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Draft 6

Taxes on sugary drinks

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Professor Mike Lean MA, MD, FRCP Hospital consultant , specialist trained in Diabetes and Endocrinology, and Professor of Human Nutrition, School of Medicine, University of Glasgow.

For around 100 years, vocal opinions have asserted fervently that sugar causes multiple medical problems, particularly obesity and type 2 diabetes, with apparently plausible supportive evidence. Another equally militant view, apparently science-based, blames artificial sweeteners for many medical problems, including obesity and cancers. From the stand-point of Human Nutrition and translational-science, both these media-led arguments are flawed. However there may be a grain of truth within each, allowing a true enemy of public health to be identified, for both groups to agree on.

During human evolution the sweetest food we ever met, bar the occasional lick of honey (an easy alcohol-source, controlled by land-owners and religious elites), was human milk. It would not be surprising if sudden global availability of unlimited unnaturally sweet drinks and sugary-fatty 'snacks' in the 19-20th centuries were to have adverse effects, just as experimental animals fed 'cafeteria diets' develop obesity and diabetes.

Although glucose is an essential nutrient, necessary for the function of every cell in our bodies, it is technically 'non-essential' in our diets, being readily generated from other foods. There are health benefits from sugar-containing fruits and vegetables, but sugar added during manufacturing confers no physical benefits. It has presented a reasonable target for taxation to raise revenue since the 1930s (Wolf HA, 1959; Snape, 1969), and now proposed explicitly against obesity (Jensen & Smed 2007; HM Treasury, 2016).

However definition is complicated. 'Added sugars' include 'refined sugars' (either natural, from cane, or synthetic, made from grain or beet crops) but also natural sugar, from raisins, apple juice, honey etc. All are biologically identical once inside the gut. The fructose component of sugar (sucrose is half-glucose, half-fructose) is converted into glucose, our primary cellular nutrient.

More problematic, the evidence linking total, or added, sugar consumption with poor health, beyond tooth decay in childhood, is weak. Consumption of 'sugar-sweetened

beverages' (SSBs) is more reliably estimated, so has a stronger evidence base for associations with poor health, and SSBs present a much simpler target for taxation.

Taxing SSBs would raise revenue, as long as SSBs remain popular. However, cheaper artificially-sweetened versions are steadily replacing conventional 10% sugar in SSBs, so the revenue-source will gradually dry up. SSBs contribute about 13% of total sugar intakes in UK, up to 30% in children, but still below 5% of calories (Public Health England 2014), so taxation could only have minor impact on total sugar consumption: reducing sugar in SSBs from 10% to 8% would affect about 0.4% of total calories, and under 1% even for the heaviest users.

There are theoretical small benefits from sugar reduction, especially for those with very high intakes, to reduce blood pressure (Te Morenga et al 2014) and cardiovascular diseases (Warfa et al 2016). If cutting down sugar intake can reduce weight gains by 2-3kg (Te Morenga et al. 2012) that would definitely help delay the onset of weight-related diseases like type 2 diabetes. However there is no intervention evidence, to support recommending a lower upper limit of sugar intakes than a relatively generous 10% of calories. Systematic reviews and meta-analyses find no weight-independent effect of sugar on diabetes development (Lean and Te Morenga 2016). A frequent failing is to adjust data for BMI and assume, incorrectly, that this has removed confounding from greater fatness (Romaguera-Bosch et al 2013; Ma et al 2016). Fatter people tend to eat more of everything, including sugar and SSBs, and BMI correlates rather poorly with body fat. The evidence linking fructose, specifically, to elevated lipids or liver damage is confounded by unfeasibly high consumptions with excessive calorie loads (Chiavaroli et al 2015; Chung et al 2014).

Two much-analysed, much-disputed, bodies of evidence tell us that problems with obesity lie not with sugar, or sweeteners, themselves, but with the modern eating patterns of snacking or grazing, which are marked by high consumption of both very sweet drinks and of sugary/fatty snacks.

First, meta-analysis of intervention trials found absolutely no effect on body weight when sugar is replaced with the same calories from other nutrients (Te Morenga et al 2012). Second, although evidence is conflicting (Miller and Perez. 2014), artificially sweetened drinks are also associated with weight gain (Brown et al 2010). Only an association, but experimental animals only gain weight when both drinking water and foods are sweetened, either with sugar or artificial sweeteners (Fowler 2016). Human epidemiology can be explained by essentially the same story: both SSBs and artificially-sweetened 'diet' versions cause tolerance to unnatural sweetness which promotes weight gain, but mainly by promoting consumption of very sweet energy-dense foods, rather than from sugar in the drinks themselves (Lean & Te Morenga 2016; Faculty of Public Health 2013). 'Reverse causality' may contribute, people with weight problems tending to choose 'diet' drinks, but

obese people prefer sweeter tastes and sweet high-fat foods (Drewnowski et al, 1985), and children who eat more fast-foods prefer sweeter tastes (Lee 2004).

To tackle obesity, an effective tax would therefore need to target SSBs punitively, eventually to rid the market, in stages, of SSBs containing over say 5% sugar, but to reduce overall calorie intakes significantly, artificially sweetened drinks with the equivalent level of sweetness must also be taxed. Taxing the sugary versions alone is likely to be ineffective if companies simply boost the sweetness artificially.

Introducing taxation in stages is sensible, much as planned for UK (HM Treasury, 2016), so sweetness falls without consumers being aware. That also gives time for industry to make the necessary, relatively low-cost, changes. Marketing to oppose the change could be potentially damaging: the Mexican SSB tax appears not to have affected consumption (Guthrie 2016). It is important not to penalise the food industry, and to compensate where justified. Taxation must be universal to avoid adversely affecting the competitive drinks industry. Leaving loopholes for small (but potentially highly productive) businesses, or for sweetened milk or fruit juices, would undermine the entire exercise.

The real gain, with respect to population health or obesity, from establishing a 'soda-tax', may not be through any direct health impact, but as part of a package (Public Health England, 2015; Faculty of Public Health 2013). The clear indication that governments are at last prepared to use fiscal mechanisms means that we may be able to change the currently sub-optimal national food supply which a free market has produced. Public health can only improve if the total food supply is changed. The only approach which will not widen health inequalities is 'health-by-stealth'-reformulating entire product portfolios, rather than creating premium-range 'health-food' products.

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