# Redefining the non-communicable disease framework to a 6×6 approach: incorporating oral diseases and sugars

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**The WHO Global Oral Health Status Report, published in 2022, highlighted the alarming state of oral health worldwide and called for urgent action by integrating oral health into non-communicable diseases (NCDs) and universal health coverage initiatives. 3·5 billion people have oral diseases, surpassing all other NCDs combined. The detrimental role of sugars as a risk factor for oral diseases and other NCDs has also been well documented. Despite the evidence, oral diseases and sugars are not part of the current NCD framing, which focuses on five diseases and five risk factors (ie, 5×5). Oral diseases and sugars remain sidelined, disproportionately affecting poor and disadvantaged populations. In this Viewpoint, we advocate for the integration of oral diseases and sugars into the current approach towards the prevention and control of NCDs. An expanded 6×6 framework would recognise growing evidence and would reiterate the need to strengthen action, resource allocation, and policy development for NCDs. We present the evidence and rationale for, and benefits of, an expanded NCD framework and detail recommendations to guide efforts towards improved priority, investment, and equitable health outcomes for NCDs, including oral health.**

## Oral diseases and the non-communicable disease agenda

Improving public health priorities for oral diseases has been a mammoth challenge. A quintessential quote from the first WHO Global Oral Health Status Report, which summarises the result of long-standing political and global health neglect, states that "the status of global oral health is alarming and requires urgent action".[1] Despite being largely preventable, an estimated all-time high of 3·5 billion people have oral diseases, more people than there are affected by all other non-communicable diseases (NCDs) combined.[1] The report also highlights the detrimental role of sugars as a key risk factor for oral disease and many other NCDs.[2] Neither oral diseases nor sugars are explicitly part of current mainstream framing of NCDs represented by the 5×5 framework endorsed by the Third UN High-level Meeting on NCDs in 2018.[3]

Several initiatives since 2019, including a *Lancet* Series on oral health and a suite of new WHO policies, have stimulated public health momentum within the NCD community and beyond.[2,4] In this Viewpoint, we summarise the evidence and advocate for a stronger conceptual and programmatic integration of oral diseases in the framing of NCDs and universal health coverage (UHC).

## Framing of NCDs as global health challenges

The conceptual and technical work of WHO and other global health stakeholders related to NCDs currently focuses on five disease groups: cardiovascular diseases, cancers, chronic respiratory diseases, diabetes, and mental disorders. Five key modifiable risk factors are associated with these diseases: tobacco use, unhealthy diet, unhealthy use of alcohol, physical inactivity, and air pollution.[3,5,6] The combined diseases and risk factors are referred to as the 5×5 approach to NCDs (figure).

This conceptual, social, and communicative framing is a key aspect in prioritising NCDs as urgent public health issues, driving resource allocation, policy development, and prioritisation in the strengthening of clinical care and health systems.[3] It also allows for simple narratives that reduce complexity and incentivise action, even though the realities of the various disease groups and associated risk factors are anything but simple.[3] The downside of such a streamlined matrix is that NCDs and risk factors that are not included become sidelined and do not benefit from the same political, scientific, health system, and health economic attention that the so-called big five might receive.[3,7] The WHO NCD action plan (2008–13)[8] and other documents, including the Political Declaration of the First UN High-level Meeting on NCDs (2011), acknowledge this shortcoming by listing numerous other NCDs, including eye, renal, and oral diseases.[9] However, such peripheral recognition—an afterthought to the big five—is yet another symptom of the neglect of oral health in global public health contexts.[2,3]

The constantly evolving narrative approaches used for NCDs are an illustration of the complex interactions between advocacy, science, politics, and situations of opportunity. They also reflect the absence of a defined process in governance and priority setting in global

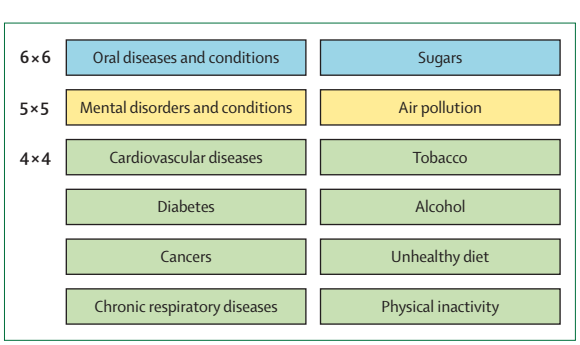


***Figure:*** **Evolution of non-communicable disease and risk-factor framing—from 4×4 to 6×6**

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For the ***Lancet* series on oral health** see https://www.thelancet.com/series/oral-health

health relating to NCDs.[3,5,7] We consider this fluidity and the transformations of the global NCD movement over time as opportunity to advocate for an evolution of the current 5×5 approach through the inclusion of oral diseases as a sixth disease group and of sugars as a sixth risk factor. The argument builds on the powerful and growing body of evidence that highlights the public health, economical, and developmental burden of oral diseases, as well as their substantial contribution to other NCDs.

## Oral diseases are major preventable NCDs

First, to emphasise that almost all diseases and conditions that form the overarching group of oral diseases fit into the definition of NCDs is important. They are chronic, non-infectious, and slowly progressing diseases that affect people over their entire life course.[10] Oral cancer, dental caries, severe periodontal disease, and toothlessness account for most oral diseases, with a combined global prevalence of 45% (excluding oral cancer), which shows remarkably little variation across regions or country-income groups.[1] Dental caries is the most common disease of children and adolescence, starting as soon as teeth erupt.[1] There is a close, often bidirectional association between oral diseases and general health, particularly with other NCDs.[11] All major oral diseases are largely preventable through proven, cost-effective, population-level community and individual measures.[10]

Second, the magnitude of the burden of oral disease is unparalleled by any other disease group, despite its low mortality. Global case numbers increased by a staggering 1 billion over the past 30 years. The high average prevalence is topped by high rates in poor, disadvantaged, and vulnerable groups, in which the prevalence of dental caries among children and adolescents can reach more than 90%.[12] The lack of access to prevention and basic oral health care results in high rates of acute and chronic toothache, infection, and other effects, including negative influences on school performance and productivity.[1,13]

Third, inequalities for oral diseases are similar, perhaps even more marked, when compared with other NCDs. Poor and disadvantaged populations in all countries have a higher burden of oral diseases than wealthier populations, together with less access to oral health care, prevention, and insurance coverage. Oral health care is generally associated with high out-of-pocket payments and is a common reason for catastrophic health expenditure, making the integration of oral health care in UHC even more important.[14]

## Focus on sugars as key NCD risk factors

The scientific literature related to the ill effects of sugars is extensive. We use the term sugars as defined by Moynihan and Kelly,[15] in which sugars includes total sugars, free sugars, added sugars, sucrose, and non-milk extrinsic sugars. We also use the term as defined in the WHO guideline on sugars:[16] "free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates". A high consumption of sugars as a modifiable dietary risk factor is currently part of the basket term unhealthy diet. The term unhealthy diet comprises foods that are high in saturated and trans fats, salt, and sugar; having a low intake of fibre, fruits, and vegetables; and having a high consumption of sugar-sweetened beverages, among other factors. The inclusion of oral diseases as a key NCD would make the addition of sugar consumption as a distinct risk factor a natural and consequential choice to foster health promotion and disease prevention.

First, high sugar intake is the single most important risk factor for the development of dental caries. There is a clear dose–response relationship between the amount of sugar consumed and the risk of tooth decay, an association much stronger than for any other sugar-related NCD.[17] The WHO guideline on sugars[16] builds on this evidence and recommends the limiting of daily sugar consumption to less than 10% of daily energy intake to reduce the risk of NCDs, including oral diseases.

Second, the excessive consumption of sugars contributes to intermediary risk factors, such as obesity, high blood glucose concentrations, and high blood pressure, that pose challenges across the entire life course.[18] Sugars are thus a pivotal risk for diabetes, insulin resistance, and cardiovascular disease.

Third, excessive sugar intake disproportionately affects the so-called bottom billion—poor, disadvantaged, and marginalised populations—exacerbating health inequalities.[19] The food environments available to these populations are a key determinant of their NCD burden and oral diseases are at the forefront of this burden along the entire life course.

Last, the WHO Global Strategy for NCDs[8] identifies the need to address unhealthy diets as a key priority for preventing and controlling NCDs. The underlying common risk-factor approach was first introduced as a concept in the Ottawa Charter for Health Promotion almost 40 years ago. Since then, sugar consumption worldwide has grown exponentially with no signs of major decline. New forms of sugars, including the widespread use of corn syrup, have emerged and are now part of many processed foods in our increasingly complex and globalised food environment, which has led to a transition to an unhealthy diet and a pandemic of obesity in many countries and populations.[20] The promotion of oral health relies on the common risk-factor approach, which creates ample opportunities for synergistic action on upstream health risk and determinants.[10] In addition, oral diseases are early markers of risks and inequalities that could lead to substantial rates of NCDs later in life.[21]

Therefore, proposing an evolved common risk-factor approach by emphasising high sugar intake as a distinct

risk factor in addition to unhealthy diet is timely and pertinent. This proposal would allow for effective, preventive public health strategies addressing the intricate interplay of risk factors associated with NCDs, ultimately fostering a comprehensive approach to health promotion and disease prevention.

## Evolving NCD framing—learning from past experience

The recognition of mental health and air pollution in the context of expanding the NCD framework not only provides valuable lessons on processes and political priority negotiations in a global health context, but also shows the benefits that such recognition might yield for an entire group of diseases.[22] After the 2011 UN High-level Meeting on NCDs, mental health was in a similar situation to oral health, with just a brief mention in the final political declaration. Yet, through intense and multifaceted advocacy and civil society support, mental health became part of the 5×5 framework in 2018.[23] Similarly, the momentum for recognising the devastating impact of air pollution on NCDs grew steadily, fuelled by years of research showing the pronounced impact on health outcomes, particularly in low-income and middle-income countries, and repeatedly featured in reports by WHO and other organisations.[24,25] The inclusion of air pollution opened doors for a more integrated approach to environmental and human health. However, oral diseases have not had the recognition and political attention that they deserve. Only in 2021, following the publication of the *Lancet* Series on oral health, was there sufficient support from WHO member states to lead to the adoption of a resolution on oral health—the first time in 14 years.[4,26]

The current conceptual framing of NCDs and their key risk factors embodies a social and communicative consensus supporting global health, although its origins and many of its related actions are dominated

***Panel 1*: Strengths, weaknesses, opportunities, and threats for a 6 × 6 framework for non-communicable diseases (NCDs)**

**Strengths**

- Robust evidence base: substantial evidence underscores the burden of oral diseases, global oral health disparities, and the adverse effect of excessive sugar consumption on human health and wellbeing
- Pioneering policy interventions: have shown success in upstream public policy interventions concerning sugar consumption and have set a precedent for other broader NCD-related policies
- Evidence-informed framework: a set of cost-effective, high-impact interventions for addressing oral diseases provides options for health planners and policy makers
- Early indicators of NCDs: oral diseases serve as early indicators of later-life NCD burden, also offering a proxy for the efficacy of NCD prevention strategies
- Rights-based perspective: there is compelling rationale to approach oral diseases, their risk factors, and determinants from a rights-based, inequality-focused standpoint
- Political backing: there is current and substantial political support to bridge oral health gaps and reduce glaring disparities

**Weaknesses**

- Perpetuated misconception on costs: there is a persisting belief that clinical oral health care is inherently costly, leading to misconceptions about affordability
- Technical capacity gap: there is a widespread deficiency in the capacity to analyse, plan, implement, and evaluate oral disease interventions at a population level
- Low priority for oral health: oral diseases are neglected and are deemed less important among decision makers in comparison with competing health priorities
- Individualistic focus: dental delivery models, governance, and political economy predominantly centre on individual needs rather than addressing population-level challenges
- Information gaps: insufficient data on oral disease hamper the formulation and planning of effective solutions

**Opportunities**

- Oral health is a human right: WHO's recognition of oral health as part of the right to health amplifies the importance of oral health
- Policy momentum from WHO: emerging WHO oral health policies generate political traction and provide political backup for extending the reach of oral health concerns within wider public health arenas
- Concerted and structured action: the WHO Global Oral Health Action Plan proposes practical actions for stakeholders, which prioritise population-wide prevention, and risk-factor control, particularly addressing sugar consumption

**Threats**

- Resistance to change: there is potential for opposition at organisational, political, and technical levels to transformative changes
- Industry opposition: there is potential for backlash from commercial and industry sectors against reinforced action on sugars, including from countries with traditional political positions that are supportive of the sugar industry
- Competition in advocacy: there could be resistance from established disease or risk-factor advocacy groups to add another disease and risk factor to the matrix
- Avoidance of dietary focus: there could be resistance to singling out dietary risk factors because high sugar consumption already falls under the umbrella of unhealthy diet

***Panel 2*: Recommendations for transitioning to a 6 × 6 framework for non-communicable diseases (NCDs)**

- Political advocacy for a 6 × 6 framework: champion political endorsement of the 6 × 6 framework within national governments and initiate discussions within WHO governance structures for the eventual formalisation through a resolution or other document
- Strengthen synergies: expand the evidence base concerning the interconnectedness between the prevention of oral diseases, sugar control, and overall NCD burden
- Inclusion of essential oral care in universal health coverage (UHC): elevate the prominence of essential oral health care within primary health care and UHC
- Enhance training opportunities: develop training avenues for health professionals in the prevention and control of oral diseases and strengthen public health aspects in their education
- Leverage WHO policies: promote and use recommendations from the WHO Global Oral Health Action Plan, especially those related to enhancing oral health information and to pivoting research focus
- Incorporate essential oral health care in UHC packages: advocate for the inclusion of essential oral health care packages within UHC
- Prioritise cost-effective interventions: emphasise high-impact, cost-effective clinical and population-level interventions over resource-intensive, low-value approaches
- Embrace a rights-based approach: align with WHO's oral health definition and foster a rights-based perspective
- Adopt the 6 × 6 framework at the UN meeting: propose the adoption of the 6 × 6 NCD framework at the Fourth UN High-level Meeting on NCDs in 2025 and secure support from key advocates and stakeholders in preparation for the meeting
- Strengthen collaborations: facilitate cross-level collaboration between oral health and NCD stakeholders, encompassing science, advocacy, civil society, insurance, professional organisations, and others
- Empower communities: promote community and civil society involvement, enabling effective policy and service co-creation
- Collaborate with WHO leadership: advocate for WHO leadership endorsement and jointly pave a governance path towards the formal adoption of the 6 × 6 framework
- Action on commercial determinants: support and encourage action against commercial influences in public policy decisions at all levels and sharpen the focus on sugar-related industry interference

These recommendations are directly related to the strengths, weaknesses, opportunities, and threats analysis (panel 1) and might be helpful to leverage strengths and opportunities advocating for a transition to a 6 × 6 framework for NCDs or in mitigating and addressing weaknesses and threats to such a framing change

by priorities set in high-income countries.[27] Critics argue that the current NCD and risk-factor framework does not cover the poorest populations, which are largely burdened by diseases that are not in the big five.[28] However, the case for oral diseases and sugars is simple and compelling: oral diseases have the highest case numbers and prevalence of all diseases, having high sugars intake has major and ubiquitous risks, and both affect poor, vulnerable, and disadvantaged populations more than any other group. Rethinking and expanding the NCD and risk-factor framing will not only improve oral health, but will also contribute to increased equity in approaches addressing NCDs by including populations who are disproportionally affected by oral diseases and other NCDs.

## New momentum for NCDs by expanding the disease and risk-factor family

Despite the evidence and technical guidance from WHO on sugars, the organisation's public health and policy response has been impeded by political bargaining and corporate influences. These actions have consistently diluted or obstructed efforts to address the risks associated with sugars.[29,30] Consequently, these obstacles have contributed to the perception of organisational inertia regarding the hazards posed by sugars.[31] The advent of new WHO policies on oral health presents a fresh opportunity for the organisation to address the issue of sugars with greater assertiveness and prominence. The Global Oral Health Action Plan includes a global objective pertaining to the regulation of the consumption of free sugars (target 2.1: "By 2030, 50% of countries implement policy measures aiming to reduce free sugars intake"),[32] accompanied by a range of tangible action options for governments and stakeholders. Additionally, progress monitoring of policy implementation relies on the new WHO Sugars Country Score Card system.[33]

NCDs need better priority and more investment, including oral diseases and sugar control. Indeed, an analysis of the wider political economy of NCDs by Jakovljevic and colleagues[34] revealed substantial obstacles to improving global priority and investment, resulting in an increase in the investment in communicable diseases that was ten times higher, despite evidence that the highest disease burden derives from NCDs.[34] Oral diseases and oral health care face great challenges necessitating an inclusive effort to avoid further disconnection and marginalisation from the broader NCD agenda. The WHO global policies on oral health[26,32] present a historic opportunity for evolving agenda setting for public health. The policies are fully aligned with the common discursive domains used in framing NCDs in a global health context, comprising the determinants of NCDs, a rights-based approach to NCDs, approaches to achieving policy coherence, and

the role of NCDs as part of sustainable development.[5] The policies also emphasise—for the first time—the human right to oral health.[26]

## The way forward towards a 6 × 6 approach for NCDs

Expanding the NCD framing to a 6×6 approach offers considerable strengths and opportunities, but can also reveal weaknesses and potential threats. We summarise these strengths, weaknesses, opportunities and threats in panel 1. Because of years of neglect, there is a widespread scarcity of technical capacities, financial resources, and other resources related to oral diseases within key stakeholder groups, including WHO, many governments, major development partner organisations, and civil society. The competitive interests of organisations and groups that are part of the current political economy of NCDs might argumentatively emphasise the challenges of the expansion of NCD framing while downplaying the potential synergies and benefits. However, the anticipated backlash of corporate entities and of some governments, especially those that have traditionally been supportive to the interests of the sugar industry, in response to strengthened action against sugars might paradoxically foster unity and alignment among NCD and risk-factor advocates.

Taking these potential weaknesses and strengths into account will be crucial. We provide recommendations on how to frame supportive argumentation (panel 2). Advancing the idea is imperative and will require close collaboration with key opinion leaders within WHO, supportive governments, the NCD Alliance, civil society organisations, and the wider oral health and public health communities. We urge governmental policy makers, WHO, and other stakeholders to acknowledge the importance of oral health and sugars as fundamental elements in shaping a more inclusive and effective response to NCDs.

**Contributors**

HB conceptualised the manuscript and developed the original draft. All authors critically contributed, reviewed, and approved the manuscript.

**Declaration of interests**

HB is the founder of the Health Bureau, an independent global health consultancy firm. All other authors declare no competing interests.

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