Sugar Toxicity: Outline for Australia

Robert H. Lustig, MD, MSL
Emeritus Professor of Pediatrics, Division of Endocrinology
Member, Institute for Health Policy Studies
University of California, San Francisco, USA

The unaffordable burden of Metabolic Syndrome in Australia

1. The diseases of "Metabolic Syndrome": obesity, type 2 diabetes, heart disease, stroke, fatty liver disease, cancer, and dementia continue to rise in prevalence and severity worldwide, including Australia.
   a. 1 in 20 adults (5%) in Australia has diabetes, an 80% increase from 2001 to 2012.
   https://www.aihw.gov.au/reports/diabetes/diabetes/contents/summary

   https://www.aihw.gov.au/reports/diabetes/diabetes/contents/about

   b. The prevalence of overweight or obesity in Australia is 25%.
   https://www.aihw.gov.au/reports/overweight-obesity/overweight-obesity-australian-children-adolescents/summary

   c. Currently, 35% of Australian adults have non-alcoholic fatty liver disease.

   https://onlinelibrary.wiley.com/doi/10.1111/jgh.16314

   d. The prevalence of cancer in Australia has increased 10% in just 5 years, and aside from lung cancer, the types of cancer that have increased the most are those of internal organs (colorectal, pancreatic); those that are most metabolically perturbable.

   https://www.canceraustralia.gov.au/impacted-cancer/what-cancer/cancer-australia-statistics#:~:text=In%202018%2C%20there%20were%20146%2C335,88%2C982%20males%20and%2073%2C181%20females).

   d. Currently, 10% of Australian adults have Alzheimer's Disease, and that frequency will triple by 2050.

   https://www.researchgate.net/profile/Anthony-Jorm/publication/291738387_Projections_of_future_numbers_of_dementia_cases_in_Australia_with_and_without_prevention/links/5bc3bcff92851c88fd6a18b4/Projections-of-future-numbers-of-dementia-cases-in-Australia-with-and-without-prevention.pdf

   e. The prevalence of each of the diseases of metabolic syndrome are highest in Aborigines.

   https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9368168
2. Current approaches to these problems (calorie-controlled diets, low-glycemic index diets, medications, or surgery) have failed – have had no impact in reversing these devastating trends, for any of the diseases of metabolic syndrome in Australia, or in any other country for that matter.
3. The diseases of metabolic syndrome have no "single" cause. They reflect multiple interacting factors, both genetic and environmental. However:
   a. Genetic factors cannot explain the dramatic recent increases in prevalence. Rather, the pattern of these global pandemics implicates one or more environmental insults.
   b. **Poor nutrition is <u>the</u> major common risk factor** underlying both declining systemic and mental health.
   c. Nutrition affects gene expression. Such effects apply at all ages, but especially in early life. Altered nutrition affects 'developmental programming' in pregnancy and early infancy through epigenetic

changes can alter lifetime risks for many physical and mental health disorders. These changes are vertically transmitted, impacting on future generations.

https://pubmed.ncbi.nlm.nih.gov/35393120/

4. The Western ultraprocessed food (UPF) diet is associated with each of the diseases of metabolic syndrome.

   https://www.mdpi.com/2072-6643/12/11/3401

Sugar is a primary, if not the only, cause of metabolic syndrome

5. Excessive consumption of refined sugar, specifically fructose (which makes up 50% of refined sugar), is *a*, if not *the*, primary cause of metabolic syndrome. Specifically, excess sugar consumption is causative for four diseases: type 2 diabetes, heart disease, fatty liver disease, and tooth decay. And excess sugar consumption has been associated with cancer and dementia. The reason is that the fructose molecule is metabolized in cells the same as is alcohol; this is the reason that children get the diseases of alcohol, without alcohol.

   https://pubmed.ncbi.nlm.nih.gov/27216628/

   https://pubmed.ncbi.nlm.nih.gov/23493539/

6. Sugar is not just 'empty calories' – the effects are much worse, and unrelated to its calories.
   a. **Fructose inhibits mitochondrial function** (the part of the cell which generates energy), and reduces energy availability (increasing hunger, and reducing motivation and ability to exercise).

      https://pubmed.ncbi.nlm.nih.gov/28972537/

   b. **Fructose drives up insulin and disrupts other key hormones**, impairing the normal self-regulation of both energy and appetite. High insulin boosts fat storage (obesity)
      https://pubmed.ncbi.nlm.nih.gov/31935149/

   c. **Fructose induces the "browning (Maillard) reaction**", also the "aging reaction" which causes cellular dysfunction and death.

      https://pubmed.ncbi.nlm.nih.gov/30468651/

   d. **Fructose is addictive**, acting on the same chemical 'reward' systems as drugs of abuse. Its sudden withdrawal creates similar cravings, mood swings, impulsive behaviour and impaired decision-making.
      https://pubmed.ncbi.nlm.nih.gov/30619993/

7. An econometric analysis demonstrates that of all the different types of foodstuffs in the diet, only changes in sugar availability predict changes in diabetes rates 3 years later; while a microsimulation study reducing sugar consumption predicts reduction in diabetes rates 3 years later.

   https://pubmed.ncbi.nlm.nih.gov/23460912/

   https://pubmed.ncbi.nlm.nih.gov/28775179/

8. There is a false notion, promulgated by some influential Australian nutritionists, that because sucrose is "low-glycemic index" (low GI), it is safe to consume. This is not true. a) Glycemic Index does not take fiber into account. The fiber content determines the Glycemic Load (GL). All real foods are low GL foods. b) Fructose is low GI, because it doesn't raise the serum glucose. It raises the serum fructose, which is 7 times worse, and causes 100 times the number of reactive oxygen species that can damage cells.

   https://www.theguardian.com/commentisfree/2013/oct/21/fructose-poison-sugar-industry-pseudoscience

9. Natural sources of fructose (e.g. whole fruits and vegetables) are not a problem, because their fiber content reduces and delays intestinal fructose absorption (i.e. low GL); thus protecting the liver and feeding the gut. In fact, fiber consumption prevents metabolic syndrome; but UPF is fiber-poor.

   https://pubmed.ncbi.nlm.nih.gov/32142510/

10. Australian SSB's contain 22% more sugar than U.S. SSB's.

    https://www.dailymail.co.uk/news/article-4573002/Australian-soft-drinks-sugar-US.html

11. Sales of SSB's in Australia have declined since 2015; however, sugar consumption continues to remain high in Australia, primarily in nutrient-poor junk food.

    https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7230225/

    https://www1.health.gov.au/internet/fr/publishing.nsf/Content/C6995F10A56B5D56CA2581EE00177CA8/$File/Policy%20Context%202017.pdf

Effects of reducing sugar consumption

12. General microsimulation studies suggest that reducing sugar consumption by the U.S. population could save countless lives and money.

    https://pubmed.ncbi.nlm.nih.gov/28775179/

    https://pubmed.ncbi.nlm.nih.gov/34445886/

13. Microsimulation studies of U.S. recipients receiving SSB's on Food Stamps demonstrate an even greater economic and medical benefit.

    https://pubmed.ncbi.nlm.nih.gov/30278053/

14. Instituting a soda sales ban in a workplace led to both decreased consumption and improved waist circumference and insulin sensitivity, demonstrating that sugar reduction is both feasible and efficacious.

    https://pubmed.ncbi.nlm.nih.gov/31657840/

Amongst the general population, health professionals, and government, a proper understanding of the role of sugar is almost non-existent

15. Lack of knowledge that poor nutrition plays in chronic disease (both physical and mental disorders).
    a. The idea that "a calorie is a calorie", and therefore reducing calories, rather than reducing sugar, is the goal. However, this has been proven to be untrue in many different studies.

       https://pubmed.ncbi.nlm.nih.gov/31105044/

       https://pubmed.ncbi.nlm.nih.gov/26499447/

    b. The idea that because fructose contains calories, that fructose is therefore "food". But in fact, any substance that inhibits burning at the level of the mitochondria is not "food", but rather "poison". While the new mantra is that "food is medicine", it can also be poison, especially if it contains sugar.

       https://pubmed.ncbi.nlm.nih.gov/33167515/

    c. The role of 'addiction' (i.e. hormonal/chemical imbalances beyond the control of the individual), in preventing compliance with official advice on diet and exercise.

    d. The idea that "there is a pill for that" – there are no medical remedies for chronic metabolic disease, because there are no medicines that improve mitochondrial function. Even the new GLP-1 analogs

Ozempic and Wegovy can't completely reverse chronic metabolic disease, and the weight and metabolic dysfunction returns as soon as the drugs are stopped.

e. The concept of "personal responsibility" gets in the way of public health efforts. In fact, "freedom to choose" is actually "freedom to blame".

https://pubmed.ncbi.nlm.nih.gov/25521876/

16. The metabolic syndrome crisis can only improve with environmental change, including to the international food supply; but neither corporations nor governments are taking the lead.
17. Thus far, public calls to reduce soda consumption have not resulted in action, in part because:
    a. The public believes "a calorie is a calorie", and that "obesity is personal responsibility". They do not understand that diabetes is a separate entity from obesity.

    https://pubmed.ncbi.nlm.nih.gov/33167515/

    b. Soda taxes are viewed as "regressive against the poor".
    c. 20% of the U.S. public is "sugar-addicted", and they demand their sugar and caffeine. This is also likely the case in Australia.

Goals for Australia Diabetes Inquiry

20. To develop a coherent and sustainable medical and public health care policy for Australia, based on sound scientific evidence concerning the fundamental impact of poor nutrition and particularly sugar, on health and wellbeing.
21. To effect diet and lifestyle changes that will improve the health and wellbeing of the Australian population now and in the future, by preventing and reducing the burden of chronic, systemic diseases.
22. To increase the consumption of water instead of soda, with resultant improvement in the diseases of metabolic syndrome starting 3 years later.

Keys to goal achievement

23. Sugar reduction obeys the Law of Public Health, which states "reducing availability reduces consumption, which reduces health harms".
24. In order to elicit buy-in and compliance from the general population, there must an equal and opposite "inducement" to the "punishment" — a CARROT AND STICK, instead of a CARROT or STICK. For instance, one option would be to promote a nationwide sugar tax, and then use the proceeds from the tax to subsidize bottled water for low-income demographic groups (known as "differential subsidization" (diet soda has its own health drawbacks).
26. Because metabolic syndrome is prevalent in Australia, there should be less uproar challenging this project, as people will not feel left out.
27. It is essential to educate the population that immediate changes in morbidity and mortality are highly unlikely, but that improvements are likely to be manifest after 3 years of initiation.
28. The City of Berkeley, CA banded together to pass its soda tax legislation by developing a campaign "Berkeley Against Big Soda". It would be easy to replicate this success with "Down Diabetes Down Under".
29. Education and training are key. Campaigns to raise awareness of the importance of nutrition for health and wellbeing (age and gender specific, e.g. pregnant mothers to reduce chronic disease in future generations). Professional training to improve evidence-based practice in schools, hospitals, care homes, etc.

30. National and provincial governments must work with leading researchers, professionals, and the food industry in order to:

a. coordinate sugar reduction and “wean” the population off its ‘sugar habit’ gradually, to reduce addiction and its consequences in a manageable and acceptable way.

b. Provide nutrition education online, and through local community organizations.

c. Set up an international workshop and conference programme, to attract and engage leading researchers, clinicians and other key experts from relevant disciplines (nutrition, medicine, biochemistry, physiology, psychology, education, management, information technology etc), and encourage them to share and combine their knowledge, expertise and experience with that of the Australian government.

31. There are likely many other stakeholders who will need to be approached, including NGO’s, public health watchdogs, churches and religjous organizations, etc.

32. Procurement is a major obstacle. People don’t know what to buy when they go to the grocery store. This can be solved with technology. For instance, *Perfact* <perfact.co> can filter out high-sugar items so that they are not even offered to consumers. Recipe management can also be accomplished with technology, e.g. *Foogal* <foogal.com> can structure a menu to be metabolically healthy for an entire family.

33. Ultimately, processed food must be re-engineered to be metabolically healthy. This can be accomplished, as we did for the Kuwaiti Danish Dairy Company, by adhering to three principles: a) protect the liver; b) feed the gut; and c) support the brain.

https://www.frontiersin.org/articles/10.3389/fnut.2023.1098453/full