

Identifying and critically examining government legislation relevant to children's dental caries in Calgary, Alberta, Canada: a health inequities lens

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Keywords

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Abstract

Objectives: Children's dental caries is an important and urgent public health concern that is largely preventable. Using a social equity framework, our objectives were to identify and critically examine government legislation relevant to the issue of children's dental health in Calgary, Alberta, Canada.

Methods: We conducted a systematic, gray literature search of federal, provincial (Alberta), and municipal (Calgary) statutes and bylaws related to children's dental caries, through the relevant law databases. Eligibility criteria were applied for document screening and selection. Data extraction and synthesis pertained to objectives of the legislation (policy task), relevant agent or actor (level of government), and upstream or downstream focus, in terms of potential impact on social inequities in health.

Results: Legislation ($n = 114$) was retrieved and grouped into eight policy tasks. Most legislation fit under the policy tasks: protection of public safety and health promotion ($n = 40$) and benefits and compensation ($n = 27$). Federal and provincial governments have greater involvement in children's dental caries than municipal (Calgary) government. The majority of legislation was classified as upstream in orientation (e.g., improving living and working conditions; macro-level policies).

Conclusions: Analysis of legislation relevant to children's dental caries reveals policies that are more often upstream in nature, and unsurprisingly are multijurisdictional. Despite this, there remains a high prevalence and inequitable distribution of children's dental caries in Canada. This suggests that the nature of upstream involvement and fragmented government involvement is ineffective in tackling this pervasive and urgent public health issue. Implications for children's dental health are discussed.

Introduction

Public health, including dental public health, is characterized by complex governance

Authority in public health results in complex multilevel governance among public and private organizations, special-purpose and general-purpose institutions, and various levels of government (1). Multilevel governance is a common phenomenon in Canada, and is defined as “a model of policymaking that involves complex interactions

among multiple levels of government and social forces” (2; p. 339). Public health – “the science and art of preventing disease, prolonging life, and promoting health through organized efforts of society” (3) – by definition, engages multiple levels of government and civic society. For example, children's public health policy in Canada is a particularly complex area of multilevel governance, with a long history of interaction between local school boards, public health boards, local and provincial authorities, and public and private actors (4).

Dental health is an example of complex governance in public health. In Canada, oral health services are predominantly situated in the private sector. However, in the public sector, each level of government also plays a role related to the determinants of dental caries and caries prevention. For example, the federal government has jurisdiction over much food policy, including regulation of cariogenic foods and beverages, and funds dental services to certain groups, such as Indigenous peoples. Although provinces are responsible for health care delivery, for the most part this excludes dental care, which is predominantly delivered in private dental offices, by regulated providers – primarily dentists, dental hygienists and dental assistants (5). Provincial public health programming along with nongovernmental organizations and charities fill some gaps in care; for example, the provincial health authority in Alberta (Alberta Health Services) provides targeted preventive and restorative public health services, such as school-based sealant programs, and community fluoride varnish programs for young children (6). Provinces are also responsible for many social policies (e.g., Alberta Child Benefit) that influence the social and economic circumstances of individuals and families, that is, the social determinants of health, which have significant impact on various overall health outcomes, including oral health (7,8).

Municipal governments in some provinces (e.g., in Ontario), play a role in administering provincially funded programs, but their key role is to act as decision-makers for community water fluoridation (5). In Calgary, Alberta's most populous city, and the focal municipality of the present study, water fluoridation (a key preventive measure for caries) was discontinued in 2011, by city council vote, after having been in place since 1991. In addition, municipalities may act as a central resource for information about publicly funded dental programs, and local, community dental programming (e.g., NGOs that provide charitable dental services) (9).

Identifying and classifying roles and activities at different levels of government may help to identify policy opportunities to prevent dental caries across jurisdictions. Oral health services, despite encompassing some preventive services, are still most accurately described as downstream or treatment-oriented activities, with the key focus on restoring decayed teeth (10). As a complementary activity, public policy potentially permits more upstream action, to tackle the social determinants of health and oral health (8), and thereby reduce inequities in oral health across the population.

Dental caries is an important public health problem, especially among young children

Dental caries is the most widespread but preventable chronic disease worldwide, and is a major global public health challenge (5). Population-based data from the

Canadian Health Measures Survey show that over half of children age 6–11 in Canada have some tooth decay (11). Pain from dental caries can have devastating effects on children, including loss of sleep, poor growth, behavioral problems, and poor learning. Moreover, it can significantly disrupt crucial developmental processes of communication, socialization, and self-esteem (12).

Children with severe disease may be treated surgically in hospital under general anesthetic, depending on the child's age and the extent of decay, and behavioral considerations (13). During 2010–2012, early childhood caries or ECC, defined as the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child under the age of 6 years, was the number one reason for day surgery among children of this age group in Canada, with roughly 19,000 day surgery operations each year (13). Surgical treatment is burdensome, approximating \$21.2 million/year for hospital costs alone, a considerable underestimate since other significant expenses such as dental surgeons' and anesthesiologists' fees, travel costs for families, or costs when ECC is treated in private dental offices, are excluded from this estimate (13).

Dental caries is inequitably distributed. Social inequities in oral health – that is, systematic differences between groups that are viewed as unfair and avoidable (14) – are well documented, with more frequent and severe oral health problems occurring in socio-economically disadvantaged populations (15–17). Furthermore, the consequences of dental decay in children may perpetuate correlated socioeconomic factors, widening existing social inequities (12). That is, obvious, unaddressed decay may perpetuate social stigma and isolation, and continued decay through childhood. For young adults with visible oral health problems, finding employment, housing, and even a life partner, are made more difficult. Whereas some jurisdictions have diversified both dental care settings and providers in response to the inequitable distribution in caries (e.g., utilizing mid-level care providers such as dental therapists in remote community settings), such diversification remains largely limited in the rest of Canada, including in Alberta (10). In short, due to the prevalence, severity, cost, inequitable distribution of dental caries, and limited service options, a public policy response is a very reasonable expectation, especially for children (18).

Purpose and research questions

Our purpose was to identify, map, and critically examine government legislation relevant to dental health (children's dental caries) in Calgary, Alberta, Canada. Our research questions were: a) To what extent is each level of government in Canada formally involved in policy implementation around children's dental caries; and b) How is public

sector involvement in this policy domain distributed in terms of upstream versus downstream approaches to addressing children's dental caries.

Frameworks: Whitehead's typology of actions to tackle social inequities and Horak's multilevel governance schema

As a framework for considering public policy options for children's dental caries, we identified Whitehead's typology of actions to tackle social inequities in health as well-established and theory-based. The typology organizes programs or policies into four categories ranging from more downstream (e.g., Category 1, strengthening individuals based on perceived personal deficits) to more upstream (e.g., Category 4, promoting healthy societal macro-policies) (14).

Additionally, to address Canada's complex governance arrangements when considering the role of policy related to children's dental caries, we grounded our effort within Horak's multilevel governance schema (2), aiming to understand how well public health objectives such as health equity are met by policy across governmental jurisdictions. Briefly, the schema identifies four "agents" – federal, provincial, and municipal governments, and local social forces (e.g., non-profit organizations) involved in "activities" – namely, policy advocacy (e.g., lobbying), policy development, policy implementation, and resource provision (e.g., money) (2). While all "actors" and "activities" in Horak's framework merit study, we focus here solely on involvement by government in "policy implementation," through a critical examination of existing government legislation, for the priority it gives to prevention and health equity around childhood tooth decay.

Children's dental caries continue to be highly prevalent, inequitably distributed, costly, and potentially serious, suggesting that existing public policy has not effectively addressed this important public health concern. Given that oral health services are largely treatment-oriented, we hypothesized that existing legislation would be predominantly downstream in nature, focusing on tooth rehabilitation services for children (18) as opposed to "upstream" efforts aimed at primary prevention and/or at addressing the broader social determinants of health (19).

Methods

Study design, information sources and search strategy

The study design is best described as a multilevel case study that takes a single vertical "slice" of governance using one municipality, within one province, and the federal government. We conducted a systematic search to identify legislation pertinent to children's dental caries. We searched

online databases of statutes, regulations, and bylaws related to dental health for the Government of Canada, Government of Alberta, and City of Calgary (20–22). No institutional ethics review was required for this study.

We identified a set of search terms based on a descriptive analysis of systematic reviews in oral health (23). Our search terms included: "dentistry," "tooth," "orthodontic," "oral surgery," "endodontic," "periodontic," "prosthodontic," "pedodontic," "pediatric dentistry," "dental public health," "oral pathology," "dental," "dentist," "dental hygienist," "teeth," "caries," "fluoride," and "fluoridation."

We recognized that these terms would not capture all relevant legislation. For example, legislation related to the social determinants of health that may impact overall health (including dental health), was not captured through our methods. This is an important limitation and challenge to which we return below. However, starting with dental-related terms explicitly seemed reasonable to establish the formal jurisdiction in this policy domain.

Eligibility assessment and study selection

Figure 1 shows the PRISMA flowchart of records included as a result of our screening process of all statutes, regulations, and bylaws (24). All records were reviewed in full online by SG, to assess legislation for its intent and relevance to dental health. Relevant data from the records was extracted into an excel file (refer to Supporting Information Appendix S1), including the title of the act or regulation, section number, summary of the general intent of the legislation, and explanation of its relevance to children's dental health (i.e., a specific summary of the context in which our dental-related search term appeared in the legislation). In the first reviews of the data, we (SG and CW) excluded all records that were irrelevant to dental health. In a second review we removed any remaining dental legislation that was not specific to children's dental caries. Examples of such exclusions include: legislation outlining seniors' dental benefits (e.g., *Seniors Benefit Act General Regulation*) or legislation that sets travel insurance regulations (e.g., *Insurance Business Regulations*). When eligibility of the legislation was unclear, the item was included for further discussion with another author (LM). All records of legislation that remained were included in the synthesis.

Synthesis of legislation

We organized legislation into eight policy tasks, through an iterative process. We then classified legislation based on the policy intent of the section(s) pertaining to children's dental health. Initial task groupings were developed through iterative discussion among three team members (SG, LM, JZ) and finalized in discussion with the full team. The final eight policy tasks are: a) benefits and

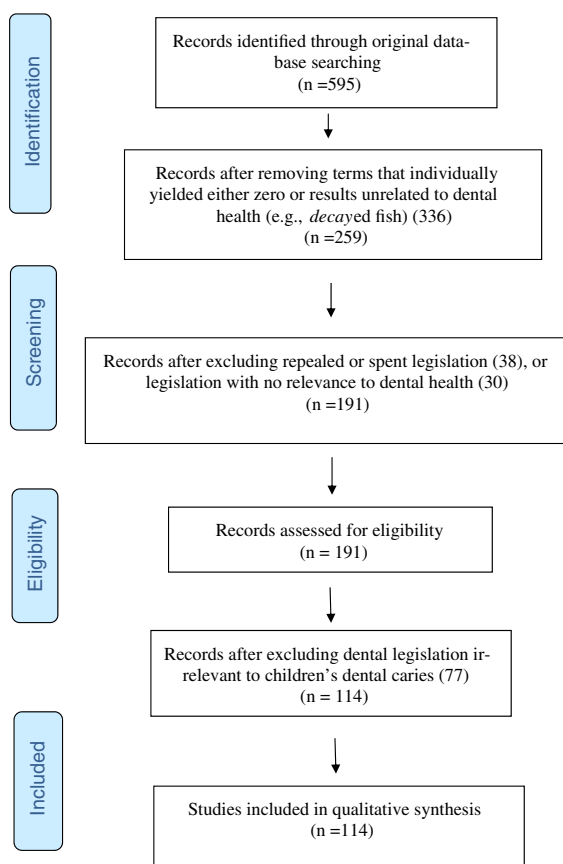


Figure 1 PRISMA 2009 flow diagram. From reference (24). [Color figure can be viewed at wileyonlinelibrary.com]

compensation, b) employment and labour policies, c) responsibility for children's dental care, d) governance and operations, e) protection of public safety and health promotion, f) taxes and tariffs, g) records and information management, and h) ethics and human rights (Table 1).

We examined the distribution of legislation based on a) level of government (federal, provincial, and municipal) and b) an upstream–downstream continuum. To examine the distribution of legislation across level of government, we summarized the presence or absence of legislation at each level of government, for each policy task. To examine the distribution of legislation across an upstream–downstream continuum, we adapted Whitehead's typology to suit our focus on government policy vis-à-vis children's dental caries (see Table 2 for a summary of Whitehead's original typology and our adapted version).

We classified legislation into our adapted version of Whitehead's typology via an iterative process led by two team members (CW, SG). Starting with a random sample of legislation ($n = 25$), the two team members worked together to develop, check, and refine the parameters of assigning legislation to a category. Any disagreement was discussed and resolved with a third team member (LM). The remaining

legislation ($n = 89$) was then categorized by CW and SG independently, using our confirmed parameters. Finally, we compared, and then discussed with LM a second time to resolve any disagreements. Once we finalized our classification of each piece of legislation across our upstream–downstream adapted typology, we synthesized our results by summarizing the presence or absence of legislation within each category (1 through 4), for each policy task.

Results

In total, 114 statutes, regulations, and bylaws related to children's dental caries were identified and grouped into eight policy tasks.

Distribution of legislation by level of government

For our focal geographic area of Calgary, Alberta, legislation was distributed across federal ($n = 50$ [44%]), provincial ($n = 57$ [50%]), and municipal ($n = 7$ [6%]) levels of government. Table 1 describes each policy task and provides examples of legislation to illustrate the formal involvement of the levels of government in policy related to children's dental caries.

Table 3 summarizes, across policy tasks, the presence or absence of legislation at each level of government. For some policy tasks, all three levels of government are involved in policy implementation (e.g., benefits and compensation; governance and operations; and protection of public safety and health promotion). For other policy tasks, only one level of government is involved (e.g., legislation within Records and Information Management is implemented by the provincial government; legislation within Taxes and Tariffs is implemented by the federal government).

Distribution of legislation by upstream/downstream orientation

Table 2 provides examples of legislation that corresponds to each of the upstream–downstream categories. Table 4 summarizes, by policy task, the presence or absence of legislation within each of the four upstream–downstream categories in our adapted Whitehead typology.

Overall, all four upstream–downstream categories were represented across the sample of legislation, but to varying degrees. As shown in Table 4, of the eight policy tasks, three tasks contained legislation that spanned all four of our adapted upstream–downstream categories (i.e., benefits and compensation; employment and labour policies; responsibility for children's dental care). In contrast, two policy tasks (i.e., records and information management; ethics and human rights) contained legislation that fit into only one category; category

Table 1 Policy task description and examples

Policy task	Description	Examples from legislation
Benefits and compensation	This policy task entails: statutes that outline the general infrastructure around delivery and acquisition of dental benefits to those who qualify; and statutes that explicitly mandate coverage of dental expenses for a target group.	Federal: immigration and refugee protection under the <i>Immigration and Refugee Protection Regulations</i> Provincial: guardians' power to consent for dental treatment for children under the <i>Family Law Act</i> Municipal: dental benefits for municipal council members under Bylaw 25 M2015 (<i>Being A Bylaw Of The City Of Calgary; To Establish A Council Compensation Review Committee</i>)
Governance and operations	This policy task contains legislation and bylaws related to the governance and daily operations of dental-related health services and personnel. This includes the oversight of establishments and buildings where these services take place.	Federal: regulations regarding provision of dental care to civilians by armed forces members under the <i>Civilian Dental Treatment Regulations</i> Provincial: protocols for health practitioners within approved hospitals under the <i>Operation of Approved Hospitals Regulation</i> Municipal: land use permits relating to where dental offices may be situated under Bylaw 13P2008 (<i>Being A Bylaw Of The City Of Calgary; To Amend The Land Use Bylaw 1P2007</i>)
Protection of public safety and health promotion	This policy task addresses health and safety protocols at the population level, which affect dental health and the provision of dental services.	Federal: protocols regarding dispensing or authorizing controlled drugs by dentists under the <i>Controlled Drug and Substances Act</i> Provincial: quality assurance for diagnostic x-ray equipment to protect dental professionals under the <i>Radiation Protection Act</i> ; health professionals' scope of practice and care settings regulation Municipal: legislation to discontinue community water fluoridation under Bylaw 20 M2011 (<i>Being A Bylaw Of The City Of Calgary; To Repeal Bylaw 37 M89, The Water Fluoridation By-Law, 1989</i>)
Employment and labour policies	This policy task addresses employment standards and labour policies, which include general guidelines pertaining to the provision (or lack) of dental benefits in the workplace. It also contains legislation that sets parameters for bargaining units and professional categories in the dental profession.	Federal: regulations regarding the inclusion of dental plans as a benefit in instances of arbitration under the <i>Federal Public Sector Labour Relations Act</i> Provincial: noninclusion of dental professionals in bargaining units, insurance schemes, and employee rights under the <i>Public Service Employee Relations Act</i>
Ethics and human rights	This policy task addresses issues of ethics and human rights related to dental health in certain instances.	Federal: prohibits unnecessary dental treatment or experimentation on prisoners under the <i>Crimes against Humanity and War Crimes Act</i> Provincial: medical and dental aids are exempt from seizure in circumstances of eviction under the <i>Civil Enforcement Regulation</i>
Responsibility for children's dental care	This policy task focuses particularly on dental-related provisions made for children under certain circumstances; and contains legislation that outlines governance of school dental health programs.	Federal: policies regarding temporary leave for prisoners to receive dental care for self or children under the <i>Corrections and Conditional Release Regulations</i> Provincial: guidelines for dental services for children with congenital cleft palate under the <i>Treatment Services Regulation</i>
Records and information management	This policy task outlines disclosure of information, protection and maintenance of health and dental records.	Provincial: management of personal and health information records by custodians including the Alberta Dental Association and College and the College of Registered Dental Hygienists of Alberta, under the <i>Health Information Regulation</i>

(Continues)

Table 1 (Continued)

Policy task	Description	Examples from legislation
Taxes and tariffs	This policy task involves taxes or tax exemptions on dental supplies and services, as well as tariffs on certain dental equipment.	<p>Federal: tax imposed on various products, including mouthwash, oral rinse, and toothpaste, under <i>The Excise Tax Act</i></p> <ul style="list-style-type: none"> - outlines medical expense credits for dental services and taxation for dental offices under <i>The Federal Income Tax Act</i> - customs tariffs imposed on various products and equipment, such as dental lamps and dental waxes and preparations (e.g., <i>CIFTA Rules of Origin Regulations; Customs Duties Accelerated Reduction Orders</i>)

3 (improving living and working conditions), and category 4 (healthy macro-policies), respectively.

Grouping categories 1 and 2 as representing “downstream” interventions, and categories 3 and 4 as “upstream,” Table 4 shows that three of the eight policy tasks contained legislation that we classified as “downstream” (i.e., benefits and compensation; employment and labour policies; responsibility for children's dental care), whereas all eight policy tasks contained legislation that we classified as “upstream” (i.e., category 3 and/or 4). Therefore, our hypothesis that existing legislation would be categorized as mostly downstream, in light of continuing high prevalence, severity, and inequitable distribution of children's dental caries, was not borne out.

Discussion

In this study, we critically examined government legislation relevant to the policy domain of dental public health, operationalized as children's dental caries, in Calgary, Alberta, Canada. We aimed to identify the extent of municipal, provincial, and federal government involvement with this urgent and prevalent public health issue, and assess legislation for its upstream or downstream focus. We located a significant quantity of relevant health policy, in terms of discrete pieces of legislation.

Our main findings are twofold. First, legislation related to children's dental caries, based on our focal case of Calgary, Alberta, is jurisdictionally fragmented, spanning all three levels of government. Second, when classified along a typology designed to capture upstream–downstream orientation, our sample of legislation was heavily weighted toward more upstream policy. This finding was contrary to our hypothesis, which was based on reports of minimal public funding for oral health services in Canada (10), and the targeted nature of the publicly funded services that do exist, which would tend to align with person-centred or downstream approaches for individuals or targeted groups in disadvantaged circumstances. In contrast, population-

centred or upstream approaches tend to address the health of all, and especially those experiencing disadvantage (14). We discuss each main finding next.

First, jurisdictional fragmentation (i.e., legislation on a policy issue from more than one level of government) (2) was present for children's dental caries. For example, responsibility for children's dental health and safety is provincial, while the decision to enact community water fluoridation – a key protective factor against children's dental caries (25) – is municipal. Jurisdictional fragmentation is not surprising given the Canadian context wherein governance over children's dental health is shared across levels of government, and is neither inherently bad nor good. It can however, enhance or reduce administrative efficiency and accountability, resulting in more or less successful whole-of-population approaches (2,26). There is indication in this field, that jurisdictional fragmentation contributes to a less successful, unsustainable approach (10).

Jurisdictional fragmentation can furthermore result in piecemeal, haphazard approaches and important policy gaps (2,10). Here, for example, legislation related to compensation and benefits for children was found across all three levels of government, largely in the form of civil service dental plans and publicly funded dental plans for vulnerable groups (e.g., low income children, seniors, eligible Indigenous individuals, and persons with disability). While this legislation serves to address inequities for some groups, children's dental caries is a serious public health issue population-wide (5,12,13). Despite this reality, we found no legislation directing public funds toward middle-income families. This is an important gap because these families often do not have the type of employment that provides good dental insurance coverage, do not qualify for publicly funded low-income dental benefits, and consequently may not be able to pay-out-of-pocket for dental services (27). Reducing health inequities requires improvement of health outcomes across the full social gradient. Such a population-wide approach is both more ethical and impactful, considering that the majority of citizens are in the levels between the worst and best off (28).

Table 2 Comparison of Whitehead's typology to tackle social inequalities in health to our adapted upstream-downstream typology (10)

Category	Whitehead's typology to tackle social inequalities in health	Our adapted upstream-downstream typology	Example legislation
1. Strengthening Individuals (downstream)	<ul style="list-style-type: none"> Addresses individual deficits that negatively impact health Aims to empower through education, counseling, and public health interventions 	<ul style="list-style-type: none"> Includes privately funded dental treatment legislation (i.e., outlines the standards and mandates of provision of private funding for target individuals) Considered downstream because the financial burden falls to individuals 	<p>Standards and mandates of provision of private funding for dental health of target individuals, including:</p> <ul style="list-style-type: none"> Children under any sort of custody agreement (e.g., <i>Child, Youth, and Family Enhancement Act</i>) Sexually exploited children (e.g., <i>Protection of Sexually Exploited Children Regulation</i>) Subjects of family violence (e.g., <i>Protection Against Family Violence Act</i>)
2. Strengthening communities (downstream)	<ul style="list-style-type: none"> Focuses on communities characterized as vulnerable; aims to empower them by fostering both horizontal social interactions/support among peers (e.g., a community centre) and vertical social interactions among groups with varying socioeconomic status (e.g., a social welfare system) 	<ul style="list-style-type: none"> Includes publicly funded dental treatment legislation (i.e., involves redistribution of public funds towards targeted groups) Aimed at reducing vulnerability associated with dental care 	<p>Standards and mandates of provision of public funding for dental health of target groups, including:</p> <ul style="list-style-type: none"> Children with disabilities (e.g., <i>Family Support for Children with Disabilities Regulations</i>) Municipal, provincial, and federal government employees (e.g., <i>City Bylaw 25 M2015, Judges Act</i>) Veterans (e.g., <i>Veterans Healthcare Regulations</i>) Inmates (e.g., <i>Corrections and Conditional Release Act</i>) The severely handicapped (e.g., <i>Assured Income for the Severely Handicapped General Regulation</i>) Immigrants and refugees (e.g., <i>Immigration and Refugee Protection Regulations</i>)
3. Improving living and working conditions (upstream)	<ul style="list-style-type: none"> Aims to reduce health-damaging environments, and to increase access to essential goods and services such as safe foods, education, and health care Potential to reduce the inequality gradient 	<ul style="list-style-type: none"> Includes broad legislation that affects whole populations Involves "classic" public health measures that aim to protect the health of a population and regulate the context for dental services 	<p>Legislation that protects the environment and human health includes:</p> <ul style="list-style-type: none"> Community water fluoridation (e.g., <i>Bylaw 20 M2011</i>, repealing water fluoridation in the city water supply) Control of various restricted substances in groundwater, wastewater, and the water supply (e.g., <i>Potable Water Regulation</i>) Radiation safety standards (e.g., <i>Radiation-emitting Devices Regulations</i>)
4. Promoting healthy macro-policies (upstream)	<ul style="list-style-type: none"> Involves larger scale policies that span sizeable populations, are inter-sectoral, and may involve national, and/or international policies Addresses macroeconomic and cultural environment, with secondary effect of reducing poverty and health inequalities. Examples: income inequalities, standard of living, employment standards, and job security 	<ul style="list-style-type: none"> Macro-policies that influence the overall dental health of the population, including any legislation that is explicitly multi-sectoral (i.e., involves more than one government department or ministry) 	<ul style="list-style-type: none"> Labour laws (e.g., <i>Canada Labour Code</i>) Taxes and tariffs (E.g., <i>Excise Tax Act, Customs duties Orders</i>) Human rights (E.g., <i>War Crimes Act, Geneva Conventions Act</i>) Inter-ministerial communication regarding school dental health programs (E.g., <i>Public Health Act</i>)

Our second finding was that upstream policy was far more represented in the legislation than was downstream policy, which was contrary to our expectations. Looking more closely at the “upstream” legislation sheds light on this finding. Much of the legislation that we classified in the upstream categories focused on the safety of hospital settings and surgical facilities, as well as regulations around the scope of practice and care settings of regulated dental health professionals (Category 3 in our adapted typology). As “do no harm” is the foundation of all health care, legislation focused on safety and scope of practice makes sense; that is, minimum standards for public safety and protection are an obvious necessity. However, while correctly classified as “upstream,” this legislation’s narrow focus on baseline safety seems insufficient to address primordial prevention (the social determinants of health) or even primary prevention (the risk factors for disease). Further, professional regulation, to the extent that it is highly restrictive on scope of services, supervision, and settings for care, could contribute to limiting access to care and unnecessarily increase the cost of providing such care (10). In effect, rather than embracing a preventive focus, the current state reflects a dental health care system deeply-rooted in a downstream, treatment (and

retreatment) model for children’s dental decay (29); despite the widely enumerated limitations of that model (30). While our interpretation likely reflects, in part, some limitations in our adapted typology, it nevertheless sheds light on the important issue of how to best operationalize different kinds of public policies, in terms of their likelihood of reducing the prevalence of serious, preventable, costly, public health problems.

Overall, while we find it inaccurate to say that government involvement in children’s dental health is absent, the division of responsibility among different levels of government, or fragmentation within policy domains, seems to create challenges in implementing population-wide, equitable strategies as described by Graham (28). Future research should compare these findings with legislation for other health issues that are similar in cost, severity, and prevalence as children’s dental caries.

While we focused on all three levels of government jurisdiction in children’s dental caries, our search was limited to the province of Alberta and the city of Calgary. Community water fluoridation, which is believed to contribute significantly to the prevention of early childhood caries, was ceased in Calgary, Alberta’s largest city, in 2011. In the aftermath of cessation, considerable discourse revolved around which level of government should be responsible for prevention of dental caries, opening up opportunities for policy discussion (31). This issue is also being discussed in other jurisdictions, nationally (32) and internationally (33). Alberta also has some of the highest dental fees in Canada, at a time when 28% of Canadians report being unable to access dental care due to cost (34). In one survey, nearly half of Albertans reported limiting their children’s dental care because of high cost (35).

Despite the uniquely informative attributes of Alberta and Calgary, future research should examine other provinces and municipalities across Canada to understand variation horizontally across provinces between similar levels of government, in addition to vertical variation across levels of government within other provinces. The role of the

Table 3 Presence/absence of federal, provincial (Alberta), and municipal (Calgary) government within each policy task

Policy task (# found)	Municipal	Provincial	Federal
Benefits and compensation (27)	✓	✓	✓
Governance and operations (9)	✓	✓	✓
Protection of public safety and health promotion (39)	✓	✓	✓
Employment and labour policies (9)		✓	✓
Ethics and human rights (3)		✓	✓
Responsibility for children’s dental care (13)		✓	✓
Records and information management (3)		✓	
Taxes and tariffs (11)			✓
Total (114)	3	7	7

Table 4 Policy tasks mapped to adapted typology categories from downstream to upstream orientation

Policy task	Category 1 strengthen individuals	Category 2 strengthen communities	Category 3 improve living & working conditions	Category 4 promote healthy macro-policy
Benefits and compensation	✓	✓	✓	✓
Employment and labour policies	✓	✓	✓	✓
Responsibility for children’s dental care	✓	✓	✓	✓
Governance and operations			✓	✓
Protection of public safety and health promotion			✓	✓
Taxes and tariffs			✓	✓
Records and information management			✓	
Ethics and human rights				✓

DOWNSTREAM UPSTREAM

provincial and perhaps particularly the municipal government in public health issues may vary widely across the country, and understanding that variation is essential to identifying public policy leverage points for improving children's dental health and health equity. Further, although Canada tends to maintain sharp demarcation between federal and provincial responsibilities, as well as between private and publicly funded health services, care providers and policy critics (12,36) note that this is by convention, rather than constitutional restriction, suggesting the possibility for change. Federal engagement in health policy is needed to address current challenges, including, but not limited to, the addition of dental prevention services for children as part of the much-needed modernization of our publicly-funded universal health system (36). Other avenues for future research, to advance understanding in the dental realm specifically, include a comparative analysis of legislation in jurisdictions with higher and lower caries prevalence, and an examination of other "actors" and "activities" from Horak's schema, including for example, local organizations involved in policy advocacy and policy development.

With respect to limitations, our search utilized dental-specific terminology, therefore we did not capture potentially relevant legislation that exists outside the dental health realm. For example, relevant macro policy that would have been missed by our search terms is food and nutrition legislation, such as regulation around manufacturing, advertising, and distribution of high-sugar beverages to children. Other relevant upstream activities that our search would have missed include legislative policies that promote and maintain supportive early life environments, and other social determinants, such as social policy related to income (e.g., minimum wage legislation) or family policy (e.g., parental leave, child care), which constitute important determinants of both general and oral health (8).

In light of the high prevalence, inequitable distribution, and largely preventable nature of children's dental caries, there is considerable urgency to identify policy levers to address this urgent public health problem. By identifying and critically analyzing existing legislation in Canada, our study represents a first step in this regard.

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References

1. Wilson K. The complexities of multi-level governance in public health. *Can J Public Health*. 2004;**95**(6):409–12.

2. Horak M. Conclusion: understanding multilevel governance in Canada's cities. In: Horak M Young R, editors. *Sites of governance: multilevel governance and policy making in Canada's big cities*. Montreal: McGill-Queen's University Press; 2012. p. 339–70.
3. Last JM, Abramson JH, Freidman GD, editors. *A dictionary of epidemiology*, 4th ed. New York: Oxford University Press; 2001. Public Health. p. 145.
4. Lucas J. Patterns of urban governance: a sequence analysis of long-term institutional change in six Canadian cities. *J Urban Aff*. 2017;**39**(1):68–90.
5. Canadian Dental Association. The state of oral health in Canada [internet]. Ottawa: Canadian Dental Association; 2017 Available from: https://www.cda-adc.ca/stateoforalhealth/_files/TheStateofOralHealthinCanada.pdf.
6. Figueiredo R, de Graff C, Rabie H, Baran S, Huber C, Patterson S, Howell M. Oral health action plan. Edmonton, Alberta, Canada: Alberta Health Services; 2016. Available from: <https://www.albertahealthservices.ca/assets/info/oh/if-oh-action-plan.pdf>.
7. Watt RG, Sheiham A. Integrating the common risk factor approach into a social determinants framework. *Community Dent Oral Epidemiol*. 2012;**40**(4):289–96.
8. Raphael D. Narrative review of affinities and differences between the social determinants of oral and general health in Canada: establishing a common agenda. *J Public Health*. <https://doi.org/10.1093/pubmed/fdy152>.
9. City of Calgary [Internet] News-Ward 7 News: Fluoride Update dental health programs for children of low income families. c-2018 [cited 2018 October 19]. Available from: <http://www.calgary.ca/citycouncil/ward-7/Pages/News/Fluoride-Update-dental-health-programs-for-children-of-low-income-families.aspx>
10. The Canadian Academy of Health Sciences. Improving access to oral health care for vulnerable people living in Canada [internet]. Ottawa: The Canadian Academy of Health Sciences; 2014 [cited 2018 May 18]. Available from: http://cahs-acss.ca/wp-content/uploads/2015/07/Access_to_Oral_Care_FINAL_REPORT_EN.
11. Health Canada. Summary report on the findings of the oral health component of the Canadian health measures survey. Canadian health measures survey 2007–2009 [internet]. Ottawa: Health Canada; 2010 [cited 2018 May 18]. Available from: http://publications.gc.ca/collections/collection_2010/sc-hc/H34-221-1-2010-eng.pdf.
12. Rowan-Legg A. Oral health care for children – a call for action. *Paediatr Child Health*. 2013;**18**(1):37–50.
13. Canadian Institute for Health Information. Treatment of preventable dental cavities in preschoolers: a focus on day surgery under general anesthesia [internet]. Ottawa: Canadian Institute for Health Information; 2013 [cited 2018 May 18]. Available from: https://secure.cihi.ca/free_products/Dental_Caries_Report_en_web.pdf.

14. Whitehead M. A typology of actions to tackle social inequalities in health. *J Epidemiol Community Health*. 2007; **61**(6):473–8.
15. Schwendicke F, Dörfer CE, Schlattmann P, Page LF, Thomson WM, Paris S. Socioeconomic inequality and caries: a systematic review and meta-analysis. *J Dent Res*. 2015; **94**(1):10–8.
16. McLaren L, McNeil DA, Potestio M, Patterson S, Thawer S, Faris P et al. Equity in children's dental caries before and after cessation of community water fluoridation: differential impact by dental insurance status and geographic material deprivation. *Int J Equity Health*. 2016; **15**(1):24.
17. Zwicker J, Dudley C, Emery H (University of Calgary, The School of Public Policy, Calgary, AB). It's not just about baby teeth: preventing early childhood caries. SPP Briefing Paper [internet]. 2016 [cited 2018 May 18];9(14). Available from <https://www.policyschool.ca/wp-content/uploads/2016/05/ecc-zwicker-dudley-emery.pdf>
18. Ostlin P, Braveman P, Dachs N, WHO Task Force on Research Priorities for Equity in Health; WHO Equity Team. Priorities for research to take forward the health equity policy agenda. *Bull World Health Organ*. 2005; **83**(12):948–53.
19. McLaren L, McIntyre L, Kirkpatrick S. Rose's population strategy of prevention need not increase social inequalities in health. *Int J Epidemiol*. 2010; **39**(2):372–7.
20. The Canadian Legal Information Institute [internet]. Ottawa (ON): Federation of Law Societies of Canada; 2001 [cited 2017 August 15]. Available from: <https://www.canlii.org/en/>.
21. Justice Laws website [internet]. Ottawa (ON): Government of Canada; c -2018 [cited 2017 August 15]. Available from: <http://laws.justice.gc.ca/eng/>.
22. Council and Committee Meetings and Bylaws [internet]. Calgary (AB): City of Calgary. 2017 [cited 2017 August 15]. Available from: <http://publicaccess.calgary.ca/searchCCProc/index.htm>.
23. Saltaji H, Cummings GG, Armijo-Olivo S, Major MP, Amin M, Major PW, Hartling L, Flores-Mir C. A descriptive analysis of oral health systematic reviews published 1991–2012: cross sectional study. *PLoS ONE*. 2013; **8**(9):e74545 PubMed PMID: 24098657.
24. Moher D, Liberati A, Tetzlaff J, Altman DG, PRISMA Group. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS Med*. 2009; **6**(7):e1000097 PMID: 19621072.
25. Maheswari SU, Raja J, Kumar A, Seelan RG. Caries management by risk assessment: a review on current strategies for caries prevention and management. *J Pharm Bioallied Sci*. 2015 Aug; **7**(Suppl 2):S320–4.
26. Scharpf FW. The joint-decision trap: lessons from German federalism and European integration. *Pub Admin*. 1988; **66**(3):239–78. <https://doi.org/10.1111/j.1467-9299.1988.tb00694.x>.
27. Ramraj C, Sadeghi L, Lawrence HP, Dempster L, Quiñonez C. Is accessing dental care becoming more difficult? Evidence from Canada's middle-income population. *PLoS ONE*. 2013; **8**(2):e57377.
28. Graham H. Tackling inequalities in health in England: remedying health disadvantages, narrowing health gaps or reducing health gradients? *J Soc Policy*. 2004; **33**(1):115–31. <https://doi.org/10.1017/S0047279403007220>.
29. Watt RG. From victim blaming to upstream action: tackling the social determinants of oral health inequalities. *Community Dent Oral Epidemiol*. 2017; **35**(1):1–11. <https://doi.org/10.1111/j.1600-0528.2007.00348.x>.
30. Edelstein BL. Pediatric dental-focused interprofessional interventions. *Dent Clin N Am*. 2017; **61**(3):589–606.
31. O'Neill B, Kapoor T, McLaren L. Politics, science, and termination: a case study of water fluoridation policy in Calgary in 2011. *Rev Policy Res*. 2018. <https://doi.org/10.1111/ropr.12318>.
32. Legislative assembly of Ontario [internet]. Toronto [ON]. Government of Ontario. 2016 [cited 2018 October 19]. Available from: https://www.ola.org/en/legislative-business/house-documents/parliament-41/session-2/2016-10-06/hansard#P890_193377
33. Ministry of Health [internet]. Government of New Zealand. 2017 March 15 [cited 2018 October 19]. Available from: <https://www.health.govt.nz/our-work/preventative-health-wellness/fluoride-and-oral-health/water-fluoridation/proposed-legislative-changes-decision-making-fluoridation-drinking-water-supplies>
34. Canadian Institute for Health Information. How Canada compares: results from the commonwealth fund's 2016 international health policy survey of adults in 11 countries [internet]. Ottawa: Canadian Institute for Health Information. 2017 [cited 2018 May 16]. Available from: <https://www.cihi.ca/sites/default/files/document/text-alternative-version-2016-cmwf-en-web.pdf>.
35. Alberta Health. Alberta dental review [internet]. Edmonton, Alberta, Canada: Government of Alberta. 2016 [cited 2018 May 16]. Available from: <https://open.alberta.ca/dataset/52597a1b-899d-4a2b-9651-d12272b2b3d2/resource/ecbd6cc7-33e8-48dd-bb9e-5a2502656e15/download/2016-alberta-dental-review-february-2016.pdf>.
36. Forest PG, Martin D. Fit for purpose: findings and recommendations of the external review of the pan-Canadian health organizations - summary report [internet]. Ottawa, Ontario, Canada: External Review of the Pan-Canadian Health Organizations. 2018 [cited 2018 May 16]. Available from: <https://www.canada.ca/en/health-canada/services/health-care-system/reports-publications/health-care-system/findings-recommendations-external-review-pan-canadian-health-organization.html>.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.