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# Cariology: Why is the 2018 Soft Drinks Levy Important to Dentistry?

**Abstract:** The link between sugar and caries is a well-established relationship and the efforts to reduce patient sugar intake is part of daily practice for a holistic clinician. Sugar taxation has been employed by many countries in an attempt to deal with the worldwide concern of non-communicable diseases. Taxation of sugar in the UK could increase its revenue, reduce sugar intake and affect caries incidence; considering how the sugar levy could shape the way caries is managed important.

**Clinical Relevance:** Review of modelling studies and actual change experienced in countries where tax has been implemented highlight what could happen in the UK and the impact this could have on dentistry and why this is important in daily practice.

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The Global Burden of Disease (GBD) 2010 study highlighted that the most prevalent condition in adults was dental caries and the tenth highest among children and deciduous teeth.<sup>1</sup> Over the years, numerous expert and consensus reports have confirmed that dental caries and its development are consistently linked to the quantity of sugar consumed,<sup>2</sup> with sugar being the most important dietary factor in the development of caries. A systematic review of the evidence of this link was commissioned by the World Health Organization (WHO) and led to the update of their guidelines on sugar consumption: it should be less than 10% of daily energy consumption in order to minimize caries risk.<sup>3</sup> Sugar-sweetened beverages (SSBs) are a significant contributor to excess sugar consumption, which is apparent across all social demographic groups.<sup>4</sup> In daily clinical practice the link between sugar intake, caries rate and socio-economic status and the regularly blamed sugar within Western diets is obvious. The possible effect of a sugar levy is relevant to all clinicians. The sugar tax on sugar-sweetened soft drinks was introduced by the UK government in 2018 in a primary drive to reduce obesity and type II diabetes. This was heavily backed by the British Medical Association (BMA), which had been campaigning for the change since 2015.

Obesity and diabetes reduction was the focus for the tax

introduction in the UK and is frequently discussed in the press. It is worth noting that caries and teeth are discussed far less. The well-documented link between caries and sugar intake leads one to assume the caries rate should decrease as less sugar is consumed. There is consistent, moderate-quality evidence that supports the relationship between the incidence of caries and amount of sugar consumed.<sup>3</sup> The relevance to restorative dentistry of a reduction in sugar intake is that, given the linear relationship between the two, caries rate might decrease over time. Countries around the world can tax sugary drinks either directly to increase the cost of all drinks, or indirectly by encouraging retailers and manufacturers to reformulate and include healthier alternatives, or reduce portion size. The purpose of the article is to compare and contrast sugar taxation schemes to review what the effects could be by reviewing modelling studies and examples of the effects seen in other countries that have made similar introductions. The aim is not to predict what will happen, but rather to speculate what the effects could be for dentistry.

## World sugar taxation

Increasing numbers of countries are implementing a sugar tax to try to reduce non-communicable disease rates since it is widely accepted that sugar, and not fat, is the bigger problem. Taxation of sugar is in place in countries of varying socio-economic status and highlights the worldwide need to reduce sugar intake particularly when the majority of the disease is experienced in the poorest.<sup>5</sup> 2016 was dubbed the 'year of the sugar tax' with multiple social media influencers,

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political groups and the WHO (specifically their Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020)<sup>6</sup> collaborating and driving the message of the importance of reducing sugar intake. Sugar taxation can be described as a Pigouvian tax: one that 'aims to address the market failure brought about by products that cause harm, where the costs of those harms are not otherwise included in the price of the product'.<sup>7</sup>

At least 20 countries have implemented taxation schemes on sugar since 2015 and many more countries are likely to follow suit over the coming years with the global trend to reduce sugar. Taxation schemes are similar in their design and often implement a higher tax for drinks or foods with higher sugar levels. Regional groups are encouraged to have consistent tax structures to avoid cross-border tax evasion. Not all countries have chosen to enforce a tax, for example, Australia. The first city in the USA to introduce a sugar tax was Berkeley (California) in 2014 with a \$0.01/oz tax. One study found this caused a 21% decrease in the consumption of sugar-sweetened beverages and a 63% increase in the consumption of water in the city's low-income neighbourhoods.<sup>8</sup>

Countries have also changed and updated tax levels with consumer change: for example Chile implemented an increase on its pre-existing sugar tax 2014 from 13% to 18% for drinks containing 6.25 g of sugar per 100 ml and this has led to a 21.6% decrease in the consumption of SSBs<sup>9</sup> and is hoped to be making a positive impact on disease levels.

Not all taxes are solely on SSBs, with Hungary introducing a tax on the majority of 'unhealthy food' – something that is argued as essential when avoiding substitution of SSBs for other non-taxed products.<sup>10,11</sup>

## UK Soft Drinks Industry Levy

The UK system operates differently from many countries in that it has differential rates of tax according to how much sugar the drink contains. The sugar tax is officially called the Soft Drinks Industry Levy (SDIL) and was introduced in the UK in 2018. It puts a charge of 24p on drinks containing 8 g sugar per 100 ml, and 18p a litre on those with 5–8 g of sugar per 100 ml, with natural fruit and milk-based drinks being exempt. In comparison to a flat rate of tax, such as in Mexico, UK tax aims to work indirectly by offering a financial incentive to reformulate drinks to bring them below the threshold for the tax. The UK Treasury department estimated it would gain £500 million in revenue from the tax, but now believes they will gain £240 million because an estimated 50% of manufacturers have reformulated to cut sugar to avoid paying the levy. Increased revenue for the country plus a reduction in sugar has had the desired effect for HMRC so far; a recent study has found that the SDIL has already incentivized manufacturers to reformulate their products in order to reduce sugar levels.<sup>12</sup>

The SDIL is not the first attempt to reduce sugar via the manufacturers of sugar-sweetened products in the UK. In 2017, Public Health England (PHE) called for a 20% cut in sugar by 2020, 5% being the target for the first year. However, the PHE progress report from May 2018 found that food manufacturers

and supermarkets have managed to cut only 2% of sugar content.<sup>13</sup> Reducing promotions on the cost of sugary food and drinks, and banning opportunistic product placement at the end of aisles are other methods that PHE has suggested. A reduction in advertising on TV and online, particularly to children, was also recommended. The potential power of social media was clear when celebrity chef, Jamie Oliver, introduced an increase in cost of sugary drinks by £0.10 in his chain of Jamie's Italian restaurants. A study found a very quick decline in sales per customer following the introduction.<sup>14</sup> Buckton *et al* highlighted this relationship of stakeholders involved in the SDIL and the probable importance of public health promotion to require popular celebrity involvement.<sup>15</sup>

## Discussion

There is controversy about whether sugar taxation is primarily a money-making scheme for governments worldwide, and whether a small extra cost will really deter people from buying sugary drinks. Those who have disposable income are unlikely to be perturbed by few pence rise in a 79p can of coke; however, those with less disposable income might decide to have something else or, on the other hand, bear a disproportionate share of the burden. Changing sugar-fuelled drinks for 'diet' options may not necessarily be the lesser of the two evils though, with evidence suggesting diet drinks can affect cardiometabolic health<sup>16</sup> and specifically for dentistry, cause significant acid erosion.<sup>17</sup> Substitution for other products such as fruit juice or chocolate bars that have not increased in price may lead to greater sugar consumption – just because the consumption of sugary drinks is reduced does not necessarily mean sugar intake is decreased. The argument to increase costs considerably more than the UK has done is aided by Berkeley's taxation scheme where a 25% tax caused a 21% drop in sales of sugary drinks in those most socio-economically disadvantaged.<sup>8</sup> However, this alongside a campaign to warn the public of the dangers of sugar.

The 2-year evidence for Mexico's 10% taxation suggests it is working, and that the long-term impact is overriding the short-term effects.<sup>18</sup> There seems to be a slow habitual change and straying away from sugary drinks: the 2014 tax resulted in a 9.7% decrease at the end of 2 years and a projection study predicted a saving of £785 million in healthcare costs as a result of reduction in non-communicable diseases.<sup>19</sup>

Since Hungary's 2011 sugar tax came into effect, 40% of manufacturers reformulated their products by reducing or removing sugar and other potentially harmful ingredients in excess, such as caffeine and salt, from their products.<sup>17</sup> This also fits in with idea of tightening the unregulated provision of junk food instead of blaming the individual for poor dietary decisions.

There is controversy surrounding the impact on the population within lower socio-economic groups with the argument that the lifestyle choices of those

with less income are unhealthy because lower pay and longer hours, and stereotypically, harder work offer less choice. This is important in terms of caries incidence as the majority of the disease is experienced by the socio-economically disadvantaged.<sup>20</sup>

There are clear pricing problems that need addressing, not just for sugar sweetened beverages: between 1980 and 2012, in the UK, the price of fresh vegetables became three times more expensive while the price of ice cream halved.<sup>21</sup> Taxing SSBs and other sugar-sweetened items may reduce disease and caries in the long run, but in the short term some argue it is illiberal – that it might disadvantage the disadvantaged even more. Campaigners for sugar taxation argue that an increase in revenue from sugar taxation could be used for reducing the cost of healthy foods and drinks so that these become the ‘easier’ choices.<sup>12</sup>

Even with the taxes that have been in place for the longest, modelling studies form the basis of the evidence around projections. Schwendicke *et al*<sup>20</sup> took a model-based approach to estimating the 10-year effect of a 20% SSB tax in Germany. They found that the highest reduction in caries would be in young low-income males, but the overall caries reduction might not be as profound as hoped. Schwendicke *et al* also concluded that a sugar tax may even reduce inequalities in caries experience and reduce treatment costs, but that these might be only moderate in comparison with third world countries; this is important to note when considering the effects on the UK.

The UK sugar levy is a relatively recent introduction, so modelling studies for the UK are few and far between. One modelling study<sup>22</sup> concluded that there is great potential for the levy to improve the health of the population directly, but that it would be significantly limited if the tax were passed on to all products from manufacturers rather than those just affected by the levy. Similarly, if the manufacturers absorb most of the cost rather than transferring it to the consumer, reformulation would lead to the biggest health benefits. All scenarios except for one led to a fall in the numbers of decayed, missing, or filled teeth (DMFT).

Cornelson and Smith<sup>23</sup> are working with the Universities of Oxford and Cambridge in a ‘major natural experimental evaluation study’ into the effectiveness of the SDIL, evidence of which is lacking. As well as looking at the consumption of the sugary drinks, the study will assess the potential switch to other products in place of SSBs and the economic issues, such as cost to the NHS. Further research comparing the effects since implementation of sugar taxes is needed, not only specific to each country’s system but comparing the systems to see which is proving most effective. This author’s opinion is that extending the tax levy to food items, as has happened in Hungary, could be of an even greater benefit than those already modelled with sugar-sweetened beverages. It is argued that the sugar-tax intervention could be a crucial moment for world health statistics, which is rivalled only by similar measures to reduce tobacco usage.<sup>23</sup>

Smith *et al*<sup>24</sup> found that British people are more responsive to price increases than decreases and, hence,

the theory that potential taxes would change people’s dietary habits, more so than reducing the cost of healthier alternatives. Those with less disposable income in the UK are more price-responsive,<sup>23,25</sup> so a price increase on something that they would spend more money on would this tax would have a greater impact on them. The population with the highest sugar intake may arguably be reliant on the calories provided – would taxation dissuade them enough to reduce consumption? If the reduction in intake is lower, it might still drive a positive change and could be a step in the right direction.<sup>25</sup>

## Conclusion

The populations of all countries suffer from poor dietary habits irrespective of their wealth; it seems it is not just a reduced intake of poor quality ‘junk food’ that is needed, but also an increase in the intake of healthier foods. Caries prevention strategies, such as sugar taxation, and the data on their effects are important, particularly in a population that is keeping their teeth for longer. Efforts such as those above from many countries are a step in the right direction with Mexico’s results being encouraging, even if there are flaws and shortcomings. Further research is needed into population health outcomes and the effects of possible substitutional purchasing. Sugar with respect to non-communicable diseases is part of a much wider problem; however, with respect to dental caries, it is the author’s opinion that global efforts in reducing sugar is of paramount importance to the dental profession. It is clear that collaboration with academics, health professionals, public health researchers and economists is essential to realise the potential health benefits of taxation of sugar.

## Compliance with Ethical Standards

Conflict of Interest: The authors declare that they have no conflict of interest.

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