FDF Response to SACN Draft Carbohydrates and Health Report

This consultation response is made by the Food and Drink Federation, the trade association for food and drink manufacturing. Food and drink is the largest manufacturing sector in the UK (accounting for 15% of the total manufacturing sector) turning over £78.7bn per annum; creating GVA of £20bn and employing up to 400,000 people.

Thank you for the opportunity to provide scientific comment on the Scientific Advisory Committee on Nutrition's (SACN) draft report on carbohydrates and health. We welcome the thorough and transparent review of the evidence undertaken using the published SACN framework for the evaluation of evidence (SACN 2012), and congratulate SACN on producing such a comprehensive report. We firmly believe public health policies should be underpinned by robust science and consider that it is important for government to commission reviews such as this so that nutrition policy continues to be based on the latest evidence. We believe similar rigour should be applied to the translation of the evidence to public policy recommendations.

Our comments are intended to be constructive. The detail within our response is provided to help clarify the rationale behind the conclusions that are drawn and with the aim of ensuring the recommendations are clear, robust and based on the best possible evidence.

We consider there are some areas in the report which would benefit from further clarification as to the analysis which has been undertaken and the interpretation of the evidence. The key areas we would like to raise are:

- The appropriateness of linking short term sugars intake to higher energy intakes and using this as a proxy for linking sugars independently to weight gain.
- The assumption that there is a linear relationship between sugars intake and energy intake.
- The evidence base that a Dietary Reference Value (DRV) for free sugars of 5 percent of energy as a population average will lead to individual intakes of less than 10 percent of energy.
- The strength of the evidence associating sugars sweetened beverages (SSBs) and risk of type 2 diabetes mellitus.

We have referenced some additional scientific papers/studies that may be of relevance within the related sections of our response.

We endorse the response submitted by the Fibre Consortium, which considers in detail the fibre aspects of the SACN draft report.

1. Sugars and energy intake

SACN concludes that diets higher in sugars are higher in energy intake, and as energy intake in excess of requirements can lead to weight gain over time, higher energy consumption (and therefore higher sugars consumption) is deemed to be detrimental to health (SACN draft report, chapter 6, sections 6.18-6.19, p85). The data are then plotted (SACN draft report, chapter 11, section 11.12, figure 1, p202) and provided as a reason to limit sugars intakes when considering the appropriate DRV.

This appears to assume a higher sugars intake is linked to weight gain, which is at odds with the evidence reviewed in the SACN supporting documents (cardiometabolic health review, obesity chapter 5, p21-138 and reflected also in chapter 6, p10-199), which concludes there is a lack of evidence to draw conclusions on the impact of sugars intake on body weight (SACN draft report, chapter 6, section 6.72, p104).

With regards to the analysis and conclusions, we would welcome SACN's consideration of the following points:

1.1 Clarification of the selection of end points from trial groups

In figure 1 (chapter 11, section 11.12, p202) data from six of the seven studies within the meta-analysis (Cardiometabolic Health Review, energy intake chapter 6, p102-110) are plotted, showing energy intake (MJ/day) versus sugars intake as a percentage of total energy intake.

For each of the studies, data from the following intervention groups have been plotted:

Table 1. Studies used in Figure 1 and end points plotted

Main author of study and year	Lower sugars intervention group	Higher sugars intervention group	Not plotted
Saris 2000	Low fat, high complex carbohydrates	Low fat, high simple carbohydrates	Seasonal control (no advice), control diet (diet typical of average national intake
Poppitt 2002	Low fat, high complex carbohydrates	Low fat, high simple carbohydrates	Control (no advice)
Raben 2002	Food containing sweeteners	Food containing sucrose	N/A
Drummond 2003	Advice to reduce dietary fat and sugar	Advice to reduce dietary fat only	N/A
Drummond and Kirk 1998	Reduced fat and sucrose, replacing with complex carbohydrate	Reduced fat only, replacing with complex carbohydrate and sucrose	Control (no advice)
Brynes 2003	High intakes of high	High carbohydrate	High-

	glycaemic-index carbohydrates	increase of sucrose	carbohydrate, low-glycaemic index group and high-fat group

We would welcome clarification as to the rationale for joining together the end points of two different intervention groups within each trial. We consider it would be more appropriate to assess all of the data points available and draw conclusions from these. Within any further analysis undertaken by SACN, we would also welcome the inclusion of data from Reid *et al*., (2010) and Reid *et al.,* (2014).

With respect to the above data, we would like SACN's views on the following, which we consider might influence the conclusions drawn:

i. A comparison is being made in both the meta-analysis and figure 1 (chapter 11, p202) between the end points of two separate groups' energy intake, when these groups were not always matched for energy intake at baseline. For example in the paper by Drummond *et al.,* (2003) the two groups have a difference at baseline of 1.21 MJ/day.

ii. Where available, control data are not included in figure 1 of the report, and this may lead to different interpretations of the data. For example, in the paper by Saris *et al.,* (2000), the energy intakes at follow-up for the higher sugars intervention group and the control group are not significantly different (10.4MJ/day, 10.3MJ/day), but the energy intake for the complex carbohydrate group (plotted as the lower sugars group) is 9.3MJ/day. This may indicate the lower energy intake is a feature of complex carbohydrate intakes not the sugars level. This is also recognised by the authors of the meta-analysis who in their conclusion state '*it should be recognised that diets that vary in sugars tend to vary in dietary fibre, energy density and GI*' (cardiometabolic health review, energy intake chapter 6, p102).

iii. Plotting data from all of the intervention groups may help indicate more broadly the effects of changing levels of macronutrients. Although we recognise this report is only considering carbohydrates, it is important to consider the likely broader impact of dietary changes. For example in Brynes *et al.* (2003), there was an increase in energy intake on the high-fat intervention relative to all three high-carbohydrate interventions (low GI, high GI, high sucrose) however this is not captured within the analysis. This is also noted in the supporting evidence where it states in reference to Reid *et al.,* (2007), this '*does not demonstrate the impact on energy intake of sugars supplementation per se since no comparison with supplemental fat or protein was undertaken*' (cardiometabolic health review, energy intake chapter 6, p104).

iv. Within the trials considered, two are hyper-caloric, providing high sucrose supplements (within food or drinks) that subjects are told to add to their diet (Raben *et al.,* 2002, Reid *et al.,* 2007). Adding sucrose in to the diet may have a different physiological and psychological effect, compared to the remainder of the trials which are iso-caloric.

1.2 The evidence of a linear relationship between percentage energy from sugars and energy intake.

Section 11.9, chapter 11, p200 of the SACN draft report states 'although there is limited evidence relating to sugars intakes below 10% of energy intake, there is little reason to doubt that the relationship continues to be approximately linear at lower percentages of energy from sugars.' This is concluded by considering the data presented in figure 1, chapter 11, p202.

As noted there are a limited number of data points on which to base these conclusions. Twelve data points have been plotted on figure 1. Three data points represent intakes higher than 97.5% of adults in the UK (NDNS, 2014), and so the relevance to free-living UK adults must be questioned.

Four data points are below the current UK adult average intakes of non-milk extrinsic sugars (NMES) of 12.1% energy. One study (Drummond *et al*.,2003) considers sugars intakes at approximately the levels that SACN is considering as the maximum individual free sugars DRV. This study involved 25 male participants and had no control group. The participants lowered their sugars intake as advised, but this did not change their energy intake and compensation was observed. In addition one data point is close to the proposed population average free sugars DRV at 4.4% energy from sugars (Raben *et al*., 2002). However this plots sucrose only, and so is likely to underestimate free sugars intake significantly.

It would therefore seem that the evidence of an impact of lowering sugars intake to a specific level below 10% of energy intake on overall energy intake is very limited.

In addition it is assumed there is a positive, direct cause and effect relationship between dietary sugars intake and total energy intake, as a linear relationship is demonstrated. However only two data points are plotted from each trial and extrapolating from this that a relationship is linear is inappropriate; a minimum of three data points is usually considered necessary to inform such a conclusion.

Given this paucity of data, it is possible that sugars intake in the range being discussed may not be linear, but could be J- or U- shaped. This is given plausibility by data from Marriott *et al*., (2010), who examined the 2003-2006 National Health and Nutrition Examination Survey (NHANES) cross-sectional data. This analysis demonstrated that individuals with either low (< 5 percent of energy) or high intakes of added sugars (> 35 percent of energy) had a similar BMI (28.9 kgm^{-2} compared to 28.1 kgm^{-2}, respectively). This indicates in this population group there is not a linear relationship between BMI and intake of added sugars. Of persons who were overweight or obese, the highest proportions reported consuming between 5 and 15 percent of their energy from added sugars. With each 5 percent increase in added sugars intake above 15 percent added sugars intake, a lower prevalence of overweight and obese individuals was found, until the highest category of sugars intake was reached (>35 percent of energy).

One reason for this lack of linearity may be that compensation occurs, and the amount of compensation may vary depending on the level of sugars provided. For example, supplementation studies by Raben *et al.* (2002) and Reid *et al.* (2007,

2010, 2014) showed that about half the energy supplemented was compensated for by reduced intake of other food or drink. The food matrix may also play a role in the level of compensation observed, although to our knowledge there is currently insufficient evidence to enable conclusions to be drawn.

We would therefore ask SACN to either review its conclusion that the relationship between sugars intake and energy is linear or to provide a more robust justification.

2 Population average DRV for sugars

SACN recommends that the DRV for free sugars should be set at a population average of 5% of dietary energy for age groups from 2.0 years upwards. This is based on the need to limit free sugars to no more than 10% of total energy intake at an individual level, which is likely to lead to a population average sugars intake of around 5% of total energy (SACN draft report, chapter 11, section 11.13, p203).

With regards to the analysis and conclusions, we would welcome SACN's consideration of the following:

2.1 The appropriateness of using a 100kcal reduction as the basis for proposing a DRV for free sugars in the context of an individual in energy balance

The modelling work which was undertaken assumes there is a linear relationship between free sugars intake and energy intake at levels between 5 and 10 percent and we have already commented on this in section 1.2 of our response.

The modelling then considers the amount of energy from sugars which would need to be reduced from the diet to achieve a 100kcal reduction in energy intake. This results in a figure of 6 percent. Given the lack of data as acknowledged by SACN, and the uncertainty around the derivation of the figure, we would welcome clarification of the reasoning for lowering the calculated figure from 6 to 5 percent of energy intake.

The 100kcal figure is based on recommendations from the Calorie Reduction Expert Group (Expert Group), convened by Department of Health in 2011. The Expert Group were asked to determine a realistic calorie reduction figure (kcal/person/day) to prevent weight gain in the UK population. The Expert Group's paper (and Hill *et al.,* (2003) which their work was based upon), does not recommend the 100kcal 'energy gap' should be achieved through the reduction of a single nutrient, rather they recommend the reduction could come from a variety of food and drink groups, including alcohol.

The original Expert Group paper clearly models a 24kcal reduction would prevent weight gain at the 90th percentile in an adult population, however the modelling work which underpins the 100kcal conclusion is not provided. We believe that the material on which these conclusions are based should form part of the SACN report and would expect any evidence used to underpin this conclusion to meet the same inclusion criteria that SACN has applied throughout this report.

From SACN's draft report the basis of the free sugars population average DRV appears to solely reflect the need to achieve a calorie reduction (modelling as outlined above). However the final recommendation does not reflect this; instead stating that any reduction in free sugars is in the context of an isocaloric switch to other carbohydrates (SACN draft report, chapter 12, section 12.26, p216). The final recommendation, therefore, does not seem to reflect the modelling work undertaken by SACN. In the report it would be helpful if there was clarity on:

- whether the final recommendation which reflects the 5 percent figure is derived on the basis of a need to reduce calories and includes a calorie reduction recommendation; ***or***
- how the 5 percent figure is derived, beyond modelling a calorie reduction. For example, if there is an assumption that a reduction of average intakes of free sugars to 5 percent of energy intakes will prevent over-consumption of energy in the diet the evidence and derivation of the 5 percent figure within that context should be included in the report.

2.2 Population modelling to understand if shifting the population average to 5% will lead to the stated aim of ensuring individual maximum intake is below 10%

From a superficial modelling of the data, if a normal distribution was assumed around 5 percent of energy intake, and 10 percent was set as 2 standard deviations above this (to provide confidence that 97.5 percent of the population fall below 10 percent), then this would result in 2.5 percent of the population eating zero free sugars. This does not appear to be realistic.

Considering current data from the NDNS (NDNS, 2014), it would appear intakes of NMES are not normally distributed, rather there is a skew to the right hand side of the curve reflected by considering the mean, lower and upper 2.5 percentage of intakes (12.1%, 2.4% and 26.3% respectively of food energy). This would mean that to achieve a population average of 5 percent, the majority of consumers would actually need to be lower than this, which may not be feasible. If the data is not normally distributed then rather than shifting the curve, it may be more appropriate to consider targeting current consumers at the upper end of intakes to bring these down towards, or below the recommended maximum individual intake.

We recommend SACN undertakes population modelling to provide underpinning to the consideration of an appropriate sugars DRV for the UK population.

2.3 Providing clarity on the intended use of the DRV for free sugars

Alongside our reasoning outlined above we believe that having both individual and population targets is confusing and we are unclear as to the purpose of having two. Taking these factors into consideration, we would welcome SACN giving consideration to whether setting one target at 10 percent of total energy intake might be appropriate.

The SACN discussion mainly relates to evidence for a 10 percent of total energy recommended maximum intake. By focusing on a single recommendation it removes the potential confusion in having two targets (population and individuals) and provides a clear and feasible target for communication, benchmarking and monitoring.

In addition, this can reflect SACN's desired population public health goal without requiring any assumptions regarding shape of the relationships (linear or not) between individual limits and population mean. The current DRV for non-milk extrinsic sugars is a population average of 10 percent, but the consumer facing advice is a 10 percent maximum (for example, NHS Choices states: "Added sugars shouldn't make up more than 10% of the energy (calorie intake) you get from food and drink each day"). A 5 percent population DRV is likely to be translated in a similar way (i.e. as a 5% limit for individuals), although this is would not reflect the evidence or conclusions as presented by SACN in this report.

If SACN considers maintaining two recommended values is appropriate, we would welcome advice on how the figures should be used when communicating with the general public. We appreciate this may be viewed as policy implementation and therefore out with SACN's remit, however as these figures will strongly inform policy we feel clarity from SACN as to their considerations of the most appropriate uses is valuable.

3 Sugars-sweetened beverages (SSBs) and type 2 diabetes mellitus (T2DM)

The SACN review of evidence states there is an association between sugars-sweetened beverages (SSBs) and type 2 diabetes mellitus (T2DM) risk. With regards to the analysis and conclusions, we would welcome SACN's consideration of the following:

3.1 Combining the studies used in the meta-analysis

In the SACN draft report (chapter 6, section 6.32, p89) six cohort studies are identified as presenting evidence on the relationship between SSBs and the incidence of T2DM. Within the same section it is stated that; "these were not combined into a meta-analysis due to variation in both serving size and the definition for sugars-sweetened beverages". In the supporting documents (cardiometabolic health review, diabetes chapter 4, p139) it states: "there was little confidence that the studies could be combined in meta-analysis without a very large amount of heterogeneity".

In contrast, section 6.33 (SACN draft report, chapter 6, p89) refers to a publication by Greenwood *et al.,(*2014) in which a meta-analysis was carried out and discusses it in significant detail. The heterogeneity was moderately high and the paper's authors caution against placing too much reliance on the pooled estimate (1.07 per 100ml, or 1.23 based on 330ml/d). The authors suggest there may be alternative explanations for the results, such as lifestyle factors or reverse causality.

The level of credence given to this paper in the report's discussion seems high, given that the section previous (SACN draft report, chapter 6, section 6.32, p89) states a meta-analysis could not be completed. We recommend SACN clarify whether they consider a meta- analysis of the data points appropriate and on what basis.

The robustness of the primary evidence base included in the Greenwood paper should also be specifically considered in the context of how it has informed the conclusions of SACN report on SSBs. For example, the Framingham Study

combined artificially sweetened and SSBs into one category called ‘soft drinks’ (Dhingra *et al.,* 2007).

4 Oral health

With regards to the evidence presented, we request SACN considers the following:

4.1 Relationship between frequency and amount of sugars consumption

Previous studies have reported that amount and frequency of sugars and SSBs intakes may be highly correlated (Moynihan and Kelly 2012), and that frequency may even be more important that amount (European Food Safety Authority 2010 ‘Scientific Opinion on dietary reference values for carbohydrates and dietary fibre’). Frequency of sugars consumption is included within the SACN terms of reference on the oral health review (oral health review, SACN supporting documents, p5), however it seems reasonable to also control for frequency when looking at amount of sugars consumption and vice versa. A list of confounders considered in prospective studies investigating dental caries risk is supplied (oral health review, SACN supporting documents, table 5 ‘confounders considered in prospective studies investigating dental caries risk’, p24) but neither frequency nor amount is listed, and the rest of the oral health review document also does not clarify this information. We would welcome this information being made available to help interpret the results found by SACN regarding sugars and oral health.

4.2 Impact of other factors on oral health

As recognised by SACN, there are many confounding factors when considering oral health, including frequency of consumption, dental hygiene and use of fluoride toothpaste. In addition, the production of acid by bacteria in response to foods, including a variety of carbohydrates, is important. We would welcome inclusion of the data on whether studies controlled for starch intakes when looking at sugars (or vice-versa) to distinguish between which carbohydrates may be responsible for the results seen. Neither starch nor sugars are included in the confounding variables considered (oral health review, SACN supporting documents, table 5 ‘confounders considered in prospective studies investigating dental caries risk’, p24).

4.3 Relationship between sugars intake and dental caries

Within the oral health review supporting documents (section 132 p46 and 180 p59), SACN comment that ‘the evidence linking the development of dental caries to sugars consumption/intake is relatively weak’, however the summary (SACN draft report, chapter 6, section 6.60, p97) states an association based on moderate evidence without the comment on the strength of the link. We recommend SACN clarifies the basis for the conclusion regarding the strength of the association and, for consistency, report this across both the supporting documents and the report.

5 Fibre

We endorse the response submitted by the Fibre Consortium, which considers in detail the fibre aspects of the SACN draft report.

6 Additional points of clarification

We note the following:

- In table 2.4 (SACN draft report, chapter 2, p19) the current DRV for total carbohydrates given is for food energy (carbohydrate: 47% total dietary energy, 50% food energy) whereas for NMES it is given for total dietary energy (NMES: 10% total dietary energy, 11% food energy). We would welcome consistency in the table as to which is being used, and if this is then carried through across the report when total dietary energy recommendations are provided.

- In section 2.38 (SACN draft report, chapter 2, p20) , the definition used with reference to the USA is not related to a definition for a whole grain food *per se*, but for a health claim for use with a whole grain food. This can be found at http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm073639.htm
  We would recommend therefore, the other definitions provided in the report (HEALTHGRAIN and the AACC) are more relevant.

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The UK Food and Drink Manufacturing Industry

The Food and Drink Federation (FDF) represents the food and drink manufacturing industry, the largest manufacturing sector in the UK, employing 400,000 people. The industry has an annual turnover of over £78.7bn accounting for 15% of the total manufacturing sector. Exports amount to over £12bn of which 76% goes to EU members. The industry buys two-thirds of all UK's agricultural produce.

The following Associations actively work with the Food and Drink Federation:

ABIM	Association of Bakery Ingredient Manufacturers
ACFM	Association of Cereal Food Manufacturers
BCA	British Coffee Association
BOBMA	British Oats and Barley Millers Association
BSIA	British Starch Industry Association
BSNA	British Specialist Nutrition Association
CIMA	Cereal Ingredient Manufacturers' Association
EMMA	European Malt Product Manufacturers' Association
FCPPA	Frozen and Chilled Potato Processors Association
FOB	Federation of Bakers
PPA	Potato Processors Association
SMA	Salt Manufacturers' Association
SN	Sugar Nutrition UK
SNACMA	Snack, Nut and Crisp Manufacturers' Association
SPA	Soya Protein Association
SSA	Seasoning and Spice Association
UKAMBY	UK Association of Manufacturers of Bakers' Yeast
UKTIA	United Kingdom Tea & Infusions Association Ltd

FDF also runs specialist sector groups for members:

BCCC	Biscuit, Cake, Chocolate and Confectionery Group
FF	Frozen Food Group
MG	Meat Group
ORG	Organic Group
SG	Seafood Group