Concise Review

Advancing Universal Oral Health Coverage via Person-Centred Outcomes

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ARTICLE INFO

Article history:
Received 31 March 2023
Received in revised form
8 June 2023
Accepted 15 June 2023
Available online 9 September 2023

Key words:
Patient-centred outcomes
Universal health insurance
Oral health
Self-report

ABSTRACT

The World Health Organization member states proposed a comprehensive "Global Strategy on Oral Health," which includes achieving universal oral health coverage by 2030. Challenges and barriers, including persistent inequalities, will hamper the achievement of universal oral health coverage. In low- and middle-income countries, the oral health of a large proportion of the population has been neglected, increasing oral health inequalities. In high-income countries, some receive excessive dental treatment, whilst particularly those with higher needs receive too little dental care. Therefore, an analysis of individual countries' needs, encompassing the training of oral health professionals in a new philosophy of care and attention and the optimisation of the existing resources, is necessary. Distancing from a person-centred focus has prompted individual and societal issues, including under-/overdiagnosis and under-/overtreatment. The person-centred approach considers the perceptions, needs, preferences, and circumstances of individuals and populations. Patient-reported outcome measures, such as self-rated and -reported health, reflect an individual's overall perception of health and are designed to mediate human biology (ie, the disease) and psychology. The usage of patient-reported outcome measures in dentistry to place the individual at the centre of treatment is delayed compared to other areas. This paper discusses some challenges and potential solutions of patient-reported outcome measures in dentistry for achieving universal oral health coverage.

Introduction

In 2021, the World Health Organization (WHO) proposed a comprehensive "Global Strategy on Oral Health," epitomising a milestone to achieving universal oral health coverage (UHC) by 2030.[1] The report highlights challenges and barriers to achieving UHC, particularly when persistent inequalities strongly influence the burden of oral disease and access to oral health care.[2]

The bold proposal requires more than the cliché of placing oral health on the global health agenda. It implies an analysis of the countries' needs, including training of oral health professionals in line with the philosophy and optimisation of existing resources. The oral health of many people has been neglected, especially in low- and middle-income countries, thus leading to a drain on resources and increasing inequalities. In high-income countries, conversely, available resources are rarely allocated according to the needs of those populations; some people receive too much dental care, whilst others—particularly those with higher needs—receive too little.

Alternatives to improve the efficient and equitable use of the available resources are paramount in operationalising the proposal. However, dental professionals tend to perpetuate the "dentist-centred approach" by focusing mainly on their

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https://doi.org/10.1016/j.identj.2023.06.006

clinical experience, values, perspectives, and clinical findings ("normative" assessment) at the expense of neglecting the perceptions of the people they should be looking after. Deviation from the "person-centred approach" (subjective/"sociodental" assessment) has occasioned individual and societal problems, including but not limited to under-/overdiagnosis and under-/overtreatment, resulting in health and financial hazards.[3]

Patient-reported outcomes (PROs) and patient-reported outcome measures (PROMs), such as self-rated and -reported health, reflect an individual's overall perception of health and are designed to mediate human biology (ie, the disease) and psychology and thus provide valuable information for the person-centred approach.[4] Whilst PROs and PROMs have been used in several medical fields, dentistry has lagged far behind, and most attempts to use self-perceived oral health have been made to replace clinical diagnoses and not for screening purposes, for example. Undoubtedly, accurate disease detection and monitoring are essential to adequately control its burden and impact on public health; however, dentists must be aware that perceived health has value on its own, independent of the "objective" health status. Even though PROs have been receiving more attention lately, little, if any, progress has been made in the use of such information except for research.[5–7]

Given the conflict amongst the need (and desire) for UHC, the available resources, and the current oral health framework based on "normative" assessments, we discuss and advocate for the use of self-perceived oral health indicators from a clinical and public health perspective to advance universal delivery of effective dental care.

Dental patient-reported outcomes (dPROs) and measures (dPROMs)

Although objective and subjective measures appear to be divergent, they are "symbiotic" components of health care. Whilst the objective assessment is performed by the dental professional (eg, clinical examination), the subjective evaluation is captured by dPROs. A dPRO is formally defined as "any report of the status of a patient's oral health condition that comes directly from the patient, without interpretation of the patient's response by a clinician or anyone else."[7] Importantly, dPROs are constructs that cannot be inferred directly from measured and observable characteristics. The instruments, developed over the last 40 years and today commonly referred to as dPROMs, capture the individuals' perceptions with questionnaires/questions that assess the various dimensions on which oral conditions affect quality of life or how the individuals evaluate or perceive their oral health.[7–13]

The use of dPROMs has several advantages from clinical and population perspectives. Foremost, it measures factors that are relevant from an individual's perspective. The impact of tooth loss depends on many factors, such as tooth location and function and individual preferences and values. Therefore, using dPROMs may also advance patient participation in clinical decision-making. dPROMs outperform clinical examination reliability, in addition to being less demanding as they do not require training or calibration prior to use.[8] Finally, dPROMs are often flexible in their use, and the mode of administration does not significantly affect the instrument scores. Thus, they can be performed using a self-administered questionnaire in the waiting room, by text messages before and/or after visits, or as a telephone interview in epidemiologic studies.

For some conditions, such as temporomandibular disorders (TMD), using dPROs in clinical practice is a prerequisite for adequate management, not an additional tool,[14] as pain is a highly subjective experience. However, this has not been the case for long. In 1992, the revised TMD diagnostic criteria included a psychosocial axis and thus aimed to provide a shift from clinician-based outcomes to dPROs.[14] However, as Manfredini et al[15] put it, such diagnostic approaches and their implications for treatment modalities are "hard to be accepted by the general dental practitioners, who had been accustomed for years to provide occlusally based treatments to their patients with TMD and are reluctant to accept any paradigmatic shifts in their daily practice." After 30 years, improvements in the measurement and use of dPROs in the screening, diagnosis, and care of TMD are needed.[9] Fortunately, dPROs are receiving more attention in other dental specialties, but they are far from widespread clinical or population health applications.[16,17]

Caution must be exercised, however, in the interpretation of dPROs and dPROMs.[18] First, most dPROMs were developed, applied, and validated using the general population or clinical patient samples, thus, by default, excluding marginalised groups with the heaviest oral disease burden.[19] On that note, it is paramount to be attentive to the inequalities within inequalities, especially amongst those with disabilities. On the other hand, clinical measures currently in use may also lack clinical significance if built without solid evidence to support specific thresholds for disease definition.[20,21] dPROs and dPROMs are closely related to social, cultural, economic, and environmental factors, which should be considered when interpreting or extrapolating results from individuals to populations. If we do not account for oral disparities, we risk perpetuating them by masking the actual impact of oral diseases amongst the more disadvantaged groups in society.[22]

Moreover, dPROS and dPROMS provide a narrow understanding of oral health, as they mainly consider the negative aspects of oral health.[11] Whilst the presence of oral diseases and disabilities are essential aspects to account for, a shift towards a broader understanding of health comprising oral health and ability becomes necessary. Some dPROMS, including self-rated health and oral health, which will be discussed in this manuscript, are able to consider positive aspects of oral health as well.[23] However, individuals must be able to value elements other than those accounted for in the prevailing normative biomedical model. This requires support and encouragement from dental professionals who should be able to move away from the "normative" model and have an appreciative attitude towards the positive aspects of oral health.[23]

Self-rated health (SRH)

SRH is one of the most commonly used dPROMs, included in major surveys, such as the US National Health and Nutrition

Examination Survey (NHANES). SRH is a subjective indicator of health status that integrates biological, psychological, social, and functional aspects of a person, including individual and cultural beliefs and health behaviors and habits.[4] It consists of asking individuals to rate their health status on a 4- or 5-point scale or comparing their health status with similarly aged peers. The applicability of SRH has been attributed to its compactness, simplicity, and relatively universal potential. However, despite its widespread use since the 1950s, SRH is still poorly understood.[24]

Despite the apparent nonspecificity of SRH, it has been shown to be a strong predictor of mortality.[25–27] Studies examining the association between SRH and mortality have yielded consistent results: SRH is associated with mortality after adjustment for age and is slightly attenuated, but it rarely disappears when health indicators are controlled for. Nevertheless, there appear to be relative differences between population groups, with SRH being a stronger predictor of mortality for young persons than elderly persons, men than women, and higher than lower socioeconomic groups.[28,29] However, rather than playing a role in the biological causal chain, SRH should be seen as a statistical predictor, probably reflecting a condensed summary of physical conditions of which the individual mind is aware and that are involved in these biological chains. The precision of SRH relies on the completeness and accuracy of the information that the individual includes in the self-assessment. Thus, it is not surprising that SRH is a stronger predictor of mortality when the cause of death is a condition that the individual is likely to be aware of when making the self-assessment.[30]

Self-rated oral health (SROH)

Like SRH, SROH is a summary measure of an individual's oral health as determined by the individual's self-assessment and is widely used as dPROM. This instrument follows the SRH format and properties; not surprisingly, SROH strongly predicts SRH, self-esteem, and life satisfaction. Consequently, SROH has gained popularity in epidemiologic studies, but little progress has been made in using SROH in areas other than research. Notwithstanding, SROH is one of the questions in the self-assessment instrument for periodontitis developed by the American Academy of Periodontology (AAP) and discussed later.

In a study of Canadian individuals aged 50 years and older, Locker et al[31] examined predictors of SROH. Potential predictors were periodontitis, functional limitation, psychological discomfort, dental visiting, age, educational level, and general SRH. SROH was similar to general SRH, leading the authors to speculate that individuals consider oral and general health an essential unit without distinguishing between both constructs.

More recently, linking data from the third NHANES and mortality, Yu et al[32] emphasised that SROH was associated with a longer life lived amongst elderly Americans, whereas edentulism was associated with decreased survival. Both "normative" and "subjective" oral health assessments were associated with mortality, reinforcing the importance of SROH.[32]

Self-reported oral health

In addition to SRH, the medical field has relied on using self-reported health conditions, including behaviours and disease diagnoses. Whilst this method is cost-effective at the population level, the validity of the information is often questioned. One may argue that self-reported conditions are not valid measures because, amongst other things, they suffer from recall and social desirability bias. Despite this being partially true, self-reported health status can be a valuable tool for screening purposes, especially when there is a need to maximise the scarce resources available.

Studies from the US and China revealed that self-reports are satisfactorily accurate for diabetes, hypertension, and routine screening exams amongst adults.[33,34] Adding biometrical measurements to self-reports may increase the validity of such predictions.[35] However, underestimations may occur due to low health literacy. This sheds light on the usefulness of self-reported health conditions. In periodontology, Glavind and Attstrom[36] first proposed the "periodontal self-examination program" in 1979, where participants learnt and self-assessed their teeth and gums in front of a wall mirror along with a self-reported questionnaire. Since the 1980s, when these measures began to be used primarily for research purposes, efforts have been made to validate self-reported oral health conditions against clinical diagnoses. A pivotal study was conducted by Pitiphat et al[37] in 2002 using a sample of US veterans and dental school patients. Whilst self-reported measures provided accurate estimates of the number of teeth, the use of dental prostheses, fillings, and endodontic treatment, they were less accurate for dental caries and periodontitis cases.[37] Using a sample of 212 male non–dental health professionals, Joshipura et al[38] found that self-reported information can provide satisfactory data on periodontal status.

Based on successful initiatives to elicit self-reported data on other chronic diseases in interview-based surveys, the US Centers for Disease Control and Prevention and the AAP have proposed instruments to assess self-reported periodontitis since 2003. Ten years later, an 8-item questionnaire was included in the 2009 and 2010 NHANES cycles. Satisfactory sensitivity and specificity were obtained when the self-reported information was combined with sociodemographic data, including age, race, sex, education level, and smoking. Interestingly, similar results were obtained when only 5 questions (instead of the original 8) were used, one of which was self-rated health of their gums and teeth and another was a self-perception of having gum disease, whilst the others asked about previous treatments or current oral health behaviours.[39] Later, studies implied that information from simple questions has the potential for screening and surveillance of periodontitis.[40–42] Thus, it is possible that (a) self-reported periodontitis is a valuable tool for identifying individuals who have periodontitis (high sensitivity) and (b) self-perceived (-rated) health is an essential component in the identification of periodontitis.

The added value for clinical care and public health

Hitherto, we have discussed the relevance of self-rated and -reported oral health information in addition to the need to

Table 1 – A clinical and public health example of the "normative" and "sociodental" approaches towards oral health care.

Clinical case example		
Approach	*"Traditional"/"Normative"*	*"Sociodental"*
A 59-year-old woman seeks advice regarding missing lower first molars on both sides of her mandible. These teeth were missing since childhood for unknown reasons; she has no treatment preferences (either for or against tooth replacement or any other therapy) and is willing to follow any recommendation given by the dentist. The dental condition has been stable for years, and the patient has had no recent or current evidence of discomfort, pain; aesthetic, functional, or other limitations. The patient is described as health-conscious and very cooperative.[49]	Focus: Consider clinical parameters and treatment options. Some recommend invasive treatments, such as dental implants, bridgeworks, recontouring, and orthodontic treatment. Some dentists recommended monitoring only. Dental training, clinical experience, and work setting influenced the clinical decision-making process.	Focus: Support the patient as she has adapted well to a relatively mild benign condition. Consider the patient's opinion and perception of her oral health status. Avoid any invasive treatments or implement minimally invasive treatments.
Public health case example		
Approach	*"Traditional"/"Normative"*	*"Sociodental"*
A leading dentist works in an area where recent population-based studies indicate a 72% prevalence of periodontitis (stages I –IV) in people aged ≥19 years and above 90% for those aged ≥50.[47,48] Public health authorities and politicians are asking for the dentist's opinion and the implications of these findings.	Focus: Consider the access to clinical services, availability, and quality of clinical care and prevention provided. Argue that more resources (eg, dentists, periodontal instruments) are needed to alleviate the situation in the area.	Focus: Consider the disease definition, as it appears to be a common condition due to its high prevalence. Explore the factors underlying periodontitis causation beyond the dental service and find relevant partners in other disciplines and sectors. Focus on the patients and the long-term goal of such a highly prevalent disease (Are patients impacted by this disease? Does it affect their ability to eat and socialise?).

adopt the concepts of a person-centred approach and the use of dPROs and dPROMs. Given the increasing burden of oral diseases, especially periodontitis, the shortage of trained personnel, the delivery of unnecessary treatment, and the ambitious proposal for UHC by 2030, it remains unclear why self-rated and -reported information is underutilised in dentistry. These measures should not be seen as a replacement for measures of physical illness or objective health measures,[43] but as potentially time-saving and cost-effective approaches in screening strategies to identify potential relevant and impactful disease cases to the individual.

Many medical settings implemented self-reported strategies with comparable or even superior results to traditional strategies.[44,45] In a paediatric hospital in Boston, self-reported information about an individual's current illness was more sensitive than physician diagnostic coding in correctly identifying several illnesses, including fever and respiratory, gastrointestinal, and dermatologic problems.[44] The authors claim that patient involvement in the disease definition process is an effective method for improving accuracy and augmenting capabilities for accurate disease surveillance. Similarly, in a prospective study using US military medical records,[45] self-reported conditions were consistent with diagnoses but more accurate in indicating the absence than the presence of certain conditions. Real-world application of oral health measures in clinical practice as well as public health programs remains scarce, and their application is mainly restricted to trials or cohorts. Learning from medical cases, one can advocate that self-rated and -reported health should be used as valuable tools for screening purposes to properly identify individuals who need oral health care.

Ideally, "normative" and "sociodental" approaches should reflect each other. Disease definitions should represent individual and societal values and the public health impacts of disease, so there should not be a large gap between "normatively" and "sociodentally" determined needs.[20,46] In this sense, at least some "normative" criteria of oral health needs would likely require revision to be more aligned with their individual and public health impact, as it is uncertain how they would contribute to providing evidence-based and equitable dental care for individuals and populations (Table 1). For example, using the most recent periodontitis classification, Norwegian studies have shown an almost ubiquitous prevalence of periodontitis amongst older adults.[47,48] Whenever a disease reaches such high prevalence, one shall speculate whether the classification accurately distinguishes between health and disease and whether the condition is a disease or, for instance, a natural consequence of ageing.[21] These disease definitions may undermine the provision of sustainable, efficient, or equitable dental care in clinical and public settings Table 1).

Whether we treat our patients according to clinical ("normative") or subjective ("sociodental") parameters likely has a massive impact on costs, the practice dental model,

Table 2 – Oral health care approaches from the "normative" and the "sociodental" perspectives.[53,54]

Approach	"Traditional"/"normative" dentist-centred	"*Sociodental*" person-centred
Outcomes in focus	**Biological status** - Physiologic: inflammation - Microbiological: oral microbiota - Sensory: pain **Clinical status** - Survival: longevity, success - Mechanical: marginal adaptation - Diagnostic: classification of periodontitis - Functional: masticatory force - Esthetic: "white" teeth **Economic costs** - Revenues	**Biological and clinical status** If relevant for sensory, functional, aesthetic, or psychosocial purposes for patients **Psychosocial** - Satisfaction: oral health - Perceptions: oral health self-rating - Preferences: the value of health states and events - Oral Health-Related Quality of Life (OHRQoL): oral health impact on life **Economic costs** - Direct costs: out-of-pocket payment - Indirect costs: lost wage, transportation
Facilitators	Experience, skills, training, trust in the profession, commercialisation, acceptance	Participant involvement, communication skills, less costly
Barriers	Payment system, shortage of trained resources, empowered patients/clients	Biomedical paradigm, lacking skills, financial incentives, lacking trustworthy evidence, challenging commercialisation
Benefits	Efficient strategy at the individual level if clinical and perceived values match	Alignment with the person's values, less costly, population-level application
Harms/risks	High costs, overdiagnosis, overtreatment, over-commercialisation, difficulty in translating into health policy	Underdiagnosis and undertreatment, particularly in already underserved populations, eg, due to low health literacy or persons with disabilities

public health programs, and workforce planning. Incorporating the population needs (objective and subjective) is fundamental to ensuring sustainable oral health care. Estimating workforce requirements is challenging and multifactorial (political, economic, and social values).[50] However, it seems that a "sociodental" mixed-skill approach in determining the population needs would require fewer dentists than "normative" strategies.[3,51] Likewise, the "normative" approach to treatment needs and the traditional way of practicing dentistry are associated with such high costs that UHC remains unaffordable (Table 2).[52] In countries already spending resources on such systems, we expect that under the "sociodental" paradigm, these resources would be reallocated to individuals with higher oral health needs or at a higher risk. Evidently, a new approach to serving currently underserved people would require considerable effort and resources, which may originate from a decrease in overdiagnosis and -treatment.

Greater patient involvement in clinical practice, guidelines, and defining oral health needs for individuals and societies could serve as strategic decisions regarding the prioritisation of interventions consistent with the monetary expenditures, thereby reducing the risk of over- or underdiagnosis and -treatment. Using self-reported information could help identify cost-effective public policies, such as food labelling or tobacco control, at the population level. Unfortunately, little is known about how widely used normative clinical measures and definitions are associated with dPROs; for instance, evidence on whether more severe periodontitis is associated with worse dPROs is lacking.[55] Dental curricula should support minimally invasive dentistry, patient participation, and evidence-based practices. Evaluation and measurement of the health impact of dental care (including the effects on dPROs) should be part of every oral health system. However, first, the idea of using dPROs should be bought into by stakeholders, which would then develop or identify measurement tools and finally implement them at all levels (practice, research, and population health surveillance).[5,55]

Current oral health care systems fail to improve the population's oral health and reduce oral health inequalities. Despite researchers' efforts to operationalise a standard set of patient-centred outcomes for adult oral health,[56] implementation of the "sociodental" approach will only be possible with a paradigm shift supported by all stakeholders. Hence, dentistry should shift from its "normative" paradigm to a "sociodental" approach, not only by incorporating the individual's perceptions but also by replacing the dentist with the patient when it comes to the centre of care. Double standards should not be applied to implement the "normative" and "sociodental" approaches. Barriers must be addressed by governments, dental schools, research institutions, and professionals. Such a shift may impact the number of professionals and working hours needed, including, but not restricted to, increased capacity to provide better care, efficient public health programs, faster system responses to patient needs, and maximising the skills and competencies of the dental team. Therefore, it seems to be a way forward to implement the WHO plan, to actually improve oral health, reduce inequalities, and transfer the control of people's lives and health to the people.

CRediT authorship contribution statement

Gustavo G. Nascimento: Conceptualization, Investigation, Writing – original draft, Funding acquisition. **Eero Raittio:** Conceptualization, Investigation, Writing – review & editing. **Vanessa Machado:** Conceptualization, Investigation, Writing – review & editing. **Fábio R.M. Leite:** Investigation, Writing – review & editing. **João Botelho:** Conceptualization, Investigation, Writing – review & editing.

Acknowledgements

We thank the Aarhus Universitets Forskningsfond (#AUFF-E 2019–7–3) for the support.

Funding

This research did not receive any external funding.

Conflict of interest

None disclosed.

REFERENCES

1. World Health Organization. Global Oral Health Status report: towards universal health coverage for oral health by 2030. Geneva: World Health Organization; 2022. Available from: https://apps.who.int/iris/handle/10665/364538 Accessed 23 November 2022.
2. Peres MA, Macpherson LMD, Weyant RJ, et al. Oral diseases: a global public health challenge. Lancet 2019;394:249–60. doi: 10.1016/S0140-6736(19)31146-8.
3. Ab-Murat N, Sheiham A, Tsakos G, Watt R. Periodontal treatment needs and workforce requirements: comparisons between the normative and sociodental approaches using different skill mix models. Community Dent Oral Epidemiol 2015;43:106–15. doi: 10.1111/cdoe.12125.
4. Jylhä M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. Soc Sci Med 2009;69:307–16. doi: 10.1016/j.socscimed.2009.05.013.
5. Karimbux N, John MT, Stern A, et al. Measuring patient experience of oral health care: a call to action. J Evid-Based Dent Pract 2023;23:101788. doi: 10.1016/j.jebdp.2022.101788.
6. Reissmann DR. Dental patient-reported outcome measures are essential for evidence-based prosthetic dentistry. J Evid Based Dent Pract 2019;19:1–6. doi: 10.1016/j.jebdp.2019.01.003.
7. John MT. Health outcomes reported by dental patients. J Evid Based Dent Pract 2018;18:332–5. doi: 10.1016/j.jebdp.2018.09.001.
8. Reissmann DR, John MT, Schierz O. Influence of administration method on oral health-related quality of life assessment using the Oral Health Impact Profile: OHIP administration method influence. Eur J Oral Sci 2011;119:73–8. doi: 10.1111/j.1600-0722.2010.00805.x.
9. Cohen LK, Jago JD. Toward the formulation of sociodental indicators. Int J Health Serv 1976;6:681–98. doi: 10.2190/le7a-ugbw-j3nr-q992.
10. Locker D. Measuring oral health: a conceptual framework. Community Dent Health 1988;5:3–18.
11. Brondani MA, MacEntee MI. Thirty years of portraying oral health through models: what have we accomplished in oral health-related quality of life research? Qual Life Res 2014;23:1087–96. doi: 10.1007/s11136-013-0541-3.
12. Brondani MA, MacEntee MI. The concept of validity in sociodental indicators and oral health-related quality-of-life measures. Community Dent Oral Epidemiol 2007;35:472–8. doi: 10.1111/j.1600-0528.2006.00361.x.
13. Gilbert GH, Duncan RP, Heft MW, Dolan TA, Vogel WB. Multidimensionality of oral health in dentate adults. Med Care 1998;36:988–1001. doi: 10.1097/00005650-199807000-00006.
14. Häggman-Henrikson B, Lobbezoo F, Durham J, Peck C, List T. The voice of the patient in orofacial pain management. J Evid-Based Dent Pract 2022;22:101648. doi: 10.1016/j.jebdp.2021.101648.
15. Manfredini D, Bucci MB, Montagna F, Guarda-Nardini L. Temporomandibular disorders assessment: medicolegal considerations in the evidence-based era. J Oral Rehabil 2011;38:101–19. doi: 10.1111/j.1365-2842.2010.02131.x.
16. Nagendrababu V, Vinothkumar TS, Rossi-Fedele G, et al. Dental patient-reported outcomes following traumatic dental injuries and treatment: a narrative review. Dent Traumatol 2023 edt.12827. doi: 10.1111/edt.12827.
17. Tao Z, Zhao T, Ngan P, Qin D, Hua F, He H. The use of dental patient-reported outcomes among randomized controlled trials in orthodontics: a methodological study. J Evid-Based Dent Pract 2023;23:101795. doi: 10.1016/j.jebdp.2022.101795.
18. Faulks D, Scambler S, Daly B, Jamieson L, Hennequin M, Tsakos G. Measuring oral health—how can the International Classification of Functioning help? Community Dent Oral Epidemiol 2023;51:153–64. doi: 10.1111/cdoe.12732.
19. McGrath C, Bedi R. An evaluation of a new measure of oral health related quality of life–OHQoL-UK(W). Community Dent Health 2001;18:138–43.
20. Doust J, Vandvik PO, Qaseem A, et al. Guidance for modifying the definition of diseases: a checklist. JAMA Intern Med 2017;177:1020. doi: 10.1001/jamainternmed.2017.1302.
21. Raittio E, Baelum V. Justification for the 2017 periodontitis classification in the light of the Checklist for Modifying Disease Definitions: a narrative review. Community Dent Oral Epidemiol 2023 cdoe.12856. doi: 10.1111/cdoe.12856.
22. Gregory J, Gibson B, Robinson PG. Variation and change in the meaning of oral health related quality of life: a 'grounded' systems approach. Soc Sci Med 2005;60:1859–68. doi: 10.1016/j.socscimed.2004.08.039.
23. Locker D, Maggirias J, Wexler E. What frames of reference underlie self-ratings of oral health? J Public Health Dent 2009;69:78–89. doi: 10.1111/j.1752-7325.2008.00103.x.
24. Jürges H. True health vs response styles: exploring cross-country differences in self-reported health: true health vs response styles. Health Econ 2007;16:163–78. doi: 10.1002/hec.1134.
25. Wuorela M, Lavonius S, Salminen M, Vahlberg T, Viitanen M, Viikari L. Self-rated health and objective health status as predictors of all-cause mortality among older people: a prospective study with a 5-, 10-, and 27-year follow-up. BMC Geriatr 2020;20:120. doi: 10.1186/s12877-020-01516-9.
26. Yu ESH, Kean YM, Slymen DJ, Liu WT, Zhang M, Katzman R. Self-perceived health and 5-year mortality risks among the elderly in Shanghai, China. Am J Epidemiol 1998;147:880–90. doi: 10.1093/oxfordjournals.aje.a009542.
27. Burstrom B. Self rated health: is it as good a predictor of subsequent mortality among adults in lower as well as in higher social classes? J Epidemiol Community Health 2001;55:836–40. doi: 10.1136/jech.55.11.836.
28. Benyamini Y, Leventhal EA, Leventhal H. Elderly people's ratings of the importance of health-related factors to their self-assessments of health. Soc Sci Med 2003;56:1661–7. doi: 10.1016/S0277-9536(02)00175-2.
29. Dowd JB, Zajacova A. Does the predictive power of self-rated health for subsequent mortality risk vary by socioeconomic status in the US? Int J Epidemiol 2007;36:1214–21. doi: 10.1093/ije/dym214.
30. Jylhä M, Volpato S, Guralnik JM. Self-rated health showed a graded association with frequently used biomarkers in a large population sample. J Clin Epidemiol 2006;59:465–71. doi: 10.1016/j.jclinepi.2005.12.004.
31. Locker D, Wexler E, Jokovic A. What do older adults' global self-ratings of oral health measure? J Public Health Dent 2007;65:146–52. doi: 10.1111/j.1752-7325.2005.tb02804.x.

32. Yu J, Qin W, Huang W, Thomas K. Oral health and mortality among older adults: a doubly robust survival analysis. Am J Prev Med 2023;64:9–16. doi: 10.1016/j.amepre.2022.08.006.
33. Martin LM, Leff M, Calonge N, Garrett C, Nelson DE. Validation of self-reported chronic conditions and health services in a managed care population. Am J Prev Med 2000;18:215–8. doi: 10.1016/S0749-3797(99)00158-0.
34. Guo H, Yu Y, Ye Y, Zhou S. Accuracy of self-reported hypertension, diabetes, and hyperlipidemia among adults of Liwan, Guangzhou, China. Iran J Public Health 2020. doi: 10.18502/ijph.v49i9.4076.
35. Molenaar EA, Ameijden EJCV, Grobbee DE, Numans ME. Comparison of routine care self-reported and biometrical data on hypertension and diabetes: results of the Utrecht Health Project. Eur J Public Health 2007;17:199–205. doi: 10.1093/eurpub/ckl113.
36. Glavind L, Attstrom R. Periodontal self-examination: a motivational tool in periodontics. J Clin Periodontol 1979;6:238–51. doi: 10.1111/j.1600-051X.1979.tb01926.x.
37. Pitiphat W, Garcia RI, Douglass CW, Joshipura KJ. Validation of self-reported oral health measures. J Public Health Dent 2002;62:122–8. doi: 10.1111/j.1752-7325.2002.tb03432.x.
38. Joshipura KJ, Pitiphat W, Douglass CW. Validation of self-reported periodontal measures among health professionals. J Public Health Dent 2002;62:115–21. doi: 10.1111/j.1752-7325.2002.tb03431.x.
39. Eke PI, Dye BA, Wei L, et al. Self-reported measures for surveillance of periodontitis. J Dent Res 2013;92:1041–7. doi: 10.1177/0022034513505621.
40. Machado V, Lyra P, Santos C, Proença L, Mendes JJ, Botelho J. Self-reported measures of periodontitis in a Portuguese population: a validation study. J Pers Med 2022;12:1315. doi: 10.3390/jpm12081315.
41. Montero E, La Rosa M, Montanya E, et al. Validation of self-reported measures of periodontitis in a Spanish population. J Periodontal Res 2020;55:400–9. doi: 10.1111/jre.12724.
42. Heaton B, Gordon NB, Garcia RI, et al. A clinical validation of self-reported periodontitis among participants in the Black Women's Health Study. J Periodontol 2017;88:582–92. doi: 10.1902/jop.2017.160678.
43. Lorem G, Cook S, Leon DA, Emaus N, Schirmer H. Self-reported health as a predictor of mortality: a cohort study of its relation to other health measurements and observation time. Sci Rep 2020;10:4886. doi: 10.1038/s41598-020-61603-0.
44. Bourgeois FT, Porter SC, Valim C, Jackson T, Cook EF, Mandl KD. The value of patient self-report for disease surveillance. J Am Med Inform Assoc 2007;14:765–71. doi: 10.1197/jamia.M2134.
45. Smith B, Chu LK, Smith TC, et al. Challenges of self-reported medical conditions and electronic medical records among members of a large military cohort. BMC Med Res Methodol 2008;8:37. doi: 10.1186/1471-2288-8-37.
46. Moynihan R, Brodersen J, Heath I, et al. Reforming disease definitions: a new primary care led, people-centred approach. BMJ Evid-Based Med 2019;24:170–3. doi: 10.1136/bmjebm-2018-111148.
47. Sødal ATT, Hove LH, Diep MT, Skudutyte-Rysstad R, Koldsland OC. Periodontal conditions in a 65-year-old population and prevalence of periodontitis according to three different bone level thresholds. BMC Oral Health 2022;22:246. doi: 10.1186/s12903-022-02276-1.
48. Stødle IH, Verket A, Høvik H, Sen A, Koldsland OC. Prevalence of periodontitis based on the 2017 classification in a Norwegian population: the HUNT study. J Clin Periodontol 2021;48:1189–99. doi: 10.1111/jcpe.13507.
49. Listl S, Faggion C, Staehle H. Professional variability in decision making in modern dentistry: a pilot study. Oper Dent 2016;41:S79–87. doi: 10.2341/14-369-O.
50. Dreesch N, Dolea C, Dal Poz MR, et al. An approach to estimating human resource requirements to achieve the Millennium Development Goals. Health Policy Plan 2005;20:267–76. doi: 10.1093/heapol/czi036.
51. Srisilapanan P, Sheiham A. Assessing the difference between sociodental and normative approaches to assessing prosthetic dental treatment needs in dentate older people. Gerodontology 2001;18:25–34. doi: 10.1111/j.1741-2358.2001.00025.x.
52. Bernabé E, Marcenes W. Can minimal intervention dentistry help in tackling the global burden of untreated dental caries? Br Dent J 2020;229:487–91. doi: 10.1038/s41415-020-2155-9.
53. Baelum V. Caries management: technical solutions to biological problems or evidence-based care? J Oral Rehabil 2008;35:135–51. doi: 10.1111/j.1365-2842.2007.01784.x.
54. Bader JD, Ismail AI. A primer on outcomes in dentistry. J Public Health Dent 1999;59:131–5. doi: 10.1111/j.1752-7325.1999.tb03261.x.
55. Needleman I, Almond N, Leow N, Phillips J. Outcomes of periodontal therapy: strengthening the relevance of research to patients. a co-created review. Periodontol 2000 2023; prd.12483. doi: 10.1111/prd.12483.
56. Riordain RN, Glick M, Mashhadani SSAA, et al. Developing a standard set of patient-centred outcomes for adult oral health – an international, cross-disciplinary consensus. Int Dent J 2021;71:40–52. doi: 10.1111/idj.12604.