AMA
Research and Reform Unit

A tax on sugar-sweetened beverages:

Modelled impacts on sugar consumption and government revenue

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CONTENTS

EXECUTIVE SUMMARY

Overweight and obesity is a significant and growing issue in Australia.

The management of the obesity crisis in Australia is a national and economic priority, and Australia's response to it must be commensurate with the breadth of its prevalence, the speed of its growth, and major impacts on individuals and society.

Rates of obesity in Australian adults have been steadily increasing for at least 25 years (from 19% in 1995 to 31% in 2018). Among children (aged 5-17), there has also been an upwards trend (from 5% in 1995 to 8% in 2018). It is estimated that a third (33%) of the projected adult population will be obese by 2025.

The AMA wants to see steps taken towards reducing obesity because it is a major risk factor for a range of chronic and preventable conditions including type 2 diabetes, heart disease, stroke and cancer. This not only diminishes the health and wellbeing of Australians, but places a huge financial burden on our health system, in particular our public hospitals.

We live in an environment that effectively promotes weight gain through widely available, advertised and highly affordable processed food products with little or no nutritional benefit. This is confounded by limited population understanding of what is in food and drink products and what constitutes a healthy diet.

Sugar-sweetened beverages (SSBs) are a major contributor to the obesity crisis and provide almost no nutritional benefit.

SSBs are soft drinks containing 'free sugars' such as sucrose, high-fructose corn syrup or fruit juice. This category of beverage typically includes carbonated and non-carbonated fruit, dairy/milk, sport, energy and cordial drinks containing free sugars, and excludes alcoholic and artificially-sweetened (diet) drinks. SSBs contain large amounts of free sugar — delivering a high number of liquid calories but providing almost no nutritional benefit. In this report it is suggested to tax a subset of SSBs — all non-alcoholic drinks containing free sugars, excluding 100 per cent fruit juice, milk-based and cordial drinks. The focus is on drinks that provide no nutritional benefit.

There is a strong association between SSB consumption and increased energy intake, weight gain and obesity. Conversely, reduced consumption of SSBs is significantly associated with weight loss.

With increasing population body mass index (BMI), direct healthcare costs increase, many of which are borne by government(s).

As population BMI rises, so do direct healthcare costs, as well as indirect costs due to reduced productivity.

A systematic review of worldwide costing studies estimated that people living with obesity have medical costs that are approximately 30 per cent greater than their healthy weight peers.

The AMA estimates that if no action is taken to stem the obesity crisis, by 2025 taxpayers will have footed a further $29.5 billion (over four years) for the direct healthcare costs of obesity.

A tax on SSBs would be an important first step towards tackling obesity and would raise revenue to take further steps.

To effect a change in SSB consumption, both a clear message for consumers that the product is unhealthy, and a tangible deterrent are warranted. A tax can deliver on both counts by creating a price signal that the product is unhealthy, and reducing consumption through higher prices (and therefore lower affordability). Furthermore, an appropriately designed tax can also incentivise manufacturers of SSBs to reformulate their products to contain less free sugar.

There is clear evidence that taxes on unhealthy food and drink can improve population diets. SSB taxes in other countries have been successful in reducing consumption and incentivising reformulation of SSBs. The World Health Organization recommends that countries implement SSB taxes, and at a sufficient scale to impact on consumer purchases.

More than 45 jurisdictions across the world have implemented SSB taxes. There has been confirmed success already in a number of countries, including the United Kingdom (2018), Mexico (2014), France (2012), Chile (2014), Catalonia, Spain (2016), and in some US jurisdictions (Portland 1991; Cleveland 2003; Berkeley 2015), where robust evaluations have shown a drop in consumption following the tax.

Meanwhile, a tax on SSBs enjoys majority support from the Australian public, with support even higher if tax revenue is hypothecated to fund initiatives to tackle obesity.

Revenue should be earmarked for preventive health measures such as awareness and education initiatives to improve health literacy around diet and nutrition. For the majority of the population, there is an affordable alternative to SSBs in the form of tap water, and part of the intent of an SSB tax would be to move consumers towards this untaxed, healthy substitute. This means that any barriers to safe water access also require action. Therefore, revenue should also be used to ensure all Australians have reliable access to a clean, safe water supply.

Modelling indicates a tax on select SSBs would reduce sugar consumption from soft drinks by 12 to 18 per cent and raise annual government revenue of $814 million to $749 million.

Utilising publicly available data, the AMA has modelled the impact of a tax on select SSBs.

The tax that has been modelled is a specific excise tax based on sugar content, set at $0.40 per 100 grams of sugar (per unit of product). This tax rate was chosen with the World Health Organization's recommendation in mind – that a tax on SSBs would need to raise the retail price by at least 20 per cent in order to have a meaningful health effect.

The impact of the tax on consumption and revenue was modelled using two different published price elasticities – one derived theoretically for Australia, and one derived from real-world impact evaluations of SSB taxes around the world (predominantly high-income countries). This takes into account both the Australian context and the realities of how humans have responded to SSB taxes in comparable countries. In particular, the latter price elasticity allows us to account for real-world variation in price pass-through to the consumer, and the effect of a price signal that the product is unhealthy.

This model builds on and refines previous modelling undertaken in this field. To the best of our knowledge, an excise tax based on sugar content has not been modelled in the Australian context to this level of detail and accuracy. In addition, use of the composite real-world price elasticity, published in 2019 by Andrea Teng and colleagues at the University of Otago, provides greater confidence in the outcomes.

There would be minimal impact on the sugar industry.

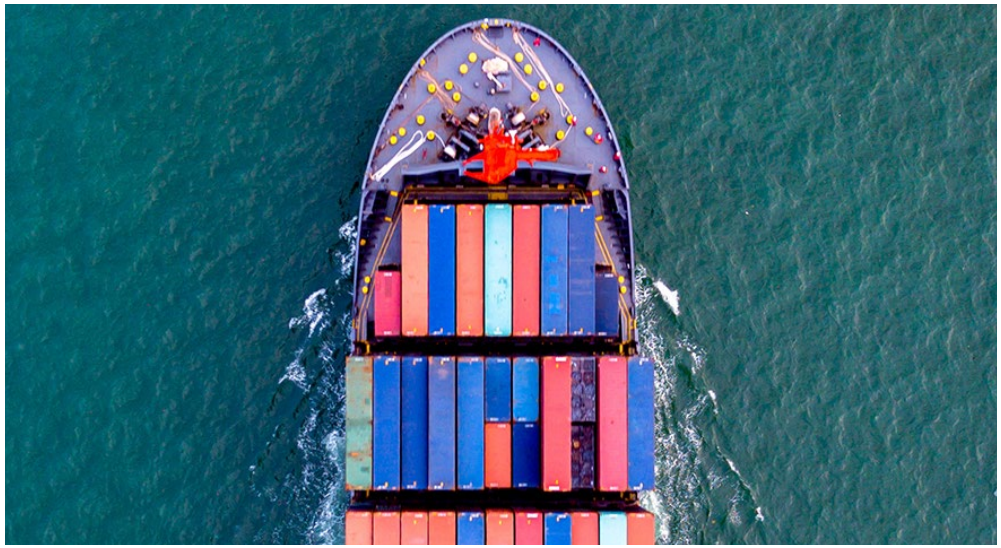
About 80 per cent of Australia's domestic sugar production is exported. The AMA estimates that only 5.3 per cent of total domestic production goes towards domestic sugar-sweetened beverage manufacture. The estimated change in SSB consumption modelled in this report translates to a 0.64 to 1.01 per cent drop in demand for domestic sugar production. The domestic sugar market already has a much greater level of volatility than this change. Given this, the impact on the sugar industry is anticipated to be minimal and does not appear to warrant a government assistance package.

Reduced sugar consumption and improved diet would likely lead to a reduction in the prevalence of obesity and substantial healthcare savings.

Previous Australian modelling estimated that an SSB tax that increases the retail price by 20 per cent would lead to a reduction in the prevalence of obesity of around 2 per cent and healthcare expenditure savings of $609 million to $1.73 billion.

For the benefit of doctors, patients and broader society, there is a clear imperative to act now to arrest the growing obesity crisis – a crisis that places a huge financial burden on our health system, in particular our public hospitals. A tax on SSBs would be a targeted and sensible first step towards improving diets and thereby tackling obesity, that would relieve pressure on our public hospitals in the long term without draining any existing resource from the health budget in the short term.

The AMA acknowledges that there is not wide political support at present for an SSB tax. For this reason, the AMA will campaign to demonstrate community support and put this issue on the political agenda.



PROBLEM

Overweight and obesity in Australia

The management of the obesity crisis in Australia is a national and economic priority, and Australia's response to it must be commensurate with the breadth of its prevalence, the speed of its growth, and major impacts on individuals and society.

Prevalence now

Obesity data suggest that 31 per cent of Australian adults and 8 per cent of children are obese. When including those who are overweight this increases to 67 per cent of adults and 25 per cent of children.[1]

For Aboriginal and Torres Strait Islander peoples, the rates of overweight and obesity are even higher, at 74 per cent of adults and 38 per cent of children.[2] Indeed, high body mass is estimated to account for 16 per cent of the health gap between Aboriginal and Torres Strait Islander peoples and the total Australian population.[3]

The obesity problem is particularly pronounced in Australia. We have the sixth highest proportion of overweight or obese people (aged 15+) among 22 Organisation for Economic Co-operation and Development (OECD) member countries.[4]

Trend over time

Rates of obesity in Australian adults have been steadily increasing for at least 25 years (from 19% in 1995 to 31% in 2018).[5] Among children (aged 5-17), there has also been an upwards trend (from 5% in 1995 to 8% in 2018).[6]

Projected prevalence

Overweight and obesity is the second biggest modifiable risk factor contributing to the burden of disease in Australia, after tobacco.[7] There is some evidence that overweight and obesity is set to overtake tobacco as the major cause of preventable death in Australia.[8]

The prevalence of obesity in Australia is expected to continue to increase. In 2015, PwC estimated that a third (33%) of the projected adult population would be obese by 2025.[9] The latest data from the Australian Institute for Health and Welfare indicates that Australia is on track to at least meet if not exceed this projection, with 31 per cent of adults obese in 2017-18.[10]

Health impact

Obesity is a major risk factor for chronic and preventable conditions including type 2 diabetes, heart disease, hypertension, stroke, gall bladder disease, osteoarthritis, sleep apnoea and respiratory problems, mental health disorders and some cancers (including endometrial, prostate, breast and colon).

From a health perspective, it is far better to prevent obesity in the first place than try to manage it once established. This means a focus on children's health and health literacy is needed. Overweight and obesity in children and adolescents is associated with poorer health and wellbeing, worse performance at school, and an increased risk of overweight and obesity in adulthood.[11]

The obesogenic environment

The ‘obesogenic environment’ refers to the conditions of life that promote or enable obesity through factors such as high availability, affordability and promotion of unhealthy food and drink, limited opportunities to exercise, and limited access to accurate information about nutrition.

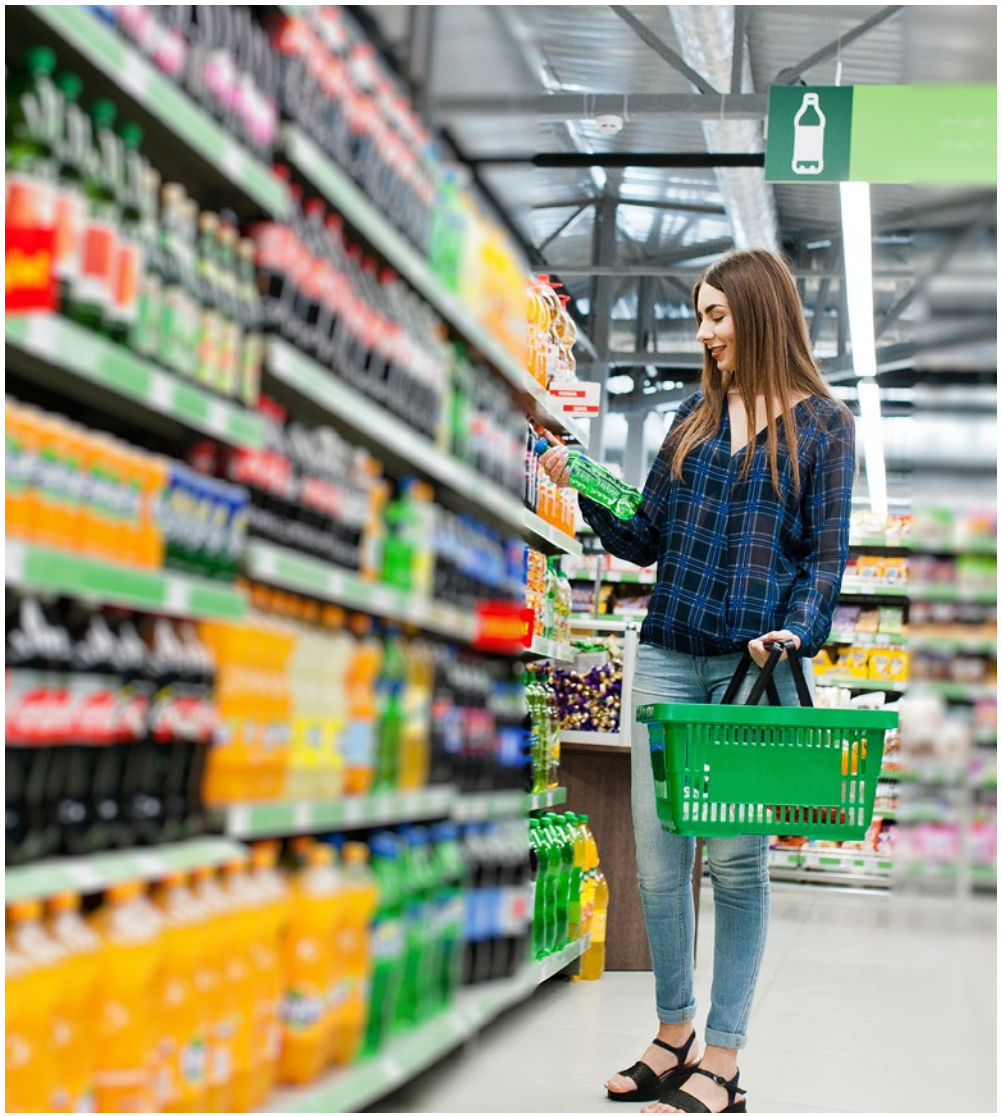
The scale of the obesity crisis is not surprising given the significant consumption of processed foods and foods high in salt, fat and sugar, and low levels of physical activity and health literacy in Australia.

We live in an environment that promotes weight gain through widely available, advertised and highly affordable products with little or no nutritional benefit. This is confounded by limited population understanding of what is in food and drink products and what constitutes a healthy diet.

There is a clear need for improved health literacy specifically around SSBs in Australia; awareness of both sugar content and health risks is limited, especially among the most frequent consumers.[12]

Shaping a better overall environment is crucial for the whole life course. Good nutrition starts during pregnancy, and continues through infancy and childhood. Habits formed early can be hard to break in adulthood, and public health policies should focus on preventing unhealthy patterns from forming in the first place, such as high consumption of SSBs. Children learn about food through exposure to a variety of foods, by observing how the adults around them interact with food, including in childcare settings and schools, and through other exposures such as marketing.

In addition to a tax on SSBs, a range of complementary public health measures should be taken to adjust the obesogenic environment. These are discussed later in the report.



Sugar-sweetened beverages (SSBs)

What are SSBs?

Sugar-sweetened beverages are drinks containing 'free sugars' such as sucrose, high-fructose corn syrup or fruit juice. This category of beverage typically includes carbonated and non-carbonated fruit, dairy/milk, sport, energy and cordial drinks containing free sugars, and excludes alcoholic and artificially-sweetened (diet) drinks. In this report it is suggested to tax a subset of SSBs.

'Free sugars' means they are free-moving within the substance, as opposed to being encapsulated in the plant cells as they are in whole fruit and vegetables. Free sugars tend to be digested more rapidly and enter the blood stream quicker. Free sugar includes both 'added sugar' (added by manufacturers, cooks or consumers) and naturally occurring sugar (such as in honey, syrup and fruit juice).[13]

SSBs contain large amounts of free sugar – delivering a high number of liquid calories but providing almost no nutritional benefit. There are 8-12 teaspoons (33-50 grams) of sugar in the average 375 millilitre can of soft drink.[14]

In 2019-20, Australians consumed on average 70 grams of free sugar a day, with over a quarter (18g) of this coming from sugary drinks. Overall, free sugars contributed 12.4 per cent of total dietary energy, which exceeds the World Health Organization's recommendation that free sugars make up less than 10 per cent of dietary energy.[15,16] Other expert groups have recommended lower targets, for example the UK Scientific Advisory Committee on Nutrition recommended no more than 5 per cent.[17]

There is a clear positive association between higher intake of dietary sugars, including from SSBs, and body fatness in adults.[18] SSBs also increase the risk of dental caries in children and adults.[19]

SSB consumption in Australia

Australians consume a lot of SSBs, with young males the biggest consumers.[20] Thirty-six per cent of adults and 41 per cent of children consume SSBs at least weekly; 9 per cent of adults and 7 per cent of children consume them daily.[21] The AMA estimates that Australians consume at least 2.4 billion litres of SSBs per year (see page 28).

SSB consumption as a driver of obesity

There is a strong association between SSB consumption and increased energy intake, weight gain and obesity.[22] Conversely, reduced consumption of SSBs is significantly associated with weight loss.[23] Evidence also supports a strong association between consumption of SSBs and type 2 diabetes and cardiovascular disease, independent of body fatness.[24]

The main mechanism by which consumption of SSBs leads to poor health outcomes is via excess energy intake. Liquid calories are thought to provide lower feelings of fullness than solid calories, and tend not to be factored into daily energy intake (i.e. people tend not to offset liquid calories by eating less).[25]

SSBs as the target of the tax

SSBs are a logical target for a public health intervention, given the high level of consumption of these products, which provide almost no nutritional benefit but make a major contribution to the obesity crisis, and to poor dental health, through high levels of free sugar.

A tax can deliver both a clear message for consumers that the product is unhealthy, and a tangible deterrent in the form of higher prices. An appropriately designed tax can also incentivise manufacturers to reduce the sugar content in their products.

SSBs are also a practical target for a tax, as they are a discreet category that is easily identifiable, representing a small step in the right direction that is more easily implemented than a wider ranging intervention.

The cost of obesity

As population BMI rises, direct healthcare costs increase, many of which are borne by government(s). Indirect costs also increase due to reduced productivity.[26]

A systematic review of worldwide costing studies estimated that people living with obesity have medical costs that are approximately 30 per cent greater than their healthy weight peers.[27]

The exact cost of overweight and obesity to society is difficult to determine. Annual cost estimates for the Australian context range from $5.3 billion[28] to $8.6 billion[29] for obesity only, to $14.9 billion[30] for obesity and overweight combined. These estimates include both direct and indirect costs, with some discrepancy in the final estimate being accounted for by different data sources and which costs are included.

If you look at only the direct healthcare costs of obesity, which can be estimated with more accuracy, annual cost estimates for the Australian context range from $2.6 billion[31] to $3.8 billion[32] for obesity only, to $8.6 billion[33] for obesity and overweight combined.

The increased health care costs associated with obesity are observable early in life, with Australian research indicating that children (aged between two and five years) who are obese incur health care costs that are 60 per cent greater than children of healthy weight.[34]

Projected cost of obesity to 2025

By a previous estimate, a third (33%) of the projected adult population will be obese by 2025.[35] Building on this, the AMA estimates that if no action is taken to stem the obesity crisis, by 2025 taxpayers will have footed a further $29.5 billion for the direct healthcare costs of obesity (over four years to 2024-25).[36]

Now is the time for action. Our political leaders must recognise the urgency and scale of the problem. This report sets out a modest first step of introducing a tax on sugar-sweetened beverages, to stem the obesity epidemic and recover some of the external costs to society from the sale of these products.

‘... the AMA estimates that if no action is taken to stem the obesity crisis, by 2025 taxpayers will have footed a further $29.5 billion for the direct healthcare costs of obesity (over four years to 2024-25).’

ACTION

Public support for an SSB tax

Australian surveys have consistently shown majority support for a tax on sugar-sweetened beverages.[37] Public support is even higher if tax revenue is hypothecated to fund initiatives to tackle obesity.[38] A nationally representative survey undertaken in 2017 found 60 per cent of Australians support a tax on sugary drinks. This increased to 77 per cent support if the proceeds were used to fund obesity prevention.[39]

An SSB tax as part of a broader obesity strategy

A tax on SSBs would be an important first step towards tackling obesity and would raise revenue to take further steps.

There is clear evidence that taxes on unhealthy food and drink can improve population diets.[40] Indeed, the World Health Organization lists a tax on SSBs as an effective intervention in its Global Action Plan for the Prevention and Control of NCDs 2013-2020.[41] Larger effects are seen for taxes on non-core food or drink products (e.g. SSBs) for which there are close substitutes that are untaxed (e.g. water).[42] However, an SSB tax is not a silver bullet for tackling overweight and obesity by itself; it would be more effective for government(s) to maintain a suite of existing and new complementary measures. Such measures could include:

- adjusting the environment by protecting children from exposure to the marketing of unhealthy food and drink products and reducing their availability and prominence;
- implementing mass media campaigns, school education programs, and better product labelling to improve nutrition literacy;
- subsidising fruits and vegetables to increase intake and encourage substitution;
- promoting physical activity;
- installing more water fountains in public spaces;
- reducing food insecurity in urban, rural and remote areas, including by improving the supply chain for healthy foods, providing financial support for food banks, community gardens and cooking programs; and
- building stronger safeguards against unhealthy food and drink products into the food regulatory system, for example through reformulation targets and a requirement for added sugar labelling.

This would require building upon and expanding current government policies.

As mentioned above, there is a clear need for improved health literacy around SSBs in Australia, with awareness of both sugar content and health risks being limited, particularly among the most frequent consumers.[43] Meanwhile there is strong public support from Australians for a government funded awareness campaign on the health effects of SSBs[44] and evidence that such an awareness campaign would work.[45]

A benefit of starting with a tax on SSBs is that, in addition to reducing consumption, it would raise revenue that could be used to fund complementary measures such as awareness and education initiatives.

The AMA also recommends that some of the revenue is set aside to evaluate the impact of the tax, to inform the design of the tax in future years and similar public health measures in future.

Furthermore, the revenue could be used to fund projects to improve access to safe drinking water in remote Aboriginal and Torres Strait Islander communities. In some remote areas SSBs can be seen as a safer alternative to the community's water supply, and consumption can be high including among young children and babies.[46] This proposal is discussed in more detail later in the report.

The international experience of SSB taxes

SSB taxes in other countries have been successful in reducing consumption and incentivising reformulation of SSBs.

The World Health Organization recommends that countries implement SSB taxes, and at a sufficient scale to impact on consumer purchases.[47] Over 45 jurisdictions across the world have implemented SSB taxes.[48] There has been confirmed success already in a number of countries, including the United Kingdom (2018), Mexico (2014), France (2012), Chile (2014), Catalonia, Spain (2016) and in some US jurisdictions (Portland 1991; Cleveland 2003; Berkeley 2015), where robust evaluations have shown a drop in consumption following the tax.[49]

Below, case studies of Mexico and the UK are presented. Mexico is a useful case study because several high quality evaluations are available, and it is interesting to see a strong pass-through rate and a sustained consumer response. The UK is presented as an interesting case of widespread product reformulation in response to the tax, and hypothecation of revenue for preventive health initiatives.

Mexico case study: Excise tax

Implemented: January 2014.

Target: Manufacturers of soft drinks with added sugar.

Design: Specific tax – liquid volume.

One peso per litre excise tax. Represented approx. 10% increase in price at time tax was passed (September 2013).[50]

Indexation: Adjustment triggered by cumulative inflation of 10%.[51]

Scope: Any non-alcoholic beverage with added sugar (including powder and concentrates).[52]

Outcome: For purchases of beverages subject to the tax, there was an average decline of 5.5% in the first year, and an average decline of 9.7% in the second year (an average decline of 7.6% over the two years combined), compared to predicted purchases if no tax was implemented. In contrast, untaxed beverages increased on average 5.3% in the first year and decreased on average 1% in the second year (an average increase of 2.1% over the two years combined).[53]

There were significant declines in taxed beverage purchases across all socio-economic groups, with the largest reductions seen at the lowest socio-economic level.[54]

The production volume of still bottled water increased by 5.2% two years after the tax was implemented, which may indicate substitution to water by consumers.[55] Indeed, modelling that compared actual purchases with predicted purchases if no tax was implemented, found a 16.2% increase in purchases of (still and sparkling) bottled water after the tax.[56]

Pass-through: There was overshifting for carbonated SSBs and undershifting for non-carbonated SSBs. The price changes represented about an 11% increase for carbonated SSBs and 3% increase for non-carbonated SSBs (in 2014 compared to 2013).[57]

Stimulus: Authors of one of the evaluation studies reflected that it is possible the effect was not entirely due to elastic demand; it may have been amplified by other contemporaneous initiatives in Mexico that raised awareness of the negative health effects of unhealthy food and drink. Conversely, a post-tax increase in marketing efforts by the drinks industry may have attenuated the effect of the tax.[58]

Hypothecation: None known.

Revenue: Unknown.

UK case study: Soft Drinks Industry Levy

Announced: March 2016.

Implemented: April 2018.

Target: Manufacturers and importers of sugary soft drinks.

Design: Specific tax – sugar content.

£0.24 per litre for drinks with over 8g sugar per 100ml (high levy category).

£0.18 per litre for drinks with 5 to 8g sugar per 100ml (low levy category).

No charge for drinks with less than 5g sugar per 100ml (no levy category).[59]

Indexation: Unknown.

Scope: All sugar-sweetened beverages, excluding 100% fruit juice and milk-based drinks.[60]

Outcome: In response, many manufacturers reduced the sugar content of drinks subject to the levy. Over 50% of manufacturers did so between the announcement and when it was implemented, with Treasury saying this was the equivalent of removing 45 million kg of sugar from the market every year.[61]

Almost one year after implementation (February 2019), the percentage of drinks with enough sugar to be subject to the levy had fallen from an expected level of 49% to 15%.[62]

After implementation there was a peak in the proportion of drinks with a sugar level between 4.5 and 5g per 100ml, indicating that many manufacturers chose to reformulate to just below the 5g threshold.[63]

Between 2015 and 2018, the total volume of sugars sold from soft drinks decreased by 29%. Meanwhile, the total volume sales of bottled water and products exempt from the tax rose by 23%.[64,65]

The levy has been found to have no long term negative effects on the share value or turnover of domestic soft drinks manufacturers.[66]

Pass-through: The price of drinks in the high levy category rose by £0.075 per litre – a 31% pass-through rate.[67]

Stimulus: Authors of the evaluation study reflected that the stimulus for these changes was likely to have been a mixture of manufacturers wanting to avoid the levy, and responding to a greater consumer demand for lower sugar drinks following the widespread media attention after the announcement of the levy.[68] Introduction of the tax was also accompanied by a large public awareness campaign.[69]

Hypothecation: Revenue was ring-fenced for sports and health initiatives in schools.[70]

Revenue: At announcement, expected revenue was £520m in year 1. At implementation, this was revised down to £240m due to widespread reformulation. However, the government committed to sustain the funding for schools at the higher level even if revenue from the levy declined.[71]

SSB tax design

Type of tax

A number of taxation options are available, including taxing on the basis of sugar content, liquid volume or value (ad valorem). Most other countries with SSB taxes in place have used one of these three options.[72]

A sugar content tax is the most logical option, given that harm is caused proportionate to the sugar content, not the value or the liquid volume. It is the only option that creates an incentive for manufacturers to lower the sugar content of their products, and therefore is the option most targeted at reducing sugar consumption.

A liquid volume tax does not efficiently target the element that causes harm – a large bottle with a small amount of sugar would be taxed more than a small bottle with a large amount of sugar. Some commentators argue that a specific tax on liquid volume is the best option to generate revenue (given the weaker incentive to reformulate), but not to reduce sugar consumption.[73]

Application of an ad valorem tax (where tax is paid as a fixed percentage of the retail price, e.g. 15%) would mean that premium products are taxed more than cheap products, which can incentivise consumers and producers to switch to cheaper products in potentially larger quantities. For example, switching from a 1.25 litre branded beverage to a 2 litre unbranded one. This could create the opposite effect to that which is desired – to raise prices in order to reduce consumption.

Target of tax

A tax could be applied at various points in the process, including customs and excise, wholesale or retail. The main point of consideration here is to what extent the tax targets the manufacturer versus the wholesaler, retailer or consumer.

In the case of an SSB tax, arguably the ideal situation is that it targets both the manufacturer (thereby incentivising reformulation) and the consumer (thereby sending a price signal that the product is harmful, and reducing consumption by increasing the price).

An excise tax is the most logical option for targeting the manufacturer based on sugar content. Of course, there is no guarantee that an excise tax will be fully passed on to the consumer, as the retailer, wholesaler or manufacturer may choose to absorb it in part or in full. However, the international experience is that the SSB tax pass-through is sufficient to have an impact on consumption.[74] The government also has a range of options to influence tax pass-through such as raising the tax over time, or investigating other options to ensure the tax is effective at the point of sale in influencing the consumer via a price signal.

The excise tax would need to be accompanied by an equivalent customs tax to ensure domestic SSB manufacturers are not unfairly disadvantaged. Domestic manufacturers that adapt to the tax by reformulating beverages would have a competitive advantage over imports which do not.

Tax rate

The World Health Organization's recommendation is that a tax on SSBs would need to raise the retail price by at least 20 per cent in order to have a meaningful health effect.[75] Modelling studies and real-world evaluations indicate that SSB taxes elicit a response in consumption that is proportional to the tax applied (i.e. the greater the tax, the larger the drop in consumption), with small taxes (around 5%) raising revenue without having a notable impact on consumer purchases.[76]

SSB tax rates vary around the world. Several comparable countries to Australia have implemented sugar content taxes, some of which are set at a similar rate to that which is proposed in this report – $0.40/100g sugar (see Table 1).

Table 1: Sugar content tax rates in comparable countries

COUNTRY	LOCAL TAX RATE	VALUE IN AUD (AND UNITS HARMONISEDFOR COMPARISON)	TAX ON 375ML CAN OF COKE WITH 40G SUGAR[77] (AUD)
France	Sliding scale ranging from €7.53/hectolitre if 1g sugar/100ml to €20/hectolitre if >11g sugar/100ml[78]	$0.12/litre if 1g sugar/100ml $0.32/litre if >11g sugar/100ml	$0.12*
Catalonia, Spain	€0.12/litre if >8g sugar/100ml[79]	$0.19/litre if >8g sugar/100ml	$0.07
Republic of Ireland	€0.20/litre if 5-8g sugar/100ml €0.30/litre if >8g sugar/100ml[80]	$0.32/litre if 5-8g sugar/100ml $0.48/litre if >8g sugar/100ml	$0.18
Portugal	€8.22/100 litres if <80g sugar/litre €16·46/100 litres if >80g sugar/litre[81]	$0.13/litre if <8g sugar/100ml $0.26/litre if >8g sugar/100ml	$0.10
United Kingdom	£0.18/litre if 5-8g sugar/100ml £0.24/litre if >8g sugar/100ml[82]	$0.32/litre if 5-8g sugar/100ml $0.43/litre if >8g sugar/100ml	$0.16
Australia (proposed tax)	$0.40/100g sugar per unit of product	$0.40/100g sugar per unit of product	$0.16

*Sugar content is 10.6g/100ml but >11g threshold has been applied due to the intermittent tax threshold in the sliding scale not being available.

Ad valorem and liquid volume tax rates also vary worldwide, with California and Pennsylvania in the United States having rates in the region of the World Health Organization's recommended minimum 20 per cent increase on retail price.[83] Some Middle Eastern countries have implemented SSB excise taxes at rates in the 50 to 100 per cent range, and Bermuda has a 75 per cent import tax on SSBs.[84]

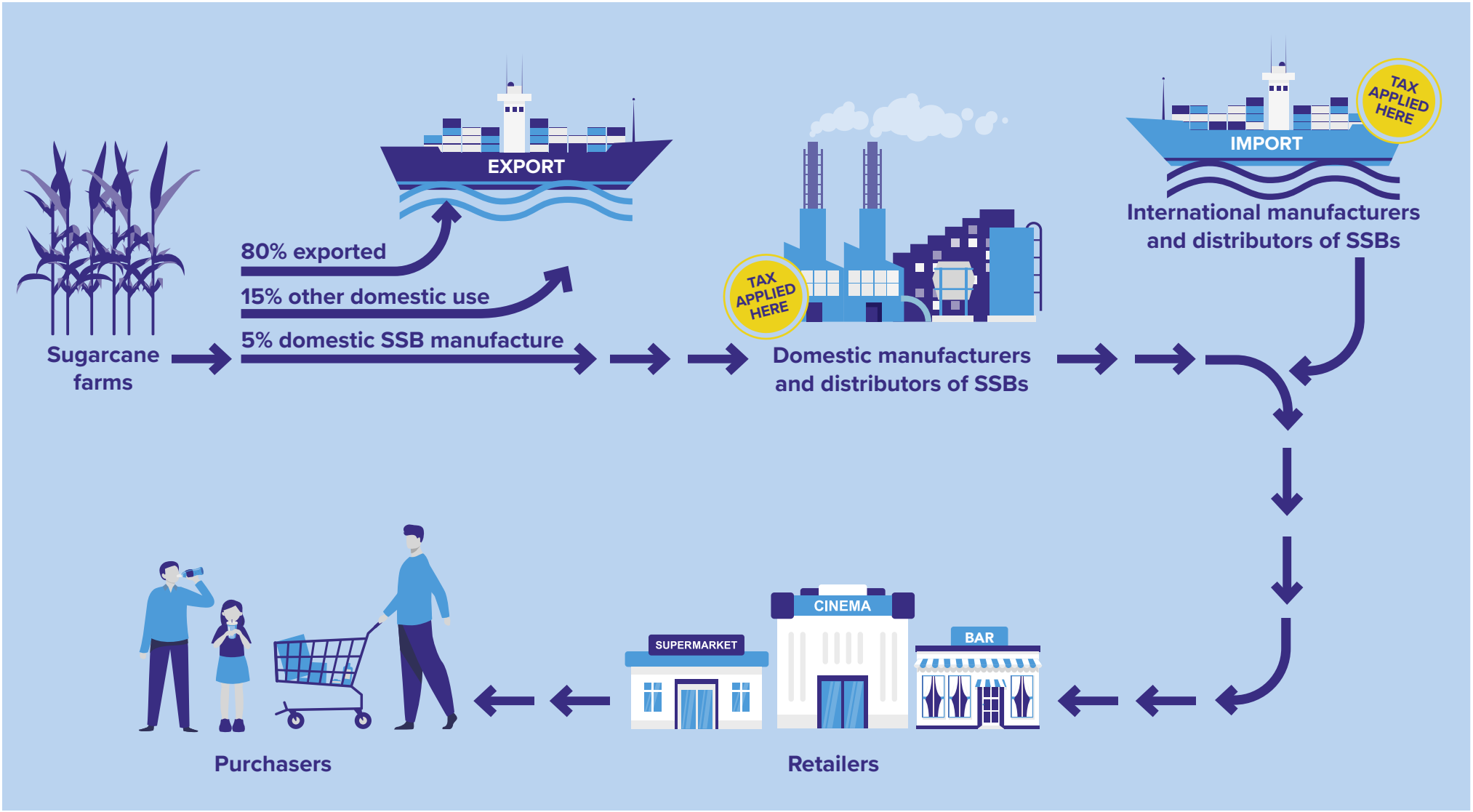
As a sugar content tax works differently to an ad valorem tax, to find a tax rate that satisfied the WHO's recommended minimum of 20 per cent, the retail price and sugar content of a range of SSBs had to be taken into account. With a sugar content tax, the effective tax rate (i.e. the percentage change in price) changes depending on the sugar content of the product and its original retail price. The tax rate of $0.40/100g sugar was chosen because it would raise the price of the average supermarket SSB by at least 20 per cent. The impact of the tax would be larger on products that are the cheapest (usually those sold in the supermarket) and have the most sugar; a smaller impact would be seen on products that are priced up (usually those sold in 'convenience' locations such as petrol stations and bars) or have less sugar. This is explained further in Appendix A.

Overall proposal

Here, the AMA proposes that the most logical and effective tax would be an excise (and customs) tax based on sugar content, to have the effect of at least a 20 per cent increase on (supermarket) retail price. This position is supported by the World Health Organization[85] and the Obesity Policy Coalition (representing Cancer Council Victoria, Diabetes Victoria, VicHealth and The Global Obesity Centre at Deakin University).[86] The tax should be targeted at the manufacturer in order to incentivise reformulation. In order to achieve a minimum 20 per cent increase on (supermarket) retail price, the tax rate should be set at $0.40/100g sugar.

The tax must also be indexed by CPI to account for inflation, so as not to erode its impact over time.

Figure 1: Overview of sugar-sweetened beverages' journey from sugar cane to consumer, showing point at which tax would be applied.



IMPACT

Original modelling: impact of tax on sugar consumption and government revenue

Modelling indicates a tax on select SSBs would reduce consumption by 12 to 18 per cent and raise annual government revenue of $814 million to $749 million.

Utilising publicly available data, the AMA has modelled the impact of a tax on select SSBs.

The tax that has been modelled is a specific excise tax based on sugar content, set at $0.40 per 100 grams of sugar (per unit of product). This tax rate was chosen with the World Health Organization's recommendation in mind – that a tax on SSBs would need to raise the retail price by at least 20 per cent in order to have a meaningful health effect. Full pass-through of the tax to the consumer has been assumed.

The policy intent is for the SSB tax to apply to non-alcoholic drinks containing free sugars, excluding 100 per cent fruit juice, milk-based and cordial drinks. The focus is on drinks that provide no nutritional benefit. The modelling matches this as far as possible, taking conservative estimates where the source data was not sufficiently granular.[87]

The model allows for all parameters and assumptions to be changed and has been used to explore a number of scenarios. There is further capacity to work with government to model a range of different options.

Here two main scenarios are presented:

1. **The impact of the tax on consumption and revenue, assuming no product reformulation**.

   In this scenario two different published price elasticities are used – one derived theoretically for Australia, and one derived from real-world impact evaluations of SSB taxes around the world (predominantly high-income countries). Price elasticity is a measurement of the change in demand for a product, in relation to a change in its price. For example, a price elasticity of -0.63 means that demand falls by 0.63% for every 1% increase in the price. Using these two price elasticities takes into account both the Australian context and the realities of how humans have responded to SSB taxes in comparable countries. In particular, the latter price elasticity allows us to account for real-world variation in price pass-through to the consumer and the effect of a price signal that the product is unhealthy.[88]

2. **The impact of the tax on consumption and revenue, assuming some product reformulation.**

   In this scenario the tax is applied as well as assuming that manufacturers undertake some product reformulation (i.e. lower the sugar content) in response to the tax. Only the composite real-world price elasticity in used in this case.

This model builds on and refines previous modelling undertaken in this field. To the best of our knowledge, an excise tax based on sugar content has not been modelled in the Australian context to this level of detail and accuracy. In addition, use of the composite real-world price elasticity, published in 2019, provides greater confidence in the outcomes.

Detailed information about the estimations and assumptions contained in the model are included in Appendix A.

Outcomes

Scenario 1: No product reformulation

Here the results are presented from the modelling of the proposed tax, with two different estimates of price elasticity. The first is as measured by Sharma et al (-0.63, referred to as price elasticity/PE 1) in the Australian context from HomeScan data of supermarket purchases.[89] The second is based on the estimate from Teng et al's meta-analysis (-1.0, referred to as price elasticity/PE 2) of real-world responses in consumer sales after the introduction of SSB taxes, and represents a larger effect on consumer behaviour.[90]

In this scenario, it is assumed there is no product reformulation in response to the tax.

In both cases the sales of SSBs fall after the introduction of the tax (see Figure 2). Total sales fall from 2.4 billion litres to 2.2 billion litres under the first price elasticity, and 2.4 billion litres to 2.0 billion litres under the second. There is a greater shift toward non-SSB alternatives using the second, real-world estimate. This reflects the larger cross-price elasticity used with the second estimate.

The fall in beverage sales and shift to lower sugar alternatives results in a drop in sugar consumption from soft drinks at a population level of 12 per cent (PE1) to 18 per cent (PE2) (see Figure 3). This translates to 11.0 litres fewer SSBs and 1.1 kilograms less sugar per person per year using PE1, or 17.5 fewer litres and 1.71 kilograms less sugar per person per year using PE2 (averaged across the whole population).

Annual revenue raised is $814m under PE1 and $749m under PE2 (see Figure 4). Revenue is lower under PE2 because a greater price elasticity corresponds to a greater reduction in consumption of SSBs subject to the tax, which in turn means less tax is paid. Indeed, with a sugar content tax, diminishing revenues is one sign of success.

Figure 2: Beverages (all soft drinks) consumed at a population level before and after introduction of the tax, showing modelled response under two different price elasticities.

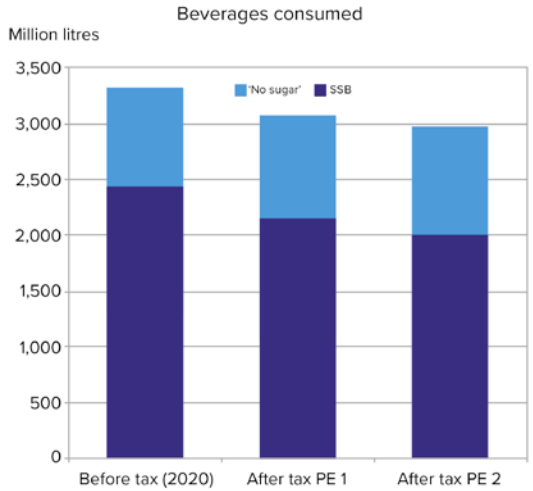


Figure 3: Sugar consumed from beverages (all soft drinks) at a population level before and after introduction of the tax, showing modelled response under two different price elasticities.

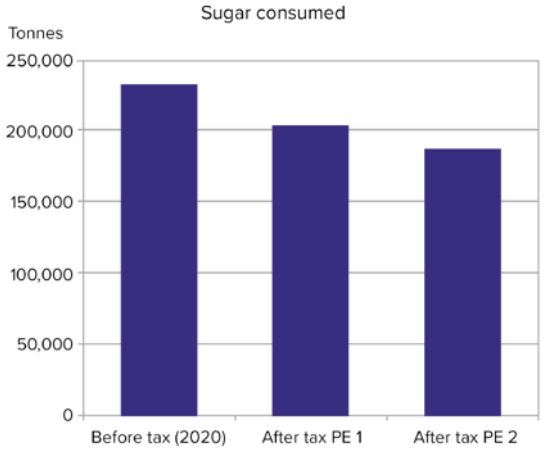
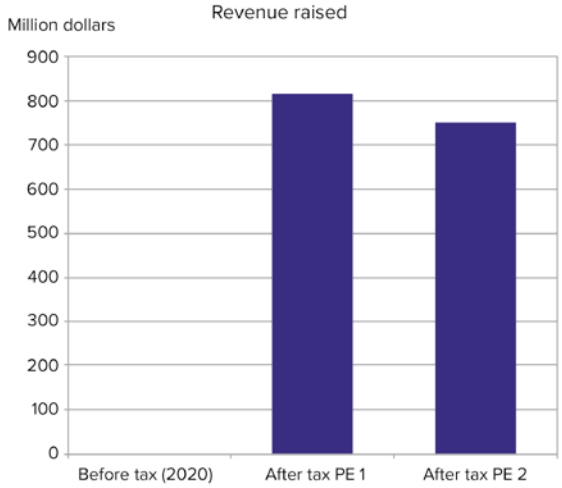


Figure 4: Annual revenue raised from SSBs subject to the tax before and after its introduction, showing modelled response under two different price elasticities.



Scenario 2: With product reformulation

This scenario explores what the outcomes could be if SSB manufacturers responded by undertaking reformulation of their products (i.e. reducing sugar content) in order to avoid the tax.

To model this, the UK's average reduction in sugar content per litre following the introduction of their sugar content tax was used. Therefore, this scenario represents what would happen in terms of beverage consumption, sugar consumption and revenue raised if a similar magnitude of change happened in Australia. While noting that the design of the two sugar content taxes differ, the UK is used as a comparator due to the availability of a detailed evaluation study.

The exact causes of the change in the UK are not known because it is not possible to measure from published data. What is known is that the volume of sugars sold from soft drinks fell from 15.5 grams per person per day in 2015 to 10.8 grams in 2018, a reduction of 30 per cent.[91] The change in average sugar content per litre could have been achieved either through product reformulation, or through consumers switching to lower sugar products, or (most likely) a combination of both.

To model the scenario the contribution of each element to the overall effect was estimated; a reformulation rate of 22.5 per cent (i.e. 22.5% reduction in sugar content) was used, with the remainder of the change attributed to consumer switching and estimated using price elasticity 2.[92] The 22.5 per cent reformulation rate does not mean every product reformulates by this amount, rather it is the average across all sugar sweetened beverages.

The higher of the two price elasticities (PE2) was used but with the cross-price elasticity assumption lifted to 1.0 (where a 1% increase in the price of SSBs results in a 1% increase in non-sugar sweetened beverages). This reflects the assumption that consumers would be more likely to switch from high to low sugar options under a reformulation scenario. This assumption is based on two things: (a) that industry reformulation would likely be accompanied by promotional activity by manufacturers to increase consumers' willingness to accept the new formulations, which in turn would likely increase the willingness to switch to lower sugar options; and (b) that, given the disparity in sugar content between sugar and no-sugar beverages becomes smaller, it is likely that more people will be willing to move their consumption to a lower sugar product rather than discontinue consumption all together.

Sugar consumption from soft drinks at a population level falls by 34 per cent under this scenario (see Figure 6), which is a greater effect seen than in scenario 1. This translates to 14.2 litres fewer SSBs and 3.1 kilograms less sugar per person per year (averaged across the whole population).

Annual revenue is lower under scenario 2, at $606m (see Figure 7). This is because the tax is based on sugar content which has been reduced. Again, lower revenue would be a good indication of a stronger health impact.

The drop in total sales is smaller than under scenario 1, because the tax impact on prices is lessened due to lower sugar content in beverages after reformulation, and the assumed higher cross-price elasticity (see Figure 5).

Figure 5: Beverages (all soft drinks) consumed at a population level before and after introduction of the tax, showing modelled outcome for Australia if average reduction in sugar content matched the post-tax UK level.

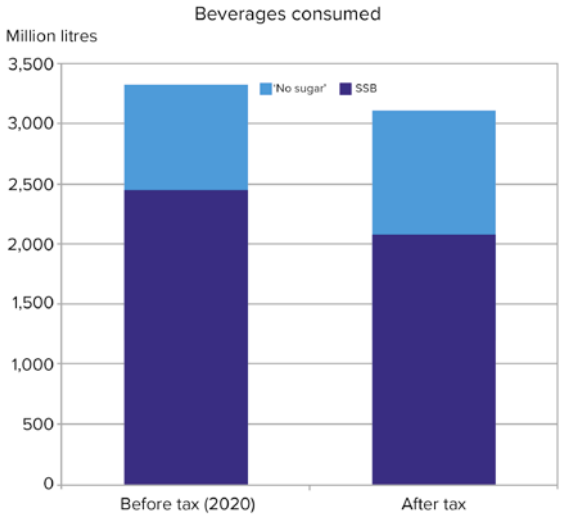


Figure 6: Sugar consumed from beverages (all soft drinks) at a population level before and after introduction of the tax, showing modelled outcome for Australia if average reduction in sugar content matched the post-tax UK level.

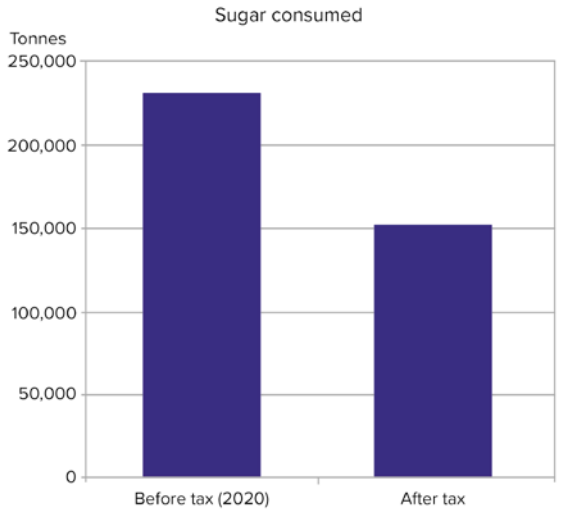
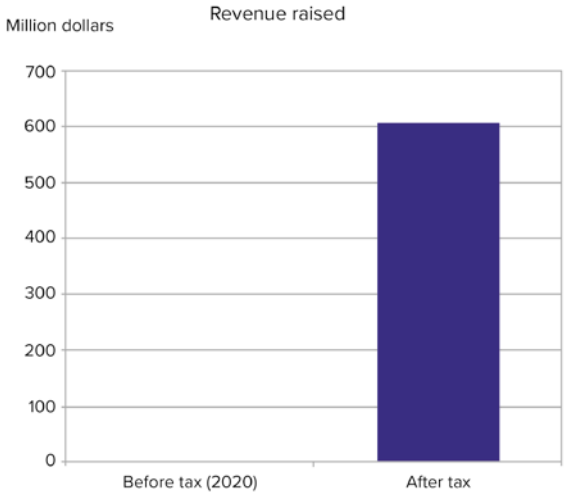


Figure 7: Annual revenue raised from SSBs subject to the tax before and after its introduction, showing modelled outcome for Australia if average reduction in sugar content matched the post-tax UK level.



Impact on obesity and healthcare expenditure

Reduced sugar consumption and improved diet would likely lead to a reduction in the prevalence of obesity and substantial healthcare savings.

According to previous Australian modelling, an SSB tax that increases the retail price by 20 per cent would lead to a reduction in the prevalence of obesity of around 2 per cent, and healthcare expenditure savings of $609 million to $1.73 billion (over the lifetime of the population modelled).

This research, by Veerman et al (2016), modelled the impact of a 20 per cent ad valorem tax on SSBs (non-alcoholic drinks with added sugar, excluding fruit juice, energy, milk-based and cordial drinks), with the assumption that the tax was fully passed on to the consumer.

Using the same price elasticity as PE1 in our model, they estimated there would be on average a 12.6 per cent decrease in SSB consumption in Australia. This translated to a decline in the prevalence of obesity of 2.7 per cent in men and 1.2 per cent in women, and within 25 years: 800 fewer cases of type 2 diabetes, 240 fewer heart disease cases, and 70 fewer cases of stroke per year.

By year 25 after introduction of the tax, the model estimated there would be 16,000 fewer prevalent cases of diabetes, 4,400 fewer cases of heart disease, 1,100 fewer persons living with the consequences of stroke, and overall 1,600 fewer deaths mostly resulting from heart disease.

Healthcare expenditure savings would total $609 million (over the lifetime of the population modelled). Annual healthcare cost savings would rise over the first 20 years and then stabilise at around $29 million per year.[93]

Lal et al (2017) built on this work, using a model to estimate how a change in overweight and obesity caused by an intervention impacts the epidemiology of several obesity-related diseases, which in turn influences health-adjusted life years (HALYs) in the population.

They modelled the impact of a 20 per cent ad valorem tax on a broader range of SSBs (soft drinks, flavoured water, sports, energy, fruit drinks, cordials containing added sugar), again with the assumption that the tax is fully passed on to the consumer.

The diseases modelled were stroke, ischemic heart disease, hypertensive heart disease, diabetes mellitus, osteoarthritis of the knee and hip, breast cancer, colon cancer, endometrial cancer and kidney cancer. As a result of the tax, the model predicted the Australian population would gain 175,300 HALYs and 111,700 years of life would be saved (over the lifetime of the population modelled).

This resulted in healthcare expenditure savings of $1.73 billion (over the lifetime of the population).[94]

Impact on lower socioeconomic groups

Lower socioeconomic groups would likely experience a disproportionate health benefit as a result of the tax.

A flat tax (one that levies the same fixed amount on every citizen regardless of income) will inevitably have a greater impact on lower income consumers of the taxed product, as a proportion of their expenditure/income.

However, this regressive effect is reduced if there is an untaxed substitute that consumers can easily switch to.[95] In the case of SSBs, healthy substitutes such as water are readily available and affordable to most people, and consumers can avoid the tax, as well as improving their health, by making this change. This is the benefit of taxing a well-defined group of products with almost no nutritional benefit as opposed to taxing a whole food group, whereby consumers cannot avoid the tax.

In some remote communities the water supply is unsafe and/or unstable. It must be recognised that price signals do not have the same relevance in this circumstance, if there is no safe and affordable source of hydration to switch to. Therefore, the impact of price rises in these areas must be considered to avoid creating further disadvantage, with particular attention paid to the safety and availability of drinking water, and the price of bottled water. The AMA recommends implementing the tax alongside measures to ensure reliable, safe access to water and affordable hydration beyond SSBs, and this is discussed later in the report.

People who live with greater socioeconomic disadvantage are more likely to have poorer diets, be overweight and obese, and at a higher risk of cardiovascular disease, than people of comparatively less disadvantage.[96] Therefore, it is likely that an SSB tax would have a particularly positive health impact on this group.

Indeed, a 20 per cent ad valorem tax on SSBs was modelled with particular attention paid to the impact on different socio-economic status (SES) groups in Australia. It was found that half (49.5%) of the total health gains accrued to the two most disadvantaged SES quintiles. While the tax burden (annual expenditure) was higher in lower income groups, the absolute monetary difference in tax paid between higher and lower income groups was small.

This model also found that $299.4 million in out-of-pocket health costs was saved over the lifetime of the population, and that healthcare cost savings as a percentage of household expenditure was highest in the most disadvantaged SES groups.[97]

Therefore, when viewed holistically, an SSB tax could be considered a progressive measure, since lower SES groups would theoretically experience a disproportionate health benefit in response to the tax, compared to higher SES groups. There is also potential to use the revenue from the tax to implement initiatives that would produce a benefit for lower SES groups, such as targeted subsidies on healthy foods.

Noting the broader social determinants that can adversely impact on equity and access to health care, broader preventive measures beyond an SSB tax are also key to achieving better health outcomes.

‘Lower socioeconomic groups would likely experience a disproportionate health benefit as a result of the tax.’

Impact on the sugar industry

There would be minimal impact on Australia's sugar industry as about 80 per cent of Australia's domestic sugar production is exported (averaged over the past decade).[98] Only 5.3 per cent of total domestic production goes towards domestic SSB manufacture.[99] The estimated change in SSB consumption due to the proposed tax is 12 to 18 per cent (scenario 1), which translates to a 0.64 to 1.01 per cent drop in demand for domestic sugar production. In absolute numbers, average sugar production is about 4.4 million tonnes and change brought about by the tax represents around 28 - 44 thousand tonnes.

The domestic sugar market has a much greater level of volatility than the likely change caused by the SSB tax. Between 2010-11 and 2019-20, Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) data show domestic production varied between 3.4 billion tonnes and 4.9 billion tonnes. Exports varied between 2.6 billion tonnes and 4.1 billion tonnes. Prices (seasonal pool prices) also varied between $383 a tonne and $518 a tonne.[100]

Given this, the impact on the sugar industry is anticipated to be minimal and does not appear to warrant a government assistance package. However, government may wish to consider whether there are any specific small farmers that mainly supply the domestic market, who may warrant an assistance package which could be funded from the tax revenue.

'There would be minimal impact on Australia's sugar industry as about 80 per cent of Australia's domestic sugar production is exported ...'

Impact on remote communities

Alongside implementing the tax, careful consideration should be given to safe water access in remote areas, in particular for Aboriginal and Torres Strait Islander communities.

Water chemistry analysis in some communities indicates that the nitrate and uranium content far exceed recommended levels for drinking. Some remote communities do not have access to treated drinking water, and local water treatment systems are desperately needed.[101]

In some of these communities, SSBs can be viewed as the safer option to the community's water supply, and consumption can be high including among young children and babies.[102]

The AMA understands that the deficiencies in water access are complex long-term issues, and are beyond the scope of this report. It is important to highlight however, the potential opportunity for the SSB tax revenue to redress some of the disadvantage experienced in these remote areas. The AMA recommends that this revenue be redirected to water infrastructure projects where they are needed the most, noting that this would traverse multiple levels of government and require substantial engagement at the community level. In any case the SSB tax has the potential to offer socio-economic benefits to some of the most unfairly disadvantaged communities in the country. While the revenue should be used in this way, longer term funding and investment from government would be needed independent of the SSB tax to ensure the success and sustainability of projects, especially if revenue declined due to changes in consumer or manufacturer behaviour.

The AMA is also aware of price anomalies between SSBs and bottled water in remote community stores and it is not the intent of the proposed SSB tax to exacerbate these any further. Food insecurity is already experienced by a disproportionate number of Aboriginal and Torres Strait Islander peoples in remote communities due to low income and high food prices, which results in the greater consumption of foods higher in fat and sugar. Improving the accessibility, availability and affordability of healthy foods in remote communities is vital to improving health and wellbeing for Aboriginal and Torres Strait Islander peoples.

Aboriginal Community Controlled Health Organisations (ACCHOs) play a crucial role in promoting good nutrition and healthy living practices and delivering nutrition and healthy living programs in remote communities. However, these initiatives are naturally going to be limited in their ability without food affordability and accessibility in remote communities being addressed. Additional allocated government funding for these promotional activities and programs would expand ACCHOs' reach and health and wellbeing outcomes.

The Commonwealth government, in collaboration with State and Territory governments, should use some of the revenue to introduce subsidies in remote Aboriginal and Torres Strait Islander communities to improve water and food security with a focus on healthy food and a clean, safe water supply. Governments should then bolster expenditure in this space based on need beyond the revenue from this proposed measure. The AMA also sees an interim policy opportunity for the Commonwealth government through Outback Stores to ensure that bottled water is affordable and available, especially where the supply of drinking water to homes and communities may be inadequate.

These initiatives must be in partnership between Australian governments and Aboriginal and Torres Strait Islander community representatives, including ACCHOs and other Aboriginal Community Controlled Organisations (ACCOs).

'The Commonwealth government, in collaboration with State and Territory governments, should use some of the revenue to introduce subsidies in remote Aboriginal and Torres Strait Islander communities to improve water and food security with a focus on healthy food and a clean, safe water supply. Governments should then bolster expenditure in this space based on need beyond the revenue from this proposed measure.'

PROPOSAL

The AMA wants to see steps taken towards reducing obesity because it is a major risk factor for a range of chronic and preventable conditions including type 2 diabetes, heart disease, stroke and cancer. This not only diminishes the health and wellbeing of Australians, but places a huge financial burden on our health system, in particular our public hospitals.

We live in an environment that promotes weight gain through widely available, advertised and highly affordable products with little or no nutritional benefit. The Commonwealth government has policy levers available to change this in order to arrest the growing obesity crisis.

This report has set out the case for the implementation of a targeted tax on sugar-sweetened beverages. The original modelling presented here indicates that a $0.40/100g excise tax on SSBs would reduce sugar consumption from soft drinks by 12 to 18 per cent and raise annual government revenue of $814 million to $749 million.

The international experience is a clear indicator that the tax would reduce sugar consumption in a real-world context. The revenue is an added bonus that could be used to fund preventive health initiatives to further address the obesity crisis and improve population health. A reduction in sugar consumption would also likely mean further savings in the long term from reduced prevalence of obesity and reduced healthcare expenditure.

The imperative is clear. If no action is taken, by 2025 a third of Australian adults will be obese and taxpayers will have footed a further $29.5 billion for the direct healthcare costs of obesity.

Therefore, the AMA recommends that the Commonwealth government:

- **Implement an excise tax based on sugar content on selected SSBs, at a rate of around $0.40/100g sugar, to reduce consumption, improve health outcomes, and lower the financial burden on the healthcare system.**
- **In the immediate term, use the revenue to evaluate the tax, improve access to safe drinking water in remote communities, and fund an education campaign.**
- **The same arguments prosecuted here about impacts on health and the healthcare system apply to other aspects of diet beyond SSBs. In the longer term, expand the tax to incorporate other products that have little or no nutritional benefit, and/or high sugar content.**

APPENDICES

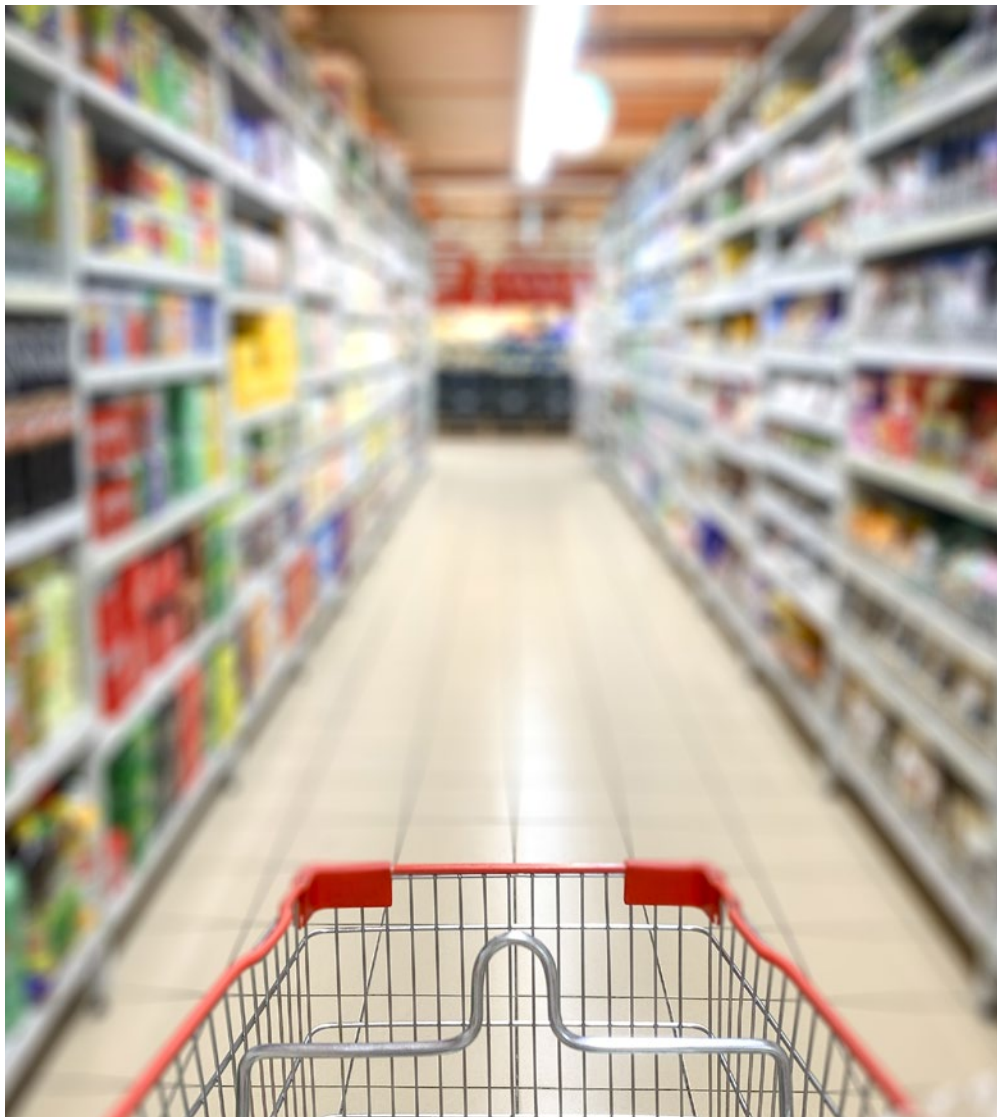
Appendix A: Modelling the tax

Tax design

The tax that has been modelled is a specific excise tax based on sugar content, set at $0.40 per 100 grams of sugar (per unit of product). This allows for drinks which have been reformulated with a lower sugar content to pay less tax. For example, a beverage with 100 grams of sugar per 100 millilitres that reformulates to 50 grams of sugar per 100 millilitres would pay $0.20 less tax per litre. This gives a price signal to consumers as well as a competitive advantage to manufacturers that reformulate. Beverages with no sugar pay no tax and receive the greatest price signal and competitive advantage.

As the tax chosen is a fixed price based on sugar content, the effective tax rate (i.e. the percentage change in price) changes depending on the sugar content of the product and its original retail price. For example, an SSB priced at $1 containing 50 grams of sugar, would attract a tax of $0.20, resulting in a price increase of 20%. An SSB priced at $2 and containing 50 grams of sugar would attract a tax of $0.20, resulting in a price increase of 10%. Meanwhile, an SSB priced at $1 containing 100 grams of sugar would attract a tax of $0.40, resulting in a price increase of 40% (assuming full tax pass-through in all cases).

This way, the impact of the tax will be larger on products that are the cheapest and have the most sugar.



Model design

The excise tax based on sugar content requires a more detailed model than has been attempted in other exercises. As explained in the previous section, the fixed dollar level of the sugar content tax will remain the same, but its impact on price change will vary depending on the sugar content and retail price of each product, as well as how the manufacturer chooses to respond to the tax. Retail price is particularly dependent on the point of sale.

In order to model the effect of such a tax, the resulting percentage change on retail prices needs to be considered. To achieve this, the different prices that apply at different points-of-sale (e.g. supermarket, service station, restaurant etc.) must first be considered. A significant proportion of the Australian SSB market is 'convenience purchases' at service stations, convenience stores, food courts, bars, dine-in restaurants and take-aways. This market segment is not captured well by public data sources, such as the Australian Bureau of Statistics (ABS) Household Expenditure Survey, or the ABS Apparent Consumption of Selected Foodstuffs. This second publication lists consumption of 170.3 millilitres of soft drinks, energy drinks and sports drinks per person per day, or 1.6 billion litres per year for the entire Australian population in 2019-20. This figure has been quoted by other studies. However, the ABS states in its summary, "it does not account for food purchases from fast food outlets, cafes and restaurants, home grown or produced foods".[103]

To capture all these convenience markets the model is designed around detailed sales data by product and by point of sale. These have been adapted from Coca Cola Amatil's (CCA) published sales information for both volume and revenue by point of sale. This gives us as detailed and accurate a picture as is possible of the soft drink industry in Australia for 2020. Sales figures from other major manufacturers were unavailable because the companies are privately owned and sales figures are commercially sensitive. Third party industry estimators take surveys of sales, which are split into industry categories and then aggregated to present an estimate of the total sales for each industry. Our model uses a similar approach by taking the aggregated figure as well as the estimated market share of CCA to scale the model results to match industry estimates of the total size of the Australian SSB market from IBISWorld. There are other calibration factors used such as the proportion of sales of non-sugar sweetened beverages. Extrapolating from CCA data is reasonable given the points-of-sale detail it provides as well as the audited nature of the sales figures.

Type of drinks included

The policy intent is for the SSB tax to apply to non-alcoholic drinks containing free sugars, excluding 100 per cent fruit juice, milk-based and cordial drinks. The focus is on drinks that provide no nutritional benefit. The modelling matches this as far as possible, taking conservative estimates where the source data was not sufficiently granular.[104]

Size and distribution of the SSB market

IBISWorld estimates the total value of the Australian industry for all 'Soft Drink' or 'Non-alcoholic Ready to Drink' beverages to be $3.8 billion in 2020. This is a broad aggregate figure which represents an 'industry estimate' of the entire market. This figure incorporates other drinks which are outside the scope of our modelling such as soda water and non-alcoholic cider. There is no detailed estimate nor robust figure for SSBs by themselves.

It is this lack of granularity and robust information which requires the model to make use of more detailed and audited public information. The Coca-Cola Amatil 'October Trading Update' has detailed sales data by product type and by point of sale. This provides robust figures to base the model around.

Actual sales figures are known for certain based on the latest annual trading for Australia[105,106]; CCA sales of SSBs equates to approximately 1.1 billion litres. CCA sales represent approximately 40 per cent (IBISWorld estimate) of the SSB market. Revenue from these CCA sales of SSBs is approximately $1.6 billion and includes a convenience consumption share of sales of 43 per cent.[107]

The model then uses the IBISWorld aggregate estimate along with the market share information for CCA to factor up the detailed CCA sales to approximate sales for all manufacturers in Australia. This equates to estimated total industry sales of all SSBs of 2.4 billion litres per year in Australia. This conservative industry estimate has been made on the assumption that CCA will have a greater penetration of the convenience segment of the market than its competitors. A model result with a lower penetration of convenience sales is included in Appendix B.

Retail prices

The model does not attempt to differentiate between brands at the supermarket but does differentiate based on the point of sale. This is because the price per litre of a convenience beverage is up to 8 times that of a supermarket beverage by unit of volume.

This has a stark impact on the effectiveness of the tax depending on the point of sale. The retail price of supermarket SSBs varies from around $0.80 to $2.50 per litre. The model uses an average price for supermarket SSBs of $1.44 per litre.[108] This is lower than results from Sharma et al using privately obtained HomeScan data (2010). There has been significant price promotional activity from the major industry players to drive sales since the Sharma report was released. Even though CCA sales figures were used, CCA products are typically at a higher price point in supermarkets than their competitors. Therefore an average price must be used below that which can be calculated from CCA data. Likewise, private label products pricing structure is too low. The estimated price is based on the average retail markup based on CCA wholesale prices in the grocery channel. That retail markup was applied to industry wide estimates of wholesale revenue compared with litres sold. In addition, as the private label brands offer a lower bound for retail prices and CCA offers an upper bound, using a weighted average approach with a 40 per cent weight on CCA pricing offers a reasonable confirmation of this retail price. The appendix includes two alternative scenarios with higher and lower average retail prices to indicate the likely impact a change in this price estimate will have.

As explained above, the greater tax impact is seen on cheaper SSBs. As such, if the average supermarket retail price of SSBs is lower than estimated, the proportional increase in price will be larger and have a greater impact on reducing sales for a given price elasticity (and vice versa if the price is higher than estimated).

Prices of convenience SSBs range wildly. Strong promotional pricing of the 'frozen' category of SSBs which retail for around $1.80 a litre, has seen notable sales growth. This category now represents approximately 6 per cent of all SSB revenue. By contrast a convenience store purchase of a 600 millilitre ready-to-drink product can retail between $4-$5, implying a price of around $8 a litre. At this price, a tax of $0.40/100g will have a smaller impact on sales for any given price elasticity. To allow for this, the model segregates sales by point of sale and product category.

Sugar content of SSBs

In the model, the average sugar density for each type of beverage has been used. To estimate the likely average sugar content for each beverage type, the nutritional information from the label of each product was collected manually on 3 Feb 2021 and has been used combined with an estimated weight of sales for each product by brand using IBISWorld industry market share. This also enables the model to be used for reformulation modelling. Any manufacturers or products that have already lowered the sugar content of their beverages will benefit over their competitors from a lower level of tax. It is likely that SSB manufacturers would choose to undertake some reformulation given competitive pressures, overseas experience and the chosen design of the tax. Manufacturers' responses to the tax could also include non-monetary mechanisms such as placement on shelves, marketing decisions, and product placement of lower and no sugar alternatives.

Price elasticity

Two different estimates of price elasticity are used in our analysis. The first is as measured by Sharma et al (-0.63, referred to as price elasticity/PE 1) in the Australian context from HomeScan data of supermarket purchases.[109] The second is based on the estimate from Teng et al (-1.0, referred to as price elasticity/PE 2) who conducted a meta-analysis of real-world responses in consumer sales after the introduction of SSB taxes.[110] The latter represents a larger effect on consumer behaviour.

In the Australian context Sharma et al's estimate of a 'single point' price elasticity is used in the model for supermarket sales. Their price elasticity is based on detailed research and analysis of Australian supermarket sales. In addition, the model allows for that tax to be passed through in full or in some other proportion depending on point of sale. The modelling presented in this report assumes a full pass-through of the tax. Without government monitoring, convenience point of sale vendors are more likely to absorb the tax given the higher price point. Consumers are also less likely to be price sensitive when purchasing convenience SSBs and alternative price elasticities for these markets can be modelled. This would provide a more robust estimate of revenue raised and also assist policy decisions by estimating the impact on sales if the tax is not passed on to consumers. This does not feature in the modelling scenarios presented though can be examined in alternative scenarios.

Sharma et al also take great care to estimate a cross-price elasticity which is used in our modelling alongside Sharma et al's own-price elasticity. The cross-price elasticity measures how likely a consumer is to switch their purchase to another product when the product they wanted to buy increases in price. The detailed work by Sharma et al notes the difficulties in measuring the nature of 'endogeneity' in the estimates. In the case of a permanent tax differential, consumers are less likely to simply wait for next week's specials and will be faced with the real choice of a permanently higher price for sugar sweetened vs non-sugar sweetened beverages. This means there are some limitations to the way Sharma et al's cross-price elasticity is calculated.

The real-world composite price elasticity measured by Teng et al is higher, or more elastic. Teng et al do not estimate a cross-price elasticity. Therefore, a cross-price elasticity to complement Teng et al's own-price elasticity was estimated. This was done by increasing Sharma et al's cross-price elasticity by the same order of magnitude as the difference between the two own-price elasticities - an additional approximate 0.4 increase. A higher cross-price elasticity means consumers are more likely to switch to an alternative beverage than discontinue the purchase all together.

Appendix B: Sensitivity for model parameters

As with any modelling, there is some uncertainty. This is particularly true given the data containing sales figures is private and commercially sensitive. The report relies upon estimates for the total industry size and for the final retail price for the existing beverages in the SSB market.

In addition, there is also a large degree of uncertainty around how the consumer will respond to price movements caused by the tax (the own price and cross price elasticity). The report offers a range of possible outcomes of the implementation of the sugar content tax for a base case estimate of the existing SSB market and alternative elasticity scenarios. Here sensitivity analysis will show the effect of the implementation of the tax for a single elasticity as estimated by Sharma (PE1) but a range of estimates for the SSB market such as alternative retail pricing, alternative share of 'convenience' sales and alternative aggregate market sizes.

Impact of estimated size of market

In this sensitivity analysis, the results show an alternative examination of the size of the SSB market. The two baseline elasticity scenarios presented in the report use an estimate of the total sales from IBISWorld of $3.8 billion and approximately 2.4 billion litres of SSBs. This is based on CCA actual sales and the estimated market share of 40 per cent. Here the impact of total sales being 10 per cent higher and 10 per cent lower than under the baseline scenarios was examined.

The modelling of the tax itself remains unchanged as the prices of beverages, locations of sale and proportions of sweetened and non-sweetened remain unchanged. The impact of the 10 per cent increase in sales volume results in a like for like increase in taxation revenue and sugar consumption.

The results are sensitive to the size of the market, of course. However, the effect of the tax revenue and sugar consumption scale with the market. This parameter is not material to the assessment of the impact of the tax on consumers but does have an impact on the government revenue and the sugar industry.

Impact of the retail price

The modelling has an estimate of the industry wide wholesale price. The tax is applied to the wholesale price and then passed onto consumers at the retail outlet. Here two alternative scenarios were run where the baseline assumed retail margin is higher and lower by 10 per cent as well as where the tax is only passed on by half, that is, absorbed by a combination of manufacturers, retailers and wholesalers into their profit margins.

When the assumed average supermarket retail price is lifted by 10 per cent, there are a number of flow on impacts. As the tax is based on sugar content and not the retail price, the proposed tax added is now a smaller proportion of the final price. This means the relative change in the price is also smaller measured as a percentage. This reduces the impact of the tax. The reverse is true when the assumed base price is lowered.

Table A1: Change caused by changes in the baseline retail price assumption by 10%

CHANGE IN RETAIL PRICE	AVERAGE RETAIL PRICE CHANGE	AGGREGATE VOLUME CHANGE OF ALL SOFT DRINKS	AGGREGATE SSB VOLUME CHANGE	CHANGE IN EXCISE REVENUE RAISED ($MIL)	CHANGE IN SUGAR CONSUMED (TONNES)
Higher base retail price $1.58	-0.16%	0.53%	0.82%	8.1	2,018
Lower base retail price $1.31	0.14%	0.58%	-0.90%	-8.9	-2,220

So the results are as predicted though the magnitude is important. An $8.1m change to a revenue estimate of over $800m in the baseline scenarios represents only a 1 per cent increase/decrease. The higher revenues under the higher price assumption are because there is a reduction in the effectiveness of the tax. Therefore it can be seen that there is an increase in the consumption of beverages from the baseline of 0.53 per cent (of total sales).

While the retail price assumption is important and does have a notable impact on the results, it merely lessens or increases the underlying impact of the tax. This should not be surprising as the tax is a fixed cost. It does highlight an issue with the tax in the ‘convenience’ segment of the market where the retail price is much higher. The tax will have a reduced impact on convenience sales.

Impact of the pass-through rate of the tax

One potential concern for policy makers is the failure of retailers, wholesalers or manufacturers to pass on the tax in full to consumers. This alternative scenario explores the impact on sales and revenue from a failure to pass on the tax in full.

The results in Table A2 show the impact of the tax is reduced for consumers as some of the price signal is lost with prices being 4.25 per cent lower than in the baseline. The result is an increase in volume of SSBs, which is 3.8 per cent higher. The revenue impact is positive for the government. As consumers do not face the full tax and therefore do not reduce consumption by as much, the tax applied remains unchanged from the baseline so the additional volume of SSBs raises an additional $55.2m. However, the health effect is undermined with 13,798 tonnes of extra sugar consumed compared with the scenario where the tax is passed on in full.

Table A2: Change caused by a 50% pass-through of the tax to retail prices

CHANGE IN PASS-THROUGH TO RETAIL PRICE	AVERAGE RETAIL PRICE CHANGE	AGGREGATE VOLUME CHANGE OF ALL SOFT DRINKS	AGGREGATE SSB VOLUME CHANGE	CHANGE IN EXCISE REVENUE RAISED ($MIL)	CHANGE IN SUGAR CONSUMED (TONNES)
50% pass-through	-4.25%	3.80%	5.81%	55.2	13,798

Impact of the convenience market share

The model takes account of where beverages are sold. The reason for this is to allow for the large price difference between convenience SSBs and supermarket SSBs. In order to do this, data from CCA was used on the share of their sales which are at convenience locations. These locations include some shops which are part of the 'retail' data collection such as petrol stations and convenience stores.

Implicit in the CCA data is the share of sales which may or may not be representative of the broader industry sales. In this sensitivity the results of the model are tested when it is assumed that a lower proportion of sales take place in convenience locations. Total sales are held as the same. It is possible that total industry sales are also lower but previous sensitivity analysis provided earlier already examined that impact.

In this scenario, the proportion of sales in the location matrix of supermarkets are raised by 10 per cent and all other points of sale are lowered in-line with their current proportions.

The results show an increase in the effectiveness of the tax; sales of SSBs drop by a further 1 per cent (13% compared with 12% in the baseline). Revenue as a result of reduced sales is lower by $40 million — $774 million compared with $814 million in the baseline. The main difference is that sugar consumption falls by even more, an additional drop of 10,000 tonnes of sugar.

The results are driven by supermarket sales having a lower price point and therefore the tax has a greater proportional price impact for the same dollar amount of tax. The baseline assumptions used the conservative assumption that the industry had the same profile of convenience purchases as CCA although the results here show that the tax is likely to be at least as effective as the baseline assumptions.

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[87] The definitions of the proposed tax do not match exactly the definitions used by Coca-Cola Amatil (CCA), whose sales figures the model is built upon. For example, CCA's 'other stills' category includes both fruit juice and 'Powerade'. In the absence of a reliable estimate of the proportion of sales attributable to 'Powerade', the entire 'other stills' category was excluded to ensure that 100% fruit juice was also excluded.

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Data was only available for the years 2015-2018. As the UK case study presented in this paper outlines, much reformulation took place between the announcement of the tax in 2016 and its implementation in April 2018. Therefore, the average sugar content in 2018 reflects this larger effect that took place over several years.

[92] The reasoning behind a reformulation rate of 22.5% is that previous reformulation has been 50% for particular products, while other manufacturers have chosen not to reformulate at all. 22.5% is a realistic mid-point reflecting a combination of small and large reformulation options.

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[104] The definitions of the proposed tax do not match exactly the definitions used by Coca-Cola Amatil (CCA), whose sales figures the model is built upon. For example, CCA's 'other stills' category includes both fruit juice and 'Powerade'. In the absence of a reliable estimate of the proportion of sales attributable to 'Powerade', the entire 'other stills' category was excluded to ensure that 100% fruit juice was also excluded.

[105] CCA figures have total beverage sales in the latest quarter (used because it is the least COVID-19 affected) of 69.5 million 'units'. CCA have a 'unit' measured based on their U.S. parent company of a case of 24, 237mL containers. This equates to 5.678 litres per 'unit'.

[106] CCA annualised volume of sales are approximately 1.6 billion litres for all beverages, generating $2.3 billion of revenue.

[107] This is a conservative assumption as convenience sales have a much higher retail price and are therefore less susceptible to changes in behaviour from the imposition of the tax. If 'convenience' segment sales are a lower proportion for the market as a whole then the impact of the tax would be greater.

[108] This figure uses the wholesale price estimated from the volume of sales and revenue from IBISWorld and adds a retail margin of 19%. The retail margin is estimated using the known wholesale grocery revenue for CCA of $1.48 against an estimated retail price based on both major supermarket standard retail prices and promotional prices using a 30% promotional sales proportion assumption.

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