

## Early Childhood Caries and Indigenous Children in Canada: Prevalence, Risk Factors, and Prevention Strategies

Ziad D Baghdadi<sup>1,2</sup>

### Contributor:

<sup>1</sup>Former Associate Professor and Consultant, Department of Pediatric Dentistry, Riyadh College of Dentistry, Riyadh, Saudi Arabia; <sup>2</sup>Researcher, Department of Community Health & Epidemiology and Medicine, University of Saskatchewan College of Medicine, Saskatoon, SK, Canada.

### Correspondence:

Dr. Baghdadi Z. 902 105 Cumberland Ave S, Saskatoon, SK S7N1L7, Canada. Phone: +(1) 306-880-8843. Email: ziad.baghdadi@usask.ca

### How to cite the article:

Baghdadi ZD. Early childhood caries and indigenous children in Canada: Prevalence, risk factors, and prevention strategies. J Int Oral Health 2016;8(7):830-837.

### Abstract:

Early childhood caries (ECC) is an oral disease affecting primary teeth of children below the age of 6. ECC is a major health concern, negatively affecting the infants' and young children's oral and general health as untreated carious lesions can lead to pain, disruption of growth and development, and in rare cases, life-threatening infections. Dental decay in Aboriginal children in Canada is epidemic and disproportionately affects disadvantaged Canadian communities. Multiple risk factors are associated with ECC and should be recognized to provide appropriate preventive strategies. The risk factors for ECC, which are particularly relevant to Aboriginal children include poverty, diet factors, and parents' smoking tobacco, in addition to multiple other factors common to dental caries. Recommended strategies to combat tooth decay in Aboriginal children include oral health promotion, caries prevention using fluoride and sealants, and access to publicly funded oral health programs and services. This requires close collaboration between dental professionals, health professionals, policymakers, child health advocates, Aboriginal communities, and researchers, to address social determinants of health and other social disadvantages affecting Aboriginal communities.

**Key Words:** Aboriginal health, dental caries, early childhood caries, oral health, indigenous

### Introduction

Early childhood caries (ECC) is a major public health concern, negatively affecting not only the oral health of infants and young children but also their general health, quality of life, and well-being.<sup>1</sup> Even though, the caries prevalence in the permanent dentition in developed countries is declining, there is evidence that dental decay in primary teeth in North America is on the rise.<sup>2</sup> Dental caries disproportionately affects disadvantaged communities including children and Aboriginal peoples in Canada.<sup>3</sup> Although not a formal systematic review, this paper will address this topic by the first reviewing some of

the key terms and concepts related to ECC and by providing prevalence rates of ECC in Aboriginal children in Canada. Risk factors associated with ECC, consequences of untreated carious lesions in children, and some recommended strategies proposed to compete this "silent" disease are then delineated to help health-care professionals understand risk factors, consequences, and prevention approaches. Early involvement of health professionals and caregivers will minimize the ECC devastating consequences on children, families, and community at large as the first step toward complete elimination, which requires effective interventional strategies from federal and provincial policy makers and health policy-makers and planners.

### Definitions

The key terms with regard to dental caries, ECC, and Aboriginal peoples in Canada will be reviewed here. Definitions from scholarly publications and agencies that focus their attention on this issue will be primarily cited. In this review, we use the terms Aboriginal and Indigenous interchangeably.

### ECC

The American Academy of Pediatric Dentistry<sup>4</sup> defines ECC as the following:

"Caries is a biofilm (plaque)-induced acid demineralization of enamel or dentin, mediated by saliva. The disease of ECC is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. In children younger than 3 years of age, any sign of smooth-surface caries is indicative of severe ECC (S-ECC). From ages 3 through 5, 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary anterior teeth or a decayed, missing, or filled score of  $\geq 4$  (age 3),  $\geq 5$  (age 4), or  $\geq 6$  (age 5) surfaces constitutes S-ECC" (p. 1).

### Aboriginal people

Aboriginal Affairs and Northern Development Canada<sup>5</sup> states that "Aboriginal peoples" is a collective name for the original peoples of North America and their descendants. The Canadian constitution recognizes three groups of Aboriginal peoples: Indians (commonly referred to as First Nations), Métis, and Inuit. These are three distinct communities with unique histories, languages, cultural practices, and spiritual beliefs. Aboriginal communities are

located in urban, rural, and remote locations across Canada, with a total number of 1.4 million people, representing 4.3% of the total Canadian population. The three distinct peoples include First Nations or Indian Bands, located on lands called reserves in most cases; Inuit communities located in Nunavut, NWT, Northern Quebec (Nunavik), and Labrador; Métis communities located mainly in Alberta, British Columbia, Ontario, Manitoba, and Saskatchewan; and urban communities of Aboriginal people (including Métis, non-status Indians, Inuit, and First Nation individuals) in cities or towns which are not part of reserves or traditional territories (for example, the Aboriginal community in Regina, the capital city of Saskatchewan).

The Aboriginal population increased 20% between 2006 and 2011, compared with 5.2% for the non-Aboriginal population. In 2011, the largest numbers of Aboriginal people lived in Ontario and the western provinces (Manitoba, Saskatchewan, Alberta, and British Columbia); they made up the largest shares of the population of Nunavut and the Northwest Territories. Aboriginal children aged 14 and under made up 28% of the total Aboriginal population (7% of all children in Canada). In contrast, non-Aboriginal children aged 14 and under represented 16.5% of the total non-Aboriginal population.<sup>6</sup> This is due to higher fertility rates (2.6 vs. 1.6 children) and shorter life expectancy (76.8 vs. 82 years).<sup>7</sup>

### Prevalence of ECC

The poor oral health of Aboriginal children in Canada is a major public health concern, with caries prevalence exceeding 90% in some Aboriginal communities.<sup>8</sup> Several recent studies (as cited below) have reported the prevalence of dental caries among Aboriginal children living in urban, rural, and remote areas in Canada. The prevalence rates of ECC are provided here in accordance with province/territory. The data provided are not exhaustive, but clearly demonstrate the severity of the problem.

#### Manitoba

Schroth *et al.*<sup>9</sup> selected four Manitoba communities, two of them were located in the southern region of the province (urban) and the other two were northern communities (on-reserve First Nations), to determine the prevalence of ECC in Aboriginal Manitoba communities. The following clinical examination of 408 children, the authors found an overall prevalence of 53.7%, with no statistically significant difference between the four communities. The mean deft (that is, the count of the number of decayed [d], extracted [due to caries, e], and filled [f] deciduous teeth [t] of an individual) was 4.2 (standard deviation [SD] 5.0).

In another study, Schroth *et al.*<sup>10</sup> (2005) reported higher ECC prevalence (89.9%) and higher deft (13.7 [SD 3.2]) in Garden Hill First Nation community in northern Manitoba. In a rural Manitoba community (Carman), non-Aboriginal preschool children exhibited less ECC prevalence rate compared to other

Canadian preschool children. Schroth and Moffatt (2005) reported a prevalence rate of 44% and deft of 2 (SD 3.3).<sup>11</sup>

#### Ontario

Several studies assessed the caries prevalence in First Nations preschoolers in Sioux lookout zone (SLZ) communities in Ontario.<sup>12-14</sup> It has been noticed temporal changes in caries prevalence over the years to reach its peak in 2004's study (prevalence 85.3%, deft 10). In another First Nations community (district of Manitoulin), the prevalence rates of ECC were 67% and 78% in 3-year-old and 5-year-old children, respectively.<sup>15</sup>

#### British Columbia

Harrison and Davis (1993) analyzed the surveys of the dental health of native children in British Columbia conducted in 1988.<sup>16</sup> They reported caries in 87.5% of children at age 5 (deft 7.5 [SD 4.9]). In another study, Harrison *et al.*<sup>17</sup> (2006) reported similar high prevalence rates of caries in children from a tribe of the Tsimshian Nation (Hartley Bay, Gitga'at).

#### Northwest territories

In the region of Keewatin, the prevalence rates of ECC in Inuit children ranged between 50% and 100% depending on community. The deft ranged between 1.8 in children up to age 2-8 in 3-5-year-old children.<sup>18</sup> In a more recent study, Leake *et al.*<sup>19</sup> (2008) reported a prevalence rate of 66% after examining 514 preschool children from the Inuvik Region, Northwest Territories, in 2004-2005. The deft was 4.8.

#### Nunavut territory and Labrador

A high prevalence of ECC was found among Inuit preschool-aged children in Nunavut Territory. The weighted prevalence of ECC was 69.1% in children aged 3-5 years from 16 of Nunavut's 25 communities randomly selected to participate in the Nunavut Inuit Child Health Survey conducted in 2007 and 2008.<sup>20</sup> The prevalence of caries in Inuit 5-6-year olds from Northern Labrador was reported to be 68% by Zammit *et al.*<sup>21</sup>

Summarizing, Aboriginal preschool-aged children across Canada are suffering from dental decay which is currently at epidemic proportions. To date, national oral health survey of preschool-aged Aboriginal children in Canada is not available; however, data from different localities indicate high prevalence rates of ECC for this cohort. Urban and on-reserve First Nations and other Aboriginal children are reported to have high rates reaching 80-90% of the population.<sup>22</sup> Other groups, such as immigrant children from Asia, are exhibiting rates above 40%. These high rates can be contrasted to 5%, the rate of ECC in children who are mainly from Saskatoon Health Region, and 25%, the rate of ECC at the national level.<sup>8,23,24</sup>

#### Risk Factors for ECC

Dental caries is a chronic, transmissible, and multifactorial disease, in which host, microbes, diet, and time play major

roles in its development.<sup>25</sup> Dental literature reports many risk factors (more than 100), but these can be categorized into four major types: Demographic (e.g., age, gender, race/ethnicity, and socioeconomic status [SES]), dietary (e.g., sugar consumption, bottle feeding, and infant formula), microbiological (e.g., presence of *Streptococcus mutans*), and behavioral (e.g., tooth brushing, use of fluoridated toothpaste).<sup>26</sup>

ECC is the form of dental caries that develops rapidly soon after a primary tooth erupts. Original terms given to this disease include nursing caries, nursing bottle caries, and baby bottle tooth decay, which suggest that inappropriate feeding habits are the main cause of this disease.<sup>26</sup> The current used terminology, ECC, reflects the current understanding of multifactorial pathogenesis of the disease. Here, we present some salient risk factors associated with ECC as reported in studies involving Aboriginal children.

### **Socioeconomic status (SES)**

Kendall (2001) stated that, "Characteristics of socioeconomic concepts in First Nations communities are: Education, employment, income, housing, industrial structure, population structure, and percent speaking an Aboriginal language at home" (p. 43).<sup>27</sup> Poverty is the single greatest risk factor for ECC.<sup>26</sup> The strength of association between social class and caries experience in children aged 1.5-4.5 years was twice that between tooth brushing and caries, and three times that between sugar confectionary and caries.<sup>26</sup> The average child poverty rate for Aboriginal children is 40%, more than twice that of all children in Canada (17%). Most shocking, however, is in the poverty rate in all status First Nations children (50%). More than half of Status First Nations children live below the poverty line in Manitoba (62%) and Saskatchewan (64%). Those who are below the poverty line are three times more likely to live in bad conditions, such as an overcrowded house or a house requiring major repairs.<sup>28</sup> Epidemiological studies in Canada and the U.S. clearly show that ECC is most prevalent among children who are from low SES families. SES is linked to low parental education and increased family size, both are associated with higher caries experience in children.<sup>11</sup>

Schroth *et al.*<sup>29</sup> (2013) reported that Manitoba First Nations children whose fathers did not complete high school were significantly more likely to have S-ECC, as well as children whose fathers did not work for pay. Interestingly, children whose paternal grandmother attended residential school were significantly more likely to have S-ECC (odds ratio [OR] = 2.16,  $P = 0.009$ ). Those whose paternal grandfather attended residential school also had a higher prevalence of S-ECC (OR = 2.0,  $P = 0.022$ ).

### **Dietary factors**

Dietary factors have double effect on the model of caries: First, they influence the availability of fermentable carbohydrates required for acid formation to initiate caries; second,

they influence host susceptibility because primary teeth enamel development is affected by prenatal and early infant nutrition.<sup>13,30</sup>

In the study of Schroth *et al.*, breastfed Manitoba First Nations children were less likely to have S-ECC compared with those who had never been breastfed (17.4% vs. 31.5%), while consuming drink crystal beverages in bottles, and daily intake of soft drinks, juices, sweets, and fast food were associated with increased risk (OR = 2.5,  $P = 0.001$ ).<sup>29</sup> Although those data were collected based on caregivers' self-reported, they are associated with data collected from direct clinical assessment. For example, similar results were reported by Leake *et al.* (2008) who found children in Inuvik Region were in significant risks when consuming drinks made from flavor crystals (OR = 2.4).<sup>19</sup> Schroth *et al.* (2005) reported that 50% of First Nations preschool-aged children from Northern Manitoba (Garden Hill) had enamel defects, which were related to vitamin D deficiencies both in children and their mothers during pregnancy.<sup>10</sup>

### **Tobacco smoke**

The effect of environmental tobacco smoke and maternal smoking status on increased risk of caries among children is very much relevant to Aboriginal peoples, who have a markedly higher smoking rate than the non-Aboriginal peoples (40% vs. 20%).<sup>31-33</sup> What is significant is that many Aboriginal mothers smoke during pregnancy.<sup>33</sup> The association of ECC with paternal smoking (OR = 1.52) and maternal smoking (OR = 2.25) is well-documented.<sup>32</sup> In Schroth *et al.*'s (2013) study, Aboriginal children whose mothers smoked during pregnancy were 1.7 times more likely to have S-ECC.<sup>29</sup>

### **Other factors**

Many other factors are reported to be associated with ECC in non-Aboriginal as well in Aboriginal children. For example, parental and children tooth brushing habits have been associated with caries experience in children.<sup>26</sup> Parental attitudes and knowledge toward children's oral health have been associated with caries development in children.<sup>19</sup> Lack of health-care services or not culturally appropriate healthcare services in Aboriginal communities are associated with S-ECC; the OR reported by Schroth *et al.*<sup>29</sup> (2013) was 2.63 ( $P = 0.001$ ). Parker *et al.* in their review of the oral health of Indigenous children in Australia, New Zealand, Canada and the USA considered colonization as the source reason for Indigenous people suffering in those 4 nations because historically colonization established disparities between Aboriginal and non-Aboriginal peoples.<sup>34</sup>

### **ECC Consequences and Prevention Strategies**

The consequences of caries in children can be dire, leading to life-threatening conditions or even death in some rare cases.<sup>35-37</sup> Less severe consequences include pain, difficulty eating and sleeping, speech difficulties, and poor self-image.<sup>38</sup> There is

solid evidence that severe forms of caries in children affect their growth, development, and ability to concentrate and function; children's quality of life is seriously impaired.<sup>1,39</sup> Schroth, Harrison, and Moffatt noted that although few studies relating ECC to general health involved Indigenous children, results from studies with non-Aboriginal children can be extrapolated to Indigenous children.<sup>1</sup>

Comprehensive full mouth dental treatment under general anesthesia (DTGA) is an accepted approach for treating severe dental caries in children. Each year approximately 19,000 day surgery operations are performed to treat cavities (due to caries) among children in Canada (excluding Quebec), making it the leading cause of day surgery for young children.<sup>40</sup> Proportions of children who are Aboriginal from among those receiving DTGA are high. In the province of Saskatchewan, the use of dental caries-related day surgery among children in 2012 was 35 per 1,000, with a total of 3886 operations.<sup>40</sup>

Considering the high cost, health risks, logistic difficulties (e.g., families reside in remote areas away from hospitals providing DTGA) associated with DTGA, and high recurrence of disease, prevention should take precedence over restorative or surgical treatment of ECC.<sup>41</sup> ECC prevention is likely to be the most cost-effective alternative; for every dollar spent on prevention in oral health care, as much as \$50 is saved on restorative and emergency dental procedures.<sup>8</sup> Long-term solutions to ECC in Aboriginal communities require collaboration among Aboriginal communities; dental, primary care, and public health practitioners; as well as decisions makers, policy makers, and researchers interested in young children health. This collaboration should address the risk factors of ECC including oral bacteria, substrate, and host; in addition to family, economic, social conditions, and other determinants of health.<sup>30</sup> Recommended prevention strategies include oral health promotion, disease prevention using fluoride and sealants, and access to publicly funded oral health programs and services.

### **Oral health promotion**

The dental program should promote the fact that dental caries is preventable. Pregnant women, parents, caregivers, teachers, and healthcare professionals (e.g., pediatricians and public health nurses) should understand that dental decay is an infectious and transmissible disease that can transmit vertically from mother (or father) to child and horizontally within families (e.g., among siblings) or from the carious tooth to the intact ones.<sup>42</sup> There is newer evidence suggesting the transmission between unrelated nursery school children.<sup>42</sup>

Public health awareness campaigns focusing on the transmission and prevention of dental caries can be led by the Ministry of Health, working collaboratively with provinces/territories and Aboriginal communities. Prowse *et al.* (2014) recognized many challenges involved in promoting oral health to high-risk

groups, including Aboriginal peoples and newcomers such as the difficulty associated with reaching these populations and distinct culture.<sup>22</sup> However, they provided certain recommendations to aid in promoting oral health such as involving grandparents in oral health promotion activities and moving toward family-centered care.

Evaluation should be an essential part of any dental programs to assess the effectiveness of oral health promotion activities on knowledge/behavior and ultimately on the prevalence of ECC in Aboriginal communities. The following evaluation of SLZ Dental Program involving Cree living in 28 communities in Ontario, Lawrence *et al.* (2004) found that the SLZ's prenatal nutrition program improved caregivers' knowledge of ECC.<sup>13</sup> However, more needs to be done to address the factors that place undo strain on parents/caregivers and lead to poor oral hygiene and dietary habits among children in Aboriginal communities.

Indigenous communities are distinct groups with different cultures and cultural contexts and, therefore, the ECC prevention efforts that have been used as pan Canadian approaches are not appropriate. Systemic level interventions to address the social determinants associated with ECC in Indigenous communities such as cultural traditions, economic security, food security, and housing status are needed.<sup>43</sup> These interventions not only contribute to overall health but also enable the necessary conditions to promote and sustain oral health. The recent work by Cidro *et al.*, The Baby Teeth Talk Study, exploring the use of four interventions (motivational interviewing, anticipatory guidance, fluoride varnish (FV) and dental care to expectant mothers) aims to reduce the prevalence of ECC in infants within Aboriginal communities.<sup>44</sup> They suggest that restoring cultural childrearing skills (i.e., breastfeeding) within a contemporary context, promoting traditional knowledge (i.e., traditional medicine), and teaching transcultural skills are an essential component in rebuilding and enhancing skills to support the healthy development of Aboriginal babies.<sup>44</sup> The Manitoba Dental Association's Free first visit program (FFV) is another intervention that increased the number of young children (infants and toddlers) who have had an FFV by 36 months of age, particularly for those from households at a lower SES (mainly, Aboriginal).<sup>45</sup> However, there is a need to evaluate the impact of the FFV program on reducing the incidence of severe caries in young children, reducing the number of dental surgeries for severe ECC, and whether this intervention lead to better and sustained access to dental care for preschool children.<sup>45</sup> There is preliminary evidence that the annual cost for children, who were non-Aboriginal, privately insured and had their first dental visit by age one, was significantly less than for children who waited until and older age.<sup>46,47</sup> Nash argued that evidence supporting early dental visits is equivocal, and therefore, more studies are warranted to evaluate the recommendation of the early visit in both non-Aboriginal and Aboriginal children.<sup>48</sup>

Fisher-Owens *et al.* argue that health promotion models should be a multilevel approach by targeting not only the individual and family factors but also factors at the community level.<sup>49</sup> In this conceptual model, the individual and family levels are situated within the community level because the community factors have a broader and more dominant role in shaping children's health, including their oral health. Social capital is one of the community-level factors that has been demonstrated to be positively affecting dental caries as well as other general health and oral health conditions.<sup>50-52</sup> Because little is known about the role of social capital and its potential role in the oral health of preschool children in general and in First Nations children in particular, Salehyar *et al.* conducted individual and focus group interviews with members of a First Nations community in Alberta which aim to better understand the concept of social capital and its role in developing a health promotion model to address oral health issues in this community.<sup>53</sup> The authors found that although the "close-knit nature" of the community can be considered as one of its strengths, it may create a backlash by encouraging unhealthy behaviors and resistance to change, which is one of difficulties faced when changing unhealthy behaviors.<sup>53,54</sup> More issues related to the social capital role for the First Nations communities such as the power and gender issues, need more focused investigations.<sup>53</sup>

#### **Disease prevention (fluoride and sealants)**

The Canadian Dental Association, the Canadian Academy of Paediatric Dentistry, and the Canadian Paediatric Society endorse the use of fluoride for the prevention and control of caries.<sup>30</sup> Multiple modalities provide fluoride both systemic (e.g., water fluoridation, salt fluoridation) and topical (e.g., toothpastes, FV). The effectiveness of fluoride requires adherence (toothpaste) or access to dental care or funding (water fluoridation, FV).

A recent preliminary evidence suggests that community fluoridation help reduces caries by 30-50% in Alaska whose inhabitants (Alaska Natives) suffer from a high prevalence of dental caries similar to Aboriginal peoples in Canada.<sup>30</sup> In Canada, less than 10% of First Nations people live in areas which have access to fluoridated water, whereas 45% of Canadians benefit from access to fluoridated water.<sup>48</sup> Unfortunately, there is a new trend of fluoridation cessation in some Canadian areas. A new study revealed that cessation occurred in May 2011 in Calgary, Alberta, has resulted in increased children's tooth decay, 2.3-3 years post-cessation, compared to another similar city in Alberta (Edmonton) where fluoridation continued.<sup>55</sup> More work needs to be done to increase access to fluoridated water and monitor trends of fluoridation cessation, taken into consideration that the fluoridation of drinking water supplies is a decision that is made by each municipality in collaboration with the appropriate provincial or territory authority and in consultation with residents. Because of public controversy

regarding the uptake of water fluoridation, Aboriginal communities should be consulted before adding fluoride to their water supply.

Introduced in the 1960s, FV and dental sealants substantially reduce dental caries in both primary and permanent teeth in children and adolescents.<sup>56,57</sup> However, both require active participation by the client and are more expensive than fluoridation of the water supply. An example of a program that applied FV is the one involved 1275 Aboriginal children living in the SLZ and Thunder Bay (northern Ontario) who received FV twice per year. Lawrence *et al.* (2008) found that children who received FV exhibited 18% reduction in dental caries over a 2-year period compared to a negative control group. Based on these findings, Lawrence *et al.* (2008) suggested the expansion of FV applications to include more children by involving primary care providers in administering FV.<sup>13</sup>

Sealants have been included in limited numbers of free preventive dental services, along with FV and scaling, to low-income children in Canada.<sup>3</sup> There is a consensus among Canadian experts in caries prevention that all children at high risk of dental caries, including First Nations and Inuit populations, should receive sealants on both primary and permanent molars.<sup>58</sup>

#### **Access to Publicly Funded Oral Health Programs and Services**

A lack of access to dental care significantly contributes to the oral health disparities experienced by Canadian Aboriginal children. Dental therapists are commonly used in some northern communities in Canada because there are inadequate numbers of dentists serving in these areas.<sup>59</sup> Recruiting (and retaining) dentists in remote Aboriginal communities is a real challenge that requires innovative solutions. Some suggest that dental schools should graduate more Aboriginal students. The University of Saskatchewan College of Dentistry's Aboriginal Equity Access Program aims at recruiting, retraining, and graduating more Aboriginal students. Started in 1996, the program so far has admitted 22 students in the predoctoral program.<sup>60</sup> However, the efficacy of the program in increasing access to dental care in Aboriginal communities needs to be established.

Readily available solutions to the workforce problem include involvement of primary care providers (e.g., pediatricians, family physicians, nurse practitioners, and community health nurses) in various Aboriginal communities in oral health care to complement the work of dental professionals. Appropriate funding for increasing access to dental prevention programs and treatment services to Aboriginal populations should be advocated. More community-based participatory research should be supported with the focus on the epidemiology, prevention, and management of ECC unique to Canadian context.

## Conclusion

ECC is a growing public health problem because a trend has been noticed over the last 25 years indicating a significant increase in primary tooth decay rates in preschool children in North America. Aboriginal Canadian preschool children are reported to have a higher burden of ECC. If untreated, ECC may impact on childhood health and well-being. ECC is a complex disease involving multiple risk factors, both social and biomedical. Therefore, ECC control requires multiple, complementary prevention strategies, with active participation from dental professionals, Aboriginal communities, researchers, and policy makers. The Canadian Dental Association's (2010) Committee on Clinical and Scientific Affairs stated in its Report on ECC that, "Although a number of innovative multidisciplinary programs have been developed in Canada, these occur in relative isolation and are not widely known. These initiatives need to be identified, recognized, supported and, most importantly, leveraged to implement successful strategies across many populations by a variety of health care professionals" (p. 5).<sup>2</sup> These strategies include oral health promotion, caries prevention, and access to publicly funded oral health programs and services. In a broader perspective, the social determinants of health and social disadvantages affecting Indigenous communities, including poverty, poor housing, and low levels of education, should be addressed in order to improve Indigenous children's oral health.

## Acknowledgments

The author would like to thank Arlene Kent-Wilkinson, RN, CPMHN(C), BSN, MN, PhD, for reviewing and commenting on the manuscript.

## References

- Schroth RJ, Harrison RL, Moffatt ME. Oral health of indigenous children and the influence of early childhood caries on childhood health and well-being. *Pediatr Clin North Am* 2009;56(6):1481-99.
- Canadian Dental Association (CDA). Report on Early Childhood Caries: 2010. Available from: [http://www.jcda.ca/uploads/pdf/ccsa/ECC-Report-FINAL-April-2010\\_for-jcda-website.pdf](http://www.jcda.ca/uploads/pdf/ccsa/ECC-Report-FINAL-April-2010_for-jcda-website.pdf). [Last accessed on 2015 May 15].
- King A. Oral Health – More Than Just Cavities: A Report by Ontario's Chief Medical Officer of Health; 2012. Available from: [http://www.health.gov.on.ca/en/common/ministry/publications/reports/oral\\_health/oral\\_health.pdf](http://www.health.gov.on.ca/en/common/ministry/publications/reports/oral_health/oral_health.pdf). [Last accessed on 2015 May 01].
- American Academy of Pediatric Dentistry (AAPD). Definition of Early Childhood Caries (ECC). Chicago, IL: AAPD; 2008. Available from: [http://www.aapd.org/assets/1/7/D\\_ECC.pdf](http://www.aapd.org/assets/1/7/D_ECC.pdf). [Last accessed on 2015 Jul 01].
- Aboriginal Affairs and Northern Development Canada. Aboriginal Peoples and Communities: Government of Canada; 2015. Available from: <https://www.aadnc-aandc.gc.ca/eng/1100100013785/1304467449155>. [Last accessed on 2015 Jul 01].
- Statistics Canada. Aboriginal Peoples in Canada: First Nations People, Metis and Inuit; 2015. Available from: <https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-011-x/99-011-x2011001-eng.cfm>. [Last accessed on 2016 May 30].
- Statistics Canada. Fertility: Fewer Children, Older Moms; 2016. Available from: <http://www.statcan.gc.ca/pub/11-630-x/11-630-x2014002-eng.htm>. [Last accessed on 2016 May 30].
- Ontario Dental Association. Tooth Decay in Ontario's Children: An Ounce of Prevention—A Pound of Cure; 2008. Available from: [http://www.oda.on.ca/images/pdfs/ODA\\_SpecialReport\\_WEB\\_booklet.pdf](http://www.oda.on.ca/images/pdfs/ODA_SpecialReport_WEB_booklet.pdf). [Last accessed on 2015 May 01].
- Schroth RJ, Moore P, Brothwell DJ. Prevalence of early childhood caries in 4 Manitoba communities. *J Can Dent Assoc* 2005;71:567.
- Schroth RJ, Smith PJ, Whalen JC, Lekic C, Moffatt ME. Prevalence of caries among preschool-aged children in a northern Manitoba community. *J Can Dent Assoc* 2005;71(1):27.
- Schroth RJ, Moffatt ME. Determinants of early childhood caries (ECC) in a rural Manitoba community: A pilot study. *Pediatr Dent* 2005;27(2):114-20.
- Hargreaves JA, Titley KC. The dental health of Indian children in the Sioux Lookout Zone of Northwestern Ontario. *J Can Dent Assoc (Tor)* 1973;39(10):709-14.
- Lawrence HP, Binguis D, Douglas J, McKeown L, Switzer B, Figueiredo R, et al. A 2-year community-randomized controlled trial of fluoride varnish to prevent early childhood caries in Aboriginal children. *Community Dent Oral Epidemiol* 2008;36(6):503-16.
- Titley KC, Bedard DH. An evaluation of a dental care program for Indian children in the community of Sandy Lake, Sioux Lookout Zone, 1973-1983. *J Can Dent Assoc* 1986;52(11):923-8.
- Peressini S, Leake JL, Mayhall JT, Maar M, Trudeau R. Prevalence of early childhood caries among First Nations children, District of Manitoulin, Ontario. *Int J Paediatr Dent* 2004;14(2):101-10.
- Harrison RL, Davis DW. Caries experience of Native children of British Columbia, Canada, 1980-1988. *Community Dent Oral Epidemiol* 1993;21(2):102-7.
- Harrison RL, MacNab AJ, Duffy DJ, Benton DH. Brighter smiles: Service learning, inter-professional collaboration and health promotion in a First Nations community. *Can J Public Health* 2006;97(3):237-40.
- Young TK, Moffatt ME, O'Neil JD, Thika R, Mirdad S. The population survey as a tool for assessing family health in the Keewatin region, NWT, Canada. *Arctic Med Res* 1995;54 Suppl 1:77-85.
- Leake J, Jozzy S, Uswak G. Severe dental caries, impacts and determinants among children 2-6 years of age in Inuvik Region, Northwest Territories, Canada. *J Can Dent Assoc* 2008;74(6):519.
- Pacey A, Nancarrow T, Egeland GM. Prevalence and risk factors for parental-reported oral health of Inuit

- preschoolers: Nunavut Inuit Child Health Survey, 2007-2008. *Rural Remote Health* 2010;10(2):1368.
21. Zammit MP, Torres A, Johnsen DC, Hans MG. The prevalence and patterns of dental caries in Labrador Inuit youth. *J Public Health Dent* 1994;54(3):132-8.
  22. Prowse S, Schroth RJ, Wilson A, Edwards JM, Sarson J, Levi JA, *et al.* Diversity considerations for promoting early childhood oral health: A pilot study. *Int J Dent* 2014;2014:175084.
  23. First Nations Information Governance Centre. The First Nations Information Governance Centre, First Nations Regional Health Survey (RHS) Phase 2 (2008/10): National Report on the Adult, Youth and Children Living in First Nations Communities; 2012. Available from: [http://www.fnigc.ca/sites/default/files/First\\_Nations\\_Regional\\_Health\\_Survey\\_2008-10\\_National\\_Report.pdf](http://www.fnigc.ca/sites/default/files/First_Nations_Regional_Health_Survey_2008-10_National_Report.pdf). [Last accessed on 2015 May 01].
  24. Gill SS. Saskatchewan Dental Health Screening Program, 2013-2014; 2014. Available from: [https://www.saskatoonhealthregion.ca/locations\\_services/Services/Oral-Health/Documents/Saskatchewan%202013-14%20Dental%20Screening%20Report.pdf](https://www.saskatoonhealthregion.ca/locations_services/Services/Oral-Health/Documents/Saskatchewan%202013-14%20Dental%20Screening%20Report.pdf). [Last accessed on 2015 May 01].
  25. Keyes PH. Research in dental caries. *J Am Dent Assoc* 1968;76(6):1357-73.
  26. Gibson S, Williams S. Dental caries in pre-school children: Associations with social class, tooth brushing habit and consumption of sugars and sugar-containing foods. Further analysis of data from the National Diet and Nutrition Survey of children aged 1.5-4.5 years. *Caries Res* 1999;33(2):101-13.
  27. Kendall J. Circles of disadvantage: Aboriginal poverty and underdevelopment in Canada. *Am Rev Can Stud* 2001;31:43-59.
  28. Canadian Centre for Policy Alternatives Manitoba Office. Work Life: Poverty or Prosperity, Indigenous Children in Canada; 2013. Available from: [https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office%2C%20Manitoba%20Office/2013/06/WorkLife\\_Poverty%20or%20Prosperity.pdf](https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office%2C%20Manitoba%20Office/2013/06/WorkLife_Poverty%20or%20Prosperity.pdf). [Last accessed on 2015 May 01].
  29. Schroth RJ, Halchuk S, Star L. Prevalence and risk factors of caregiver reported severe early childhood caries in Manitoba First Nations children: Results from the RHS Phase 2 (2008-2010). *Int J Circumpolar Health* 2013;72.
  30. Irvine J, Holve S, Krol D, Schroth R. Early childhood caries in Indigenous communities: A joint statement with the American Academy of Pediatrics. *Paediatr Child Health* 2011;16(6):351-64.
  31. Aboriginal Canadians. Smoking Among Aboriginal Canadians. Available from: <http://www.somke-free.ca>. [Last accessed on 2015 May 01].
  32. Hanioka T, Nakamura E, Ojima M, Tanaka K, Aoyama H. Dental caries in 3-year-old children and smoking status of parents. *Paediatr Perinat Epidemiol* 2008;22(6):546-50.
  33. Creative Spirits. Aboriginal Smoking: A Serious Health Problem; 2015. Available from: <http://www.creativespirits.info/aboriginalculture/health/aboriginal-smoking-a-serious-health-problem#axzz3cIXanEjL>. [Last accessed on 2015 May 01].
  34. Parker EJ, Jamieson LM, Broughton J, Albino J, Lawrence HP, Roberts-Thomson K. The oral health of Indigenous children: A review of four nations. *J Paediatr Child Health* 2010;46(9):483-6.
  35. Hibberd CE, Nguyen TD. Brain abscess secondary to a dental infection in an 11-year-old child: Case report. *J Can Dent Assoc* 2012;78:c49.
  36. Kleiss K. Girl, 9, Nearly Died from Dental Infection While on Alberta Child Welfare Officials' Watch: Report; 2015. *Edmonton Journal*. Available from: <http://www.edmontonjournal.com/Girl+nearly+died+from+dental+infection+while+Alberta+child+welfare+officials+watch+report/11088052/story.html>. [Last accessed on 2015 May 01].
  37. Sproule D. Health: Dental care in Canada; 2015. *Canadian Newcomer*. Available from: <http://www.cnmag.ca/issue-11/440-health-dental-care-in-canada-e06>. [Last accessed on 2015 May 01].
  38. Baghdadi ZD. Effects of dental rehabilitation under general anesthesia on children's oral health-related quality of life using proxy short versions of OHRQoL instruments. *ScientificWorldJournal* 2014;2014:308439.
  39. Alkarimi HA, Watt RG, Pikhart H, Sheiham A, Tsakos G. Dental caries and growth in school-age children. *Pediatrics* 2014;133(3):e616-23.
  40. Canadian Institute for Health Information (CIHI). Treatment of Preventable Dental Cavities in Preschoolers: A Focus on Day Surgery Under General Anesthesia; 2013. Available from: <https://www.secure.cihi.ca/estore/productFamily.htm?locale=en&pf=PFC2386&lang=en>. [Last accessed on 2015 May 25].
  41. Amin M, Nouri R, ElSalhy M, Shah P, Azarpazhooh A. Caries recurrence after treatment under general anaesthesia for early childhood caries: A retrospective cohort study. *Eur Arch Paediatr Dent* 2015;16(4):325-31.
  42. Doméjean S, Zhan L, DenBesten PK, Stamper J, Boyce WT, Featherstone JD. Horizontal transmission of mutans streptococci in children. *J Dent Res* 2010;89(1):51-5.
  43. Naidu A, Macdonald ME, Carnevale FA, Nottaway W, Thivierge C, Vignola S. Exploring oral health and hygiene practices in the Algonquin community of Rapid Lake, Quebec. *Rural Remote Health* 2014;14(4):2975.
  44. Cidro J, Zahayko L, Lawrence HP, Folster S, McGregor M, McKay K. Breast feeding practices as cultural interventions for early childhood caries in Cree communities. *BMC Oral Health* 2015;15:49.
  45. Schroth RJ, Guenther K, Ndayisenga S, Marchessault G, Prowse S, Hai-Santiago K, *et al.* Dentists' perspectives on the Manitoba dental association's free first visit program. *J Can Dent Assoc* 2015;81:f21.
  46. Nowak AJ, Casamassimo PS, Scott J, Moulton R. Do early dental visits reduce treatment and treatment costs for

- children? *Pediatr Dent* 2014;36(7):489-93.
47. Nash DA. Letter to the editor. *Pediatr Dent* 2015;37:324.
48. Stoneman J, Wallar L, Papadopoulos A. Community water fluoridation in Canada—Trends, benefits, and risks; 2014. Available from: [http://www.ncceh.ca/sites/default/files/Community\\_Water\\_Fluoridation\\_Feb\\_2014.pdf](http://www.ncceh.ca/sites/default/files/Community_Water_Fluoridation_Feb_2014.pdf). [Last accessed on 2015 May 01].
49. Fisher-Owens SA, Gansky SA, Platt LJ, Weintraub JA, Soobader MJ, Bramlett MD, *et al*. Influences on children's oral health: A conceptual model. *Pediatrics* 2007;120(3):e510-20.
50. Pattussi MP, Hardy R, Sheiham A. The potential impact of neighborhood empowerment on dental caries among adolescents. *Community Dent Oral Epidemiol* 2006;34(5):344-50.
51. Liu GG, Xue X, Yu C, Wang Y. How does social capital matter to the health status of older adults? Evidence from the China health and retirement longitudinal survey. *Econ Hum Biol* 2016;22:177-189.
52. Aida J, Hanibuchi T, Nakade M, Hirai H, Osaka K, Kondo K. The different effects of vertical social capital and horizontal social capital on dental status: A multilevel analysis. *Soc Sci Med* 2009;69(4):512-8.
53. Salehyar MH, Keenan L, Patterson S, Amin M. Conceptual understanding of social capital in a First Nations community: A social determinant of oral health in children. *Int J Circumpolar Health* 2015;74:25417.
54. Curry-Chiu ME, Catley D, Voelker MA, Bray KK. Dental hygienists' experiences with motivational interviewing: A qualitative study. *J Dent Educ* 2015;79(8):897-906.
55. McLaren L, Patterson S, Thawer S, Faris P, McNeil D, Potestio M, *et al*. Measuring the short-term impact of fluoridation cessation on dental caries in Grade 2 children using tooth surface indices. *Community Dent Oral Epidemiol* 2016;44(3):274-82.
56. Ahovuo-Saloranta A, Hiiiri A, Nordblad A, Mäkelä M, Worthington HV. Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. *Cochrane Database Syst Rev* 2008;3(4):CD001830.
57. Marinho VC, Higgins JP, Logan S, Sheiham A. Fluoride varnishes for preventing dental caries in children and adolescents. *Cochrane Database Syst Rev* 2002;3:CD002279.
58. Azarpazhooh A, Main PA. Pit and fissure sealants in the prevention of dental caries in children and adolescents: A systematic review. *J Can Dent Assoc* 2008;74(2):171-7.
59. Uswak G, Keller-Kurysh E. Influence of private practice employment of dental therapists in Saskatchewan on the future supply of dental therapists in Canada. *J Dent Educ* 2012;76(8):1092-101.
60. Teplitsky PE, Uswak GS. The university of Saskatchewan's aboriginal equity access program in dentistry. *J Dent Educ* 2014;78(2):181-6.