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Sugar: is there a need for a dietary guideline?

Abstract

There have been dietary guidelines in Australia since 1979 and all editions have included recommendations about sugar. This paper reviews changing recommendations in Australia, current levels of consumption, recent studies on the potential effects of nutrient dilution and dental caries, and discusses potential risks associated with a dietary guideline.

Keywords

sugar, dietary guidelines

Disciplines

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Title: **Sugar: is there a need for a dietary guideline? ***

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1 **Introduction**

2 When the first official dietary guidelines were established in Australia, three reasons were
3 cited for avoiding too much sugar (dental caries, reduced intake of essential nutrients and
4 obesity) and this recommendation was placed fifth out of eight — ahead of
5 recommendations about fibre, salt and alcohol. In the new 1999 dietary guidelines for
6 older Australians, dental caries is the only health condition still associated with sugar
7 consumption and the advice to use added sugars only in moderation is ranked as least
8 important out of twelve guidelines. Table 1 sets out the evolution of this dietary guideline
9 over the past twenty years.⁽¹⁻⁵⁾

10
11 Clearly there has been a change in thinking about dietary recommendations on sugar.
12 Emphasis has shifted from advice about all sugars to added sugars, and the importance of
13 this guideline (as reflected in its ranking) has progressively declined. Partly this has been
14 due to better knowledge about the impact of sugar consumption on nutrient intakes and
15 health and partly due to a change of focus, with growing interest in this country in the
16 concept of the glycemic index of carbohydrate-rich-foods.

17
18 Many developed countries (including Canada and Japan) do not include sugar amongst
19 their dietary guidelines ⁽⁶⁾ and FAO is now promoting the development of food-based
20 dietary guidelines that do not focus on individual nutrients.⁽⁷⁾ This paper reviews some of
21 the new information about sugar that has been published since the establishment of the
22 last set of dietary guidelines for the general Australian population nine years ago and
23 suggest that it is time to reconsider whether a sugar guideline is still needed.

1

2

3 **Australian Sugar Consumption**

4 Australian apparent total sugar consumption has remained relatively static this century,
5 declining slightly from 50.8 kg per head per year in 1938-39 to 48.4kg in 1996-97.⁽⁸⁾

6 Over this same time, there was an apparent trend for more of this sugar to be consumed in
7 manufactured foods rather than as added table sugar (from 32% to 65%). Surveys of
8 actual total sugar intake confirm that added sugar and refined sugar products are now a
9 relatively small component of the total Australian diet. The 1995 national nutrition survey
10 found that total sugars contributed 19.4% of adult energy intake ⁽⁹⁾, with the most highly
11 refined sources (sugar, honey, syrups, jams and spreads, confectionery and soft drinks)
12 contributing just under 8%.⁽¹⁰⁾ This is slightly less than the value of 9-10% reported by
13 Baghurst et al ⁽¹¹⁾ when they summarised the data from three surveys conducted in the
14 1980s.

15

16 Table 2 indicates the major sources of sugars in the Australian adult diet.

17 While this analysis does not distinguish intrinsic food sugars and that added during
18 manufacture, clearly over half of the sugar being consumed today comes from food
19 categories that are generally being promoted as nutrient-dense foods (milk, fruit,
20 vegetables, and cereals).

21

22 Surveys by CSIRO in both Victoria and South Australia in the early 1990s found that the
23 proportion of the population meeting the dietary target for sugar was greater than for other

1 targets such fat, fibre or sodium.^(12,13) Table 3 presents some of the 1993 South
2 Australian results. They show that most Australians already consume only relatively
3 modest amounts of sugar. If we were to prioritise public health messages and activities on
4 the basis of the proportion of the population not meeting recommendations, advice about
5 sugar would appear to be much less important than other components of the diet.

6

7

8 **Sugar and Health**

9 Despite some ill-informed popular views to the contrary ⁽¹⁴⁾, all recent authoritative
10 reviews have concluded that sugar intake is not related to diabetes, hypoglycemia,
11 cardiovascular disease, or hyperactivity.⁽¹⁵⁻¹⁹⁾ One case-control study suggested that diets
12 high in sugar increased the risk of colon cancer ⁽²⁰⁾, but even in that study the lowest odds
13 ratio was not in the group with lowest sugar intake, and the conclusion has been disputed
14 by other reviewers.^(21,22)

15

16 Only three health concerns have been cited as the reasons for earlier Australian dietary
17 guidelines about sugar. In each case, more recent research has raised questions about the
18 relevance of the current guideline.

19

20 *Obesity*

21 In the background papers to the 1992 guidelines, the increasing proportion of the
22 population who were overweight or obese was noted. It was concluded that "for this
23 group of people especially, sugar intake should be discouraged as it contributes to the

1 excess in energy intake that is mainly responsible for obesity".⁽³⁾ In contrast, findings
2 from a number of population studies over the past decade show an inverse association
3 between the proportion of energy from total sugars and obesity.⁽²³⁻²⁷⁾ Indeed, since
4 dietary fat and sugar appear to be inversely related ^(26,28-30) some authors have suggested
5 that advice to reduce fat and sugar simultaneously may be unattainable.⁽³¹⁾

6

7 One Australian study, following dietary changes in adults over a four year period, found
8 that changes in the percentage of energy from sugar were strongly negatively correlated
9 with changes in percentage of energy from fat in both men and women.⁽³²⁾ Some authors
10 do still argue that extrinsic sugar can be a vehicle for dietary fat.⁽³³⁾ However, while it is
11 possible to identify some foods rich in both fat and sugars, in the context of the whole
12 diet foods that are the primary sources of sugars are only minor sources of fat and vice
13 versa.⁽²⁸⁾

14

15 There is also no conclusive evidence that the sweetness of sugar contributes to increased
16 appetite. In fact the opposite may be true; the body tends to have a much better appetite-
17 reduction response to carbohydrates and sugar than it does to dietary fat and reducing
18 sugar could actually undermine appetite regulation.^(34,35) Certainly weight reduction can
19 occur as well on high sugar diet (with 43% of energy from sucrose) as on a low sugar diet
20 (with only 4%) ⁽³⁶⁾, and a recent British dieting book written by a Professor of Dietetics
21 promotes increased sugar intake to assist in weight management.⁽³⁷⁾ The FAO/WHO
22 report⁽¹⁸⁾ concluded that "there is no indication that sugar is associated with excessive
23 food intake" and energy control with the primary emphasis on restriction of fat, rather

1 than sugar, remains the cornerstone of recommended dietary treatment of obesity.^(38,39)

2 Thus the best available evidence does not support any population dietary guideline for
3 sugar intake on the grounds of obesity.⁽⁴⁰⁾

5 *Nutrient Dilution*

6 Table sugar has been labelled a food consisting only of "empty calories" and it had been
7 argued that a high consumption of sugar might displace micronutrient-rich foods from the
8 diet and increase the risk of deficiency. In the US there has been particular concern
9 expressed about the quality of diets of people consuming large quantities of soft
10 drinks.^(41,42) The new wording of the American dietary guideline ("Choose beverages and
11 foods to moderate your intake of sugars") cautions consumers not to let soft drinks crowd
12 out other foods needed to maintain health, such as low-fat milk.⁽⁴³⁾ However, national
13 dietary guidelines need to reflect each country's own nutritional priorities and there are
14 significant differences between the US and Australia, with a lower level of soft drink
15 consumption in this country - contributing only 2-3% of the energy intake of adults⁽¹⁰⁾ -
16 and higher milk intakes.

17
18 Moreover, many studies in the US and the UK have shown that in most cases energy and
19 nutrient intakes are positively related to total sugar intake^(24,29,30,44). The COMA Report
20 ⁽⁴⁵⁾ concluded "on average people with high total energy intakes eat more of all nutrients
21 including sugar" and "sugar intake is a weaker predictor of absolute micronutrient intake
22 than total energy consumption".

1 A number of authors have examined the relationship between the proportion of energy
2 from sugar and micronutrient intakes. Baghurst et al ⁽⁴⁶⁾ divided the intakes of 2800
3 Australian adults into tenths according to the percentage of dietary energy from added
4 sugars, ranging from <4.7% to >19.3%. Intakes of vitamin B6, B12, carotene, folate,
5 magnesium and zinc demonstrated an inverse trend with added sugar, but the decline was
6 only significantly different from the median in the highest and lowest deciles. Across the
7 broad range of 4-16% energy from added sugars there was no significant variation in
8 micronutrient intakes. Results from several other studies vary depending on the
9 classification of different sugars used ^(29,47,48) but in general moderate sugar consumers
10 appear to have the most adequate diets. Reviewers have concluded that added sugar
11 intakes between 5% and 16% of energy do not appear to have any detrimental effect on
12 micronutrient intakes ⁽²⁷⁾, a range that spans the 20th to the 90th percentiles of the
13 contribution of refined sugar to total energy intake in Australia.⁽¹¹⁾

14
15 In conclusion, there does not seem to be any compelling evidence that the current level of
16 sugar consumption in Australia has any detrimental effect on diet quality. The mean
17 intakes of most vitamins and minerals exceed the RDIs, with the notable exception of
18 calcium⁽⁹⁾, and the percentage of Australian adults with calcium intakes below 70%RDI is
19 lowest in those in the highest decile of percentage of energy from added sugars⁽⁴⁶⁾.

20 21 *Dental caries*

22 While there is no doubt that dental caries continues to be a significant public health
23 problem in Australia, there have been dramatic declines in average levels of dental decay,

1 as defined by the number of decayed missing and filled teeth (DMFT) over the past three
2 decades. In 12 year old children DMFT scores fell from approximately 8 in 1965 to 1.01
3 in 1995. These improvements are obviously the starting point for future improvements in
4 oral health in later life, but even in adults the average number of missing teeth has fallen
5 from 8.3 in 1973 to only 3.6 in 1995.⁽⁴⁹⁾

6
7 Until recently, it has been usual to blame sugar as the chief factor in the cause of dental
8 caries. In 1991 Sheiham⁽⁵⁰⁾ stated that "dental caries is a sugar induced disease" and
9 recommended a maximum intake of 15kg/person per year (about one third of the current
10 Australian intake). On the other hand, caries prevalence has decreased markedly during
11 the past 30 years in most developed countries although the consumption of sugars has
12 remained relatively unchanged.^(51,52) The main reason for this improvement has been the
13 introduction of fluoridated toothpastes and water supplies⁽⁵³⁾, rendering high-sugar diets
14 less of a caries risk than they used to be 20 years ago.⁽⁵¹⁾

15
16 In Australia too Sivaneswaran and Barnard⁽⁵⁴⁾ concluded "the dramatic decline in dental
17 caries bears no relationship to the apparent consumption of sugar, which has remained
18 relatively high". A study of annual sugar consumption and dental records in 29
19 industrialised countries found sugar explained less than 1% of the variation in scores of
20 decayed, missing or filled teeth (DMFT), despite a broad range of sugar consumption
21 (from 80-195g/d).⁽⁵⁵⁾

1 The recent WHO/FAO expert consultation on carbohydrates confirmed that the incidence
2 of dental caries is influenced by a number of factors. Foods containing sugars and
3 starches that can be easily broken down by alpha-amylase and bacteria in the mouth can
4 produce acid, which increases the risk of caries. Many starchy foods are as cariogenic as
5 sugary foods, judged by the pH fall in dental plaque after consumption, and starchy foods
6 with a high glycemic index can be worse than sucrose solutions.⁽⁵⁶⁻⁵⁸⁾ Thus the impact of
7 carbohydrates on caries is dependent on the type of food, frequency of consumption,
8 degree of oral hygiene, availability of fluoride, salivary function and genetic factors.⁽¹⁸⁾ In
9 UK children, for example, the levels of consumption of the main sugar-containing food
10 groups do not vary significantly across social classes, but the percentage of children with
11 decayed teeth varies enormously, being more than six times higher in the class V versus
12 class I.⁽⁵⁹⁾ It is thought that oral hygiene practices are the most significant factor in this
13 variation. Analysis of the UK National Diet and Nutrition Survey of children found no
14 relationship between caries and consumption of extrinsic sugars, chocolate, or soft drink,
15 and an association between caries and sugar confectionery was only present among
16 children whose teeth were brushed less than twice a day.⁽⁶⁰⁾

17
18 Nonetheless, in public health we often make policies in relation to risk factors that may
19 not be the most significant variables. The important questions to ask are: would lowering
20 the mean intake of sugar further reduce the caries incidence in Australia, and would this
21 be a cost-effective method of caries prevention? There are few intervention studies to
22 help answer this question. The best evidence comes from examinations of the impact of
23 sugar reductions at a population level. A review of data from 67 countries in the period

1 1982 to 1994 found no reliable relationship: of 43 countries where there had been a
2 reduction in the per capita sugar supply, 18 had a decrease in DMFT and 25 had
3 increases.⁽²⁷⁾

4
5 Even total removal of sugar from the diet would not necessarily eliminate caries in a
6 population.⁽⁶¹⁾ Many other foods have cariogenic potential and some snacks like plain
7 crackers and potato crisps result in slower and more prolonged release of acid than some
8 sugar-containing snacks.⁽⁶²⁾ The WHO/FAO report finally rejected the terms "extrinsic"
9 and "intrinsic" sugars in favour of a "more rational approach to the role of fermentable
10 carbohydrates in dental caries" and concluded that prevention programs to control and
11 eliminate caries should focus on fluoridation and adequate oral hygiene rather than
12 sucrose intake alone.⁽¹⁸⁾ This conclusion is supported by economic analyses that have
13 found that advice about toothbrushing is likely to be a more cost-effective means of caries
14 prevention than attempts at sustained dietary change.⁽⁶³⁾

17 **Are there any risks from a dietary guideline on sugar?**

18 It may be argued that the current recommendations to consume only “moderate” amounts
19 of sugar are conservative and unlikely to cause any harm. But many consumers will
20 interpret such a message as a general warning against all sugar consumption. If there are
21 serious questions about the evidence available to support a general population guideline
22 that aims to limit sugar consumption, the question then arises: can a dietary guideline on

1 sugar send any confusing or misleading messages to consumers or have any potential
2 negative impacts on health? I believe that it can.

3

4 *Confusion between sugar as a nutrient and a food*

5 In all the research on the relationship between sugar and health, there is a constant
6 difficulty in distinguishing between sucrose used as table sugar or as "added sugar" in
7 manufactured foods from other naturally occurring sugars. The Australian food tables do
8 not identify the source of sugars in foods and neither do the nutrition information panels
9 on food labels. This dietary guideline helps to perpetuate the myth that sucrose and
10 "added sugars" are in some way special; that added sucrose has different properties to the
11 other sugars naturally present in many foods.

12

13 Consumers often rely on the nutrition information panel (NIP) on manufactured foods to
14 make judgements about their nutritional value. How is the average shopper to evaluate the
15 NIP on a food like dried fruit or low fat flavoured milk, when they are being advised to
16 eat only a moderate amount of sugars? Focus groups in the US found consumers were
17 confused by this apparent contradiction⁽⁴³⁾ and recent ANZFA consultations with
18 Australian health professionals about a new format for a NIP on all packaged food
19 supported the removal of sugar from the mandatory list of nutrients to be declared.
20 Diabetes educators in particular felt that many consumers were overly focussed on the
21 sugar figure to evaluate whether a food was suitable for inclusion in a diabetic diet.

22

1 *Sugar-Fat seesaw*

2 The consistent inverse relationship between sugar and fat suggests that advice to
3 moderate sugar intakes may lead to higher fat intakes, or at least make it much harder to
4 keep them low. Even recommendations to eat more fruit and vegetables are probably
5 going to increase the consumption of sugars if they are replacing fatty and salty snacks.
6 We should recognise that the evidence for fat as a dietary risk factor is much stronger
7 than that for sugar and focus our communication efforts there.

8

9 *Glycemic Index (GI)*

10 The new Dietary Guidelines for Older Australians are perhaps the first in the world to
11 include advice about eating more low glycemic index foods, noting the FAO/WHO
12 recommendations that the GI be used in conjunction with information on food
13 composition to guide food choices.⁽¹⁸⁾ Increasingly it is being recognised that lower GI
14 diets may be protective against diabetes and heart disease.⁽⁶⁴⁾ There is little distinction
15 between the glycemic index of foods containing naturally occurring sugars and those with
16 added refined sugars.⁽⁶⁵⁾ Foods containing sugar generally have low to intermediate GI
17 values; by contrast, a low sugar intake has been associated with a higher dietary GI
18 overall.⁽⁶⁶⁾ Thus the old guideline helps to perpetuate outdated views about sugar and
19 ignores the recent scientific developments in our understanding of carbohydrate digestion
20 and metabolism.

21

1 *Food restriction vs enjoyment and variety*

2 The current sugar guideline promotes moderation in consumption, not unnecessary
3 restriction of sugar-containing foods, except for those who are overweight. But we know
4 that restrictive attitudes to food can begin at early ages and may have influence on the
5 long-term development of disordered attitudes to eating.^(67,68) A negative focus on
6 problem-based messages implying that sugar is bad may contribute to underlying fears
7 about food and weight gain, which can precipitate eating problems. Child-feeding
8 practices that restrict children's intakes of foods at the top of the dietary pyramid may
9 actually promote their liking for and intake of those foods.⁽⁶⁹⁾

10

11 Humans are born with an genetic preference for sweet tastes⁽⁷⁰⁾ and have incorporated
12 highly sweet foods such as honey in the diet for thousands of years.⁽⁷¹⁾ The Dietary
13 Guidelines for Older Australians acknowledge that “inclusion of a moderate amount of
14 added sugar ... can increase variety and palatability without compromising nutrient
15 intake”.⁽⁵⁾ As we come to recognise the importance of food variety for good health, we
16 should also acknowledge that addition of sugars to products such as milk, yoghurts, fruit
17 and cereals can significantly increase their appeal and therefore promote greater variety in
18 the diet overall.

19

20

21

1 **Conclusion**

2 While the science on sugar has been changing, it also appears that consumers are now
3 ready to accept a change in dietary advice on the role of sugar in the diet. A recent article
4 in the Australian Consumers' Association magazine *Choice* concluded: "if eating more
5 sugar makes a healthy low-fat diet more palatable and easier to stick to, and you take
6 good care of your teeth, there may be a case for relaxing your attitude to sugar".⁽⁷²⁾
7 Perhaps in the next revision of the dietary guidelines, Australians would be better served
8 by focusing attention on positive messages to increase intakes of desirable foods and
9 communicating more about the concept of the glycemic index, rather than maintaining a
10 restrictive message about a single ingredient for which there is little evidence of need to
11 change current consumption levels.

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Table 1. History of Australian dietary guidelines on sugar

<i>Date</i>	<i>Document</i>	<i>Wording of guideline</i>	<i>Ranking</i>	<i>Reasons cited</i>
1979	AAD dietary guidelines for Australians ⁽¹⁾	<i>Decrease consumption of sugars</i>	3 rd of 9	<ul style="list-style-type: none"> • Dental caries • Obesity
1981	Dietary guidelines for Australians ⁽²⁾	<i>Decrease refined sugar consumption</i>	5 th of 8	<ul style="list-style-type: none"> • Dental caries • Displacing nutritious foods and reducing intake of essential vitamin and minerals • Obesity
1992	Dietary guidelines for Australians ⁽³⁾	<i>Eat only a moderate amount of sugars and foods containing added sugars</i>	6 th of 10	<ul style="list-style-type: none"> • Dental caries • Obesity
1995	Dietary guidelines for children and adolescents ⁽⁴⁾	<i>Eat only a moderate amount of sugars and foods containing added sugars</i>	7 th of 10	<ul style="list-style-type: none"> • Dental caries • May displace more nutrient dense foods
1999	Dietary Guidelines for Older Australians ⁽⁵⁾	<i>Use added sugars in moderation</i>	12 th of 12	<ul style="list-style-type: none"> • Dental caries

Table 2. Main source of sugars in the Australian diet in the 1995 National Nutrition Survey

(percent)

<i>Food Sources</i>	<i>Males 19+</i>	<i>Females 19+</i>
Milk products	16.2	17.4
Soft drinks	15.5	9.3
Sugar products	13.7	10.8
Fruit	12.5	17.1
Fruit and vegetable juices	10.1	11.2
Cereal based products	10.1	11.2
Cereals	6.3	6.1
Vegetables	4.4	5.2
Confectionery	3.5	4.6
Sauces	2.1	1.9
Meat	1.8	1.6
Alcoholic beverages	1.5	1.6

Table 3. Percentage of the South Australian population conforming to dietary targets in 1993^(a)

<i>Target</i>		<i>Men</i>	<i>Women</i>
Sugar	≤12% energy	68	77
Fibre	30g/d	37	31
Sodium	≤2300mg/d	23	52
Fat	≤30% energy	21	27
Sat fat	≤10% energy	12	18

(a) Baghurst et al (reference 12)