

## PEER REVIEW HISTORY

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### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Protocol: Systematic review of the literature on the effectiveness of product reformulation measures to reduce the sugar content of food and drink on the population's sugar consumption and health.
<b>AUTHORS</b>	Hashem, Kawther; He, Feng; MacGregor, Graham

### VERSION 1 - REVIEW

<b>REVIEWER</b>	Jack Winkler Nutrition Policy Unit UK
<b>REVIEW RETURNED</b>	10-Feb-2016

<b>GENERAL COMMENTS</b>	<p>This protocol describes a potentially important piece of research on an important subject, one that is also top of the current policy agenda. BMJ Open should definitely publish this paper.</p> <p>Let me declare my biases immediately. I share the authors' preference for nutritional reformulation as a public health policy. I also know the authors personally and respect them all greatly.</p> <p>Having said that, even at this protocol stage, the paper needs to be expanded to take account of the complexities of the subject and not mislead readers. Below I make suggestions for such supplements.</p> <p><b>VIRTUES</b></p> <p>Let me start by recognising the strengths of the paper.</p> <p>The promise of this project is that it will bring together available information on the most practical way forward to reduce our diet-related health problems. Others interested in the field should know that such a project is underway.</p> <p>Education, regulation and taxation, which have successfully yielded improvements in many areas of public health, are faced in the context of food and drink with numerous political, bureaucratic, economic, commercial and cultural obstacles. Therefore, an article which draws attention to voluntary nutritional reformulation as a health intervention is critical, not just for researchers and health professionals, but in establishing policy priorities.</p> <p>Further, given that the last government's attempts to stimulate reformulation became mired in political controversy and polemics, a sober, objective review of the evidence is just what is needed.</p> <p>The authors are fully aware that "a broader more flexible approach will be required to construct a review that remains fit for purpose while utilising a systematic methodology". Indeed. A traditional "systematic review" is impossible with food and drink. Many of my comments are invitations to the authors to elaborate on this point.</p> <p>They also opt appropriately to present a "narrative" analysis. Attempting a conventional meta-analysis would be useless.</p> <p>They are also right to include "grey" literature in their review. However, the term "grey" is inappropriate in this context. It is</p>
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	<p>commonly a form of denigration for less rigorous studies. In fact, on reformulation, industry sources are not just the primary source of information, they actually have better information than that available to any outside health researchers.</p> <p>One suggestion I would make to the authors on this point is that they expand the types of “grey” information they cover to include interviews with relevant industry personnel. Public Health England did this to good effect in its recent review of policy instruments on sugar, and the authors could follow that precedent. If they choose to do so, it would be politic not to insult key informants by implying that they have only second-grade information.</p> <p>Importantly, the authors promise to note gaps in the available information. Knowing what we do not know is critical because, for reasons clarified below, I fear there will be more gaps than findings. With that possibility in mind, I would add another suggestion—that the authors also note the numerous and differing reasons why the gaps exist. Raising awareness of the practical problems in learning about reformulation could be one of the most valuable contributions this project makes.</p> <p>This is a substantial catalogue of virtues for the paper. That is why I recommend that it should be published. But important issues remain to be addressed if readers are not to be given a false sense of certainty about the prospects for this project.</p> <p><b>ISSUES</b></p> <p><b>MEASURING THE INDEPENDENT VARIABLES:</b> Both the independent variables at the heart of this project are, for different reasons, very difficult to measure.</p> <p>(a) How much has the sugar content of products been reduced through reformulation?</p> <p>The formulation of products is normally treated as “commercially confidential” by their manufacturers. This information is not commonly disclosed publicly by companies. And declarations on labels are, as the authors recognise, an inadequate surrogate measure, for a variety of reasons.</p> <p>Further, as I know from my own research, many companies do not even maintain records of earlier formulations. So determining how much sugar has been reduced from individual products is impossible.</p> <p>Occasionally, as with the Healthy Weight Commitment programme in the US, companies may declare parts of their changes in aggregated form. But this is inadequate for the authors’ purposes. Against that background, any information the project could uncover on the extent of sugar reformulation would be extremely valuable. But the protocol, as presently written, concentrates only on “impacts”, that is, the effects of reformulation.</p> <p>Ironically, this would exclude some of the authors’ own valuable research — their periodic surveys of the content of sweet foods and drinks. This work, along with similar surveys by Which?, and by consumer organisations in other countries, is the major source of publicly available information on the sugar content of foods. And hence on the extent of reformulation. Comparing surveys on the same product categories over time is, for practical purposes, the single best way to assess how much reformulation has occurred. Such studies should be included in the review. Or, to put the point more broadly, the review should consider the extent as well as the</p>
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	<p>effects of reformulation. Lack of basic information on the extent of sugar reformulation is one of the fundamental "gaps" in our understanding. Filling it should explicitly be part of this review. My guess is that a search will not find a great deal. But that in itself is a major finding. And it is one of the reasons why the inclusion of a section on gaps and the reasons for gaps is so important.</p> <p>(b) How much less sugar do consumers eat as a result of reformulation?</p> <p>In part, this is one of the effects, the dependent variables, in this project. But the degree of reduction is also the independent variable for the health consequences of reformulation, which is the ultimate outcome with which this project is concerned.</p> <p>Leaving aside short term studies in metabolic wards, there are two commonly used measures of food intake in free-living subjects — diet surveys of individual consumption and food balance sheets for population intakes. Both are flawed, and well known to be flawed. Measuring free-living individuals' consumption of foods is extremely difficult. All dietary surveys, everywhere, rely on subjects telling researchers honestly what they eat, so-called "self report" data. But "self-report" data is well-known to be inaccurate, unreliable and variable between subjects, time periods, and foods. Commonly, people claim to eat a healthier diet than they actually do, an important pattern for a study on stigmatised nutrient like sugars. This is the problem of "under-reporting" (on which more below). There are additional problems of converting reported food intakes into intakes of individual nutrients, commonly through various compositional databases. But going into the details of that would only divert attention from the main point.</p> <p>On only two intakes do we have usable measures that are independent of self-reporting errors, that is, on which practical "biomarkers of intake" exist. These are for calories (through doubly labelled water = DLW) and salt (through 24 hour urine collections). The authors have exemplary experience with salt. But there is no equivalent biomarker for sugars.</p> <p>The relevant conclusion for this review is that studies that attempt to show an association between sugar intakes and some indicator of health or well-being will also be based on self-report data, and therefore not credible.</p> <p>Again, documenting the studies that claim to show associations, and analysing the limitations of their data, would be an extremely important finding for this project. A rigorous analysis the practical limitations of such association studies would be an important contribution to nutritional science as well as nutrition policy.</p> <p><b>UNDER-REPORTING:</b> the paper acknowledges the problem of under-reporting on p3, but in a limited way and without exploring the implications for their main project.</p> <p>First, given the appropriate prominence they give to the SACN report on carbohydrates, it is notable that they include five references on the subject, but not to SACN. The relevant paragraph is 3.5 in the final report.</p> <p>This is more than a technical or courtesy matter. In that paragraph, SACN acknowledges that the official UK figures on sugar intakes from the NDNS are wrong. They even cite the most recent DLW study showing 34% under-reporting by adults.</p> <p>But SACN asserts, correctly, that there is no rational basis for extrapolating to the true figures. So they continue to use for the rest</p>
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	<p>of their report figures on sugar consumption that they know to be wrong. And very substantially wrong.</p> <p>That may be inevitable for a government agency, but it is inappropriate in a research review such as the authors propose. Yet they, like most others in the field, report the official figures on sugar intakes as if they were an accurate representation of the real world. They are citing figures which they, and every one else, knows are wrong.</p> <p>At the very least, they should expand their proposal to discuss this issue. But more is required than that.</p> <p>The first point is to acknowledge the implications of under-reporting for the main focus of this review, the effects of reformulation. This is, to repeat the point above, that any studies of associations with health or well-being based on self-report data will not be credible. But under-reporting is also relevant to the authors' broader and more important purpose (which I share) -- to guide policy makers towards an appropriate policy response. And here they do themselves a disservice by citing figures that they know to be under-estimates. The point is that the problem of excessive sugar consumption is larger — much larger — than official figures suggest. Larger than they themselves suggest. And because official figures under-estimate the scale of the problem, they under-estimate the scale of the policy responses necessary to deal with it.</p> <p>By sticking to official intake figures, the authors make it less likely that policy makers will adopt the solution that they advocate. It is in their own interest to discuss this matter more fully in the paper.</p> <p><b>SWEETENERS:</b> in the proposal the authors describe their preferred version of sugar reformulation. This is not technically necessary to a systematic review, but is entirely understandable. It shows the authors are human. And, for the most part, I share the feeling that the strategy they describe is the best available.</p> <p>But in setting out their preferred option they include the phrase “no substitution with non-caloric sweeteners, so that the taste preference would adjust”. In this context, that wording is likely to create confusion, on two grounds.</p> <p>First, it may make some readers think that the review will not include reformulations that have used sweeteners as the means to reduce the sugar content of products. In fact, to the best of current knowledge, pending the outcome of this review, most of the significant sugar reformulations so far have involved sweeteners — intense sweeteners in soft drinks and polyols in chewing gums. Such reformulations using sweeteners must certainly be included in any review of the past. And the arrival of so-called “natural” sweeteners (stevia, monk fruit and others) suggests that they may become even more important in future, and for a broader range of food categories.</p> <p>Second, the precise phrasing risks giving the impression that the authors do not understand the technology of sweeteners. I know that they do, but this wording might suggest otherwise. And this would discredit their review in the eyes of one of their main groups of readers, the food industry.</p> <p>Incorporating sweeteners in a product is compatible with changing its taste (lowering the sweetness). With sweeteners, as with sugars, you can adjust the sweetness of the final product simply by using less. Therefore, it would be in their own interest for the authors to reword this phrase.</p>
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	<p>SUGARS v SUGARY FOOD/DRINK: while on the subject of rewriting, there is another sentence that looks like it needs to be rewritten.</p> <p>On p5, they define the type of interventions they will include as those which measured the effectiveness of a “reduction in intake of sugary food and/or drink through reformulation”.</p> <p>But prima facie this contradicts one of the virtues of their strategy (p4), that it “does not rely on consumer behaviour changes”. That is, consumers do not have to change their food choices, they do not have to eat few sugary products. The authors' preferred strategy (and mine) involves reducing sugar intake through reformulation, rather than reducing intakes of sugary foods and drinks. The wording on p5 could be improved to make this clear.</p> <p>DRINKS v FOODS: like many papers on sugar these days, the authors emphasise “sugar-sweetened drinks”. In part, this is understandable. In Britain, as in many developed countries, soft drinks are the largest single source of sugars. And they have been the object the most extensive reformulation programmes.</p> <p>Nonetheless, soft drinks still contribute only a minority of our sugar intakes. Three categories of sweet foods are also significant contributors -- confectionery, baked goods (cereals, biscuits, cakes) and dairy goods (ice cream, yoghurt, milk drinks).</p> <p>One of the most valuable contributions this review could make would be to discover new information about the extent of sugar reformulation in foods as well as drinks. Again, I doubt they will find much, but documenting the lack of information would still be useful. This is particularly important precisely now, in 2016, when new and cheaper versions of the "natural" sweeteners are about to become available. They may not be the authors' preferred solution, but one of their attributes is that they are more compatible with food reformulation than the previous generations of sweeteners. And they are being marketed for precisely this purpose.</p> <p>From selective market research information, they are already stimulating numerous new product launches of sugar-reduced foods, albeit for the most part niche products at this stage. This is a development that needs monitoring, so this review could be useful in establishing the baseline on sugar reformulation in foods, before the new "natural" sweeteners begin to have an effect on a public health scale.</p> <p>LACTOSE &amp; INTRINSIC SUGARS: the authors recognise (p3) some of the complications from the fact that the present focus on "free sugars" does not deal well with lactose and with the intrinsic sugars in fruit and vegetables. But this needs to be expanded.</p> <p>There is no current test that distinguishes these types of sugars. And neither do the current labelling requirements for "total sugars".</p> <p>One implications of this, as I know from my own research, is that it is difficult to determine the extent of reformulation in any "dairy goods". And even in any products that contain substantial (variable) amounts of fruit and vegetables.</p> <p>This not only makes research difficult. More importantly, it acts as a disincentive to manufacturers to attempt sugar reformulation when their efforts at reduction can be confounded by the presence of milk, fruit and vegetables.</p> <p>HISTORY: as in most systematic reviews, the authors have "exclusion criteria" for the evidence they will consider. This is a practical necessity to avoid being overwhelmed with data.</p>
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	<p>Hence, the proposed starting point for their review is 1990. By the standards of many reviews, that is generous. But not in the context of sugar reformulation.</p> <p>It would exclude important historical material, specifically most of the 99-year debate in the US about the effects of saccharin, on cancer and other health problems. That debate, led by the FDA, involved a great deal of relevant research -- not just about saccharin or sweeteners in general, but about the relative risks of unreduced sugar consumption as well.</p> <p>Analysis of that long saga could be invaluable for this review. More broadly, the authors would benefit from including selected historical sources in their review material. With saccharin, some of the key points have been conveniently summarised in review articles.</p> <p>The start date is also too late because aspartame, the dominant sweetener at present in the UK, was introduced here in the 1980s. Early on it was used in both yoghurts and ice creams, most of which have subsequently been withdrawn. It is important for the review to consider failed reformulations as well as successful ones.</p> <p>LANGUAGE: for understandable practical reasons, in common with many others, the authors propose to limit their search to the English language literature. But they might consider two partial supplements.</p> <p>Chinese: unusually, this review team includes a native Chinese speaker among its members. China is particularly important in the food world. So some limited scanning of Chinese language material might prove disproportionately useful.</p> <p>First, because of its large population, China is a major food consumer. And because of production constraints, it also a major food importer. Hence, China has a strong economic as well as health interest in nutritional reformulation -- in using less of expensive imported ingredients.</p> <p>Also, because of growing prosperity and consequent dietary changes, China has become particularly active in nutritional research. And the sheer scale of China's research establishment means it produces a large number of research papers. Many are in English, as even a cursory scan of nutrition journals will show. But there will be yet more in Chinese, including perhaps more specialist papers on reformulation and sugar.</p> <p>I do not mean to suggest a major addition to an already large review. But some scan of relevant key words in Chinese might provide large benefits.</p> <p>Germany: this a particularly important country for sugar reformulation because dietary advice on diabetes differs radically from the UK.</p> <p>Here, the prevailing approach is to eat a normal healthy diet. Germany has long advocated the use of specialist diabetic products -- that is, products with reduced sugar content.</p> <p>As a result, it has a much wider range of sugar-reduced foods conveniently available to consumers than the UK. And as a result, it is likely to have a more extensive information base on which to study their effects. So I would expect Germany to be a particularly rich source for the major focus of this review -- the health effects of reformulated products.</p> <p>Many German scientists are fluent in English and publish in English language journals. But there is bound to be a substantial additional literature in German.</p> <p>This may be easier to access than seems apparent. German diabetic, consumer, industry and medical associations will monitor</p>
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	<p>such German-language literature. Key personnel will almost certainly speak English, so they may be able to guide the authors to additional research papers, perhaps even provide translations, at least of abstracts. It would worth making enquiries.</p> <p><b>SUMMARY</b></p> <p>This review has included a long list of technical problems with any research on reformulation. Nonetheless, a systematic review such as proposed in this paper would be extremely valuable. It would:</p> <ul style="list-style-type: none"> <li>* draw attention, in an objective way, to the importance of reformulation as a policy option; and</li> <li>* make clear some of the practical issues with reformulation, as an antidote to the partisan simplifications that prevail at present, on both sides of the debate.</li> </ul> <p>Therefore, I think this paper should definitely be published. But the authors should expand the text to make clearer some of the complexities of the underlying research that they will be reviewing, for their readers' sake and, more importantly, as a practical guide to policy makers.</p>
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<b>REVIEWER</b>	Jimmy Chun Yu Louie The University of Hong Kong
<b>REVIEW RETURNED</b>	29-Feb-2016

<b>GENERAL COMMENTS</b>	<p>The authors presented a protocol for a systematic review examining the effectiveness of product reformulation to reduce sugar content of food and drink on the population intake of sugar and health.</p> <p>I must admit that I am not used to review a protocol manuscript, and as such some of my comments below may not be appropriate, which I believe the editors will take into account.</p> <p>While the manuscript is generally well written, there are several shortcomings:</p> <ol style="list-style-type: none"> <li>1. The protocol is not registered on PROSPERO.</li> <li>2. It would be of great benefit to the readers if a draft search strategy could be provided; also a draft data collection form would be appreciated.</li> <li>3. The PICOS question appeared too broad and there is a risk of returning too many studies, resulting in a systematic review that has no focus.</li> <li>4. On the other hand, based on my limited understanding, literature on the effect of sugar reformulation on population intake is quite limited, and hence the systematic review may be unpublishable.</li> <li>5. The authors appeared to have ignored the functionality aspects of sugar, and proposed a very simple, unrealistic approach of simple sugar removal may work for all foods as in the case of salt. While this approach may work with SSB as the authors' group have used in a recent modelling paper, this is unlikely to work in other foods where sugar provides more than just sweetness.</li> <li>6. In general, when sugar is removed, either an alternative ingredient(s) is required to replace the lost functionality and/or sweetness, or when no replacement occurs (as proposed by the authors), all remaining ingredients/nutrients 'concentrates' on a per</li> </ol>
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	<p>100 g basis. The effect of this was unknown.</p> <p>7. In my opinion the scientific rationale behind the research question is rather weak due to points #5 and 6.</p> <p>8. Overall I think the research question at hand is better tackled with a dietary modelling instead of a systematic review.</p> <p>Some other minor comments:</p> <p>1. Some of ref #10-17 refers to SSB not free sugars per se, and are inappropriate to be used to support the authors' claim.</p> <p>2. It would be of benefit to the reader if free sugars could be defined early on.</p> <p>3. ....sugars, particularly in sugar-sweetened....</p> <p>4. The WHO recommends an intake of &lt;10%E. &lt;5%E is for additional health benefits so it is different from the stance of SACN.</p> <p>5. An extra period on line 47.</p>
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<b>REVIEWER</b>	Dr Gerhard Sundborn Section of Epidemiology and Biostatistics, University of Auckland, New Zealand
<b>REVIEW RETURNED</b>	10-Mar-2016

<b>GENERAL COMMENTS</b>	<p>Dear authors, I wonder if you have considered whether to focus this systematic review solely on the sugar content on drink? (or possibly another systematic review)</p> <p>In many countries including the UK (25%) sugar sweetened beverages (SSB) are the leading single food item that contribute the largest proportion of the sugar to peoples diet. There is also evidence that SSB intake is an independent risk factor for obesity, type II diabetes and dental caries.</p>
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### VERSION 1 – AUTHOR RESPONSE

Reviewer: 1

Reviewer Name: Jack Winkler

Institution and Country: Nutrition Policy Unit UK Competing Interests: None

#### REVIEW COMMENTS FOR BMJ OPEN

J T WINKLER

on

“Systematic review of the literature on the effectiveness of product reformulation measures to reduce the sugar content of food and drink on the population’s sugar consumption and health”.

Kawther M Hashem, Feng J He, Graham A MacGregor

Thank you very much to Professor Jack Winkler for reviewing our protocol and for his thorough comments. We have summarised the key points below and provided a response to each individual point.

Query regarding ‘grey literature’

Our response: We agree with Professor Winkler that the wording ‘grey’ is not appropriate. However,



this phase has been commonly used in systematic reviews and meta-analysis and is well understood by readers. Nevertheless, we have added the following sentence to highlight the importance of this source of data. - Despite being named 'grey literature', they are an important source of information. Indeed, they may provide more useful information in some areas, such as ours.

Query regarding conducting interviews with relevant industry personnel.

Our response: We agree this would be a great addition to the review. However, this is outside the scope set out to this systematic review which is to review published literature. Also we do not have the resource to conduct this in the timescale allocated to this systematic review. But we very much hope that other academics would pursue this type of research.

Query regarding extending our research to include extent as well as the effects of reformulation.

Our response: We agree this would be a great addition to the review. However, we anticipate that would qualify for a separate systematic review and we will look into doing this in the future. Also we do not have the resource to conduct this in the timescale allocated to this systematic review.

Query regarding gaps and underreporting.

Our response: We have added a section on gaps and limitations to the protocol. Also we are fully aware of the implications of under-reporting and that the problem of excessive sugar consumption is larger than official figures suggest, so we added this to the 'gaps and limitations' section too. But we will aim to emphasis and provide detailed description of the gaps, reasons for gaps and limitations in the subsequence write up of the findings of this systematic review.

Query regarding including German and Chinese.

Our response: We agree it would be better to include non-English articles. However, it is difficult to obtain full papers for non-English journals we have therefore limited our literature search English only. It is worth noting, that many important papers even if non-English speaking researchers are often published in English. Additionally, we do not have the resource to conduct this in the timescale allocated to this systematic review.

Query regarding reference to SACN.

Our response: We have amended this in the protocol and added the correct reference.

Query regarding non-calorie sweeteners.

Our response: We have removed this sentence pending the findings of the systematic review.

Query regarding sugary food and/or drink through reformulation sentence.

Our response: We have amended the sentence to the following - any studies investigating the effectiveness of product reformulation measures to reduce the population's sugar consumption and health.

Query regarding extending the date.

Our response: We have amended the text to explain the rationale behind the choice of year. The scope of this systematic review is to review the effect of product reformulation on the population's sugar consumption and health since publications on reformulation began to increase in the early 2000, therefore setting the search from 1990 will guarantee the capture of any papers published pre 2000.

Reviewer: 2

Reviewer Name: Jimmy Chun Yu Louie

Institution and Country: The University of Hong Kong, Hong Kong Competing Interests: None declared

The authors presented a protocol for a systematic review examining the effectiveness of product reformulation to reduce sugar content of food and drink on the population intake of sugar and health.

I must admit that I am not used to review a protocol manuscript, and as such some of my comments below may not be appropriate, which I believe the editors will take into account.

While the manuscript is generally well written, there are several shortcomings:

1. The protocol is not registered on PROSPERO.
2. It would be of great benefit to the readers if a draft search strategy could be provided; also a draft data collection form would be appreciated.
3. The PICOS question appeared too broad and there is a risk of returning too many studies, resulting in a systematic review that has no focus.
4. On the other hand, based on my limited understanding, literature on the effect of sugar reformulation on population intake is quite limited, and hence the systematic review may be unpublishable.
5. The authors appeared to have ignored the functionality aspects of sugar, and proposed a very simple, unrealistic approach of simple sugar removal may work for all foods as in the case of salt. While this approach may work with SSB as the authors' group have used in a recent modelling paper, this is unlikely to work in other foods where sugar provides more than just sweetness.
6. In general, when sugar is removed, either an alternative ingredient(s) is required to replace the lost functionality and/or sweetness, or when no replacement occurs (as proposed by the authors), all remaining ingredients/nutrients 'concentrates' on a per 100 g basis. The effect of this was unknown.
7. In my opinion the scientific rationale behind the research question is rather weak due to points #5 and 6.
8. Overall I think the research question at hand is better tackled with a dietary modelling instead of a systematic review.

Some other minor comments:

1. Some of ref #10-17 refers to SSB not free sugars per se, and are inappropriate to be used to support the authors' claim.
2. It would be of benefit to the reader if free sugars could be defined early on.
3. ....sugars, particularly in sugar-sweetened....
4. The WHO recommends an intake of <10%E. <5%E is for additional health benefits so it is different from the stance of SACN.
5. An extra period on line 47.

Thank you to Jimmy Chun Yu Louie for your very helpful comments. We have provided a response to each individual points below.

1. We registered the protocol on PROSPERO on 07/02/2016, reg number: CRD42016034022.
2. An example of the search strategy has been included. We are still formulating the data collection form but brief draft has been added as a supplementary file.
- 3-4. From pilot searches we anticipate that there will be at least 4 studies that will be included in the systematic review. We believe that over the last few years there has been an increase in research on reformulation and this systematic review aims to collate all this. Therefore, we hope that it will be publishable and this will be beneficial to the nutrition public health field and academics in this area.
- 5 -7. We acknowledge the functionality aspects of sugar. Therefore, we have amended the protocol with the following – However, a major difference to salt reformulation is that the sugar content does contribute to the weight or volume of the product (although not in liquids). Therefore a reduction in

sugar content in solid products can be achieved by reducing the portion size, although this does not mean people will necessarily eat less overall. However, it is possible to substitute sugars with polyols or insoluble fibres that are not metabolised or absorbed. Liquid products can have the sugar reduced without affecting the volume, e.g. sugar-sweetened drinks.

8. There have been several dietary modelling studies and this systematic review will aim to collate this research along with any intervention studies.

1. We have amended the introduction section with an emphasis that the evidence is focused on the sugar-sweetened soft drinks. - It is recognised that excessive consumption of free sugars, particularly in the form of sugar-sweetened soft drinks, is associated with these conditions.

2-3. We have also moved the definition of free sugars to appear earlier in the introduction. We amended the text to state that the SACN recommendation is in line with the World Health Organisation's new conditional guideline on free sugars intake.

4. We have removed the extra period.

Reviewer: 3

Reviewer Name: Dr Gerhard Sundborn

Institution and Country: Section of Epidemiology and Biostatistics, University of Auckland, New Zealand

Competing Interests: None declared

Dear authors, I wonder if you have considered whether to focus this systematic review solely on the sugar content on drink? (or possibly another systematic review)

In many countries including the UK (25%) sugar sweetened beverages (SSB) are the leading single food item that contribute the largest proportion of the sugar to peoples diet. There is also evidence that SSB intake is an independent risk factor for obesity, type II diabetes and dental caries.

Our response: Thank you to Dr Gerhard Sundborn for your very helpful comments. We considered focusing this systematic review on reformulation of drinks but anticipate that there are some, even limited, studies on food reformulation and it would be beneficial to capture this research too.

Depending on the findings we will split the findings into food and drinks since we acknowledge that reformulation of food will be different to reformulation of drinks.