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Why Australia should have a tax on sugar sweetened beverages

Grattan Institute submission to the Select Committee into the Obesity Epidemic in Australia

Stephen Duckett

Grattan Institute Support

This submission was written by Stephen Duckett, Director, Health Program, Grattan Institute.

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Overview

Obesity is a challenge for the Australian economy - it is associated with increased health care use, reduced workforce participation and higher sickness benefit payments. Obesity costs taxpayers about $5 billion each year.

Current policies to address this problem include weak exhortations to reduce calorie intakes and exercise more. Those policies, in place for decades, have not worked - obesity continues to increase. No one claims those policies should be abandoned but more of the same is clearly not the answer. Recent calls for a sugar tax, or more accurately a tax on sugar sweetened beverages, is one such contemporary response.

More and more jurisdictions are introducing sugar sweetened beverage taxes, and the accumulating evidence is they work, consumers are shifting consumption to unsweetened drinks, including water. Industry is fighting back, of course, through concentrated public campaigns against referendums in the United States to legislate such taxes, and through concerted lobbying efforts elsewhere. More sophisticated industry responses seek to undermine the case for a sugar sweetened beverage tax by reformulating product offerings, a voluntary strategy recently announced in Australia.

Sugar sweetened beverage taxes are often justified on the grounds that increasing prices of sugar sweetened drinks with reduce consumption. But changing behaviour is only one justification for a sugar sweetened beverage tax.

A different basis for the tax is that consumption of sugar sweetened beverages costs the Australian taxpayer about $500 million each year, as sugar sweetened beverages contribute about 10% to rates of obesity. And sugar sweetened beverages, particularly soft drinks, can be distinguished from other products in that they have almost no nutritional value.

A sugar sweetened beverage tax would recoup some of that cost to taxpayers from people who chose to drink sugar sweetened beverages. In making their consumption choice sugary drink consumers would face the full cost consequences of their decisions. Such a justification does not rely on speculating about whether consumption will be affected by the tax - although the evidence is that it will be, especially if accompanied by signalling with appropriate product labelling - but rather is about narrowing the tax burden of consumption decisions from all tax payers to all those who consume sugary drinks. This is the justification advanced in a 2016 Grattan Institute report which proposed such a tax. That report is incorporated in this submission.

The increased revenue from such a tax could go to improving the budget bottom line, although in most countries where a tax has been introduced, some or all of the increased revenue has been allocated to health promotion campaigns to reduce obesity in younger people.

A sugar sweetened beverage tax will not 'fix obesity' on its own, a range of policies are needed. Most likely it will simply slow the current growth in rates of obesity, especially among younger people who have higher rates of sugary drink consumption. But in the absence of any other serious policies to shift obesity rates, it is worth considering, despite industry protestations.

GRATTAN Institute

November 2016

A sugary drinks tax

Recovering the community costs of obesity

Stephen Duckett and Hal Swerissen

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Deloitte

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The Myer Foundation

Urbis

Westpac

Grattan Institute Report No. 2016-15, November 2016

This report was written by Stephen Duckett, Grattan Institute Health Program Director, Hal Swerissen, Fellow in the Health Program and Trent Wiltshire, Associate.

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Overview

Australians are getting fatter. More than one in four adults are classified as obese, up from one in ten in the early 1980s. About 7 per cent of children are now obese.

Obesity is predominantly caused by people eating too much unhealthy processed food, often at considerable cost to their health and quality of life. It can be argued that people ought to be free to make those choices and bear the consequences. But the damage is done not just to consumers, and market failures can contribute to the overconsumption of unhealthy foods. The problem confronted in this report is that excessive consumption of unhealthy foods, including sugar-sweetened beverages (SSBs), not only causes long-term problems for consumers but also imposes enormous costs on the broader community.

In addition to personal costs, obese people, on average, receive more healthcare than other people, with taxpayers funding most of the costs of those services. Obese people also have lower rates of employment, receive more social services payments, and contribute less income tax than people in the normal weight range. Together, this foregone tax and additional health and welfare expenses mean that taxpayers are about $5.3 billion worse off each year.

This report calls for a tax on sugar-sweetened beverages. We recommend an excise tax of 40 cents per 100 grams of sugar on non-alcoholic, water-based beverages that contain added sugar. This will increase the price of a two-litre bottle of soft drink by about 80 cents. This tax would raise about $500 million a year, generate a drop of about 15 per cent in consumption of SSBs and likely result in a small decrease in obesity rates, as people switch to water and other drinks not subject to the tax.

We recognise that a tax on sugary drinks is not a ‘silver bullet’ solution to the obesity epidemic – that requires numerous interventions at an individual and population-wide level. But it will address these third-party costs of obesity by reducing sugar intake from SSBs.

Many countries have already introduced such a tax, including the United Kingdom, France and parts of the US.

Not all obesity is caused by SSBs – in fact we estimate about 10 per cent of Australia’s obesity problem is due to these drinks. But it is important to reduce the consumption of SSBs because of their contribution to obesity – most contain little or no nutritional benefit, they contribute to additional energy intake, they are consumed heavily by children and teenagers, and Australia’s added-sugar intake is already high. Consumers could easily avoid the tax by switching to other drinks, such as water or artificially-sweetened beverages. The Australian sugar industry will face some transition costs as more sugar will need to be exported, as about 80 per cent is already.

The revenue raised by the new tax could go to promoting healthier eating, preventing obesity, reducing the budget deficit or a variety of other purposes. Most importantly, a tax on SSBs would help to ensure that the producers and consumers of those drinks start paying closer to the full costs of this consumption – including costs that until now have been passed on to other taxpayers.

Key findings and recommendations

- The prevalence of obesity has increased significantly over the past few decades. In 2014/15, 28 per cent of adult Australians were obese.
- Obesity imposes significant personal and community/third-party costs. Third-party costs, primarily borne by governments, include higher healthcare spending, higher welfare spending and lower tax revenue due to lower employment rates. We estimate that the third-party costs of adult obesity in 2014/15 were about $5.3 billion.
- Many factors are contributing to the rising prevalence of obesity in Australia. But the primary cause is excessive consumption of unhealthy processed food. This is, in part, driven by 'market failures', including consumers having a limited understanding of processed foods and behavioural factors that can limit self-control, and people not bearing the full costs of over-consumption of unhealthy foods.
- We propose that the Commonwealth Government use tax measures to reduce the third-party costs created by the excess consumption of energy-dense, nutritionally poor foods that contribute to obesity.
- An excise tax on the sugar contained within SSBs is the best, and simplest, tax option to recoup some of the third-party costs generated by obesity and reduce consumption of SSBs. However, an SSB tax by itself will not solve Australia's obesity problem.
- SSBs that should be subject to a tax are non-alcoholic, water-based drinks with added sugar. This includes soft drinks, flavoured mineral waters, energy drinks, cordials and fruit juices with added sugar.
- The SSB tax should be levied at a rate of about 40 cents per 100 grams of sugar contained within SSBs. This will increase the price of a two-litre bottle of soft drink by about 80 cents. The second-best alternative is a tiered excise tax based on the volume of liquid per SSB.
- An SSB excise tax as described will generate around $500 million in annual revenue to recoup the third-party costs of obesity, reduce consumption of SSBs by about 15 per cent by increasing the retail price and lead to a slight reduction, about 2 per cent, in the prevalence of obesity.
- About 80 per cent of Australia's sugar production is exported. An additional 1 per cent of Australia's annual sugar production will need to be exported due to the suggested SSB tax, and this may mean transition assistance is required for the millers and refineries affected.
- The revenue from an SSB tax could be spent on obesity prevention programs and interventions, healthcare, or used to reduce the Commonwealth Government's budget deficit.

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1 The obesity problem in Australia

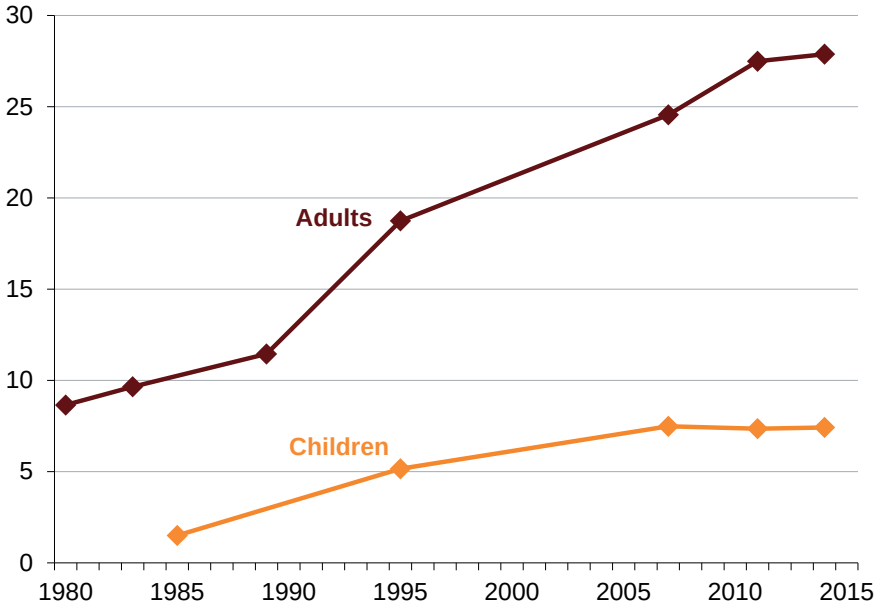
Obesity is a major health problem in Australia. About 28 per cent of Australian adults are obese, with a further 36 per cent classified as overweight. About 7 per cent of children are obese. Obesity increases a person's risk of developing type 2 diabetes, heart disease and cancer.

1.1 Obesity prevalence is increasing in Australia

The World Health Organisation (WHO) defines overweight and obesity as 'abnormal or excessive fat accumulation that may impair health'.[1] Although it has limitations,[2] the most common measure of underweight, overweight and obesity is Body Mass Index (BMI), which is calculated by dividing weight in kilograms by height in metres squared. If a person's BMI is 30 or more, they are classified as obese (Table 1.1 on the following page). Obesity is considered a disease risk factor in Australia, not a disease.[3]

The prevalence of obesity has increased significantly over the past few decades in Australia (Figure 1.1). In 2014/15, more than one in four adults were classified as obese and a further 36 per cent were

Figure 1.1: More than one in four Australian adults are obese
Per cent obese



Notes: Obesity classified as BMI of 30 or more. BMI from measured height and weight. 1980, 1983 and 1989 are adults 25-64, other years 18 and over. Children aged 5-17, except 1985 which is NSW school children (kinder to year 10). Not age-standardised.

Source: Australian Bureau of Statistics (2009), Australian Bureau of Statistics (2013b), Australian Bureau of Statistics (2015a), Australian Institute of Health and Welfare (2003) and Hardy et al. (2010).

1. World Health Organisation (2016b).
2. BMI does not distinguish between fat and muscle so is an indirect measure of body fat. While there is a correlation between body fat and BMI, it is not linear and differs between men and women, Rothman (2008). Visceral fat, intra-abdominal fat that surrounds vital organs, is most closely linked to diseases such as type 2 diabetes and cardiovascular disease (Mathieu et al. (2009), Després (2012) and Janiszewski (2012)). While there is a correlation between BMI and visceral fat, people with a relatively low BMI can have high levels of visceral fat, see Rankinen et al. (1999).
3. Obesity Australia (2014) wants obesity to be formally recognised as a disease. The WHO and the American Medical Association have formally recognised obesity as a disease (World Health Organisation (2000), Stoner et al. (2014) and Obesity Australia (2015)).

overweight.[4] The rate of childhood obesity has plateaued in the past decade but is significantly higher than the negligible prevalence in the 1980s.[5] Childhood obesity increases the likelihood of obesity in later life, especially if a child's parents are obese.[6]

Unless things change, the rate of obesity is projected to continue to increase significantly. Walls et al. (2012) predict an increase among adults from 20 to 34 per cent between 2000 and 2025.[7]

1.2 The health consequences of obesity are severe

Global and national studies have found a strong correlation between obesity and premature death, with more severe obesity associated with much higher mortality rates.[8] Obesity is a risk factor for many non-communicable diseases, including type 2 diabetes, cardiovascular diseases (heart attack, stroke, hypertension), cancers, sleep apnoea, abnormal lipids and fatty liver disease.[9] The relationship between body mass and morbidity is complex,[10] but the causal path for diseases like diabetes and cardiovascular disease is well established.[11] Reducing obesity will mean better health outcomes.

4. Australian Bureau of Statistics (2015a, Table 8.1).
5. Hardy et al. (2010); and Booth et al. (2003).
6. National Health and Medical Research Council (2013), J. L. Baker et al. (2007), Popkin et al. (2004) and Summerbell et al. (2005). Sobko et al. (2011) state that the chances of a child becoming obese as an adult increase about threefold if one parent is obese and rises tenfold with two obese parents.
7. PwC (2015) forecast there will be a total of 7.2 million obese adults by 2025, a rate of 33 per cent among adults 18 years and over
8. Global BMI Mortality Collaboration (2016); Aune et al. (2016); Flegal et al. (2013); and Korda et al. (2013).
9. World Health Organisation and Food and Agriculture Organisation of the United Nations (2000, pp. 39–40); Must et al. (1999); Global BMI Mortality Collaboration (2016); and Nordström et al. (2016).
10. Swinburn et al. (2004); and Livingston et al. (2012a).
11. Poirier et al. (2006); Kritchevsky et al. (2015); Rueda-Clausen et al. (2015); and Blackburn (1995).

Table 1.1: Using BMI to categorise obesity

Classification	BMI
Underweight	< 18.50
Normal range	18.50–24.99
Overweight	25.00–29.99
Obese class I	30.00–34.99
Obese class II	35.00–39.99
Obese class III	40.00 or more

Source: Department of Health (Cth) (2009).

In 2011, 5.5 per cent of the total burden of disease in Australia was attributable to 'high body mass' (Table 1.2 on the following page).[12] A range of individual dietary factors, such as a diet high in sweetened beverages, also contributed to the total burden of disease.

1.3 Policies have been ineffective in reducing obesity

Obesity is becoming an increasing focus for governments in Australia and internationally. The Australian government has identified it as one of nine National Health Priority Areas.[13] Yet, despite commissioning numerous reports, many policies aimed at reducing obesity have failed (see Table 1.3 on page 12).[14] Successive governments have focused

12. Australian Institute of Health and Welfare (2016a, Table 6.1). Disability-adjusted life years (DALY) is a measure of the burden of disease. The total attributable disability-adjusted life years for high body mass increased by 23 per cent between 2003 and 2011 (the largest increase of the major risk factors).
13. Obesity was added to the Priority Areas list in 2008. A new National Strategic Framework for Chronic Conditions is expected to be released in 2016, which will supersede the National Chronic Disease Strategy 2005.
14. Swinburn et al. (2013). Some state government programs have been successful at reducing population weight in regions, for example: Healthy Together Victoria (a systems approach to intervention) and Make Healthy Normal (a NSW government

on individual responsibility, physical activity and voluntary food policies (*e.g.* voluntary food labelling), rather than fiscal policies (such as taxes) or regulation.[15]

Public health experts are critical of successive prevention policies for the focus on soft interventions and personal responsibility.[16] Some blame the food industry's involvement in policy development.[17] Experts also argue that governments have not committed enough money to obesity interventions and prevention policies.[18]

The WHO's target is to first halt the rise in obesity and then reduce the prevalence to 2010 levels (it is estimated that the obesity prevalence rate in Australia in 2010 was 26 per cent).[19] If Australia were to reverse the trend and return to 2010 levels from the current rate of 28 per cent, there would be 1.6 million fewer Australians with obesity in 2025.[20]

Table 1.2: High body mass is the second largest contributor to Australia's burden of disease

Per cent of total burden attributable to top risk factors, 2011

Risk factor	% of total
Tobacco use	9.0
High body mass	5.5
Alcohol use	5.1
Physical inactivity	5.0
High blood pressure	4.9
High blood plasma glucose	2.7
High cholesterol	2.4
Occupational exposures and hazards	1.9
Drug use	1.8
Joint effect	31.5

Notes: There are also numerous dietary factors such as 'diet low in vegetables' and 'diet high in sweetened beverages'. The joint effect is a calculation of all combined risk factors in the study.

Source: Australian Institute of Health and Welfare (2016a, Table 6.1).

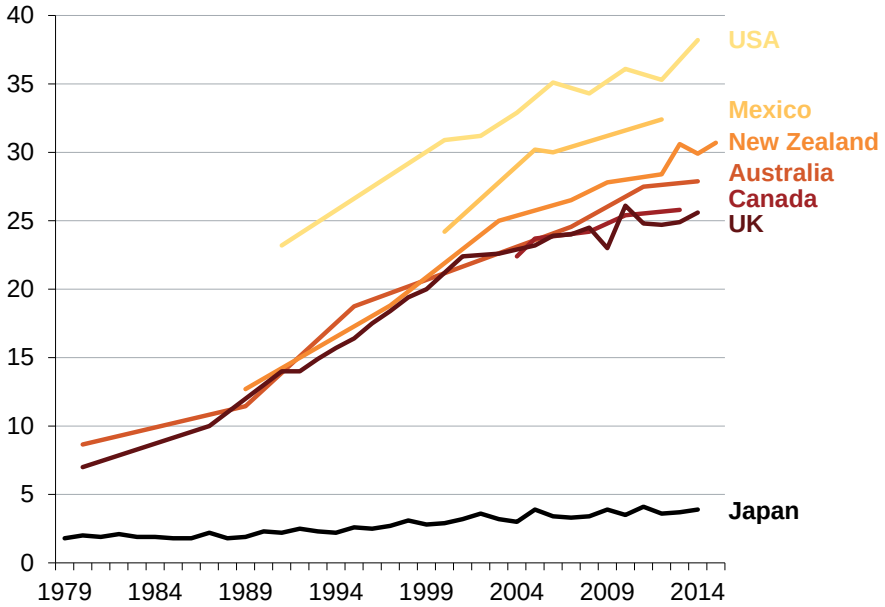
program aimed at changing behaviour) and Good for Kids (a NSW program to promote healthy eating and physical activity). Other programs include: Towards Zero Growth: Healthy Weight Action Plan (in the ACT); LiveLighter (healthy eating campaign in Victoria and Western Australia).

15. Roberto et al. (2015) state that, globally, 'the actual implementation of strategies to address obesity has largely favoured changes in behaviour over changes in food and physical activity environments.' This reluctance to introduce regulation on ingredients or fiscal policies is not confined to Australia (Swinburn et al. (2013) and Capacci et al. (2012)
16. Capacci et al. (2012); Swinburn et al. (2013); and Obesity Australia (2015).
17. Swinburn et al. (2013), Roberto et al. (2015) and Brownell et al. (2009c). For example, the Australian Food and Grocery Council, the processed food industry body, has been a full member of the government's Preventative Health Taskforce and the Dietary Guidelines Committee.
18. Swinburn et al. (2013) state that, 'the total investment in this Australian prevention effort over a period of 9 years is $923m for 23 million people'. Obesity Australia (2015) state that, 'an investment of around $6 billion would be required to 2025 to meet the WHO target to halt the growth in obesity'.
19. Reducing the prevalence of obesity is one of the WHO's nine commitments to reduce non-communicable diseases (World Health Organisation (2013) and World Health Organisation (2016b)).
20. Obesity Australia (2015).

But obesity has proved to be a difficult policy problem. No country has successfully reversed the epidemic, and obesity rates are rising in many countries (Figure 1.2).[21] There has been some improvement in child obesity rates, but only in countries with already high rates.[22]

There is no single policy or intervention that will end the obesity epidemic. A coordinated, whole-of-society and interventionist approach (like the examples in Box 1 on the next page) will be needed to win this battle.[23]

Figure 1.2: Obesity rates are rising in most countries
Per cent of adults with BMI of 30 or more



Notes: Measured BMI; Australian series uses Grattan estimates.

Source: Organisation for Economic Co-operation and Development (2016); Grattan analysis.

21. Obesity Australia (2015); Roberto et al. (2015); and Swinburn et al. (2004).
22. Roberto et al. (2015).
23. Sassi (2016), Karnani et al. (2016) and Huang et al. (2009). Swinburn et al. (2013) state that 'This systems approach is a new and more complex way to reduce obesity, but ultimately it promises to be more sustainable and effective'. An example is the Healthy Together Victoria obesity prevention initiative. See also McKinsey Global Institute (2014) and Australian Medical Association (2016).

Table 1.3: Commonwealth Government obesity/preventive health reports and committees

Campaign name	Year	Description
Healthy Food Partnership	2015	Aims to raise awareness of healthier food choices and portion sizes and to encourage product reformulation. Members include food industry and public health representatives
eatforhealth.gov.au	2013	Provides information about healthy eating, including the Australian Dietary Guidelines
Weighing it up: Obesity in Australia (House of Representatives Standing Committee on Health and Ageing)	2009	Provides recommendations on what governments, industry, individuals and the community can do to reverse the obesity epidemic and reports on obesity's implications for Australia's health system.
Australia: The Healthiest Country by 2020 (National Preventative Health Taskforce)	2009	The report outlines ten key areas to address obesity, including: increasing the availability and demand for healthier foods, reducing exposure of children to marketing of unhealthy foods and decreasing the availability and demand for unhealthy foods (including through pricing measures).
Healthy Weight for Adults and Older Australians	2006	The report outlined three goals; prevent weight gain at the population level, achieve better management of early risk, improve management of weight.

Source: Commonwealth Government department websites.

Box 1: Successful public health campaigns have involved governments and individuals

Campaigns to reduce road deaths and smoking rates are two examples of successful public health campaigns. These relied on government interventions, regulations and changes to individual behaviour.[a]

Road safety campaigns combined information and social marketing with safer road and vehicle design and sanctions for speeding, drink driving and failure to wear seat belts. As a result, motor vehicle deaths have fallen from 30 per 100,000 population in 1970 to 5 per 100,000 in 2016.[b]

Anti-smoking campaigns combined information and social marketing, restrictions on smoking behaviour, support for quitting, packaging regulations and taxation to increase the price. Between 1980 and 2013, adult smoking rates declined from 35 per cent to 15 per cent.[c]

a. MacKay (2011).
b. Bureau of Infrastructure, Transport and Regional Economics (2016); and Bureau of Infrastructure, Transport and Regional Economics (2010).
c. Scollo et al. (2016).

2 Obesity creates significant costs for the individual and the community

We estimate that in 2014/15, adult obesity created $5.3 billion in third-party or community costs, mostly borne by governments. But when personal costs are included, the total costs are much higher.

2.1 The total costs of obesity

The most recent estimate of the total costs of obesity, including personal costs borne by individuals and third-party/government costs, is from PwC's 2015 report '*Weighing the cost of obesity - a case for action*', which estimated total costs in 2011/12 of $8.6 billion (in 2014/15 dollars).[24] This is comparable to other recent estimates (Table 2.1).

2.1.1 The personal costs of obesity

People who are obese suffer significant personal costs, predominantly higher healthcare costs. They use more healthcare services and pay more in out-of-pocket costs than non-obese people. Use of healthcare services is significantly higher for very obese individuals.[25] Total costs for people with a BMI of 40 or more are more than twice those of people who are overweight or in the normal BMI range.[26]

In addition to these health costs, obese people may also have reduced wellbeing because of illness and quality of life, foregone earnings due to lower employment rates, and possibly discrimination.[27]

Table 2.1: Estimates of the annual costs of obesity in Australia
2014/15 dollars

Source	Year	Total costs
PwC	2011/12	$8.6b
Access Economics	2008	$9.7b
Medibank	2008/09	$8.9b
Colagiuri *et al*	2005	$12.9b

Notes: Additional costs compared to normal BMI weight range. Study estimates inflated to 2014/15 dollars using CPI. Estimates exclude costs such as foregone earnings and lost wellbeing due to disability and illness. Colagiuri et al. (2010) estimate includes the costs of overweight and obesity.

Source: PwC (2015), Access Economics (2008), Medibank (2010) and Colagiuri et al. (2010).

2.1.2 The third-party/community costs of obesity

In addition to the substantial personal costs, obesity imposes costs on third parties through higher healthcare expenditure, reduced tax revenue and higher welfare expenditure.[28] This is funded by taxes and paid for by Commonwealth, state and local governments.

We estimate that the third-party costs of adult obesity in 2014/15 were $5.3 billion (Figure 2.1 on the next page). Third-party costs were estimated by calculating the additional costs generated by obese people (BMI 30+) compared to people in the normal weight range.[29]

24. This is the estimated additional costs for people who are obese compared to those in the normal BMI range.
25. Obese class III (BMI of 40+)
26. PwC (2015); Park et al. (2012); and Obesity Australia (2014).
27. PwC (2015) estimated the health and wellbeing costs of obesity to be $47 billion in 2011/12, with foregone earnings costing an additional $12 billion. Access Economics (2008) estimated that obese people suffered $50 billion in 'net cost of lost wellbeing'. For estimates of lower employment rates and discrimination, see: Rooth (2009), Böckerman et al. (2016), Reichert (2015) and Cawley (2015).
28. Carers (family members) also face costs due to obesity, see Freebairn (2010).
29. The estimates for the third-party costs of obesity are based on the framework in PwC (2015), with Grattan Institute modifications to methodology and updated to 2014/15. Details of the third-party cost calculations are in Appendix B on page 52.

Additional health care costs

We estimate that obesity generated $2.6 billion in extra healthcare spending by governments in 2014/15. $0.6 billion of the extra healthcare spending is on GP services, specialists and allied health services. $0.6 billion is government spending on hospital care. $1.4 billion is Commonwealth Government spending on pharmaceuticals through the Pharmaceutical Benefits Scheme.

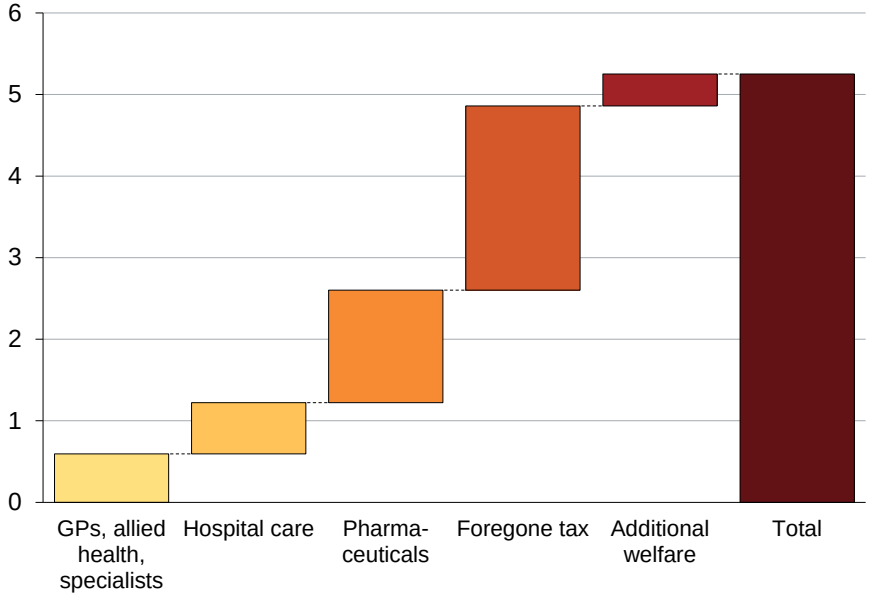
Foregone tax revenue from lower employment rates, absenteeism and lower productivity

We estimate that the Commonwealth Government misses out on $2.3 billion a year in tax revenue due to obesity. As obese people are less likely to be employed, foregone tax revenue from lower employment rates is estimated to be $2.2 billion. In 2011/12, employment rates were about 5 percentage points higher for people with normal weight compared to those who were obese. We assume obese people would earn $51,600 in 2014/15 if they were employed.[30]

Obese workers, on average, take more sick leave (referred to as absenteeism), and have lower productivity than non-obese workers.[31] As a result, employers face higher employment costs and lower productivity than otherwise, reducing profits and therefore the tax revenue received by Commonwealth Government (an estimated $0.1 billion).

Figure 2.1: The third-party costs of adult obesity were about $5.3 billion in 2014/15

$ billions



Notes: Foregone tax includes foregone income tax from lower employment rates, and foregone company tax from absenteeism and lower productivity. Additional welfare includes additional disability support pension and Newstart allowance payments.

Source: PwC (2015), Colagiuri et al. (2010), Australian Bureau of Statistics (2016c), Australian Bureau of Statistics (2016a), Australian Bureau of Statistics (2015a), Australian Bureau of Statistics (2013a), Australian Bureau of Statistics (2013b), Australian Institute of Health and Welfare (2015) and Grattan analysis.

30. In line with findings from the literature on obesity and employment, we assume that obesity makes it less likely that people will be employed (Böckerman et al. (2016), Reichert (2015), Cawley (2015) and Rooth (2009)). Due to lower education levels among obese people on average, we assume average earnings would be 9 per cent lower than average earnings of the adult population.
31. House of Representatives Standing Committee on Health and Ageing (2009) and Medibank (2011).

Higher welfare spending by the Commonwealth Government

Social services payments are about $0.4 billion higher due to obesity. Some very obese people can get the disability support pension if conditions linked to obesity impair their ability to work.[32] Obese people also, on average, are more likely to be unemployed and receive the Newstart Allowance.[33]

2.2 Additional costs of obesity

There are some additional third-party costs that are not included in our estimate due to uncertainties and difficulty obtaining data.[34] These include:

- State and Commonwealth Government spending on obesity campaigns and interventions
- The deadweight loss from the additional tax revenue that needs to be generated to pay for the extra public expenditure on health and welfare
- Higher private health insurance premiums due to higher healthcare costs from obesity
- The costs of childhood obesity

32. Department of Social Services (Cth) (2014).
33. Böckerman et al. (2016) found that a higher BMI increases the probability of receiving social assistance.
34. See Appendix B on page 52 for details on additional third-party costs of obesity.

3 Why are we becoming more obese?

There are many causes of the rising prevalence of obesity in Australia. The primary one is that too many of us eat too much unhealthy processed food, which is driven by several 'market failures'. These include consumers having a limited understanding of the impact of processed foods on obesity and health, behavioural factors that can limit self-control, and people not bearing the full costs of over-consumption of unhealthy foods. Genetics also contribute, although these are unlikely to have changed during the period of rapidly increasing obesity. Changing work patterns and sedentary lifestyles are also factors.

3.1 There is a mix of factors

We put on weight when, over a long period, we take in more energy than we use.[35] Even a small energy imbalance over an extended period can lead to weight gain.[36] Our energy balance is determined by diet (energy in) and physical activity (energy out) (Table 3.1).

Changing social and economic factors have had a big impact on our diet and physical activity, as urbanisation and industrialisation have progressed. For example, the dramatic increase in the production, marketing and consumption of energy-dense, nutritionally poor foods; less preparation and eating of food at home; fewer mothers breast feeding; widespread use of labour-saving work and technology; and a lack of clear consumer information about diet and physical activity.[37]

35. World Health Organisation (2016b); World Health Organisation (2000); Ebbeling et al. (2002); Swinburn et al. (2004); Cutler et al. (2003); and Roberto et al. (2015).
36. Ebbeling et al. (2002); and Cutler et al. (2003).
37. Livingston et al. (2012b); Ewart-Pierce et al. (2016); Roberto et al. (2015); Keith et al. (2006); Wright et al. (2012); Lakdawalla et al. (2009); Popkin et al. (2004); Popkin (2001); Karnani et al. (2016); Bray et al. (2004); World Health Organisation (2000); and Swinburn et al. (2004).

Table 3.1: Causes of obesity

Factors	Underlying causes
Energy-in	Widespread food marketing
	Proliferation of cheap, energy-dense foods
	Increasing palatability of processed food
	Bigger portion sizes
	Rising incomes and more women working – leading to more eating out and takeaway food
Energy-out	Sedentary leisure activities
	Less physically-demanding work
	Wider car ownership
	Increasing urbanisation
Other	Genetics: a factor for some individuals but not everyone
	Rare genetic conditions
	Epigenetics
	Greater use of pharmaceuticals
	Falling smoking rates
	Too little sleep

Notes: Epigenetics refers to changes in how cells read genes.

Source: World Health Organisation (2000), Wright et al. (2012), Swinburn et al. (2004), Drewnowski et al. (2005), Roberto et al. (2015), Ebbeling et al. (2002) and Karnani et al. (2016).

Government policies on urbanisation, agricultural, food and transport have generally reinforced these trends.

3.2 'Energy-out' is a contributor

Inadequate physical activity, or 'energy out', contributes to obesity, but has been more stable than energy consumption during the time obesity has been increasing.[38] The Australian Institute of Health and Welfare estimates more than half of Australian adults do insufficient physical activity, and this proportion has remained stable over the past 25 years (Figure 3.1).

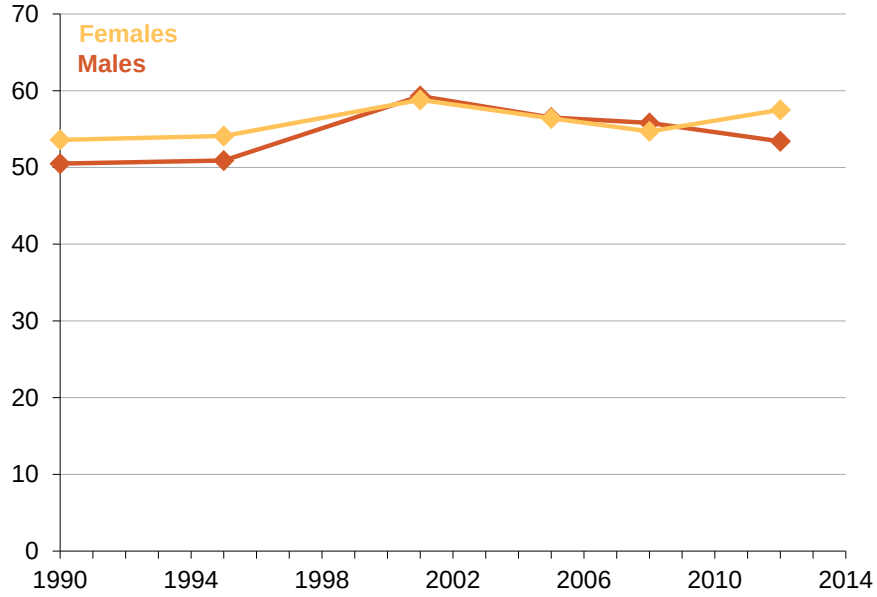
Less physically-intense work (due to a higher proportion of services jobs and more automation), higher rates of car ownership and changing leisure activities all contribute to the lack of physical exertion.[39] Automation has reduced the amount of energy we need to exert at home, work and play.[40] Increased urbanisation is also cited as a contributing factor, although in Australia obesity rates are higher in regional areas.[41]

3.3 Genetics are a contributing factor for some people

About one in six people have a variant of the FTO gene that makes them hungrier and affects their response to food, increasing the likelihood of obesity.[42] Some other, rarer, genetic occurrences can also heighten the risk of obesity.

Figure 3.1: More than half of Australian adults do insufficient physical activity

Per cent of adult population that do insufficient physical activity



Notes: Rates age-standardised to the 2001 Australian population. Trends are based on duration, session and intensity over a two week recall period, and are averaged over a week (excludes incidental physical activity).

Source: Australian Institute of Health and Welfare (2016b) analysis of ABS National Health Surveys.

38. Keith et al. (2006); Popkin et al. (2004); Wiklund (2016); and Stubbs et al. (2004).
39. Popkin et al. (2004); Finkelstein et al. (2010); Popkin et al. (1998); and Drewnowski et al. (1997).
40. Caballero (2007); and Popkin et al. (2004).
41. Australian Bureau of Statistics (2013b); Popkin et al. (1998); and Drewnowski et al. (1997).
42. Frayling et al. (2007). Karra et al. (2013) found that FTO increases preference for energy-dense foods and predisposes people to energy intake and obesity.

However, genetic factors have not changed since the 1980s, when obesity prevalence began increasing. This suggests that while genetics is a contributor to obesity for some people, it is not a population-wide reason for the increased prevalence of obesity.[43]

Modifications to how genes are 'read' by cells, referred to as epigenetics, also contributes to obesity.[44] The pre-natal diet can influence food preferences and hunger levels for children later in life, as can children's diets in their early years.[45]

3.4 Excess 'energy-in' is the primary cause

Eating too much is generally recognised as the most significant contributor to the obesity epidemic.[46] The reasons too many of us eat too much unhealthy food include 'market failures' (Section 3.5 on page 20), the proliferation of energy-dense foods, bigger portion sizes, more women working, rising incomes, and the marketing of unhealthy foods (see Table 3.1 on page 16).

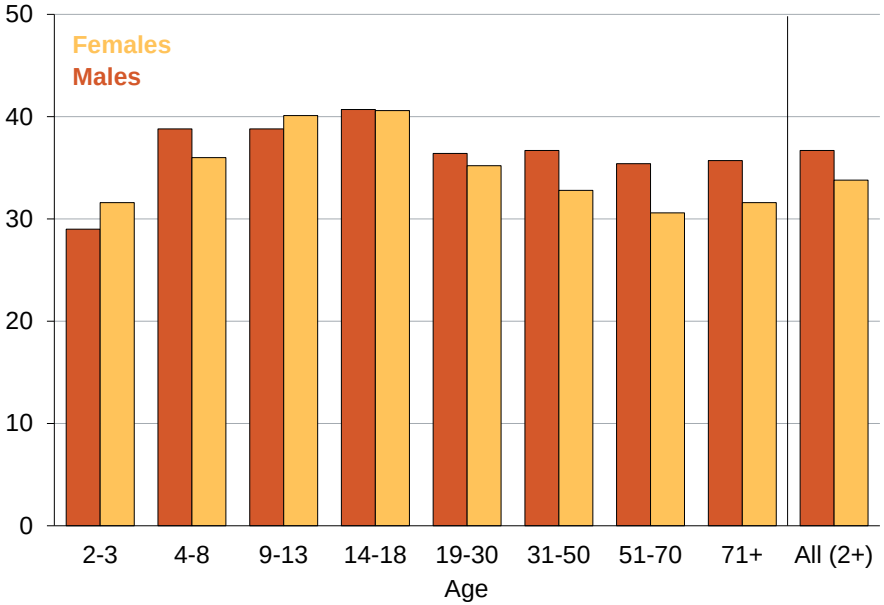
Accurate long-run data on Australians' energy-intake are limited due to measurement differences between surveys.[47] But the available estimates indicate energy intake and consumption of processed foods has increased in recent decades. One study calculated that mean energy intake per adult increased by about 350kJ a day between 1983 and 1995, or nearly 4 per cent.[48] The trends are similar overseas.[49] In the United States, it has been estimated that energy intake per person per day increased by 1255kJ between the late 1970s and 2000, and that this was the major contributor to weight gain because physical activity had not increased.[50] Liquid calories, often consumed via sugary drinks, are recognised as a major contributor to increased energy intake due to not providing a feeling of fullness.[51]

Australians are eating more energy-dense, processed foods (Figures 3.2 to 3.3 on the following page). On average, more than one-third of our daily energy is derived from 'discretionary foods', that is, non-essential foods often high in fat, salt or sugar.[52] Of the money we spend on food, more of it is going on meals out and takeaway foods.[53] Energy-dense foods are often cheaper than more nutritious food, and children prefer sweet processed foods.[54] Some 'foods', such as soft drinks, can be energy-dense and provide few nutrients but do not make us feel full.[55] And few Australians eat the recommended amount of fruit and vegetables.[56]

43. Karra et al. (2013). Ebbeling et al. (2002) state that, 'Genetic factors can have a great effect on individual predisposition; however, rising prevalence rates among genetically stable populations indicate that environmental and, perhaps, perinatal factors must underlie the childhood obesity epidemic'.
44. Obesity Australia (2014).
45. Li et al. (2010); and Ebbeling et al. (2002).
46. Wiklund (2016); Finkelstein et al. (2010); World Health Organisation (2000); Bray et al. (2004); Ewart-Pierce et al. (2016); Karnani et al. (2016); Livingston et al. (2012b); Roberto et al. (2015); Tataranni et al. (2003); Stunkard et al. (1999); Swinburn et al. (2006); and Drewnowski et al. (2005).
47. Australian Institute of Health and Welfare (2012) and Bleich et al. (2007). The Food and Agriculture Organisation of the United Nations has long run data on food supply, but is not an accurate measurement of energy intake as it does not account for waste and transformation of foods during cooking.
48. Cook et al. (2001) adjust national nutrition surveys to account for survey design changes, changes in the food composition database and changes in the Australian population to make them comparable. This difference is statistically significant, with increases in (percentage terms) larger among children.
49. Cavadini et al. (2000); Nielsen et al. (2002); and Bleich et al. (2007).
50. Woodward-Lopez et al. (2010).
51. Woodward-Lopez et al. (2010); and Johnson et al. (2009).
52. Australian Bureau of Statistics (2014); and Hendrie et al. (2016).
53. This trend is apparent across all incomes.
54. Roberto et al. (2015).
55. Mozaffarian (2016); Fletcher et al. (2011); Malik et al. (2006); Ruyter et al. (2012); and Johnson et al. (2009).
56. Hendrie et al. (2016). According to Australian Institute of Health and Welfare (2012), in 2007/08, 9 in 10 people aged 16+ did not consume sufficient vegetables.

Figure 3.2: More than one-third of Australians' daily energy is derived from 'discretionary foods'

Per cent of energy from discretionary foods, 2011/12

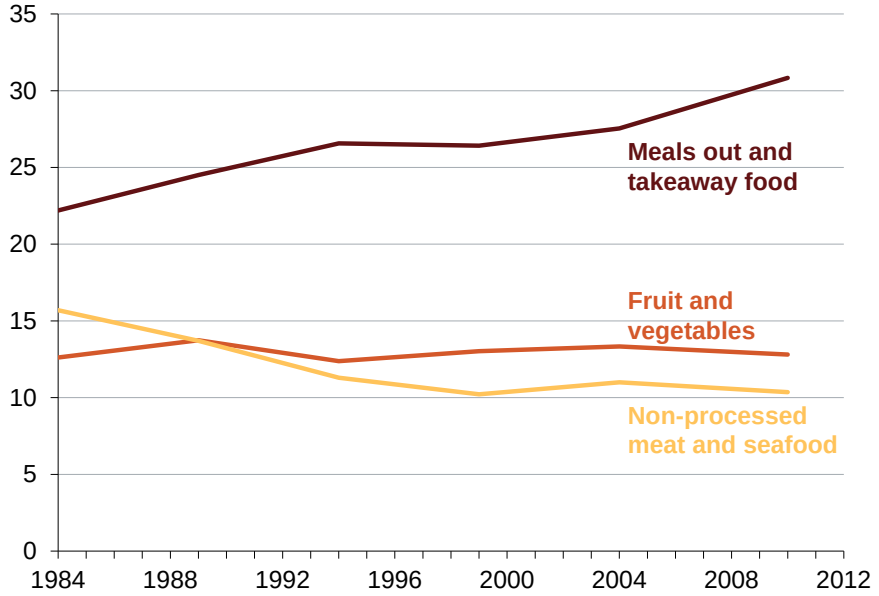


Notes: The Australian Dietary Guidelines state that discretionary foods are: 'foods and drinks not necessary to provide the nutrients the body needs, but that may add variety. However, many of these are high in saturated fats, sugars, salt and/or alcohol, and are therefore described as energy dense'.

Source: Australian Bureau of Statistics (2014) Table 9.1.

Figure 3.3: Households are spending more on eating out and takeaway foods

Per cent of food and non-alcohol beverage expenditure



Notes: Data for 1984 are Victoria only. Fruit and vegetables includes nuts.

Source: Australian Bureau of Statistics 1984, 1988/89, 1993/94, 1998/99, 2003/04, 2009/10 Household Expenditure Surveys.

3.5 'Market failures' contribute to excess consumption of unhealthy foods

Obesity is partly attributable to failures in the market for food.[57] This market failure occurs when people consume more food, or different types of food, than they would if they:

1. Had full knowledge of the effects on their body (such as the potential for weight gain).
2. Had full control over their choices (rather than being susceptible to marketing, as children are especially).
3. Faced up to the full costs of obesity (most costs are covered by our publicly-funded health system and social safety net).

If people were perfectly informed, had complete control over their food choices and met the full costs of obesity, they would be much more likely to maintain their weight in the healthy range.

3.5.1 Individuals lack full information about foods and the health consequences of obesity

Australians are often confused about nutrition requirements, food and beverage labelling, and the link between obesity and bad health.[58] A lack of consumer understanding in the market for food, particularly processed food, is a well-recognised instance of market failure.[59] Nutrition and health information has 'public good' properties, so is undersupplied without regulation or government provision.[60] As a result, too many of us eat too many foods that are unhealthy and contribute to weight gain. Children and teenagers are most likely to have poor knowledge of nutrition and the consequences of eating badly.

Governments have implemented policies to address this information asymmetry problem (see Box 2 on the next page). Of course, achieving 'perfect' consumer understanding of nutrition and obesity is impossible, especially for children. But there are numerous policies governments can implement to improve the situation. For example, governments can:

- Restrict the marketing to children of unhealthy processed food;[61]
- Require better labelling of food, with more information about nutrition (see Box 2);[62]
- Fund nutrition education and information campaigns;[63]
- Improve our understanding of the benefits of physical activity.

3.5.2 People are not always rational in their consumption

Behavioural and physiological influences mean people may be unable to regulate their consumption of tasty processed unhealthy foods, leading to over-consumption. Individuals may discount the long-term costs of excess consumption of unhealthy foods (and the health consequences of obesity) more than the short-term benefits from this excess consumption.[64]

57. Karnani et al. (2016).
58. P. Baker (2014); and Karnani et al. (2016).
59. Referred to as 'information asymmetry', see Karnani et al. (2016) and Freebairn (2010)
60. Freebairn (2010).
61. World Health Organisation (2016c); Cairns et al. (2013); Magnus et al. (2009); Chou et al. (2005); Boyland et al. (2011); and Capacci et al. (2012).
62. MacKay (2011); Freebairn (2010); Capacci et al. (2012); Roberto et al. (2012); Restrepo (2014); Magnusson (2010); Cowburn et al. (2005); Hawley et al. (2013); and Méjean et al. (2014).
63. World Health Organisation (2016c); Capacci et al. (2012); Hawkes (2013); Pettigrew et al. (2013); and Liquori et al. (1998).
64. Cnossen (2010), Cawley (2015) and Gruber et al. (2004). Ruhm (2012) states that there is evidence of 'at least some irrationality in food consumption'.

We have in-built biological preferences for sweet, fatty and salty foods – and food companies manufacture their products to exploit this.[65] There is also growing evidence that processed food is addictive, limiting an individual's self-control.[66] These factors mean some people cannot properly regulate their consumption of processed foods.

3.5.3 Individuals do not bear the full costs of their over-consumption of unhealthy foods

An individual consumer does not face the full cost or the consequences of excess consumption of unhealthy foods and drinks that contribute to obesity. There is a 'cost transfer' from obese people to non-obese taxpayers, for two reasons:

1. Most healthcare costs are covered by government;
2. The government provides a social safety net for people who may become under-employed, unemployed or disabled because of obesity.[67]

Some people eat more unhealthy food than they would if the costs of obesity were incorporated into the price of food. This suggests foods with excessive calories and poor nutritional value are under-priced. This results in higher health and welfare costs than otherwise and a cost transfer from obese people to non-obese taxpayers.[68]

65. Moss (2013); and Ruhm (2012).
66. New Zealand Beverage Guidance Panel (2014); Gearhardt et al. (2009); Ifland et al. (2009); Karnani et al. (2016); Lennerz et al. (2013); and Schulte et al. (2015).
67. Karnani et al. (2016); Freebairn (2010); Koplan et al. (2010); Brownell et al. (2009b); and Productivity Commission (2010).
68. Bhattacharya et al. (2011). The cost of providing these services through higher taxes creates an additional deadweight loss due to distortions created by taxation.

Box 2: The Health Star Rating system

The Health Star Rating system is a front-of-pack labelling system aimed at enabling people to compare the nutritional profile of packaged foods within a product category.[a] The system also encourages food manufacturers to reformulate products to receive a higher rating. Products are labelled with a rating between half a star (least healthy) and five stars (healthiest) on the front of the pack. The system, which began in 2014, was developed by governments in collaboration with industry, public health and consumer organisations. The system is voluntary for the first five years.

While there is some support for the scheme, critics argue it could be more effective. A major criticism is that the scheme is voluntary, meaning food companies can choose what products display a rating.[b] Another is that the system only allows comparison across similar products; it does not provide an absolute rating of the healthiness of foods.[c] Evidence suggests that a 'traffic light' labelling system would be more effective in enabling consumers to choose healthier products, particularly for high risk people,[d] but the food industry successfully argued in favour of the star rating system.[e]

a. Health Star Rating System (2014).
b. Clemons (2015).
c. Lawrence et al. (2015); and Clemons (2015).
d. Hawley et al. (2013); Kelly et al. (2008); Méjean et al. (2014); and Turner et al. (2014).
e. Sacks (2011); Gill (2011); and Turner et al. (2014).

4 Taxing sugar-sweetened beverages to address market failures

Addressing the market failures that contribute to excess consumption of unhealthy foods should be a priority for governments.

Governments can tax products that contribute to the third-party costs of obesity to reduce consumption and to recoup some of these costs. Consumers also need better information about food and the link between obesity and health. Governments can also reduce the availability of unhealthy food and increase the availability of healthy food through guidelines and regulation.

We argue a tax on sugar-sweetened beverages (SSBs), such as soft drinks, fruit drinks and cordials, is the best tax option. We define SSBs as non-alcoholic, water-based beverages with added sugar. Such a tax would reduce consumption of these drinks, increase the retail price closer to the social cost and recoup some of the costs to non-obese people caused by obesity. Most SSBs have no nutritional value and contribute to a large share of added sugar consumption, especially among young people. There is strong evidence that SSBs contribute to weight gain, obesity and associated health problems. SSBs have contributed an estimated 10 per cent to Australia's obesity problem.[69] A new tax is justified because the market has failed: the obesity epidemic is imposing a heavy cost burden on governments and non-obese Australians.

4.1 A tax on unhealthy foods or ingredients is justified

Levying a tax on a good or service that imposes third-party costs is a well-recognised approach to dealing with this type of market failure (described in Section 3.5).[70] For example, taxes are levied on alcohol and cigarettes to account for the extra healthcare costs, third-party health costs and anti-social consequences linked to consumption.[71]

In principle, a tax on a product that creates third-party costs not borne by the consumer or the producer should increase the price so that consumption falls to a socially optimal level.[72] By implementing a tax, the government places responsibility on producers and consumers to pay for the negative consequences of their production and consumption.

4.2 Why the government should act

Most obesity policy emphasis until now has been on improving information available to consumers, encouraging physical activity, and light-touch regulation of the production and distribution of unhealthy food. There has been little use of tax measures.

69. Based on findings in Woodward-Lopez et al. (2010), see Section 4.5 on page 29.

70. Third-party costs (negative externalities) occur when a cost is incurred by parties who are not part of the transaction, resulting in an inefficient level of production. A corrective tax can provide a net benefit to society by reducing consumption (Freebairn (2010) and Greenwald et al. (1986)).

71. Bahl et al. (2003); World Health Organisation (2015b), 'the costs to society of consuming these products (external costs) may be significant but not reflected in either the private costs of producing the product or the price that the consumer pays. This is an example of a "market failure", which is an economic justification for government intervention'.

72. Taxing a product so that the price faced by the consumer (the marginal private cost) equals the marginal social cost (the cost of consumption borne by third parties) eliminates the efficiency loss from consumption above a socially optimum level. Theoretically, a corrective tax should be levied on the marginal excess cost of consumption. However, marginal excess costs are difficult to calculate, and vary across individuals, so in practice a tax is more likely to be based on the average external cost, see Cnossen (2010).

Obesity creates an estimated $5.3 billion in costs on non-obese Australians. These costs are transferred through the taxation, public health and welfare systems.[73]

There are two broad types of arguments made for a tax on unhealthy foods that contribute to obesity. Others have argued as we have, that there is an economic rationale for reducing consumption of unhealthy foods and recouping the excess costs caused by obesity using taxes.[74] An alternative argument is that taxes should be used to improve public health by 'correcting' the decisions individuals make.[75]

This latter argument for increased taxation is often criticised as leading to a 'nanny state'.[76] We argue that government intervention is justified *even if* the significant personal and family costs of obesity are ignored or considered a matter of personal responsibility.[77] Government intervention can be justified to reduce consumption of unhealthy food and beverage and at least partially recoup the costs this imposes on third-parties.

73. Some economists regard transfers through publicly-funded healthcare or the welfare system as 'fiscal externalities', a particular type of externality (for example, see Browning (1999)). Others consider the third-party costs created by obesity as 'pecuniary externalities' (for example Productivity Commission (2010)). Pecuniary externalities are generally considered a transfer through the price system in a competitive market, not an externality. There is also an associated efficiency loss from the government having to raise more tax revenue than otherwise to cover higher medical expenses and welfare spending, see Daley et al. (2015).
74. For example, Veerman et al. (2016), Karnani et al. (2016), Cawley et al. (2012) and Parks et al. (2012) Cawley et al. (2015) state, 'there is in fact a credible economic rationale for an SSB tax: to internalize the negative externalities associated with obesity and the chronic conditions associated with a poor diet'.
75. For example, the National Preventative Health Taskforce report in 2009 recommended that the Commonwealth Government consider the use of taxes and subsidies to encourage the consumption of healthy foods and discourage the consumption of unhealthy foods. See also Powell et al. (2013), World Health Organisation (2015b), Thow et al. (2014) and Sassi et al. (2013).
76. Novak (2012); Keane (2016); Lesh (2016); and Elliott (2016).
77. There is a strong public health argument for government intervention to try and reduce obesity, especially among children, because obesity reduces well-being and life expectancy (Roberto et al. (2015), Waters et al. (2011) and Ewart-Pierce et al. (2016)).

4.3 A tax must be feasible and target foods that contribute to obesity

The options for taxing unhealthy foods and drinks are outlined in Table 4.1 on the next page. The perfect tax to correct for the third-party costs of obesity is a variable tax on an individual's additional calories that contribute to obesity.[78] However, it is impractical to tax excess calorie intake for individuals.

A tax on foods that are energy-dense and nutrient poor is the next closest option to a perfect tax to target consumption of foods that contribute most to the obesity problem. However, determining a standardised nutrient profile for tax purposes is complex and hard to administer.[79]

Alternatively, a tax can be levied on individual ingredients in processed foods that contribute to weight gain, such as sugar or saturated fat. Doing so provides a partial solution to the costs created by obesity. But no one ingredient causes all obesity and products can be changed to avoid the tax. Such a tax may also capture nutritious food.

Taxing an ingredient within a market segment, where this is possible, has the advantage of being relatively simple to apply. This also encourages healthier product reformulation,[80] as well as encouraging consumers to switch to healthier products. This explains why there is now considerable interest in taxing the sugar contained in SSBs.[81]

78. Freebairn (2010).
79. Australia has the Nutrient Profiling Scoring Calculator, which is used to determine whether a food is suitable to make a health claim. The WHO is developing a nutrient profile model that can be used by countries to implement food taxes (see World Health Organisation (2016a)).
80. United Kingdom Behavioural Insights Team (2016b).
81. Smith (2016); and National Treasury of the Republic of South Africa (2016).

Table 4.1: Tax options

Option	Example	Advantages	Disadvantages
Individual tax on excess 'empty' calories	Tax above a personalised level of consumption of nutrient-poor foods	Targets only the additional, empty calories that cause obesity	Impossible to implement
Tax on a nutrient profile	Tax on low star-rating foods	Can target unhealthy or energy-dense foods	Complex A food index for tax purposes has not been developed
Tax on ingredient	Tax on sugar or fat used in processed foods	Targets problem ingredients Encourages healthy product reformulation	A single ingredient is not the problem May affect core or healthy foods
Tax on an ingredient within a product	Tax on sugar contained within sugar-sweetened beverages	Targets problem products Changes preferences and tastes Encourages substitution Encourages product reformulation	More difficult than taxing a product A single ingredient is not the problem
Tax on market segment or product	Tax on 'fast food' or soft drinks	Easy to implement Can target problem products Encourages substitution	Hard to classify a certain segment May capture healthy foods or ingredients

Source: World Health Organisation (2000), Wright et al. (2012), Swinburn et al. (2004), Drewnowski et al. (2005) and World Health Organisation (2015b).

A tax on a market segment is the simplest option and encourages substitution to more healthy products, although it is not perfect. The major difficulty is identifying an appropriate market segment to avoid foods that have nutritional value. Taxing SSBs is an example of this tax. An SSB tax (mostly) does not inadvertently tax needed nutrients (compared to, for example, taxing hamburgers, which have ingredients that contain nutrients). This type of tax on SSBs is advocated by many public health experts and advocacy groups.

4.4 Taxing SSBs is the best tax option

More than twenty countries and sub-national governments have implemented or announced an SSB tax to increase the cost of SSB consumption in line with social costs, reduce SSB consumption and generate revenue to fund other obesity prevention policies (Table 4.2 on the following page).[82] SSB taxes have, in general, been successful in reducing consumption and raising revenue.

Taxing the sugar content of SSBs, or SSBs as a product (by volume or based on price), is the best tax option because it is simple, it can be implemented quickly, it effectively targets products contributing to the obesity problem while minimising capturing products with beneficial nutrients, and it can be incorporated into the existing excise tax system so administrative and set-up costs are minimal. While an SSB tax does not perfectly target the costs of excess unhealthy food consumption that contributes to obesity, as economic theory requires, it is a good second-best option to reduce consumption and recover some of the third-party costs of obesity.[83]

We define SSBs as non-alcoholic, water-based beverages with added sugar. This definition includes soft drinks, flavoured mineral waters, fruit juices/drinks, energy drinks, flavoured waters and iced teas.[84] These drinks are mostly energy-dense and high in sugar and most contain few or no valuable nutrients.[85] This makes SSBs different from other processed foods, which generally contain some valuable nutrients.[86]

Although it should contribute to a reduction in obesity, an SSB tax is not a 'silver bullet' that will solve the obesity epidemic.[87] An SSB tax should be introduced as one of many policies aimed at correcting market failures to reduce energy-in. Governments could also introduce policies that improve people's access to healthy foods, particularly for disadvantaged households, and policies aimed at increasing physical activity, especially among children. The revenue raised by an SSB tax could be used to fund these policies.

82. Many countries have taxes on processed foods, including SSBs, although these are not aimed at obesity and are generally levied at low rates. In Australia, SSBs are subject to the GST, whereas fruit, vegetables, meat, bottled water and fruit/vegetable juice are GST exempt, see Australian Taxation Office (2016b). However, evidence suggests that taxes need to be significant to change behaviour and reduce obesity. Cancer Council Australia (2014) argue that taxes on some SSBs actually fell with the introduction of the GST.
83. An SSB tax will still provide a social benefit if the reduction in costs caused by over-consumption is greater than the loss of welfare from non-obese people consuming the taxed products, see Cnossen (2010).
84. Friedman et al. (2012), from the Yale Rudd Center for Food Policy and Obesity defines SSBs as beverages 'with added sugar or other caloric sweeteners such as high fructose corn syrup, including soda, sports drinks, fruit drinks, teas, flavored/enhanced waters, and energy drinks'. Even 100 per cent fruit juices, which we exclude, can contain high levels of sugar.
85. Kaplin et al. (2013); and Mozaffarian (2016).
86. Lordan et al. (2011). The Australian Dietary Guidelines recommend limiting the consumption of SSBs (and other products with added sugars) (National Health and Medical Research Council (2013), Guideline 3).
87. However, even if an SSB tax only has a limited impact on obesity, it should nevertheless be implemented because it partly offsets the third-party costs of obesity caused by consumption of unhealthy foods and beverages.

Table 4.2: Many governments have implemented or announced SSB or soft drink taxes

Country/region	Start date	Tax coverage	Tax type	SSB tax details
Taxes in place				
Belgium	2016	Soft drinks (including artificially sweetened)	Volumetric	€0.03/litre (A$0.04/litre)
Fiji	2016	SSBs	Volumetric	A$0.03/litre
Barbados	2015	SSBs	Ad valorem	10 per cent ad valorem tax
Chile	2015	SSBs	Ad valorem	18 per cent ad valorem tax on SSBs with sugar content above 6.25g/100 mL (10 per cent tax on SSBs with lower sugar content)
Dominica	2015	SSBs	Ad valorem	10 per cent ad valorem tax
Berkeley, California	2014	SSBs	Volumetric	US$0.01/fl. oz. (A$0.44/litre)
Mexico	2014	SSBs	Volumetric	1 peso/litre (A$0.07/litre)
Mauritius	2013	SSBs	Sugar content	MUR 3/100 grams of sugar (A$0.11/100 grams) contained within SSBs
France	2012	SSBs and artificially sweetened beverages	Volumetric	€0.075/litre (A$0.11/litre)
Hungary	2011	Soft drinks and energy drinks	Volumetric	Soft drinks: HUF 7/litre (A$0.03/litre) (sugar content greater than 8 grams/100mL); selected energy drinks: HUF 250/litre (A$1.16/litre)
Finland	2011	Soft drinks	Volumetric	€0.22/litre (A$0.31/litre) on soft drinks with more than 0.5 per cent sugar
Nauru	2007	SSBs and flavoured milk	Ad valorem	30 per cent ad valorem tax
French Polynesia	2002	Soft drinks	Volumetric	CFP 40/litre (A$0.48/litre) domestic; CFP 60/litre (A$0.71/litre) imported
Samoa	1984	Soft drinks	Volumetric	WST 0.4/litre (A$0.21/litre)
Proposed taxes				
United Kingdom	2018	SSBs	Tiered volumetric	£0.18/litre (A$0.30/litre) on SSBs with total sugar content above 5g/100 mL; £0.24/litre (A$0.40/litre) SSBs total sugar content above 8g/100 mL
Ireland	2018	SSBs	Tiered volumetric	In line with United Kingdom
Portugal	2017	Soft drinks	Tiered volumetric	€0.0822/litre (A$0.12/litre) on SSBs with sugar content less than 8g/100 mL; €0.1646/litre (A$0.23/litre) on SSBs with sugar content above 8g/100 mL
South Africa	2017	SSBs	TBC	TBC (Treasury recommends a sugar content tax of ZAR 2.29/100 grams of sugar (A$0.21/100 grams) contained within SSBs)
Philadelphia, Pennsylvania	2017	SSBs and artificially sweetened beverages	Volumetric	US$0.015/fl. oz. (A$0.66/litre)
Boulder, Colorado	2017	SSBs	Volumetric	US$0.02/fl. oz. (A$0.88/litre)
Cook County, Illinois	2017	SSBs	Volumetric	US$0.01/fl. oz. (A$0.44/litre)
San Francisco Bay Area, California	2017/2018	SSBs	Volumetric	US$0.01/fl. oz. (A$0.44/litre)

Source: Grattan analysis, Thow et al. (2011), Thow et al. (2014), Colchero et al. (2016), Veerman et al. (2016) and World Health Organisation (2016a).

4.4.1 Consumption of SSBs is closely linked to obesity

There is strong evidence that SSB consumption is associated with increased energy intake, weight gain and greater risk of diseases such as type 2 diabetes and metabolic syndrome.[88] This is the case for adults and children. The National Health and Medical Research Council states the link between SSB consumption and excess weight gain has strengthened in recent years.[89]

Replacing SSBs with water or non-caloric sweetened beverages reduces body weight.[90] US randomised-control trials have found that replacing SSBs with non-caloric beverages reduced bodyweight and energy intake among adolescents[91] and adults,[92] and a trial of Dutch children found that consuming sugar-free rather than sugar-containing beverages led to a decrease in body mass.[93] Prospective cohort studies also indicate a causal relationship over the longer-term.[94]

88. Johnson et al. (2009), Woodward-Lopez et al. (2010), Ludwig et al. (2001), Berkey et al. (2004), Gill et al. (2006), Te Morenga et al. (2013), Tam et al. (2006), Basu et al. (2013), Dhingra et al. (2007), Vartanian et al. (2007), Imamura et al. (2015), Pan et al. (2013), Malik et al. (2006), Malik et al. (2010a), Malik et al. (2010b), World Health Organisation (2016c), World Health Organisation (2015a) and United States Department of Agriculture and United States Department of Health and Human Services (2010). 0.3 per cent of the total burden of disease in Australia was attributable to a diet high in sweetened beverages in 2011, see Australian Institute of Health and Welfare (2016a).
89. National Health and Medical Research Council (2013, p. 67), an evidence grading of 'probable association'. Industry-funded studies generally find that SSB consumption has a smaller effect on energy intake and body weight. For example, Vartanian et al. (2007) found that 'beverage industry-funded studies are four to eight times more likely to show a finding favourable to industry than independently-funded studies'. See also Bes-Rastrollo et al. (2013) and Lesser et al. (2007).
90. Malik et al. (2006).
91. Ebbeling et al. (2002).
92. Chen et al. (2009).
93. Ruyter et al. (2012); and Malik et al. (2006).
94. Hu (2013); Malik et al. (2006); and Te Morenga et al. (2013).

The dangers associated with drinking SSBs are numerous. People often drink excessive amounts because the body does not send appropriate 'full' signals from calories consumed in liquid form.[95] Sugars in SSBs are absorbed quickly. SSBs can induce hunger, resulting in a higher total energy intake than is accounted for by the SSBs themselves.[96] Soft drink and SSB consumption at a young age can also shape preferences for sweet foods and drinks, and can displace more nutritious beverages such as milk.[97]

4.4.2 SSB consumption in Australia is high, especially among teenagers

Per capita SSB consumption in Australia has increased dramatically since the mid-20th century. In the late 1960s, Australians consumed 47 litres of 'aerated and carbonated waters' per person; by the 1990s, this had increased to 113 litres per person.[98]

Per capita consumption of SSBs is high compared to other countries. According to 2014 Euromonitor data, Australia is the 11th largest purchaser of soft drink, with 87 litres purchased per capita each year.[99]

Sugar-sweetened soft drinks are consumed by more than 80 per cent of the population.[100] Over the past 20 years consumption has declined

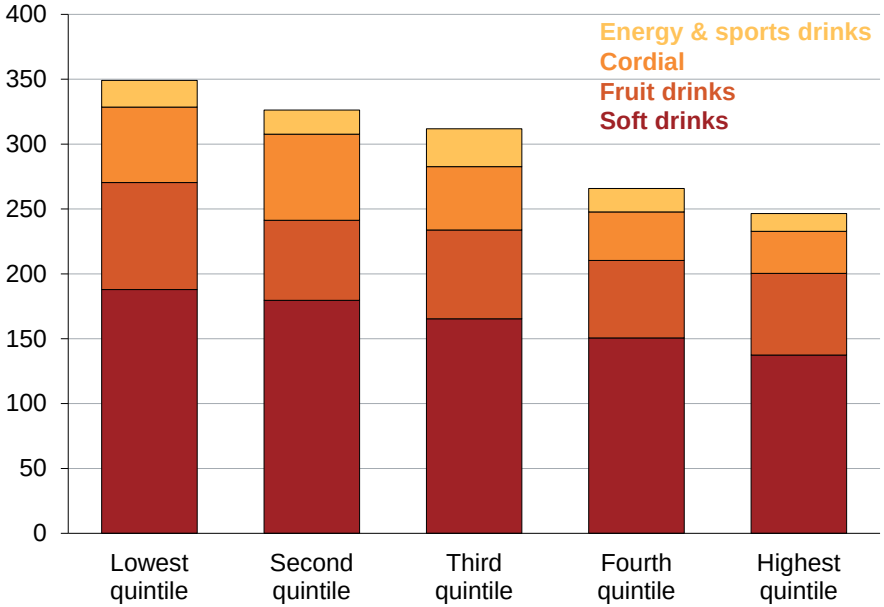
95. Mozaffarian (2016) states, 'the high sugar doses and rapidity of digestion make SSBs fundamentally different, and more dangerous, than other foods and drinks of similar caloric content'. See also Fletcher et al. (2011), Malik et al. (2006), Ruyter et al. (2012), Johnson et al. (2009), Gill et al. (2006), New Zealand Beverage Guidance Panel (2014), Malik et al. (2010a), Popkin (2012), Harvard School of Public Health (2016) and National Health and Medical Research Council (2013)
96. Vartanian et al. (2007); and St-Onge et al. (2004).
97. Popkin (2012); Malik et al. (2006); and Vartanian et al. (2007).
98. 'Aerated and carbonated waters' is a proxy for soft drinks, see Australian Bureau of Statistics (2000).
99. Silver (2015); and Popkin et al. (2016).
100. Levy et al. (2014).

modestly. Average daily soft drink consumption for those 19 and older declined modestly, from 180 grams in 1995 to 175 grams in 2011-12.[101] Soft drinks and flavoured mineral water accounted for around half of the energy people get from SSBs (Figure 4.1). Across the same period, there was a slight decline in the proportion of adults consuming sugar-sweetened beverages on the day prior to the ABS survey, from 35 per cent to 31 per cent of the population. The proportion of young children (aged 2-3) consuming SSBs fell more markedly, from 64 per cent to 30 per cent. Consumption of SSBs fell predominantly among higher-income people. Aboriginal and Torres Strait Islanders and people from areas of greater socio-economic disadvantage consume more SSBs than other Australians on average (Figure 4.1).[102]

In 2011/12, 'sugar- and intense-sweetened beverages' accounted for 3.5 per cent of the total energy intake for people 2 years and over, and 5.6 per cent for teenagers aged 14-18 (Figure 4.2 on the next page).[103] Although SSBs account for only a small share of total energy intake for most Australians, there is evidence that the cumulative effect from small increases in caloric intake can be substantial, and that small reductions in consumption can halt weight gain.[104]

SSBs are a major contributor to Australians' added sugar intake. The WHO concluded from an extensive literature review that reduced intake of added sugars was associated with a decrease in body weight.[105]

Figure 4.1: People with higher incomes consume fewer SSBs
Average energy (kJ) from SSBs per person per day, by SEIFA quintile of relative socio-economic disadvantage, age 2+, 2011/12



Notes: includes artificially-sweetened beverages (which contain almost zero energy).

Source: Australian Bureau of Statistics (2014).

101. Includes artificially-sweetened beverage (Australian Bureau of Statistics (2014, Table 5.1) and Australian Bureau of Statistics (1999, Table 1)). Consumption of fruit and vegetable juices, drinks, and cordials also declined modestly, from 124 grams to 120 grams. According to the Australian Bureau of Statistics (2014), increases in under-reporting may account for some of the decrease in consumption of SSBs between 1995 and 2011-12. Under-reporting was more pronounced among males aged 9-50 years.
102. Australian Bureau of Statistics (2014); and Australian Bureau of Statistics (1999).
103. Australian Bureau of Statistics (ibid.) Table 18.
104. Fletcher et al. (2011); and Cutler et al. (2003).
105. World Health Organisation (2015a).

Slightly more than half of Australians (aged 2+) exceed the WHO recommendation for 'free sugar' intake (over 70 per cent of children aged 9-18).[106] Soft drinks and fruit drinks are the major contributors to the amount of added and free sugars consumed, particularly for teenagers (Figure 4.3 on the following page).[107]

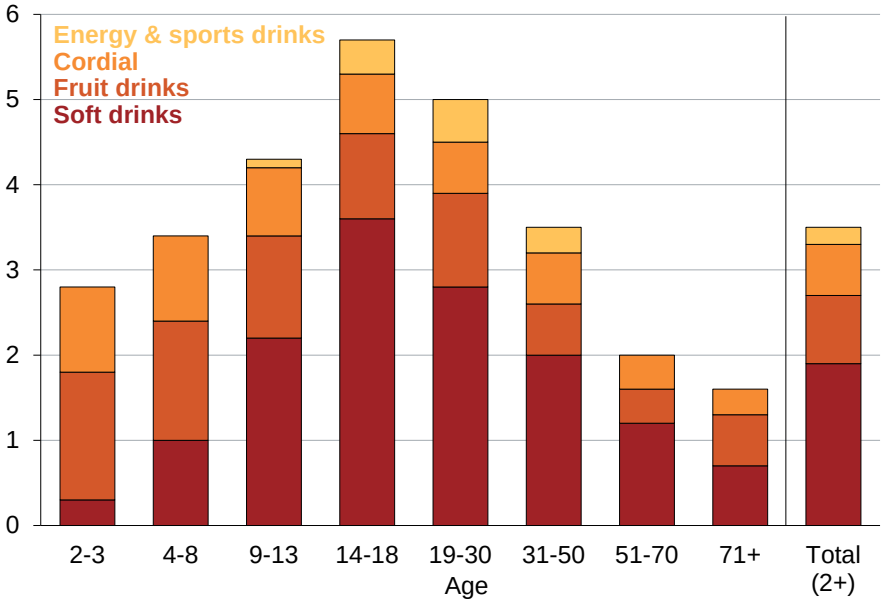
4.5 Consumption of SSBs contributes to the third-party costs of obesity

SSB consumption contributes to weight gain and obesity, so SSB consumption contributes to the third-party costs of obesity.[108]

In 2011/12, SSBs accounted for 3.5 per cent of daily energy intake on average across the Australian population (Figure 4.3 on the next page).[109] Considering that most SSBs have no nutritional value, are energy-dense and do not make drinkers feel "full", this consumption contributes to excess energy-in for many people.[110]

Figure 4.2: Adolescents and young adults drink more sweetened beverages than older adults

Per cent of total energy consumed, by age group, 2011/12



Notes: includes artificially-sweetened beverages (which contain almost zero energy).

Source: Australian Bureau of Statistics (2014).

106. Lei et al. (2016). Free sugars are added sugars from processing and preparation as well as honey and the sugar naturally present in fruit juice (Australian Bureau of Statistics (2016b, Table 3.1)). In both adults and children, the World Health Organisation (2015a) recommends reducing the intake of free sugars to less than 10 per cent of total energy intake (and preferably below 5 per cent).
107. Australian Bureau of Statistics (2016b).
108. SSBs also contribute to extra dental costs, some of which are publicly funded.
109. For those aged 19 and over, SSB consumption contributed 3.3 per cent of daily energy intake (Australian Bureau of Statistics (2014), Table 14.1). This is a lower-bound estimate because the ABS believes there was an increase in under-reporting in 2011/12.
110. Heavy consumers derive even more of their daily energy from SSBs (the median SSB consumption for those aged 19 or over (of those who consume) is 375mL (Australian Bureau of Statistics (2013b, Table 18)). The top ten per cent consumed more than 1 litre on the day prior to interview, peaking at 1.5 litres for males aged 19-30 years.

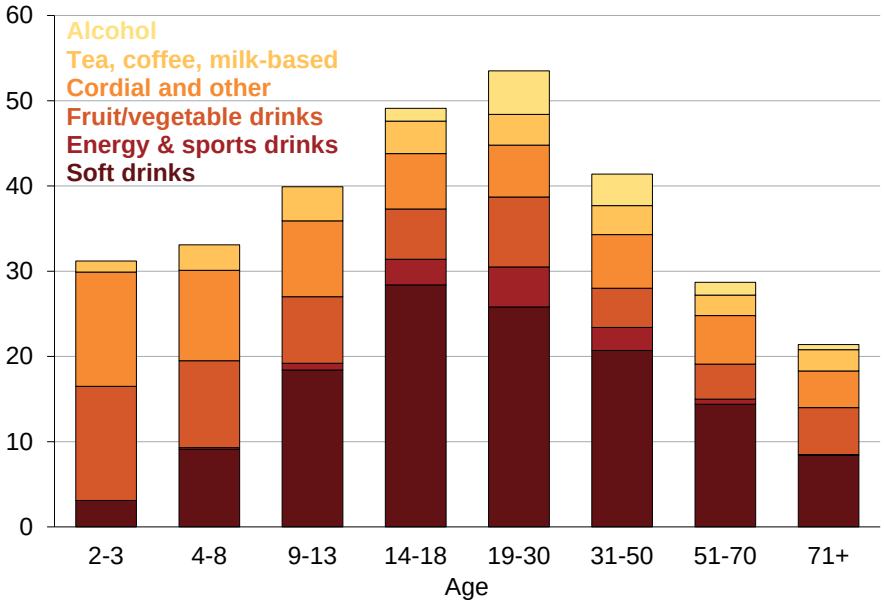
The contribution of SSBs to the third-party costs of obesity is greater than just the proportion of the energy intake. SSBs are not just additional calories; they can induce hunger, be addictive, and contribute to additional food consumption (Section 4.4.1 on page 27).[111] SSBs also increase preferences for sweet foods, especially among children, encouraging over-consumption of other high sugar foods.[112] SSBs themselves account for a high proportion of Australian's added sugar intake (Figure 4.3).

Woodward-Lopez et al. (2010) estimate that SSB consumption contributed to one-fifth of the weight gain in the US from the late 1970s to the 2000s. Although SSB consumption and obesity rates are higher in the US than in Australia, trends in SSB consumption and obesity rates are similar.[113] Using a conservative estimate based on Woodward-Lopez et al. (2010), we calculate that SSBs have contributed about one-tenth of Australia's obesity problem, or about $500 million.[114]

4.6 There is wide-ranging support for an SSB tax

Public health organisations including the World Health Organisation, Australian Medical Association, Obesity Policy Coalition, Cancer Council of Australia, Public Health Association Australia, Australian Healthcare and Hospitals Association, Council of Presidents of Medical Colleges and National Heart Foundation support the introduction of an SSB tax.[115] Public health experts have encouraged the introduction of an

Figure 4.3: SSBs are a big contributor to Australia's added-sugar intake
Per cent of total added-sugar intake, by age group, 2011/12



Source: Australian Bureau of Statistics (2016b).

111. Vartanian et al. (2007); Lennerz et al. (2013); Schulte et al. (2015); Fortuna (2012); Popkin (2012); and New Zealand Beverage Guidance Panel (2014).
112. Popkin (2012).
113. Popkin et al. (2016); and Silver (2015).
114. Therefore, we estimate that SSBs have contributed to approximately one-tenth of the third-party costs of obesity.
115. Obesity Policy Coalition (2016), Australian Medical Association (2016) and Australian Medical Association (2016). The conclusion of a WHO technical meeting was that there is strong evidence for implementing an SSB tax to reduce

SSB tax as one of the numerous policies and interventions that will be needed to reduce obesity in Australia.[116]

According to a recent survey, most Australians support the introduction of an SSB tax if the revenue were used to reduce the cost of healthy foods (Table 4.3).[117] In the 2012 survey of 1,511 adults, 69 per cent supported the idea. There was a similar level of support for taxing a broader range of unhealthy foods. Support was higher among parents, at 73 per cent.

Table 4.3: There is strong support for policies to tackle obesity

Policy	Support (%)
Traffic-light labelling on all packaged foods	87
Product reformulation - reduce fat, sugar and salt in processed foods	87
Taxing unhealthy foods and using the money for health programs	62
Increasing the price of unhealthy foods to reduce the cost of healthy foods	71
Taxing soft drinks to reduce the cost of healthy food	69
A ban on the advertising of unhealthy foods at times children watch TV	83
A total ban on the advertising of unhealthy foods	56
Restricting marketing on websites aimed at children	89
Restricting the use of toys and giveaways in the promotion of unhealthy foods	86
Restricting sponsorship of children's sporting activities by food companies	71

Notes: The 'support' figure represents the proportion of respondents who were in favour ('strongly in favour' or 'somewhat in favour') or think the practice should be restricted.

Source: Morley et al. (2012, Table 2).

consumption (World Health Organisation (2016a)). The WHO's Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013-2020 recommends that countries consider taxes and subsidies to discourage the consumption of unhealthy foods. Recommendation 1.2 of the WHO's 2016 'Report of the Commission on Ending Childhood Obesity' is to 'implement an effective tax on sugar-sweetened beverages'.

116. Brownell et al. (2009b); Veerman et al. (2016); Sharma et al. (2014); Ni Mhurchu et al. (2014); Kaplin et al. (2013); Long et al. (2015); and Cawley et al. (2015).
117. Morley et al. (2012).

5 How should a sugar-sweetened beverages tax be designed?

The Commonwealth Government should impose an excise tax on the sugar contained within SSBs. The tax should be in the range of 40 cents per 100 grams of sugar contained within SSBs. This will result in an average price increase of about 15-20 per cent and is in line with SSB taxes overseas. The second-best alternative is a tiered excise tax of around 20 cents per litre for low-sugar SSBs and 40 cents per litre for high-sugar SSBs.[118]

An SSB tax along these lines will initially generate around $500 million a year in revenue, recover some of the third-party costs of consumption that contribute to obesity, reduce the consumption of SSBs by increasing the retail price, and lead to a small reduction in obesity rates.

5.1 Only drinks with added sugar should be subject to a tax

The SSB tax should apply to non-alcoholic, water-based beverages with added sugar.[119] 100 per cent fruit juices with no added sugar should not be subject to the tax because they contain valuable nutrients, even though the sugar content of these drinks can be similar to soft drinks.

118. This is a tiered volumetric tax, *i.e.* a tax on the volume of liquid in each unit of SSB sold.
119. Added sugar includes caloric sweeteners such as high-fructose corn syrup, honey or fruit juice concentrate, and fructose and glucose. A lower limit on added sugar could be used as a cut-off point, for example SSBs with more than 2 grams of added sugar per 100mL.

5.2 Artificially-sweetened beverages should not be subject to the SSB tax

While there is some evidence that consumption of artificially-sweetened beverages[120] can contribute to weight gain by increasing an individual's craving for sweet foods, by changing metabolism, or due to an increase in consumption of other foods, this evidence is still preliminary.[121] Exempting artificially-sweetened beverages means consumers can switch from SSBs to close substitutes such as diet/no-sugar drinks to avoid the SSB tax, with a minimal loss of enjoyment.[122]

5.3 An excise tax is the most effective tax

There are two main types of excise taxes that could be applied to SSBs.[123] The first is a *specific* excise tax, which is applied to the volume or quantity of a good. In the case of SSBs, this could be a tax on the

120. These are also referred to as intensely-sweetened or diet/no-sugar beverages. Artificially-sweetened beverages are sweetened by non-nutritive sweeteners, such as aspartame, sucralose and saccharin. Stevia, a natural low-calorie sweetener, is also used to sweeten some beverages. Recent studies have found no evidence of an association between consumption of artificial sweeteners and cancer in humans (National Cancer Institute (2009) and Cancer Council New South Wales (2015)).
121. Mattes et al. (2009); Popkin (2012); Q. Yang (2010); Swithers (2013); Green et al. (2012); Fowler et al. (2008); and Friedman et al. (2012).
122. There is strong evidence that this occurs in response to an SSB tax, *e.g.* Colchero et al. (2016), Briggs et al. (2013a), Sharma et al. (2014) and Zhen et al. (2010). Exempting artificially-sweetened beverages will also reduce opposition from the beverage industry.
123. An excise tax is a tax on a good or range of products and is levied on the producer or distributor of the good (if imported). An example of an existing excise tax is the petroleum excise tax (levied at the rate of $0.396 per litre). Value-added taxes, such as the GST, are levied on all (or a wide range) of products (see Cnossen (2010)).

volume of the drink, the sugar in the drink, or per bottle/can. The second is an *ad valorem* excise tax, which is a tax on the value of a good. This could be a percentage of the retail price of SSBs.

The Commonwealth has the exclusive power to impose an excise tax (under s. 90 of the Constitution). The High Court has interpreted the definition of an excise tax broadly, so states cannot levy an excise tax.[124] The Commonwealth currently implements excise taxes through the *Excise Tariff Act 1921* (Cth).[125]

Table 5.1 on the next page outlines possible SSB tax options. Specific excise taxes have the advantage of deterring bulk buying of SSBs.[126] A tax on the sugar within SSBs (a 'sugar content' tax) and a 'tiered' volumetric excise tax encourage producers to reformulate products to contain less sugar to avoid paying the tax and more effectively target sugar consumption, encouraging consumers to consume less sugary drinks.[127] A volumetric tax, as introduced in parts of the US and Mexcio, discourages bulk buying of SSBs but does not encourage producers to reformulate drinks to contain less sugar. An ad valorem excise may be simpler to administer than a sugar content excise tax. However, this tax encourages consumers to buy cheaper drinks and bulk buy SSBs, limiting the effect on consumption and reducing tax revenue.[128]

5.4 A specific excise tax on sugar within SSBs is the best option

Choosing the best SSB tax requires balancing feasibility, administrative costs and the stated aims of the tax.

Sugar content is the link to obesity and related costs, so an SSB tax should be targeted at the sugar contained within drinks.[129]

Although a tax on the sugar content of SSBs is potentially more administratively complex than a volume-related tax,[130] it targets the sugar contained within SSBs, encouraging producers to reduce the sugar content of SSBs and consumers to drink fewer sugary drinks.[131].

An SSB tax should have the following features:

- A specific excise tax on sugar content, with the rate in the range of 40 cents per 100 grams of sugar.
- SSB taxes should be paid by manufacturers and importers of SSBs that are licensed by the ATO.[132] Evidence suggests it will be fully passed on to consumers.[133]

124. *Ha v New South Wales (1997) 189 CLR 465*
125. Goods subject to an excise tax are included in the schedule attached to the *Excise Tariff Act (1921)*.
126. Sharma et al. (2014); Freebairn (2010); Brownell et al. (2009a); Bonnet et al. (2013); Wetter et al. (2016); and World Health Organisation (2016a).
127. Smith (2016); and World Health Organisation (2016a).
128. Powell et al. (2013); Sharma et al. (2014); Brownell et al. (2009a); and World Health Organisation (2016a).
129. Bonnet et al. (2013) state that 'an excise tax based on the sugar content is the most effective way to limit [soft drink] consumption. This is also the least costly in terms of welfare'. Also see Smith (2016), World Health Organisation (2016a) and the recommendation of a sugar content tax by the National Treasury of the Republic of South Africa (2016).
130. The World Health Organisation (2016a) states that countries with strong tax systems, such as Australia, should implement a sugar content tax rather than a volumetric or ad valorem tax. A tax on the sugar content of SSBs is analogous to taxing the alcohol content of beer and spirits, which is currently done in Australia.
131. Drink manufacturers in the UK have already begun to reduce the amount of sugars contained in their drinks ahead of the introduction of the SSB tax in 2018, see United Kingdom Behavioural Insights Team (2016b)
132. Manufacturers and distributors pay the ATO for delivered goods subject to excise (Australian Taxation Office (2016c)). Applying a tax at the manufacturer level reduces complexity because fewer firms need to comply (Freebairn (2010) and Cnossen (2010)). Exporters of SSBs should be exempt from the tax and small manufacturers could be exempted if administrative costs are too high.
133. Grogger (2015); Bergman et al. (2010); Berardi et al. (2016); Bonnet et al. (2013); and ChangeLab Solutions & Healthy Food America (2016).

Table 5.1: SSB tax options

Options	Example	Advantages	Disadvantages	Existing tax
Specific excise on sugar within SSB ('sugar content' tax)	40 cents/100 grams of sugar in SSBs	Each gram of sugar is taxed consistently Encourages product reformulation Consumers can shift to less sugary SSBs Deters bulk buying	Potentially more complex than a volumetric excise tax Eroded by inflation	Beer excise tax ($47.95 per litre of alcohol)
Specific excise on SSB volume – tiered rates ('tiered volumetric' tax)	20 cents/litre on SSBs with sugar content <8 grams/100mL; 40 cents/litre on SSBs with sugar content >8 grams/100mL	Encourages product reformulation to reduce sugar content to below the threshold Deters bulk buying	More complex than one standard volumetric rate Eroded by inflation Sugar content not taxed consistently	Proposed UK soft drink tax
Specific excise on SSB volume ('volumetric tax')	30 cents/litre tax on SSBs	Simple to administer Deters bulk buying	Eroded by inflation More tax paid per gram of sugar on low-sugar drinks	Petroleum excise tax ($0.396 per litre)
Ad valorem excise tax	20 per cent tax on the retail value of SSBs	Keeps pace with inflation Simple to administer	Encourages bulk buying and substitution to cheaper drinks Unpredictable revenues Undermined by price cuts	Wine equalisation tax (29 per cent of the wholesale value of wine)

Source: World Health Organisation (2015b), Powell et al. (2009), ChangeLab Solutions & Healthy Food America (2016), Sunley (1998), Wetter et al. (2016), World Health Organisation (2016d) and Australian Taxation Office (2016a).

- The tax should increase SSB retail prices by around 20 per cent.[134]
- SSBs should have a label that shows consumers that their drink is subject to a tax.
- The second-best tax option, if implementing a sugar content tax is too difficult, is a tiered volumetric tax based on sugar content.

5.4.1 An SSB tax will raise substantial revenue

Grattan Institute modelling suggests the revenue generated by an SSB tax will be around $400-550 million a year, depending on the type and rate of the tax (Table 5.2 on the following page).[135] The preferred tax, a sugar content tax of 40 cents per 100 grams of sugar contained within SSBs, is estimated to generate revenue of $520 million if it is in place in 2017, and $400-$450 million in later years.[136] Our revenue estimates align with modelling by the Parliamentary Budget Office (2016) and Veerman et al. (2016), which modelled the revenue generated by a 20 per cent ad valorem tax on SSBs.[137]

Tax revenue was estimated at an aggregate level and by SSB sub-category. Key assumptions and model inputs, based on Australian and international evidence, include:

- SSBs were defined to include water-based, non-alcoholic beverages with added sugar. This includes soft drinks, fruit juice, fruit drinks, energy drinks, cordial, mixers, flavoured mineral waters, iced tea and sports drinks
- SSB price elasticity of demand equal to –0.9[138]
- Average sugar content of 9.3 grams per 100mL
- Total SSB sales of $3.3 billion (1.62 billion litres) in 2015[139]
- An average SSB before tax retail price of $2.04 per litre in 2015

5.4.2 An SSB tax is regressive, but health benefits are likely to be greater for low-income households

Low-income households spend a higher proportion of their disposable income on drinks (but less in absolute terms), so an SSB tax will likely be regressive – they will pay a higher proportion of their income in tax (Figure 5.1 on page 37).[140] Modelling of the suggested sugar content

134. World Health Organisation (2016a) As Australian SSB retail prices are relatively high, specific excise taxes need to be levied at a high rate to increase prices by ~20 per cent, see Long et al. (2015).
135. Details of the SSB tax modelling are in Appendix C.
136. SSB prices will increase by an average of 18 per cent under this SSB tax option. SSB tax revenue in later years will likely be lower if consumers continue to switch to non-SSBs (this may be accelerated by an SSB tax) or SSB manufacturers reformulate products so they contain less sugar. Under a scenario of a further 10 per cent reduction in SSB consumption by 2020 and a lower average sugar content (8.5 grams/100mL, compared to 9.3 grams/100mL), annual revenue will be $400-450 million.
137. PBO modelling completed at the request of the Greens before the 2016 election estimated tax revenue as a share of GDP is also similar to modelling for hypothetical taxes in comparable countries (Andreyeva et al. (2011) and Briggs et al. (2013a)). For example, Mhurchu et al. (2007) model a 20 per cent SSB tax in New Zealand, which is estimated to generate NZ$30 million in tax revenue, approximately 0.02 per cent of GDP (Grattan Institute estimates equal ~0.02-0.03 per cent of GDP).
138. Price elasticity of demand refers to the change in quantity demanded in response to a change in price. The price elasticity of demand for SSBs is generally found to be in the range of –0.6 to –1.3, with the best point estimate –0.9 (Andreyeva et al. (2010), Block et al. (2010), Sharma et al. (2014), Yang et al. (2016), Lin et al. (2010), Powell et al. (2013), Bahl et al. (2003), Miao et al. (2013) and Escobar et al. (2013)). Different elasticities were used for sub-categories of SSBs. See Appendix A on page 46 for more details on SSB tax studies with elasticity estimates.
139. This total revenue estimate aligns with other sources, such as Levy et al. (2014). Forecast sales in 2017 with no tax were estimated to be $3.3 billion (1.64 billion litres).
140. Studies find that difference in tax paid across households is minimal and the overall impact of an SSB tax is modest (Backholer et al. (2014) and Etilé et al. (2015)).

tax (at the rate of 40 cents per 100 grams) indicates the financial burden is modest because spending on beverages accounts for a small share of household income (Figure 5.1 on the next page), but will be slightly higher for people from lower socio-economic areas, meaning lower socio-economic households will pay a higher proportion of their disposable income in tax.[141] A recent analysis of SSB tax studies also found that an SSB tax will likely result in a slightly larger tax burden for lower socio-economic groups (in dollar terms).[142]

But SSBs are not a necessity and there are many close substitutes, so people can easily avoid the tax. Tap water is a basically free substitute to SSBs, and artificially-sweetened drinks are a close substitute and are not subject to the proposed tax.[143] Consumers switching from SSBs to artificially sweetened beverages will face only a small loss of enjoyment. People on low incomes are generally more responsive to price rises and are therefore more likely to move to non-taxed (healthier) beverages.[144] So although an SSB tax may be regressive in monetary terms, the greatest health benefits will flow through to low-income consumers due higher current rates of obesity and a greater reduction in consumption.[145] Revenue raised by the tax can also be spent on obesity prevention programs and to improve access to and affordability of healthy foods for the least well-off.[146]

141. We estimate that the average tax burden is about $18 per person for people in the highest socio-economic areas and $24 person for people in the lowest socio-economic areas.
142. Backholer et al. (2016).
143. Briggs et al. (2013a), Colchero et al. (2016), Sharma et al. (2014) and Zhen et al. (2014) find that people switch to water and artificially-sweetened beverages in response to an SSB tax.
144. Low-income consumers have more elastic demand compared to high-income consumers (Yang et al. (2016), Colchero et al. (2016), Etilé et al. (2015) and Briggs et al. (2013a)).
145. Obesity Policy Coalition (2016); World Health Organisation (2016a); and Backholer et al. (2016).
146. Wetter et al. (2016); and World Health Organisation (2016a).

Table 5.2: Estimates of SSB tax revenue in 2017

Source	SSB definition	Tax details	Revenue
Grattan Institute	Water-based, non-alcoholic beverages with added sugar	40 cents/100 grams of sugar in SSBs	$520m
		30 cents / 100 grams of sugar in SSBs	$400m
		Tiered volumetric tax	$480m
		30 cents / litre volumetric excise	$430m
		20 per cent ad valorem excise tax	$550m
Parliamentary Budget Office (2016)	Water-based, non-alcoholic beverages containing natural sugars and/or added caloric sweeteners (>5 grams of sugar/100mL)	20 per cent ad valorem excise tax	$550m
Veerman et al. (2016)	Soft drinks and flavoured mineral waters	20 per cent ad valorem excise tax	>$400m

Notes: Tiered volumetric tax is 20 cents/litre SSBs with sugar content <8 grams/100mL; 40 cents/litre with sugar content >8 grams/100mL.

Source: Grattan analysis; Veerman et al. (2016) and Parliamentary Budget Office (2016).

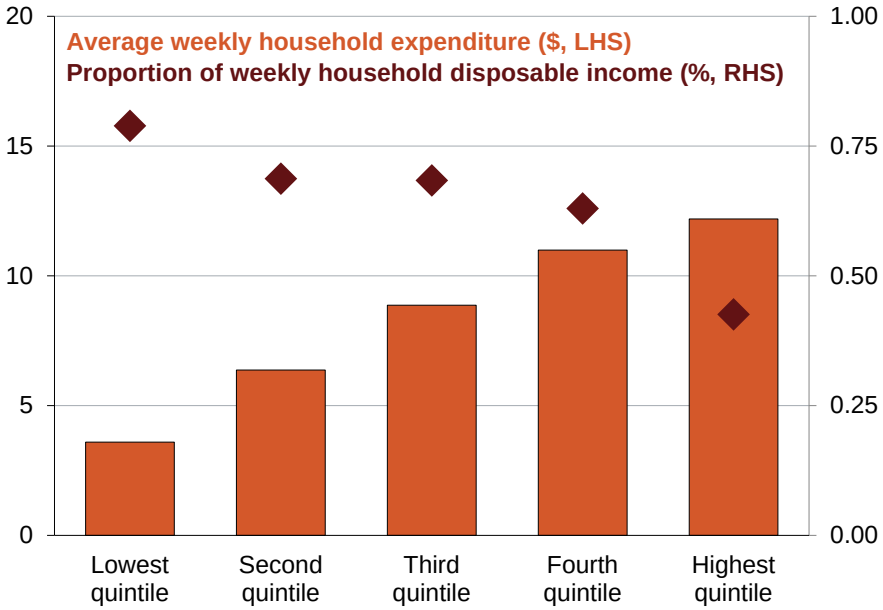
5.4.3 An SSB tax will most likely be passed on in full

The Commonwealth Government should levy the SSB excise tax on the manufacturer, distributor or importer of SSBs. Overseas evidence indicates that the tax will be fully passed on to the retail price of the drinks.

For example, for the suggested sugar content tax of 40 cents per 100 grams of sugar within an SSB, on an average two-litre soft drink the producer would be required to pay 80 cents in excise tax to the ATO.[147] If the initial retail price of the drink was $3 and the final price of the drink after the tax is imposed rises to $3.80 then the burden of the tax falls entirely on the consumer. If the retail price rises by less than 80 cents, the burden is shared between the producers (along the supply chain) and the consumer. If retail prices rise above $3.80, the tax is 'over-shifted'.

The evidence from SSB excise taxes introduced overseas is that taxes are quickly passed on in full to consumers, or over-shifted.[148] However, because Australia's retail market is dominated by a few large companies with strong brands, it is not certain that an SSB excise tax will be fully-shifted to retail prices.[149] If, as recommended, an excise tax is levied only on SSBs and not artificially-sweetened drinks, there is the potential

Figure 5.1: High-income households spend the most on SSBs
Expenditure on soft drinks, fruit juice and cordial, by gross household income quintile, 2009/10



Notes: 2009/10 dollars. Includes expenditure on sugar-sweetened, artificially-sweetened and unsweetened soft drinks, fruit juice and cordial.

Source: Australian Bureau of Statistics (2011a) and Australian Bureau of Statistics (2011b).

147. Assuming a sugar content of 10 grams of sugar per 100mL.
148. Grogger (2015) finds that the Mexican SSB excise tax of ~9 per cent was over-shifted, with retail prices for regular soda increasing by 12 per cent. In Denmark, the increase in soft drink excise tax was on average over-shifted (Bergman et al. (2010)). For the French SSB tax, the tax was fully shifted on soft drinks within six months, but less than fully-shifted for fruit drinks and flavoured waters (Berardi et al. (2016) and Bonnet et al. (2013)). Cawley et al. (2015) and Falbe et al. (2015) find that the Berkeley SSB tax was under-shifted. However, this tax could be avoided by purchasing from a neighbouring city, unlike an SSB tax applied to a whole country.
149. The evidence on pass-through of excise taxes on alcohol is mixed, with studies finding that taxes can be under or over-shifted, depending on market structure and other factors (Cawley (2015), DeCicca et al. (2013) and Dubé (2004)).

that manufacturers will cross-subsidise the excise tax on SSBs by raising the price of artificially-sweetened drinks and not fully-shift the excise tax on SSBs to consumers. If excise taxes are not fully-shifted to consumers, this will result in a smaller reduction in consumption of SSBs (due to a smaller price rise), but the tax revenue generated will be larger than if the tax was fully-shifted to SSBs.

5.4.4 An SSB tax will reduce consumption of SSBs

There is a large body of evidence that shows a tax on SSBs leads to a fall in consumption.[150]

Modelling of the effects of an SSB tax in Australia has found that SSB consumption will likely fall in response to higher prices. Veerman et al. (2016) modelled a 20 per cent ad valorem excise tax on soft drinks and flavoured mineral waters with added sugars. The authors estimated this tax would result in a 12 per cent fall in consumption.[151]

Sharma et al. (ibid.) modelled the effects of a 20 per cent ad valorem excise tax and a 20 cents/litre volumetric excise tax on different income groups.[152] The authors found that the reduction in consumption would be higher under a volumetric tax than an ad valorem tax. They found that consumption of diet soft drinks and bottled water would increase modestly in response to an SSB tax, a result also found in other studies.[153]

The available studies of the effects of SSB taxes implemented overseas aimed at reducing consumption and obesity prevalence find that they work: there is a significant fall in consumption of the taxed beverages and a switch to untaxed beverages.[154] A study by Colchero et al. (2016) of the Mexican SSB tax found that purchases of beverages subject to the tax (which increased prices by 8-10 per cent) fell by an average of 6 per cent over 2014, and by up to 12 per cent by December 2014 (compared to December 2013).[155] There was a move away from taxed beverages, with purchases of non-taxed drinks (mainly bottled water) increasing. The fall in consumption of SSBs was highest among low socio-economic status households. A study of the Berkeley SSB tax found that consumption of SSBs fell 21 per cent in low-income Berkeley neighbourhoods and increased by 4 per cent in neighbouring cities, and that consumption of bottled water increased significantly in Berkeley.[156]

150. The studies are evaluation studies of implemented SSB taxes overseas and modelling studies for Australia and overseas. A detailed summary of SSB tax modelling studies (for Australia and other countries) and evaluation studies is in Appendix A. As a tax must be substantial if it is to change consumer behaviour, small taxes may be absorbed by retailers or not noticed by consumers, see Thow et al. (2014), Powell et al. (2013), Mytton et al. (2012), United Kingdom Behavioural Insights Team (2016b), Lordan et al. (2011) and World Health Organisation (2016a).
151. The authors used the elasticity estimate derived in Sharma et al. (2014) of –0.63.
152. Ibid. calculate a mean elasticity of SSBs of –0.9, with soft drinks less elastic (–0.63). Elasticity estimates are lower than other studies where price endogeneity is not controlled for.
153. Colchero et al. (2016), Briggs et al. (2013a) and Falbe et al. (2015). The evidence that people replace SSBs with other energy-dense/low-nutrient foods is weak. Zhen et al. (2014) find an increase in consumption of sodium and fat after the introduction of an SSB tax, but an overall reduction in energy. There is also only weak evidence that people change from SSBs to alcoholic drinks (Wansink et al. (2014)).
154. Modelling of SSB taxes overseas also predicts a decrease in consumption in response to an SSB tax, see Ni Mhurchu et al. (2014) (New Zealand), Manyema et al. (2014) (South Africa), Briggs et al. (2013a) (UK) and Long et al. (2015) (US).
155. A specific excise tax of 1 peso/L on non-dairy and non-alcoholic beverages with added sugar and an ad valorem tax of 8 per cent on a defined list of non-essential highly energy dense foods (containing $\geq$275 calories (1151 kJ) per 100 g) came into effect on 1 January 2014. Differences in consumption were compared to a no-tax regime.
156. Falbe et al. (2016).

Studies generally find that people with low incomes, and young people, are more responsive to price increases than older and richer people.[157]

Consumers will likely switch to water and artificially sweetened beverages, and to a lesser extent to 100 per cent fruit juice, in response to an SSB tax as proposed.[158] There will be only a minimal switch to other unhealthy foods.[159]

Our modelling predicts that a sugar content tax of 40 cents per 100 grams of sugar reduces per capita SSB consumption by about 10 litres a year and sugar consumption per capita from SSBs from around 6kg a year to 5kg a year.

5.4.5 An SSB tax will reduce weight and improve health

Modelling of SSB taxes in Australia and overseas generally finds that population weight falls modestly and obesity prevalence declines after the introduction of a tax, with a larger impact on heavy consumers of SSBs and people with low incomes.[160]

Modelling of an SSB tax in Australia predicts a small reduction in obesity rates. Veerman et al. (2016) found that a 20 per cent ad valorem excise tax on SSBs in Australia could result in a decline in the prevalence of obesity of about 2.7 per cent among men and 1.2 per cent among women, compared to business as usual.[161] Sharma et al. (2014) found that a volumetric excise tax would result in a greater per capita weight loss than an ad valorem tax (0.41 kg vs 0.29 kg). Under both taxes, weight loss is greater for heavy consumers of SSBs. [162]

Long et al. (2015) modelled the impact of a US$0.01/ounce SSB tax in the US and finds in the second year of the tax average BMI would fall by 0.16 units among youth and 0.08 units among adults.[163] Briggs et al. (2013a) modelled a 20 per cent ad valorem tax on SSBs in the UK and estimated it would reduce the number of obese adults by 1.3 per cent. Manyema et al. (2014) estimated that a 20 per cent tax on SSBs in South Africa could result in a 3.8 per cent and 2.4 per cent decline in obesity in men and women respectively.

5.5 An SSB tax will also have a signalling effect that the product is unhealthy

An SSB tax will act as a signalling device that consumption of the product is unhealthy and consumption should be limited.[164] This may

157. Yang et al. (2016), Colchero et al. (2016), World Health Organisation (2016a), Batis et al. (2016), Sharma et al. (2014), Obesity Policy Coalition (2016), Friedman et al. (2012) and Clements et al. (2015) However, Finkelstein et al. (2010) and Lin et al. (2011) find that low-income consumers have less elastic demand. Heavy SSB consumers are less responsive to price, but are often low income, which has offsetting effects (World Health Organisation (2016a) and Etilé et al. (2015)).
158. Finkelstein et al. (2013); Colchero et al. (2016); LeBodo et al. (2016); and Briggs et al. (2013a).
159. Finkelstein et al. (2013).
160. Briggs et al. (2013a), Manyema et al. (2014), World Health Organisation (2016a), Veerman et al. (2016), Sharma et al. (2014) and Andreyeva et al. (2011). The impact of recently introduced SSB taxes on population weight and health outcomes have not been analysed due to these taxes generally having been in place for a short period.
161. Equivalent to a reduction of 0.7 percentage points among men and 0.3 percentage points among women
162. Weight loss for heavy consumers is greater under the volumetric tax. Also in an Australian context, Sacks (2011) modelled a 10 per cent junk food tax and found energy intake would fall by 174 and 121kJ per day for males and females, respectively. This equates to a 1.9kg reduction in mean population body weight for males and a 1.3kg reduction for females.
163. Fletcher et al. (2010) find that a one percentage point increase in soft drink taxes in US states decreases adult BMI by 0.003.
164. The United Kingdom Behavioural Insights Team (2016a) hypothesise that 'if cans of cola are clearly marked as being higher in price because of the levy, this may lead to a greater effect on behaviour'. See also Q. Yang (2010), Thow et al. (2011), Friedman et al. (2012), Sassi et al. (2013), Thow et al. (2010), Kaplin (2011) and Kaplin et al. (2013).

reduce consumption by more than predicted by the increase in price, especially if there is a label indicating that the SSB is subject to a tax due to its sugar content.

The government should require SSBs subject to the tax to display a label indicating that the SSB contains sugar and is subject to a tax. One option could be to require SSB manufacturers to display the Health Star Rating on SSBs subject to the tax (see Box 2 on page 21).

5.6 An SSB sugar-content tax taxes sugar consistently

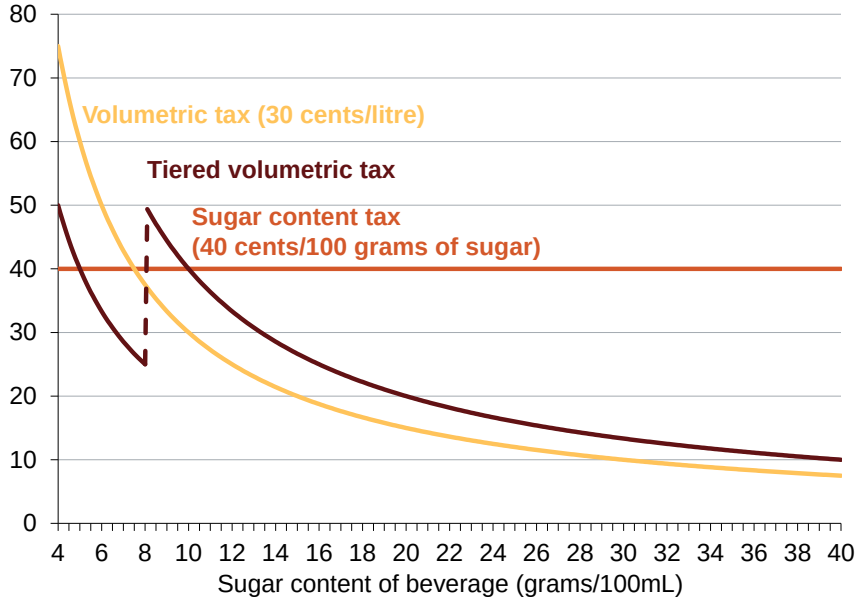
A sugar-content tax taxes sugar within SSBs at a consistent rate. Under a volumetric tax, the sugar within high-sugar SSBs is taxed at a lower rate than drinks with less sugar, although a tiered volumetric tax partly addresses this problem (Figure 5.2; Table 5.1 on page 34).

5.7 An excise tax will not be too difficult or expensive to administer

An SSB tax would not be difficult to implement or overly expensive to administer. SSBs would simply need to be defined and added to the schedule in the *Excise Tariff Act 1921* (Cth). Manufacturers and distributors of SSBs would be required to obtain a licence from the Australian Taxation Office, as is the case with alcohol.[165] The Parliamentary Budget Office estimates that the administrative costs of an SSB tax are about $7 million a year, with a further $7 million of set-up costs.[166]

Figure 5.2: Under a tax based on SSB volume, high-sugar SSBs are taxed at a lower rate per gram of sugar

Tax (cents) per 100 grams of sugar within SSBs



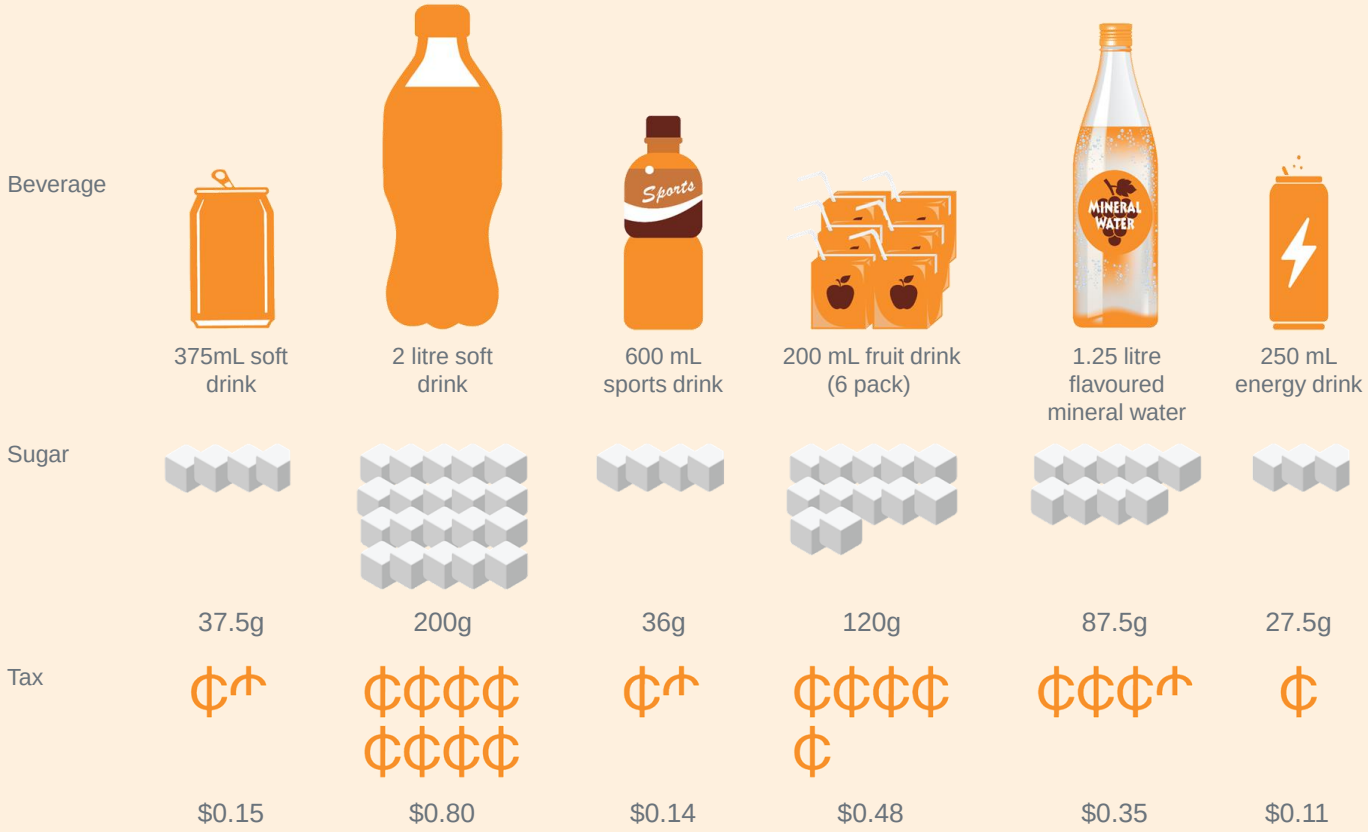
Notes: Tiered volumetric tax 20 cents/litre on SSBs with sugar content <8 grams/100mL; 40 cents/litre with sugar content >8 grams/100mL.

Source: Grattan analysis based on Smith (2016).

165. Applying a tax at the manufacturer level reduces complexity because fewer firms need to comply (Cnossen (2010) and Freebairn (2010)).
166. Parliamentary Budget Office (2016). This costing was for a 20 per cent ad valorem excise, but administrative costs are likely to be similar, or perhaps slightly higher, for a volumetric excise tax or a sugar content excise tax.

Box 3: Impact of proposed sugar content tax on the retail prices of SSBs

Tax of 40 cents per 100 grams of sugar within SSBs



Source: Grattan analysis.

5.8 Arguments against an SSB tax are overblown

Unsurprisingly, the Australian beverage industry is strongly opposed to the introduction of an SSB tax. The non-alcoholic beverages peak body, the Australian Beverages Council, has argued against the implementation of an SSB tax in the media and in submissions to government inquiries.[167] The beverage industry's main arguments against an SSB tax are that it will be ineffective in combating obesity, it is regressive and that SSB (particularly soft drink) consumption is only a small proportion of energy intake and is falling.[168]

We have addressed each of these arguments in this report. We acknowledge that an SSB tax is not a solution to the obesity problem on its own. But an SSB tax will reduce consumption, partly reduce the third-party costs of SSB consumption which contribute to obesity and likely lead to a modest decline in obesity prevalence. We also acknowledge that the SSB tax impost is regressive. But the tax burden is modest, there are similar untaxed healthier substitutes, and the health benefits are likely to be greatest for lower-income people. Finally, while SSBs account for only a small proportion of "energy-in", they are high in sugar, are absorbed quickly, can induce hunger and contain few or no valuable nutrients.

The processed food industry has a long history of aggressive lobbying against policies aimed at reducing consumption.[169] In the US, the beverage lobby group spent millions unsuccessfully opposing the introduction of SSB taxes in Berkeley and Philadelphia, but successfully campaigned against other proposed SSB taxes in other cities and states.[170]

Job losses in the beverage industry will be minimal, and jobs will be created in other sectors of the economy as consumption patterns change.[171] There will likely be some switch to tap water, so overall demand for packaged beverages will likely fall only modestly. However, as we have described, there will be a significant switch to bottled water and artificially-sweetened beverages, which are also manufactured by SSB producers (for example, Coca-Cola Amatil produces Mt Franklin bottled water, the highest-selling bottled water brand in Australia). This switch to non-sugar beverages will mean the reduction in total demand for beverages produced by Australian manufacturers will be minimal. In addition, producers will reformulate products to reduce their exposure to the SSB tax.

The impact of an SSB tax on the sugar industry will also be minimal. A small amount of sugar previously sold to domestic SSB producers will instead need to be exported, although there may be localised transition costs (see Box 4 on the next page).

167. For example, the Australian Beverages Council submission to the NHMRC Australian Dietary Guidelines in 2012 (Australian Beverages Council (2012)), and in response to the Greens 20 per cent SSB tax announcement (Australian Beverages Council (2016)).
168. Sharma et al. (2014).
169. Nestle (2015); Corporate Europe Observatory (2016); and Koplan et al. (2010).
170. Nestle (2015); Nadolny (2016); World Health Organisation (2016a); Steinmetz (2014); Nadolny (2016); and Belluz (2016).
171. Following the introduction of the Mexican SSB tax, employment in the beverage and energy-dense food sectors did not fall, and the overall unemployment rate did not increase (Instituto Nacional de Salud Pública (2016)). Powell et al. (2014) predict that SSB taxes will not have a negative impact on state-level employment in the US.

Box 4: The Australian sugar industry will need to export more sugar due to the proposed SSB tax

The Australian sugar industry produces 4-5 million tonnes of raw sugar per year, of which 75-80 per cent is exported as bulk raw sugar.[a] 95 per cent of Australia's sugar cane is grown in Queensland with the remainder grown in northern NSW. In the past five years, Australia has accounted for 2-3 per cent of total world raw sugar production and 5-7 per cent of total world exports of raw sugar in recent years.[b] The sugar industry employs around 16,000 people.[c]

Australian SSB manufacturers use approximately 320,000 tonnes of Australian-produced sugar in their products (about 6 per cent of Australia's sugar production). A reduction in SSB consumption in response to the proposed sugar content SSB tax will reduce demand for Australian produced sugar. As a result, sugar industry groups have argued against the introduction of a tax on sugar. However, an SSB tax will mainly result in more sugar being exported, rather than sold domestically, with a minimal impact on prices.

The estimated 15 per cent fall in SSB consumption in response to an SSB tax will result in a ~50,000 tonne reduction in demand for Australian sugar from domestic SSB manufacturers (~1 per cent of all sugar produced in Australia). As sugar is a globally traded commodity and as manufacturers will likely pass on the SSB tax to retail prices in full (see Section 5.4.3), there should be minimal impact on the price received by sugar producers and cane growers.

The sugar that was previously sold to domestic SSB manufacturers will instead need to be exported rather than sold domestically. As Australia only accounts for 5-7 per cent of total world exports and is a price-taker, increasing exports by ~50,000 tonnes (~0.03 per cent of world production) would have a minimal impact on world prices, which are volatile and influenced by many global factors.

An SSB will have some impacts though. As Australia produces high-quality sugar, there will likely be additional costs to find new export markets. Adjustment costs may also be localised. For example, the NSW Sugar Milling Cooperation mill and refinery at Harwood in northern NSW sells all of its produce into the domestic market, and may need to begin exporting. These export difficulties and adjustment costs could be warrant a small government transition package.

a. This raw sugar is derived from 30-35,000 million tonnes of sugar cane (Canegrowers (2015), United States Department of Agriculture (2016) and Australian Sugar Milling Council (2016)).
b. Australia's sugar production and consumption is projected to be flat at 5.0 million and 1.2 million tons, respectively, in 2016/17. Exports are forecast to be higher at 3.9 million tons because trade agreements have increased access to markets such as South Korea (United States Department of Agriculture (2016)).
c. Australian Sugar Milling Council (2016).

6 Using the sugar-sweetened beverages tax revenue

An SSB tax will raise substantial revenue for the Commonwealth Government, in the range of $500 million a year depending on the design of the tax. The government does not need to hypothecate the revenue from an SSB tax for a particular purpose. However, identifying potential uses of the additional revenue is useful to generate support for the introduction of the tax.[172]

6.1 Additional spending on health or health research

We have predicated the SSB tax based on the third-party costs of obesity, most of which are borne by the government through higher health expenditure and foregone tax revenue.

The SSB tax revenue could be added to the health budget to improve primary care or hospitals. The revenue could also be designated to preventive health measures or to the Medical Research Future Fund to research preventions and treatment of chronic diseases.

6.2 Obesity prevention programs and interventions

The SSB tax revenue could be spent on obesity prevention policies and interventions. There is growing evidence that the best such interventions and policies have multiple elements or a 'whole of systems' approach.[173]

The WHO and public health advocates recommend improving access to healthy, unprocessed foods. This can be done by subsidising healthy foods,[174] providing school breakfast/lunch programs, or other assistance to improve access to healthy foods in remote or disadvantaged areas.[175] The most effective policies to increase consumption of healthy alternatives are fruit and vegetable subsidies, and subsidised health foods at schools.[176] However, while subsidising healthy foods can increase consumption of targeted foods, thereby improving diet, subsidies can also increase overall energy intake.[177] There is strong public support for using the revenue from an SSB tax to reduce the price of healthy foods.[178]

School nutrition education programmes and other consumer education programmes are also effective in improving knowledge about healthy eating.[179] Many of these interventions could be introduced through existing Primary Health Networks.

172. Freebairn (2010), World Health Organisation (2016a) and Cnossen (2010). Although the hypothecation or 'earmarking' of revenue from an excise tax can be politically useful, it is in practice irrelevant because the marginal expenditure decisions made by the government exist regardless of the source of the tax.
173. Ewart-Pierce et al. (2016), Australian Medical Association (2016), Hawkes et al. (2015), World Health Organisation (2016a), Roberto et al. (2012) and McKinsey Global Institute (2014). Randomised controlled trials are also underway to determine the effectiveness of different interventions in combating obesity in young children. For example, the Sobko et al. (2011) study which took place in Sweden.
174. Lordan et al. (2011); and World Health Organisation (2016a).
175. The World Health Organisation (2015b) states that without intervention, 'the prices of fruit and vegetables at point of purchase are likely to exceed the socially optimal price, and the quantity sold will be below the level needed for the maximum benefit to society', see also Kaplin et al. (2013). Basic nutritious foods can be 30 per cent more expensive in rural areas (Australian Institute of Health and Welfare (2012)). Access to affordable healthy foods is recognised as a problem in remote areas, especially among indigenous communities (Thurber et al. (2014)).
176. Kaplin et al. (2013), Thow et al. (2014) and An et al. (2013). There is evidence that combining taxes with subsidies for fruit and vegetables is effective at reducing population weight, see World Health Organisation (2016a).
177. Kaplin et al. (2013); World Health Organisation (2016a); and Cawley (2015).
178. Morley et al. (2012).
179. Woolcott Research (2007); Capacci et al. (2012); Ebbeling et al. (2002); Hawkes (2013); Hawkes et al. (2015); and World Health Organisation (2016c).

Some policies and initiatives that are generally regarded as an important part of efforts to combat obesity, such as restricting food marketing to children, require changes to laws and regulations, not government spending.[180]

6.3 Reducing Australia's budget deficit

Finally, the Commonwealth Government could use the SBS tax revenue to reduce the budget deficit, forecast to be $37.1 billion in 2016/17.[181]

Box 5: Other jurisdictions with an SSB tax have allocated the revenues to children

To increase the public's acceptance of an SSB tax, some jurisdictions have devoted the revenue raised to children's education and childhood obesity prevention policies. For example, Philadelphia City Council plans to use the revenue from its soda tax to expand early childhood education programs and improve parks and recreation centres in the city.[a] The UK government intends to spend the revenue from the proposed SSB tax on physical activity and healthy eating programs for school-aged children.[b] Some of the revenue from Mexico's soft drink and fast food tax has been used to install water fountains in schools in disadvantaged areas.[c]

a. Nadolny (2016).
b. HM Treasury (2016).
c. Soares (2016).

180. For example, processed food advertising has been banned or limited in countries such as Norway, Sweden and South Korea (Cawley (2015)).
181. The Treasury (Cth) (2016).

A Sugar-sweetened beverages taxes – literature review

Table A.1: Summary of Australian studies on SSB taxes

Authors	Study details	Elasticities / effect on consumption	Effect on population weight
Backholer et al. (2016)	Meta-analysis of studies (Australia and international) that identify the effects of SSB taxes by socio-economic position	An SSB tax will be modestly financially regressive, with a similar tax burden across socio-economic position (in dollar terms).	An SSB tax will deliver similar benefits across socio-economic position or possibly greater benefits to people within low socio-economic positions.
Veerman et al. (2016)	Modelled a 20 per cent ad valorem tax on retail price of SSBs (fruit juices, energy drinks, milk-based drinks and cordials excluded)	Estimated 12 per cent decrease in consumption of SSBs due to the tax (using elasticity of soft drinks of –0.63). Average change in consumption of SSBs from 141 g/day to 124 g/day across the adult male population and from 76 to 67 g/day for women.	The tax estimated a decline in the prevalence of obesity of about 2.7 per cent (0.7 ppt) among men, and 1.2 per cent (0.3 ppt) among women, compared to business as usual.
Yang et al. (2016)	Examined the impact of price changes on children's consumption of SSBs using stated preference panel data	Uncompensated own-price elasticities for SSBs range from –0.83 to –0.94. Low income households are more responsive to price changes. High-income households are less responsive to price and not responsive to non-price attributes.	
Etilé et al. (2015)	Modelled a 20 per cent volumetric excise tax and a 20 per cent ad valorem excise tax on SSBs	Elasticity of SSBs estimated to be –0.95. Heavy consumers are estimated to have less elastic demand, but higher health gains (price elasticity –2.3 at the median to –0.2 at the 95th quantile). Volumetric excise: reduction in consumption of around 0.6 l/cap/month at the simulated median. Volumetric excise tax more effective at reducing consumption of heavy SSB consumers than ad valorem tax. Ad valorem excise: reduction in consumption of around 0.6 l/cap/month at the simulated median.	Reductions in body weight greater for heavy consumers of SSBs under volumetric excise tax compared to ad valorem tax.

Table A.1: Summary of Australian studies on SSB taxes (continued)

Authors	Study details	Elasticities / effect on consumption	Effect on population weight
Sharma et al. (2014)	Modelled a 20 per cent volumetric excise tax and 20 per cent ad valorem excise tax on SSBs	Mean elasticity of demand for SSBs approximately equal to –0.9. Elasticity of soft drinks = –0.63 (controlling for price endogeneity) (–0.89 with exogenous prices). Elasticity of diet soft drinks: –1.01; fruit juice: –1.20; cordial –0.98 (controlling for price endogeneity). The reduction in consumption is higher under a volumetric tax. Substitution (a 3.2 per cent increase) towards diet drinks because of the ad valorem tax.	A 20 per cent valoric tax and a 20 cents/litre volumetric tax lead to reductions in bodyweight, of around 0.29kg and 0.41kg per capita for an average consumer of SSBs, respectively.
Sacks (2011)	Modelled a 10 per cent ad valorem tax on soft drinks, flavoured mineral waters and electrolyte drinks (in addition to tax on other junk foods)	Reduction in energy intake estimated to be 14.9 kJ/day for males and 6.7 kJ/day for females.	Reduction in body weight due to reduction in SSB consumption.

Table A.2: Summary of overseas studies on SSB taxes – evaluation studies

Authors	Study details	Elasticities / effect on consumption	Effect on population weight
Colchero et al. (2016)	Evaluation of Mexican SSB tax using recorded food purchase (household) data	Relative to the counterfactual in 2014, purchases of taxed beverages decreased by an average of 6 per cent and decreased at an increasing rate up to a 12 per cent decline by December 2014. Purchases of untaxed beverages were 4 per cent higher than the counterfactual, (mainly bottled plain water). Reductions were higher among low SES households, averaging a 9 per cent decline during 2014, and 17 per cent decrease by December 2014 (compared with pre-tax trends).	
Falbe et al. (2016)	Questionnaire to evaluate the change in consumption of SSBs after the introduction of the Berkeley SSB tax (four months after implementation)	Consumption of SSBs decreased 21 per cent in Berkeley and increased by 4 per cent in comparison cities. Water consumption increased more in Berkeley (+63 per cent) than in comparison cities (+19 per cent).	
Fletcher et al. (2010)	Evaluation of existing soft drink taxes in US states on weight		A one percentage point increase in (non-health focused) soft drink taxes in US states decreases adult BMI by 0.003.

Table A.3: Summary of overseas studies on SSB taxes – modelling and meta-analyses studies

Authors	Study details	Elasticities / effect on consumption	Effect on population weight
Long et al. (2015)	Modelled a US$0.01 per fl. oz SSB excise tax in the USA	Estimated own-price elasticity of demand for SSBs = –1.22. Tax estimated to reduce baseline SSB consumption by 20 per cent.	BMI predicted to fall by 0.16 units among youth and 0.08 units among adults in the second year of the tax.
Manyema et al. (2014)	Modelled a 20% ad valorem tax on SSBs in South Africa	An own-price elasticity of demand for SSBs of –1.3 was used. A 20% tax estimated to reduce energy intake by about 30kJ per person per day.	Obesity is projected to reduce by 3.8% in men and 2.4% in women.
Ni Mhurchu et al. (2014)	Modelling of 20% ad valorem tax on carbonated drinks in New Zealand	Maori and Pacific Islander consumers have more elastic demand. The tax estimated to reduce daily energy intake by 0.2 per cent (20kJ/day).	
Zhen et al. (2014)	Modelled a half-cent per fluid ounce excise tax on SSBs in the USA, controlling for price endogeneity	Elasticity of regular carbonated soft drinks: –1.035; diet carbonated soft drinks: –0.959; juice drinks: –1.192; sports/energy drinks: –2.363. Some increase in consumption of other foods in response to SSB tax, although overall energy intake falls. Regular and diet soft drinks found to be substitutes	Tax expected to result in weight reductions of 0.37 and 0.16kg/person in 1 year and 0.70 and 0.31kg/person in 10 years for low- and high-income adults respectively.
Briggs et al. (2013a)	Modelled a 10% ad valorem tax on SSBs in Ireland	SSB tax estimated to result in a mean reduction in energy intake of 2.1 kcal per person per day	Estimated to reduce prevalence of obesity by 1.3% and prevalence of overweight by a further 0.7%.
Briggs et al. (2013b)	Modelled a 20% ad valorem tax on SSBs in the UK	20% tax estimated to reduce SSB consumption by 16%. Substitution to diet drinks, tea and coffee, milk, and fruit juice. Greatest substitution to fruit juice and diet soft drinks among lowest income. The estimated own price elasticity is –0.92 for soft drinks and –0.81 for SSBs. SSBs/soft drinks and diet soft drinks found to be substitutes. Elasticity across income classes similar, although lower income class has more elastic demand for soft drinks.	Estimated to reduce the number of obese adults by 1.3% and the number who are overweight by 0.9%.

Table A.3: Summary of overseas studies on SSB taxes – modelling and meta-analyses studies (continued)

Authors	Study details	Elasticities / effect on consumption	Effect on population weight
Escobar et al. (2013)	Meta-analysis of nine articles on SSB taxes	Across the nine studies, pooled own price-elasticity of demand for SSBs = –1.3	US articles showed that a higher price could lead to a decrease in BMI, and decrease the prevalence of overweight and obesity.
Finkelstein et al. (2013)	Modelled a 20% ad valorem tax on SSBs in the USA	Elasticity for SSBs = –0.90 (instrumental variable estimate), –1.32 (exogenous estimates). More inelastic demand among heavy SSB consumers.	SSB tax would result in a decrease in store-bought energy of 24.3 kcal per day per person. This translates into an average weight loss of 1.6 pounds during the first year and a cumulated weight loss of 2.9 pounds in the long run.
Miao et al. (2013)	Estimates elasticities of foods that may contribute to obesity	Estimated average own-price elasticity of demand for carbonated soft drinks = –0.95. Fruit juices = –0.87.	
Powell et al. (2013)	Review of US studies on food price elasticity and SSB taxes	Estimated own-price elasticity of demand for SSBs = –1.21, soft drinks = –0.86.	SSB taxes have a small effect on weight (but studies analysed US state taxes that are relatively small)
Andreyeva et al. (2011)	Modelled a US$0.01 per fl. oz SSB excise tax in the USA	Used price elasticity of demand for SSBs = –1.2. Estimated reduction in consumption of SSBs of 24%. SSB tax could potentially could reduce daily per capita caloric intake from SSBs from the current 190–200 calories to 145–150 calories (assuming no substitution to other caloric beverages or food).	Reduction in SSB consumption could translate into significant losses in average body weight – up to 5 lb/year.
Andreyeva et al. (2010)	Review of 160 studies on the price elasticity of demand for food	Own-price elasticity of demand for SSBs = –0.8; soft drinks = –1	
Finkelstein et al. (2010)	Modelled a 20/40 per cent ad valorem tax on carbonated SSBs only and SSBs in the USA	Carbonated SSBs own-price elasticity = –0.73. All SSBs elasticity = –0.87; –0.49 for households in the 50% to 75% income quartile to 0.06 for the 76% to 100% income quartile.	

Table A.4: Summary of studies on pass through of SSB taxes to retailers

Authors	Study details	Elasticities / effect on consumption	Pass through of excise tax to retail price
Berardi *et al.* (2016)	Evaluation of French soft drink tax on consumer prices		Tax fully shifted to soda, almost fully shifted to fruit drinks, incomplete to flavoured waters (6 months after introduction).
Grogger (2015)	Evaluation of Mexico's SSB tax using Mexico's Consumer Price Index		The SSB excise tax of ~8-10 percent raised the price of regular soda by 12 per cent.
Bonnet and Réquillart (2013)	Modelled the effects of an ad valorem and excise tax on French retail soft drink prices		Retailers passed on to consumers between 60 and 90 per cent of the ad-valorem tax increase, and between 110 and 130 per cent of the excise tax.
Bergman and Hansen (2010)	Evaluation of Denmark excise tax		The increase in soft drink excise tax was on average over-shifted, although many retailers did not increase their price at all.
Bahl *et al.* (2003)	Evaluation of Ireland's soft drink tax levied in the 1970s to the early 1990s	The estimated price elasticity of demand for soft drinks = –1.10	Under-shifting of tax to retail prices.

B Calculating the third-party costs of obesity

The third-party costs of obesity calculated in this report are based on the methodology used in PwC's 2015 report '*Weighing the cost of obesity - a case for action*'. We use the most recent obesity data from the ABS National Health Survey: First Results 2014/15 (Table B.1).[182]

We estimate the additional costs incurred by obese people relative to people in the normal BMI range. The additional costs incurred by governments are considered third-party costs because they are paid for by higher taxes.

B.1 The third-party costs of obesity

We estimate that the third-party costs of obesity in 2014/15 were $5.3 billion (Table B.2).

B.1.1 GP, specialist and allied health costs

Additional GP, specialist and allied health costs were estimated to be $595 million in 2014/15. Additional costs are based on additional excess costs for medical services (GP visits, allied health services and specialists) for obesity class I, II and III patients estimated by Colagiuri et al. (2010).[183] These excess costs were inflated by the health cost index calculated by the Australian Institute of Health and Welfare.[184]

The excess costs for GP visits, allied health services and specialists for the obese class I, II and III categories were multiplied by the number of people in each obesity category in 2014/15 (Table B.1).

Table B.1: Adult obesity estimates
18 years and over, 2014/15, by obese class (BMI).

Category	BMI	Number
Class I	30-34.99	3,251,000
Class II	35-39.99	1,120,000
Class III	40+	572,000
Total		**4,944,000**

Source: Australian Bureau of Statistics (2016b).

Table B.2: Third-party costs of adult obesity in 2014/15

Category	Third-party costs
GPs, specialists, allied health	$0.6b
Hospital care	$0.6b
Pharmaceuticals	$1.4b
Foregone tax	$2.3b
Additional welfare	$0.4b
Total	**$5.3b**

Notes: Foregone tax includes foregone income tax from lower employment rates, and foregone company tax from absenteeism and presenteeism. Welfare includes additional disability support pension and Newstart allowance payments.

Source: Source: PwC (2015), Grattan analysis.

182. PwC calculates costs in 2011/12 and inflates this to 2014/15 dollars.
183. Unpublished data from Colagiuri et al. (2010), obtained from author. Originally in 2004/05 dollars. Excess costs are assumed to be government costs.
184. Australian Institute of Health and Welfare (2015), Table C2. Health costs increased by 27.9 per cent between 2004/05 and 2014/15.

The calculated excess costs due to obesity for each medical service, in 2014/15 dollars, were $226 million for GP services, $123 for allied health service and $246 million for specialists.

B.1.2 Hospital care

The additional spending per obese person on inpatient, outpatient and emergency hospital treatment compared to those in the normal BMI range was calculated by PwC from a variety of sources.[185] Costs were split by age groups (18-44 and 45+) and obesity class (I, II and III). These estimates were multiplied by the number of people in each obesity class that had a hospital episode.[186] Total additional costs were calculated to be $1.2 billion.

PwC estimate that 51 per cent of the total additional cost of hospital care due to obesity is borne by Commonwealth and state governments.[187] This proportion was applied to the total additional cost estimate, resulting in an estimate of the third-party costs attributable to hospital care of $628 million.

B.1.3 Pharmaceuticals

An estimated 74 per cent of obese class I and 78 per cent of obese class II and III use pharmaceuticals.[188] Pharmaceutical costs are subsidised by the Commonwealth Government through the Pharmaceutical Benefits Scheme.

Obese class I, II and III were split by age into two age groups, 18-44 and 45+. Additional spending on obese people aged 45+ relative to people of normal weight on pharmaceuticals was derived from Buchmueller et al. (2015). Pharmaceutical costs for 18-44 year olds were estimated to be 34 per cent of costs for the older age group.[189]

Using these assumptions, the additional pharmaceuticals costs incurred by the Commonwealth Government due to obesity in 2014/15 was estimated at $1.38 billion.

B.1.4 Foregone tax

Lower employment rates

The employment rate among obese people was 65 per cent in 2011/12, 4.7 percentage points lower than people in the normal BMI range.[190] The employment rate among obese class III individuals is estimated to be 1.5 percentage points lower than obese class I and II.[191]

Employment rates for obese class I and II individuals were therefore calculated to be 65.2 per cent, and 63.7 per cent among obese class III individuals. We assume that obesity contributes to lower employment rates, based on recent studies which generally conclude that obesity results in poorer labour market outcomes.[192] This reduces the income tax received by the Commonwealth Government.

185. PwC (2015, p. 48).
186. Obtained from Australian Health Survey: Health Service Usage and Health Related Actions, 2011/12 (Australian Bureau of Statistics (2013a)).
187. The remainder is assumed to be covered by private health insurers and individuals.
188. Buchmueller et al. (2015).
189. PwC (2015, p. 50).
190. Australian Bureau of Statistics (2013b).
191. PwC (2015, p. 59), 'This corresponds with the proportion of obese type III individuals estimated to claim disability pensions based on Department of Social Services claims totals for relevant disease categories, adjusted for per cent of these categories with obesity co-morbidities and relative risk from obesity'.
192. Böckerman et al. (2016) find that higher BMI reduces employment and increases social welfare payments. Reichert (2015) finds a positive employment effect of weight loss for women. Rooth (2009) finds that obese women are less likely to receive a call-back for an interview after a CV appraisal. Cawley (2015) also summarises the literature and finds that obesity worsens employment prospects. However, there are some findings that unemployment contributes to obesity and other unhealthy behaviours Schmeiser (2009) and Marcus (2014).

We assume that unemployed obese people would receive 9 per cent less than average earnings if employed due to lower education among obese people (on average).[193] The average annual total private sector earnings in 2014/15 was $56,641, with expected earnings for an obese person estimated to be $51,602.[194]

Using the 2014/15 personal income tax rates, the average tax paid was $9,955, plus the 2 per cent Medicare levy ($1,133) (a total of $11,088). This foregone tax on average earnings was multiplied by the 232,000 obese people that we assume would be employed if employment rates for obese people were the same as for people in the normal BMI range, resulting in total foregone income tax of $2.17 billion.

Absenteeism and presenteeism

Absenteeism and presenteeism reduce firm profits through higher labour costs and lower productivity. Lower profits flow through as a cost to the government through lower company tax receipts.

We estimate that the third-party costs from lower company tax revenue due to absenteeism are minimal. We use the assumption that obese people were absent from work on average 4 hours more per year than non-obese people,[195] based on Australian Bureau of Statistics (2013a). The employment rate for obese people was 65 per cent,[196] 19 per cent of workers are casual workers[197] (so don't receive wages if sick) and average ordinary time earnings per hour in 2014/15 were $38.80.[198] Using these assumptions, the additional wages paid by employers to workers absent due to obesity was estimated to be $400 million. As firms face higher labour costs and therefore reduced profits, government revenue from company tax is reduced by $121 million (using a 30 per cent company tax rate). However, these workers pay income tax on these earnings (through sick leave). So there is only a small net reduction in government revenue. We assume that 30 per cent of the $121 million in lost company tax revenue is not offset by income tax receipts from workers, resulting in absenteeism costing the government $36 million in annual revenue.

Low productivity at work due to poor health or other reasons is known as presenteeism. Presenteeism due to obesity increases labour costs. PwC estimate that obese workers are 0.23 per cent less productive at work due to co-morbidities related to obesity (diabetes, heart disease, hypertension, cancer and back/neck problems).[199] There were 3.2 million obese workers in Australia in 2014/15, with estimate average annual private sector earnings of $51,602.[200] This results in lost productivity worth $418 million in 2014/15. We conservatively estimate that half of this productivity loss is a cost to firms, which reduces company tax revenue by $57 million in 2014/15.

193. For example, 12 per cent of obese adults hold a Bachelor's degree compared to 22 per cent with a normal BMI (Australian Bureau of Statistics (2016b)). The 9 per cent reduction was estimated using the earnings premium from Norton (2012) and education levels from Australian Bureau of Statistics (2013b). Kortt et al. (2010) find no significant relationship between BMI and hourly wages among Australian adults, controlling for a variety of factors such as years of education, whether born overseas, age and father's occupational status. This suggests there is no weight discrimination by Australian employers. Overseas studies generally find that a higher BMI is associated with lower wages, particularly for women, controlling for other factors (see Cawley (2004) and Cawley et al. (2005)).
194. This is the average of November 2014 and May 2015 seasonally adjusted private sector total earnings, multiplied by 52 (Australian Bureau of Statistics (2016c), Table 5). We use earnings for all workers, rather than average earnings for full-time workers used by PwC.
195. PwC (2015, p. 55).
196. Australian Bureau of Statistics (2013b).
197. Australian Bureau of Statistics (2015b).
198. Australian Bureau of Statistics (2016c).
199. PwC (2015, p. 56).
200. Australian Bureau of Statistics (2016c).

B.1.5 Welfare

PwC estimate that 1.5 per cent of obese class III individuals are on the Disability Support Pension (DSP). In January 2015, the DSP was worth $20,665 per year.[201] We assume that 80 per cent of people on the DSP could gain employment if they were not obese, so additional DSP payments by the Commonwealth Government in 2014/15 were estimated to be $142 million.

Commonwealth Government unemployment assistance payments (the Newstart Allowance) are higher than would be the case if there was no obesity, because obesity contributes to lower employment rates (see 'Foregone tax'). Colagiuri et al. (2010) calculate that obesity class III people receive an average of $438 (2014/15 prices) more Newstart Allowance payments per person than normal weight and overweight people.[202] There were 572,000 obese class III people in 2014/15, resulting in total excess Newstart Allowance payments of $250 million.

Summing these two forms of welfare gives an estimated $392 million in additional welfare payments in 2014/15.[203]

B.2 Additional third-party costs of obesity

There are additional third-party costs of obesity we have not taken into account in our $5.3 billion estimate.

201. The maximum basic rate DSP for a single person.
202. Colagiuri et al. (2010) estimate that obese class I and II people receive slightly less unemployment benefits than people with BMI in the 19-29.9 range. This difference is ignored.
203. Böckerman et al. (2016) find that a higher BMI is associated with a higher chance of receiving social assistance.

Deadweight loss from higher taxes

Raising taxes is not costless. All taxes distort decision making, reducing efficiency and economic output.[204]. To generate the additional ~$3 billion in taxes to pay for the additional health costs and welfare spending (ignoring the foregone tax revenue due to obesity), assuming a marginal excess burden of 25 cents for each dollar of tax raised, would result in a deadweight loss of $750 million.

Higher private health insurance premiums

Private health insurers cover the higher expected medical costs of obese people by charging higher premiums for all policyholders. These higher premiums are paid by all people with private health insurance due to the 'community rating' principle that requires insurers to charge all people the same premium, regardless of age or health.[205] As a result, non-obese people have higher private health insurance premiums than if there was no obesity.[206]

Costs of childhood obesity

The third-party costs of obesity calculated above do not include the costs of childhood obesity. However, the third-party costs of childhood

204. Daley et al. (2015, Box 1) and Freebairn (2010)
205. In the US, employers can charge obese workers higher premiums if they decline to participate in a wellness program, such as those to promote healthy weight (Karnani et al. (2016)).
206. In addition to this transfer from non-obese to obese people, there is also the possibility of an additional externality arising from people behaving differently since they know they are covered by insurance. This 'moral hazard' is more important in countries such as the US where there is no universal public healthcare system (Bhattacharya et al. (2011) and Botkins (2015)). Some of the cost of higher insurance premiums is absorbed by the Commonwealth Government through the means-tested private health insurance rebate (expenditure on the rebate was just under $6 billion in 2014/15).

obesity are likely to be fairly small because prevalence rates are lower and there are no tax revenue losses from lower employment rates and extra welfare payments). Health costs would also be much lower due to lower rates of chronic diseases among children.

Lifetime costs arising from childhood obesity are significant because obese children are more likely to become obese adults.[207]

Government spending on obesity campaigns and interventions

The Commonwealth Government spends money on public interventions and campaigns to reduce obesity rates, estimated to be $60 million in 2014/15.[208] State governments also spend significant amounts on obesity prevention campaigns, advertising and interventions.[209]

207. National Health and Medical Research Council (2013); J. L. Baker et al. (2007); Summerbell et al. (2005); and Popkin et al. (2004).
208. PwC estimated that $154 million would be spent on preventative health, but in the 2014/15 Budget it was announced that this would be discontinued, saving $90 million each year (PwC (2015) and The Treasury (Cth) (2016)).
209. PwC (2015) estimated that state governments spent an additional $390 million on health care due to obesity.

C Sugar-sweetened beverages tax modelling

SSB consumption and sales revenue data

SSB industry sales data were used to calculate revenue from a hypothetical SSB tax and changes in SSB consumption in 2017. SSBs were defined as non-alcoholic, water-based beverages with added sugar.

Using data from IBISWorld and Retail World, total SSB sales were calculated to be 1.62 billion litres ($3.31 billion in revenue) in 2015.[210] This estimate aligns with the Levy et al. (2014) estimate of SSB sales of 1.62 billion litres in 2011 (as there has been modest growth in SSB volumes in recent years) and ABS data from 2011/12.[211]

Using the assumption of volume growth of 0.4 per cent per annum (the growth rate from 2014 to 2015[212]), projected SSB sales was forecast to be 1.64 billion litres in 2017.

SSB tax options

Four SSB excise tax options were modelled, with different tax rates modelled for each tax type:

- A tax on the sugar within SSBs (*e.g.* 40 cents per 100 grams of sugar)(a 'sugar content' tax)
- A tax on the volume of SSBs (*e.g.* 40 cents per litre) (a volumetric tax)
- A tax on the volume of SSBs, with tiered rates (a 'tiered' volumetric tax)
- An ad valorem excise tax (*e.g.* a tax of 20 per cent on the retail price of SSBs)

Calculating SSB tax revenue – the key assumptions

SSB tax revenue estimates were done for 2017. 2017 sales and consumption forecasts were done for a scenario with no SSB tax, and compared to a scenario with an SSB tax.

The key assumptions were:

- Average price of SSBs estimated to be $2.00 per litre in 2017 for aggregate estimates ($2.04 in 2015).[213] Category prices for market segments (*e.g.* soft drinks, juices, iced tea) were used for tax estimates calculated by summing market segments and the tiered volumetric SSB tax.
- Excise tax fully passed on to retail price[214]
- Price elasticity of demand for SSBs of –0.9 for aggregate estimates Category elasticities for market segments (*e.g.* soft drinks, juices)

210. Retail Media (2015), IBISWorld (2016a) and IBISWorld (2016b). According to Retail World data, drinks with added sugar account for 52 per cent of the volume of beverages sold.
211. By multiplying average consumption of SSBs per person and the population Australian Bureau of Statistics (2014).
212. Retail Media (2015).
213. The average price per litre for SSBs in 2015 was calculated by dividing total sales value over volume, giving an average price of $2.04 per litre. Because water-based, non-alcoholic beverages prices have fallen in recent years, and this is expected to continue, the average price of SSBs is forecast to be $2 per litre in 2017.
214. The evidence from SSB excise taxes introduced overseas is that taxes are fully or over-shifted and that excise taxes are passed on to consumers quickly.

were used for tax estimates calculated by summing market segments and the tiered volumetric SSB tax.[215]

- Average sugar content of SSBs = 9.27 grams/100mL in 2017, unchanged from current level (this assumes no immediate product reformulation in response to the tax)[216]
- GST effects ignored[217]

Calculating SSB tax revenue – the results

Projected consumption in 2017 with an SSB tax was calculated by subtracting the change in quantity due to the excise tax from projected consumption in 2017 with no SSB tax.[218] Total tax revenue was then obtained by multiplying the projected consumption with an SSB tax by the tax rate.[219] Tax revenue estimates were between $400 million and $550 million, with consumption of SSBs expected to fall by 7–10 litres (see Table C.1).

215. Elasticities for SSB categories were obtained from Sharma et al. (2014) and Zhen et al. (2014), and ranged from –0.63 for soft drinks to –2.36 for sports and energy drinks. Substitution across categories, using cross-price elasticities, was not included in the model. Cross-price elasticity estimates differ significantly between studies (World Health Organisation (2016a)). A general finding is that the cross-price elasticity between SSBs and artificially-sweetened beverages is positive, which means they are substitutes. Bottled water and SSBs are also found to be substitutes.
216. Weighted average of sugar content using sub-categories of SSBs (soft drinks (cola and non-cola), fruit juice/drinks, energy drinks, cordial, mixers, sports drinks, flavoured mineral waters, iced tea) (Rethink Sugary Drink (2016) and Department of Health (Cth) (2014)).
217. GST revenue may increase slightly due to an SSB excise tax.
218. $\%\Delta$quantity due to tax = $\%\Delta$price $\times$ price elasticity of demand.
219. For the sugar content tax, this was the tax rate by the amount of sugar consumed within SSBs. For the volumetric tax, this was the projected consumption in litres multiplied by the tax rate. For the ad valorem tax, this was the projected total revenue multiplied by the tax rate.

Table C.1: Possible SSB taxes raise $400-550 million in revenue and reduce SSB consumption by 7-10 litres
2017

SSB tax option	Average price per litre after tax	Change in consumption (litres per capita per year)	Tax revenue
Sugar content tax (30 cents/100 grams)	$2.27	–7	$400m
Sugar content tax (40 cents/100 grams)	$2.37	–10	$520m
Tiered volumetric tax	$2.31	–9	$480m
Volumetric tax (30 cents/litre)	$2.30	–8	$430m
Volumetric tax (40 cents/litre)	$2.40	–10	$550m
Ad valorem (20 per cent of retail value)	$2.40	–10	$550m

Notes: Tiered volumetric tax is 20 cents/litre on SSBs with sugar content <8 grams/100mL; 40 cents/litre sugar content >8 grams/100mL.

Source: Grattan analysis.

Tax revenue from the 20 cents/40 cent tiered volumetric SSB tax option was estimated by creating high sugar content (more than 8 grams of sugar per 100mL) and low sugar content (less than 8 grams of sugar per 100mL) SSB groups.[220] Category price elasticities were used to calculate changes in consumption. $430 million of the $480 million in tax generated by the tiered volumetric tax was from the high sugar drinks (sugar content >8 grams/100mL).

For each SSB tax option, total SSB tax revenue was also calculated by summing the tax generated by SSB sub-categories to compare with the aggregate SSB tax estimate.[221] Summing the revenue generated within each SSB sub-category yielded very similar results to the aggregate SSB tax calculations for all SSB tax options (within 2-4 per cent of the aggregate estimate).

220. The volume of high-sugar SSBs was estimated to be 1.35 billion litres (83 per cent share) and the volume of low sugar SSBs was estimated to be 0.29 billion litres (17 per cent share). 20 per cent of non-cola soft drinks and 20 per cent of fruit juices/drinks were assumed to be low-sugar, as were all cordials, sports drinks and iced teas.
221. The SSB categories used were: soft drinks (cola and non-cola), fruit juice/drinks, energy drinks, cordial, mixers, sports drinks, flavoured mineral waters, iced tea. Volumes were estimated using the same approach to gross-up the aggregate sales of SSBs. The share of sugar-free/diet drinks within each category were obtained from Levy et al. (2014, Table 1). If no evidence was available, the proportion of sales within a category that contained added sugar was estimated (*e.g.* that 80 per cent of non-cola soft drinks contain added sugar). Cross-category substitution was not considered.

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