to experience the greatest health benefits (Eyles e al. 2012; Finkelstein et al. 2010; Sharma et al. 2014). However, Saxena et al. (2019b) predicted that the PHP 6 per liter excise tax on SSBs enacted in the Philippines would avert more deaths in higher-income than lower-income quintiles. Bourke and Veerman (2018) similarly predicted that a hypothetical US¢30 per liter tax on SSBs in Indonesia would benefit the health of higher-income quintiles significantly more than lower-income quintiles.

No significant differences in health impact by income group have been predicted from hypothetical 20 percent taxes on SSBs in the United Kingdom (Briggs et al. 2013a) and Ireland (Briggs et al. 2013b). However, both these studies predicted that the greatest health impact from these taxes would be in younger age groups (under 30 years), who are the largest consumers of SSBs (Briggs et al. 2013a, 2013b). Briggs et al. 2013a hypothesized that this effect may in part explain why the effects of the hypothetical 20 percent tax on SSB consumption are relatively large compared to a relatively modest reduction in obesity prevalence (1.3 percent)—obesity rates are higher among older adults who are the smallest consumers of SSBs.

While the health impacts may benefit lower-income groups in the long-term, a common concern about SSB taxes is that they are regressive; that is, the tax burden falls disproportionately on those with lower incomes. While price increases resulting from SSB taxes might represent a large short-term burden on low-income households, the largest benefits are also likely to accrue to individual low-income consumers who respond strongly to price changes (Sassi et al. 2018). The financial burden on low-income individuals should also be considered more broadly than just increased spending on SSBs. In the long run, reduced SSB consumption and SSB-associated diseases will lead to individuals spending less on medical costs and earning more from increased years of productive life. When an extended cost-benefit analysis was undertaken to calculate the net income effect of an SSB tax in Kazakhstan, including the effect on household spending on SSBs, out-of-pocket spending on SSB-related medical costs, and productivity from increases in working life years, lower-income households benefitted more than higher-income deciles from the tax in relative terms in the long run (World Bank 2019).

TABLE 6 • Modelling evidence on long-term impacts of SSB taxes

Country	Tax scenarios and predicted outcomes
Australia	Veerman et al. 2016: 20% price increase on SSBs predicted to • Reduce average daily SSB consumption by 12.6%; • Reduce obesity prevalence by 2.7% in men and 1.2% in women with larger BMI reductions in younger age groups; • Avert 800 new cases of diabetes each year; • Reduce prevalent cases of CHD by 4,400, cases of incident stroke by 1,100, and avert 1,606 deaths after 25 years; • Gain 112,000 HALYs for men, 56,000 for women; • Generate health care cost savings of AUD 609 million over lifetime of population; and • Raise AUD 400 million in tax revenue annually. Lal et al. 2017: 20% tax on SSBs predicted to • Gain 175,300 HALYs, with highest gains in lower-SES groups; • Generate health care cost savings of AUD 1,733 million over lifetime of population—highest out-of-pocket cost savings (as % household expenditure) in most disadvantaged groups; and • Raise AUD 642.9 million tax revenue annually.
India	Basu et al. 2014: 20% tax on SSBs predicted to • Reduce overweight and obesity prevalence by 3.0% and type 2 diabetes incidence by 1.6%, with largest relative effect expected among young rural men.
Indonesia	Bourke and Veerman 2018: US¢30 per liter tax on SSBs predicted to • Benefit higher-income quintiles significantly more than lower-income quintiles; • Reduce cases of overweight and obesity by 15,000 for women and 12,000 for men in the lowest-income quintile and by 417,000 for women and 415,000 for men in the highest-income quintile; • Avert 63,000 cases of diabetes in the lowest quintile and 1,487,000 in the highest over 25 years. Similar magnitudes observed for stroke and ischemic heart disease (IHD); and • Raise US$920 million revenue in first year and US$27.3 billion over 25 years.
Ireland	Briggs et al. 2013b: 10% tax on SSBs predicted to • Reduce adult obesity prevalence by 1.3% (9,900 adults)—similar reductions for men and women and similar for each income group but greater in young adults than older adults (for example, 2.9% in adults ages 18–24 years versus 0.6% in adults ages 65 years and over).
Philippines	Saxena et al. 2019b: PHP 6 per liter (approximately 13%) tax predicted to • Avert 5,913 deaths related to diabetes, 10,339 deaths from IHD, and 7,950 deaths from stroke over 20 years; • Avert more deaths in higher-income than lower-income quintiles; • Generate US$627 million (PHP 31.6 billion) health care cost savings over 20 years; and • Raise PHP 41.0 billion (US$813 million) in revenue per year.
South Africa	Manyema et al. 2014: 20% tax on SSBs predicted to • Reduce obesity prevalence by 3.8% in men and 2.4% in women Saxena et al. 2019a: 10% tax on SSBs predicted to • Avert 8,000 type 2 diabetes-related premature deaths over 20 years, with most deaths averted among the third and fourth income quintiles; • Generate ZAR 2 billion (US$140 million) subsidized health care cost savings over 20 years; and • Raise ZAR 6 billion (US$450 million) in tax revenue annually.

Country	Tax scenarios and predicted outcomes
United Kingdom	Briggs et al. 2013a: 20% tax on SSBs predicted to • Reduce obesity prevalence by 1.3% (180,000 people), with greatest reduction in young people and no significant differences between income groups. A 10% tax would be predicted to have half the impact—0.6% reduction in obesity prevalence.
United States	Finkelstein et al. 2010: 20% and 40% taxes on SSBs predicted to • Reduce SSB consumption by 7.0 and 12.4 kcal per day per person, respectively; • Result in mean weight losses of 0.32 (0.09) and 0.59 (0.16) kg per year per person, respectively, with greatest weight reductions in middle-income households; and • Lead to 60% greater weight reductions when covering all SSBs, compared to carbonates only; 40% tax would generate US$2.5 billion in tax revenue. Andreyeva, Chaloupka, and Brownell et al. 2011: Nationwide US¢1 per ounce (approximately 10%) tax on SSBs predicted to • Reduce annual per capita SSB consumption by 24% and • Generate US$79 billion tax revenue over 5 years. Wang et al. 2012: Nationwide US¢1 per ounce (approximately 10%) tax on SSBs predicted to • Reduce consumption by 15% among adults ages 25–64; • Prevent 2.4 million diabetes person-years over 10 years, 95,000 CHD events, 8,000 strokes, and 26,000 premature deaths; • Generate US$17 billion health care cost savings over 10 years; and • Raise US$13 billion in annual tax revenue. Long et al. 2015: Nationwide US¢1 per ounce (approximately 10%) tax on SSBs predicted to • Reduce SSB consumption by 20%; • Reduce mean BMI by 0.16 among young people, 0.08 among adults, in the second year; • Avert 101,000 DALYs over 10 years; • Gain 871,000 quality-adjusted life years (QALYs) over 10 years; • Generate US$23.6 billion health care cost savings over 10 years; and • Raise US$12.5 billion tax revenue over 10 years. Wilde et al. 2019: Nationwide US¢1 per ounce (approximately 10%) tax on SSBs predicted to • Avert 4,494 lifetime myocardial infarction (MI) events and 1,540 lifetime total IHD deaths per million adults; • Gain 3.4 million lifetime QALYs; • Generate US$45 billion lifetime health care cost savings; and • Generate cost saving after just one year of implementation.

3.3. SUMMARY OF EVIDENCE

In summary, SSB taxes work to reduce consumption and improve population health through four key mechanisms:

- Increasing retail prices;
- Raising public awareness (signaling);
- Incentivizing non-price industry responses that reduce sugar intake; and
- Generating revenue (which can be directed toward programs and services that improve population health).

Growing evidence from evaluations of implemented taxes clearly demonstrates that SSB taxes (a) increase retail prices, (b) reduce sales and purchases, and (c) reduce consumption of taxed beverages. The magnitude and nature of these effects vary according to tax size and structure, range of products covered, and characteristics of the taxing jurisdiction. Within jurisdictions, effects vary between population groups, geographic locations, retailer types, beverage categories, and package sizes.

There is very little evaluation evidence available on the awareness-raising (signalling) effect of SSB taxes, although this mechanism is thought to be important.

Evidence is emerging on the effect of SSB taxes on encouraging non-price industry responses such as product reformulation. Tiered tax designs implemented in the United Kingdom, Portugal, and South Africa have been shown to be effective at encouraging reformulation and reducing sugar content.

Larger taxes, taxes that cover entire countries, and taxes that incentivize reformulation are likely to have more significant impact on consumption and greater health benefits.

Substitution effects can have a significant influence on the overall effectiveness of an SSB tax and tend to be context and population specific. Broad-based taxes that raise prices on a wide range of unhealthy products minimize scope for substitution of equally (or more) unhealthy untaxed products and have the greatest potential to improve overall diet quality and population health.

Evidence on the long-term effects of SSB taxes on health outcomes is currently limited to simulation studies. These have consistently shown that SSB taxes can lead to significant reductions in DALYs, prevalence and incident rates of obesity and type 2 diabetes, and dental caries, provided a sufficiently large tax rate is applied.

Finally, evaluation evidence indicates that revenue generated by SSB taxes can be considerable although difficult to predict. Promoting the revenue-generating potential of a proposed SSB tax can help generate public and political support for the measure, but raising societal welfare through reduced SSB consumption should be the primary focus. Failure to generate predicted revenue may be used later by opponents of such taxes to undermine support.

4. CONCLUSION

A number of governments around the world are either considering or in the process of developing an SSB tax. This brief summarizes international evidence on SSB tax implementation and effectiveness to support policymakers as they make these decisions.

Taxing SSBs is best viewed one important component of a comprehensive, whole-of-society approach to tackling unhealthy diets and NCDs. No single strategy alone can solve the problem.

From a public health perspective, SSBs are a key target for intervention given the considerable disease burden attributable to them, and their entirely discretionary role in the diet. From an economic perspective, SSBs are an appropriate target for corrective taxes (raised over and above a blanket goods and services-type tax) due to the substantial internalities and externalities they impose on individuals and societies that are not reflected in the sale price.

There is strong and growing evidence demonstrating that SSB taxes are an effective, cost-effective, and progressive policy instrument available to governments to reduce disease burden, generate domestic revenue, improve productivity, and raise societal welfare. Over the long-term, low-income consumers, and children and young people, are likely to benefit the most from SSB taxes.

International experiences show that (often considerable) opposition to SSB taxes can be successfully countered with broad-based support and advocacy, and a careful and considered approach to tax framing and design, using strong evidence-based reasoning and attention to due process.

The optimal design of an SSB tax will vary between jurisdictions. However, emerging evidence demonstrates some ´best practice´ principles. Larger taxes, taxes that cover entire countries (as opposed to city- or state-level taxes), and taxes that incentivize industry reformulation are likely to have the greatest impacts. Tiered volume-based and sugar-based excise tax designs appear to be most effective because they can incentive both consumer behaviour change and industry reformulation. Broad-based taxes that raise prices on a wide range of unhealthy food products can minimize scope for substitution of equally (or more) unhealthy untaxed products.

To maximise population health impacts, taxes on SSBs and other unhealthy products should ideally be implemented as part of a package of evidence-based measures aimed at improving diets, including restrictions on unhealthy food marketing, clear and transparent nutrition labelling, and reallocating public investments to incentivise production and consumption of healthy foods.

GLOSSARY

Ad valorem tax: Tax based on a percentage of the value of a good or service, rather than being a fixed rate or by weight or quantity.

Body mass index (BMI): A person's weight in kilograms (kg) divided by height in meters squared (m2).

Cross-border shopping: Purchasing of goods or services outside of a taxing jurisdiction to avoid the tax.

Demand elasticities: Sensitivity of demand for a good in response to changes in other economic variables, such as price or income:

- Own-price elasticity of demand is a measure of the responsiveness of demand for a product to a change in the price of that product (that is, the percentage change in the consumed quantity of a product resulting from a 1 percent increase in its own price).
- Cross-price elasticity of demand is a measure of the responsiveness of demand for one product to a change in the price of other products (that is, the percentage change in the consumed quantity of one product resulting from a 1 percent change in the price of another product).
- Income elasticity of demand is a measure of the responsiveness of demand for a good or service to a change in income. Goods with positive income elasticities (that is, >0) are considered 'normal' goods, which means that demand rises with income. Goods with income elasticities between 0 and 1 are considered 'necessities' (for example, staple foods and beverages), while goods with income elasticities > 1 are considered 'luxury or superior' goods (rise in income results in proportionately greater rise in demand). Goods with negative income elasticities (that is, demand drops as income rises) are considered 'inferior' goods (for example, public transportation, instant coffee, canned foods, supermarket 'own brand' products).

Demerit goods: Products (such as tobacco and alcohol) and activities (such as gambling) that are considered harmful to the individual and typically impose negative externalities.

Disability-adjusted life year (DALY): Number of years lost due to ill health, disability, or premature death within a given population.

Excise tax: Tax levied on a particular product, typically at the point of manufacture or the point of entry for imported goods. Can be either specific, based on quantity (volume or sugar content), or ad valorem, based on the percentage of product value or maximum retail price (MRP).

Externalities: Costs or benefits of an activity (typically production or consumption of a good or service) that affect other parties and are not reflected in the prices charged.

Fiscal policy: A government's revenue (taxation) and spending policy.

Glycemic index (GI) value: A measure that ranks foods on a scale of 0 to 100 based on how quickly they are expected to raise blood glucose levels. Does not take into account the quantity of carbohydrate in a food.

Glycemic load (GL): A measure that estimates how much a serving of carbohydrate-containing food will raise a person's blood glucose levels by taking into account both the quality (GI value) and quantity of carbohydrate.

Goods and services tax: Broad-based consumption tax levied on most goods and services sold for domestic consumption. Is, in most cases, a type of value added tax (VAT) (see Value added tax) because it is assessed incrementally as a percentage of price at each stage in the production and distribution chain, but the ultimate cost of the tax is borne by the end consumer.

High-sugar/low-sugar/no-sugar beverages: Categories used to distinguish SSBs by their sugar content (that is, determine tax tier thresholds) in tiered tax designs (see Tiered tax below). The sugar content level of each category varies between taxing jurisdictions.

Internalities: The long-term benefit or cost to individuals that they do not consider when making the decision to consume a good or service.

Levy: A charge, such as a tax, fine, or other fee, that is imposed on something.

Low/zero-calorie ('diet') sweetened beverages (LCSBs): Low-calorie (´diet´) versions of SSBs that are sweetened with intensely sweet, low/zero-calorie sweeteners (such as aspartame, sucralose, saccharin, and stevia) in place of caloric sweeteners (such as sugar and high-fructose corn syrup). Also referred to as artificially sweetened beverages (ASBs) and nonnutritive sweetened beverages (NNSBs).

Market failure: A situation in which the free market fails to allocate goods and services efficiently, often leading to a net social welfare loss.

Noncommunicable diseases: Diseases that are not passed from person to person. Also known as chronic diseases because they are typically of long duration and, generally, slow progression. The four main types of NCDs are cardiovascular diseases (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as chronic obstructive pulmonary disease and asthma), and diabetes.

Pass-through rate: The percentage of a tax that is passed on to consumers in the form of higher retail prices.

Preemption: When a higher level of government overrules the authority of a lower level of government to act.

Premature mortality: Potential years of life lost before the expected age of death in a specific population.

Price elasticity of supply: The expected proportional change in a product supplied for a given percentage change in price.

Prospective cohort study: Type of longitudinal epidemiological study in which a group (cohort) of people are recruited and followed over a period. Differences in the risk (incidence) of an outcome of interest (usually a disease outcome) over time are compared between individuals with a known risk factor or exposure and those without the risk factor or exposure. Prospective cohort studies are the strongest observational study design because risk or protective factors are assessed before disease outcomes arise.

Regressivity: The extent to which the burden of a tax is higher for people on lower incomes and/or represents a smaller percentage of income for those on higher incomes.

Signaling effect: The disincentivizing effect of a tax on demand/consumption arising from the 'signals' sent (information provided) to a population about why the tax is necessary (for example, conveyance of information about the detrimental health effects of overconsumption of SSBs) as opposed to the disincentivizing effects of higher prices. Signals can be sent by the government (for example, through public information campaigns), media, public interest groups, or between consumers.

Substitution: An effect caused by a rise in price that induces a consumer (whose income has remained the same) to buy more of a relatively lower-priced good and less of a higher-priced one.

Sugar-based excise tax: Type of specific excise tax based on a product's sugar content as opposed to volume.

Sugar-sweetened beverages: Any beverage that contains added caloric sweeteners, such as sucrose (sugar), high-fructose corn syrup, or fruit-juice concentrates. The main categories of SSBs are carbonated soft drinks, energy drinks, sports drinks, less than 100 percent fruit or vegetable juices, ready-to-drink teas and coffees, sweetened waters, and milk-based drinks.

Tiered tax: A tax in which SSBs are taxed at different rates depending on sugar content (that is, grams of sugar per serving). Tax tier thresholds vary between jurisdictions (see High-sugar/low-sugar/no-sugar beverages above).

Time-inconsistent preferences: Decisions made by individuals that prioritize immediate satisfaction over future consequences, leading to negative internalities.

Value added tax: Broad-based tax assessed incrementally as a percentage of price at each stage in the production and distribution chain. Considered a consumption tax because the ultimate cost of paying the tax is borne by the consumer at the point of purchase.

Volume-based (volumetric) tax: Type of specific excise tax based on beverage volume, as opposed to nutrient (for example, sugar) content.

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APPENDIX 1. CURRENT TAXES ON SUGAR-SWEETENED BEVERAGES WORLDWIDE

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Bahrain	December 2017	Excise tax	Ad valorem		50% on soft drinks; 100% on energy drinks	Any aerated beverage except unflavored aerated water and includes any concentrates, powzzder, gel, or extracts intended to be made in to an aerated beverage	
Barbados	August 1, 2015	Excise tax	Ad valorem		10%	Locally produced and imported sugary drinks, including carbonated soft drinks, juice drinks, sports drinks, and others	Exempt: 100% natural fruit juice, coconut water, plain milk, and evaporated milk
Belgium	January 1, 2016	Excise tax	Specific	Volume based	€0.068 (around US$0.07) per liter	All soft drinks, including nonalcoholic drinks and water containing added sugar or other sweeteners or flavors	Additional excise tax levied on any substance intended for the use of manufacturing soft drinks (liquid: €0.41 per liter [around US$0.45]; powder: €0.68 per kg [around US$0.70])
Bermuda	April 1, 2019	Import duty	Ad valorem		75%	Waters, including mineral waters and aerated waters, containing added sugar or other sweetening matter or flavoring, and other nonalcoholic beverages	Exempt: Fruit and vegetable juices; Raised from a 50% ad valorem import duty implemented on October 1, 2018

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Brunei	April 1, 2017	Excise tax	Specific	Tiered volume based	BND 0.40 per liter (around US$0.28) on SSBs with more than 6 g per 100 ml total sugar; soy milk drinks with >7 g per 100 ml total sugar; malted or chocolate drinks with >8 g per 100 ml total sugar; coffee-based or flavored drinks with ≥6 g per 100 ml	All sugar-sweetened soft drinks, soy milk-based drinks, malted or chocolate drinks, coffee-based or flavored drinks	Exempt: Milk-based drinks and fruit juices
Chile	October 1, 2014; updated on January 1, 2015	Excise tax	Ad valorem		10% on all sugary drinks with less than 6.25 g of sugar per 100 ml; 18% on all sugary drinks with >6.25 g per 100 ml of sugar	All nonalcoholic drinks with added sweeteners including energy drinks and waters	Exempt: 100% fruit juice and dairy-based beverages; Replaced previous single-tier excise tax of 13% on SSBs
Colombia	January 1, 2019	VAT			19%	VAT now applied on SSBs as a multiphase tax at production, distribution, and commercialization phases of supply chain (previously only applied to production phase)	
Cook Islands	April 2014	Excise tax	Specific	Sugar based	NZD 0.0098 (around US$0.0064) per gram of sugar	Beverages containing added sugars	Exempt: Artificially sweetened waters; Replaced previous 77% import levy on SSBs

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Dominica	September 1, 2015	Excise tax	Ad valorem		10%	Soft drinks and other sweetened drinks, including energy drinks	Also applies to foods with high sugar content; Revenues from the tax to contribute to national Get Healthy campaign
Ecuador	May 2016	Excise tax	Ad valorem		10% on SSBs with <25 g sugar per liter and on all energy drinks; US$0.0018 per gram of sugar on drinks with >25 g sugar per liter	SSBS and LCSBs	Exempt: Dairy products and their derivatives, mineral water, and juices that have 50% of natural content
Estonia	January 1, 2018	Excise tax	Specific	Tiered volume based	€0.10 per liter on artificially sweetened drinks and products with 5–8 g sugar per 100 ml; €0.20 per liter on products with artificial sweeteners, sugar and sugar content of 5–8 g per 100 ml; €0.30 per liter on products with sugar content of >8 g per 100 ml and on products with artificial sweeteners, sugar and sugar content of >8 g per 100 ml	Nonalcoholic beverages, including carbonated and noncarbonated drinks sweetened with sugar or artificial sweeteners, 100% juice drinks and sweetened milk drinks	

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Fiji (1/2)	2006; updated in 2016 and 2017	Excise tax	Specific	Volume based	US¢35 per liter (around US$0.17)	Locally produced sweetened beverages including carbonated and noncarbonated drinks sweetened with sugar or artificial sweeteners	Raised from earlier tax level of US¢10 cents per liter (around US$0.05 per liter). Tax revenue goes to a general fund.
Fiji (2/2)	2006; updated August 2017	Import duty	Ad valorem		10% on powders and preparations used to make beverages (other than milk-based drinks), as well as flavored and colored sugar syrups; 32% (US$2 per liter) on SSBs	Imported sweetened beverages, powders and preparations used to make beverages (other than milk-based drinks), and flavored and colored sugar syrups	Duty on SSBs raised from previous rate of 15% in 2018–2019 budget and from 10% in 2011.
Finland	1940; updated in 2011	Excise tax	Specific	Volume based	€0.11 per liter on sugar-free soft drinks and mineral waters; €0.22 per liter (US$0.25) on sugar-containing soft drinks	All nonalcoholic beverages	Producers with annual production volume <50,000 liters are exempted from the tax.
France	2012; updated on July 1, 2018	Excise tax	Specific	Sugar based	Sliding scale tax starting at 1 g sugar per 100 ml and rising to €0.20 per L (US$0.23 per L) on drinks with >11 g sugar per 100 ml;	Drinks with added sugar and artificial sweeteners, including sodas, fruit drinks, flavored waters, and 'light' drinks	Revenue used for the general budget;

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
French Polynesia	2002	Excise tax	Specific	Volume based	CFPF 40 per liter (around US$0.44) on domestically produced sweetened drinks; CFPF 60 per liter (around US$0.68) on imported sweetened drinks	All sweetened drinks	Between 2002 and 2006, tax revenue went to a preventive health fund. Since 2006, revenue has been allocated to the general budget with 80% earmarked for the Ministry of Health's general budget.
Hungary	September 2011	Excise tax	Specific	Volume based	HUF 7 per liter (around US$0.024) on soft drinks; HUF 200 per liter (around US$0.70) on concentrated syrups used to sweeten drinks	Soft drinks, energy drinks, and concentrates used to sweeten drinks	Also applies to salt and caffeine content of various categories of sugar-sweetened prepackaged, ready-to-eat foods, and salty snacks
India	July 1, 2017	GST			40% (28% GST + 12% cess - tax upon a tax)	Includes aerated waters and drinks containing added sugar or other sweetening matter or flavor	Applies nationally and replaces all other GST laws at the state level; Is the highest GST rate for goods in India; Applies to all goods containing added sugar or other sweetening matter or flavor.
Ireland	May 1, 2018	Excise tax	Specific	Tiered volume based	US¢20 per liter for drinks with between ≥5 g per 100 ml and 8 g per 100 ml; US¢30 per liter for drinks with ≥8 g per 100 ml	Nonalcoholic, water-based, and fruit-based drinks with added sugar content ≥5 g per 100 ml	Exempt: Fruit juices and dairy products

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Kiribati	2014	Excise tax	Ad valorem		40%	Nonalcoholic beverages, including mineral and aerated waters that contain added sugar, other sweeteners, or flavorings	Exempt: Fruit and vegetable juices as well as fruit concentrates
Latvia	May 2004; increased in 2016	Excise tax	Specific	Volume based	€0.074 per liter (US$0.084)	Drinks with added sugar, sweetener, or other flavoring	Exempt: Fruit/vegetable juices with <10% added sugar and flavored/ functional waters without added sugars, sweeteners, or flavorings; Increased from €0.0285 per liter in 2016
Malaysia	July 2019	Excise tax	Specific	Tiered volume based	MYR 0.40 (around US$0.10) per liter on soft drinks with >5 g sugar per 100 ml, milk-based drinks with >7 g per liter, and fruit or vegetable drinks with >12 g added sugar per 100 ml	Carbonated, flavored, and other nonalcoholic drinks, including milk-based, fruit, and vegetable drinks	Exempt: Fruit and vegetables with less than 12 g sugar
Mauritius	January 1, 2013, updated in October 2016	Excise tax	Specific	Sugar based	MUR 0.03 per gram sugar (around US$0.0008)	All SSBs, imported or locally produced, including juices, milk-based beverages, and soft drinks	Between 2013 and 2016, the tax was only applied to the sugar content of soft drinks.

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Mexico	January 1, 2014	Excise tax	Specific	Volume based	MXN 1 per liter (around US$0.05, or 10%). 25% special tax has applied to energy drinks (concentrates, powders and syrups used to prepare energy drinks) since 1 January 2011.	All drinks with added sugar	Exempt: Milks and yoghurt drinks. Revenue is currently being allocated to the general budget. An ad valorem excise duty of 8% also applies to food with high calorie density ≥275 kcals per 100 g.
Nauru	2007	Import duty	Ad valorem		30%	Imported carbonated SSBs, cordials, flavored milks, sugar-sweetened drink-mix beverages	Also applies to sugar, confectionery, and high-sugar foods
Norway	1981, updated 2017	Excise tax	Specific	Volume based	NOK 3.34 per liter (around US$0.40) and NOK 20.32 per liter (around US$2.44)	Nonalcoholic beverages containing added sugar or sweeteners and concentrated syrups, respectively	
Oman	June 2019	Excise tax	Ad valorem		50% on all carbonated drinks except sparkling water; 100% on energy drinks	Carbonated sweetened drinks, energy drinks	Exempt: Unsweetened waters
Palau	September 2003	Import duty	Specific	Volume based	US$0.28175 per liter	Carbonated soft drinks	

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Panama	November 2019	Excise tax	Ad valorem		7% tax on carbonated SSBs (previously 5%) and 5% on other nonalcoholic SSBs; 10% on syrups and concentrates used to produce sugary drinks (previously 6%)	Nonalcoholic beverages containing added sugar or sweeteners and concentrated syrups	Exempt: Dairy drinks, juices with >7.5 g sugar per 100 ml
Peru	May 10, 2018	Excise tax	Ad valorem		25% on beverages with ≥6 g per 100 ml	Nonalcoholic beverages, sweetened waters, and 0% alcohol beer	Previous 17% tax continues to apply to beverages with <6 g per 100 ml sugar content
Philippines	January 1, 2018	Excise tax	Specific	Volume based	PHP 6 per liter (around US$0.12) on drinks containing sugar and artificial sweeteners; PHP 12 per liter (around US$0.24) on drinks containing HFCS	Juices, tea, carbonated beverages, flavored water, energy and sports drinks, powdered drinks not classified as milk, juice, tea, and coffee, cereal and grain beverages	Exempt: 100% natural fruit and vegetable juices, milk products, meal replacement, and medically indicated beverages
Portugal	February 1, 2017	Excise tax	Specific	Tiered volume based	€0.08 (around US$0.10) for drinks with <80 g per liter, or €0.16 (around US$0.20) for drinks >80 g per liter	Mineral, flavored, and aerated waters containing added sugar or sweeteners	

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Qatar	January 1, 2019	Excise tax	Ad valorem		50% on carbonated sweetened drinks and concentrates intended to be made into carbonated drinks; 100% on energy drinks	All imported, produced, or stockpiled aerated beverages (except unflavored aerated water) and energy drinks	
Samoa	1984; updated 2008	Excise tax	Specific	Volume based	WST 0.4 per liter (around US$0.17)	Soft drinks, both imported and locally produced	Between 1984 and 2008, the excise tax amounted to WST 0.3 per liter (around US$0.12); in 2008, the rate increased to WST 0.4 per liter (around US$0.17).
Saudi Arabia	June 9, 2017; updated in December 2019	Excise tax	Ad valorem		100% on energy drinks; 50% on all SSBs	All drinks with added sugars	Previously applied only to energy drinks and carbonated soft drinks
Seychelles	April 1, 2019	Excise tax	Specific	Volume based	SCR 4 (US$0.29) per liter)	All imported beverages containing >5 g sugar per 100 ml, including milk-based drinks	Exempt: Fresh, locally produced fruit drinks without additives and plain milk
South Africa	April 2018	Excise tax (Sugary Beverages Levy)	Specific	Sugar based	ZAR 0.021 (US$0.0015) per gram sugar over 4 g per 100 ml (effective tax rate approximately 12%)	Sugary beverages (mineral and aerated waters containing added sugar or other sweeteners or flavors and other nonalcoholic beverages) that contain >4 g per 100 ml	Exempt: Fruit and vegetable juices, dairy drinks, and drinks that contain <4 g per 100 ml sugar

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Spain (Catalonia region only)	May 1, 2017	Excise tax	Specific	Tiered Volume based	€0.08 per liter for drinks with 5–8 g per 100 ml sugar, €0.12 per liter for drinks with >8 g per 100 ml. Mandatory 100% pass-through of tax to final consumer	Packaged sugary drinks: soft drinks, flavored water, chocolate drinks, sports drinks, cold tea and coffee drinks, energy drinks, fruit nectar drinks, vegetable drinks, sweetened milk, alternative milk drinks, milkshakes, and milk drinks with fruit juice	Exempt: Natural fruit juices, alcoholic beverages, sugar-free soft drinks and alternatives to milk with no added caloric sweeteners
Sri Lanka	November 2017; lowered in December 2018	Excise tax	Specific	Sugar based	US¢30 per gram sugar	Carbonated soft drinks and fruit drinks	Initially implemented at US¢50 per gram sugar but was weakened to US¢30 per gram sugar (a 40% reduction) in December 2018
St. Helena	May 27, 2014	Excise tax	Specific	Volume based	£0.75 per liter (around US$0.95)	High-sugar carbonated drinks defined as drinks containing ≥15 g per liter sugar	
Thailand (1/2)	September 16, 2017	Excise tax	Specific	Tiered volume based	3-tiered volume-based tax on all drinks with >6 g sugar per 100 ml: 6–8 g per 100 mL - THB 0.10 per liter (around US$0.0031) 8–10 g per 100 ml - THB 0.30 per liter (around US$0.0095) 10–14 g per 100 ml - THB 0.50 per liter (around US$0.015) >14 g per 100 ml - THB 1 (around US$0.031)	Artificial mineral water, soda water, carbonated soft drinks without sugar or other sweeteners and without flavor, mineral water and carbonated soft drinks with added sugar or other sweeteners or flavors, and fruit and vegetable juices	Tax increases every two years. From 2023 onward, it will be as follows: • 6–8 g per 100 ml - THB 1 per liter (around US$0.031) • 8–10 g per 100 ml - THB 3 per liter (around US$0.095) • >10 g per 100 ml - THB 5 per liter (around US$0.15)

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
Thailand (2/2)	September 16, 2017	Excise tax	Ad valorem		10% on fruit and vegetable juices; 14% on artificial mineral water, soda water, carbonated soft drinks with and without sugar or other sweeteners and flavors	Artificial mineral water, soda water, carbonated soft drinks with or without sugar or other sweeteners or flavors (14%), and fruit and vegetable juices (10%)	
Tonga	2013	Excise tax	Specific	Volume based	TOP 1 per liter (around US$0.050)	Soft drinks containing sugar or sweeteners	
United Arab Emirates	October 1, 2017	Excise tax	Ad valorem		50% on all carbonated soft drinks, except sparkling water; 100% on energy drinks	Carbonated drinks (including concentrations, powders, gel, or extracts intended to be used in carbonated beverages), and energy drinks	The excise tax applies to the import, manufacture, stockpiling, or release of excisable goods. 50% tax to be extended on January 1, 2020, to include all ready-to-drink drinks containing sugars or added sweeteners, as well as concentrates, gels, powders, or extracts to be made into drinks, and a range of food products.
United Kingdom	April 1, 2018	Excise tax (SDIL)	Specific	Tiered volume based	£0.18 per liter (US$0.25) for drinks with 5–8 g total sugar per 100 ml; £0.24 per liter (US$0.34) on drinks with >8 g total sugar per 100 ml	Any prepackaged soft drink with added sugar containing at least 5 g of total sugars per 100 ml, produced and packaged in the United Kingdom and soft drinks imported into the United Kingdom	Exempt: Milk-based drinks, milk substitute drinks, pure fruit juices or any other drinks with no added sugar, alcohol substitute drinks, and soft drinks of a specified description which are for use for medicinal or other specified purposes

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
United States (city of Berkeley, California)	March 2015	Excise tax	Specific	Volume based	US¢1 per ounce	Soda, energy drinks, and heavily pre-sweetened tea as well as caloric sweeteners used to produce them	Exempt: Infant formula, milk products, natural fruit and vegetable juices, meal-replacement drinks, and artificially sweetened drinks. The revenue goes into the City's General Funds and is used for community health and nutrition programs.
United States - Navajo Nation (spans portions of Arizona, Utah, and New Mexico)	April 1, 2015	Excise tax	Ad valorem	—	2%	SSBs	Applies to 'minimal-to-no-nutritional value food items,' including prepackaged and non-prepackaged snacks and soft drinks. The revenue is earmarked for projects such as farming, vegetable gardens, greenhouses, farmers' markets, healthy convenience stores, clean water, exercise equipment, and health classes, all part of the Community Wellness Development Projects Fund.
United States - city of Albany, California	April 1, 2017	Excise tax	Specific	Volume based	US¢1 per ounce	Includes soda, energy drinks, and heavily sweetened tea, as well as added caloric sweeteners used to produce the drinks	Exempt: Infant formula, milk products, natural fruit and vegetable juices, artificially sweetened drinks

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
United States - city of Philadelphia, Pennsylvania	January 1, 2017	Excise tax	Specific	Volume based	US¢1.5 per ounce	Any nonalcoholic beverage with caloric sugar-based sweetener or artificial sugar substitute listed as an ingredient, including soda, non-100% fruit drinks, sports drinks, flavored water, energy drinks, pre-sweetened coffee or tea, and nonalcoholic beverages intended to be mixed into an alcoholic drink; also, syrups or other concentrates used in beverages	Revenue is used to help fund community initiatives including prekindergarten schooling, community schools, parks, recreation centers, and libraries.
United States - city of Boulder, Colorado	July 1, 2017	Excise tax	Specific	Volume based	US¢2 per ounce	Any nonalcoholic beverage which contains at least 5 g per 12 fluid ounces	Exempt: Any milk product, infant formula, alcoholic beverage, or beverage for medical use. Also, any distribution of syrups and powders sold directly to a consumer intended for personal use. The revenue will be spent on health promotion, wellness programs, and chronic disease prevention programs that improve health equity, especially for those with low income and those most affected by chronic disease linked to sugary drink consumption.

Country	Implementation date	Policy instrument	Type of measure	Tax design	Amount of tax	Products subject to the tax	Additional notes
United States - city of Oakland, California	July 1, 2017	Excise tax	Specific	Volume based	US¢1 per ounce	Defined as any beverage to which one or more caloric sweeteners have been added and that contain ≥25 kcals per 12 fluid ounces of beverage and include sodas, sports drinks, sweetened teas, and energy drinks	Exempt: Milk products, 100% fruit juice, infant or baby formula, diet drinks, or drinks taken for medical reasons. Revenue will be used for any lawful government purpose.
United States - city of Seattle, Washington	January 1, 2018	Excise tax	Specific	Volume based	US¢1.75 per ounce of SSB + US¢1 per ounce, for manufacturers with a worldwide gross income of >US$2,000,000 but <US$5,000,000	Beverages with caloric sweeteners and the syrups and powders used to prepare them, including sodas, energy drinks, fruit drinks, sweetened teas, and ready-to-drink coffee drinks	Exempt: Drinks with <40 kcals per 12 ounce serving, beverages with milk as the principal ingredient, 100% natural fruit and vegetable juice, meal replacement beverages, infant formula, and concentrates used in combination with other ingredients to create a beverage
United States - city of San Francisco, California	January 1, 2018	Excise tax	Specific	Volume based	US¢1 per ounce	Applies to any SSB containing added sugar and >25 kcals per 12 ounces. The tax also applies to syrups and powders that can be made into SSBs.	Exempt: 100% fruit juice, ASBs, infant formula, and milk products are exempt from tax. Revenue goes into the City's General Fund but is used for health and nutrition.
Vanuatu	February 9, 2015	Excise tax	Specific	Volume based	VUV 50 (around US$0.47) per liter	Applied to carbonated beverages containing added sugar or other sweeteners including mineral waters and carbonated waters	