

Sugars and dental caries

Key facts

- Dental caries (also known as tooth decay or dental cavities) is the most common noncommunicable disease (NCD) worldwide, affecting 2.5 billion people(1).
- Even though dental caries is preventable, it poses a major health burden for many countries and affects people throughout their lifetime, causing pain, discomfort, difficulties in eating and sleeping, tooth loss and reduction in quality of life.
- The consumption of free sugars in foods and beverages is the most common risk factor for dental caries and is a shared risk factor across NCDs.
- Free sugars* are the essential dietary factor in the development of dental caries because dental caries do not occur in the absence of dietary sugars. Dental caries develop when bacteria in the mouth metabolize sugars to produce acid that demineralizes the hard tissues of the teeth (enamel and dentine).
- Severe dental caries often causes pain and infection, which may result in tooth loss, and may be associated with increased risk of under nutrition.
- Limiting free sugars intake to less than 10% of total energy intake – and ideally even further, to less than 5% – minimizes the risk of dental caries throughout the life course(2).
- WHO recommends that children under 2 years of age should not consume any sugar-sweetened beverages and should limit consumption of 100% fruit juice (3).
- WHO recommends implementation of a policy to tax sugar-sweetened beverages (SSBs) as a cost-effective fiscal policy measure to reduce sugar consumption intake and body weight and dental caries(4).
- Cost effective minimally invasive interventions (such as application of topical fluorides and restorative technique using hand instruments) on oral health are available and demonstrate that effective high quality oral health care exists which is not expensive(5).

* Free sugars include all monosaccharides and disaccharides cook added to foods and drinks by the manufacturer, or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates (WHO Guideline on sugars intake for adults and children, 2015: http://www.who.int/nutrition/publications/guidelines/sugars_intake/en/).

Introduction

Dental caries is a major public health problem globally and is the most widespread noncommunicable disease (NCD). It is prevalent throughout the life course affecting both permanent teeth (2 billion people) and deciduous teeth (510 million children)(1).

Consumption of free sugars* is a major risk factor for overweight, obesity and dental caries. Dental caries can be prevented by avoiding dietary free sugars. Simple and cost-effective interventions are available to support populations in reducing sugar consumption, preventing dental caries and providing minimally invasive treatment in primary health care settings.

Severe dental caries can lead to tooth loss and impair quality of life. The consequences of untreated dental caries include:

- physical symptoms such as pain, discomfort or chronic systemic infection;
- functional limitations such as challenges eating, speaking, breathing or sleeping; and
- detrimental impacts on emotional, mental and social well-being.

In low-income settings, the majority of dental caries goes untreated. Teeth affected by caries are often extracted (pulled out) when they cause pain or infection. Prevention and treatment for dental caries is usually not part of national Universal Health Coverage (UHC) benefit packages. This often leads to catastrophic costs and significant financial burden for families and communities(6). Improving integration of essential oral health care services in primary health care and UHC benefit packages would improve access to prevention and management of oral diseases to better respond to the needs of populations.

Scope of the problem

Almost half of the world's population is affected by oral diseases, and most of these cases are due to dental caries. High levels of dental caries occur in middle-income countries, where sugars consumption is high. In such countries, health systems are challenged to provide preventive population-wide strategies and primary oral health care often is not available (1).

Who is at risk?

Dental caries affects all age groups, starting with the eruption of the first teeth (deciduous teeth) and increasing in prevalence until late adulthood, then remaining at high levels until older age. In children, dental caries is associated with adverse growth patterns and a frequent cause of absence from school. For adults, untreated dental caries is associated with absence from work, may negatively affect employment opportunities and reduce productivity (1).

There is a clear dose–response relationship between sugars* consumption and dental caries for all age groups (7). Dental caries results when plaque forms on the surface of a tooth and converts the free sugars* (all sugars added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrups and fruit juices) contained in foods and drinks into acids that destroy the tooth over time. A continued high intake of free sugars, inadequate exposure to fluoride and a lack of removal of plaque by toothbrushing with fluoride toothpaste containing 1000-1500 ppm concentration can lead to dental caries.

Social and commercial determinants of health

The burden of dental caries is also influenced by social determinants of oral health, which comprise the social, economic and political conditions that influence oral diseases, including access to safe water, sanitation and hygiene. There is a strong and consistent association between socioeconomic status and the prevalence and severity of dental caries. It disproportionately affects poor, vulnerable and/or marginalized members of societies, often including people who are on low incomes; people living with disability; older people living alone or in care homes; people who are refugees, in prison or living in remote and rural communities; and people from minority and/or other socially marginalized groups.

Additionally, the burden of dental caries is also affected by *commercial determinants of NCDs*, which are the strategies used by some commercial sector actors to promote products and choices that are detrimental to health. This includes marketing, advertising and sale of products that cause oral diseases and other NCDs, such as foods and beverages that are high in free sugars(8–21).

Commercial entities with a vested interest in sugar include producers of cane, beet, and corn sugar, as well as sugars and other sweeteners. These entities range from transnational corporations and national food and beverage industries that incorporate sugars and sweeteners into their products to trade associations representing businesses with a stake in commercial use and consumption of sweeteners. They may also include hybrid entities operating in the public, private, and third sectors, which encompass voluntary and civil society organizations(22).

A significant challenge in public health lies in comprehending the global reach and influence of these commercial entities. They not only oppose policies to reduce sugars intake but also actively shape the policy landscape through direct opposition or more subtly through influencing research agendas(23).

Signs and symptoms

Dental caries develops over time; loss of tooth substance (enamel and dentine) is caused by acid production resulting from bacterial metabolism of sugars. Early stages are often without symptoms, but advanced stages of dental caries may lead to pain, infections and abscesses, or even sepsis.

Prevention and control

Population-wide strategies to reduce free sugars consumption are a key public health approach to reduce the burden of dental caries. Such interventions include:

- nutrition labelling: front-of-pack or other interpretative labelling to inform about sugars content, including mandatory declaration of sugars content on pre-packaged foods(24)
- reformulation limits or targets to reduce sugars content in foods and beverages(25)
- public food procurement and service policies to reduce offering foods high in sugars(26)
- policies to protect children from the harmful impact of food marketing, including for foods and beverages high in sugars(27, 28)
- taxes on sugar-sweetened beverages (SSBs) and on sugars or foods high in sugars(4).

Global impact

As the most common NCD, dental caries affects huge numbers of people across all age and socioeconomic groups, affecting their health and well-being, social interactions and economic status. The direct financial costs alone are considerable. The total direct expenditure for oral diseases among WHO's 194 Member States amounted to US\$ 387 billion or a global average of about US\$ 50 per capita in 2019. This represents about 4.8% of global direct health expenditures. At the same time, productivity losses from oral diseases were estimated at about US\$ 42 per capita, totaling around US\$ 323 billion globally(30).

WHO response

Following adoption of the Resolution on oral health (WHA74.5) in 2021, there is renewed momentum on oral health policy and integration into the broader NCD and UHC agenda (31). In response to the mandate outlined in the resolution, the WHO Secretariat developed the *Global strategy on oral health*, adopted in May 2022 (decision WHA75(11)), and translated into *Global oral health action plan 2023–2030* (GOHAP), noted by the Seventy-sixth World Health Assembly in 2023 (WHA76(9))(31). The GOHAP includes a range of actions for Member States, the WHO Secretariat, international partners, civil society organizations and the private sector to promote the reduction of sugars consumption and its impact on dental caries. There are also 11 global targets to track progress on implementation of the GOHAP, including target 2.1 By 2030, 50% of countries implement policy measures aiming to reduce free sugars intake. The Sugars Country Score Card in the Global database on the Implementation of Food and Nutrition Action (GIFNA) is the primary data source to inform the indicator for this target(32).

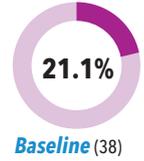
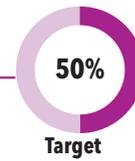
Many oral diseases including dental caries can be prevented and treated in their early stages with cost-effective minimally invasive interventions. Integrating a set of essential oral health care services into national UHC benefit packages using the PHC approach will have a significant impact on reducing the global burden of dental caries by improving availability and accessibility to quality care.

Public health solutions for prevention of dental caries and other oral diseases are most effective when integrated with the prevention of other NCDs, based on the principles of addressing common risks and the wider shared determinants of health. Implementing policy measures (upstream interventions) to promote the reduction of free sugars intake is an effective way of addressing the burden and impact of dental caries globally. WHO works with Member States and partners on specific policies and programs to reduce sugars consumption and the burden of dental caries as part of the wider NCD agenda.

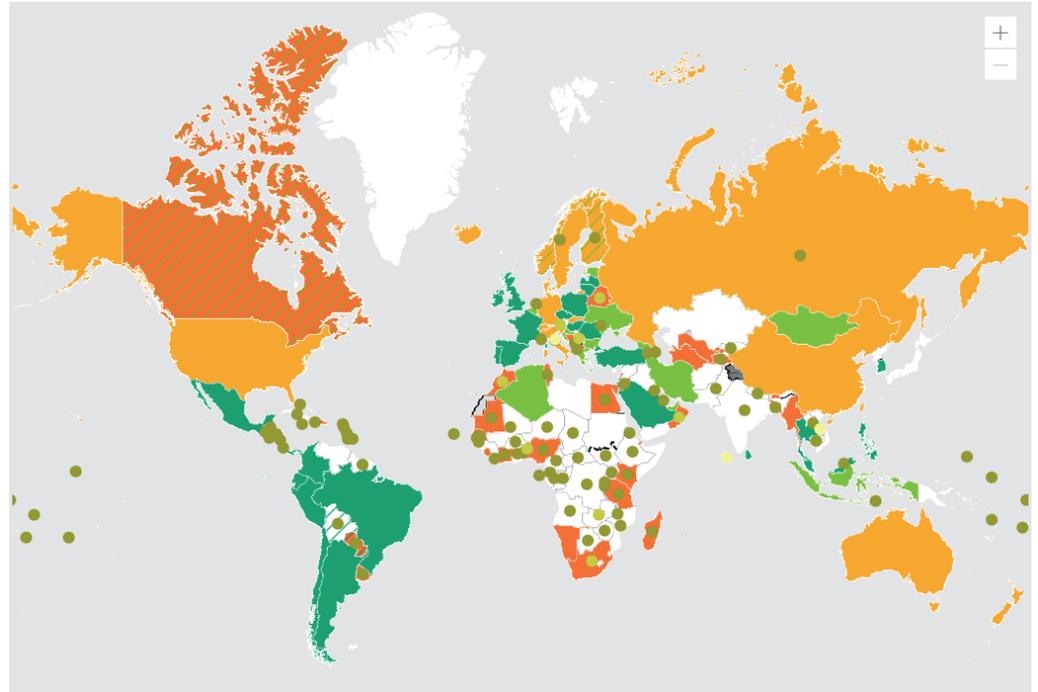
As part of the *NCD Implementation road map 2023–2030* (agreed to in 2022, Decision WHA75(11))(33), WHO updated cost-effectiveness analyses that informed the menu of policy options for NCDs and their shared risk factors, entitled; *Tackling NCDs: Best buys and other recommended interventions for the prevention and control of noncommunicable diseases* (34). This guidance is a tool to support countries to prioritize and scale up the implementation of impactful and feasible interventions relevant to their national context. Reduction of sugars consumption features as part of the impact pathway for recommended interventions on food product reformulation (including to reduce sugars content); front-of-pack labelling and public food procurement and service policies for healthy diets.

Additionally, the impact of dental caries was incorporated into the cost-effectiveness analyses for the intervention on taxation on sugar-sweetened beverages as part of fiscal policies for healthy diets (as featured in *Tackling NCDs: Best buys and other recommended interventions for the prevention and control of noncommunicable diseases*). WHO has subsequently published guidelines on *Fiscal policies to promote healthy diets: WHO guideline* (4), issuing a strong recommendation for implementation of a policy to tax sugar-sweetened beverages (SSBs). This WHO recommendation is further supported by the *WHO manual on sugar-sweetened beverage taxation policies to promote healthy diets* which provides further guidance on implementation (35). These policy options are further supported by the WHO Guidelines on *Use of non-sugar sweeteners* that suggest non-sugar sweeteners, not be used as a means of achieving weight control or reducing the risk of noncommunicable diseases, which may impact existing policies that promote product reformulation(36).

Implementation of public health strategies to promote appropriate exposure to and use of fluoride should also be encouraged (5, 37). Although exposure to fluoride reduces the development of dental caries and delays the onset of the cavitation process, it does not completely prevent dental caries if implemented as a sole (i.e. an isolated) action. Addressing the cause (i.e. free sugars) is therefore essential in preventing and reducing the burden of dental caries.



Global oral health action plan 2023–2030 (GOHAP). Global target 2.1: Policies to reduce free sugars intake. Core indicator 2.1. Percentage of countries that implement policy measures aiming to reduce free sugars intake



The *Global database on the Implementation of Food and Nutrition Action* (GIFNA). Sugars Country Score Card.

- 1. National policy commitment to reduce sugars intake: National policies, strategies or action plans that express a commitment to reduce sugars intake
- 2. Voluntary measures to reduce sugars: Voluntary measures that reduce sugars in the food supply or encourage consumers to make healthier food choices about sugars
- 3. Mandatory measures adopted for sugars reduction: Mandatory measures to reduce sugars in the food supply or encourage consumers to make healthier food choices, including mandatory declaration of sugars on all pre-packaged food
- 4. Multiple mandatory measures adopted for sugars reduction: Multiple mandatory measures to reduce sugars in the food supply or encourage consumers to make healthier food choices, including mandatory declaration of sugars on all pre-packaged food
- Mandatory measures for sugars reduction adopted to bring country to Score 3 (not yet all in effect)
- Mandatory measures for sugars reduction adopted to bring country to Score 4 (not yet all in effect)
- Other mandatory measures targeting SSBs or sugar
- Other mandatory and voluntary measures targeting SSBs or sugar
- Other voluntary measures targeting SSBs or sugar
- Missing data



Acknowledgments

WHO is grateful to the following external experts who contributed to the review of the 2025 update to this WHO Technical information note on sugars and dental caries:

- Cristin Kearns, University of California San Francisco, United States of America
- Paula Moynihan, University of Adelaide, Australia
- Nassos Gkekas, University of York, United Kingdom of Great Britain and Northern Ireland.

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Suggested citation. WHO technical information note: sugars and dental caries, May 2025. Geneva: World Health Organization; 2025. <https://doi.org/10.2471/B09443>

