

Oral health for healthy ageing

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Over the past 70 years, the global population and age structure have been changing rapidly. Analyses from the 2017 Global Burden of Diseases, Injuries, and Risk Factors Study forecasted a continuation of global ageing throughout the remainder of the 21st century, creating major challenges for health-care systems to ensure healthy longevity for ageing societies. Oral health is an intrinsic constituent of general health and wellbeing; however, oral health is largely overlooked on the global health agenda. Oral conditions are mostly preventable or treatable, yet older people often do not receive the necessary routine care to maintain a good standard of oral health. The neglect of oral health constitutes a failure of global health policy and a failure to deliver the basic human rights of older people. The aim of this Personal View is to encourage a refreshed vision of oral health, enabling policy makers to recognise the implications of poor oral health in older adults. We call for urgent action to manage the projected challenges throughout the coming decades, to ensure that additional years of life are spent in a state of good health and to help mark global ageing, not as a burden, but as a major anthropological achievement.

Challenges for oral health in ageing populations

Oral health has been a neglected dimension of global health for too long. Its siloed existence from general health care has led to oral health provision rarely being prioritised by policy makers. The future trajectory of global oral health is fast approaching a crucial juncture as more population age structures invert, expanding the proportion of older adults relative to other age groups. Modelling research from the 2017 Global Burden of Diseases, Injuries, and Risk Factors Study predicts major shifts in age structure and anticipates that there will be 2.37 billion (95% uncertainty interval [UI] 1.91–2.87) people who are older than 65 years, by 2100.¹ These challenges converge with a radically changing milieu of social and economic determinants that risk further increasing the prevalence of oral diseases in older adults. Urgent and bold policy action is required to recognise oral health as a contributor to healthy longevity and truly enable the realisation of the UN Decade of Healthy Ageing.

Given that most oral diseases are preventable, the global prevalence and disability-adjusted life-years (DALYs) burden of oral diseases is unnecessarily high. According to the 2019 Global Burden of Disease study, edentulousness (complete tooth loss), severe periodontitis (chronic gum disease), and untreated dental caries (tooth decay) account for 23.1 million DALYs (95% UI 13.6–37.4) worldwide—a loss of approximately 284.6 (95% UI 167.7–459.3) years per 100 000 population.² 28.02% (95% UI 25.87–30.09) of the increase in DALYs for oral conditions between 1990 and 2010 is solely attributed to population ageing.³ Worldwide, oral disorders contributed 8 million years lived with disability among people aged 50–74 years in 2019 (figure 1). Without a radical reform in the provision of dentistry, the absolute number of people with oral disorders are likely to continue growing, amplified by the challenges of population ageing.

Untreated dental caries in permanent teeth affect approximately 2.5 billion people,⁴ with the highest incidence at age 70 years and displaying marked international variation for those aged 65 and older.⁵ The skewed global distribution of people with dental caries

can be partly explained by a changing landscape of the commercial determinants of health, with different factors depending on the income level of the country.⁵ For example, higher consumption of sugar-sweetened beverages alone has substantially raised the risk of severe untreated caries in the average US adult dentition.⁶ Evidence suggests that middle-income countries (eg, Bolivia, Honduras, India, and Indonesia) have the highest prevalence of dental caries, which could be due to changes in social, economic, and commercial effects, and underdeveloped or unaffordable oral health-care systems.⁷

Along with dental caries, there are several other oral diseases and functional problems that are more common in older adults: periodontal disease, oral cancer, and edentulousness. Oral cancers are of particular concern for older adults; around 95% are diagnosed between the ages of 40 and 60 years.⁸ The prevalence of periodontal disease is highest in those aged 60 years and older, and regionally varied, with the highest in east sub-Saharan Africa (51%) and lowest in Oceania (10%).⁴ The burden of periodontal disease has reduced in older adults from high-income countries.^{9,10}

Dental traumatic injuries caused by falls substantially affect older adults; more than one in four older adults have a fall each year.^{11–13} The association between reducing falls and reducing dental traumatic injury is a relatively unexplored research area. Traumatic dental injuries are costly (US\$2 000 000–\$5 000 000 per million inhabitants), labour intensive, and are estimated as the fifth most prevalent disease or injury—despite being unmeasured in the Global Burden of Disease studies.¹⁴ There have been calls for dental care providers to be embedded in multidisciplinary care networks for the management of patients with osteoporosis, with additional emphasis on fracture prevention.¹⁵ However, few efforts have been reciprocated to minimise dental traumatic injuries that detrimentally affect quality of life for older adults in the short and long term.

Worldwide, approximately 30% of adults aged 65–74 years are edentulous, whereby periodontal disease is the primary cause.¹⁶ Edentulism accounts for the largest proportion of

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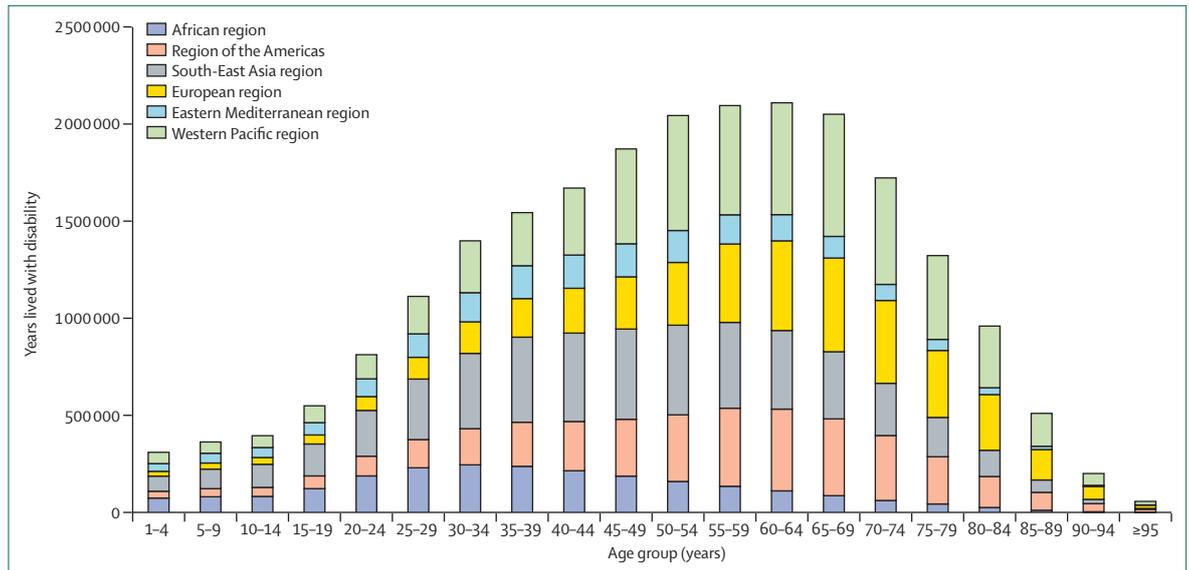


Figure 1: Years lived with disability by WHO region and age group in 2019

Data are GBD estimates for 2019, which were obtained via the Institute for Health Metrics and Evaluation GBD Compare tool. GBD=Global Burden of Disease.

For the Institute for Health Metrics and Evaluation GBD Compare tool see <http://www.healthdata.org/data-visualization/gbd-compare>

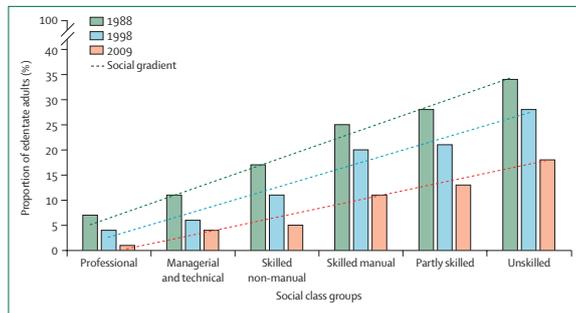


Figure 2: The proportion of adults with edentulism

Data are from the Adult Dental Health Surveys in England, Wales, and Northern Ireland (1988, 1998, and 2009 surveys; n=20 126). Reproduced from Bernabé and Sheiham.¹⁸

the DALYs attributable to oral disorders, which is greatest in high-income countries and highest in the 75–79 years age group.¹⁷ The proportion of UK adults with edentulism closely follows the social gradient, with those in lower social class groups consistently having higher rates of edentulism over three 10-year intervals (figure 2).⁶ Tooth loss has profound consequences in terms of impairments to nutrition and overall quality of life.¹⁹

The risk factors for oral diseases among older adults (eg, tobacco, alcohol, and low socioeconomic status) have wide global distribution. Across parts of Europe, the eastern Mediterranean, and Asia, smoking or chewing tobacco remains common among many older adults and is the leading cause of oral cancers, periodontal disease, and premature tooth loss.²⁰ Although the global trend in the prevalence of tobacco smoking has steadily declined since 1990, the absolute number of smokers has risen and many older adults smoked tobacco heavily before giving up.²¹

Alcohol consumption, another major risk factor for developing lip and oral cavity cancers, accounted for 177 757 deaths in 2020, and most new cases (377 713 cases in 2020) are largely attributed to its use.^{22,23} When alcohol and tobacco are combined, the risk of oral cancer increases by 15 times.⁶ Dental injuries from accidents or falls are also more likely to occur when alcohol has been consumed and older adults in high-income countries consume more than those in middle-income countries.^{24,25}

Socioeconomic status is a consistent determinant of oral health worldwide. Oral diseases in older adults—including caries,²⁶ periodontal disease²⁷ and oral cancer—²⁸ increase as socioeconomic status decreases. Wealthy individuals are more able to afford and access dental care services than people who are on low incomes, a finding that is consistent across all countries studied.⁶ Older adults living in urban areas are also more likely to have received care for a problem with their mouth or teeth than those in rural areas,²⁹ reflecting the multifaceted inequalities in accessing dental care.¹⁶ Considerable challenges underpin the ambition to advance global oral health, but is there a strong case to support oral health as an important aspect of general health?

Oral health in older adults matters

In 2016, the World Dental Federation adapted its definition of oral health from a narrow focus solely on disease, to a broader, multidimensional view that includes the ability to speak, smile, smell, taste, touch, chew, swallow, and convey a range of emotions through facial expressions with confidence and without pain or discomfort.³⁰ Sub-optimal oral health, including functional problems (eg, broken or missing teeth or ill-fitting dentures), can cause

oral pain and infections, with major consequences to quality of life. Commonly, these consequences are directly linked to reduced nutritional uptake, behavioural effects on food choices, challenges in communication, and difficulties associated with mastication and deglutition.³¹ People living in residential settings often have a rapid decline in their oral health after moving into a residential care setting, even if their dentition is stable upon admission.^{32,33} This decline can be the result of a combination of xerostomia (dry mouth), possibly due to polypharmacy, fewer functional teeth, decreased bite force, and a decline in the ability to carry out self-care as a result of physical or neurological disability.³⁴ Because of this discomfort, older adults can have a so-called anorexia of ageing effect, which involves appetite loss and decreases in food intake, causing malnutrition due to weight loss and frailty.³⁵ The mechanisms underpinning this effect are complex and remain unclear, hence why clinical prevention is a major challenge. An emerging concept conveys poor oral health as both a predictor and a marker for frailty, so-called oral frailty.³⁶ Oral health is a modifiable risk factor and oral health examinations in frailty assessments can be a relatively simple measure for proactive clinicians seeking solutions to prevent the onset of malnutrition.

Oral diseases and other major non-communicable diseases (NCDs) share common modifiable risk factors, such as tobacco use, alcohol consumption, psychosocial stress, and poor diet high in free sugars.³⁷ Against a backdrop of common risk factors, the primary cause of the onset and progression of common oral conditions is dental plaque—a matrix of bacteria and their by-products adhering to teeth and dentures. Without regular removal of this biofilm, microbial communities are driven into dysbiosis, an ecological shift favouring greater pathogenic activity. Furthermore, haematogenous dissemination of bacteria and inflammatory mediators is triggered, resulting in a harmful amplification of systemic inflammation in some individuals. Alongside other biological mechanisms, the resulting pathological footprint affects multiple organs, with strong evidence of particularly detrimental links to endocrine,³⁸ cardiovascular,³⁹ pulmonary,⁴⁰ and neurological systems.⁴¹ This inflammatory footprint is exacerbated by the inflammaging process, contributing towards the chronic low-grade upregulation of the proinflammatory state developed with advancing age.

There is strong evidence supporting the independent associations between periodontitis and common chronic inflammatory diseases of ageing. Advanced periodontitis, the sixth most common health concern worldwide,⁴² has profound implications on systemic health. The existence of a bidirectional link between type 2 diabetes and periodontitis is unequivocal.³⁸ Severe periodontitis adversely affects blood glucose concentrations, in people with and without diabetes, and the risk of developing diabetes is raised even in the presence of moderate

periodontitis.⁴³ In these patients, the benefit of routine oral care is accentuated; mechanical periodontal therapy can improve glycaemic control to an extent that reduces complications associated with raised haemoglobin A1C concentrations and even mitigates the need for a second drug in a diabetic pharmacological routine.⁴³ Good oral hygiene is essential for controlling the total oral bacterial load, maintaining, or re-establishing the oral symbiotic equilibrium, and preventing the dissemination of oral bacteria to other sites in the body.⁴⁴

Oral bacteria can also be directly aspirated into the respiratory tract and can be a cause of pneumonia, especially in older people with swallowing impairments.⁴⁵ Several reviews of older adults in hospitals and community settings show that improving oral care reduces the risk of morbidity and mortality from aspiration pneumonia by as much as 67%.^{40,46} Around one in ten deaths in residents aged 65 years and older living in nursing homes, are considered to be preventable by improving oral hygiene practices.⁴⁷ Wearing dentures overnight can double the risk of aspiration pneumonia.⁴⁸ It is important that people who wear dentures and their carers are made aware of these health risks and the importance of good oral health practices.

There is high quality evidence to support an association between cardiovascular disease and oral health, specifically the relationship between chronic periodontitis and atherosclerosis. Studies show that periodontal therapy is associated with reductions in surrogate markers of atherosclerotic cardiovascular disease.^{39,43} Preclinical laboratory studies also suggest a link between periodontal disease and neurodegenerative disorders. It is plausible that when people develop later stages of dementia, the ability to care for their mouth becomes more challenging, leading to an increase in poor oral hygiene and periodontal disease.⁴⁹ Emerging evidence suggests a complex interconnected pathophysiology, which remains unexplored.⁵⁰ For these reasons, the oral health community frequently calls for the mouth to be put back in the body—ie, for non-dental practitioners to recognise the importance of oral health's contributions towards general health.

Oral health status has changed substantially over the past decade with many people in high-income countries retaining teeth for longer.⁵¹ Accordingly, the requirement for regular dental maintenance to prevent disease onset and further complex treatment needs has risen, especially as individuals become more frail.⁵² Complex dental treatment makes favourable oral hygiene habits more challenging, particularly for people with cognitive impairment. In England, a 2019 report by the Care Quality Commission³⁴ identified that older adults in residential care have difficulties accessing home and urgent dental care and urgent dental care services and receive poor standards of support with their mouth care; these problems are present in countries worldwide.⁵³

Regardless of whether older people live in communities, supported care homes, or hospitals, oral health care is

usually not part of general medical care. There is a need for all medical and health professionals to understand the importance of oral health and to be able to recognise common oral problems. Health-care workers and carers for older people are well positioned to identify orofacial problems and dietary changes. These challenges are compounded in the presence of cognitive impairment and are usually overlooked until a relatively minor dental problem becomes an emergency. When late-stage oral conditions are managed, more invasive treatments are required for their optimal management. These issues can be mitigated with appropriate and regular training for all members of the care team.

Historically, training programmes across the world have been implemented to upskill non-dental health-care workers in care environments.⁵³ Several barriers to upskilling have been identified, including insufficient oral health education in undergraduate health-care programmes and care environments where staff turnover is high and transient.⁵⁴ Medical physicians and care staff often do not feel confident in diagnosing or managing oral health conditions in older people in community or hospital settings.^{55,56} There is an urgent need to address this issue with leadership and education provided by qualified dental staff, ensuring the translation of knowledge to care staff.

Oral diseases represent a substantial global financial burden, accounting for US\$545 billion in direct and indirect costs.⁵⁷ Improving oral health in older adults can deliver financial returns on investments, as shown by two programmes that incorporated health economics modelling into the programmes' research and quality improvement. In England, the Mouth Care Matters programme⁵⁸ was developed to improve the standards of oral health provision in hospitals, primarily by upskilling all grades of staff and empowering them to make appropriate treatment choices. In Australia, the Senior Smiles programme places qualified dental practitioners (dental hygienists or oral health therapists) into residential aged care facilities, to provide risk assessments, care plans and referral pathways for advanced treatment needs. Both programmes have showed strong benefits to the residents, patients, and staff and the economic analyses have shown extensive health savings. Over a 5-year period, the Mouth Care Matters project was found to generate £2·66 in cost savings for every £1 spent within the UK health-care system. Over a 3-year period, the Senior Smiles project generated a cost saving for the health-care system of AU\$3·14 for every AU\$1 spent.⁵⁴ Improved oral health can also lead to fewer primary care visits, shorter hospital stays, lower admission rates, lower inappropriate prescribing rates and improved quality of life.^{54,58}

Future directions

Current dental care systems are costly, fundamentally inadequate to manage the ongoing challenges, and unlikely to manage the forecasted challenges anticipated

through global ageing. System-wide changes are urgently needed. Advocates for global oral health have called for the integration of oral diseases under existing global health governance frameworks for NCDs, namely the agreements set by the UN High-Level Meetings. Purposeful integration would require collaboration with the NCD Alliance to harness their tools of targeted outreach for greater recognition among the advocates for change (ie, governments, industry, and the media). However, the unifying requests from the NCD Alliance are unclear and the introduction of oral diseases into this remit presents a serious risk of continued neglect.

We therefore recommend that the priority focus for improving health in older adults should be to reorient healthy ageing policies to include greater focus and action on oral health. The Health in All Policies concept is a suitable framework to embed oral health as a way of recognising interdependence and encouraging collaborative national governance within regions.⁵⁹ National examples show that when there is a clearly understood relationship between health and other sectors and policy areas, decision makers are more likely to implement health prevention measures.⁶⁰ Regardless of a country's income, this approach benefits from greater flexibility in defining population-specific agreements and transfers the decision making process from a largely authoritarian approach to a collaborative process, engaging a range of partners.

The Integrated Care for Older People (ICOPE) guidelines are a basic approach to care with a proactive vision aimed towards monitoring health changes in the intrinsic capacity of older adults.⁶¹ This framework can be leveraged to support the development of national policies on healthy ageing and can foster the amalgamation of health and social care systems. Hence, as part of a strategic plan, implementation of oral health services within a reorganised integrated health system would be valued and contributes to achieving universal health coverage. The ICOPE framework defines a target group for the healthy ageing model: people with a (risk of) substantial loss of intrinsic capacity, or functional ability. Shifting the focus on intrinsic capacity preserves the importance of routine oral health assessment, and values oral health as a key determinant of older adult health.

Another practical step, capable of producing widespread benefit, is to establish multidisciplinary teams within all health setting environments, to understand and accept the importance of oral health. In the initial phase of this approach, oral health-care providers should be integrated as part of the aged care multidisciplinary team, at all health-care levels. Integration within primary care, more broadly, is a realistic possibility and achievable, using various creative approaches, such as inter-professional education and collaborations, and public-private partnerships.⁶²

Oral diseases are one of the most expensive groups of disease to treat (figure 3). Current models rely heavily on

out-of-pocket expenditure.⁶⁴ In 2016, preventive dental care comprised US\$60.5 billion (95% UI 57.3–63.2) of all health-care spending in the USA, which was disproportionate to the health burden and far greater than health spending on other disorders with greater health burden, such as lung cancer (US\$7 billion), drug use disorders (\$13 billion), and alcohol use disorders (\$8 billion).⁶⁵ Routine dental procedures such as scale and polish treatments and the delivery of brief oral hygiene advice, are a costly waste of resources, delivering no substantial clinical benefits and representing an inefficient clinical approach to managing oral health.⁶⁶ It is imperative that dental care services are radically reformed to build the resilience needed to manage ageing populations. This reformation would require a system change from an interventionist model of care to a prevention-based system, accounting for the many determinants (ie, behavioural, social, nutritional, economic, and environmental factors) that affect health and wellbeing.⁴

Global oral health inequality is a universal burden. Unmet demands for dental care are increasing, especially in low-income and middle-income countries (LMICs).⁶⁷ Many advocates for change recognise the inclusion of dental services within a universal health coverage (UHC) framework as a high priority towards achieving Sustainable Development Goal 3 (ie, good health and wellbeing). Some countries have already included oral health services in UHC, such as Brazil, Thailand, and Japan. UHC in Thailand, covering oral health services, was implemented for most of the population in 2002. Since its implementation, it has been shown to be a major driver in improving welfare coverage, the accessibility and use of subsidised public health services, especially in lower socioeconomic groups.^{63,68} Brazil launched their National Oral Health Policy under the Unified Health System in 2004. After more than 10 years, it has shown that the policy is financially sustainable. During that time period, oral health teams worked alongside community health teams, showing a 445% increase in this primary health-care network.⁶⁹ For wider application of this model, however, health systems require substantial strengthening to support community-oriented long-term care.

In LMICs, task shifting and task sharing are highly important to UHC models.⁷⁰ Contextually appropriate task sharing, as a stop-gap measure, with long-term plans for definitive human resources for health solutions are essential in these settings.⁷¹ The spectrum of shared or shifted tasks should include the available workforce, the skills of that workforce, backed by appropriate policies and their full implementation, including training, and supportive supervision.⁷²

Current methods of dental care are largely based on curative and interventionist systems, which are not easily accessible in low-income countries and contribute towards widening inequalities.⁴ The common risk factor

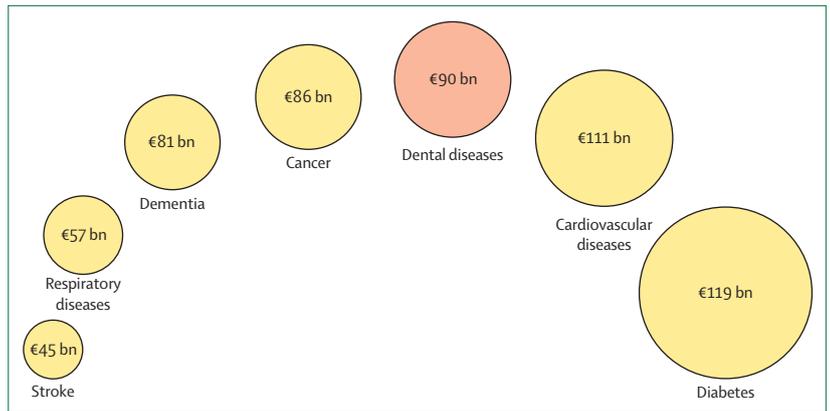


Figure 3: The direct expenditure on selected major diseases across the 28 EU member states in 2015. Data are from Peres et al.⁶³

Search strategy and selection criteria

References for this Personal View were identified by searching the PubMed database for articles published between Oct 1, 1997, and Jan 1, 2021. The search strategy was also complemented by Scopus and Google Scholar searches with no date restrictions. We used the keywords “oral health”, “dental care”, “gerodontology”, “ageing”, “longevity” and “older adults”. Our search included articles and reviews published in English. Reference lists of relevant articles were also screened and hand-searching broadened the search. The final reference list was generated on the basis of originality and relevance to the broad scope of this Personal View. The majority of the epidemiological data were obtained via the Institute for Health Metrics and Evaluation Global Burden of Disease Compare tool.

approach was proposed as a strategy for disease prevention, promotion, and control in 2000.³⁷ However, this strategy has not been widely used. Therefore, a stronger international movement that prioritises strategic upstream action is required across a wider range of interdependent health policies.

Engaging caregivers and volunteers through enhanced education programmes can be applied to deliver daily oral care in aged care settings. Training could be used to improve the quality of skills, knowledge, and attitudes that lead to empowerment of those being trained. When health-care providers unequivocally appreciate the cumulative benefits of improving oral health, this can lead to a positive change in their behaviours. Therefore, the training of health-care teams should be well designed to integrate empowerment concepts and the oral health dimension of care.

Global oral health is frequently cited as merely an issue of social justice. We strongly believe there is an important realisation to be made in positioning oral health as an intrinsically important aspect of health, particularly in older adults. WHO defines healthy ageing as, “the process

of developing and maintaining the functional ability that enables wellbeing in older age".⁷³ The evidence synthesised in this Personal View challenges whether a vision of healthy ageing can truly be realised in the absence of oral health. We are encouraged by the resolution on oral health adopted by WHO at the 2021 World Health Assembly, which incorporates oral health in UHC and NCD agendas and values its intersections with the Sustainable Development Goals. As biomedical advances lead to increased longevity (adding years to life), a simultaneous effort to improve quality of life is needed (adding life to years), for which good oral health is central.

Contributors

JP conceptualised the Personal View. JR evaluated the epidemiological data and JP presented the visualisations of these data. All authors drafted sections of this paper. JP discussed contributions with all coauthors. JW, MD, and PS made crucial revisions across the manuscript. All authors reviewed and edited each subsequent draft. All authors approved the final version of the Personal View. JP had the final responsibility to submit for publication.

Declaration of interests

IBY is president-elect of FDI World Dental Federation. All other authors declare no competing interests.

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