

Invited Commentary

Sugars and health – risk assessment to risk management

Public health nutrition research is dominated by studies of assessment and analysis of diet-related health outcomes and estimates of food and nutrient intakes. Single studies provide clues, but it is the totality of evidence from well-crafted investigations that enable a full risk assessment to be undertaken. The process and interpretation of review-level evidence has become increasingly complex as the quantity of evidence grows and techniques for quality control develop. The emergence of the GRADE (Grading of Recommendations Assessment, Development and Evaluation) system for evaluating the quality of evidence represents a useful way forward in the decision-making process for recommendations and developing dietary guidelines⁽¹⁾.

The WHO draft guideline on sugars intake for adults and children⁽²⁾ is an example of how the GRADE system can be used to assess the burgeoning evidence on sugar consumption, dental caries and excess body weight in order to assist the process of informing recommendations for food policy and dietary practices. The strength of large, heterogeneous cohort studies of participants followed from early years to later life, and appropriately powered randomized controlled trials (RCT), provide rich insight to the impact of sugar consumption on two major, globally relevant diet-related health problems: dental caries and excess weight gain. Ecological studies, including repeated historical observations, are often ignored in favour of RCT, but in cases where RCT are not practically possible these studies provide a useful lens on the diet–disease relationship.

Evidence on dental caries

In the case of dental caries, despite reductions in prevalence among children and young people in Europe with wide-scale use of fluoridated toothpaste and fluoridated water, this preventable condition remains a significant health burden across the world and especially in socio-economically deprived groups. Dental caries is probably the first non-communicable disease experienced in life and is likely to continue throughout the lifespan. A recent study reported higher caries levels in adults compared with children in all twenty-six countries studied⁽³⁾. The data analysed by the WHO group report on dental caries drew from a wide range of study types including observational and ecological designs and (unsurprisingly) no RCTs⁽⁴⁾. Of forty-two out of fifty studies examined in children and all five in adults, a positive association between free sugars and dental caries was reported. Positive associations between free sugars consumption

and dental caries were detected across all ages (<5 years to >65 years) and in developing, transitional as well as industrialized countries. There is evidence of moderate quality to show that dental caries is lower when free sugars intake is <10 % of energy. Furthermore, analysis of three Japanese studies showed significant benefits in limiting sugars to <5 % of energy (compared with 10 % of energy) in order to minimize the risk of dental caries.

Evidence on weight gain

Many public health practitioners may be disappointed that the WHO review did not extend to type 2 diabetes or CVD. The recent UK Scientific Advisory Committee on Nutrition (SACN) draft review on carbohydrates in the diet⁽⁵⁾ has highlighted an association between greater consumption of sugar-sweetened beverages and the development of type 2 diabetes. Recent cohort evidence from the USA also points to a significant relationship between added sugars consumption and increased risk for CVD mortality⁽⁶⁾. Evidence relating specifically to conditions like diabetes is likely to be a more powerful lever for garnering support for effective food policy and risk management strategies from medical communities than obesity *per se*. Nevertheless, evidence on sugar intake in relation to weight change remains useful.

Assessing the impact of changes in sugar intake on health outcomes is a major challenge. It is recognized that so many other dietary factors are also likely to change at the same time. Using a public health rather than therapeutic approach, the commissioned systematic review and meta-analysis for the WHO draft guideline did not include studies of trials specifically designed to achieve weight loss⁽⁷⁾. Studies that aim to reduce sugar intake from confectionery and desserts inevitably result in lower intake of fat, thus creating both a primary and secondary effect of sugar reduction on caloric consumption and the challenge of quantifying the impact of sugar intake apart from other dietary factors. The findings of a meta-analysis of five trials in adults with *ad libitum* diets found that reduced intake of dietary sugars was associated with a decrease in body weight of 0.80 kg, although at least one of these studies also included advice to reduce fat intake⁽⁸⁾. It is notable that these studies also included guidance on using calorie-free sweeteners to replace sugars which, while helpful for caloric reduction, may also result in maintained preference for sweet taste with potential long-term impacts. The length of follow-up of these trials was short (10 weeks to 6 months) and longer trials would be welcome. Overall,

the findings suggest that guidance to reduce free sugars to avoid weight gain should also steer people towards wholegrain complex carbohydrates and the avoidance of foods rich in animal fats.

Reducing sugars may also result in overcompensation by other carbohydrates, and it is notable that the meta-analysis of eleven trials that examined isoenergetic exchanges of dietary sugars with other carbohydrates showed no change in body weight⁽⁷⁾. However, the length of follow-up was limited (2 weeks to 6 months) and eight of the studies involved people with diabetes who may have been more motivated to adhere to the dietary regimens. Complicated though sugar reduction may be, these trials do demonstrate that people can comply with desirable dietary changes.

What is clearer is the impact of increasing sugar on increasing body weight. A meta-analysis of ten RCT showed that increased intake of dietary sugars was associated with significantly greater weight (0.75 kg) at the end of the intervention period by comparison with no increase in sugar intake⁽⁷⁾. Once again, these studies were of short duration, and the two that lasted longer than 8 weeks showed greater effect.

Here, the value of short-term studies should be considered. In the absence of long-term trials, there are three options: (i) ignore, because they are only indicative and not persuasive enough; (ii) wait until long-term trials are carried out; or (iii) take action now, because the evidence from the large number of short-term trials consistently shows benefits associated with lower sugar intake and no indication of harm.

The RCT data examined by the WHO group for trials of reduction of sugar-sweetened beverages in children were deemed to be characterized by generally low compliance with dietary advice and showed no overall change in body weight. These findings may merit further examination. The data show that nutrition education to change carbohydrate has limited effect on changing sugar intake and therefore makes it difficult to draw any conclusions about sugar and body weight change from studies based on education alone. However, in three trials that offered multi-component interventions (nutrition education plus provision of non-caloric beverages) and reported compliance measures indicative of a lower sugar intake, where a lower sugar intake was achieved a change in body weight was attained^(9–11). Indeed, the UK SACN grades the RCT evidence in this area as showing an effect (although evidence is limited) and concludes that the direction of the effect demonstrates that greater consumption of sugar-sweetened beverages is detrimental to health, at least with respect to BMI.

Recommendations based on interpretation of the evidence

The process used by the WHO team to categorize the recommendations is not entirely clear but appears to have been developed through the consensus of members of the WHO Secretariat present and the Nutrition Guidance Expert Advisory Group. It is notable, however, that there

were no strong disagreements by those present on any aspect of the guideline. Clearly, for the recommendations graded strong, the desirable effects of adherence to the guideline outweigh any undesirable effects. Risk managers must now plan strategic actions that will result in reduced intake of free sugars throughout the life course, aiming for intakes that do not exceed 10 % of total energy. A conditional recommendation to reduce intakes to below 5 % of energy because of 'very low' quality evidence relating to three ecological studies on dental caries flags this recommendation as worthy of consideration for further study. The more recent draft SACN review⁽⁵⁾ recommends aiming to attain no more than 10 % of total energy intake at an individual level, but assumes that an overall lowering of individual intakes should achieve a population-average free sugars intake of about 5 % of total energy.

While sugar industry representatives have described the WHO recommendation to reduce sugar intake to <5 to 10 % of energy as draconian, it might be wise to remember that there is no dietary requirement for free sugars. These are not needed for the achievement of health, they can displace nutrient-dense foods (especially important in the very young and elderly) and make a significant contribution to poor health outcomes.

From risk assessment to risk management

Risk management strategies need to steer a careful path to promote the replacement of free sugars with wholegrain starches and sugars contained within the cellular structure of foods (e.g. fruit) and milk. Avoiding unintended consequences such as replacement of sugars by foods high in saturated fat should also be a clear part of any healthy eating strategy.

Effective risk management is likely to need approaches which embrace consumers, the food supply chain and the consumer food environment⁽¹²⁾. It is unlikely that a reliance on traditional educational approaches targeted at consumers will have a major impact on dietary habits by itself, although clear colour-coded nutrition labelling will be a key tool to help guide healthful choices assuming low-sugar options are available.

To achieve serious reduction in free sugars intake, the food industry must now work towards significant reductions in the sugar content of foods without increasing fat intake. Tinkering over small reductions in the sugar content in foods/drinks that fundamentally remain high-sugar foods/drinks is unlikely to achieve the desired levels of sugar reduction in the near future. Marketing messages and endorsement of 'lower sugar content' in foods that remain high in sugar may detract from more basic strategies aimed at avoiding regular consumption of these products in their current portion size. In other words, reducing consumption of sugar, preserves and confectionery, biscuits, buns and cakes should be the main strategy to reduce sugar intake overall, rather than maintaining high consumption of lower-sugar-content versions of these same foods. Importantly,

consumption of sugar-sweetened beverages does not easily fit within a healthy diet and intakes should be minimal.

In the long term, the role of the consumer food environment – including marketing, pricing and availability – needs to be explored and re-balanced to provide meaningful support for healthful dietary choices, including appropriate levels of sugar consumption.

Conclusion

In conclusion, the WHO report presents a significant body of evidence to support action for major reductions in sugar consumption for health gain. This evidence has been elaborated and explored further by the UK SACN in their draft review on carbohydrates and both groups of experts are consistent in their recommendations to decrease sugar consumption. Globally and nationally, we can no longer afford to ignore the ways in which sugar has been allowed to become so pervasive within communities and so readily available to children as well as adults. As public health nutritionists in academia, we might begin by rethinking and adjusting our role in how sugar is endorsed, for example through meeting sponsorship and other marketing approaches.

Annie S Anderson

Centre for Public Health Nutrition Research

Centre for Research into Cancer Prevention and Screening

Division of Cancer Research

Medical Research Institute

Level 7, Mailbox 7

University of Dundee

Ninewells Hospital and Medical School

Dundee DD1 9SY, UK

Email: a.s.anderson@dundee.ac.uk

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