Universally funded oral health care and oral health outcomes

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Research article

Keywords: Universal oral health care, oral health disparities, critical literature review

Posted Date: June 28th, 2019

DOI: <https://doi.org/10.21203/rs.2.10720/v1>

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Abstract

Objectives To critically review the oral health care systems of four countries with a universal public health care system in terms of structure, scope and delivery and their impact on oral health outcomes. **Methods** A comparative review on the oral health care systems from Brazil, New Zealand, Canada and Sweden was performed between August 2017 and January 2018 using PubMed/MEDLINE and the key words 'universal' AND 'dental OR oral' AND 'care OR access' AND 'outcome'. This is a critical essay based on evidence available in the literature and interactive conversations with key informants in all four countries. **Results** Although all four countries provide universal health care, the administration, funding and delivery of oral health care varied. About 6% of oral health care expenditure in Canada are publicly-funded. Brazil provides free oral health care at the point of use via salaried dental professionals, while Sweden offers a high-cost protection plan favouring those with greater needs, and New Zealand delivers free oral health care to children only up to their 18th birthday. With service utilization varying from 44% to more than 80%, sixty-one percent of Canadian children, 67% of Swedish children, 50% of Brazilian children and 45% of New Zealand children are caries-free at age 12 while 6.4%, 0.8%, 6.5%, and 9.6% of adults between the ages of 20 and 79 years are edentulous, respectively. **Conclusions** All countries have some form of publicly-funded oral health care, but a wide spectrum of salary-based and private-practice delivery models exists. Services utilization and oral health outcomes differ in each country.

Background

Oral health has a significant impact on overall health and quality of life, and yet remains neglected and overlooked in most health care systems (1). Social disparities in access to oral health services are found almost everywhere, but are more prominent in countries where oral health care is administered, funded and delivered predominantly through the private sector (2). Volunteer and charitable-based dental clinics have not demonstrated lasting effects upon improving a population's oral health because they provide mostly relief of pain and emergency care (2). The existence of charitable dental clinics in wealthy countries might be indirectly demonstrating the failure of the dental profession, the government and society to address the oral health care needs of all citizens (3); charitable dentistry is not a substitute approach for equitable access to care. Those bearing the greatest burden of dental disease tend to be members of socially and economically deprived segments of the population that are least likely to be able to afford oral health care (4).

Arguably, a publicly funded or "universal" approach to oral health would eliminate or reduce the impact of affordability as a barrier; it is also believed to improve oral health outcomes and lessen inequity. However, research on the impact of universally funded oral health care on access to treatment and on outcomes remains sparse, and with mixed results (5,6). This study explores critically the extent to which publicly funded or universal oral health care impacts oral health outcomes in terms of service utilization (i.e., visiting a dentist in the previous 12 months), dental caries experience via Decayed-Missing-Filled-Teeth (DMFT) in 12-year-olds and edentulism (i.e., being toothless) in adults between the ages of 20 and 79 years-old. Given that a publicly funded or universal oral health care likely exists within an equally publicly

funded or universal health care system, a comparative review amongst Canada, New Zealand, Brazil and Sweden is presented and discussed in terms of their oral health care systems' structure, scope and service delivery, as well as their impact on the oral health of their populations. These four selected countries do offer a subsidized health care financed system to offset the cost of some or all healthcare needs of their respective populations.

Methods

A comparative reflective review based on the available literature and on interactive conversations with key informants from four national oral health care systems was performed:

- 1) The Brazilian Unified Health System;
- 2) The New Zealand Dental Care System;
- 3) The Swedish Dental Care Benefits Scheme;
- 4) The Canadian Public Health Care System.

A brief search on PubMed/Medline using the key words 'universal' AND 'dental OR oral' AND 'care OR access' AND 'outcome' was performed between August 2017 and January 2018 and supplemented by the grey literature from Google Scholar using the same key words. When applicable, quotes from informal face-to-face and electronic interactions with key informants (academics, researchers and dental professionals from all four countries) were used to support or refute our line of reasoning. These key informants were approached between September 2016 and August 2017 and were asked to answer the following question: *'what would be a positive and a negative aspect of your oral health care delivery system?'* This question aimed at simply revealing more information and details about the respective systems beyond the published literature for a more insider view. Unlike a qualitative study, answers to this question were not analysed thematically for their content; rather, they were used to illustrate the firsthand experiences of those working within the four different oral health care systems. Hence, the answers to the above questions by no means were exhaustive or generalizable.

Results

Search strategy

The search strategy described above yielded 882 hits after 36 duplicates were excluded. Hits were limited to journal articles, commentaries, reviews and systematic reviews as indexed at the searching engines used. Hits that were about animal studies and in languages other than English, Portuguese, Italian, Spanish and Swedish (that the authors could understand) were eliminated, yielding 697 hits. We further eliminated hits that consisted only of abstracts without a full text to a sub-total of 451 full-text hits. The authors (MB and KM) read the full text of these 451 hits and subsequently eliminated publications

describing health care for systemic diseases only (#261 hits), discussing medications with oral side-effects (#38 hits), presenting laboratory and clinical studies in dentistry (#67 hits), conversing about infection and vaccination (#16 hits) and genetic studies (#11 hits), which resulted in 68 publications. A Google Scholar search focusing on online reports, books, books chapters, graduate theses and grey literature not typically indexed on PubMed/Medline found 11 more publications for a final total of 79 hits (Figure 1). As some of the 79 hits contained similar information, we tried to avoid reiteration of unnecessary data by using 35 of these manuscripts, reports, theses, and book chapters in support of the findings advanced by our reflective review. The full list of the 79 hits are available upon request to the corresponding author.

Health care systems: scope and structure

All four countries offer some form of universally funded health care to their citizens, with Brazil, Canada, New Zealand and Sweden spending 8.3%, 10.4%, 11.0% and 11.9% of their Gross Domestic Product (GDP) on health care, respectively (7) (Table 1).

Canada: Publicly funded health care is financed with general revenue raised through federal, provincial and territorial taxation. The provinces and territories administer and deliver most of Canada's health care services under a private model within the Canada Health Act without direct charges to the patient. All health care services must adhere to the five principles of the Canada Health Act: 1) publicly administered; 2) comprehensive in financial coverage of care; 3) universally available to all Canadians; 4) portable across provinces; 5) and accessible (i.e., without user fees) (8).

Brazil: The Unified Health System ("Sistema Único de Saúde" - SUS) oversees the payment and delivery of health services publicly provided at federal, state and municipal levels with complementary participation of the private sector (6,9). The SUS works under the three basic principles of universality, equity and comprehensiveness informed by decentralization, regionalization and social control (10).

New Zealand: The health care system is government-funded to the public. The system is a complex net of various agencies at different levels and includes the Ministry of Health, the Pharmaceutical Management Agency, and the Health Quality and Safety Commission. Although there are no deductibles, co-payments are required for general medical practitioner's services. New Zealanders residing in low-income areas have their annual per-patient capitation paid for medical care and, in return, patient co-payments are capped (11).

Sweden: All three levels of Swedish government – national, regional and local – are involved in the healthcare system. Much like Canada and Brazil, there are no direct charge to the patient. The basic principles to health care in Sweden mandates the system to offer equal entitlement to dignity and same rights regardless of individual status in the community, to give priority to those in greatest need of care, and to be cost-effective in all its levels (12).

Oral health care delivery systems

Public funding and delivery of oral health care exists to varying degrees in all four countries. In Canada, the provision of these services has been excluded from the Canada Health Act, with the exception of the federal government's responsibility to provide oral health care to Indigenous people, serving members of the Canadian Forces, eligible veterans, inmates in federal penitentiaries, and some groups of refugee claimants (13). Most provinces also provide limited public dental care benefits for those living in financially straitened circumstances. Approximately 6% of Canadian annual dental expenditure comes from public funds but the care is primarily delivered by private practitioners on a fee-for-service model.

Brazil offers the SUS, a public oral health care system that is universal, and employs salaried dental professionals working in community clinics usually referred to as Family Health Units within primary health care services (14,15). Oral health care is delivered through a network of dentists and dental assistants and, in some cases, dental hygienists. When specialised care including periodontal or endodontic treatment is required, patients are referred to a specialized dental center (CEO) for free care, also with dental professionals on a salary (15).

New Zealand offers free oral health care to children up to the age of 18 years old delivered by either oral health therapists or dentists. Adults pay for the care privately in the form of out-of-pocket payments direct to the private provider. Treatment for non-fault dental trauma is provided by private dental practitioners and is funded at a fixed cost by the Accident Compensation Corporation, which also covers temporary visitors who have suffered personal injuries (16).

In Sweden, basic oral health care is paid for children and adolescents while it is subsidised to those older than 21 years old under a high cost-protection plan. Under this plan, patients receive a small fixed annual subsidy for examinations and preventive care, typically around \$34 USD for adults between 21 to 29 years old and those older than 65 years of age, and \$17 USD for 30 to 64 year-olds (as per the exchange rate in October 10 2017 at USD \$1 for SEK8.09). For other oral health care services within a 12-month period, patients older than 21 years pay the full cost of services up to \$371 USD (SEK3000), 50% of the cost for services between \$371 USD and \$1,854 USD (SEK15,000), and 15% of costs for services above \$1,854 USD. There is no cap on users' charges for oral health care, as the system is based upon on needs rather than on affordability in which those with greater care needs pay only part of the treatment cost (18).

The workforce

The available dental workforce likely influences access to dental care. In 2017, Brazil had 232 dental schools, Canada had 10, New Zealand had one, and Sweden had four; the dentist to population ratio in these countries also varies (Table 1). Despite the numbers of dental professionals in these four countries, very few graduates pursue careers in dental public health in Canada (19), while the Brazilian public oral health care system employs the largest number of salaried dental professionals (14,15). Either way, the subsequent lack of strong leadership in public health has resulted in deteriorating support for allied professionals who typically provide care for marginalized populations. For example, the Canadian

National School of Dental Therapy was closed in November 2011 (20), although Canada has historically relied heavily upon dental therapists to provide community-based care in Indigenous communities. Only New Zealand (21) (and now to a much lesser extent Canada) continuously employs oral health therapists (a.k.a. dental nurses or dental therapists) as part of the dental workforce aimed to improve access to oral health care for children and adolescents (22). In Brazil, the development of the National Policy of Oral Health in 2004 placed access to oral health care within the national agenda (23), while dental hygienists experienced an increased limitation in their scope of practice over the past 30 years. Interestingly, the scope of practice of dental hygienists in Canada and in Sweden (16) is gradually expanding and those who can already practice independently can also provide interim stabilization and atraumatic restorative therapies. Regardless of the type of dental professional, workforce alone is insufficient to promote positive oral health outcomes and equitable access to oral health care.

Oral health outcomes

In the four countries studied, the percentage of the population utilizing oral health care services for any reason in a 12-month period varied from 44.4% in Brazil (24), 64.6% in Canada (25), 51.2% in New Zealand (26), to 87.4% in Sweden (27). The percentage of caries-free 12-year-old children was: 50% in Brazil, 61% in Canada; 45% in New Zealand; and 67% in Sweden. The percentage of edentulous adults between the ages of 20 and 79 years of age in each country was, respectively: 6.4% in Canada, 9.6% in New Zealand, 0.8% in Sweden, and 6.5% in Brazil (Table 1). Despite the overall decrease in the incidence of dental decay in developed countries, profound oral health disparities still exist by gender, income, age, and race/ethnicity that are beyond the scope of this manuscript (28,30,31).

Discussion

This manuscript aimed at reviewing critically the oral health care systems of four different countries in terms of structure, scope and the impact on oral health. Access to oral health care remains key in reducing the burden of oral diseases and improving the quality of life to the extent that *“universal dental care is the only way to erase the [oral health] disparities”* (29). However, there is limited documentation as to what extent publicly-funded (i.e., universal) oral health care can lead to acceptable oral health outcomes and can reduce oral health inequalities effectively (2). In the case of this study, utilization of services seemed to not depend on the actual availability of oral health care at least, for example, when comparing utilization rates in Brazil (44.4%) and Sweden (87.4%). Utilization does depend on many other factors other than availability or universality, including predisposing and enabling factors such as distribution and geographic location of the services, relevance of the services offered, patients preferences for providers they trust, and so on (30,31).

Whether or not oral health care is universally offered, Saekel emphasizes that oral health can only be achieved *“if dentists take a less interventionist approach ... as treating dental diseases [and focus on] preventive and tooth-preserving methods”* (32). When asked about a positive aspect of the Brazilian

public dental care system, a 32-year-old salaried dentist working at one of the CEO in Porto Alegre city for 4 years mentioned this less interventionist way of treating patients:

"What I like about the CEO is that we receive the referral for a particular treatment so we know what we will be doing....we do not go beyond what was suggested by the other colleague just because the patient gets it all covered. We do what the patient needs and avoid doing what is not [needed]."

This less interventionist approach might not be enough to decrease inequalities as seen by the DMFT and edentulism rates (Table 1). On the other hand, as oral health care remains privately financed, administered, and delivered in Canada, 1/3 of Canadians remains without any form of dental coverage while 64.6% of the population utilizes the services. Moreover, less than 6% of Canadians receive some form of universal coverage via government-sponsored dental plans (33). According to a 36-year-old junior faculty member from the University of Saskatoon's School of Dentistry, a potential negative aspect of the Canadian dental care is this discretionary aspect of the system:

"Perhaps if we, as a country, had the same priorities to serve all Canadians, things would be different. I mean, very few people have dental care from the government, especially the elderly. But I know of good dental public services to seniors in Alberta and to children in Ontario. It is unfortunately that we have to choose who to serve instead of treating them all the same way across."

For families living at or below the poverty line, out-of-pocket dental expenses are potentially catastrophic health expenditures. Disposable income is virtually non-existent in these households and so oral health inequalities remain (34). Hence, low-income Canadians may rely on the availability of charitable or community dental clinics to have their needs addressed (2), or end up in hospital emergency rooms for dental pain relieve (35). But the availability of universal or subsidized oral health care does not imply that all individuals will obtain necessary treatment given that other life priorities came into play, as well as issues of dental fear and anxiety (36), and the predisposing and enabling factors described above (30,31). Although Sweden pays for oral health care for children and adolescents, and subsidizes it for adults, a 45-yr old salaried dentist working at a dental clinic for low income Swedes told us that:

"If you look as an outsider, the Swedish dental system is almost perfect: you have free dental exams and the more you need in treatment, the less you pay yourself. But every patient here is different and some do not care if they can have that tooth fixed. They have other burning issues in life, survival is one of them, and in that case, a missing or a broken tooth does not get too much of their attention."

Ismail and Sohn (37) highlighted further that having access to a universally financed oral health care does not fully eliminate disparities, at least in the caries experience in 6- and 7-year-old children in Nova Scotia, Canada. In fact, in New Zealand, early childhood caries is not showing a downward trend despite the free access to dental care for that age group. Such stagnation in caries reduction points out to extraneous factors including poverty, social inequality and sugar consumption as strong players in dental caries development (38).

Other than children, studies involving older adults who receive medical and oral health care at a discounted cost still show a social gradient in utilization against the poor and the very old (39). With a larger number of older adults keeping their natural teeth for life, a 52-year-old private practicing dentist from Vancouver commented on the need for constant adaptation of the health care system:

“As a negative aspect, dental care is not universal in Canada. But if we did have one [public dental care system], it would have to change and adapt to the changes in disease patterns particularly in older adults. When I started, there was a lot of need for rehabilitation in the form of removable and fix appliances, and that was a good financial return. Now, the seniors I see are keeping their natural teeth. Cleaning and restorative is the new norm, and cost much less; I make less. The dental system would have to adapt to that.”

The robust Brazilian public oral health care system seems to be more utilized by those who are socio-economically disadvantaged and have greater need for treatment, although it is less than 50% of overall use. Oral health inequalities remain stronger within rural and remote communities and nationally, the primary dental care coverage is still below 40% for Brazilians (40). Public oral health systems have yet to show their intended role in promoting positive oral health outcomes, reducing inequalities, and providing universal access to comprehensive oral care regardless of the number of dental professionals available. According to a 47-year-old Brazilian salaried manager of a large public dental clinic:

“Since Brazil introduced the CEO, we did see more patients coming through the system, but the numbers seem to have reached a plateau, and not everybody uses the services. But does this indicate a ceiling effect in dental care attendance regardless of the availability of universal care? I’m not sure, but it looks like there are significant inequalities among various regions.”

The Swedish universal oral health care seems to be more equitable in reducing social inequalities as only about 7.7% of adults between the ages of 20 and 79 refrained from dental treatment for financial reasons in 2016 (41) while more than 80% of Swedes visited a dentist in a 1-year period (27,42). Interestingly, the attendance rate of Canadians who do not benefit from a universal oral health care is almost 70% although many more Canadians, approximately 17% of them, do not get dental treatment because of financial reasons (32). Could this discrepancy between Canada and Sweden be a result of the system’s failure to look after its citizens? Such accountability of a nation to its citizens was indeed an issue to a 26-year-old salaried oral health therapist in New Zealand’s North Island:

“I sometimes see myself running in circles. I see a young kid usually from a low income family with lots of dental disease and the parents want all done at once, under general anaesthesia at a hospital, which I refer. When I see this kid again with a more permanent dentition, the disease is still there, and there are no baby teeth left. Is our entire system that good that may cover an expensive treatment at a hospital and yet, fail to prevent the disease to happen again?”

Universal oral health care should be understood within a complex systems model as suggested by Rutter and colleagues (43) in which *“poor health and health inequalities are outcomes of a complex multitude*

of interdependent elements within a connected whole". These elements include patients' attitude towards dentistry, living circumstances, self-perceived oral health, and dental fear and anxiety as discussed above (35,44). Such complexity also precludes any direct causal link between universally funded oral health care and reduced oral health disparities. For example, even though Brazil provides universal public oral health services while Canada does not provide dental coverage for most adult citizens, oral service utilization in Canada (64.6%) is higher than that of Brazil (44.4%).

Although at different levels, oral health disparities in Canada, Sweden, New Zealand and Brazil will not change without widespread commitment from government, dental professionals, stakeholders and society at large. However, together with this combined commitment, Werhane (45) pointed out that *"morally ... a systemic approach has to take into account the multi-perspective dynamics involved in health care ... without ignoring the critical roles and responsibilities each of professionals, providers, payers, or patients"*, which is a similar suggestion brought up recently by Rutter et al. (42). Although such systems thinking has yet to materialize in dentistry, *"oral health care should never be a choice between feeding your children and getting that front tooth fixed,"* said a 45-year-old Canadian Dentist from Vancouver working in a local community clinic.

Conclusions

It is undeniable that either the Swedish high cost-protection scheme or the Brazilian publicly funded oral health care tends to minimize or even eliminate affordability as a barrier. However, either system has to yet fully eliminate inequity and oral health disparities – utilization rather than access remains a personal choice mediated by life circumstances, choices and perceived benefits. Moreover, Leake (3) highlights that *"unless an alternative direction is taken, dentistry will lose its relevance as a profession working for the public good and this will be followed by further erosion of public support for dental education and research"* regardless of undergraduate dental education attempting to address dental public health (19), community services (46,47) and social responsibility (48) within its future workforce.

Sweden and Brazil are not the only countries to have adopted a more universal oral health care system (48). Austria, Denmark, Germany, Poland, Thailand, Spain, and Mexico do provide basic oral health care services either through government-sponsored or employment-based insurance, while the same care is delivered through a combination of subsidized private practitioners and government health services in Greece, Turkey, and Finland (49). Cuba, Chile, Colombia, Costa Rica and other Latin-American countries offer primary and specialized oral health care mainly to children, mostly limited to school programs (50). However, there is an urgent need to evaluate the various oral health services through country-specific health care systems in terms of their ability to promote oral health outcomes and address oral health disparities regardless of age, gender, socioeconomic status or health conditions (2,33).

The limitations of this critical review include the lack of comparison with countries that have no publicly funded health care system, the convenience of the informal interviews without a proper methodology to collect and analyze the information; they have been presented to illustrate the discussion albeit

expressing only opinions of a very small selected number of participants. Hence, the use of DMFT and edentulism as outcome measures of oral health pose another limitation on this review. The countries' historical, political, social and economic trajectories that affected their oral health care systems were also not discussed. Lastly, the lack of a more uniform source of data to support the various statements made throughout this manuscript might have biased the information presented.

Despite having publicly funded health care, albeit at different levels, Brazil, Canada, New Zealand and Sweden struggle with the balanced utilization and equitable provision of oral health care to all residents. Universal funding of oral health care helps reduce economic barriers in accessing services, but much like universal healthcare, it does not eliminate disease. This critical and comparative review provides relevant information to academics, front-line workers and policy makers by depicting various approaches used to finance, organize, and deliver oral health care services.

Abbreviations

CEO – Centro de Especialidades Odontologicas

DMFT – Decayed-Missing-Filled-Teeth

GDP – Gross Domestic Product

SUS – Sistema Unico de Saude

Declarations

Ethical approval and consent to participate: The University of British Columbia Researcher Information Services (RISe) Ethical Approval was obtained through H16-00735. Consent to participate was obtained verbally. The datasets used and analyzed during the current study are available upon request.

Consent for publication: Not applicable

Availability of data and materials: Most of the data generated and analysed during this study (e.g., findings from the literature review) are included in this published article. The full list of the 79 publications are available upon request from the corresponding author.

Competing interests: The authors declare no conflict of interest, and have consented to have the manuscript submitted for publication.

Funding: Not applicable

Authors' contributions: MAB conceptualised the study, drafted and edited the manuscript; KMM contributed to the information pertaining to the Canadian health care system; GES and PS contributed to the information pertaining to health care system in Sweden; MS and WMT contributed to the information

pertaining to health care system in New Zealand; TA and FH contributed to the information pertaining to health care system in Brazil.

Acknowledgments: The authors are thankful to all the volunteer informants who gave their insights into their respective oral health care systems. This manuscript was based on a poster presentation during the 2017 conference of the Canadian Association of Public Health Dentistry in September in Toronto, Canada.

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Tables

Table 1 – Gross domestic product and per capita, GINI index, health and oral health expenditure, number of dental schools, dental workforce, and oral health outcomes in Brazil, Canada, New Zealand and Sweden

	Brazil	Canada	New Zealand	Sweden
GDP^a (world ranking)	\$1.79 trillion (9th)	\$1.53 trillion (10th)	\$153 billion (53rd)	\$511 billion (22nd)
GDPPC^b (world ranking)	\$15,242 (80th)	\$46,437 (22nd)	\$37,294 (31st)	\$49,836 (15th)
GINI index^c (world ranking, from most unequal)	52.87 (13th)	33.68 (107th)	36.20 (83rd)	27.32 (144)
Health expenditure (% of the GDP)⁷⁴	8.3d	10.4	11.0	11.9
Oral health expenditure (% of the GDP)	0.1715	0.874	N/A	0.773
Number of dental schools in 2016	232	10	1	4
Number of dentists per 100,000 population	115	58	60	80
Allied dental professional^e	-Dental Auxiliary, -Dental laboratory technicians	-Dental hygienists, -Certified dental assistants, -Oral health therapists -Denturists -Dental technicians	-Dental hygienists, -Dental assistants, -Oral health therapists -Dental technicians	-Dental hygienists, -Dental nurses
Oral Health Outcomes				
Caries-free children at age 12 (%)	50	61	45	67
Edentulous adults (20-79 Years)	6.5	6.4	9.6	0.8

^a Gross Domestic Product as per the International Monetary Fund in 2016, in US\$.

b Gross Domestic Product per capita as per the International Monetary Fund in 2016, in US\$0.

c It measures the extent to which the distribution of income among individuals or households within a country deviates from a perfectly equal distribution, and it varies from 0, representing a perfect equality to 100, representing a perfect inequality. From World Bank Estimate.

d This is total expenditure: public expenditures are approximately 4% and the remaining is from direct expenditures by individuals and families.

e There is variation in terms of definition and scope of practice of these professions. In Canada, while dental hygienists perform scaling and root planing and can work independently in some jurisdictions, in Brazil they cannot work independently. An oral health therapists in New Zealand is able to provide restorative and preventive care for children and adolescents until the age of 18, and preventive care (including scaling) for those aged 18 or over.

Figures

Figure 1

Inclusion and exclusion criteria for the literature search strategy