Author’s response to reviews

Title: Reductions in sugar sales from soft drinks in the UK from 2015-2018

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How much progress have soft drink companies made towards reducing sugar in the UK? (Lauren Kate Bandy; Peter Scarborough; Richard A Harrington; Mike Rayner; Susan A Jebb)

Response to reviewers’ comments

Please see the authors’ response to each reviewers’ comments given below in blue. All line numbers refer to the final manuscript (with track changes).

In addition to the responses below, we included Figure S1 as an Additional File.
Reviewer 1, Barry Popkin

There are several major concerns. First there is a tendency to mix up supply and demand changes. The nutrition facts panel shifts in sugar reflect solely industry reactions, albeit unadjusted for two issues—the time the SDIL was being discussed before it went into effect and then after it went into effect. You must more clearly acknowledge this gap as you acknowledge broadly earlier trends—which relate to discussions of sugar and health and many others that led to the SDIL going back to all the obesity discussions and programs under the end of the Blair and Brown regimes and onwards (Kopelman, Jebb et al. 2007) and other Jebb pieces on SSB trends in the UK and by many others (Ng 2012).

A) We have revised the introduction to make it clear that sugar consumption and childhood obesity have long been a public health priority, using the references above (lines 108-111). We have also more clearly acknowledged that the change in sugar content over 2015-2018 is due to changes in both consumer and industry behaviour, partly as a result of the announcement and implementation of the SDIL (lines 405-409).

In many countries the entire period surrounding a tax [before certainly as well as after] represent a massive public education campaign and dialog around the impacts of SSB and sugar on health gets many subpopulations to shift their demand as seen in the US and Mexico and even the UK in the period before the tax. So how much is the industry changes However, the total volume [sales-weighted ] changes reflect both industry changes and consumer demand shifts. I would recommend the reformulation and industry supply shifts be separated from the demand shifts and you present first all the reformulation changes and then a different section on overall changes. Of course, the supply changes by industry reflect consumer demand changes also but you can at least come closer to addressing that.

B) We have added non-sales weighted versions of figures 1 and 2 as supplementary material. These show specifically how the sugar content of soft drinks has changed solely due to industry behaviour.
In our analysis we found that the total volume of sugars fell by 29% from 2015-2018 due to both a change in industry and consumer behaviour. When we repeated this analysis but kept the sugar content of all soft drinks the same as they were in 2015, we found that the total volume of sugars fell by 4%. This suggests that the majority of the reduction seen here was due to a change in reformulation/industry behaviour rather than changes in volume sales/demand. We have reported these results in the paper to make the distinction highlighted by the reviewer more explicit (lines 424-431). We have not changed the structure of the paper as it is difficult to separate how supply influences demand and vice versa. The key feature of this this paper is to take a sales-weighting approach to the analysis which measures total purchases of sugar consumption as a combination of changes in both supply and demand.

A second major concern is that you should have a longitudinal sample and a cross-section one on your nutrition facts panel data to separate reformulation of existing products from new product introduction. I wish I could share our Chilean reformulation paper which does that to begin to try understanding these two issues. If not your write-up must talk about overall portfolio changes in products related both to reformulation and new product introduction.

C) We agree that adding this analysis would be beneficial, however Euromonitor data does not allow for us to differentiate between new products entering the market and existing products that have been reformulated. Using Euromonitor data makes possible the most novel aspect of this paper which is the information on sales. However, we have made it much clearer in the discussion that the changes presented here will be due to changes in the overall product portfolio, including reformulating existing products and the introduction of new ones (276-277) and that limitations in the data mean we can’t necessarily distinguish between the two (lines 332-335). An unweighted version of figure 1 can be found as Additional file 1: Figure S1 (lines 213-214).

Finally, the discussion is very narrow. This is a global journal and you compare your results with UK studies but do not put this into a global context as the first tiered tax evaluation of industry and total demand changes. unadjusted for trends. Several others have tiers but have not been evaluated.
D) We apologise and on reflection realise this was too UK centric. We have now added a paragraph to the discussion to put this case study in context with the experience in other countries. In most other countries the changes in sugar in beverages have been analysed specifically in the context of sugar-sweetened beverage taxes. Whilst this is likely to be the first public report of the changes in the sugar content of soft drinks since the introduction of the SDIL in the UK, we have not drawn any direct comparisons with the results of the other studies as 1) this paper takes a more holistic view of the effect of UK policy on sugar reduction and is not a specific evaluation of the UK SDIL and 2) most other studies look at household-level purchases to evaluate changes in price and consumption, rather than mean sugar content and total consumption of sugar, as set out in this paper. This has been explained in lines 370-378.

Specific issues

1. separate as noted above the reformulation and new product introduction changes from all the sales weighted changes.

Please see the response in paragraph C above, Additional file 1: Figure S1 and lines 276-277 and 332-335 in the revised manuscript.

2. the sales data ignores population changes. it might be useful to put those data into per capita/day changes so the health audience that reads these papers can get some sense of the impact on the individual. I think this way it is very hard to understand these effects and you can overestimate greatly the health effects. We need to understand the size daily of the impact to compare with other countries on how potentially impactful the SDIL was vs other taxes

The authors thank the reviewer for this useful suggestion and have added a table that displays the results in per capita per day (table 5, line 247).

3. Euromonitor has several imitations and you can attempt to address the one you noted. Namely trying to use the proportion of shifts of diet vs regular brands to do a sensitivity test on how this would change the sprite and other beverages that are combined.

We agree and we have expanded the discussion of these limitations from lines 309. A new paragraph (lines 424-431) describes the sensitivity test mentioned by the reviewer.
4. In the US, we found a huge increase in beverages with both sugar and nonnutritive sweeteners (low calorie sweeteners). I am surprised you did not find this and Euromonitor will not help with that but your nutrition facts panel data will with full searches for the ingredients lists. This paper shows this for the US (Piernas, Ng et al. 2013) Euromonitor does not cauterize those reformulations so you are stuck with regular vs diet.

This would be an interesting analysis but is beyond the scope of this paper.

5. Euromonitor also omits some local brands and you would not know that necessarily as they might be just in one region outside London.

The reviewer is correct. Euromonitor classify smaller and local brand under the umbrella term ‘others’ and were excluded from this study. This has been made clearer in the methods (lines 201-202) and discussion (lines 328-220).

6. I am surprised how few beverages there are in the UK. Our total beverages are many folds greater than this set. We find more in several countries we study.

The authors are unsure what unit of analysis the reviewer is referring to by “beverages”. This could mean the number of brands, the number of individual products, the number of different products sold in different pack sizes, or the number of different products sold in different pack sizes sold in different shops. With the data sources available to us (Euromonitor and Brand View) we are able to estimate the first two of these categories, and we acknowledge in the limitations that there may be some under-estimates (e.g. excluding products and brands that are sold in small numbers outside of supermarkets). However, it does seem that there is a marked difference in the number of products in the UK and USA.

7. A really major limitation that is not reflected in the abstract and in the paper is that using Euromonitor data you see a marked decline in SSB purchases and shift to lower calorie purchases before. This means you cannot fully ascribe these changes to the law as you note but this truly gives a major overestimate of the impact of the SDIL. At least on your sales portion give a trend for Euromonitor of different categories of beverages. you can readily do this with another part of the Euromonitor data. This will provide the reader with some sense of the preSDIL trend but not give any sense of industry changes.
The aim of this paper is not to evaluate the announcement and introduction of the SDIL. While the SDIL is important context for the time period we examined in this paper, our aim was to assess the sugar content of soft drinks and report on the annual progress made by individual soft drink companies (as stated in lines 145-151). This paper cannot explicitly evaluate the tax as we only have four annual time points. This time series is not granular enough to complete an interrupted time series looking at the specific dates of the announcement and introduction of the SDIL. We have added a line to the discussion (line 408-409) to make it clearer that this paper does not aim to evaluate the SDIL and that further work here is needed.

8. But I am surprised you can't look at that for at least major market leaders to get some sense of reformulation patterns before and after the SDIL also to give us a sense of how much reformulation occurred in more than a few years before and after the law. Or use your UK dietary data for that which you have at your fingertips.

Please see point 7 above. We are not aiming to evaluate the SDIL in this paper. The published UK dietary data does not identify individual companies.

9. Your discussion of the PHE study and kantar ignored that kantar is only on food purchases from retailers. I am assuming your Euromonitor data includes all categories of trade as the brand data has that. Kantar missed not only omissions but also food service sales and vending machine sales along with underestimation potential.

The authors thank the reviewer for this point – the strengths and weaknesses of these data sources have been addressed the paragraph from lines 309-320.

Reviewer 2, Feng He

In this paper, Bandy et al carried out a cross-sectional study to assess how individual soft drink companies have responded to calls to reduce sugar consumption and to the soft drink industry levy between 2015-2018. The importance of having a clear reduction in sales of sugar in soft drinks are well described in the paper. The authors are well aware of the previous research works and surveys conducted in the field and the limitations of the data collection methods.

There are several points to be considered before publishing:
1. In the manuscript, it is stated that there might be overestimates of sales in Euromonitor due to their indirect approach of estimation. The reliability of the database 'Euromonitor' and 'Brand View' and whether the databases cover all the eligible products needs to be justified.

The authors thank the reviewer for this comment and have adjusted the discussion to make the justification of using these data sources clearer (lines 311-313).

2. In the manuscript, it is not clear when to include/exclude the 100% fruit juice and bottled water in the analysis/tables. Please also clarify if the 'soft drinks' (e.g., in line 188) means all drinks including bottled water and fruit juice or not.

The authors thank the reviewer for this comment. For clarity, all categories have been added to the tables to make it clear they are all included in the analysis.

3. One of the main reasons for the rise in the volume sales and sugar content in low and zero sugar categories could be the products in high and mid sugar categories being reformulated to low and zero sugar categories.

We agree with the reviewer and hope that this has been made clear throughout the results and discussion sections (e.g. lines 276-281, 405-410 and 433-436)

4. In table 2 and table 3, is the IQR more useful than just using the variance?

The distribution of sugar content in these categories is not normally distributed. For total soft drinks, the distribution is closer to a uniform distribution, with spikes representing zero sugar drinks. For the categories defined by sugar content, the distribution is curtailed at the sugar thresholds used to define the category. Therefore, reporting mean and standard deviation (or variance) would not give an appropriate indication of the shape of the data and we prefer to use the non-parametric method of reporting the 25th, 50th and 75th percentiles. We also provide the arithmetic mean for each category, as this number contributes to the overall sales of sugar from soft drinks which are the primary results for this paper.
5. There is inconsistency between figures in the text and in the tables. For example, in line 202, the absolute mean sugar content of soft drinks fell from 5.4g/100ml in 2015 according to table 2 rather than from 5.5g/100ml in 2015. In line 205, for the low sugar category the mean sugar content rose from 0.9 g/100ml (0.5-3.2g/100ml) to 4.2g/100ml (0.9-4.7g/100ml) rather than from 1.7 g/100ml to 3.2 g/100ml.

We apologise and thank the reviewer for identifying these errors- they have been corrected (lines 217 and 220-221).

6. Please provide further details on the volume sales or difference to the main results for including/excluding the 12 brands that are not sold in supermarkets.

These 12 brands represent 2% of volume sales. This figure has been added to line 305.