Response to Scientific Advisory Committee on Nutrition's (SACN) Draft Carbohydrates and Health Report

From Sigrid Gibson, RNutr.

Sig-Nurture Ltd.

I am responding to this consultation in a personal capacity as a registered public health nutritionist and researcher. My company conducts research (peer reviewed and in the public domain) and provides consultancy services to a number of food and beverage companies and not-for-profit organisations, as well as government agencies.

Thank you for the opportunity to provide scientific comment on the report. My comments relate both to the scientific review and to the recommendations for intake of sugars, approached with the premise that the recommendations affecting public health policy should be based on robust scientific evidence of effect.

I have a number of general points on the recommendations for sugars intake (DRVS) and specific queries on the associations between sugars and energy intake, obesity, and type 2 diabetes.

Proposed Dietary Reference Values (DRVs) for sugars

In my opinion the new quantitative recommendation for free sugars at 5% of total energy is insecure for the following reasons:

1. Lack of evidence supporting 5% as optimum level of free sugars

- The scientific data mainly relate to the adverse effects of very high sugar diets on excess energy intake, which cannot be extrapolated to imply that very low sugar diets necessarily reduce energy intake over the long term.
- There is insufficient support for benefit at 5% energy from sugars. As acknowledged in the report (para 11.10) "*there are few data at this level of intake to draw firm conclusions".* In fact there is only one intervention in the meta-analysis which used intakes at this level, (Raben, 2002) and this is quotes a *sucrose* intake of 4.4% (Raben 2002), which underestimates free sugars intake significantly.
- Most sugar restriction studies used 8-9% sugars in the low sugar group (Drummond 1998, Drummond 2003, Byrnes 2003) suggesting this is the lowest than can be achieved practically without compromising balance and variety. In addition, there are no developed nations with sugars intakes as low as 5% in modern times.
- A 5% sugars energy DRV gives undue emphasis to reducing everyone's sugar intake, which is not scientifically well founded and may have unintended consequences. It would be helpful to show the distribution of free sugars intake (estimated from NDNS) and the modeling assumptions used in arriving at the 5% mean.
- Having two targets (<10% and 5%) will confuse consumers.

2. **Redefining 10% free sugars DRV as an individual maximum (para 11.10)**

- The report asserts that the existing <10% recommendation should now apply to individuals, not to the population mean. No scientific rationale is presented for this shift, which is contrary to the principles used in setting other UK DRVs. It is also inconsistent with the supporting data from RCTs, which gives group mean intakes.
- I am not aware of any reliable data to show that an intake of more than 10% energy from free sugars is harmful for individuals with an active lifestyle and normal body weight.

3. **Justification of 5% level based on 100kcal desired energy reduction (para 11.10)**

- An estimate of effect size of 28kcal per 1% sugars energy, presumably derived from a regression analysis on the RCTs, has been used to predict a 100kcal reduction in total energy intake if free sugars intake is reduced by 4%. However, this estimate does not represent the independent effect of sugars but reflects all the dietary differences between studies, including fibre content, energy density and palatability. The fact that this value (28kcal) is higher than the actual contribution of 1% energy for a reference adult woman or man (20kcal or 25kcal respectively) illustrates that other dietary factors are responsible.
- Compensation is not taken into account, yet supplementation studies (Raben 2002)(Reid 2007, 2010, 2014) showed that about half the energy supplement was compensated for by a reduced intake of other food or drink.
- No justification is given as to why the 100kcal desired energy deficit should be achieved solely by reducing sugars intake, rather than other macronutrients such as saturated fat or alcohol, which are equally, or more significant as energy sources. The overriding importance of total calories in energy balance needs to be stressed.

4. **The proposed 5% energy from free sugars (recommendation) is unrealistic and may undermine achievement of a balanced diet**

- The proposed 5% target represents approximately 50% reduction in intake for adults and two-thirds reduction for teenagers. This risks rejection by the public not only of these recommendations but other public health advice.
- One small glass of fruit juice (150ml), and one bowl of high fibre cereal would use up most of an average woman's daily sugar allowance (25g). The diet would be very restrictive: modest amounts of sugar-sweetened fruit yogurts, sugar in cooking or on fresh berries would exceed the remaining allowance while biscuits, cakes, confectionery and desserts would be a very occasional treat. Moreover, in dry foods substitution by other ingredients (per 100g) would mean the impact on calorie intake would probably be small. Substitution with other fermentable carbohydrates may not alter caries risk either.
- The risks of unintended consequences should be considered before finalizing this new recommendation. Salt intakes might rise as people switch to savoury foods to cut sugar, while

the recommendation to raise fibre intakes to 30g will be even more difficult without the use of sugar or fat to enhance palatability. In addition, a focus on sugar detracts from more substantive messages on energy balance, including energy density, portion size and the role of physical activity.

- Currently approximately 11.5% of the population has NMES intakes over 20% of energy. Consideration could instead be given to targeting groups with high intakes or who are at greatest risk of obesity.

Specific queries relating to sugars and energy intake, body weight and type 2 diabetes

5. **Energy intake** (Fig 1, p202 of Ch 11)

- Fig 1 is based on a subset of 6 of the 7 studies used in meta-analysis of energy intake in the high vs. low sugars groups (Forest plot Figure 6.6 on p 106, Chapter 6). Fig 1 plots energy intake against % sugars at the end of the study and does not adjust for baseline differences between groups. This also appears to be the method used in the meta- analysis (Fig 6.6). I suggest that this overestimates the effect size.
- Lack of data on change and standard deviation may have been the reason for this, but the result is that the difference in energy intake between groups may be overestimated in Fig 6.6 for at least 4 of the studies. For example, it is 35% higher for Raben (mean difference of 2796kJ at outcome vs. 2056kJ if adjusted for baseline); 48% higher for Drummond 1998 (.845 vs 570kJ); 476% higher for Drummond 2003 (1000kJ vs 210kJ) and 11% higher for Reid 2007 (1315 kJ vs. 1185kJ).
- In the study by Drummond 2003) the slope in Fig 1 is further overestimated because the baseline- adjusted difference in sugars energy between the groups was 2.9% rather than 1.5%.
- The studies differ in how they define sugars (sucrose/NMES/total sugars), complicating interpretation of effect size. For Drummond & Kirk 1998 the data plotted in Fig 1 are for total sugars not NMES.
- Both the meta-analysis and plot omit a study by Reid (2010), which was within the criteria and timescale.
- Further minor errors in text and tables include that heterogeneity is stated as 0% when it is 20% in Fig 6.6. The change in energy intake in the high sugars group (Saris 2000) is misquoted as 0.7 MJ instead of -0.7 MJ and the data used for Drummond & Kirk appear to be 6m data (ID 14858) not 6week data (ID 1485, asterisked). In Fig 1 the legend for Raben 2001 should read Raben 2002.

In conclusion, I would suggest that Fig 1 may not accurately represent the relationship between energy intake and free sugars, or support the assertion in para 11.10 that "there appears to be an even greater reduction in energy intake when sugars are consumed at 5% of energy".

6. Obesity/body weight and sugars or SSB

- The inadequacy of evidence for sugars and obesity outcomes is acknowledged on p102 -103 and summarized in para 6.72. *Due to paucity of studies there is lack of evidence to draw conclusions on the impact of sugars intake on the majority of cardiometabolic outcomes including bodyweight, in adults.*
- The data on Sugar Sweetened Beverages (SSBs) are suggestive of an impact on weight gain only in children based on only 2 quality studies (Para 6.58)(effect: limited evidence), and there were insufficient data to establish an effect on energy intake (Table 6.2).
- Chapter 11 (DRVs) focuses on the one class of studies that found a significant result for SSB (SSB/RCT/children). This finding is based on 2 new trials, of which 1 (De Ruyter et al. 2012) was considered of sufficient standard to warrant upgrading the judgement from inconclusive to effect based on limited evidence (para 6.58 p 96). It could be argued that this is an insufficient basis on which to change a policy.
- Evidence was insufficient for the other 11 classes (sugars -all groups; SSB- adults, SSB-child cohort studies).
- The trials on SSB and obesity have been reviewed critically many times with varying conclusions. One recent high quality review concluded "Evidence to date is equivocal in showing that decreasing SSB consumption will reduce the prevalence of obesity. Although new evidence suggests that an effect may yet be demonstrable in some populations, the integrated effect size estimate remains very small and of equivocal statistical significance" (Kaiser, K. A., Shikany, J. M., Keating, K. D. & Allison, D. B. 2013. Obes Rev, 14, 620-33.
- More studies have focused on SSB consumption as this is relatively easy to manipulate experimentally and is a significant source of sugars for some age groups. Many of these studies required mandatory consumption of large volumes of SSB. Despite this several demonstrate that weight gain is much less than predicted or expected from the energy difference (Raben et al., 2002; Reid et al 2007, 2010, 2014).
- The RCTs on children are noteworthy in using more realistic amounts of SSB substituted with low calorie beverages. In para 11.8 the summary confuses SSB reduction and addition "RCT in children and adolescents indicate that consumption of SSB… resulted in weight gain". It would be more accurate to say *consumption of non-calorically sweetened beverages in place of SSB resulted in reduced weight gain*.

My personal view is that the evidence presented does not provide support for a general recommendation for all ages to *minimise* SSB consumption, though it may be appropriate for those who are overweight to limit their consumption or switch to lower calorie alternatives.

7. Type 2 Diabetes

- The conclusion relating to SSB and Type 2 Diabetes (cohort/ adults) “Association – moderate evidence” is surprising in view of the larger number of studies finding no effect, or no association, for sugars and any type of glycaemia or related health outcome (6.20-6.31). This suggests that further research may be required to evaluate the totality of the evidence and examine biological plausibility before finalising this judgment.
- The evidence presented is the meta-analysis of cohort studies by Greenwood et al. 2014. The effect size is modest at best (1.07 per 100ml, or 1.23 based on 330ml/d) and prone to sources of bias and confounding by other dietary and lifestyle factors.
- Heterogeneity was moderately high and the authors of the paper caution against placing too much reliance on the pooled estimate. Where this degree of heterogeneity is present, conclusions cannot be generalised.
- The positive but weaker LCS result (RR 1.13) suggests that the result for SSB is not directly attributable to sugar content.

Final remarks

In regard to sugar intake and metabolic outcomes, the evidence base itself is weak and inconsistent (few studies, few subjects, mixed quality, heterogeneity in design, exposure, follow up and assessment, potential for bias). The review acknowledges this, but the recommendations appear to be based on a minority of population/exposure/outcome combinations (paragraphs 11.8 to 11.13).

The justification for halving the recommended intake of free sugars relies heavily on reported effects on energy intake (which is not very reliably measured), rather than on the main outcome of clinical relevance (body weight).

Further clarification is suggested for the details of the energy intake meta-analysis and particularly for Fig 1, which appears to form the basis for the quantitative recommendations. The energy intake meta-analysis was based on 7 RCTs in adults; however another 3 studies (excluded) showed no consistent effect and a later study by Reid (2010) was omitted; other studies are also now published or in preparation and it may be appropriate to revisit the analysis given its centrality to the recommendations.

It is highly uncertain whether the proposed changes are achievable within a normal balanced diet; further work is needed to assess the practicality of the proposed recommendations and the risk of unintended consequences.

Sigrid Gibson R Nutr.