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Assessment of the Economic Burden of Dental Diseases

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Abstract

A part of overall health includes oral health. Oral diseases are among the most common diseases in the world and have significant adverse consequences on both health and economy. Dental caries, periodontal disease, tooth loss, and oral malignancies are the oral disorders that have the highest impact on world health. Families and healthcare systems have a significant financial burden from the expense of treating oral diseases. The increased prevalence of oral diseases in many low- and middle-income nations is particularly concerning as oral diseases are a global public health issue. In order to help healthcare decision-makers, this article will outline the assessment of the economic impacts of dental diseases. In order to reduce oral diseases, behavioral changes connected to oral health are necessary and can be brought about by health economics and public policy working together. By focusing on specific instances of evidence gaps in oral health and care, health economics can be a useful tool to guide the design of policies linked to oral health.

Keywords: Oral health, Costs and cost analysis, Health expenditures, Dental public health.

INTRODUCTION

The consequences of the economic hardship caused by dental diseases, which put more economic burden on health care budgets, would present policymakers with ongoing issues for determining the best distribution of resources (S. Listl *et al.*, 2015).

The dentistry research community has not made considerable use of health economics. There is still a knowledge gap about practical public health measures to reduce the impact of dental caries (Righolt *et al*., 2018).

This article's aim is to provide decision-makers in the health care industry with an analysis of the economic impact of dental diseases.

LITERATURE REVIEW

Authors of a study on the global economic burden of dental diseases estimated the direct costs of dental care and the indirect costs of lost productivity at the global, regional, and national levels (Righolt *et al*., 2018).

A previously established systematic method was used to estimate the direct costs of dental diseases, and a method created by the World Health Organization was used to estimate the indirect costs (Bernabe *et al.*, 2020).

Given adequate resources, improvements in oral health could be very advantageous from an economical perspective and help to enhance improvements in people's well-being.

By using health economics techniques, it is crucial to strengthen the knowledge base used to inform decisions about oral health care. To estimate the economic impact of dental diseases, it is necessary to synthesize the data that are currently accessible. Establishing a reliable methodology that forecasts future patterns in dental expenditure is also crucial.

Additionally, from the perspective of oral health care, it is important to clearly evaluate the advantages and disadvantages of implementing taxes on sugar sweetened beverages (SSB) and food labeling (Hagenaars *et al.*, 2021).

Economic Burden of Dental Diseases

Dental diseases impose a significant financial burden on society. The financial burden is caused by three types of expenses: direct costs (treatment costs), indirect costs (productivity losses from absences from work and school), and intangible costs (pain, difficulties with speaking, tasting, biting, chewing, or eating, difficulties expressing emotions like smiling, and involvement in social activities) (S. Listl *et al*., 2015).

On the basis of the data that is currently available, significant global spending on oral health has been identified. In 2015, dental diseases cost the economy more than $544 billion USD (Righolt *et al*., 2018). In details, worldwide, in 2015, dental diseases accounted for direct costs of $357 billion USD, and indirect costs of $188 billion USD. In a comparison of expenditures on various diseases in the EU-2018 in 2015, dental diseases (EUR 90 billion) ranked third behind diabetes (EUR 119 billion), and cardiovascular diseases (EUR 111 billion) (Righolt *et al*., 2018).

Additionally, dental diseases may make other diseases more difficult to manage, adding to the financial burden of these conditions. For instance, poor glycemic management in diabetic individuals has been associated to periodontal disease. It has been demonstrated that periodontal therapy can lower overall and diabetes-related healthcare expenses for these patients (Nasseh *et al*., 2017).

For policymakers, a better understanding of the financial impact of oral diseases is crucial. In order to help policymakers act rapidly in the interest of public health, a study offered innovative and unique insights into the long-term financial effects of dental diseases (Milica Jevdjevic *et al*., 2021).

Prediction results show an increase in per capita oral health spending across the majority of nations, assuming no significant policy changes. Germany is predicted to spend the most expenditure in 2040 ($889 USD), while Mexico would spend the least ($52 USD). Consequently, it will probably be necessary to take comprehensive steps to ensure the financial viability of dental healthcare systems (Milica Jevdjevic *et al*., 2021).

According to published research, public health initiatives are three to four times more cost-effective than curative care, suggesting they may be a feasible response to the rising cost pressures (Rudmik & Drummond, 2013).

Overcoming the interventionist dental care approach, where preventive is provided in dental chairs, is crucial. Younger age groups may benefit most from reductions in the prevalence of caries, while older age groups may still gain from delaying the start of the restorative/invasive dental treatment cycle.

For the evaluated measures to be adopted, health economic estimations alone are insufficient. It would be extremely beneficial to have more evidence-based advice for policymakers on how to get a measure like sugar taxation adopted (M. Jevdjevic *et al*., 2019; Stefan Listl & Jevdjevic, 2020).

Challenges for Oral Health Related Economic Evaluations

Economic analyses have been a useful method in the healthcare industry for assisting with decision-making and policy formulation. The recommended course of therapy or intervention should be chosen after a rigorous analysis of the potential short- and long-term health benefits, risks, and related costs to society or the healthcare system (Bertram *et al*., 2021).

Economic evaluations, which are based on a methodical, comprehensive, and transparent data synthesis, can be crucial in helping to rationalize healthcare spending under financial restraints in order to maximize health benefits (Stefan Listl *et al.*, 2019).

Numerous aspects of oral healthcare have been the subject of economic analyses, which have been conducted and published. There have been more evaluations of population-level treatments over the past ten years. Additionally, studies have been conducted to evaluate the efficacy of various public health interventions like water fluoridation (Ran & Chattopadhyay, 2016), and food labeling (M. Jevdjevic *et al*., 2021).

Health benefits and costs constitute the primary components of evidence synthesis in economic evaluations. Modelling these two components may present a unique set of difficulties (Bertram *et al*., 2021).

Insufficient effectiveness data and its conversion to useful, quantifiable metrics are significant barriers in oral health and care. For instance, a wide range of indices can be used to convey epidemiological information on the incidence of caries. Indices are ranging from incidence density, caries prevalence, number of Decayed Missing Filled Surfaces (DMFS), Decayed Missing Filled Teeth (DMFT), or combinations of these components (DT, DMT, DS), number of untreated caries decays, caries increment, being caries experience-free (DMFT=0) or with active caries lesions, etc.

In addition to the challenge of merging person-level and aggregate data from various sources, taking into account these different outcome measures adds complexity and poses risks to reliability and validity (Saramago *et al.*, 2012).

The scientific community has been relatively unaware that even the most commonly cited data on the

burden of caries worldwide (The Global Burden of Disease Study), based their statistics on a contentious assumption where all DMFT reported in epidemiological studies were counted as the DT component, representing solely untreated caries lesions (Bernabe *et al.*, 2020).

Additionally, the GBD's use of disability weights for oral diseases has not been properly reported. This and comparable assumptions' possible effects on parameter estimate have rarely been examined or debated in public.

Another challenge is that extrapolation from other settings is sometimes included in extensive appendices without adequate reasoning or computation details, making it challenging to understand and evaluate for professionals outside the modeling discipline, including the key policy makers.

Body of health economic evidence dominantly centers on the monetary value needed to achieve one Quality Adjusted Life Year (QALY) (Whitehead & Ali, 2010), a metric favored by several institutions (Angelis *et al*., 2018). Also, Disability-Adjusted Life Year (DALY) has been used and endorsed by the World Bank and the World Health Organization (WHO) (Abbafati *et al*., 2020).

Despite several attempts to construct a meaningful alternative measure to translate oral health benefits (Birch & Ismail, 2002), the lack of utilities employed in economic evaluations has been listed as one of the main shortcomings of dental research (Qu *et al*., 2019; Rogers *et al*., 2019).

The dental research community should be aware that possibly unintentional mistakes could produce false conclusions and ultimately undermine the effective distribution of scarce resources. Therefore, while attempting to employ the aforementioned health indicators in oral health care, cautious thought is required before going into analysis.

Potential Solutions for the Challenges

Reliable estimates of the burden of oral diseases are essential in order to build a new policy framework and reinforce the position of oral health within the universal health coverage (UHC) agenda, as announced during the 148th meeting of the WHO Executive Board.

Recent developments should be a motivator for the dental research community and dental professionals to work together to develop reliable, practical, and cost-effective global measures for oral health monitoring and surveillance.

A possible remedy might be a new robust measure, such as the Total Observed Caries Experience (TOCE), as recently proposed by a recent study (Huang *et al*., 2019). Although its deployment is still in the future, the TOCE was anticipated to solve some of the modeling issues when examining the cost-effectiveness of community preventative initiatives.

The results given must be intelligible and straightforward for interpretation and additional comparisons if one wishes to make sure that policy leaders have the necessary knowledge on high-value caries-directed preventative initiatives.

It is yet to be verified if the most commonly used measures (e.g. the number of prevented caries lesions, caries-free time or DMFT increment) are insightful and sufficient for policy makers, or if they should be supplemented with something more tangible such as days absent from school due to toothache, school performance, episodes of pain etc.

These results, however, still limit a comparison of therapies across several oral health care professions (Bernabe *et al*., 2020).

Recommendations for Future Research

Future research should investigate if these estimates can actually be applied globally uniformly, taking into account the significance of DALYs in determining the global burden of all non-communicable diseases, as well as comparisons and evaluations of nation profiles (Richards *et al*., 2016).

It would be helpful to ascertain whether variables like accessibility and cost of dental care affect the length and severity of caries symptoms as a first step. More general disparities between dental healthcare systems or country subgroups could be identified in this approach, increasing the accuracy of future modeling techniques.

The identified data gaps should be openly acknowledged, with their implications adequately addressed and investigated. A value of information analysis can be used to justify starting new investigations to compensate up data gaps (Fenwick *et al*., 2020).

The most important research issues can then be proactively screened out and given the highest priority for research projects. Another option for dealing with data uncertainty in modeling could be to use an interactive web-based simulation model, as was shown in a previous study (M. Jevdjevic *et al*., 2021). It enables the processing of various model assumptions based on recently acquired data.

Additionally, individual contact with the data via interactive platforms encourages learning and makes conclusions more acceptable due to information overload and time restrictions for article assessment.

It would also be helpful for future research to establish the aspects of oral health-related economic evaluations that require further study. For instance, a number of approaches have been presented to address the disparities in oral health, but it is still difficult to give health policy makers useful data. Rarely have disparities in the prevalence of dental disease and the availability of interventions been examined.

Furthermore, there is a lack of studies examining distributional effects on health and financial outcomes and taking into account differences in efficacy across different demographic groups. Financial risk protection benefits may be especially appealing when other interventions are considered due to the high percentage of households that are disadvantaged or have catastrophic health expenditure because of out-of-pocket costs for dental care (Bernabé *et al.*, 2017).

Researchers could move past the mainstream economic evaluations and promote multifaceted techniques that include equity issues in order to influence future priority settings, particularly when seeking to reduce oral health disparities and achieve UHC (e.g. distributional cost-effectiveness analysis and extended cost-effectiveness analysis).

CONCLUSIONS

Together, health economics and public policy can bring in the crucial behavioral adjustments related to oral health that are required to reduce oral diseases.

Health economics can be a useful instrument to direct the formulation of oral health-related policy by addressing particular examples of evidence gaps in oral health and care.

Building beneficial relationships and encouraging collaboration with relevant stakeholders are necessary to optimize the effect of our research. There is an urgent requirement for continuous advancement and the application of various scientific techniques.

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