

Chapter 2

Reasons for Specifically Targeting Sugar-Sweetened Beverages

Abstract Sugar-sweetened beverages (SSBs) generally designate non-alcoholic beverages containing added sugars. Conclusive epidemiological evidence indicates that overconsuming those beverages places individuals at greater risk of developing overweight, type 2 diabetes, and dental caries. SSB overconsumption is supported by intense marketing practices in terms of offer, distribution, price and promotion. In Canada, sugar-sweetened beverages are a significant dietary source of sugars in some groups of the population, particularly in adolescents. Specific prevention efforts are required at a large scale to tackle SSB consumption trends at population level and to limit SSB contribution to daily energy intakes at individual level.

2.1 Definition of a Sugar-Sweetened Beverage (SSB)

Among a wide array of NCDs' diet-related determinants, the overconsumption of sugar has been singled out as a risk factor for body weight gain, cardiovascular diseases, and dental caries (Te Morenga et al. 2012; Yang et al. 2014; Moynihan and Kelly 2014). Recent results from a systematic review and meta-analyses of 39 randomized controlled trials by Te Morenga et al. (2014) confirm that higher (vs. lower) intakes of dietary sugars negatively impact blood pressure and serum lipids independently of effects on body weight. WHO recently reaffirmed the recommendation to maintain the intake of free sugars¹ to fewer than 10 % of total energy intake (WHO 2015). The report even suggests that halving this limit to 5 % could have additional benefits, which met strong opposition from industry stakeholders (Basu 2015).

Sugar-sweetened beverages (SSBs) represent a significant dietary source of sugars in some groups of the Canadian population (Langlois and Garriguet 2011). It contributes to explaining why the overconsumption of these beverages has raised public health concerns (see Box 2.1).

¹According to WHO's definition, free sugars include "monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates" (WHO 2015, p. 4).

Box 2.1: What is Meant by “Sugar-Sweetened Beverage Overconsumption”?

At individual level, we refer to “sugar-sweetened beverage overconsumption” as the daily consumption of SSB resulting in a daily intake of added sugars that exceeds 10 % of daily energy intake. This threshold is congruent with the WHO recent recommendation to maintain the intake of free sugars to fewer than 10 % of total energy intake (WHO 2015). In average, an individual serving of SSB (size varying between 200 and 600 ml) contains between 20 and 60 g of added sugars (see Table 2.1), which represents between 4 and 12 % of daily energy intake (when considering a normal-weight person consuming 2000 kcal daily). As a result, the daily consumption of one serving of SSB per day could already be considered “overconsumption”, depending on the sugar content of this beverage and the intake of added sugars from other foods.

The definition of SSB varies in the literature, but generally converges to designate non-alcoholic beverages containing added sugars. According to the Canadian Food and Drug Regulations, the term “sugars” encompasses all monosaccharides and disaccharides (including glucose, fructose, sucrose) and the term “sugar” specifically refers to sucrose.² Consequently, beverages containing “added sugars” designate beverages whose sugars content has been increased through the addition of sugars, or through the addition of ingredients containing added sugars (Government of Canada 2015).³

In this book, SSBs include carbonated drinks, fruit drinks, flavoured waters, energy drinks and sports drinks, as long as these beverages contain added sugars. Consequently, our definition excludes beverages containing no added sugars, such as bottled water, 100 % fruit juice, milk and non-calorically sweetened beverages (NCSBs). We also propose to exclude from our definition all forms of sugar-sweetened milk (e.g. chocolate milks and flavoured milk): although these beverages may contain as much added sugars as the aforementioned SSBs, it also brings essential micronutrients (especially calcium for youth) and does not appear to reach high intakes levels in Canada (MC Paquette, personal communication, unpublished supermarket sales data). Finally, we propose to exclude from our definition hot chocolate, hot coffee- and hot tea-based beverages for three main reasons: (1) the intake levels of these beverages in the Canadian population and their contribution to energy intakes remain weakly documented (Agriculture and

²Combination of the monosaccharides glucose and fructose.

³According to Agriculture and Agri-Food Canada (2015), corn sugar (mainly imported from the US) is much more commonly used than cane or beet sugar by the Canadian soft drink industry.

Table 2.1 Sugar content of various sugary beverages, measured in teaspoons (tsp)^a or grams (g) per 250 ml and per individual serving size (as sold)

	250 ml portion	Individual serving size
<i>Beverages containing added sugars included in our SSB definition</i>		
Energy drink (Full Throttle citrus ®)	8 tsp	473 ml 14 tsp (58 g)
Cola flavoured soda (Coca-Cola ®)	7 tsp	355 ml 10 tsp (39 g)
Fruit drink (Grape cocktail Rougemont ®)	6 tsp	200 ml 5 tsp (21 g)
Fruit punch (Fruité ®)	6 tsp	300 ml 8 tsp (30 g)
Sports drink (Gatorade Perform Cool Blue ®)	4 tsp	591 ml 9 tsp (35 g)
Vitamin water (Glaceau Vitaminwater watermelon pink grapefruit ®)	3 tsp	591 ml 8 tsp (31 g)
<i>Beverages containing added sugars excluded from our SSB definition</i>		
Chocolate milk base beverage (Hershey ® milkshake creamy chocolate)	9 tsp	355 ml 13 tsp (51 g)
Yogurt drink (Strawberry Yop ®)	7 tsp	200 ml 6 tsp (22 g)
Chocolate milk (Beatrice ®)	7 tsp	200 ml 6 tsp (22 g)
Cold specialty coffee (Iced capp ®)	6 tsp	648 ml (large) 16 tsp (62 g)
Hot specialty coffee (Starbucks ® Caramel macchiato)	4 tsp	591 ml (venti) 10 tsp (40 g)
<i>Beverages containing no added sugars</i>		
100% apple juice (tradition ®)	6 tsp	300 ml 8 tsp (30 g)
Plain milk (Québon ®)	3 tsp	237 ml 3 tsp (11 g)
Coffee	0 tsp	0 g
Water	0 tsp	0 g

^a1 teaspoon of white sugar eq. 4 g of sugar

Sources companies' websites

Agri-food Canada 2010; Coffee Association of Canada 2011; Cardwell 2015)⁴;
 (2) although these beverages may contain as much added sugars as SSBs, this
 content may vary importantly since the beverage is prepared at the point of

⁴In the future, if the contribution of these beverages to daily energy intakes appears to be significant in some groups of the population, greater consideration should be deserved to their possible inclusion in the SSB definition.

purchase and depends on consumer preferences⁵; (3) current soda taxes implemented at a large scale across the world and related evidence generally do not apply to this type of beverage (see Table 1.1). The sugar content of the above-mentioned beverages and their inclusion (or not) in our SSB definition are summarized in Table 2.1.

It should also be noted that some types of SSBs (particularly energy drinks) have raised other specific health concerns due to their high content in stimulants (caffeine, in particular), considered to enhance mental acuity and physical performance. In 2011, the Canadian Government announced new measures, including capped caffeine content and explicit labelling requirements, in order to reduce the chances of caffeine overconsumption (Health Canada 2011a). Specific taxes on drinks containing stimulants at a high dose have been discussed in other countries (Le Monde 2014). However, only taxation issues related to sugars in non-alcoholic beverages are addressed in this book.

The following sections discuss the reasons why SSBs may be specifically targeted to prevent obesity and related diseases. The health risks that have been associated with SSB intakes are presented, as well as SSB consumption trends and marketing practices in Canada. Finally, additional considerations on other non-alcoholic beverages are discussed.

2.2 SSB and Health Risks

In line with international recommendations (AICR/WCRF 2007; WHO 2015), Canada's food guide recommends limiting the consumption of foods and beverages "high in calories, fat, sugar or salt such as [...] fruit-flavoured drinks, soft drinks, sports and energy drinks, and sweetened hot or cold drinks" (Health Canada 2011b). Indeed, SSB overconsumption has been frequently singled out as an independent risk factor for several health issues in the scientific literature.

The most recent reviews and experimental studies clearly suggest that high SSB intakes are associated with weight gain in children and adults and that limiting SSB intake in youth may contribute to prevent weight gain (de Ruyter et al. 2012; Ebbeling et al. 2012; Malik et al. 2013; Ebbeling 2014).⁶ However, it remains

⁵In the framework of a food policy targeting specifically the presence (or not) or the amount of added sugars in a beverage, this situation makes technically and administratively burdensome the distinction between on-site prepared drinks containing added sugars or not. The fact that some consumers (and not others) add sweeteners themselves at the point of purchase also raises concerns. Finally, since many of these beverages contain milk, including it in our SSB definition would interfere with the aforementioned exclusion of all forms of sugar-sweetened milk.

⁶Over the last 10 years, nearly 20 literature reviews have been published as regards the relationship between sugar-sweetened beverages and body weight (Massougbdji et al. 2014). Until recently, these reviews offered dissenting conclusions: some of them concluded that the evidence of a causal relation was weak or limited (e.g. Forshee et al. 2008; Mattes et al. 2011) whereas others concluded that the evidence was strong or significant (e.g. Malik et al. 2006;

difficult to precisely estimate the strength of the association because of the diversity of study designs, their respective methodological limitations, as well as because of the difficulty to fully control for a broad range of potential confounders (Sievenpiper and de Souza 2013; Pereira 2014).⁷ Attempting to take as much as possible account of these issues, Malik et al.'s recent systematic review and meta-analysis (2013) conclude that, in prospective cohort studies, one daily additional 12-oz serving of SSB is associated with a 0.06 BMI-unit increase⁸ among youth and a 0.12–0.22 kg of body weight gain among adults over a one-year period. That is to say that the effect size may be clinically modest and uncertain on the long term, but it may prove significant at the population level, especially in at-risk subgroups (e.g. high SSB consumers, overweight individuals). As regards potential underlying mechanisms, the research is suggestive but not conclusive (Ebbeling 2014). SSB's high contribution to fructose intake has been suggested as a potential explanatory factor, since the latter has been associated with decreased insulin sensitivity, dyslipidemia and visceral adiposity in overweight adults (Welsh et al. 2013). However, as regards body weight, a recent systematic review indicates that the negative impact of a higher (vs. lower) intake of sugars and SSB would be more likely mediated by the increase in energy intake per se than by specific physiological or metabolic effects of sugars (Te Morenga et al. 2012). The lower effect of liquid calories on satiety has proved to cause extra energy intake and weight gain in adults on the short term but, in a longer term, this explanatory hypothesis may not be true (Bachman et al. 2006; Trumbo and Rivers 2014; Allison

(Footnote 6 continued)

Woodward-Lopez et al. 2011). In 2012, the controversy reached a turning point, as shown by the opening debate of the 30th Annual scientific meeting of the Obesity society (Billes 2012) and the subsequent release of new findings from two randomized controlled trials supporting the hypothesis that limiting access to SSBs may contribute to prevent weight gain in youth (Rabin 2012). Subsequent reviews still offer methodological debates and contrasting conclusions, but clearly tend to agree that increasing SSB intake increases the risk of weight gain (Kaiser et al. 2013; Hu 2013). Additionally, two studies have looked at the funding source of reviews on SSB consumption and weight gain (2006–2013) and suggest that it may have introduced a bias in their conclusions, since industry-funded reviews are significantly more likely to suggest weak evidence of an association than other reviews (Bes-Rastrollo et al. 2013; Massougbdji et al. 2014).

⁷In Canada, some cross-sectional and longitudinal studies have analyzed the association between SSB consumption and body weight. We did not particularly emphasize these results in this section since the cause-to-effect relationship between SSB and weight has been largely covered in methodologically more robust systematic reviews and meta-analyses at international level (see the previous footnote). These reviews provide the best available evidence to date. However, on an indicative basis, we refer the reader to some Canadian studies on youth SSB consumption and body weight published over the last years. On the one hand, significant positive associations (with at least one weight-related outcome for the whole population) have been found in several studies based on a cross-sectional design (Gillis and Bar-Or 2003; Reid et al. 2015) or a longitudinal design (Dubois et al. 2007). Absence of any significant positive association was also reported in studies based on a cross-sectional design (Janssen et al. 2005; Vanderlee et al. 2014) or a longitudinal design (Mundt et al. 2006). Finally, mixed results (depending on gender/age group) have been reported in cluster analyses (Danyliw et al. 2012).

⁸For a definition of body mass index (BMI), see Chap. 1, footnote 2.

2014). Finally, research suggests that genetic factors (some of which associated with ethnicity), adiposity and glucose intolerance may influence the susceptibility to SSB consumption's effects on metabolism and body weight. Further research is required in this area (Wang et al. 2013; Ebbeling 2014).

A high SSB intake has also been associated with increased risks of type 2 diabetes, cardiovascular disorders and metabolic syndrome, partially beyond the interaction with obesity (Malik et al. 2010; Ambrosini et al. 2013; Huang et al. 2014; Keller et al. 2015; Greenwood et al. 2014). For instance, results from a recent systematic review and meta-analysis of 17 prospective cohort studies following adults initially without diabetes revealed that the intake of one SSB serving/day was associated with an 18 % greater relative risk of type 2 diabetes. From a public health perspective, if such association would correspond to causation, the authors estimate that SSB consumption may be responsible for 4–13 % of type 2 diabetes new cases in the USA between 2010 and 2020 (Imamura et al. 2015). A high consumption of SSB has also been associated with a higher risk of kidney stone formation in large cohort studies (Ferraro et al. 2013). Finally, the quantity and frequency of added sugars consumption have been recognized as an important risk factor in the development of dental caries in both children and adults. This risk is shown to be cumulative over the life course, which indicates that reducing added sugars consumption during childhood can have a protective effect for dental health in the long term (WHO 2003, 2015).

All in all, considering well-powered prospective cohort studies alongside short-term randomized controlled trials, Hu (2013, p. 1) concludes that “a significant association, established temporality and direct dose–response relationship between SSB consumption and long-term weight gain and risk of type 2 diabetes” have been demonstrated. He adds that “taken together, the evidence that decreasing SSBs will decrease the risk of obesity and related diseases such as type 2 diabetes is compelling” (Hu 2013, p. 1). As Hu suggests, we consider that “we should avoid the trap of waiting for absolute proof before allowing public health action to be taken” (2013, p. 1).

Other relevant reasons for specifically focusing public health action on SSBs are that these beverages have no or low added value for health (they are often energy-dense beverages with few micronutrients) and that healthier substitutes are commonly available, starting with water (Popkin et al. 2006). In sum, although SSB overconsumption is not the only dietary risk factor linked to obesity and NCDs (Sievenpiper and de Souza 2013), it clearly seems to be a relevant target for public health action, particularly in heavy consumers (including youth), patients at health risk, and on territories where average consumption is high (Ebbeling 2014; Le Bodo et al. 2015).

2.3 SSB Marketing and Sales Trends

In their recent analyses of SSB sales trends around the world,⁹ Popkin and Hawkes (2016) indicate that the four regions with the highest consumption¹⁰ are as follows: (1) North America, (2) Latin America, (3) Australasia and (4) Western Europe. With the exception of Latin America, average SSB intake has been declining in these four regions over the last years. In North America, this decline has been mainly driven by a decrease in the sales of caloric soft drinks, despite the fact that the sales of sports and energy drinks increased significantly.¹¹ All in all, in 2014, North America still ranked first (by far) for total sales of SSBs, and Canada ranked 14th out of 54 countries¹² for which data have been analysed (Popkin and Hawkes 2016).

A closer analysis of Canadian Market data tends to confirm these trends: the consumption of carbonated beverages (excluding sports drinks and energy drinks) increased from 55 to 117 l/capita between 1972 and 1998, before declining to 85 l/capita in 2009, which still represents a very high consumption level (Statistics Canada 2010). Overall, in a study based on soft drink sales data from the Canadian Socioeconomic Information Management System (Statistics Canada),¹³ Merchant et al. (2010) demonstrate that the average available energy from SSB¹⁴ per capita has increased of 37 kcal per day between 1976 and 2007, which represents 23 % of the increase in total available energy per capita per day over the same period. Interestingly, yearly averages show that the higher is the contribution of soft drinks to total available energy, the higher tends to be the total available energy per capita per day. Whereas the ecological study design precludes assuming cause-to-effect, this analysis suggests that a greater SSB intake may have been both a contributor to and a marker of increasing energy intakes in the diet of the Canadian population over the last 30 years¹⁵ (Merchant et al. 2010).

⁹Popkin and Hawkes' calculations are based on the Euromonitor Passport International database, for the period 2009–2014.

¹⁰Expressed in Kcal per person per day.

¹¹Popkin and Hawkes' analyses are based on three SSB categories: caloric soft drinks (carbonated and non-carbonated); fruit drinks (sweetened beverages of diluted fruit juice and often other caloric sweeteners and flavourings); and sports and energy drinks (including sugar-sweetened waters).

¹²Before Canada ranked Chile, Mexico, USA, Argentina, Saudi Arabia, Germany, Netherlands, Slovakia, Austria, Brazil, Belgium, Israel and Ireland.

¹³Provided by the Canadian Soft Drink Association.

¹⁴Excluding juices.

¹⁵Indeed, the fact that SSB intake has been frequently associated with overall energy intake could be partly related to the fact that SSB consumption is a marker of food patterns involving other dietary factors favouring excessive energy intake (Woodward-Lopez et al. 2011). Anyway, considering the evidence presented overall in this section, it seems plausible that the increase in SSB consumption over the last decades has somewhat contributed in itself to increase energy intakes in some groups of the Canadian population.

Although SSB manufacturers and retailers have made voluntary efforts over the last years, e.g. to reduce SSB availability in schools or to reduce SSB advertising to children (Canadian Beverage Association 2015), heavy marketing is still practised in terms of product diversification, availability, prices and promotion (Welsh et al. 2013). Here below are summarized some key facts and figures.

An attractive and diversified choice: in 2009, in Canada, carbonated soft drinks represented the second non-alcoholic beverage volume market share (16.3 %), just after coffee (16.6 %) and before tea (12.9 %), milk (12.7 %), bottled water (10.6 %) and non-carbonated fruit beverages (including juices) (8.7 %) (Agriculture and Agri-Food Canada 2015). The non-alcoholic beverage industry offers an increasing variety of products to adjust to consumers' preferences. It includes the creation and development of juices, fruit-flavoured beverages, dairy-based beverages, iced tea, vitamin waters, sports drinks and energy drinks. In Canada, the largest SSB companies propose more than 30 different brands and a diversity of packages and innovative flavours (Agriculture and Agri-Food Canada 2015). Over the last decades, higher SSB intakes have been prompted by steady increases in portion sizes. Between 1977 and 1996, US consumption surveys show that the average SSB portion size consumed by all age groups increased from 402 to 621 ml, whereas milk beverages' average portion size decreased from 346 to 322 ml (Nielsen and Popkin 2004). Some US data also indicate a two- to threefold increase in the size of soda poured from fountains in two large fast-food chains between their time of introduction (in the 1950s) and 2002 (Young and Nestle 2003).

A widespread distribution: according to Agriculture and Agri-Food Canada (2015), two-thirds of SSB sales are not for on-site consumption, which reflects important takeaway sales from fast-food restaurants but also a particularly large diversity of easy-to-access points of sales such as vending machines, convenience stores and gas stations. Although representing a small market segment, SSB presence in schools has been used as a way to position SSB brands and to encourage out-of-school consumption across the world (Hawkes 2010). The situation in Canada does not seem to make exception. A study relying on data from the British Columbia Adolescent Health Survey ($n = 174$ schools/10,879 grades 7–12 students, 2007–2008) found SSB availability at school to be associated with a higher SSB intake¹⁶ (Mâsse et al. 2014). As a result, many governments have taken action. In Quebec, for instance, policy recommendations have been issued to limit SSB and NCSB availability in schools¹⁷ and childcare centres (Ministère de

¹⁶Independently of neighbourhood-level post-secondary education and school setting (urban/suburban/rural) at school level, and independently of age and sex at student level.

¹⁷This “Policy framework for a health turn at school” (*Politique cadre pour un virage santé à l'école*) has been set up in 2007. A process evaluation has been published in 2009. For the food environment, this evaluation is based on data collected from 720 schools. The sample was further weighted to make it representative of all Quebec schools (according to type, network and region). Results indicate that 94 % of primary schools (eq. to elementary schools) and 59 % of secondary schools (eq. to middle and high schools) report having removed SSBs and NCSBs from their main

l'Éducation, du Loisir et du Sport 2009; Martin et al. 2014). On the other hand, Canadian manufacturers have collectively issued voluntary-based guidelines for the sale of beverages in schools (Canadian Beverage Association [CBA] 2012).¹⁸ These efforts should be further encouraged and evaluated. A recent research conducted in the province of Quebec (Sherbrooke area, $n = 39$ schools/7099 students, 2007–2008) indicates that beyond individual characteristics and the school's socioeconomic status, a significant difference of daily SSB consumption was observed between schools. It was further estimated that a student moving from a school with a lower rate of SSB consumption to a school with a higher rate of SSB consumption would typically increase his risk of becoming a daily SSB consumer by 52 %.¹⁹ Beside the school's socioeconomic status, students in schools located in a higher urban density area had a significantly higher risk of SSB consumption (Lebel et al. under review). These results suggest that beyond SSB availability at school, the school vicinity may play an important role in favouring SSB consumption in youth.

A very affordable option: in high-income countries, an increasing affordability gap is generally observed between low nutritive energy-dense foods and more nutritive choices (e.g. meat, fruit and vegetables). For example, in Canada, a study conducted on the price of a diversity of food items sold in Edmonton supermarkets illustrated that the price per calorie of “processed sweets” was 7 times cheaper than the price per calorie of “fish and poultry” (Cash and Lacanilao 2007). Among these low nutritive energy-dense foods, SSBs are considered to be particularly and increasingly affordable. Agriculture and Agri-food Canada (2015) indicates that this is partly due to a highly competitive environment: “the [soft drink] industry has

(Footnote 17 continued)

food service. Very few primary schools offer vending machines (2 %) but among secondary schools, 47 % report having removed these beverages from vending machines (Ministère de l'Éducation, du Loisir et du Sport 2012).

¹⁸These guidelines prone the removal of soft drinks from elementary and middle schools and displacement by water, 100 % juice and milk. In high schools, the guidelines indicate that “at least 50 % of the beverages offered [...] should be water and low- or no-calorie options” and also encourage capped caloric content for SSBs, capped portion sizes for SSBs, and non-availability of energy drinks. According to the Canadian beverage association, its members have “completed [the] implementation of the guidelines during the 2009–2010 school year” (CBA 2012, §1).

¹⁹The multilevel logistic modelling procedures used in this study made possible to appreciate the school built environment effect on daily SSB consumption independently of other variables that may influence consumption at individual level (gender, academic cycle, cultural origin, participation in organized physical activities) and independently of the school socioeconomic status. Concerning the school built environment's vicinity, it is noteworthy that none of the contextual characteristics measured (number of fast-food restaurants, number of convenience stores, walkability, degree of vegetation cover, distance to the closest fast-food restaurant, distance to the closest convenient store) had a significant association with SSB consumption when taken separately. However, the combination of these characteristics showed an important difference in students' SSB consumption between schools. This observation confirms the complex aetiology of eating habits and the most probable influence of a pattern of contextual characteristics rather than a significant influence of one risk factor considered in isolation.

experienced intense price competition with the expansion of private label sales and decreasing consumer demand for carbonated soft drinks. Price reductions have been an important element to enable the industry to maintain its dominant market share in a beverage market where the choice of products is increasing”. Additionally, the organization suggests that SSBs are frequently used as a drawing card: “During the recent difficult economic climate, price reductions are still occurring, especially in the retail grocery sector where chains have reduced prices to encourage consumers to visit their establishments”. Indeed, SSBs have been shown to be highly subject to specific pricing strategies such as rebates, bulk offers and free refills in fast-food restaurants (Quebec Weight Coalition [CQPP] 2012). An analysis of food and beverages purchases in supermarkets by a large representative panel of UK households ($n = 30,000$) over two years shows that price promotions on carbonated drinks are heavily practised (PHE 2015). Unsurprisingly, a very large proportion of consumers are sensitive to price promotions on those drinks (the so-called promotionally sensitive shoppers)²⁰ (PHE 2015, p. 19). On average, overtime, it was estimated that price promotions increase total purchases of regular carbonated drinks by 31 % in comparison with a hypothetical situation where no price promotion was practised at all (PHE 2015, p. 28). Accounting for compensation effects, it was also estimated that the total volume of sugars included in purchased food and beverages could be 0.7 % lower if no price promotions were practised on regular carbonated drinks²¹ (PHE 2015, p. 34). These data (although specific to the UK) clearly suggest that SSBs are a relevant starting point for public health efforts aimed to tackle price promotions on sugary food and drinks.

A strong promotion, especially towards youth: in Canada as elsewhere, brand names, advertising and promotion are essential dimensions of the competition in the soft drink sector. Placement in the store and on the shelf is deemed particularly critical to stimulate consumer purchases (Agriculture and Agri-Food Canada 2015). Evidence indicates that advertisements are usually appreciated by youth and influence their dietary behaviours (Hastings et al. 2007). Accordingly, in 2009 in the USA, carbonated beverage companies’ marketing expenditures targeting youth (2–17 years of age) reached US\$395 millions (i.e. 22 % of all food categories). It was the #1 food category in terms of teen-directed marketing expenditures. Traditional media (TV, radio, print advertising) are complemented by a diversity of marketing techniques including appealing packages, point-of-purchase displays, movie cross-promotions, sponsorship of sports events, advertisements using celebrities (Federal Trade Commission [FTC] 2012). Over the last years, facing international pressure (WHO 2010), the food and beverage industry has accelerated its large-scale voluntary commitments to limit marketing to children, as shown in

²⁰In this study, three types of price promotions were considered: “temporary price reductions”, “multibuy” offers (e.g. “buy 2 for 5\$” or “buy one and get one free”) and “extra free” offers (i.e. portions larger than usual for the same price). The analysts emphasize that food price promotions are heavily practised in the UK and may represent a proportion of purchases that is twice as much elevated than in other European countries (i.e. $\approx 40\%$ vs. $\approx 20\%$).

²¹With equal percentage found for chocolate and cakes.

North America by the US Children's Food and Beverage Advertising Initiative (Council of Better Business Bureaus 2006) or the Canadian Children's Food and Beverage Advertising Initiative (CAI) (Advertising Standards Canada 2007). Overall, the evaluations of such "pledges" have shown mixed results (sometimes in the same country and for the same intervention) because of different sampling methods and heterogeneous criteria used to measure success (Hawkes 2013). The US Federal Trade Commission did observe an overall decrease²² in marketing expenditures on non-alcoholic beverages towards young people between 2006 and 2009 and note "small but positive changes in the nutritional profile of drinks marketed to youth"²³ between 2006 and 2009 (FTC 2012, ES-5). However, the FTC also highlights that "almost all of the sugar in drinks marketed to both children and teens was added sugar, rather than naturally occurring sugar from fruit or fruit juice" (FTC 2012, ES-5). Another concern is the significant increase in youth-directed new media expenditures²⁴ on food and beverages between 2006 and 2009,²⁵ with carbonated beverages ranking #1 among all food and beverage categories in 2009.²⁶ The report adds that "carbonated beverages marketed to teens averaged 10 % more calories and added sugars in new media than in traditional measured media" in 2009 (FTC 2012, p. ES-5). Uncertainties as regards the effectiveness of self-regulation were also expressed on a Canadian ground. A comprehensive assessment of food and beverage TV advertising in Toronto and Vancouver between 2006 and 2011²⁷ shows that the total number of soft drinks spots broadcasted on children's speciality stations actually decreased.²⁸ As a result, the average number of soft drinks spots actually viewed by children (aged 2–11) on these channels effectively decreased. However, when considering all stations, the total number of soft drinks spots broadcasted did not decrease over the same period. As a consequence, the authors note that the decrease in soft drinks TV ads viewed by children between 2006 and 2009 was mitigated in Toronto and fully compensated in Vancouver when all stations were considered (Potvin Kent et Wanless

²²59 % decrease (adjusted for inflation) in child-directed marketing of carbonated beverages (from US\$96 million to US\$42 million) and 29 % decrease (adjusted for inflation) in teen-directed marketing of carbonated beverages (from US\$508 million to US\$382 million).

²³The US Federal Trade Commission (2012, p. ES-5) observes that drinks marketed to youth (2–17 years old) "averaged 20 fewer calories per serving in 2009 than in 2006".

²⁴Consisting of "company-sponsored websites, Internet, digital, word-of-mouth, and viral marketing" (FTC 2012, p. 9).

²⁵50.5 % increase (adjusted for inflation) for all food categories (from US\$76.6 million in 2006 to US\$122.5 million in 2009).

²⁶Moreover, between 2006 and 2009, the relative increase in child-directed new media expenditures focused on juices and non-carbonated beverages has been substantial (+617 %, adjusted for inflation) (FTC 2012).

²⁷Using Nielsen Media Research data specific to Vancouver and Toronto cities.

²⁸Considering the evolution of TV advertisements targeting kids in Toronto between 2006 and 2011, Potvin Kent et al. (2014) note that this decrease was particularly due to the fact that companies adhering to CAI had eliminated soft drinks advertisements on these stations, which was not the case of non-CAI members.

2014). Research also indicates that the TV marketing techniques used to target children and teens in 2011 have been more intense than in 2006. Another concern appears to be that the promotion of “less healthy” items by companies adhering to CAI has increased in children and teens over the same period (Potvin Kent et al. 2014). Finally, another study suggests that Canadian self-regulatory measures imperfectly protect children from Internet marketing of energy-dense food and beverages (Potvin Kent et al. 2013).

Altogether, this overview shows that SSB consumption is substantially supported by marketing practices. In the next section, we will review consumption trends at the individual level.

2.4 SSB Consumption Trends

In 2004, according to the Canadian Community Health Survey—Nutrition (CCHS, 24-h dietary recall), average dietary sugar intakes (including added and naturally occurring sugars) represented 21 and 25 % of total daily calories in adults (aged 19 + years) and youth (aged 9–18), respectively. Regular soft drinks represented the second dietary source of sugar intake in adults and the first one in youth aged 9–18 before milk, fruit and confectionery (Langlois and Garriguet 2011).

According to CCHS-2004 data, Brisbois et al. (2014) estimate that on average, sweetened drinks²⁹ contribute 3.3 % to daily calories in Canadian adults. According to Garriguet (2008a, same data source), the highest proportion of adults reporting having consumed regular soft drinks the day before the survey was found in adult men aged 19–30 (47 %), for whom the average daily consumption reached 649 g.³⁰ The lowest proportion was found in Canadian women aged 71 or older (10 %), for whom the average daily consumption reached 305 g.

According to CCHS-2004 data, average consumption of sweetened drinks in Canadian youth is similar across provinces, with slightly higher values in New Brunswick, Newfoundland and Labrador, and slightly lower values in British Columbia. The contribution of milk and 100 % fruit juice to daily calories decreases with age, whereas the contribution of sweetened drinks increases with age (see Fig. 2.1) (Garriguet 2008b).

In teens aged 14–18, average daily intake of regular soft drinks³¹ reached 179 and 376 g in girls and boys, respectively. For this age group, the average contribution of sweetened drinks³² to daily calories was 7 % in girls and 8 % in boys (see

²⁹Including regular soft drinks and fruit drinks.

³⁰Regular soft drinks volumes expressed in grams (g) or in millilitres (ml) are generally close. For instance, according to the Canadian Nutrient File (CNF), 100 ml of cola-type soft drinks is equivalent to 104.2 g (Source: Health Canada, file consulted in March 2012 from: <http://webprod3.hc-sc.gc.ca/cnf-fce/index-fra.jsp>).

³¹Excluding fruit beverages and fruit juices.

³²Including regular soft drinks and fruit drinks.

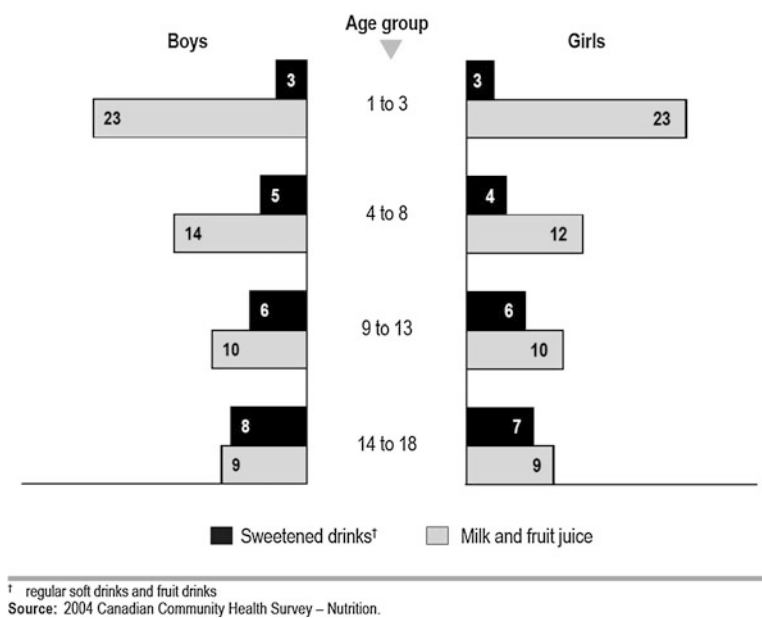


Fig. 2.1 Percentage of daily calories derived from sweetened drinks and from milk and fruit juice, by gender and age groups, household population aged 1–18, Canada, excluding territories, 2004. *Source* Garriguet (2008b). Beverage consumption of children and teens. Health Matters. Statistics Canada, Catalogue no. 82-003-XPE. Health Reports, Vol. 19, no. 4, December 2008 (Reproduced with permission)

Fig. 2.1) (Garriguet 2008b). In comparison, average SSB contribution to total energy intake has been estimated to be 13 % in US teens aged 1–19 and 5 % in European teens aged 12.5–17.5 (Le Bodo et al. 2015). These numbers represent averages of total population daily intake of SSB, including people who did not consume any. According to CCHS-2004 data, among Canadian adolescents (aged 14–18) reporting having consumed sweetened drinks the day before the survey (i.e. 35 % of girls and 53 % of boys), this consumption reached 514 g/day in girls and 715 g/day in boys (Garriguet 2008b). The CCHS—Nutrition has been repeated in 2015. The release of the data in 2017 will provide an updated description of the situation (Statistics Canada 2014).

Meanwhile, more recent data from provincial surveys tend to confirm that SSBs are still consumed in high proportions by Canadian youths. In British Columbia (BC), for example, data from the BC Adolescent Health Survey (2007–08) indicate that grades 7–12 students ($N = 11,385$) were 32 and 10 % to report having consumed one and at least two SSB(s) the previous day, respectively³³ (Mâsse et al. 2014). In the province of Quebec, the large survey on the health of secondary

³³As for all self-reported data, measurement errors may occur (e.g. underreporting of SSB consumption) and may influence the results.

school children (2010–2011, $N = 63,196$) indicates that 25 % of students report consuming SSB at least once a day (28 % of boys vs. 21 % in girls)³⁴ (Camirand et al. 2012). In another Quebec survey concerning students from all the 42 public primary and secondary schools of the Sherbrooke area (2008, $N = 13,500$), data confirm that the proportion of weekly SSB consumers is sizeable and increases with age, fruit drinks being the most popular beverages (from 34 % of consumers at age 5, to 65 % at age 17), followed by soft drinks (12 % at age 5, to 52 % at age 17) (Morin 2010; Morin et al. 2013). Recent data from other provinces confirm and even exceed these trends. According to a study including data from 10,188 youth (aged 13–18) from Hamilton and Thunder Bay (Ontario) and the province of Prince Edward Island (PEI) in 2009–10, 36 % of the students reported having consumed one to two SSB(s)³⁵ the day preceding the survey and 44 % of the students reported having consumed three or more SSBs. The proportion of daily SSB consumers in the PEI subgroup was statistically lower than in the Ontarian ones (Vanderlee et al. 2014).

A growing body of evidence also suggests that SSB consumption is associated with a less healthy dietary pattern (e.g. frequent fast-food meals, lower intakes of healthy beverages, breakfast skipping) and TV watching among children and adolescents (Mathias et al. 2013; Welsh et al. 2013). In the province of Quebec, the aforementioned survey on the health of more than 60,000 secondary school children indicates that carbonated drinks consumption is correlated to “junk food”³⁶ consumption in restaurants (see Fig. 2.2) (Camirand et al. 2012). The same survey indicates that students having at least 6 portions of fruit and vegetable per day are less likely to be daily SSB consumers³⁷ compared to those having less fruit and vegetable (22 % vs. 25 %) (Camirand et al. 2012, p. 87). Daily SSB consumers are also slightly³⁸ less likely to report consumption of at least 4 glasses of water per day (38 %) and slightly more likely to report consumption of fewer than 1 glass of water per day (9 %) compared to those having fewer than one SSB per day (40 and 6 %, respectively) (Camirand et al. 2012, p. 84). Although statistically significant, these differences (2 or 3 % points) remain small in magnitude.

In other provinces, the aforementioned study conducted in Ontario and PEI also shows that a higher SSB consumption in youth is slightly correlated with a higher

³⁴In this survey, beyond the proportion of daily consumers, the proportion of occasional SSB consumers is sizeable. For instance, 36 % of students report consuming fruit-based drinks from one to six times per week (38 % for boys vs. 33 % for girls) and 36 % of students report consuming carbonated drinks between once to six times per week (43 % for boys vs. 29 % for girls).

³⁵In addition to fruit-flavoured drinks, regular soft drinks, sports drinks and high-energy drinks, SSBs here also include hot chocolate, cappuccino or frappuccino, slurpees, and shakes.

³⁶In this survey, the term “junk food” encompasses foods that should only be consumed exceptionally according to official Quebec guidelines, such as French fries, hamburgers, pizza, chicken wings, fried chicken, hot dogs.

³⁷i.e. having SSB at least once a day.

³⁸Difference statistically significant ($p \leq 0.05$).

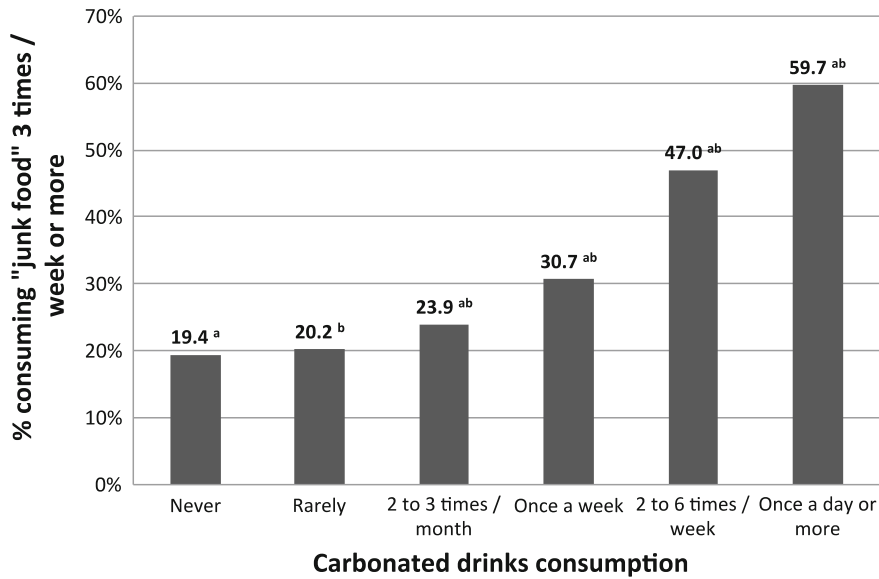


Fig. 2.2 “Junk food” consumption 3 times per week or more in a restaurant or a café during the school week, according to carbonated drinks consumption, secondary school children, Quebec, 2010–2011. Same exponent (a or b) means a statistical difference between proportions ($p \leq 0.05$). *Source* Camirand et al. (2012) *Habitudes alimentaires*, dans L’Enquête québécoise sur la santé des jeunes du secondaire 2010–2011. Le visage des jeunes d’aujourd’hui: leur santé physique et leurs habitudes de vie, Tome 1, Québec, Institut de la statistique du Québec, p. 89

consumption of 100 % fruit juice and milk. However, the authors note that a reverse correlation between SSB consumption and milk consumption has been more frequently documented elsewhere in the literature, which raises calcium displacement concerns (Vanderlee et al. 2014).

Using CCHS-2004 data and distinguishing sources of naturally occurring and added sugars in the diet, Brisbois et al. (2014) estimate that the average contribution of added sugars to daily calories in Canadians is 9.9 % in adults, 10.4 % in children (aged 1–8) and 14.1 % in adolescents (aged 9 to 18). These average values for all Canadians suggest how even more difficult it may be for SSB consumers (youth in particular) to limit the daily energy intake from free sugars below 10 % of total daily energy intake, as recommended by the World Health Organization (WHO 2015).

The evidence presented in this section confirms that specific efforts to prevent SSB overconsumption are relevant in Canada. Our conclusions are consistent with Saunders’ ones, who considered large pieces of evidence to rank potential contributors to the Canadian paediatric obesity epidemic. He concludes that “although influenced by numerous factors, available evidence suggests that the Canadian childhood obesity epidemic is most closely related to deleterious changes in sugar-sweetened beverage intake, sedentary behaviour, reduced sleep, and adult obesity [i.e. parental obesity and gestational weight gain]” (Saunders 2011, p. 6).

2.5 Additional Considerations on Other Non-alcoholic Beverages

Beyond the fact that SSBs are generally the core target of taxation proposals, the need to prevent excessive intake of other non-alcoholic caloric beverages sometimes comes into the debate.

The relevance to include 100 % fruit juice is sometimes questioned. The calorie and sugar content of these beverages may be similar or even higher than for SSBs (see Table 2.1). Furthermore, 100 % fruit juice intakes have increased in some groups of the Canadian population over the last years. For example, in Quebec adults, fruit juice³⁹ intake has increased by 80 % between 1990 and 2004⁴⁰ (Blanchet et al. 2009). However, 100 % fruit juice's contribution to micronutrients recommended daily intakes makes them “sparingly” drinkable on a daily basis, although whole fruit consumption should be preferred (Popkin et al. 2006). This last consideration makes these beverages generally exempt from soda taxes currently implemented across the world (see Table 1.1), even though they are included in the WHO recommendations as a source of free sugar (WHO 2015).

More controversial is the case of non-calorically sweetened beverages (NCSBs or “diet drinks”), whose consumption has been correlated to increased appetite for sweetness, risks of metabolic syndrome and type 2 diabetes in several clinical and observational studies (Popkin et al. 2006; Nettleton et al. 2009; Fagherazzi et al. 2013). However, to date, evidence supporting a cause-to-effect relationship is limited: no clear mechanism has been demonstrated and conclusions from epidemiological studies are inconsistent (de Koning et al. 2011; Greenwood et al. 2014; Imamura et al. 2015). According to Pereira's reviews (2013, 2014), the more rigorous prospective studies controlling for many potential confounders are not conclusive or suggest a reverse causality bias (i.e. higher NCSB consumption in overweight persons attempting to lose weight or to prevent further weight gain by substituting SSBs for non-caloric beverages). Indeed, consistent evidence from experimental and cohort studies suggest that substituting NCSBs for SSBs can help control total energy intake and prevent weight gain in the long term (de Ruyter et al. 2012; Zheng et al. 2015). Consequently, to date, NCSBs may remain an acceptable alternative to SSBs, although water should be explicitly promoted as the healthiest option (Popkin et al. 2006; Pereira 2013; de Ruyter et al. 2014). Excluding diet drinks from the scope of soda taxes has been recommended in the literature (Brownell et al. 2009; Mytton 2015). Generally, with some exceptions (e.g. the

³⁹In the CCHS-Nutrition survey, the fruit juice category corresponds to 100 % pure juice. It includes the “juice portion of alcoholic beverages and juice recipes (concentrate and water)”. Fruit drinks correspond to “beverages that contain less than 100 % fruit juice” (Garriguet 2008b, p. 27).

⁴⁰Difference statistically significant ($p \leq 0.05$).

French and Belgian soda taxes),⁴¹ “diet drinks” are exempt from soda taxes currently implemented across the world (see Table 1.1).

These considerations will have important implications when we analyse if exempting beverages deemed healthier than SSBs from the tax may encourage higher consumption of the former and lower consumption of the latter (see Sect. 7.3). Altogether, this will also have important implications when considering which beverages should be included (or not) in the scope of a soda tax (see Sect. 12.4.1).

Key Messages

- Most recent systematic reviews, meta-analyses and experimental studies confirm that SSB overconsumption increases the risk of weight gain, type 2 diabetes and dental caries.
- SSB consumption is stimulated by an attractive and diversified offer, a widespread distribution, low prices and a strong promotion (especially towards youth).
- SSB consumption represents a significant proportion of sugar intake and daily energy intake in some groups of the Canadian population, in particular youth.
- From a public health perspective, preventing SSB overconsumption in Canada requires specific efforts at a large scale.

References

- Advertising Standards Canada. (2007). Children’s food and beverage advertising initiative. <http://www.adstandards.com/en/childrensinitiative/default.htm>. Accessed December 15, 2015
- Agriculture and Agri-Food Canada. (2010). The Canadian coffee industry. Sub-Sector Profile. October 2010. <http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/processed-food-and-beverages/the-canadian-coffee-industry/?id=1172237152079>. Accessed March 1, 2015
- Agriculture and Agri-Food Canada. (2015). The Canadian soft drink industry. <http://www.agr.gc.ca/eng/industry-markets-and-trade/statistics-and-market-information/by-product-sector/processed-food-and-beverages/the-canadian-soft-drink-industry/?id=1172167862291>. Accessed March 1, 2015

⁴¹Actually, the inclusion of NCSBs in the French soda tax was not part of the initial bill. It was even strongly fought by the government during parliamentary sessions, who considered that it was jeopardizing the public health credibility of the tax. The extension of the SSB tax scope to NCSBs rather holds to budgetary considerations defended by members of the parliament whose intent was to raise greater fiscal revenues in order to fund a reduction of wage costs in the farming sector. However, once the extension of the tax scope was voted at the parliament, the French government also invoked NCSBs’ potential harmful nutritional effects to justify this political move (French Constitutional Council 2011) (see also Sect. 13.6).

- Allison, D. B. (2014). Liquid calories, energy compensation and weight: What we know and what we still need to learn. *The British Journal of Nutrition*, 111(3), 384–386. doi:[10.1017/S0007114513003309](https://doi.org/10.1017/S0007114513003309).
- Ambrosini, G. L., Oddy, W. H., Huang, R. C., Mori, T. A., Beilin, L. J., & Jebb, S. A. (2013). Prospective associations between sugar-sweetened beverage intakes and cardiometabolic risk factors in adolescents. *The American Journal of Clinical Nutrition*, 98(2), 327–334. doi:[10.3945/ajcn.112.051383](https://doi.org/10.3945/ajcn.112.051383).
- American Institute for Cancer Research (AICR), & World Cancer Research Fund (WCRF) (Eds.). (2007). *Food, nutrition, physical activity and the prevention of cancer: A global perspective: A project of World Cancer Research Fund International*. Washington, D.C: American Institute for Cancer Research.
- Bachman, C. M., Baranowski, T., & Nicklas, T. A. (2006). Is there an association between sweetened beverages and adiposity? *Nutrition Reviews*, 64(4), 153–174.
- Basu, J. (2015, March 5). Academics and industry clash over WHO sugar advice. FOODNavigator.com. <http://www.foodnavigator.com/Policy/WHO-releases-final-sugar-advice-for-children-and-adults>. Accessed March 5, 2015
- Bes-Rastrollo, M., Schulze, M. B., Ruiz-Canela, M., & Martinez-Gonzalez, M. A. (2013). Financial conflicts of interest and reporting bias regarding the association between sugar-sweetened beverages and weight gain: A systematic review of systematic reviews. *PLoS Medicine*, 10(12), e1001578; discussion e1001578. doi:[10.1371/journal.pmed.1001578](https://doi.org/10.1371/journal.pmed.1001578)
- Billes, S. K. (2012, September 21). Obesity 2012 opens with keynote debate. In *TOS Times, OBESITY 2012 30th Annual scientific meeting*, San Antonio, Texas, September 20–24.
- Blanchet, C., Lamontagne, P., Rochette, L., Plante, C., Institut national de santé publique du Québec, & Direction recherche, formation et développement. (2009). *La consommation alimentaire et les apports nutritionnels des adultes québécois*. Montréal, Québec: Institut national de santé publique du Québec. <http://site.ebrary.com/id/10350771>. Accessed February 25, 2016
- Brisbois, T., Marsden, S., Anderson, G., & Sievenpiper, J. (2014). Estimated intakes and sources of total and added sugars in the Canadian diet. *Nutrients*, 6(5), 1899–1912. doi:[10.3390/nu6051899](https://doi.org/10.3390/nu6051899).
- Brownell, K. D., Farley, T., Willett, W. C., Popkin, B. M., Chaloupka, F. J., Thompson, J. W., & Ludwig, D. S. (2009). The public health and economic benefits of taxing sugar-sweetened beverages. *New England Journal of Medicine*, 361(16), 1599–1605. doi:[10.1056/NEJMp0905723](https://doi.org/10.1056/NEJMp0905723).
- Camirand, H., Blanchet, C., & Pica, L. A. (2012). Habitudes alimentaires. In *L'enquête québécoise sur la santé des jeunes du secondaire, 2010–2011. Le visage des jeunes d'aujourd'hui : leur santé physique et leurs habitudes de vie*. (Vol. Tome 1, pp. 71–96). Québec: Institut de la statistique du Québec.
- Canadian Beverage Association (CAB). (2012, September). Industry Guidelines for sale of beverages in schools. <http://www.canadianbeverage.ca/wp-content/uploads/2013/09/School-guidelines-CBA-2012-FINAL-ENG-as-ratified-by-Bd-20120918.pdf>. Accessed October 1, 2015
- Canadian Beverage Association (CAB). (2015). Guidelines. <http://www.canadianbeverage.ca/nutrition/guidelines/>. Accessed March 1, 2015
- Cardwell, M. (2015, March 9). Coffee consumption habits continue to shift in Canada. Grocers stand to profit from the popularity of in-home, single-serve coffee machines. *MarketingMag.ca*. <http://www.marketingmag.ca/consumer/coffee-consumption-habits-continue-to-shift-in-canada-139728>. Accessed December 14, 2015
- Cash, S., & Lacanilao, R. (2007). Taxing food to improve health: Economic evidence and arguments. *Agricultural and Resource Economics Review*, 36(2)
- Coffee Association of Canada. (2011). Canadian coffee drinking study—2011 highlights. <http://www.coffeeassoc.com/coffee-in-canada/canadian-coffee-drinking-study-2011-highlights/>. Accessed December 14, 2015

- Council of Better Business Bureaus. (2006). Children's food and beverage advertising initiative. <https://www.bbb.org/council/the-national-partner-program/national-advertising-review-services/childrens-food-and-beverage-advertising-initiative/>. Accessed December 15, 2015
- Danyliw, A. D., Vatanparast, H., Nikpartow, N., & Whiting, S. J. (2012). Beverage patterns among Canadian children and relationship to overweight and obesity. *Applied Physiology, Nutrition and Metabolism*, 37(5), 900–906. doi:10.1139/h2012-074.
- de Koning, L., Malik, V. S., Rimm, E. B., Willett, W. C., & Hu, F. B. (2011). Sugar-sweetened and artificially sweetened beverage consumption and risk of type 2 diabetes in men. *American Journal of Clinical Nutrition*, 93(6), 1321–1327. doi:10.3945/ajcn.110.007922.
- de Ruyter, J. C., Katan, M. B., Kas, R., & Olthof, M. R. (2014). Can children discriminate sugar-sweetened from non-nutritively sweetened beverages and how do they like them? *PLoS One*, 9(12), e115113. doi:10.1371/journal.pone.0115113.
- de Ruyter, J. C., Olthof, M. R., Seidell, J. C., & Katan, M. B. (2012). A trial of sugar-free or sugar-sweetened beverages and body weight in children. *New England Journal of Medicine*, 367(15), 1397–1406. doi:10.1056/NEJMoa1203034.
- Dubois, L., Farmer, A., Girard, M., & Peterson, K. (2007). Regular sugar-sweetened beverage consumption between meals increases risk of overweight among preschool-aged children. *Journal of the American Dietetic Association*, 107(6), 924–934; discussion 934–935. doi:10.1016/j.jada.2007.03.004
- Ebbeling, C. B. (2014). Sugar-sweetened beverages and body weight. *Current Opinion in Lipidology*, 25(1), 1–7. doi:10.1097/MOL.0000000000000035.
- Ebbeling, C. B., Feldman, H. A., Chomitz, V. R., Antonelli, T. A., Gortmaker, S. L., Osganian, S. K., & Ludwig, D. S. (2012). A randomized trial of sugar-sweetened beverages and adolescent body weight. *New England Journal of Medicine*, 367(15), 1407–1416. doi:10.1056/NEJMoa1203388.
- Fagherazzi, G., Vilier, A., Saes Sartorelli, D., Lajous, M., Balkau, B., & Clavel-Chapelon, F. (2013). Consumption of artificially and sugar-sweetened beverages and incident type 2 diabetes in the Etude Epidemiologique aupres des femmes de la Mutuelle Generale de l'Education Nationale-European Prospective Investigation into Cancer and Nutrition cohort. *American Journal of Clinical Nutrition*, 97(3), 517–523. doi:10.3945/ajcn.112.050997.
- Federal Trade Commission (FTC). (2012). A review of food marketing to children and adolescents: Follow-up report. <https://www.ftc.gov/sites/default/files/documents/reports/review-food-marketing-children-and-adolescents-follow-report/121221foodmarketingreport.pdf>. Accessed February 25, 2016
- Ferraro, P. M., Taylor, E. N., Gambaro, G., & Curhan, G. C. (2013). Soda and other beverages and the risk of kidney stones. *Clinical Journal of the American Society of Nephrology*, 8(8), 1389–1395. doi:10.2215/CJN.11661112.
- Forshee, R. A., Anderson, P. A., & Storey, M. L. (2008). Sugar-sweetened beverages and body mass index in children and adolescents: A meta-analysis. *The American Journal of Clinical Nutrition*, 87(6), 1662–1671.
- French Constitutional Council. (2011). *Décision No2011-644DC. Article, consolidation, travaux parlementaires*. <http://www.conseil-constitutionnel.fr/conseil-constitutionnel/francais/les-decisions/acces-par-date/decisions-depuis-1959/2011/2011-644-dc/decision-n-2011-644-dc-du-28-decembre-2011.104235.html>. Accessed March 1, 2012
- Garriguet, D. (2008a). Beverage consumption of Canadian adults. Health matters. *Health Reports*, 19(4), 23.
- Garriguet, D. (2008b). Beverage consumption of children and teens. Health matters. *Health Reports*, 19(4), 17.
- Gillis, L. J., & Bar-Or, O. (2003). Food away from home, sugar-sweetened drink consumption and juvenile obesity. *Journal of the American College of Nutrition*, 22(6), 539–545.
- Government of Canada. (2015). Food and drug regulations. C.R.C., c. 870. FOOD AND DRUGS ACT. http://laws-lois.justice.gc.ca/eng/regulations/C.R.C.%2C_c._870/FullText.html. Accessed September 22, 2015

- Greenwood, D. C., Threapleton, D. E., Evans, C. E. L., Cleghorn, C. L., Nykjaer, C., Woodhead, C., & Burley, V. J. (2014). Association between sugar-sweetened and artificially sweetened soft drinks and type 2 diabetes: Systematic review and dose-response meta-analysis of prospective studies. *The British Journal of Nutrition*, 112(5), 725–734. doi:10.1017/S0007114514001329.
- Hastings, G., McDermott, L., Angus, K., Stead, M., & Thomson, S. (2007). *The extend nature and effect of food promotion to children: a review of the evidence* (No. Technical paper prepared for the World Health Organization). Geneva, Switzerland: Institute for Social Marketing, University of Stirling & The Open University, United Kingdom. http://www.who.int/dietphysicalactivity/publications/Hastings_paper_marketing.pdf. Accessed February 25, 2016
- Hawkes, C. (2010). The worldwide battle against soft drinks in schools. *American Journal of Preventive Medicine*, 38(4), 457–461. doi:10.1016/j.amepre.2010.01.011.
- Hawkes, C. (2013). *Promoting healthy diets through nutrition education and changes in the food environment: an international review of actions and their effectiveness*. Rome (Italy): Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations. <http://www.fao.org/docrep/017/i3235e/i3235e.pdf>. Accessed February 25, 2016
- Health Canada. (2011a). Caffeinated energy drinks. <http://www.hc-sc.gc.ca/fn-an/prodnatur/cafdrink-boissons-eng.php>. Accessed January 14, 2016
- Health Canada. (2011b). Canada's food guide. <http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/index-eng.php>. Accessed September 23, 2015
- Huang, C., Huang, J., Tian, Y., Yang, X., & Gu, D. (2014). Sugar sweetened beverages consumption and risk of coronary heart disease: A meta-analysis of prospective studies. *Atherosclerosis*, 234(1), 11–16. doi:10.1016/j.atherosclerosis.2014.01.037.
- Hu, F. B. (2013). Resolved: There is sufficient scientific evidence that decreasing sugar-sweetened beverage consumption will reduce the prevalence of obesity and obesity-related diseases: Sugar-sweetened beverages and risk of obesity. *Obesity Reviews*, 14(8), 606–619. doi:10.1111/obr.12040.
- Imamura, F., O'Connor, L., Ye, Z., Mursu, J., Hayashino, Y., Bhupathiraju, S. N., & Forouhi, N. G. (2015). Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: Systematic review, meta-analysis, and estimation of population attributable fraction. *BMJ (Clinical Research Ed.)*, 351, h3576.
- Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., et al. (2005). Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and their relationships with physical activity and dietary patterns. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 6(2), 123–132. doi:10.1111/j.1467-789X.2005.00176.x.
- Kaiser, K. A., Shikany, J. M., Keating, K. D., & Allison, D. B. (2013). Will reducing sugar-sweetened beverage consumption reduce obesity? Evidence supporting conjecture is strong, but evidence when testing effect is weak. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 14(8), 620–633. doi:10.1111/obr.12048.
- Keller, A., Heitmann, B. L., & Olsen, N. (2015). Sugar-sweetened beverages, vascular risk factors and events: A systematic literature review. *Public Health Nutrition*, 18(7), 1145–1154. doi:10.1017/S1368980014002122.
- Langlois, K., & Garriguet, D. (2011). Sugar consumption among Canadians of all ages. *Health Reports*, 22(3), 23. <http://www.statcan.gc.ca/pub/82-003-x/2011003/article/11540-eng.pdf>. Accessed February 28, 2016
- Le Bodo, Y., Paquette, M.-C., Vallières, M., & Alméras, N. (2015). Is sugar the new tobacco? Insights from laboratory studies, consumer surveys and public health. *Current Obesity Reports*, 4(1), 111–121. doi:10.1007/s13679-015-0141-3.
- Le Monde. (2014, September 19). Le Conseil constitutionnel censure de nouveau la taxe sur les boissons énergisantes. *LeMonde.fr*. http://www.lemonde.fr/sante/article/2014/09/19/le-conseil-constitutionnel-censure-de-nouveau-la-taxe-sur-les-boissons-energisantes_4490601_1651302.html. Accessed March 1, 2015

- Malik, V. S., Pan, A., Willett, W. C., & Hu, F. B. (2013). Sugar-sweetened beverages and weight gain in children and adults: A systematic review and meta-analysis. *The American Journal of Clinical Nutrition*, 98(4), 1084–1102. doi:10.3945/ajcn.113.058362.
- Malik, V. S., Popkin, B. M., Bray, G. A., Després, J.-P., Willett, W. C., & Hu, F. B. (2010). Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: A meta-analysis. *Diabetes Care*, 33(11), 2477–2483. doi:10.2337/dc.10-1079.
- Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: A systematic review. *The American Journal of Clinical Nutrition*, 84(2), 274–288.
- Martin, V., Parent, M.-P., Blouin, M., & Durand, C. (2014). *Gazelle et Potiron: cadre de référence pour créer des environnements favorables à la saine alimentation, au jeu actif et au développement moteur en services de garde éducatifs à l'enfance*. Québec, Canada: Ministère de la Famille du Québec. <http://www.uqtr.ca/biblio/notice/document/30823897D.pdf>. Accessed February 28, 2016
- Mäse, L. C., de Niet-Fitzgerald, J. E., Watts, A. W., Naylor, P.-J., & Saewyc, E. M. (2014). Associations between the school food environment, student consumption and body mass index of Canadian adolescents. *The International Journal of Behavioral Nutrition and Physical Activity*, 11(1), 29. doi:10.1186/1479-5868-11-29.
- Massougboji, J., Le Bodo, Y., Fratu, R., & De Wals, P. (2014). Reviews examining sugar-sweetened beverages and body weight: Correlates of their quality and conclusions. *The American Journal of Clinical Nutrition*, 99(5), 1096–1104. doi:10.3945/ajcn.113.063776.
- Mathias, K. C., Slining, M. M., & Popkin, B. M. (2013). Foods and beverages associated with higher intake of sugar-sweetened beverages. *American Journal of Preventive Medicine*, 44(4), 351–357. doi:10.1016/j.amepre.2012.11.036.
- Mattes, R. D., Shikany, J. M., Kaiser, K. A., & Allison, D. B. (2011). Nutritively sweetened beverage consumption and body weight: A systematic review and meta-analysis of randomized experiments. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 12(5), 346–365. doi:10.1111/j.1467-789X.2010.00755.x.
- Merchant, A. T., Tripathi, A., & Pervaiz, F. (2010). Available energy from soft drinks: More than the sum of its parts. *Public Health Nutrition*, 13(12), 1997–1999. doi:10.1017/S136898001000128X.
- Ministère de l'Éducation, du Loisir et du Sport. (2009). *Framework policy on healthy eating and active living—Going the healthy route at school. Foods and beverages containing sweeteners*. Québec, Canada. http://www.education.gouv.qc.ca/fileadmin/site_web/documents/dpse/adaptation_serv_comp/VirageSanteEcole_FicheInfo_Edulcorant_a.pdf. Accessed February 28, 2016
- Ministère de l'Éducation, du Loisir et du Sport. (2012). *Bilan de la mise en œuvre de la politique-cadre pour une saine alimentation et un mode de vie physiquement actif - Pour un virage santé à l'école, Thème 1 : Environnement scolaire Volet saine alimentation*. Québec, Canada
- Morin, P. (Ed.). (2010). *Portrait des jeunes Sherbrookoises de 4 à 17 ans en matière d'alimentation et d'activité physique et sportive rapport final*. Québec: Québec en forme. <http://public.eblib.com/choice/publicfullrecord.aspx?p=3279285>. Accessed February 28, 2016
- Morin, P., Turcotte, S., & Perreault, G. (2013). Relationship between eating behaviors and physical activity among primary and secondary school students: Results of a cross-sectional study. *The Journal of School Health*, 83(9), 597–604. doi:10.1111/josh.12071.
- Moynihan, P. J., & Kelly, S. A. M. (2014). Effect on caries of restricting sugars intake: Systematic review to inform WHO Guidelines. *Journal of Dental Research*, 93(1), 8–18. doi:10.1177/0022034513508954.
- Mundt, C. A., Baxter-Jones, A. D. G., Whiting, S. J., Bailey, D. A., Faulkner, R. A., & Mirwald, R. L. (2006). Relationships of activity and sugar drink intake on fat mass development in youths. *Medicine and Science in Sports and Exercise*, 38(7), 1245–1254. doi:10.1249/01.mss.0000227309.18902.fe.
- Mytton, O. (2015). Time for a sugary drinks tax in the UK? *Journal of Public Health*, 37(1), 24–25. doi:10.1093/pubmed/fdu033

- Nettleton, J. A., Lutsey, P. L., Wang, Y., Lima, J. A., Michos, E. D., & Jacobs, D. R. (2009). Diet soda intake and risk of incident metabolic syndrome and type 2 diabetes in the multi-ethnic study of atherosclerosis (MESA). *Diabetes Care*, 32(4), 688–694. doi:10.2337/dc08-1799.
- Nielsen, S. J., & Popkin, B. M. (2004). Changes in beverage intake between 1977 and 2001. *American Journal of Preventive Medicine*, 27(3), 205–210. doi:10.1016/j.amepre.2004.05.005.
- Pereira, M. A. (2013). Diet beverages and the risk of obesity, diabetes, and cardiovascular disease: A review of the evidence. *Nutrition Reviews*, 71(7), 433–440. doi:10.1111/nure.12038.
- Pereira, M. A. (2014). Sugar-sweetened and artificially-sweetened beverages in relation to obesity risk. *Advances in Nutrition: An International Review Journal*, 5(6), 797–808. doi:10.3945/an.114.007062.
- Popkin, B. M., Armstrong, L. E., Bray, G. M., Caballero, B., Frei, B., & Willett, W. C. (2006). A new proposed guidance system for beverage consumption in the United States. *The American Journal of Clinical Nutrition*, 83(3), 529–542.
- Popkin, B. M., & Hawkes, C. (2016). Sweetening of the global diet, particularly beverages: Patterns, trends, and policy responses. *The Lancet Diabetes & Endocrinology*, 4(2), 174–186. doi:10.1016/S2213-8587(15)00419-2.
- Potvin Kent, M., Dubois, L., Kent, E. A., & Wanless, A. J. (2013). Internet marketing directed at children on food and restaurant websites in two policy environments. *Obesity (Silver Spring, Md.)*, 21(4), 800–807. doi:10.1002/oby.20124
- Potvin Kent, M., Martin, C. L., & Kent, E. A. (2014). Changes in the volume, power and nutritional quality of foods marketed to children on television in Canada. *Obesity (Silver Spring, Md.)*, 22(9), 2053–2060. doi:10.1002/oby.20826
- Potvin Kent, M., & Wanless, A. (2014). The influence of the children's food and beverage advertising initiative: Change in children's exposure to food advertising on television in Canada between 2006–2009. *International Journal of Obesity*, 38(4), 558–562. doi:10.1038/ijo.2014.4.
- Public Health England (PHE). (2015). *Sugar reduction: The evidence for action. Annexe 4: An analysis of the role of price promotions on the household purchases of food and drinks high in sugar. A research project for Public Health England conducted by Kantar Worldpanel UK*. London. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/470175/Annexe_4_Analysis_of_price_promotions.pdf. Accessed January 22, 2016
- Quebec Weight Coalition (CQPP). (2012). *Sugar-sweetened beverage marketing unveiled. Volume 2: Price, an argument that pays off*. <http://www.cqpp.qc.ca/en/sugar-sweetened-beverages/marketing>. Accessed March 1, 2013
- Rabin, R. C. (2012, September 21). Avoiding sugared drinks limits weight gain in two studies. *The New York Times*. New York. http://www.nytimes.com/2012/09/22/health/avoiding-sugary-drinks-improves-childrens-weight-in-2-studies.html?_r=1. Accessed October 1, 2015
- Reid, J. L., Hammond, D., McCrory, C., Dubin, J. A., & Leatherdale, S. T. (2015). Use of caffeinated energy drinks among secondary school students in Ontario: Prevalence and correlates of using energy drinks and mixing with alcohol. *Canadian Journal of Public Health=Revue Canadienne De Santé Publique*, 106(3), e101–e108.
- Saunders, T. (2011). Potential contributors to the Canadian pediatric obesity epidemic. *ISRN Pediatrics*, 2011, 1–10. doi:10.5402/2011/917684.
- Sievenpiper, J. L., & de Souza, R. J. (2013). Are sugar-sweetened beverages the whole story? *The American Journal of Clinical Nutrition*, 98(2), 261–263. doi:10.3945/ajcn.113.067215.
- Statistics Canada. (2010). *Food statistics 2009* (No. Catalogue no. 21-020-X). <http://www.statcan.gc.ca/pub/21-020-x/21-020-x2009001-eng.pdf>. Accessed March 1, 2012
- Statistics Canada. (2014). Canadian community health survey—nutrition (CCHS). <http://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5049>. Accessed October 29, 2015
- Te Morenga, L. A., Howatson, A. J., Jones, R. M., & Mann, J. (2014). Dietary sugars and cardiometabolic risk: Systematic review and meta-analyses of randomized controlled trials of the effects on blood pressure and lipids. *The American Journal of Clinical Nutrition*, 100(1), 65–79. doi:10.3945/ajcn.113.081521.

- Te Morenga, L., Mallard, S., & Mann, J. (2012). Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. *BMJ*, 346(3), e7492–e7492. doi:[10.1136/bmj.e7492](https://doi.org/10.1136/bmj.e7492)
- Trumbo, P. R., & Rivers, C. R. (2014). Systematic review of the evidence for an association between sugar-sweetened beverage consumption and risk of obesity. *Nutrition Reviews*, 72(9), 566–574. doi:[10.1111/nure.12128](https://doi.org/10.1111/nure.12128).
- Vanderlee, L., Manske, S., Murnaghan, D., Hanning, R., & Hammond, D. (2014). Sugar-sweetened beverage consumption among a subset of Canadian youth. *The Journal of School Health*, 84(3), 168–176. doi:[10.1111/josh.12139](https://doi.org/10.1111/josh.12139).
- Wang, J. W., Mark, S., Henderson, M., O'Loughlin, J., Tremblay, A., Wortman, J., et al. (2013). Adiposity and glucose intolerance exacerbate components of metabolic syndrome in children consuming sugar-sweetened beverages: QUALITY cohort study. *Pediatric Obesity*, 8(4), 284–293. doi:[10.1111/j.2047-6310.2012.00108.x](https://doi.org/10.1111/j.2047-6310.2012.00108.x).
- Welsh, J. A., Lundeen, E. A., & Stein, A. D. (2013). The sugar-sweetened beverage wars: Public health and the role of the beverage industry. *Current opinion in Endocrinology, Diabetes, and Obesity*, 20(5), 401–406. doi:[10.1097/01.med.0000432610.96107.f5](https://doi.org/10.1097/01.med.0000432610.96107.f5).
- Woodward-Lopez, G., Kao, J., & Ritchie, L. (2011). To what extent have sweetened beverages contributed to the obesity epidemic? *Public Health Nutrition*, 14(3), 499–509. doi:[10.1017/S1368980010002375](https://doi.org/10.1017/S1368980010002375).
- World Health Organization (WHO). (2010). *Set of recommendations on the marketing of foods and non-alcoholic beverages to children*. Geneva, Switzerland: World Health Organization. http://whqlibdoc.who.int/publications/2010/9789241500210_eng.pdf. Accessed February 29, 2016
- World Health Organization (WHO). (2015). *Guideline: Sugars intake for adults and children*. Geneva: Switzerland.
- World Health Organization (WHO), & Food and Agriculture Organization (FAO) (Eds.). (2003). *Diet, nutrition, and the prevention of chronic diseases: report of a WHO-FAO Expert Consultation on Diet, Nutrition, and the Prevention of Chronic Diseases*. Geneva: World Health Organization.
- Yang, Q., Zhang, Z., Gregg, E. W., Flanders, W. D., Merritt, R., & Hu, F. B. (2014). Added sugar intake and cardiovascular diseases mortality among US adults. *JAMA Internal Medicine*, 174(4), 516–524. doi:[10.1001/jamainternmed.2013.13563](https://doi.org/10.1001/jamainternmed.2013.13563).
- Young, L. R., & Nestle, M. (2003). Expanding portion sizes in the US marketplace: Implications for nutrition counseling. *Journal of the American Dietetic Association*, 103(2), 231–234. doi:[10.1053/jada.2003.50027](https://doi.org/10.1053/jada.2003.50027).
- Zheng, M., Allman-Farinelli, M., Heitmann, B. L., & Rangan, A. (2015). Substitution of sugar-sweetened beverages with other beverage alternatives: A review of long-term health outcomes. *Journal of the Academy of Nutrition and Dietetics*, 115(5), 767–779. doi:[10.1016/j.jand.2015.01.006](https://doi.org/10.1016/j.jand.2015.01.006).

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