

What can the food and drink industry do to help achieve the 5% free sugars goal?

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Abstract

Aims: To contribute evidence and make recommendations to assist in achieving free sugars reduction, with due consideration to the broader picture of weight management and dietary quality.

Methods: An expert workshop in July 2016 addressed options outlined in the Public Health England report 'Sugar reduction: The evidence for action' that related directly to the food industry. Panel members contributed expertise in food technology, public health nutrition, marketing, communications, psychology and behaviour. Recommendations were directed towards reformulation, reduced portion sizes, labelling and consumer education. These were evaluated based on their feasibility, likely consumer acceptability, efficacy and cost.

Results: The panel agreed that the 5% target for energy from free sugars is unlikely to be achievable by the UK population in the near future, but a gradual reduction from average current level of intake is feasible. Progress requires collaborations between government, food industry, non-government organisations, health professionals, educators and consumers. Reformulation should start with the main contributors of free sugars in the diet, prioritising those products high in free sugars and relatively low in micronutrients. There is most potential for replacing free sugars in beverages using high-potency sweeteners and possibly via gradual reduction in sweetness levels. However, reformulation alone, with its inherent practical difficulties, will not achieve the desired reduction in free sugars. Food manufacturers and the out-of-home sector can help consumers by providing smaller portions. Labelling of free sugars would extend choice and encourage reformulation; however, government needs to assist industry by addressing current analytical and regulatory problems. There are also opportunities for multi-agency collaboration to develop tools/communications based on the *Eatwell Guide*, to help consumers understand the principles of a varied, healthy, balanced diet.

Conclusion: Multiple strategies will be required to achieve a reduction in free sugars intake to attain the 5% energy target. The panel produced consensus statements with recommendations as to how this might be achieved.

INTRODUCTION

In 2015, the World Health Organization (WHO) issued a strong recommendation that free sugars should not provide more than 10% of energy intake, with a conditional recommendation for further reduction to 5% of energy intake, based on low-quality evidence suggesting increased risk of dental caries.¹ In the United Kingdom, following a comprehensive review on *Carbohydrates and Health*, by the Scientific Advisory Committee on Nutrition (SACN),² Public

Health England (PHE) adopted a new dietary guideline to restrict free sugars consumption to less than 5% of the total energy intake. This will be challenging for industry and for most consumers, and also for health professionals communicating this message in the context of other nutritional considerations. The previous UK guideline for the broadly similar category of non-milk extrinsic sugars (NMES) was 10% of total energy (or 11% of food energy),³ and current intakes are still well above this level.⁴

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A comparison of sugar intakes in the 1990s with data collected more recently between 2008 and 2012 showed that NMES have decreased in all age groups except elderly women.⁵ Reductions in sugar-sweetened beverages have been seen in young children in particular. Reductions in table sugar and confectionery have been seen in all age groups.

The PHE 2015 publication 'Sugar reduction: the evidence for action'¹ addressed the changes required to reduce intake of free sugars further,⁶ drawing guidance from a previously commissioned project⁷ which had identified ways in which free sugars consumption could be reduced. Such changes included the following:

- Producing/importing less;
- using less;
- selling less;
- marketing less;
- recommending less;
- eating less.

PHE then generated the following series of eight action points to form the basis of the strategy on sugar reduction:

1. Reduce and rebalance the number and type of price promotions in all retail outlets.
2. Significantly reduce opportunities to market and advertise high-sugar foods and drinks.
3. The setting of a clear definition for high-sugar foods (to aid with 1 and 2 above).
4. Introduction of a broad, structured and transparently monitored programme of gradual sugar reduction in everyday foods and drinks.
5. Introduction of a price increase of a minimum of 10%–20% on high-sugar products through a tax or levy, such as on full/mid-sugar soft drinks;
6. Adopt, implement and monitor the government buying standards for food and catering services across the public sector.
7. Ensure that accredited training in diet and health is routinely delivered to all of those who have opportunities to influence food choices.

8. Continue to raise awareness of concerns around sugar levels in the diet to the public as well as health professionals, employers, the food industry and so on.

The aim of the expert workshop and this paper was to contribute evidence and make recommendations on the most likely options for achieving free sugars reduction at a population level. During the preparation of this paper, the UK government published a childhood obesity plan⁸ which challenged all sectors of industry to reduce sugar across a range of products by at least 20% by 2020, including a 5% reduction in Year 1. This requires the cooperation and collaboration of other stakeholders, including industrial partners. Specific targets are currently being discussed according to what may be feasible for different categories of food and drink.

METHODS

A roundtable structured workshop was convened in London on 18th July 2016 to review the implications of the 5% free sugars target and to make recommendations for future actions. The five expert panel members were selected for their range of disciplines and independence. The project was designed, planned and facilitated by two independent nutrition consultants (SG and MA). All seven participants are authors of this paper.

In refining the scope of the workshop and the areas to be discussed, it was decided that two of the eight action points outlined by PHE were more relevant than others to the food industry. These were options 4 and 8. These focussed on gradual sugar reduction via reformulation, new product development and reducing portion sizes of high-sugar foods or drinks to help consumers control consumption (option 4) and awareness-raising through labelling and communication (option 8).

An initial questionnaire explored panel members' views on how free sugars reduction should be targeted, priorities for reformulation and how else the industry could help. It also explored

knowledge gaps due to lack of adequate evidence base.

In preparation for the workshop, members of the panel developed five fact sheets that focussed on possible recommendations based on the selected options.

1. Physical replacers for free sugars;
2. high-potency sweeteners (HPS);
3. portion size reduction;
4. voluntary labelling of free sugars;
5. promoting the *Eatwell Guide*.

The fact sheets were circulated prior to the workshop and panellists were asked to rate each option on four criteria (feasibility, efficacy, cost and acceptability to consumers) on a scale of 1–5 as follows:

- 5 = no problems/very effective/acceptable, low cost;
- 4 = minor problems easily overcome/effective/reasonable cost and acceptability;
- 3 = problems but possible/somewhat effective/acceptable, relative cost neither high nor low;
- 2 = major problems/low effectiveness/acceptability, high cost;
- 1 = impossible/ineffective/unacceptable/very high cost.

At the workshop, the panel discussed each recommendation in turn in relation to the four criteria.

In the case of the first two recommendations (sugar replacement either physically or using HPS), the panel also explored the feasibility of use in different products (beverages, baked goods, breakfast cereals, confectionery, desserts).

The panel decided to produce an overall comparison of the five recommendations, based on the likelihood of them succeeding in terms of the four criteria:

- High (the best likelihood of success);
- moderate (not the worst and not the best likelihood of success);
- low (the worst likelihood of success);
- mixed (situations where there could be differing consumer opinions).

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Box 1. Regulatory constraints relevant to sweeteners and substitute sugars.

The use of sweeteners and substitute sugars is strictly regulated in the legislation on permitted use of additives under European Union (EU) Regulation 1333/2008 (see Appendix for summary).

Permitted use depends on the food category or categories into which the product falls. Guidance on what products fall under which category can be found on the EU Commission website (Annex II, Part D). For cakes, biscuits and pastries, this may involve more than one category. Most importantly, in the context of free sugars reduction, there are labelling requirements for foods with added sweeteners where use must be indicated (e.g. 'with sweeteners'). Article 7 of the regulation states that sweeteners can only be used for the production of energy-reduced food or food with no added sugars or non-cariogenic food. These claims are defined in EU Nutrition and Health Claims Regulations 1924/2006. Energy-reduced claims may only be made where the energy value is reduced by at least 30%, and so sweeteners cannot be used to reduce energy by less than 30%.

Box 2. Regulatory constraints relevant to bulk replacers for sugars.

A regulatory assessment is needed before polyols are used in products as they are not permitted for use in all categories of foods. Polyol use restrictions are summarised in Group IV of the additive regulation (above). They are generally permitted only if there is 30% reduction in energy compared with the original food or a similar product or in the case of 'no added sugar' (no added monosaccharides or disaccharides). Exceptions include foods for special medical uses, diet replacers (Regulation 609/2013), sauces and table-top sweeteners.

Other bulk replacers for sugars include polydextrose (E 1200), celluloses/resistant starches and other dietary fibres, such as sucromalt and inulin/fructo-oligosaccharides.

A laxative warning is required for products containing more than 10% polyols by weight. Article 35 of EU Regulation 1169/2011 on the provision of food information to consumers (EUFIIR).

Finally, they discussed the sustainability of each recommendation, that is, whether its future was likely to be assured or under threat.

For each recommendation, at least one draft consensus statement was generated, and then this was finalised by correspondence after the workshop.

RESULTS AND DISCUSSION

Regulatory considerations

The panel believed it was important to note that some of the action points and their solutions for reducing free sugars are subject to regulatory constraints, summarised below (Boxes 1 and 2).

Physical replacers for free sugars

In many foods, the bulk provided by sugar needs to be replaced for technological reasons in order to provide the required texture, consistency, stability, preservation, freezing point depression and flavour. Hence, where sugar has functional roles other than providing sweetness, reducing the amount in the recipe can be challenging. Table 1 summarises the deliberations and conclusions of the panel:

HPS

HPS (also referred to as intense sweeteners, non-nutritive sweeteners or low-calorie sweeteners) are food additives which substitute sugar's sweetness while contributing significantly less food energy. Most HPS are synthetic, although steviol glycosides are derived from a natural source – the stevia leaf. The HPS now commonly used in Europe are acesulfame-K, aspartame, neotame, saccharin, sucralose and steviol glycosides (high-purity stevia leaf extract).

The use of intense sweeteners is permitted only in certain product categories, and the maximum doses allowed are specified under EU Regulation 1333/2008.

HPS are typically used in low/lower calorie soft drinks, desserts, dairy products, confectionery, chewing gums and powdered milk-based drinks. Most are also available as table-top sweeteners, which are used in tea and coffee or for adding to other foods, such as fruit and breakfast cereals.

Table 2 summarises deliberations and conclusions of the panel.

Portion size reduction

Food and drink portion sizes affect how much is consumed,^{15,16} and there is a cumulative effect when larger portions are served repeatedly.¹⁷ This occurs because there is no precise energy balancing by the body,¹⁸ coupled in part with a tendency to eat all or almost all of the food on our plate.¹⁹ There is ample evidence that portion sizes of many foods, including packaged foods and foods served in the home and in the out-of-home (OOH) sector, have increased since at least the 1990s.²⁰ However, more recently, the portion sizes of packaged goods such as confectionery have been reduced (for economic reasons), prompting some adverse consumer reaction. Reversing the previous trend of larger portions could significantly reduce overall energy intake, including sugar intake, and thereby reduce risk of overweight and obesity.¹⁵ Table 3 summarises deliberations and conclusions of the panel.

Voluntary labelling of free sugars

Consumers need to know what is in products in order to reduce their sugar

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Table 1 Physical replacers for free sugars: consideration of their feasibility, cost, efficacy and acceptability

Feasibility in products	Cost	Efficacy in achieving 5% free sugars in diet	Likely consumer acceptance
Polyols, alternative sugars, inulin/FOS, novel soluble fibres and modified starches can fulfil many of sugar's functional roles. Technologies are being developed using water and fibre to dilute sugars via alternative ingredients, such as gel particles, fruit pulp/fibres, micro-crystallisation, limit dextrins, resistant starch and other fibres. Polyols are used in reduced-sugar confectionery and preserves, but adverse effects limit use and require laxative warning labels above 10% w/w. The optimum solution is replacement of added sugars with a combination of polyols to provide sweetness and dietary fibres to replace bulk.⁹ Baked goods and breakfast cereals present the most difficult category for replacing sugars without compromising eating experience, because palatability and texture are important.	Development and marketing costs are high with any new product and particularly with nutritionally modified versions. Many standard products do not have a high profit margin, and therefore, the additional development, manufacturing, ingredients and marketing costs may be crucial to viability.	Replacers vary in energy content relative to sugars.^a Hence, efficacy is highest with non-digestible fibre and minimal with starch or other carbohydrates. In high-fat foods (cakes, biscuits, pastries, puddings and chocolate), reducing or replacing sugars can even increase energy density (kcal/100 g). Overall, bulk replacers may have a modest effect on free sugars intakes and a smaller effect on energy intakes. However, widespread use across many categories could help lower free sugars intake, especially for high consumers.	Case studies exist where reduced fat in products (confectionery and biscuits) has been rejected by consumers on taste grounds. Previous attempts to claim 'reduced sugar' in breakfast cereals has met with consumer disappointment that the energy content was not reduced as well. Apart from taste being their overriding concern, consumers like simple, natural ingredients and clean transparent labelling. The use of sugar replacers makes this challenging.

FOS: fructo-oligosaccharides.

^aEnergy content: sugars, 4 kcal/g; starch, 4 kcal/g; polyols, 2.4 kcal/g (erythritol 0 kcal/g); dietary fibre and resistant starch, 2 kcal/g; polydextrose <1 kcal/g.

Table 2 High-potency sweeteners (HPS): consideration of their feasibility, cost, efficacy and acceptability

Feasibility in products	Cost	Efficacy in achieving 5% free sugars in diet	Likely consumer acceptance
HPS are technologically feasible replacers of sweetness, but there are serious regulatory hurdles. HPS are permitted only where 30% reduction in energy or 'no added sugar' is achieved. There are exceptions, for example, medical/diet foods, fruit/vegetable preserves in vinegar, oil, brine, preserved fish and mustards. All HPS are restricted to individual maximum use levels. There are also restrictions by category. HPS can be used in breakfast cereals, but only if they are energy reduced/no added sugar AND 15% fibre AND 20% bran. In the fine bakery wares category, only wafers and products for special nutritional purposes are permitted to use HPS. HPS are not permitted in infant foods.	All synthetic HPS are significantly cheaper than carbohydrate sweeteners. Natural sweeteners such as steviol glycosides tend to cost about the same as sugar.	HPS can facilitate substantial reductions in added sugar intake¹⁰ and help to reduce energy when used in place of higher energy ingredients.^{11,12} They are most effective in beverages. Systematic review and meta-analyses show that use of HPS helps to reduce energy intake.^{13,14} However, users invariably compensate to some degree so that energy reduction never reaches the theoretical maximum.¹⁴ The determinants and time course of compensation need to be explored further as they are crucial to the question of HPS effectiveness in a real-world situation.	Most consumers accept sweeteners and choose their sweetener on taste. Some consumers do not like HPS because they consider them 'artificial' and distrust the extensive evidence supporting their safety, even at levels well in excess of likely use. The growth in natural HPS such as stevia should help to overcome these concerns, but taste will be paramount. Sugar blends with natural HPS might be the answer.

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Table 3 Portion size reduction: consideration of feasibility, cost, efficacy and acceptability

Feasibility in products	Cost	Efficacy in achieving 5% free sugars in diet	Likelihood consumer acceptance
Serving less of the same (i.e. unaltered) food or drink is straightforward. The challenge for reducing portion size is maintaining the acceptability of the product or meal to the consumer. One approach might be to add non- or low-calorie ingredients that increase the feeling of fullness (e.g. non-starch polysaccharides). Feeling full, however, may not be intrinsically rewarding,¹⁸ so it may be better to compensate by increasing the 'quality' of the food and therefore the pleasure of eating it by, for example, increasing the taste/flavour/texture variety and/or intensity. Decreasing energy density of high energy-dense products may be less noticeable in terms of loss of reward value, than in low-energy-dense products.	Changes in manufacturing (equipment, labels, etc.) incur costs, but there may be long-term savings in producing, packaging and transporting smaller portions. However, the savings are likely to be small compared with the overall price of the item. The cost of compensating consumers by increasing product quality would likely significantly outweigh the saving achieved from producing the smaller portion.	Effectiveness of reducing portion size will be determined largely by the extent to which compensatory behaviours occur. Reducing portion size reduces the 'reward value' of the item. Consequently, large reductions in portion size might lead to two portions being consumed or one portion consumed with supplementary items. The extent of compensatory eating is likely to be greatest at or soon after the meal or snack occasion in question.^{18,21}	There is the risk of losing sales with a smaller portion, which is likely to be perceived to be poor value for money by consumers and the media. However, products with low or reduced sugar might be attractive to some consumers. For others, improved food quality and pleasure might be more important than portion size.^{22,23} Changes by stealth might be easier to achieve in the OOH sector, where portion sizes tend to be larger²⁴

OOH: out-of-home.

intake consciously. Although this is feasible for total sugars, labelling of free sugars poses much more of a problem.

Since there can never be an analytical method for free sugars, a clear definition and method for estimation are paramount. The working definition produced by PHE can be currently summarised as follows:

Free sugars include all monosaccharides and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and unsweetened fruit and vegetable juices and purees. (PHE, personal communication, 19th September 2016)

A more detailed definition and set of working principles is being developed to allow free sugars content of composite foods to be estimated.²⁵ The following represents the current classification discussed by SACN working group on

carbohydrates in June 2016 (<http://bit.ly/29DZWn2>):

Included in free sugars:

All added sugars in whatever form (this includes honey and syrups);

All sugars in fruit and vegetable juices, in smoothies and in milk substitutes;

All sugars in fruit puree and jams.

Excluded from free sugars:

Sugars in fresh, frozen, stewed, canned and dried fruit and vegetables;

Milk sugar (lactose) naturally present in milk and dairy products;

Sugars naturally present in small amounts in cereal grains, nuts and seeds unless consumed as a drink (see above).

The WHO defines free sugars as 'monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and

sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates'. Hence, the only difference between the WHO definition and the UK definition is that the latter includes fruit and vegetable purees and also vegetable juices.¹ Table 4 summarises the deliberations and conclusions of the panel.

Promoting the Eatwell Guide

The *Eatwell Guide*²⁹ is a practical tool that encompasses all dietary guidelines and encourages a holistic approach to nutrition rather than a focus on a single nutrient. This is helpful in the current environment as interest, particularly in the media, has focussed primarily around free sugars with little regard to other important issues (e.g. fibre, micronutrients). The *Eatwell Guide* was published by PHE in March 2016 as an update to the former Eatwell Plate, triggered by the need to revise the model due to the adoption of new dietary recommendations for free sugars and dietary fibre.² The angles of the

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Table 4 Voluntary labelling of free sugars: consideration of feasibility, cost, efficacy and acceptability

Feasibility in products	Cost	Efficacy in achieving 5% free sugars in diet	Likely consumer acceptance
The major technical hurdle is that there would need to be an accepted definition and method to allow calculation of free sugars, given that there is no analytical method. There are also regulatory hurdles: Claims, such as low sugars, can currently only be made for total sugars, not free sugars, because this area is covered by European Union (EU) legislation where the reference intake (RI) for total sugars is given as 90g per day²⁶ The UK Front of Pack labelling scheme also bases its sugars labelling on total sugars.²⁷ The United Kingdom's decision to leave the European Union might give greater flexibility to determine what information should be presented on packaged food and how it should be displayed.⁸ There is a precedent (although for added sugars) in the recently revised Nutrition Facts label in the United States.²⁸	There would be costs of re-labelling products according to this voluntary labelling scheme.	Traffic-light and front of pack labelling can be an incentive for companies to reformulate for a competitive advantage.²⁷ However, this will depend if the thresholds are achievable. For consumers who are motivated, labelling provides the information necessary to compare and select products. Labelling information does not benefit all consumers; some do not use labels, others may find lower sugar content less appealing. For salt, it is uncertain how much of the successful reduction in intake is due to consumers using labels to choose less salty foods, versus a general reduction in salt content across categories.	Based on consumer liking of the UK Front of Pack labelling scheme, consumer acceptance would be high.²⁷

segments were derived using optimisation modelling, which aims to select the combination of foods which meets recommendations for carbohydrates, free sugars, fat, saturated fat, protein, salt, fibre, fruit and vegetables, fish and red/processed meat. Although the model was designed to produce a solution with the smallest change to the total population diet, the changes proposed are major and unprecedented in recent history.^{30,31} A limitation is the lack of guidance on portion size or frequency of consumption. The British Nutrition Foundation has disseminated the guide to schools on behalf of PHE. Table 5 summarises the deliberations and conclusions of the panel.

SEMI-QUANTITATIVE ASSESSMENT OF THE PANEL'S RECOMMENDATIONS

The panel attempted to make an overall assessment of their five

recommendations. None in isolation was thought to be able to achieve the 5% free sugars energy target. Rather, all could help in reducing free sugars. Table 6 shows that the use of HPS and the promotion of smaller portion sizes were thought to be the most likely recommendations to help reduction of free sugars across the whole population, but even these have some hurdles to overcome.

SUSTAINABILITY

No recommendation is worth pursuing if it is not likely to be sustainable for the long term. Apart from the issues discussed above, the Panel also considered how their recommendations might fare in the future. Table 7 summarises these discussions.

CONCLUSION

This expert panel workshop was focussed on assessing the best options

where industry could play a role in helping to reduce intakes of free sugars in the UK population. Taking our remit from the issues identified by PHE, we selected action points that were of greatest relevance to industry. Of the five recommendations generated, taking into account their feasibility, cost, effectiveness and likely consumer acceptability, those with greatest potential in helping consumers reduce their free sugars intake are the following:

- Wider use of HPS;
- a gradual reduction in portion sizes of food and drinks high in sugars but relatively low in micronutrients.

We hope that this review will improve understanding of the practical issues of reducing free sugars, stimulate further contributions and encourage collaboration between industry, government and other organisations with a commitment to better public health.

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Table 5 Promoting the *Eatwell Guide*: consideration of feasibility, cost, efficacy and acceptability

Feasibility	Cost	Efficacy in achieving 5% free sugars in diet	Likely consumer acceptance
Sectors whose products are encouraged are most likely to promote the <i>Eatwell Guide</i>. Industry-wide collaboration (including retailers and OOH sector) would help consistent messaging. Manufacturers of high-sugar foods may be less inclined but could contribute to important messaging on frequency of treats and smaller portions.	The <i>Eatwell Guide</i> is easily available and costs would relate to the specific materials/resources developed.	Food-based dietary guidelines may improve knowledge about diet and health, but this may not always translate to dietary behaviour change. Food-based dietary guidelines have been available in the United Kingdom for the last 20 years (since the Balance of Good Health in 1995), yet few adults are adopting an eating pattern reflective of the previous recommendations.³² Modelling suggests that the new sugar and fibre guidelines make the totality of recommendations even harder to achieve.³³	The <i>Eatwell Guide</i> has been developed with some consumer testing in adults primarily from low socio-economic groups, which should help with its understanding. However, the proportions in the guide represent a large change from current dietary patterns, such as greater than 50% reduction in sugary foods, meat and poultry, and more than 50% increase in starchy foods and fruit and vegetables.³¹

OOH: out-of-home.

Table 6 Semi-quantitative summary of the panel's recommendations

	Feasibility	Economic viability	Efficacy in reducing free sugars	Likely consumer acceptance
Physical replacers for free sugars	Low	Low	Low	Low
High-potency sweeteners	High	High	High	Mixed
Portion size reduction	High	Moderate	High	Moderate
Voluntary labelling of free sugars	Low (currently)	Moderate	Moderate	high
Promoting the <i>Eatwell Guide</i>	Moderate	Low/Moderate	Moderate	High

During the workshop, the panel decided to produce an overall semi-quantitative comparison of their opinions of the five recommendations, based on the likelihood of them succeeding in terms of the four criteria in the following way: (1) low (the least likelihood of success), (2) moderate (not the least and not the best likelihood of success), (3) high (the best likelihood of success) and (4) mixed (situations where there could be differing consumer opinions).

CONSENSUS STATEMENTS

General

- The role of the food industry is to provide foods and drinks that are safe, legal, correctly described and responsibly marketed. Significant sums are invested in new products and processes to improve quality, healthiness, sustainability or affordability.
- The new dietary target of 5% energy from free sugars is unlikely to be

achieved at a population level in the near future. Modelling shows that it would require major changes in typical dietary patterns that are unlikely to be adopted by most consumers. However, reducing intakes of free sugars from current levels is feasible over the longer term, although progress requires collaborations between government, non-government organisations

(NGOs), manufacturers, the OOH sector, retailers, service providers, health professionals, educators and consumers.

- We recommend that the food and drink industry should copy the example of leading manufacturers who have a programme for gradual sugar reduction in products. Priority should be directed towards the largest contributors of sugars in the

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Table 7 Long-term sustainability for the five recommendations

	Future assured?	Future under threat?
Physical replacers for free sugars	It is likely that there will continue to be a demand for sweet foods such as cakes, biscuits and confectionery. Industry is continually innovating to offer new products (or healthier versions of old products) that taste good and fit consumer lifestyles. Reformulation could see consumers benefit in terms of health (provided substitutes are lower calorie, less cariogenic, or higher in fibre). Reformulation may improve consumer trust and provide opportunities to communicate wider nutritional attributes.	Policy-makers and health professionals would like high-sugar foods to be treats rather than everyday items. The market for this category may decline if consumers become more health conscious. Higher costs of ingredients, plus research and marketing costs could reduce industry profits and prove unsustainable. The impact on health equalities could be negative if low-income groups avoid reformulated products and choose traditional versions, while high-income groups select healthier options. Obesity reduction and other health benefits would be negligible if reformulation does not change energy content or consumers compensate by increasing consumption of the product.
High-potency sweeteners	There are no sustainability problems with synthetic HPS. Costs are likely to remain significantly lower than sugar. Safety issues are well covered by regulatory framework. Steviol glycosides or other natural sweeteners, especially in blends with sugars, may offer an option to those consumers who reject synthetic ingredients. UK government advice currently suggests low-calorie drinks as a suitable replacement for high-sugar drinks.²⁹	Some consumers have an irrational fear of the synthetic HPS and will always opt for sugar-sweetened products that they consider to be the natural option. Manufacturers of HPS will need more scientific evidence to overcome consumer concerns. Studies may emerge in the future suggesting adverse effects. The UK government could change their advice away from low-calorie drinks to discouraging 'sweetness' in general. This is the position taken by the Scientific report of the US Dietary Guidelines advisory committee, which states, 'added sugars should be reduced in the diet and not replaced with low-calorie sweeteners, but rather with healthy options, such as water in place of sugar-sweetened beverages'.³⁴
Portion size reduction	Early portion size reduction could be reinforced over time as smaller portions (or even lower sweetness) become the 'norm', in the same way that larger portions have become normal.³⁵ Some research suggests that enhancing eating pleasure could substitute for size to help people choose smaller portions.^{22,23}	Efforts towards portion size reduction could be undermined by media criticism of industry profiteering. Some manufacturers may offer large portions claiming greater value for money and/or greater satisfaction. Government incentives or disincentives, fiscal or otherwise, supporting portion size reduction might be required to prevent this.
Voluntary labelling of free sugars	Industry could already be using a scheme if EU legislation changes to permit labelling of free sugars. New product development could be based on this scheme. In fact, the United Kingdom's decision to leave the EU might present more flexibility in labelling.⁸	European Commission (EC) might not go down the free sugars route for many years, and so UK industry could be at disadvantage to other EU companies. If EC eventually decided on a reference intake for free sugars, this might differ from that agreed by industry.
Promoting the <i>Eatwell Guide</i>	Awareness of the new model will rise with continued use, and it is likely that the guide will be central to dietary advice provided by health professionals, as well as to dietary information in schools.	The guide is developed on current UK dietary advice (2015). Although there are unlikely to be changes soon, media criticism of current guidelines could cause changes and new consensus on scientific evidence might warrant changes, for example, the ongoing SACN review of fatty acids will be available in 2017/2018.

HPS: high-potency sweeteners; EU: European Union; SACN: Scientific Advisory Committee on Nutrition.

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diet, and particularly to products relatively low in micronutrients.

- Furthermore, we recommend that industry should work in collaboration with government and NGOs to raise awareness of what free sugars are, to understand the need to reduce free sugars in the diet and to give advice on how to achieve this in the wider context of a healthy, balanced diet and lifestyle.

Reformulation using physical replacers for sugars

- In addition to providing sweetness in foods and drinks, sugar has multiple technical functions. Sugar reduction is more feasible for some categories than others; for example, polyols are now widely used in confectionery, but there are practical and regulatory limitations on their use because of gastrointestinal effects. Replacing free sugars in baked goods is more problematic as none of the bulk materials that can replace sugar (sucrose) behave and taste exactly like sugar. Costs of development, manufacturing and marketing are high and new or reformulated products will normally be more expensive for consumers. The additional ingredients listing can go against consumer preference for simple and transparent ('clean') labels and products that appear 'natural' and 'authentic'.
- In many categories (cereal products, confectionery, desserts), the energy reduction achieved with sugar replacement would be minimal because of the additional energy provided by the other carbohydrates replacing free sugars. This conflicts with consumer expectations. Examples include reduced-sugar breakfast cereals and digestive biscuits. Reducing free sugars content without lowering energy content would also be contrary to other industry and public health initiatives.
- Unless major technological advances are forthcoming, we believe the food industry will find sugar replacement with physical replacers difficult in many products. Energy reduction is

likely to be modest and the barriers of higher costs, consumer preference for clean labels and regulatory restrictions on use will probably prove prohibitive.

Reformulation using HPS

- Consumers' preference for sweetness is innate and difficult to modify. Hence, the low-sugar products which have best consumer acceptance are those that achieve a taste profile very similar to sugar-containing products by using one or more HPS. Their main application is in soft drinks where substantial reductions can be and have been achieved. As soft drinks contribute around one-third of free sugars intake overall, this option is likely to be very effective, especially in older children and high consumers. Availability, promotion and demand for low/no sugar soft drinks are largely responsible for the fall in sugar intakes among younger children over the past 20 years. There are also successful examples of covert reduction.
- There is substantial evidence from intervention trials that replacing sugar-sweetened beverages with beverages sweetened with HPS results in a reduction in energy intake and modest weight loss, even if some energy compensation occurs.
- HPS use could be more widespread if regulatory hurdles were removed to allow smaller reductions in free sugars content. Current legislation restricts use of HPS to products with no added sugar or greater than 30% reduction in energy compared to the original or similar product (EC Reg. 1333/2008). This denies industry a 'stealth' path to free sugars reduction which has been so successful for salt reduction.
- The UK government already sees HPS as a way forward, but more positive endorsement for them would help overcome consumer concerns, particularly regarding synthetic sweeteners. Sweeteners of natural origin such as stevia, especially in blends with sugars, offer another way

forward. We recommend that industry works with UK government to reassure consumers and overcome regulatory hurdles. This would allow opportunities to expand the range of products on offer that use HPS.

Reducing portion sizes

- Reducing portion size is an obvious and feasible way to lower sugar consumption, provided there is no temptation for the consumer to eat more portions. This would involve a reversal of the industry trend in recent decades towards supersizing products, supersizing serving sizes and promotions such as 'buy one get one free'.
- Consumers are likely to expect a benefit in price or quality of products as a trade-off to reduced size, or they will feel dissatisfied. Costs may not be reduced due to additional manufacturing and marketing expense.
- A gradual reduction in portion size is likely to be more acceptable to consumers than sudden changes, and some sectors of the industry have already done this. Categories where this is already taking place and with highest potential include treats such as confectionery and ice cream and also foods where current serving sizes are large, such as soft drinks. Industry might see this as opportunity for the development of premium products.
- Industry-wide agreement may be needed to avoid losing out to competitors. We recommend that Industry works with UK government to set up research studies on consumer reactions to reduced portion sizes and to determine which factors may determine any 'tipping points' beyond which consumers increase their serving size or reject products. This could lead to guidance on suitable portion sizes that is not available now.

Voluntary labelling of free sugars

- Labelling to show the free sugars content on packaging could be

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helpful to consumers, as a supplement to the existing information on total sugars. In the United States, the new Nutrition Facts label will include added sugars (a slightly different definition to free sugars).

- However, labelling of free sugars is currently not feasible. There is no analytical method to measure these in products; there is no EFSA reference intake (RI) and the claim regulations are couched in terms of total sugars. If these barriers could be overcome, feasibility to introduce free sugars labelling is high. If labelling of free sugars became possible, we would encourage industry to use it.
 - The effect of providing information via labelling on consumer behaviour needs more research. There is evidence that health-conscious groups use labels more than target groups (high consumers), but reliable data on consumption effects are more scarce.
 - In addition to effects on consumer purchases, labelling may also drive industry reformulation (based on the precedent of the effect of traffic light (TL) labelling on front of pack).
 - Costs would initially depend on the agreed definition of free sugars and the method of estimation. After that, there would be labelling and packaging costs. We recommend that industry works with UK government to agree a definition and method of estimation and to agree a simple RI for adults.
- recommendations and guidelines for macronutrients, fibre, fruit and vegetables, fish and also micronutrients. Food high in free sugars are outside the main guide (consume less often/in small amounts). Beverages are recommended to be low/no calorie, and fruit juice is limited to 150 mL/day.
- Industry could develop self-evaluation tools based on the guide (either web-based or apps). The current UK government-created Sugar Smart app (within the Change4Life programme) aims to help consumers calculate their free sugars intake but is currently based on total sugars, due to lack of information about free sugars content on labels. This is misleading when combined with information within the app on recommended amounts of free sugars (gram per day or cubes of sugar). The accuracy and utility of such apps depend on agreement on definition, estimation method and labelling, which is an obvious area where Industry could work with Government (see above).
 - As government has limited funds to promote the *Eatwell Guide*, we recommend industry could cooperate and address some of the gaps. Specifically, more guidance could be given on 'treats' (portion size/frequency) and how to balance these in context of meal planning and energy balance. Furthermore, the *Eatwell Guide* could be the basis of food-based messaging on Industry websites and additional materials to consumers.

documents and no sight of the article until after submission.

CONFLICT OF INTEREST

Sigrid Gibson has received research grants and consulting fees from Sugar Nutrition UK, the International Sweeteners Association and food and beverage companies. Margaret Ashwell has received consulting fees from food and beverage companies and is on the Scientific Advisory Board of the Global Stevia Institute, funded by Pure Circle Ltd. Jenny Arthur is director of nutrition and innovation at Leatherhead Food Research which provides expertise and support to the global food and beverage sector. Lindsey Bagley has received consulting fees for product development from food and ingredient manufacturers. Alison Lennox (Stephen) has been on scientific advisory groups for Nestle and the British Nutrition Foundation. Peter Rogers has received grant support from Sugar Nutrition UK for research on the effects of sugar on human appetite, payments for consultancy services from Coca Cola Great Britain and speaker's fees from the International Sweeteners Association. Sara Stanner is Science Director at the British Nutrition Foundation which receives some income through membership and donations from the food industry. Ethical approval was not required because this was not a research study.

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NOTE

UK government targets and strategy reports commonly use the shorthand 'sugar' for free sugars. In this paper, we have used the term 'free sugars' to refer to the sugars (nutrient) that are targeted in new recommendations and 'sugar' to refer to the commodity, which is mainly sucrose.

Using the *Eatwell Guide*

- The *Eatwell Guide* illustrates the proportions of different food groups that should ideally be consumed by adults in order to meet dietary

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References

1. World Health Organization (WHO). *Guideline: Sugars Intake for Children and Adults*. Geneva: WHO, 2015.
2. Scientific Advisory Committee on Nutrition. *Carbohydrates and Health*. London: TSO, 2015.
3. Department of Health. Dietary reference values for food energy and nutrients for the United Kingdom. Report of the panel on dietary reference values of the Committee on Medical Aspects of Food Policy. *Reports on Health and Social Subjects Journal* 1991; 41: 1–210.
4. Bates B, Cox L, Nicolson S *et al*. *National Diet and Nutrition Survey: Results from Years 5 and 6 (combined) of the Rolling Programme (2012/13–2013/14)*. (ed Public Health England and The Food Standards Agency). PHE Publications gateway number: 2016248. London: PHE, 2016.
5. Haresign R, Stanner S, Lennox A *et al*. Nutrition science – Past, present and future. *Nutrition Bulletin* 2016; 41: 290–5.
6. Public Health England. *Sugar Reduction: The Evidence for Action*. PHE publications gateway number 2015391, 2015. Available online at:

What can the food and drink industry do to help achieve the 5% free sugars goal?

- https://www.gov.uk/government/publications/sugar-reduction-from-evidence-into-action
7. UK Health Forum for Public Health England. *Options for Action to Support the Reduction of Sugar Intakes in the UK*, 2014. Available online at: <https://www.gov.uk/government/publications/sugar-reduction-from-evidence-into-action>
 8. Department of Health. *Childhood Obesity: A Plan for Action*, 2016. Available online at: <https://www.gov.uk/government/publications/childhood-obesity-a-plan-for-action>
 9. Leatherhead Food Research/Food and Drink Federation. Reformulation guide spotlight on sugars for small to medium sized companies 2016. August 15 2016. Available online at: https://www.fdf.org.uk/corporate_pubs/Reformulation-Guide-Sugars-Aug2016.pdf
 10. EUFIC. EUFIC review benefits and safety of high potency/low calorie sweeteners, 2012. Available online at: <http://www.eufic.org/en/whats-in-food/article/benefits-and-safety-of-low-calorie-sweeteners>
 11. Gardner C, Wylie-Rosett J, Gidding SS *et al*. Nonnutritive sweeteners: Current use and health perspectives: A scientific statement from the American Heart Association and the American Diabetes Association. *Diabetes Care* 2012; 35(8): 1798–808.
 12. Gibson S, Drewnowski A, Hill J *et al*. Consensus statement on benefits of low-calorie sweeteners. *Nutrition Bulletin* 2014; 39(4): 386–9.
 13. Miller PE, Perez V. Low-calorie sweeteners and body weight and composition: A meta-analysis of randomized controlled trials and prospective cohort studies. *The American Journal of Clinical Nutrition* 2014; 100(3): 765–77.
 14. Rogers PJ, Hogenkamp PS, de Graaf C *et al*. Does low-energy sweetener consumption affect energy intake and body weight? A systematic review, including meta-analyses, of the evidence from human and animal studies. *International Journal of Obesity* 2016; 40(3): 381–94.
 15. Ello-Martin JA, Ledikwe JH, Rolls BJ. The influence of food portion size and energy density on energy intake: Implications for weight management. *The American Journal of Clinical Nutrition* 2005; 82(1 Suppl.): 236S–41S.
 16. Hollands GJ, Shemilt I, Marteau TM *et al*. Portion, package or tableware size for changing selection and consumption of food, alcohol and tobacco. *Cochrane Database of Systematic Reviews* 2015; 9: CD011045.
 17. Rolls BJ, Roe LS, Meengs JS. The effect of large portion sizes on energy intake is sustained for 11 days. *Obesity* 2007; 15(6): 1535–43.
 18. Rogers PJ, Brunstrom JM. Appetite and energy balancing. *Physiology & Behavior* 2016; 164: 465–71.
 19. Fay SH, Ferriday D, Hinton EC *et al*. What determines real-world meal size? Evidence for pre-meal planning. *Appetite* 2011; 56(2): 284–9.
 20. British Heart Foundation. *Portion Distortion*, 2013. Available online at: <https://www.bhf.org.uk/publications/policy-documents/portion-distortion-report-2013>
 21. Almiron-Roig E, Palla L, Guest K *et al*. Factors that determine energy compensation: A systematic review of preload studies. *Nutrition Reviews* 2013; 71(7): 458–73.
 22. Cornil Y, Chandon P. Pleasure as an ally of healthy eating? Contrasting visceral and Epicurean eating pleasure and their association with portion size preferences and wellbeing. *Appetite* 2016; 104: 52–9.
 23. Rogers PJ, Ferriday D, Jebb SA *et al*. Connecting biology and psychology to make sense of appetite control. *Nutrition Bulletin* 2016; 41: 344–52.
 24. Lachat C, Nago E, Verstraeten R *et al*. Eating out of home and its association with dietary intake: A systematic review of the evidence. *Obesity Reviews* 2012; 13(4): 329–46.
 25. Buttriss J. Nutrition labels to change in the United States (editorial). *Nutrition Bulletin* 2016; 41(2): 197–201.
 26. European Parliament and Council. Regulation (EU) No 1169/2011 on the provision of food information to consumers. *Official Journal of the European Union* 2011; 304: 18–63.
 27. Department of Health. *Guide to Creating a Front of Pack (FoP) Nutrition Label for Pre-Packed Products Sold through Retail Outlets*. Available online at: <https://www.gov.uk/government/publications/front-of-pack-nutrition-labelling-guidance>
 28. The White House and FDA announce modernized nutrition facts label [press release], 2016. Available online at: http://www.foodpolitics.com/wp-content/uploads/NFL_WHrelease_DRAFT.pdf
 29. Public Health England. *The Eatwell Guide. Helping you eat a healthy, balanced diet*. 2016.
 30. Cobiaci LJ, Scarborough P, Kaur A *et al*. The Eatwell Guide: Modelling the health implications of incorporating new sugar and fibre guidelines. *PLoS ONE* 2016; 11(12): e0167859.
 31. Scarborough P, Kaur A, Cobiaci L *et al*. Eatwell Guide: Modelling the dietary and cost implications of incorporating new sugar and fibre guidelines. *BMJ Open* 2016; 6(12): e013182.
 32. Harland JI, Buttriss J, Gibson S. Achieving eatwell plate recommendations: Is this a route to improving both sustainability and healthy eating? *Nutrition Bulletin* 2012; 37(4): 324–43.
 33. Hooper B, Spiro A, Stanner S. 30 g of fibre a day: An achievable recommendation? *Nutrition Bulletin* 2015; 40(2): 118–29.
 34. USDA. *Scientific Report of the 2015 Dietary Guidelines Advisory Committee*, February 2015. Available online at: <https://health.gov/dietaryguidelines/2015-scientific-report/pdfs/scientific-report-of-the-2015-dietary-guidelines-advisory-committee.pdf>
 35. Robinson E, Oldham M, Cuckson I *et al*. Visual exposure to large and small portion sizes and perceptions of portion size normality: Three experimental studies. *Appetite* 2016; 98: 28–34.

APPENDIX

Article 7 of EU Regulation 1333/2008

Specific conditions for sweeteners.

A food additive may be included in the Community list in Annex II for the functional class of sweetener only if, in addition to serving

one or more of the purposes set out in Article 6(2), it serves one or more of the following purposes:

- (a) Replacing sugars for the production of energy-reduced food, non-cariogenic

food or food with no added sugars; or

- (b) Replacing sugars where this permits an increase in the shelf-life of the food; or
- (c) Producing food intended for particular nutritional uses as defined in Article 1(2) (a) of Directive 89/398/EEC.