



Is the UK's proposed soft drink tax an effective way to reduce obesity?

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ABSTRACT

Obesity is one of the biggest health and economic problems facing the United Kingdom. Nearly 60 per cent of British adults are overweight or obese. Obesity costs the UK an estimated £73 billion per year and this burden is growing. Among the many factors driving obesity, there is one clear culprit: excessive sugar consumption.

There has been an international move towards taxing soft drinks, which contain a lot of sugar, as a way to combat obesity. In the UK's 2016 Budget, the Chancellor introduced plans for a levy on soft drinks producers and importers to be implemented in April 2018. The Treasury estimates that it will raise £1.5 billion in the first three years, which means the tax rate will likely be 15-20 per cent. There are many ways to go about fighting obesity, including taxing other high-calorie foods, improving school nutrition and implementing bans on where sugary drinks can be sold. Using an analytical framework that outlines the preconditions necessary for a soft drinks tax to reduce obesity, this paper aims to answer the question: Is the UK's proposed soft drinks tax an effective way to reduce obesity?

INTRODUCTION

The health problem of obesity and its associated costs in the UK

The top risk factor for disease in the United Kingdom is entirely preventable. Poor diet can lead to type 2 diabetes, stroke and heart disease; nearly 60 per cent of British adults are overweight, and one-quarter of them are obese¹ (OECD, 2014). The problem starts early and persists: Almost 20 per cent of ten-year-olds are obese (Public Health England, 2016) and 80 per cent of obese teenagers will remain so throughout their lives (HM Treasury, 2016b). Overall, the UK's obesity rates are the second highest in Europe (OECD, 2014). Reducing this trend is paramount in the health agenda.

Obesity is also an economic problem, costing the UK £73 billion per year (McKinsey, 2014). It has the second-worst economic impact on the country, below smoking and just above armed violence, war and terrorism (McKinsey, 2014). Obese adults are more likely to miss work, be less productive and suffer from depression (Marron *et al.*, 2015). By 2040, obesity's economic impact could jump from an already shocking 3 per cent of gross domestic product (GDP) to 11-14 per cent (McKinsey, 2014).

Reducing obesity and mitigating its economic impact is complex. Yet among the many factors driving obesity, there is one clear culprit: sugar consumption. The Chief Medical Officer of the UK government has highlighted reducing sugar consumption as a priority in the fight against obesity and type 2 diabetes, which cost the National Health Service (NHS) £27 billion and £8.8 billion per year, respectively (HM Treasury, 2016b). In the UK, on average children ingest 15 per cent of their daily calories from sugar, triple the daily recommended intake of 5 per cent (Public Health England, 2016). Sugar-sweetened beverages are the number one source of sugar for these children (HM Treasury, 2016b).

1. For most adults, a body mass index (BMI) of 25-29.9 is overweight; 30-39.9 is obese; and 40+ is severely obese. BMI is determined based on weight and height. For additional information: <http://www.nhs.uk/Conditions/Obesity/Pages/Introduction.aspx>.

A growing number of countries have introduced taxes on soft drinks to combat sugar consumption. Soft drinks are an easy target since they constitute a clearly-defined category, are often marketed to children, have no nutritional value and contain high levels of sugar. Over 60 public health organisations, including Public Health England and the Royal Society for Public Health, support a tax on sugary beverages (HM Treasury, 2016b), so it is no surprise that the UK government has decided to move forward with one. There are many ways to go about fighting obesity, including taxing other foods, improving school nutrition and implementing bans. This paper therefore aims to answer the question: Is the UK's proposed soft drinks tax an effective way to reduce obesity?

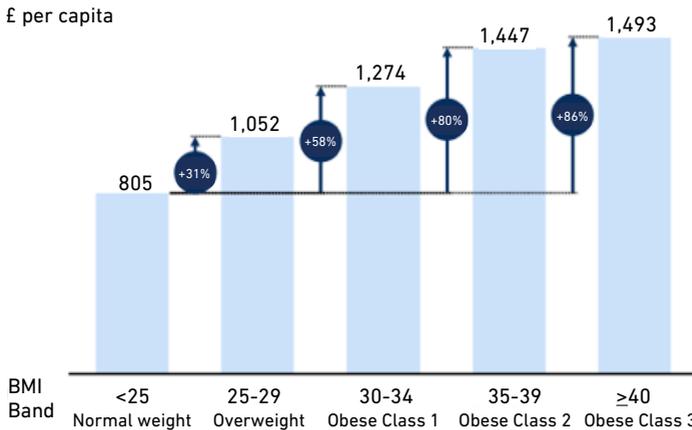
Sin taxes

“Sin taxes” are added to products associated with negative health outcomes, such as tobacco, alcohol and sugar. They essentially charge people for their increased burden on society through direct and indirect healthcare costs. It is estimated that healthcare costs incurred by the government for obese individuals are 30 per cent higher than for their healthy peers (Withrow and Alter, 2011), although this number may be higher (Figure 1). Sin taxes force individuals to internalise the externality their choices place on society. This is a major argument for sin taxes.

Another driving factor behind sin taxes is the idea of “internalities,” costs incurred upon oneself by not fully assessing future preferences or consequences. People, particularly children, prioritise present desires more than the future (Brownell *et al.*, 2009). Deciding what to consume, for example, they do not fully account for costs of their present actions on their future selves. Sin taxes force people with self-control issues to consider future costs by adding them to the price tag (O'Donoghue and Rabin, 2006).

Sin taxes are generally considered regressive as they place a disproportionate burden on lower-income individuals. Many

FIGURE 1 ASSOCIATED UK MEDICAL COSTS AS BMI INCREASES, 2012



1. Includes primary care, general practitioner prescriptions, hospitalization, accident and emergency, and outpatient care. 2003 values taken from Tigbe *et al.* (2003) adjusted using 2012/2013 Federation Internationale de Medecine du Sport and Health Examination Survey data on per capita UK costs in each category.

Source: McKinsey, 2014.

critics contend that their regressive nature outweighs any potential benefits, since lower-income families end up spending a higher proportion of their income on the product, in some cases displacing spending on other items (Nestle and Rosenberg, 2015). Advocates have disputed this claim by highlighting the substantial health benefits, but this remains a point of contention.

The UK tax

Proposed in the 2016 Budget, the tax is expected to be levied on soft drink producers and importers in April 2018. Drinks with under 5g of sugar per 100ml remain untaxed, drinks with 5-8g per 100ml are taxed at a certain rate, and those with more than 8g per 100ml are taxed at a higher rate (HM Treasury, 2016a). Milk-based drinks and pure fruit juices without added sugar will be exempt, as they have some nutritional value (HM Treasury,

2016b). The Treasury estimated that it will raise £1.5 billion in the first three years. These estimates have been used to calculate the implied tax, which is expected to be 15-20 per cent (Daneshkhu, 2016), in line with Public Health England and Parliament's recommendations (House of Commons Health Committee, 2015).

The UK joins a growing group of countries including France, Hungary and Mexico that have introduced fiscal measures to curb consumption of sugary drinks. Most of these arrived post-2011, and few are implemented independent of other food-related taxes, meaning causal data linking the tax to consumption is hard to establish. While the World Health Organization (WHO) has credited soda taxes as the best way to improve diet, this is based on theory, not empirical data (Nestle and Rosenberg, 2015). Success of such taxes is therefore still open to debate.

The official title of the UK tax is "Soft drinks industry levy to pay for school sport" (HM Treasury, 2016a). Despite the title's implication that the tax is a way to raise revenue, the document primarily discusses obesity and the relationship between sugar consumption, soft drinks and childhood obesity (HM Treasury, 2016a). At the heart of the tax, therefore, is the idea that reducing soft drink consumption will reduce obesity.

This paper will answer the research question by analysing six hypotheses that determine whether the tax will be effective. The next section will develop the analytical framework and hypotheses, followed by an attempt to prove the hypotheses based on theory and empirical data. The final section will discuss the findings and provide policy recommendations.

THE CONDITIONS FOR AN EFFECTIVE SOFT DRINKS TAX: FRAMEWORK OF ANALYSIS

This paper drew on secondary sources, primarily journal articles, white papers and relevant newspaper articles to inform the

analysis and provide data on the variables of interest. Literature was found through searches on PubMed and Google Scholar and in the reference lists of studies on soft drinks and sin taxes.

The analytical framework identifies the preconditions necessary for decreasing soda consumption to reduce obesity and evaluates whether the proposed tax will be effective (see Figure 2 on next page). To be true, reduced soft drink consumption will have to translate into lower obesity, which will take years to establish – and causality is nearly impossible to infer given the many factors that contribute to obesity. Nevertheless, alongside tracking whether there is a reduction in average BMI once the tax comes into play, additional areas can be assessed. Excess calorie consumption is a major driver of obesity and soft drinks are a major source of excess calories, so the effectiveness of the tax can be evaluated across three areas:

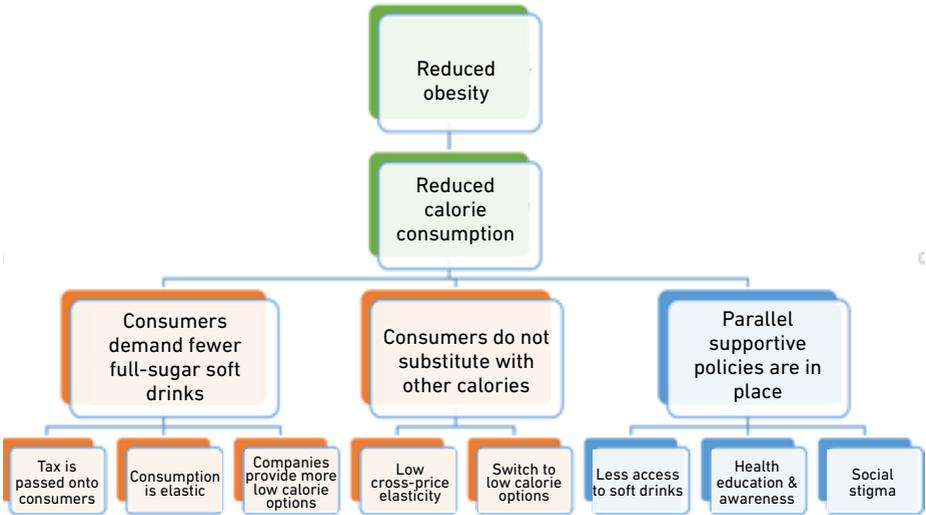
1. Do consumers demand fewer full-sugar soft drinks?
2. Do consumers substitute calories from soft drinks with other calories?
3. Are parallel supportive policies in place?

Hypothesis 1: Lower soft drink consumption will reduce obesity

The primary assumption behind a sin tax is that it will reduce negative health impacts – in this case, obesity. For this to be true, sugary soft drinks must constitute a significant amount of regular caloric intake. According to Public Health England (2015), soft drinks are the top source of sugar for teenagers and children in the UK, and one of the top sources for adults (see Table 1 on next page).

Individuals who consume soft drinks tend to drink one can per day, which on average contains approximately 140 calories

FIGURE 2 ANALYTICAL FRAMEWORK



Source: Author.

The bottom-level boxes are the necessary preconditions for the three main criteria. The orange indicates a direct link to the soft drinks tax, while the blue signifies essential but separate policies that do not fall within the scope of this paper. As a result, the bottom orange boxes have been reformulated into hypotheses that must be true in order for the tax to be effective. Before these can be evaluated, the premise of the tax – that lower soft drinks consumption will reduce obesity – will also be assessed as the first hypothesis.

(Public Health England, 2015). Yet they do not sufficiently account for the additional calories they drink when making food decisions later, suggesting that they think of liquid energy differently from solid. Vartanian *et al.*'s systematic review and meta-analysis found that over 90 per cent of the studies report higher caloric intake when soft drinks were consumed (2007). This is supported by Mourao *et al.* (2007), who found that because liquid forms of the same foods did not lead to the same feelings of satiety, individuals consumed between 12.4-19 per cent more

Table 1 Contributors to sugar intake in the UK, 2008-2012

% contribution to sugar intake	Adults	Teenagers	Children 4-10 years	Children 1.5-3 years
Soft drinks	16	30	17	12
Biscuits	6	7	8	8
Buns, cakes, pastries and fruit pies	7	6	9	6
Puddings	2	2	3	3
Table sugar and preserves	17	8	7	7
Confectionery	9	13	14	12
Fruit juice	8	10	13	14
Alcoholic drinks	10	2		
Breakfast cereals	6	6	8	6

Source: Public Health England.

calories when their sugar was in liquid form rather than solid. Another study found that middle schoolers increased their risk of becoming obese by 60 per cent with every extra serving of a sugary beverage per day (Ludwig *et al.*, 2010).

Studies have also directly modelled the impact of a 20 per cent tax – the recommended and expected UK levy – on caloric intake, body mass index (BMI) and health outcomes (Finkelstein, 2010; Smith *et al.*, 2010; Briggs *et al.*, 2013; Finkelstein *et al.*, 2013; Sharma *et al.*, 2014; Collins *et al.*, 2015). Two of these studies estimated a weight loss of approximately one-third of a kilogram per person per year (Finkelstein *et al.*, 2010; Sharma *et al.*, 2014) while another estimated a weight loss of 1.6 pounds per year and a cumulative weight loss of 2.9 pounds over time (Finkelstein *et al.*, 2013). Another study predicted that the tax could reduce the number of obese adults in the UK by 1.3 per cent, or 180,000 people (and overweight by 285,000) – with the highest benefits to people under 30 (Briggs *et al.*, 2013).

Obesity is not the only outcome variable: Malik *et al.* (2010) found that daily consumers of sugar-sweetened beverages had a 26 per cent greater risk of type 2 diabetes than those who had less than one serving per month, while Collins *et al.* (2015) found that the 20 per cent tax could lead to 2,400 fewer diabetes cases, 1,700 fewer stroke and coronary heart disease cases and 400 fewer cancer cases per year between 2010-2030 in England. Highest impact would likely be in urban areas with young populations.

Other studies have found small or non-statistically significant effects on BMI or obesity as a result of taxes, but these are for much lower tax rates. Fitts and Vader (2013), for example, found no significant effect on BMI with the tax rates between 2-7.25 per cent. Similarly, Powell *et al.* (2009) saw no significant association between the BMI of adolescents and state soda taxes. Fletcher *et al.* (2015) found no evidence of weight changes for soda taxes in the United States up to 12 per cent, which was the highest rate before Berkeley, California instituted its tax in January 2015.

Given the scale of the obesity problem, reducing soft drinks may seem like a drop in the bucket. Yet one can of Coca-Cola has 139 calories, or 7 per cent of the daily recommended intake for an average adult. Refraining from just one can per day would have a significant impact in the course of one year. The Department of Health (2011) called for a reduction of 100 calories per person per day as a start in the fight against obesity, so the calorie contribution of soft drinks is not negligible. All other things equal, if calories are not replaced by other drinks and foods, drinking fewer soft drinks does lead to lower weight and BMI and reduces the risk of type 2 diabetes and other obesity-related illnesses. The question of whether this happens in practice will be further explored in the analysis of cross-price elasticity in hypothesis six.

Hypothesis 2: The tax will be passed onto consumers

In order for a soft drink tax to successfully reduce consumption, it must change consumers' habits. Before a tax can change behaviour, however, the price increase has to be passed on to the customer. The majority of the tax will be borne by whichever side is more elastic: If consumers buy fewer soft drinks rather than pay the tax, then producers will likely to reduce their margins and cover the tax themselves. However, evidence from other countries with comparable taxes suggests that the tax will be passed on consumer in full or by even more than the value of tax (The Economist, 2015; House of Commons Health Committee, 2015). In France, the tax was fully paid by the customer for carbonated soft drinks and more than 85 per cent of it was passed along to consumers for flavoured water and juice (Berardi *et al.*, 2012). In Mexico, consumers paid 12 per cent more for soft drinks, on average, after the tax was implemented, which is even higher than the tax itself of 9-10 per cent (Marron *et al.*, 2015).

The limited experience of soft drinks taxes in other countries does not of course guarantee the same outcome in the UK. If instead producers absorb the tax and continue selling their sugary drinks at the same price, consumers will have no financial motive to change their behaviour. But it is reasonable to expect that, rather than take the financial hit of absorbing the tax, producers would be incentivised to adjust their product line toward lower-sugar drinks to avoid the higher tax brackets altogether. The success of the soft drinks tax largely depends on this hypothesis being proven true – that consumers' demand for soft drinks is also price-elastic, as will be discussed in hypothesis three. Overall, experiences from other countries suggest that the tax will be fully or mostly passed on to the consumer. Introducing a levy at the higher level, e.g. 20 per cent, further increases chances it will be passed along by producers.

Hypothesis 3: Soft drink consumption is price-elastic

Assuming the tax is passed on to consumers, the price elasticity of demand will largely determine the impact on consumption. The estimated ranges vary based on many factors including income and the type of beverage being taxed, and there is of course inherent uncertainty in these numbers. Most empirical data is based on taxes below what proponents suggest in order to see an impact, so the potential elasticity may be even greater than what has been seen in practice. Mexico's tax of 9-10 per cent – one peso per litre – is at the lower end of recommendations from Public Health England and other experts (Public Health England, 2015; Boseley, 2015).

A widely-accepted elasticity estimate is -0.8 to -1.0, meaning that a 10 per cent increase in price would translate roughly to an 8-10 per cent decrease in consumption (Andreyeva *et al.*, 2010). A systematic review of studies analysing the impact of price on consumption and body weight found an elasticity of -1.2 for sugar-sweetened beverages (Powell *et al.*, 2013). These are all in line with the recent findings for the soda tax in Mexico, which led to a 6 per cent initial decrease in sales, dropping to 12 per cent by the end of the first year (Colchero *et al.*, 2016). For the lowest-income households, it fell by 17 per cent (Colchero *et al.*, 2016). In some European countries, comparable taxes led to a 4 to 10 per cent fall in consumption (Charlesworth, 2016). France's soft drinks tax, a 3 per cent levy introduced in 2012, translated into a 3 per cent decrease in sales the first year and a further 2 per cent reduction in the second year (Daneshku, 2016), although drinks with artificial sweetener were also taxed. Encouraging individuals to switch to diet soft drinks is a fundamental part of the UK government's strategy, so an even greater drop in soft drink sales can

be anticipated given the higher tax rate and the exemption of diet beverages.

Despite the evidence that higher soft drink taxes translate to lower sales, some economists argue that the mind-set of a person with a food craving may not be accounted for in the tax system. For example, Gul and Pesendorfer (2001) have suggested that the disutility of foregoing the good might outweigh the perceived future benefits, so people will continue to purchase and consume until they are satisfied. If there is any price sensitivity, however, this may reduce the satiation point slightly by introducing additional disutility from having to pay a higher price (O'Donoghue and Rabin, 2006). Similarly, Bernheim and Rangel (2004) have explored the idea that people enter a "hot state" when confronted with a tempting or addictive product, and therefore make irrational, non-price-sensitive purchasing decisions about that good. This would mean that demand in that state is extremely inelastic and a tax would simply raise the amount of money paid without changing consumption (O'Donoghue and Rabin, 2006). If true, the tax would essentially become a revenue-raising and externality-correcting tax, rather than an internality-correcting one. Yet if the revenues go toward health-promoting activities and education, as will be the case in the UK, this may still be a successful outcome even if soft drink consumption is not reduced.

It is difficult to establish causality between the tax and consumption because soft drink taxes are usually implemented with other price changes or are smaller than the 20 per cent amount recommended by many public health experts, but data still indicates that taxes reduce consumption. Most elasticity estimates based on observed behaviour are for lower tax rates, so if the tax is mostly or fully passed-through to the consumer in the UK, there should be an even greater drop in consumption.

Hypothesis 4: The tax structure will encourage companies to produce lower-sugar soft drinks

The structure of a tax drives its differential impact. The UK levy was specifically designed to encourage producers to reduce the sugar content of their existing drinks and develop new, lower-sugar product lines (HM Treasury, 2016b). The tiered approach combined with the delayed implementation of the tax gives producers two years to adjust to the clearly-delineated tax categories. Many see this as an opportunity for companies to change their marketing strategies and refocus their product development (Marron, 2016), although the industry itself is frustrated by the negative light the tax shines on its products and claim that the tax is unnecessary since the industry is already moving away from full sugar. Director of the British Soft Drinks Association (BSDA) Gavin Partington remarked:

We are extremely disappointed by the Government's decision to hit the only category in the food and drink sector which has consistently reduced sugar intake in recent years – down 13.6 per cent since 2012. We are the only category with an ambitious plan for the years ahead – in 2015 we agreed [to] a calorie reduction goal of 20 per cent by 2020. By contrast, sugar and calorie intake from all other major take home food categories is increasing – which makes the targeting of soft drinks simply absurd. (BSDA, 2016)

Existing industry trends do point to a shift toward a larger product range with lower-sugar, lower-calorie options. The top soft drink companies have been taking steps to change their formulas by reducing the sugar content and using artificial or natural sweeteners like stevia (Euromonitor International, 2015). The Coca-Cola Company almost doubled its product offering from 400 in 2004 to 700 in 2015 (Sanger-Katz, 2015), and has reduced the average calories of its carbonated beverages by 5.3 per cent since 2014. It has also invested £15 million to reduce the calories and sugar in its top drinks between

2012 and 2014 (Coca-Cola, 2015). This push is reflected by retailers as well: In 2015, Tesco committed to dropping the sugar content of its branded drinks by 5 per cent per year beginning in 2016 (Boseley, 2015).

These efforts will prove to be key in reducing consumption of full-sugar soft drinks. In 2005, the UK had a push to reduce salt consumption, which succeeded primarily thanks to producers lowering salt content, not consumers changing their purchasing patterns (Marron, 2016). The government needs the industry to continue reducing sugar content in order to wean the nation off of high-sugar drinks. It is unclear if the additional pressure of a tax is necessary to motivate that change, or if it unnecessarily alienates industry by casting them as the “bad guy”. Either way, recent trends suggest that producers will continue to shift their product range toward lower sugar and calorie drinks.

Hypothesis 5: The tax structure will push consumers toward lower-sugar beverages

The UK government hopes that consumers will shift toward lower sugar beverages due to the price incentives, increased awareness around the unhealthy high sugar levels in regular soft drinks, and expanded low-sugar offerings from producers. The proposal accomplishes this goal first through taxing only sugary soft drinks – and not those with artificial sweeteners – and second through the tiered structure of the tax, which provides a financial incentive to move toward lower-sugar options.

A number of countries including Finland, France and Hungary tax sugary soft drinks but also tax diet soda or bottled water, obviating a reason for consumers to avoid sugary ones in particular (Nestle and Rosenberg, 2015). By excluding artificially-sweetened drinks from the tax, UK customers have a more affordable option available. With 59 per cent of soft drinks low or no-calorie and new

incentives for producers to expand this offering, there is plenty of scope to move away from higher-sugar choices (BSDA, 2015).

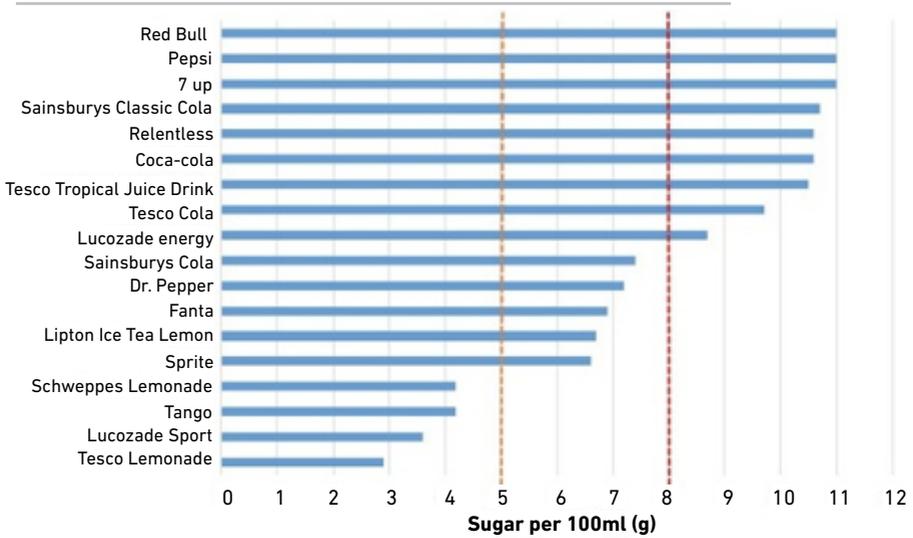
The three-tiered structure of the UK's proposal is innovative and addresses concerns that soft drinks taxes tend to treat all sugary beverages equally. Finland and St Helena both have a sugar threshold before the tax is levied, but only Chile has a comparable tiered system, with different rates on sugary drinks with more and less than 6.25g per 100 ml. In the UK, the levy will be an estimated 24p per litre for beverages with more than 8g of added sugar per 100 ml, 18p per litre for beverages from 5-8g of sugar per 100 ml, and no tax below 5g (Institute for Fiscal Studies, 2016). The sugar content of the top soft drinks and where they fit into the tax bands can be seen in Figure 3.

The UK's tax also avoids a pitfall that other countries experienced by targeting sugar content rather than drink volume. Whereas most countries charge a tax per litre, treating the sugar of low-sweetened iced tea and Coca-Cola the same, the UK's tax per gram of sugar ensures that a price-sensitive consumer will be pushed toward the lower-sugar options.

Applying the levy as an excise tax rather than a value-added tax (VAT) ensures that consumers are fully aware of the price increase when making purchasing decisions because it is already on the sticker (Marron *et al.*, 2015). When VAT is added at the cash register, some may only realise the price difference when they have already decided to buy (Brownell *et al.*, 2009). A VAT would potentially benefit budget brands over lower-sugar beverages since it is proportional to the price of the product; the excise tax, on the other hand, applies the same tax rate to the same sugar content whether it is Coca-Cola or Tesco. The added benefit of the excise tax combined with the tiered system is that brand-loyal customers will be incentivised to follow their brand to a lower-sugar product rather than switch to a non-branded company.

If consumers are indeed price-sensitive, then there is a clear motivation to avoid the tax. Not everyone will switch from a full-sugar

FIGURE 3 SUGAR CONTENT OF LEADING SOFT DRINK PRODUCERS



Source: Harper et al., 2016.

soda to no-sugar beverages, though, so creating a tiered system encourages an adjustment to lower-sugar beverages. By not taxing diet soft drinks, there is a better chance that the replacement drink will be low-calorie for price-elastic individuals. If consumers are receptive to these options, it appears that the UK's proposed tiered levy will indeed push consumers toward them.

Hypothesis 6: There is low cross-price elasticity between soft drinks and other high-calorie products

Opponents of soft drink taxes contend that people will simply offset calories from the taxed beverage, such as by replacing soft drinks with untaxed high-calorie beverages like fruit juice, which is naturally high in sugar, or milk-based drinks, or if they increase their consumption of sugary foods. There is not enough data and

too many confounding factors to conclude how the public will react when the tax is implemented, but empirical studies on cross-price elasticity and the metabolic impact of soft drinks can help predict the outcome.

Studies indicate that there will be some form of substitution by other beverages or foods, but it is difficult to say how much. Brownell *et al.* (2009) suggest that 25 per cent of calories from sugar-sweetened beverages will be substituted by other drinks and foods. Both Barquera *et al.* (2008) and Colchero *et al.* (2015) found that higher-priced soft drinks were correlated with higher expenditure on water and milk and lower expenditure on other sugar-sweetened beverages like fruit juice and energy drinks. Dharmasena and Capps (2009) found that a 1 per cent increase in soft drink prices would see a 1.9 per cent fall in soft drink consumption and a 0.49 per cent reduction in diet soft drinks, while there would be a 0.29 per cent increase in low-fat milk, a 0.49 per cent increase in high-fat milk and a 1.15 per cent increase in fruit juice. In an analysis of the United States, individuals in states with higher soda taxes reduced their consumption of soda by 6 calories per day for each 1 cent increase in the tax; but completely replaced the calories by drinking other high-calorie beverages like milk and juice (Fletcher *et al.*, 2010). Much more research is required on the topic to understand the effects of a larger tax and consumer behaviour, but it is clear that caloric substitution is a critical component and does exist to some degree.

Research on the effects of liquid versus solid carbohydrates increasingly shows that liquids do not produce the same feeling of satiation as solids with the same calories (Pan and Hu, 2011; Malik *et al.*, 2006) and people who drink beverages with a lot of calories do not compensate by reducing their food consumption at subsequent meals, leading to higher overall energy intake (Mourao *et al.*, 2007; Vartanian *et al.*, 2007; DiMeglio and Mattes, 2000). In addition, soft drinks may be complementary with other unhealthy foods like pizza and hamburgers, and their consumption may be negatively correlated with healthy eating habits overall (Vartanian *et al.*, 2007; Fin-

kelstein *et al.*, 2013). Based on this line of research, even if people switch from drinking soft drinks to eating snacks, the overall calorie consumption might still go down.

Substitution of regular soft drinks with diet drinks or water is expected to lower caloric consumption, but this may not necessarily be the case. In their review of a soft drinks tax in the UK, Tiffin *et al.* (2014) found that if diet drinks are not taxed, then a shift to those beverages would enhance the effectiveness of the tax by reducing caloric intake. Indeed, the soft drinks tax in Mexico resulted in a 4 per cent increase in bottled water sales in the first year, while sales of soda dropped (Colchero *et al.*, 2016). Yet there are concerns that drinking diet beverages may give people a sense that they are “justified” in consuming more calories later or may increase preference for sweet foods and drinks (Mattes and Popkin, 2009). It is interesting to note that overweight and healthy-weight Americans drink the same amount of regular soda, whereas overweight Americans are more likely to drink diet soda (Mendes, 2013).

It is unrealistic to imagine that a consumer will be diverted from soft drinks but will not find another product to fill the gap. If that product is diet soda, then all else being equal, calorie consumption will go down – and, to a small extent, so will obesity. But if the replacement product has calories, or if the diet drink makes the consumer feel entitled to compensate with more food, then the effect of the tax will be attenuated if not negated. The outcome of this hypothesis, which is central to the success of the tax, will depend on a combination of consumer behaviour and the effects of complementary interventions such as health education and marketing. Only a comprehensive and consistent approach will translate into an effective tax.

CONCLUSION

Obesity is a complex problem, and the solutions are more complex still. Yet the importance of reducing it is undeniable. Waiting for a panacea will just allow the problem to grow. None of the hypotheses presented in this paper can be irrefutably proven, but theoretical and empirical data fall on the side of the tax in nearly every case:

- Evidence indicates that lower soft drink consumption will indeed reduce obesity, even if only in part;
- The experiences of other countries tell us that the tax will be passed onto consumers, most likely in full – and since the UK tax will probably be one of the highest to date, even a partial pass-through should see results;
- With a higher sticker price, at least 8-10 per cent of existing soft drink purchases will likely no longer be made;
- A tiered tax structure will encourage companies to continue to produce lower-sugar soft drinks in order to avoid the tax, providing more choice to consumers;
- Through a combination of fiscal incentives, more low-sugar and sugar-free options, and the marketing around the tax, consumers are likely to shift consumption away from sugar-added beverages.

The most uncertain hypothesis, and one central to the effectiveness of the tax, is cross-price elasticity. It is very sensitive to geography, taxes on other products, pre-existing food preferences, education and other variables. This is where parallel support-

ive policies such as reduced access to soft drinks and increased access to water in schools, expanded nutritional education, and clarity around where the tax revenues go become essential. Moving forward with a soft drinks tax as part of a larger package of policy changes makes sense, but other policies and government initiatives should be in place to maximise effectiveness.

One of the most important efforts in the soft drinks tax campaign will be addressing the argument that it is regressive. As the House of Commons Health Committee pointed out in its report on childhood obesity, “there is a strong case that [lower income families] should also derive the most benefit” from the tax (House of Commons Health Committee, 2015). The regressivity of the tax could be offset if the money is targeted toward lower-income communities, while the health benefits might also outweigh the financial burden in the long run. The UK has committed to using the tax revenue to support longer school days for secondary schools to facilitate after-school activities, increase funding for school sports, and develop the school breakfast club programme to provide healthy breakfasts to more children (HM Treasury, 2016b). As the revenue comes in, the government should be vocal and clear about where the money is going and how children are benefiting.

Soft drinks are high in calories and low in nutritional value. Excessive consumption of them is associated with higher BMI, type 2 diabetes, tooth decay and consumption of other unhealthy foods. Taxing soft drinks will not be the main way of reducing obesity, as no one product is responsible for the majority of caloric intake. However, if one product category is to be targeted, and there is a strong value placed on changing young people’s habits from an earlier age, then it is a good candidate for intervention. As part of a full package of comprehensive and consistent policies, the proposed soft drinks levy will be effective and beneficial to the health of UK citizens.

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