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UNMET DENTAL NEEDS AMONG CHILDREN AND BARRIERS TO SEEKING CARE

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Dedication

This thesis is dedicated to Jordan. You are the most amazing, loving and encouraging husband. I appreciate your patience and understanding throughout this journey. There were many sacrifices for you, and for us as a couple; yet, you always remained supportive. With sincere love and admiration, I promise to always support your dreams and aspirations, and to be the partner that you deserve. I look forward to our next adventure. You are truly my love, my life, my friend.

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Abstract

Dental caries continues to be the most chronic childhood disease, and it is experienced most by the socioeconomically disadvantaged. This study aims to add to the limited body of knowledge on children's oral health in Nova Scotia; to investigate if disparities in access to oral care for children persist despite the current initiatives; and to explore the use of The Health Impact Pyramid to guide oral health policy and programing in alternate settings. The Health Impact Pyramid informed the study of the impact of various oral health initiatives. This research study utilized a quantitative cross-sectional descriptive design. The questionnaire based on Aday and Andersen's Framework for the Access to Care was completed by caregivers at the IWK Health Centre. The data were analyzed using descriptive and inferential statistical tests. Low income status was classified using a Statistics Canada Low Income Cutoffs (LICO) table. This study supports the current evidence that the socioeconomically disadvantaged are more susceptible to oral diseases. Future public policy and programming to reduce the inequalities in the oral health status of vulnerable populations should be guided by The Health Impact Pyramid. Utilizing midlevel oral health care and allied health care providers in alternate practice settings should be considered.

Keywords: Allied health care, alternate care settings, dental caries, early childhood caries, Framework for the Study of Access, midlevel oral health care providers, Nova Scotia, oral health inequities, social determinants of health, The Health Impact Pyramid, vulnerable populations

Table of Contents

List of Tables

List of Figures and Illustrations

Abbreviations

ADA	American Dental Association
CAHS	Canadian Academy of Health Sciences
CDA	Canadian Dental Association
CDC	Centers for Disease Control and Prevention
CDHA	Canadian Dental Hygiene Association
CDHNS	College of Dental Hygienists of Nova Scotia
CHIP	American Children's Health Insurance Program
CHMS	Canadian Health Measures Survey
CIHI	Canadian Institute for Health Information
COHP	Children's Oral Health Program
dmfs	decayed, missing, filled surfaces in primary teeth
DMFS	decay, missing, or filled surfaces of permanent teeth
ECC	Early childhood caries
FMSEI	Fluoride Mouthrinse School Eligibility Index
FNIGC	First Nations Information Governance Centre
IWK	Izaak Walton Killam
LICO	Low Income Cut-offs
NIHB	Health Canada's Non-Insured Health Benefits
NS	Nova Scotia
NSOHS	Nova Scotia oral health survey of children and adolescents
REB	Research Ethics Board
S-ECC	Severe early childhood caries
SES	socioeconomic status

WHO World Health Organization

Definitions of Important Terms

Caries is a multifactorial disease that decomposes tooth structure. It is the effect of cariogenic carbohydrates (i.e. sugar) on bacteria which produces acid. The acidic (low pH) environment allows for the destruction of the tooth (The Centers for Disease Control and Prevention (CDC), 2016a; King, 2012; Rowan-Legg, 2016).

Dental home is an ongoing relationship with an oral health care provider, especially important for children who are at higher risk for oral diseases (American Academy of Pediatric Dentistry, 2016/2017).

Dental sealant is a thin coating applied to the pits and fissures of teeth to prevent dental caries (CDC, 2016b).

Early childhood caries (ECC) is a multifactorial disease defined as one or more carious lesions (cavities), missing teeth due to caries, or restored surfaces in a primary tooth, and influenced by social determinants of health. Advanced forms of this disease are termed severe early childhood caries (S-ECC) (Canadian Dental Association (CDA), 2010a).

Equity is the absence of preventable differences among groups of people (World Health Organization (WHO), 2017).

Oral health encompasses the health of teeth, tissue, and the orofacial system that enables facial expression, verbal communication, and mastication (CDC, 2016a).

Social determinants of health are the factors that affect our health such as "income and social status; social support networks; education; employment/working conditions; social environments; physical environments; personal health practices and coping skills; healthy child development; gender; and culture" (Government of Canada Public Health Agency, 2016, para 1).

Chapter I - Introduction

Statement of the Problem

An 11-year old typically healthy boy was taken to a hospital emergency department because he was vomiting, nauseated and had a dull headache. The diagnosis was the flu or migraines. He was discharged. The next day, the boy was rushed back to emergency because his mom found him screaming, bracing his head, unable to verbally communicate, confused, lethargic, and unstable. Diagnosis – a brain abscess secondary to severe dental caries (cavity). Treatment included two craniotomies and removal of the severely decayed tooth. After ninety-three days and intensive rehabilitation therapy, the boy was discharged but continued to need the care of speech and language pathologists and occupational therapists (Hibberd & Nguyen, 2012). This was all because of a preventable disease (Canadian Institute for Health Information (CIHI), 2013; Divaris et al., 2014; Rowan-Legg, 2016).

While a scenario of this magnitude is rare, dental disease can have grave impacts on the quality of life (FDI World Dental Federation, 2016). This is a story of a boy living in Canada, a First World country, in the 21st century. Despite the advances in oral health because of the use of fluorides and a shift to a focus on prevention (Peterson & Ogawa, 2016), dental caries continues to be the most chronic childhood disease (CIHI, 2013; Divaris et al., 2014; Rowan-Legg, 2016), and those who are socioeconomically disadvantaged still suffer most from oral disease and experience the most barriers to care (Canadian Academy of Health Sciences (CAHS), 2014).

Early childhood caries (ECC) describes severe cases of dental caries in children. ECC is a painful condition that affects the child's ability to eat, sleep, communicate, socialize, and ultimately influences optimal growth and development (i.e. failure to thrive) (CIHI, 2013). It is

estimated that 2.26 million school days and 4.15 million work days are lost in Canada each year because of caries (Health Canada, 2010). In Canada, day surgery to treat ECC is the leading cause for surgery in children between the ages of one and five.

Ismail and Sohn's Cross-sectional Study

If vulnerable populations have inequitable oral health needs, then their needs must be addressed as such to create equality in the oral health status of children. The most recent publication in a peer-reviewed journal on the oral health status of children of in the province of Nova Scotia is Ismail and Sohn (2001). The authors analyzed data from a 1995-96 cross-sectional study of first grade children in Nova Scotia including an intraoral screening and parental questionnaire to answer the following question: "in an environment of universal access to dental care with a high rate of utilization among children since birth, does low SES remain a significant risk factor for development of dental caries in primary teeth?" (Ismail & Sohn, 2001, p. 296).

Of the approximately 12,000 first grade children, 1614 children were sampled. Of the sample, 1342 consented to completing a questionnaire. Of those who completed the questionnaire, 1271 six or seven year olds were screened intraorally. The results indicated that 91.6 percent of children did not have their first dental visit until age two or later. Education status of caregivers was significantly correlated to dmfs (decayed, missing, filled surfaces in primary teeth) scores. Children whose first visit was for a dental examination had a lower mean dmfs score than those who visited the dentist for other reasons. Children who visited the dental office at least once a year had a significantly lower number of untreated carious lesions than those who did not. Children in schools with optimal water fluoridation had a 43 percent lower mean dmfs score than children in schools with suboptimal water fluoridation. Frequency of

toothbrushing was also associated with dmfs scores. The authors suggested that children who seek early preventive oral health care come from socioeconomic advantaged families, and the burden of oral disease is experienced most by socioeconomically disadvantaged children. The following are the key findings and recommendations from Ismail and Sohn's (2001) cross-sectional study.

Key Findings

Universal access to public insurance. It is widely thought that universal insurance improves access to care, though Ismail and Sohn (2001) found that despite a highly-utilized children's insurance program, children from disadvantaged socioeconomic backgrounds experienced a higher rate of oral disease than those more fortunate. The authors established that "the Nova Scotia oral health program for children may have reduced disparities in access to dental care but not necessarily inequalities in oral health status" (p. 302). Furthermore, increasing access to care through universal access to public insurance was recognized as one factor to reduce the inequities, but it alone cannot eliminate the burden of oral disease.

Social determinants of health. Ismail and Sohn (2001) consider dental caries to be a "biosocial" infectious disease, and state that prevention and treatment should consider a multifactorial approach that addresses social determinants of health. Interventions that consider these social determinants have the greatest impact to improve population health. Successful comprehensive public health programing involves a synergistic approach of various intervention strategies (Frieden, 2010). The recommendations of Ismail and Sohn (2001) are consistent with the two frameworks used in the current study: Andersen's Framework for the Study of Access (1974) and the Health Impact Pyramid (Frieden, 2010).

Recommendations

Ismail and Sohn (2001) state that professional dental care cannot be the sole delivery for oral health. Rather, oral health must be promoted through community-based preventive services, oral health promotion programs such as school-based education, and media promotion.

Update on Public Programming since the Ismail and Sohn Study

Despite the findings of the 1995-96 province wide oral examination and recommendations by Ismail and Sohn (2001), human resources continue to decline in dental public health in Nova Scotia. Furthermore, despite having less current evidence than other caries prevention methods, the primary initiative of public health hygienists in Nova Scotia is the Fluoride Mouthrinse Program (Oral Health Advisory Group, 2015).

Ismail and Sohn: The Basis for the Current Study

As Ismail and Sohn (2001) indicated, policy decisions must factor the need for equity in oral health status for vulnerable populations, the basis for the current study is the lack of evidence-based policy decisions in oral health. Equity is the absence of preventable differences among groups of people. In some cases, providing services universally to all populations may still result in health inequities. In order to achieve equity in health, an unequal distribution of services may be necessary (World Health Organization (WHO), 2017). In other words, to achieve equity in health, health policy and distribution of services should be based on the needs of the population. WHO (2017) maintains that reducing health inequities is a fundamental human right.

According to WHO (2017) and Ismail and Sohn (2001) public policy should focus not only on reducing the disparities to access to care, but also on reducing the inequalities in the health status of the socioeconomically disadvantaged. The current initiatives in oral health policy in Nova Scotia may not address these inequalities.

Research Objectives

The purpose of this cross-sectional descriptive study was to add to the current limited body of knowledge on children's oral health in Nova Scotia. The objectives of this study were to determine the barriers to accessing dental care for children, the profile of both children with unmet dental needs and their caregivers, and the caregiver's perception of the oral health care system. Specifically, this study focused on the barriers to oral health care of those seeking dental care at the IWK (Izaak Walton Killam) Health Centre, and the caregivers' perceptions of oral health care in Nova Scotia. The overarching question to be addressed is: Do disparities in access to oral care for children persist in Nova Scotia despite the current initiatives?

Significance of the Research

The IWK Health Centre treats oral diseases in children across Nova Scotia (NS) who are unable to be treated in private dental clinics because of a variety of medical and dental concerns. This study was limited to the children who were eligible for universal public insurance, the Children's Oral Health Program (COHP), and who were seeking care at the IWK because of their unmet dental needs.

Nova Scotia offers public insurance for children's oral health services; however, insurance coverage does not always translate to an increase in utilization of oral care services (Ismail & Sohn, 2001; Yarbrough, Nasseh, & Vujicic, 2014). In a recent report to the Minister of Health and Wellness, the Oral Health Advisory Group (2015) proposed 11 recommendations to improve the COHP. This study addresses recommendation seven: "Nova Scotia should undertake research to understand our population and the barriers that are preventing eligible children from accessing the COHP, especially in the early years" (p. 17). Evidence-based policy decisions are recommended. The following are examples of the type of research that would be instructive.

Olley, Hosey, Renton, and Gallagher (2011) suggest there is a need to identify caregivers' views towards seeking oral health services and how to stimulate behaviour change. As research evidence has shown, providing publicly insured populations oral health care in private offices is not the best approach for the vulnerable populations (Biordi et al., 2015; Hakim, Babish, & Davis, 2012; Mathu-Muju, Friedman, & Nash, 2013; Nebeker et al., 2014; Pahel, Rozier, Stearns, & Quiñonez, 2011; Quiñónez, 2012; Quiñonez, Figueiredo, Azarpazhooh, & Locker, 2010; Siegal and Richardson, 2010; Simmer-Beck et al., 2015; Taylor et al., 2014). This study aims to expand on prior research, inform future studies, and bridge the knowledge gap in the literature regarding the oral health of socioeconomic disadvantaged children in Nova Scotia. The ultimate goal is to influence future oral health policy and programming.

Review of the Literature

A review of current dental and public health literature related to childhood oral disease included a literature search of EBSCO, Embase, Google Scholar, PUB MED, ProQuest, and The Cochrane Library, and was conducted using the following parameters. The terms were: allied health professionals, at risk populations, Canada, children's public dental insurance, children's universal dental insurance, community dental programs, community oral health programs, community water fluoridation, dental care, dental caries, dental hygienist, dental public health, dental therapist, early childhood caries, fluoride varnish programs, fluoride mouthrinse programs, Framework for the Study of Access, Nova Scotia, pediatric hospital dental programs, primary care, vulnerable populations, oral health care, oral health inequities, school dental programs, school oral health programs, sealant programs, social determinants of health, and The Health Impact Pyramid. Fields included all and limits were publications 2010-2017, English, and peer-reviewed. A review of secondary literature included policy and research textbooks. Finally,

the grey literature reviewed included websites of dental organizations and government agencies, and reports and position statements on oral health.

The Importance of Oral Health

Oral health encompasses the health of teeth, tissue, and the orofacial system that enables facial expression, verbal communication, and mastication. Some of the most common diseases that have serious impacts on oral health are dental caries, also known as decay or cavities, and periodontal (gum) disease (CDC, 2016a). The FDI World Dental Federation states that oral health is important to overall health and well-being as it affects one's

> ability to speak, smile, smell, taste, touch, chew, swallow and convey a range of emotions through facial expressions with confidence and without pain, discomfort and disease of the craniofacial complex … [all of which] reflects the physiological, social and psychological attributes that are essential to the quality of life. (2016, para 4-5)

Dental Caries

Dental caries is one of the most predominant chronic diseases (King, 2012). It is a multifactorial disease that decomposes tooth structure. Caries is the effect of cariogenic carbohydrates (i.e. sugar) on bacteria which produces acid. The acidic (low pH) environment allows for the destruction of the tooth (CDC, 2016a; King, 2012; Rowan-Legg, 2016). Untreated dental caries can cause abscesses (infection) in the mouth that can spread to other areas of the body. Dental abscesses can have serious and sometimes fatal consequences (CDC, 2016a), as demonstrated in the case study referred to in the introduction (Hibberd & Nguyen, 2012).

The focus of this study is childhood dental caries. The most severe and chronic form is early childhood caries (ECC) which is preventable and infectious (CIHI, 2013; Divaris et al., 2014; Rowan-Legg, 2013). ECC is a multifactorial disease defined as one or more carious

lesions, missing teeth due to caries, or restored surfaces in a primary tooth, and influenced by social determinants of health. Advanced forms of this disease are termed severe early childhood caries (S-ECC) (Canadian Dental Association (CDA), 2010a). According to Harris and Whittingon (2016), there is a strong association between children of low income families and/or those living in areas with regional inequalities, and dental caries. A risk factor for ECC is prolonged exposure to drinks with cariogenic carbohydrates such as milk or juice baby bottles or sippy cups, typically during the nighttime (Harris & Whittington, 2016). Aside from the detrimental impact to the dentition, dental caries can result in acute or chronic pain that may affect the child's ability to eat, sleep, communicate, socialize, and ultimately influence optimal growth and development (i.e. failure to thrive) (CDA, 2010a; CIHI, 2013; Rowan-Legg, 2013).

In Canada, treatment of ECC is the leading cause for day surgery in children between the ages of one and five (CIHI, 2013). The impact of oral disease most effects those who are socioeconomically disadvantaged.

Children at Higher-Risk for Oral Disease

Canada's most vulnerable groups include: young children living in low income families; aboriginal peoples; refugees and immigrants; persons with disabilities; and those living in rural and remote regions. (CAHS, 2014). Low education has also been linked to poorer oral health status and fewer oral health care visits (CAHS, 2014; Camargo, et al., 2012; Heima, Lee, Milgrom, & Nelson, 2015).

Low Income

Low income families are a vulnerable population who suffer the most from oral disease and who experience the most barriers to accessing care (CAHS, 2014). The most recent (2007-2009) Canadian Health Measures Survey (CHMS) (Health Canada, 2010) found that lower

income Canadians have a significantly lower rate of dental visits for check-ups, prevention, and curative treatment. A higher proportion of avoidance of dental visits and declining of treatment is due to cost. In fact, CHMS found that 17 percent of Canadians avoid oral health care because of cost of oral health care. Yet, a survey of low income families in Alberta found that publicly funded dental benefits for children were underutilized and that public awareness of the program did not appear to be motivation for caregivers to seek care for their children (Amin, 2011).

Insurance Status

Utilization of oral health care services is strongly associated with the ability to pay (Ravaghi, Quinonez, & Allison, 2013a). Caregivers of low income children who are part of the working poor are usually ineligible for public insurance, lack private insurance, and are unable to pay out-of-pocket (Rowan-Legg, 2013). Fifty percent of the working poor do not have dental insurance (Health Canada, 2010) and consequently have the least access to care and the greatest risk of untreated disease (Rowan-Legg, 2013). The impoverished avoid seeking preventive care and postpone curative treatments; therefore, they develop more severe oral disease and have more untreated disease (Ravaghi et al., 2013a). The oral health seeking behaviour of caregivers for themselves is correlated with that for their children, regardless of the insurance status of the child (Isong, Dantas, Gerard, & Kuhlthau, 2010).

Aboriginal

The results of the 2008-10 First Nations Regional Health Survey indicate that almost 40 percent of respondents felt that they had less access to health care services than Canada's general population. Reported barriers to dental care included lengthy wait lists for dental care, unavailability of services, and a lack of coverage under the federal public insurance program, Health Canada's Non-Insured Health Benefits (NIHB) (First Nations Information Governance

Centre (FNIGC), 2012). According to Davy, Harfield, McArthur, Munn, and Brown (2016), accessing health care for Indigenous peoples is a complex issue with a host of additional barriers including discrimination and racism. Utilization of oral health care services is lower among First Nations people than the general Canadian population (CAHS, 2014; Davy et al., 2016; FNIGC, 2012). Approximately 43 percent of First Nations children live on a household income of less than $20,000. Approximately 40 percent of First Nations adults have less than a high school education (FNIGC, 2012). An inverse correlation exists between oral care visits, and low education and low income levels (Ravaghi, Quiñonez, & Allison, 2013b). The results of the First Nations Regional Health Survey 2008-10 suggest that only 28.7 percent of First Nations children sought dental care by age two (2012). A study in the United States of Medicaid-enrolled children found that children who received preventive dental care by age two were more likely to continue preventive care and less likely to need restorative or emergency care (CAHS, 2014). Despite the fact that all Aboriginal children living in Canada are insured through the Federal Non-Insured Health Benefits (NIHB) program (Health Canada, 2016), the rate of ECC is high and often remains untreated. The First Nations Regional Health Survey indicates that only 40.6 percent of infants affected by ECC received treatment (2012). CIHI found that day surgery to treat ECC was 8.6 times higher for children from neighbourhoods with a high Aboriginal population (CIHI, 2013).

New Immigrants

New immigrants may come from countries that do not value oral health care; they may be unfamiliar with our health care system; and they may not be aware of any public insurance programs. They may also struggle with language, oral health literacy, and cultural barriers (Rowan-Legg, 2016). Barriers to oral health for newcomer immigrant and refugee children

include less value of oral hygiene practices and professional dental care, the language barrier, and lack of proximity to oral health care professionals (Reza et al., 2016). These findings have implications for Canada because of the large increase in the immigrant population since the arrival of the Syrian refugees since November 2015 (Statistics Canada, 2016).

Rural Communities

Due to isolation of the less populated areas, private oral health care is often unavailable even though the public funding is (CAHS, 2014). A Quebec study concluded that there is a strong statistically significant relationship between urban centres and a high concentration of dental professionals (Emami, Khiyani, Habra, Chassé, & Rompré, 2016). CIHI (2013) found that day surgery to treat ECC was found to be 3.1 times higher for children from rural neighbourhoods.

Low Education

Educational obtainment is directly related to oral health, and caregiver education levels have been associated with children's dental visits, toothbrushing, and caries rate (Heima et al., 2015; Camargo et al., 2012). Children of caregivers who completed highschool were shown to be 5.78 times more likely to seek oral health care than those who did not resulting in 34 percent less untreated caries and 28 percent fewer carious or restored teeth (Heima et al., 2015).

Reasons for Oral Health Inequities among Children

Oral disease is multifactorial and there are many reasons for disparities in oral health among children (Divaris et al., 2014; Liao, Ganz, Jiang, & Chelmow, 2010; Olley et al., 2011; Quiñonez, 2012; Quiñonez et al., 2010; Rowan-Legg, 2016).

Caregivers

Caregiver characteristics are an obvious influence on whether a child receives preventive oral health care since the child is entirely dependent on their caregiver(s) (Divaris et al., 2014). Preventive oral health care may be viewed as a luxury, especially among those who struggle to acquire the necessities of life (Rowan-Legg, 2016). Seeking preventive dental care for children may be challenging for caregivers who are not familiar with the system. Also, caregivers are typically not aware of the early oral signs and symptoms of ECC. Consequently, seeking dental care for advanced ECC in emergency hospital departments is not uncommon (Divaris et al., 2014). When caregivers do not value oral health, or perceive a need to seek oral health care unless there is a problem causing pain, there will be low utilization of preventive care (Divaris et al., 2014). Olley et al. (2011) stated that for oral health prevention-based programs to be successful, the beliefs and attitudes of caregivers must be addressed because of their impact on the child's oral health and the child's oral health behaviours. Divaris et al. (2014) considered caregivers to be "the quarterbacks of their children's healthcare … [and they] must be placed in the epicenter of efforts to promote optimal oral health behaviors', including early preventive dental visits" (p. 1275).

Despite children with severe oral disease requiring general anesthesia for treatment, most of their caregivers do not seek regular preventive oral health care on their behalf and find it challenging to support their child's healthy oral habits including difficulties limiting intake of sugary foods and drinks, and encouraging toothbrushing. A key reason for not seeking oral health care for their children is a lack of time due to long-working hours and large families (Olley et al., 2011).

Quiñónez (2012) suggested that the private dental practice model of delivery is a major contributor to unequal access to care. In this model of care, caregivers are expected to bring their children to a private dental office, despite many low income individuals having previously encountered discrimination from dental providers who blamed them for their oral disease, and who made them feel inferior because of their low income status.

Providers

Oral health care providers also contribute to the oral health inequities among children. Dental organizations and governments are closely aligned, and although the dental profession is unsatisfied with public insurance programs, they have discouraged public involvement in the delivery of oral health care aside from continuing to publicly fund the services provided in their private practices (Quiñónez et al., 2010). Professional preferences may well define the policy direction that the government is willing to take (Quiñónez, 2012; Quiñónez et al., 2010). In regards to publicly financed dental care, Quiñonez et al. (2010, p. 157) stated that:

> there is a disconnect between what governments arguably should do to treat those most in need, with the policy directions they are willing to consider in the face of professional pressures (which if alleviated, would arguably lead to the exploration of other service delivery options [such as community clinics]).

The long-term dissatisfaction by dentists towards public insurance programs is reported to be due to the rate of reimbursement which is lower than their recommended fee guide, the high number of broken appointments by users of public programs, low patient compliance, and an onerous claims process (Liao et al., 2010; Quiñónez, 2012).

Nova Scotia offers universal children's oral health insurance; yet the last published statistics found that the rate of dental caries among low income children is still higher than their

middle and high income counterparts (Ismail & Sohn, 2001). Ismail and Sohn (2001) suggest that the COHP may reduce disparities in access to care, but not inequities in oral health status, and that society needs pubic programs that consider "all determinants of disparities – social, community, personal, and familial factors" (p. 302).

Publicly Funded Initiatives to Improve Children's Oral Health

Community-Based Oral Health Programs

Olley et al. (2011) note that "interventions that better oral health outcomes should be innovative and build the evidence base, addressing the social determinants of health and working to give every child the best start in life" (p. 8). Divaris et al. (2014) suggested community-based interventions using school, family, or health promoter-based strategies to reduce the caregiver's barriers to accessing oral health care for their children. The CDC (2015) recommends community fluoride varnish, dental sealants, and community water fluoridation as viable options to prevent dental caries.

Community water fluoridation (CWF). Water fluoridation is one of the great public health achievements of the 20th century because of its role in the decline of dental caries (CDC, 2013a). A recent systematic review published in The Cochrane Library concluded that water fluoridation is effective at reducing caries in children (Iheozor-Ejiofor & al., 2015). Likewise, a Canadian study by McLaren and Singhai (2016a) determined that the research supports an increase in the caries rate post community water fluoridation cessation. The authors stated that implementation of an alternative mechanism for caries prevention (post-cessation) to be an important consideration. Many health organizations promote water fluoridation including CDC (2015), Health Canada (2016), and the WHO (Petersen & Ogawa, 2016). Dissenting agruments against CWF are rarely evidenced-based (Podgorny & McLaren, 2015).

In May of 2011 Calgary, Alberta discontinued community water fluoridation, after fluoridating the water since 1991. To determine the impact of removing fluoride from the public water system on the oral health status of socioeconomically disadvantaged children, the rate of childhood dental caries and socioeconomic indicators in Calgary were compared between 2009-10 during CWF and 2013-14 post-CWF. Inequities in dental caries increased after the removal of water fluoridation. A limitation to this study was the lack of a comparsion group and the inability to control for confounding variables (McLaren et al., 2016b).

A follow up study by McLaren et al. (2016c) determined the short term impact of CWF on the rate of dental caries by comparing Calgary to Edmonton, a similar city where CWF still exists. Data from a 2004-05 mouth screening in elementary schools in both cities was compared with data collected in 2013-14 and showed a statistically signifcant increase in the caries rate of primary teeth in both cities, but the increase in caries in primary teeth was significantly higher in Calgary. This study confirms the adverse impact on the oral health of children due to the cessation of water fluoridation in a modern times. This strong evidence may be a relevant in Nova Scotia as the support for CWF wavers among the public, policy makers, the dental community, and anti-fluoridationists.

Despite the evidence, some municipalties in Nova Scotia continue to not fluoridate the public water supply. Some Nova Scotians rely on a private water supply, and do not monitor or supplement the fluoride levels. The most recent 1995-96 screening of children in Nova Scotia found that children in schools with less than optimal levels of fluoride had significantly more restored teeth, and higher mean dmfs scores (Ismail & Sohn, 2001).

Fluoride varnish programs. An alternative or adjunct option to CWF is fluoride varnish programs. Few recent publications have studied the cost-effectiveness of fluoride varnish;

however, it is endorsed as a cost-effective method to prevent caries (CDC, 2015). A Swedish longitudinal study found that the benefit to cost ratio of a school-based fluoride varnish program to be 1.8:1 (Skold, Petersson, Birkhed, & Norlund, 2008).

The effectiveness of fluoride varnish to prevent caries and reverse incipient caries is well documented in clinical trials and systematic reviews (Lenzi, Fernandes Montagner, Zovico Maxnuck Soares, & de Oliveira Rocha, 2016; Marinho, Worthington, Walsh, & Clarkson, 2013; Memarpour, Fakhraei, Dadaein, & Vossoughi, 2015). The evidence strongly supports fluoride varnish programs as a viable option to reducing caries in children.

School sealant programs. The CDC (2015) also endorses sealant programs as a preventive measure. A dental sealant is a thin coating applied to the pits and fissures of teeth to prevent dental caries (CDC, 2016b). Sealant programs typically target vulnerable populations that may not otherwise receive preventive care. School-based sealant programs are an effective way to reach and prevent caries among children and are well supported by strong evidence (CDC, 2013b; Griffin, Wei, Gooch, Weno, & Espinoza, 2016a), particularly among among children in low socioeconomic areas (Muller-Bolla, Pierre, Lupi-Pégurier, & Velly, 2016).

The evidence also indicates that the benefits of school-based dental sealant programs exceed their cost when targeting schools attended by children who are at high risk for dental caries (Griffin, Naavaal, Scherrer, Patel, & Chattopadhyay, 2016b).

Fluoride mouthrinse programs. A more historical form of delivering fluoride is through fluoride mouthrinse programs. Much of the research on fluoride mouthrinse programs was prior to this decade and was most prevalent before the 21st century A systematic review found that fluoride mouthrinse programs resulted in a 27 percent reduction in DMFS (decay, missing, or filled surfaces of permanent teeth). This benefit was likely present regardless of use

of fluoridated toothpaste or fluoridated water (Marinho et al., 2016). A recent cost-benefit or cost-effectiveness analysis was not found.

Nova Scotia has been offering a fluoride mouthrinse program to select schools since 1998 (Nova Scotia Fluoride Mouthrinse Program Ad Hoc Fluoride Mouthrinse Review Committee, 2004).

Children's Public Dental Insurance Programs

Reducing inequalities in vulnerable populations is a priority for many governments (Steele et al., 2015). The goal of public oral health insurance is to diminish inequalities by reducing the burden of cost and to increase access to care (Liao et al., 2010; Quiñónez, 2012). This goal has not been fully met, because despite public insurance programs, a substantial number of children are deprived of oral health care, including prevention (Liao et al., 2010).

Nova Scotia has offered universal public insurance to children since 1974 (Kraglund & Cooney, 2008). Universal access to dental insurance can improve access to oral health in low income children, and yet it does not always reduce the oral health disparities for high risk populations (Ismail & Sohn, 2001; Rowan-Legg, 2016). Based on the 1995-96 oral health screening in Nova Scotia, Ismail and Sohn (2001) conducted a study using the last published data from the COHP to determine if low socioeconomic status (SES) was still a risk factor in a population with universal public dental insurance. Despite the universal public insurance, children of low SES still experienced a higher caries rate than children of higher SES. Children whose caregivers attended university had statistically ($p<.05$) fewer dmfs, than children of caregivers with less education. The assumption that universal access to oral health care eliminates the inequalities in the oral health status of low SES children compared to their middle

to high income counterparts was not supported (Ismail & Sohn, 2001). These findings are congruent with those in the United States (Divaris et al., 2014; Nebeker, et al., 2014).

Public insurance does increase access to care, but it may not be enough to eliminate the inequity in oral health status for those most in need. The American Children's Health Insurance Program (CHIP) was designed to provide insurance for children who do not qualify for Medicaid insurance (McKenzie, 2011). A 2012 survey of CHIP recipients to determine the impact of the program across ten of the American states found that public insurance improved access to dental care but addressing oral health status "will likely require more aggressive and effective implementation of outreach and education policies" (Clemans-Cope, Kenney, Waidmann, Huntress, & Anderson, 2015, p. S83). The authors suggest more parental guidance and dental services through community or school-based centres and private providers. Similarly, a study of children enroled in either Medicaid or CHIP insurance programs in 50 American states found that the percentage of children receiving care was below 50 percent; the number of toddlers or infants visiting the dental office was low despite the recommended age of first visit being by age one; and, the dental needs of low income children were not being met. A combination of school-based programs (school-aged) and dental care in the medical home (very young) were recommended to address oral health for children (Hakim et al., 2012).

The recommendations of the CDA (2010b) align with that of Hakim et al. (2012), and both extend beyond financial assistance. The CDA supports the following as preventive measures against caries in children:

- Education and support of expectant and new mothers;
- Including oral health as an integral part of early childhood development programs;
- Fluoridating public drinking water;

- Examining targeted preventive programs for the population;
- Ensuring accurate measures for determining disease level and monitoring program outcomes;
- Coordinating public health programs including outreach programs. (p. 7)
- First dental visit by age one for early diagnosis and treatment, or prevention of caries

The Association acknowledges that dental insurance programs offer little benefit to families who for other reasons have difficulties accessing care. A collaboration among public schools, outreach programs, community centres, dental organizations, child advocacy agencies, allied health care providers, and government was recommended. Strategies such as school-based programs or screening high risk children through primary care programs are recommended (CDA, 2010b). A stark contrast to disease prevention is the continuing, and for some populations increasing need for day surgery in Canada because of children's significant unmet dental needs (ECC) (CIHI, 2013; Rowan-Legg, 2016).

Hospital-based Children's Dental Programs

Most children in Canada receive care in dental offices, though many have serious extensive dental conditions that require surgery in hospital under general anesthesia. The cost of treatment is high, and there is an associated risk, albeit low, with general anesthesia for morbidity and mortality (Rowan-Legg, 2016). A nationwide report was published by the CIHI (2013) that focused on surgical treatment of ECC under general anesthesia. Rates of day surgery for ECC in Canada were calculated using a two-year cohort between 2010 and 2012. In Canada, for every 1000 children, 12.5 children between the ages of one and five underwent day surgery for ECC. This was the leading cause of day surgery among this age group at 31 percent. Almost all (99.6 percent) of the children received anesthesia for surgery to treat ECC. The rate of

surgical treatment for ECC in Nova Scotia was just below average at 12.1 children for every 1000. The average cost of day surgery for treatment of ECC in Nova Scotia was $1,657 (CIHI, 2013).

As previously discussed, of the children who required day surgery for treatment of ECC, rates were 8.6 times higher for children of neighbourhoods with a high Aboriginal population, compared to low; 3.9 times higher for children of least affluent neighbourhoods, compared to most; 3.1 times higher for children of rural neighbourhoods, compared to urban; and somewhat higher in neighbourhoods with relatively few immigrants (CIHI, 2013).

The structure of public programs has a major impact on the ability of families to access needed care. This is especially important in rural communities where the availability of dental providers is scarce (CIHI, 2013). The CIHI (2013) endorses the recommendations of the CDC (2010b), which extend beyond insurance to include public health, education, and surveillance.

Public Health in Nova Scotia

What has Nova Scotia done to lessen the burden of oral disease and eliminate the need for surgical treatment of dental caries among children? The implementation of Medicare in the late 1960s and early 70s was met with opposition and dental care primarily became the jurisdiction of the provincial and territorial governments. Saskatchewan was the first province to initiate a targeted dental program in 1974. This acclaimed program focused on school-based delivery of oral health care for children by allied dental professionals (Marchildon, 2011).

Saskatchewan was the pioneer, and Nova Scotia quickly followed. In the same year, Nova Scotia introduced a program that focused on publicly financed oral health care for children delivered in private offices rather than school-based delivery. Preceding the inception of this children's insurance program, Nova Scotia provided oral health care services to rural areas

through a team of dentists and dental hygienists. In fact, in 1980, the former Department of Health's Dental Division employed 9 dentists and 28 dental hygienists. The economic downturn in the late 1980's and 1990's resulted in decreased funding to dental public health. The rationalization for decreasing dental public health was that children's oral health needs were being met in private offices because of the publicly funded insurance program (Kraglund & Cooney, 2008). In 1997, the Children's Oral Health Program (COHP) replaced the Children's Dental Plan.

Despite the need to extend beyond public insurance and include public health initiatives to reach vulnerable populations (CDA, 2010b; CIHI, 2013), human resources in dental public health in Nova Scotia continue to decline. At the time of the Oral Health Advisory Group's Phase 1 Report (2015) to the Minister of Health and Wellness, public health employed 16 dental hygienists (14.2 FTEs). Though fluoride mouthrinse may not be the best approach in current literature (CDC, 2015; Griffin et al. 2016a; Griffin et al. 2016b; Griffin et al. 2016c; Lenzi et al., 2016; Marinho et al., 2013), the Provincial Fluoride Mouthrinse Program continues to be the primary oral initiative of public health in Nova Scotia.

The Public Health division within the Department of Health and Wellness of Nova Scotia also:

- Promotes community water fluoridation – 51.2% of Nova Scotians live in an area where the water is fluoridated. (42% of Canadians have access to fluoridated water.)
- Develops integrated oral health key messages (i.e. oral health messages for provincial resources such as pre-natal resources (*Loving Care* is a series of four eBooks for parents of children from birth to age 3) and Nova Scotia's Tobacco Strategy.
- Contributes to the development of healthy public polices (i.e. School Food and Nutrition

Policy for NS Public Schools)

- Partners with the Department of Education to develop and integrate oral health information and key messages in the Healthy Living Learning Framework for Nova Scotia's Health curriculum and supports the Health Promoting Schools initiative
- Provides support to lay visitors who visit high risk homes through the Enhanced Home
- Partners with the Department of Education to develop and integrate oral health information and key messages in the Healthy Living Learning Framework for Nova Scotia's Health curriculum and supports the Health Promoting Schools initiative
- Provides support to lay visitors who visit high risk homes through the *Enhanced Home Visiting* parent support program. (Oral Health Advisory Group, 2015, p. 4)

Aside from the Fluoride Mouthrinse Program, the public health dental hygienists are focused on education-based initiatives. As shown in the Health Impact Pyramid (Frieden, 2010), education-based initiatives have the least impact to population health, yet are beneficial when integrated into a synergistic approach. Dental Hygienists are skilled oral health professionals who are educated to provide a wide range of oral health care services (College of Dental Hygienists of Nova Scotia (CDHNS), 2012).

Current Publicly Funded Initiatives for Children in Nova Scotia

Some municipalities in Nova Scotia fluoridate the public water supply though this information is not widely available to the public.

Municipal Water Fluoridation

Though the evidence supports water fluoridation as a safe, effective and economic intervention to reduce dental caries and as an efficient mechanism to reduce the inequities in oral health status (CDC 2013a; Iheozor Ejiofor et al., 2015; Ismail & Sohn, 2001; McLaren and

Singhai, 2016a; McLaren et al., 2016b; McLaren et al., 2016c), sadly, many municipalities in Canada have chosen to not implement or to discontinue community water fluoridation (CAHS, 2014).

Only 51.2 percent of Nova Scotians benefit from public water fluoridation (Oral Health Advisory Group, 2015), the remaining 48.8 percent either drink from private water sources or live in communities that do not implement fluoridation. Provisions for alternative oral disease prevention measures have strong evidence but are not implemented as recommended.

The Nova Scotia Children's Oral Health Program

The Children's Oral Health Program (COHP) is a public insurance program provided by the Nova Scotia Provincial Government and, since 2002, acts as the payer of last resort (Oral Health Advisory Group, 2015; Province of Nova Scotia Department of Health and Wellness, 2016a). Since the implementation of the program in 1974, the amount of dental coverage offered and the age limitations of the recipients have varied (Kraglund & Cooney, 2008). Changes to the program have occurred because of economic trends, and the values of the government in power (Quiñonez et al., 2010).

Currently, all children with a valid MSI health card number are insured for basic dental care until the end of the month in which they turn 15 (Province of Nova Scotia Department of Health and Wellness, 2016a; Province of Nova Scotia, 2015). Children may also be eligible for the provincial Cleft Palate/ Craniofacial Program, the Dental Surgical Program, Maxillofacial Prosthodontics Program, the Mentally Challenged Program (Province of Nova Scotia, 2015), and the federal Non-Insured Health Benefits (NIHB) Program for First Nations & Inuit Populations (Health Canada, 2015).

Dentists are paid based on fee-for-service following a regulated provincial fee schedule (Province of Nova Scotia, 2015). Dentists are the sole providers and even though dental hygienists are the likely clinicians to provide preventive services in a dental office, these same services are not covered under COHP if the dental hygienist is practicing independent of a dentist (Chalmers, 2014). Dental hygienists in Nova Scotia have been legislated to practice independently since 2009. A goal of independent practice is to increase access to care for underserved populations (CDHNS, 2012). The inability to access public insurance if treated by an independent dental hygienist diminishes the capacity to increase access to care.

The COHP insures diagnostic, preventive, and treatment services. At the present time, preventive services includes fluoride treatments, nutritional dietary counselling (four appointments per lifetime), caries prevention services including rubber cup polishing and minor scaling (removal of plaque and calculus) once per lifetime, pit and fissure sealants on six and twelve year molars (one application per tooth per year), and disking of interproximal surfaces of primary teeth (three units or forty-five minutes of time per lifetime) (Province of Nova Scotia, 2015).

The 2015-16 MSI Annual Statistical Tables show that the Children's Oral Health Program cost $6,810,366. The program was utilized by 47 percent (62,475) of the eligible children (Province of Nova Scotia MSI Health Information Department, 2016). Of the 53 percent who are not accessing the insurance program, it is likely that many of these children are at higher-risk for oral disease and the most in need for treatment, as suggested by Canadian sources (CAHS, 2014; Health Canada, 2010). These same children would benefit most from oral health care in alternative settings such as schools, community or primary care centres (Mathu-Muju, Friedman, & Nash, 2013; Siegal & Richardson, 2010; Simmer-Beck, et al., 2015; Taylor et al.,

2014). While public insurance improves access to care (McKenzie, 2011) and some evidence supports fluoride mouthrinse programs (Divaris, Rozier, & King, 2012; Marinho, Yee Chong, Worthington, & Walsh, 2016), more can be done in Nova Scotia to reduce the burden of oral disease among vulnerable children.

Fluoride Mouthrinse Program

The Fluoride Mouthrinse Program is the primary initative by public health dental hygienists in Nova Scotia, though, as previously mentioned, the current evidenced-based literature supporting fluoride mouthrinse programs is limited. Initiated in 1998, it offers weekly fluoride rinse to children in grades primary through six in designated schools across Nova Scotia. The program is coordinated by public health dental hygienists who train volunteers to administer the rinse to the children.

Program eligibility and evaluation. The initial program eligibility criteria included: caries rate from the Nova Scotia oral health survey of children and adolescents (NSOHS) 1995-96, socioeconomic caries risk factors, interest of school personnel, and availability of dental hygienists to implement the program. Due to lack of program consistency and a need for standardization across the province, the program underwent a review in 2001 including oral health screening, eligibility criteria, and program evaluation (Nova Scotia Fluoride Mouthrinse Program Ad Hoc Fluoride Mouthrinse Review Committee, Report of the Criteria Subcomittee, 2004).

The review committee recognized education, income and employment as the best socioeconomic factors to determine caries risk and the need for fluoride mouthrinse. After mapping the census information of these three factors, the factors were awarded a score based on quintiles (-2 to +2). A summative score (-6 to +6) was awarded to each school based on these

socioeconomic statistics. The 141 schools with the lowest socioeconomic factors received the lowest score and were deemed eligible to participate. The committee recommended that this model (the Fluoride Mouthrinse School Eligibility Index (FMSEI)) be validated using an intraoral screening of children in the eligible schools and for this baseline data to be compared to a follow-up screening four to five years later (Nova Scotia Fluoride Mouthrinse Program Ad Hoc Fluoride Mouthrinse Review Committee, Report of the Criteria Subcomittee, 2004). The oral health screening of grade two students in Nova Scotia and the discussion paper on the evaluation of the FMSEI were never published, and there is no public record that the recommended follow-up screening was completed.

IWK Health Centre

Many of the children who suffer from the most significant unmet dental needs are treated at the Izaak Walton Killam (IWK) Health Centre in Halifax, Nova Scotia. The following dental conditions are treated (IWK Health Centre, 2016):

- Children and youth with significant medical conditions or behavioural needs
- Children and youth with significant dental care needs
- Severe or rare dental conditions or genetic disorders
- Cleft palate-craniofacial anomalies
- Acute trauma and emergencies

The population of interest to this study were children eligible for coverage under the COHP, and whose primary reason for seeking care at the IWK Dental Clinic was unmet dental needs. Excluded were caregivers whose children's general health or behavior was the primary inhibitor to seeking care in a private dental clinic.

The IWK Dental Clinic uses the National Triage System to manage and triage patients (R. Anderson, personal communication, September 1, 2015). Based on this system, there are two categories of patients waiting for an appointment. Wait time 1 is the time between referral from dentist or physician to time of consultation at the IWK Dental Clinic. Wait time 2 is the time between consultation and treatment (Wright & Menaker, 2011).

According to Dr. Ross Anderson, Chief of Dentistry of IWK Health Centre, the wait time 1 target for children and youth who are ASA class 1 and have visible carious lesions is 90 days. This target is never met; the average wait time for a consultation is 12 to 18 months. The target for wait time 2 for this population is also 90 days. This target is rarely met; the average wait time between consultation and treatment is 12 to 14 months. In the years 2012-13 there were 193 children and youth waiting for treatment, 157 of whom waited past the 90-day target (personal communication, September 1, 2015).

For those who are ASA class 1 and have abscessed teeth, the target for wait time 1 is 42 days. This target is not always met; the average wait time between referral and consult is 6 to 12 weeks. The target for wait time 2 is 90 days; yet, the average wait time from consult to treatment is 6 to 9 months. In the years 2014-15, 109 children and youth waiting for treatment, 91 of whom waited past the 42-day target (R. Anderson, personal communication, September 1, 2015).

Children and youth who are experiencing facial cellulitis need to be seen and treated within a 24-hour period; this target is always met. Anderson states that the system is good at handling emergent and urgent care such as facial cellulitis and treating children and youth with significant medical conditions and dental care needs, but fails to efficiently treat tertiary care, including abscesses and carious lesions. Anderson states the reason is simple; “the demand exceeds the ability to supply” (personal communication, September 1, 2015). Ideally, he would

like to eliminate preventable oral diseases; however realistically speaking, the goal is to reduce the burden of oral health related illness (R. Anderson, personal communication, September 1, 2015).

Recommendations for Reducing the Inequities in the Oral Health Status among Children

Evidence suggests that direct delivery of dental care; integrating oral health into primary care; and utilizing midlevel oral health care and allied health care providers can reduce the inequities in the oral health status among children.

Direct Delivery via School and Community-Based Programs

Rather than publicly funded, privately delivered oral health care, some social activist groups would "prefer that governments reinvest in direct delivery, noting that this would better meet the needs of socially marginalized groups, such as the homeless, those of low income, or those receiving welfare transfers" (Quiñonez et al., 2010, p. 153). Quiñonez et al. (2010) found that most of the respondents preferred to access publicly financed oral health care through a private clinic although, of the 19 percent who preferred a community clinic, the majority were low income individuals. This is likely because this population feels uncomfortable and discriminated against in private dental offices (Nebeker et al., 2014; Quiñonez et al., 2010).

The recommended age of first visit is within six months of the eruption of their first tooth or no later than age one (American Dental Association (ADA), n.d.; CDA, 2017; Canadian Dental Hygienists Association (CDHA), n.d.), however, the percentage of children seeking oral health care is frequently less than fifty-percent (Hakim et al., 2012). A combination of primary care and school-based programs may have a more positive impact on the oral health of children (Hakim et al., 2012); and school-based programs have demonstrated high enrollment and improved access to care (Mathu-Muju et al., 2013).

Dental sealants are a proven method to prevent dental pit and fissure caries (Griffin et al., 2016a; Griffin et al., 2016b; Griffin et al., 2016c; Mathu-Muju et al., 2013). Those who are higher risk are less likely to receive needed care in a private dental clinic (CAHS, 2014; Health Canada, 2010; Siegal & Richardson, 2010). Siegal and Richardson (2010) found that higher risk children at schools that offered a sealant program were twice as likely to have sealants than children at schools that did not (59.4 % versus 28.7 %, $p<0.001$), demostrating that school-based programs are effective at reaching higher risk children.

Simmer-Beck et al. (2015) studied the impact of dental hygienists delivering oral health services in a school setting on the oral health status of low income children. The researchers found that the number of appointments with the dental hygienist had a statistically significant impact of the oral health of the children: the rate of caries decreased (-0.12, P=.014); an increase in met dental needs via restorations was found (0.21, p=.002); and a decrease in treatment urgency was observed (-0.15, p=.038).

Services provided in school-based programs can improve the oral health status of low income children who would not otherwise receive care (Simmer-Beck et al., 2015). School-based programs are effective at improving the oral health of school-aged children, though children must be screened at a much earlier age. Collaboration with allied health professionals can increase access for toddlers and school-aged children.

Integrated Approach for the Earliest Intervention Possible

Despite the recommendation to see a child for their first visit within six months of the eruption of their first tooth or no later than age one (ADA, n.d.; CDA, 2017; CDHA, n.d.), many offices continue to see children for their first visit between the ages of three and five, which evidence shows is too late. First visit at age three is not effective at preventing caries in high risk

populations (Rowan-Legg, 2016). Rowan-Legg (2016) calls on pediatric and family physicians to identify and advocate for children who are at high risk for oral diseases. In Nova Scotia, only 13 percent of children utilized the COHP by age one (Oral Health Advisory Group, 2015). Approximately 20 percent of children enrolled in the American Medicaid program did not have a preventive oral care visit by age three (Divaris et al., 2014). These statistics speak to the need to reach children of low income families in non-dental settings such as wellness clinics to promote preventive oral care visits and the importance of establishing a dental home. The first visit by age one and establishing a dental home, an ongoing relationship with an oral health care provider, is especially important for children who are at higher risk for oral diseases. Children who have early preventive visits are more likely to continue to seek preventive care and less likely to need costly restorative or emergency treatments (American Academy of Pediatric Dentistry, 2016/2017; Olley et al., 2011; Rowan-Legg, 2016).

Taylor et al. (2014) suggest that interprofessional collaboration and allied health training and practice is a successful model to address "the unmet oral health care needs of low income and at-risk children" (Taylor et al., 2014, p. e5). The following are recommendations for integrating oral health into allied health practice: 1) provide inexpensive and readily available training resources for students and practitioners; 2) select practice settings that offer preventive services for children and are suitable for oral health services; 3) collaborate with and utilize allied health care practitioners who work in the community to expand oral health capacity; 4) incorporate oral health training into allied health academic programs; 5) encourage recent allied health graduates to share and implement their oral health knowledge and skills in the working environment; and 6) initiate policies that expand and support oral health services by allied health

practitioners in community health settings (Taylor et al., 2014). This model is one that could be implemented to reduce the inequities in oral health in Nova Scotia.

Integrating oral health services into primary care has been found to increase access to care for vulnerable children at an early age (Biordi, et al., 2015). Dental hygienists are prevention specialists and are ideal liaisons for such programs.

To combat ECC, North Carolina introduced a program in the year 2000 that offered preventive oral health services in medical offices including: screening and referrals as needed, parental counselling, and fluoride varnish application. Children were included in the study who were enrolled in the program at age six months and were enrolled for at least one year. These children were followed until they were six years old or no longer enrolled in the program. Data collected between the years 2000 to 2006 demonstrated that integrating oral health services into medical offices was effective at reducing ECC. Multiple fluoride varnish applications that coincide with the eruption of primary teeth were most beneficial, and screening and referrals for curative treatment improved oral health for low income children (Pahel et al., 2011).

Utilize Dental Midlevel Providers to Increase Access to Care for Vulnerable Populations

Dentists are not the only providers for oral health care. Dental therapists and dental hygienists are highly trained dental professionals who can improve access to care and reduce oral health care inequities for vulnerable populations.

Dental therapists. While the scope of practice varies across the globe, dental therapists are trained to perform assessments, diagnostics, planning, prevention, instructional care, restorative and surgical procedures (Wright et al., 2013). More than 50 countries have developed public, school-based programs with dental therapists, to address children's access to care. This delivery model has been demonstrated to improve access to care and oral health outcomes while

providing quality care economically" (Mathu-Muju et al., 2013, p. e7). Since the inception of dental therapy in New Zealand in 1921, these professionals have been providing quality preventive and restorative care that is comparable to the level of care of dentists. When oral health care is lacking in an area, dental therapists improve access to care and oral health status (Mathu-Muju, Friedman, & Nash, 2016; Mathu-Muju et al., 2013).

Canada has had two dental therapy programs that no longer exist. One program was designed to serve Aboriginal children in remote northern Canada. The other was a school-based program in Saskatchewan that ran for 13 years in the late seventies/ early eighties. Despite the success of the program, it was abolished due to lack of government support (Mathu-Muju et al., 2016; Mathu-Muju et al., 2013).

A systematic review showed that services by dental therapists resulted in a decrease in the rate and severity of caries that was comparable to that of populations served by dentists. However, oral health disparities existed for vulnerable populations regardless of the provider (dentist versus dental therapist). It is important to note that evidence for dental therapist programs is substantive (Wright et al., 2013). To improve access to care for vulnerable populations, Wright et al. (2013) recommended that the focus needs to switch from disease intervention to prevention.

Dental hygienists. Prevention of oral diseases is the focus of dental hygienists (CDHNS, 2012; Province of Nova Scotia, 2009). Dental hygienists provide therapeutic, preventive and maintenance services, and programs for the promotion of optimal oral health. Dental hygienists also collaborate with other health professionals to educate and promote oral health, and to integrate preventive oral health care into general health care (Province of Nova Scotia , 2009). In Nova Scotia, dental hygienists are a self-regulated, and able to practice independently. The

following are the services within the Scope of Practice of a dental hygienist within the Province of Nova Scotia (CDHNS, 2012; Chalmers, 2014; Province of Nova Scotia, 2009):

Table 1. Scope of Practice of a Dental Hygienist in Nova Scotia

Assessment	• Medical and oral health history • Vital signs assessment • Oral cancer screening • Screening of hard and soft tissues • Periodontal assessment • Use of appropriate indices • Ordering, administering and interpreting radiographs for dental hygiene services • Consultation with other health care professionals
Diagnosis and Planning	• Complete clinical assessment • Dental hygiene diagnosis • Client centred goals/objectives • Dental hygiene treatment plan • Appropriate referrals

Implementation	• Dental prophylaxis
	• Periodontal debridement
	• Use of or prescribing antimicrobial agents, other than antibiotics; desensitizing agents; and, anticariogenic agents (e.g., fluoride, sealants)
	• Provide evidence-based information and instruction to promote oral health
	• Education on oral disease prevention including dietary counselling for caries control and smoking cessation counselling
	• Dental impressions
	• Polishing teeth and restorations
	• With written orders:
	  ◦ Placement of restorative materials (fillings)
	  ◦ Administration of oral anesthetics
	  ◦ Orthodontic procedures

Evaluation	• Clinical re-assessment • Review and modification of client goals and dental hygiene treatment plan as required • Use of appropriate indices and charting • Evaluate the client's oral status

An Alabama study found that preventive oral health care visits with dental hygienists

reduced the need for subsequent curative services (Sen et al., 2013). An Ohio state school-based sealant program delievered by dental hygienists and dental assistants was effective at reaching higher risk children (Siegal & Richardson, 2010). In the Simmer-Beck et al. (2015) study, dental hygienists offered "comprehensive evidence-based preventive oral health care, appropriate for children at high caries risk (prophylaxis, radiographs, topical fluoride application, sealants, oral health education and supplies, nutritional counseling, and dentist referral coordination) … delivered with portable dental equipment" (p. 1764). Services provided by dental hygienists improved the oral health status of low income children who would not otherwise receive care.

The Knowledge Gap

Effective public health programs consider the social determinants of health. In considering the social determinants of health, public health programs can reduce inequities by targeting both oral disease prevention and access to care (Siegal & Richardson, 2010).

Many changes have occurred in Nova Scotia's children's public insurance program since its inception in 1974. Changes have also occurred in the oral public health programming in Nova Scotia, human resources have greatly diminished since the peak of dental public health in this Province in the 1980's.

Although an improvement in global oral health has taken place because of fluoride and a shift to a focus on prevention (Peterson & Ogawa, 2016), the segment of the population that is most impacted by the social determinants of health still suffer the most disease and experience the most barriers to care (Canadian Academy of Health Sciences (CAHS), 2014; Health Canada, 2010).

Oral health information available in Nova Scotia is extremely sparse, limiting the evidence base for the oral health programs provided. There are obvious knowledge gaps that

research can address. The goal of this study is to add to the limited body of knowledge on children's oral health in Nova Scotia. The overarching research question is: Do disparities continue to exist in Nova Scotia despite the current initiatives?

Chapter II - Theoretical Frameworks

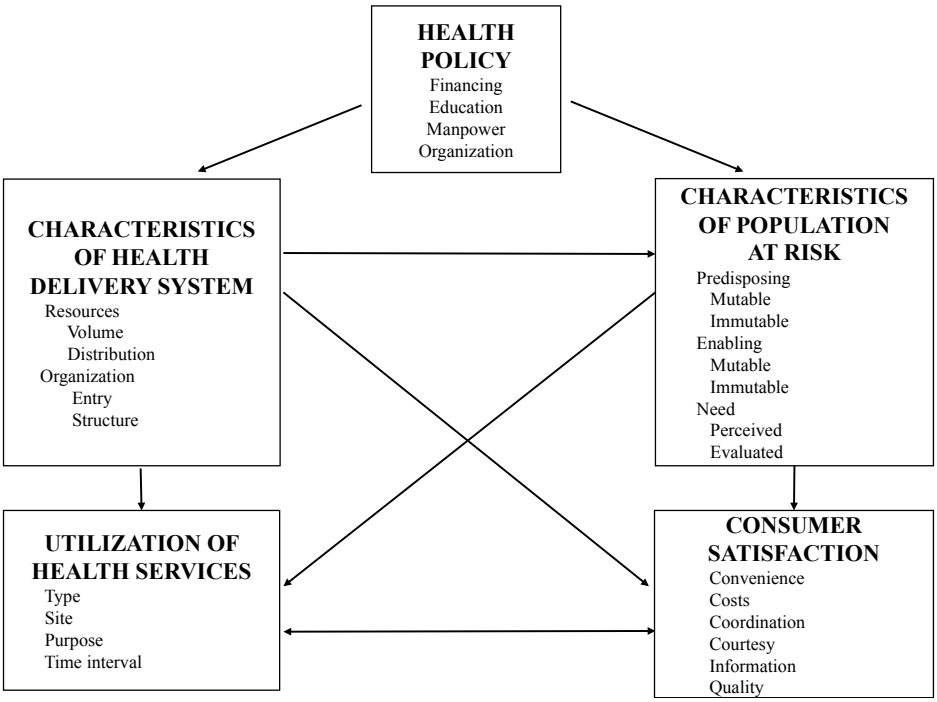
Creswell (2014, 2002) recommends implementing a framework as a guide to inform all aspects of a study. Adopting a framework that has been previously accepted by scholars and well-grounded in the literature contributes to the validity of the inquiry. This study is informed by two theoretical frameworks: The Framework for the Study of Access (1974) and The Health Impact Pyramid (2010).

Framework for the Study of Access

As of February 10th, 2017, the conceptual framework of Aday and Andersen (1974) was cited on the Embase database 1059 times, specifically 20 times in dentistry. This model is also known as the Andersen Model, the Behavioral Model, the Framework for the Study of Access to Medical Care, and the Sociobehavioral Model. Numerous health-related studies are based on this framework. This widely accepted model has also been used as the framework for studies that focus on the access and utilization of oral health care services including: Beil and Rozier (2010); Crowder and Chinchar (2014); Jang, Yoon, Park, Chiriboga, and Kim (2014); Lai, Milano, Roberts, and Hooper (2012); and Lai, Milano, and Hooper (2011).

The Framework for the Study of Access meets the objectives of this study. It is conceptualized as the interrelations between health policy objectives, inputs and outputs; inputs including characteristics of the health delivery system and characteristics of the population at risk, and outputs including utilization of health services and consumer satisfaction. The Aday and Andersen (1974) framework is graphically presented below:

Figure 1. Framework for the Study of Access



(Aday & Andersen, 1974)

The interdependency and relationships between the elements of this framework are indicated on the diagram by single arrows for a one-way dependency, and double headed arrow for two-way interdependency (Aday & Andersen, 1974). The elements of the Study of Access and their relationships are used to inform the current study, and are engrained throughout the literature review. The following are brief generalized descriptions of the framework's elements.

Health Policy

Policy is a framework, a course of action or inaction to resolve problems (Pal, 2014); specifically, health policy is concerned with health care and population health (Bryant, 2009). The premise of the Framework for the Study of Access is the effect of health policy in altering access to care. Programs in financing, education, manpower, or organization can alter access to

health care (1974). Policy driven public oral health care includes direct delivery, public financing of private delivery, health promotion, and fluoridation (Rowan-Legg, 2016).

The oral health policy of the Province of Nova Scotia is largely public financing of private delivery of children's oral health care. This program is universal and insures all children until their 15th birthday (Oral Health Advisory Group, 2015; Province of Nova Scotia Department of Health and Wellness, 2016a) to improve access to care for children.

Characteristics of Health Delivery System

The term characteristics of health delivery system refers to the characteristics of the arrangement of delivery of health care services including resources and organization. Resources are the volume and distribution of human and tangible resources that are dedicated to health care. Organization refers to how the resources are organized to provide health care (Aday & Andersen, 1974).

Characteristics of Population At Risk

The characteristics of at risk populations can be categorized by factors that predispose a population to illness or disease, enabling factors that impact one's ability to access care, and the need for care based on severity of illness or disease (Aday & Andersen, 1974). The social determinants of health are the factors that affect our health such as "income and social status; social support networks; education; employment/working conditions; social environments; physical environments; personal health practices and coping skills; healthy child development; gender; and culture" (Government of Canada Public Health Agency, 2016, para 1). The ability for an individual or community to obtain health care services is termed enabling. This includes the resources available such as income and insurance, and accessibility of health care services in a community such as the differences in access in a rural versus urban area. The predisposing and

enabling characteristics that can be changed through health policy to improve access to care are mutable characteristics such as social support networks or insurance. Characteristics that cannot be changed are immutable, such as gender, culture and geographic location. The level of need for care may be either perceived by the individual or community, or evaluated through an individual health assessment or population-based health screening. The level of need or urgency for care is based on the level or severity of illness or disease (Aday & Andersen, 1974).

Utilization of Health Services

The utilization of health care services is based on several factors: type, site, purpose, and time. Type refers to health discipline and the provider who offers the health care service. The site refers to where the health care service is delivered. The purpose refers to the reason why the health care service is offered. Time interval includes the process of entry to the health care service and the ability to continue to use such service based on need (Aday & Andersen, 1974).

Consumer Satisfaction

This element is best identified with the consumers' past experiences with health care; and their perceptions of convenience, cost, coordination, courtesy, information, and quality. How convenient was it to receive care? What are the costs to the individual and society? How well were the health care services coordinated? How respectful were the health care providers? Did the health care professionals provide the information that was needed to manage or treat the illness or disease? Was the consumer involved in the process of care? Did the consumer perceive the health care services they received to be quality care? Did the consumer receive optimal health care? (Aday & Andersen, 1974)

The primary goal of the current study is to determine if barriers to care and inequities to oral health exist despite the oral health policies and programs implemented by the Provincial

Government of Nova Scotia. If inequities exist, what policies and delivery systems will have the greatest impact to minimize the inequities in the oral health status of children?

The Health Impact Pyramid

In addition to the Aday and Andersen (1974) framework, The Health Impact Pyramid (2010) was used to inform this study on the impact of the various population oral health interventions including those implemented in Nova Scotia. This framework will guide the study's recommendations to the province for future oral health policy and programming.

The Health Impact Pyramid (2010) was developed by the former director of the CDC, Thomas R. Frieden. As of Febuary 10th, 2017, this framework was cited 383 times in the Embase database indicating a valued framework in the scholarly world. The Health Impact Pyramid has been utilized in many studies relating to prevention including the fields of tobacco cessation (Garrett, Dube, Babb, & McAfee, 2015), injury (Mack, Liller, Baldwin, & Sleet, 2015), cancer (Hesse, Cole, & Powe, 2013), and child and maternal health (Fraser, 2013). A search of the relevant literature in PubMed yielded one article applying The Health Impact Pyramid to dentistry (Sheiham et al., 2011). Sheiham et al. (2011) was not original research, rather a discussion paper on reducing the inequalities in oral health. The authors recommended The Health Impact Pyramid guide oral health prevention actions.

The Health Impact Pyramid (2010) provides a framework for conceptualizing the impact of public health interventions on improved health. Frieden suggests that this model includes the determinants of health that are fundamental to public health initiatives and often overlooked in other models. The interventions towards the lower portion of the pyramid are most effective because of the broad reach in population health with little need for individual intervention, though these lower levels are more controversial and require the most political commitment. For

any health problem, the effectiveness and feasibility of the intervention must be considered. Frieden suggests successful comprehensive public health programing involves a synergistic approach of interventions at multiple levels. The various levels of the pyramid starting at the base (greatest impact) ascending towards the peak (least impact) are shown in Figure 2. All levels of the pyramid can have an impact on health. Though the levels closer to the peak of the triangle are more suited for change in individual health, making it difficult to reach entire populations. Also, there is a dependency on individual behavior to affect change in health in the levels toward the peak of The Health Impact Pyramid.

Socioeconomic Factors

Changing the social determinants of health is the greatest opportunity to improve health. Intervening at this level is controversial since not all believe that change of this magnitude is the government's responsibility and many believe changes of this scale are not achievable. However, examples of change at this level are reducing poverty and improving education levels (Frieden, 2010).

Changing the Context to Make Individuals' Default Decisions Healthy

The second level "represents interventions that change the environmental context to make healthy options the default choice, regardless of education, income, service provision, or other societal factors" (Frieden, 2010, p. 591). In other words, healthy choices offered to populations that are difficult to avoid. The interventions at this level are typically the most effective public health actions. Frieden (2010) offers the following examples: clean air, water and food, food safety legislation, safe roads and vehicles, communities designed to promote healthy lifestyles, taxation of tobacco, alcohol, and unhealthy foods and drinks. Water fluoridation of public water

supplies is highlighted as it is difficult to avoid, improves health, and reduces economic strain by decreasing health spending and loss of productivity from school and work.

Long-Lasting Protective Interventions

Level three involves single or infrequent interventions that do not require ongoing care. This level has less impact on health than levels one and two because it is necessary to reach individuals rather than an approach that includes a collective population. Examples are immunizations to prevent a multitude of diseases, colonoscopies to prevent colon cancer, smoking cessation programs (involving treatment), and male circumcision to prevent the transmission of HIVs (Frieden, 2010).

Long-lasting protective oral health interventions include dental sealants (Lenzi et al., 2016; Memarpour et al., 2015; CDC, 2016a, 2015; Marinho et al., 2013) and fluoride varnish applications (CDC, 2016b; CDC, 2015; Griffin et al., 2016a; Griffin et al., 2016b; Griffin et al., 2016c; Muller-Bolla et al., 2016).

At risk populations are most in need of these interventions and the most effective access to these individuals is through an intregated approach with allied health care professionals, (Biordi et al., 2015; Pahel et al., 2011; Rowan-Legg, 2016; Taylor, et al., 2014) or through community or school-based programs (Hakim et al., 2012; Mathu-Muju et al., 2013; Nebeker et al., 2014; Quiñonez et al., 2010; Siegal & Richardson, 2010; Simmer-Beck et al., 2015).

Clinical Interventions

The fourth level is clinical interventions. Evidence-based clinical care can improve health but the impact “is limited by lack of access, erratic and unpredictable adherence, and imperfect effectiveness. Access can be limited even in systems that guarantee health coverage for all”

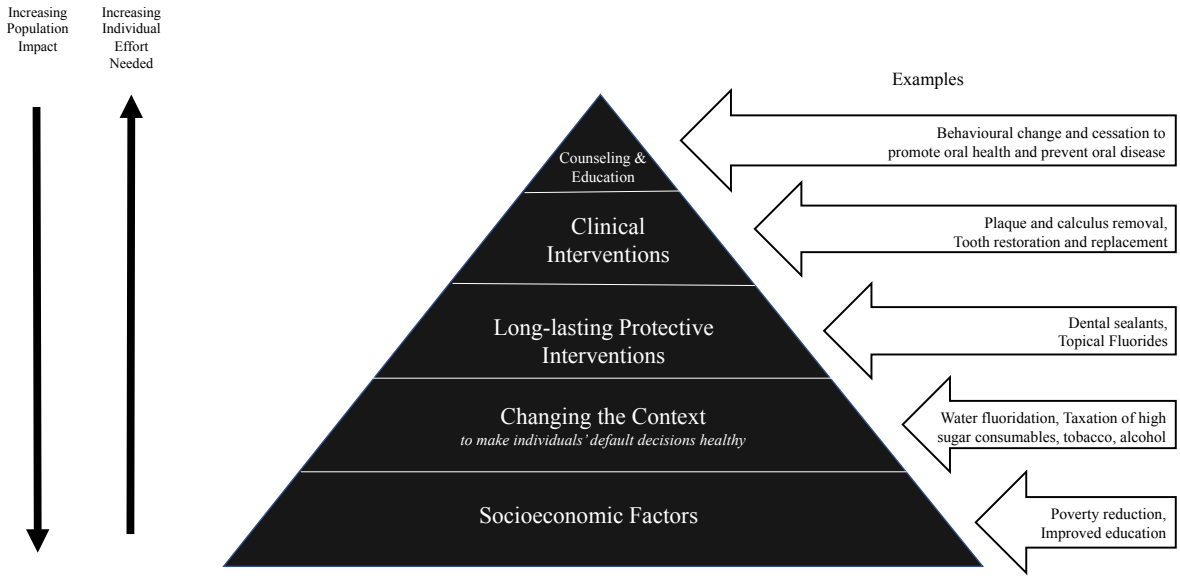
(Frieden, 2010, p. 592). Oral care practitioners offer a range of primary, secondary, and tertiary clinical interventions to individuals (Nathe, 2017).

Counselling and Education

Education at the peak of The Heath Impact Pyramid (2010) can be provided in both a clinical setting or by public health in other settings. It is the least effective mechanism to impact change in population health. The goal of counselling and education is behavior change; success is rare unless the invention is consistently repeated. Frieden (2010) provided examples of counselling and education to reduce obesity and smoking cessation.

The Health Impact Model was recommended by a task group that focused on strategies to reduce oral health inequalities (Sheiham et al., 2011). There is little research on this framework in oral health, as this publication was the only finding in the literature search on the application of The Health Impact Model to dentistry. Following the recommendation of Sheiham et al. (2011), this study clearly illustrates an adaptation of The Health Impact Pyramid for oral health (Frieden, 2010; Nathe, 2017).

Figure 2. The Health Impact Pyramid



Adapted from: Frieden (2010)

Chapter III – Method/Methodology

It is difficult to gain access to children and caregivers for research purposes. The eight schoolboards across the province were contacted and asked about accessing the parent listserv to invite caregivers to participate in the study. Only personnel from two school boards responded. Accessing the parent listserv was not a viable option for participant recruitment. The IWK Health Centre offered access to children from across the province with clear unmet dental needs. The IWK Health Centre appeared to be the best option to meet the objectives of this study.

Rationale for Quantitative Cross-sectional Descriptive Methodology

The objectives were to determine the barriers to accessing dental care for children, the profile of both children with unmet dental needs and their caregivers, and the caregiver's perception of the oral health care system. Specifically, this study focused on the barriers to oral health care of those seeking dental care at the IWK Health Centre, and the caregivers' perceptions of oral health care in Nova Scotia. The overarching question to be addressed was: Do disparities in access to oral care for children persist in Nova Scotia despite the current initiatives?

To meet the objectives, the study utilized a quantitative cross-sectional descriptive design. The aim of this design is to answer the research questions by describing variables. Descriptive research allows data to be summarized in a meaningful way to detect emergent patterns. Descriptive research questions begin with words such as "how much?"**,** "how often?"**,** "what percentage?"**,** "what proportion?"**,** "what is?" and "what are?" (Lund Research Ltd, 2012, para. 2). Such questions as what proportion of the sample was from a rural community? or, what percentage of the population was below the Low Income Cut-offs (LICO)? were able to be answered because of the quantitative cross-sectional descriptive design. The

limitation of this design is that it is difficult to make inferences about the children in Nova Scotia with unmet needs.

Design

As previously noted, the study was a quantitative cross-sectional descriptive design. The research tool, a questionnaire for caregivers of children, was adapted from a previously tested questionnaire (Lai et al., 2011) based on Aday and Andersen's Framework for the Access to Care (1974). Permission was granted by Bien Lai, the primary author, to use and adapt the questionnaire for the purposes of this study (Appendix A). The Lai et al. (2011) questionnaire was adapted to meet the needs of the current study while considering the elements of the Aday and Andersen (1974) framework. Many of the questions in the Lai et al. (2011) study that pertained to demographics, utilization of dental care, and barriers to accessing care were particularly useful. Questions concerning Autistic Spectrum Disorder were excluded from the current study. Additional questions were developed using the Aday and Andersen (1974) framework to meet the objectives of this study, and the specificities of oral health care in Nova Scotia and at the IWK Health Centre.

Setting and Population

As previously mentioned, the IWK Health Centre is in Halifax, Nova Scotia and serves the Atlantic Provinces. The dental clinic treats oral diseases in children who are unable to be treated in private dental clinics because of a variety of medical and dental concerns (IWK Health Centre, 2016). The IWK Health Centre was chosen as the research site because it permitted access to children with unmet dental needs from across the province. While the children were the focus of the study, their caregivers, as the responsible decision-makers, were the study's eligible participants.

Inclusion and exclusion criteria. Caregivers of the IWK dental clinic patients were eligible to participate in the study if their child was: entitled to coverage under the Children's Oral Health Program, and seeking or had sought care at the clinic for unmet needs such as visible carious lesions, dental abscesses, or facial cellulitis. Excluded were caregivers whose children's general health or behavior was the primary inhibitor to seeking care in a private dental clinic.

Sample size. The minimum target sample size for this study was 46, which was calculated using a sample size calculator (Creative Research Systems, 2012). This calculation was based on a population of ~52 eligible patients (derived from clinic records during the study period of July-Aug 2015), a confidence level of 95% and a confidence interval of 5%. In total, a sample of 62 participants was recruited via quota sampling over a three-week period in August 2016.

Purposive sampling is a common form of non-probability sampling. This method satisfied the sample size objective of 46 caregivers of children with unmet dental needs. Children with unmet dental needs seeking care at the IWK Dental Clinic are a subpopulation of the children in Nova Scotia with unmet needs. However, due to the nature of non-probability sampling, it is difficult to make inferences about the children in Nova Scotia with unmet needs based on the sample population (Lund Research Ltd, 2012).

Data Collection

While at the IWK pediatric dental clinic or day surgery clinic for their child's dental appointment, eligible caregivers were invited to complete a questionnaire on a portable computer tablet with Internet access, using LimeSurvey™. LimeSurvey™ is an online secure survey software that enables users to create and distribute surveys, and collect survey responses.

LimeSurvey™ provides basic statistical analysis and allows data to be exported to statistical analysis software such as SPSS™ (LimeSurvey, 2017).

The questionnaire (Appendix B) had 52 items which covered the following topics: caregiver and child demographics, use of oral health services, barriers to oral health care for both the caregiver and child, and the caregiver's perception of Nova Scotia's oral health care system.

Recruitment process. A checklist of the inclusion and exclusion criteria was useful to determine the eligibility of the participant. The primary researcher, and sole data collector, had access to the daily schedule and patient charts. The IWK dental team could answer the researcher's questions if the information could not be found in the daily schedule or patient chart. The eligible participants were approached by the primary researcher who introduced herself and the study. The caregivers were asked to participate in the study and if they agreed, the computer tablet was handed to the participant and verbal instructions were given about the implied consent form and the questionnaire. Incentives were offered once the caregiver was finished participating in the study. The incentives are further discussed below.

Analysis

The data was exported from LimeSurvey™ to the IBM SPSS™ Statistics v23 software. Data analysis was conducted using the SPSS™ file once downloaded to the researcher's computer. Participants were classified as low income using Statistics Canada's Low Income Cut-offs (LICO) (2013 base) before tax table, which combines family size and community size to determine the low income threshold (Statistics Canada, 2015). Descriptive statistics (frequencies, measures of central tendency and variance) were calculated for each variable. A series of bivariate inferential comparisons were run using the chi-square test to examine whether demographic variables (such as community size, education level, or income level) had an impact

on respondents' perceptions of availability of dental services. Independent samples t-tests were used to look for differences in child's age of first visit between each of the following: respondents with different insurance status; respondents with differing perceptions of the importance of dental care; and respondents whose children had different oral health status at first visit.

Incentives

As a token of appreciation, the participants were offered a five-dollar gift certificate to Tim Hortons and the opportunity to enter in a draw to win one the of two Samsung tablets that were used during data collection. To avoid coercion, mention of the gift certificate and the draw followed the participant's involvement in the study.

Validity

The original questionnaire was previously demonstrated to determine unmet dental needs and barriers to dental care (Lai et al., 2011)**.** Prior to data collection, a pretest was conducted. My thesis advisor and committee members, a dental public health expert and another who is a pediatric dentist at the IWK, scrutinized the questions regarding the internal validity of the questions to meet the study's objectives. Their feedback was incorporated into the questionnaire prior to implementation.

The questionnaire was pretested by two caregivers to gain their perspective on how well this questionnaire would be received by participants. One of the caregivers had previously utilized the IWK dental clinic for their child. The other caregiver spoke English as a second language. The feedback from the caregivers was that the questions were easily understood and not offensive.

Reliability

The consent and questionnaire were written at a grade eight reading level to increase understanding of the questions and/or to allow for more participants to understand the intent of the questions. A grade eight reading level was the recommendation of the IWK Health Centre Research Ethics Board (REB). As previously mentioned, the feedback from the pilot of questionnaire was that the questions were easily understood. The readability of the questionnaire was tested using Microsoft Word™. The Microsoft Word™ Flesch-Kincaid Grade Level test rates text based on an American grade school level. The consent and questionnaire was revised until a score of 8 was achieved. This meant that an eighth grader can understand the document (Microsoft, n.d.)

Rigor

Interrater reliability was not an issue as the author was the sole person completing data collection. An audit trail log was kept to document all events and decisions throughout the study. The audit trail log was organized by date of data collection. A record was kept of the number of participants who were invited to participate in the study and the number of participants who consented to participate. Also, a record of the participants (only the unidentifiable number) who were unable to finish the questionnaire because of time or problems with the internet connection. Furthermore, correspondence with the members of the IWK Health Centre team or the research committee was documented.

Ethical Considerations

Ethics approval. As a faculty member of Dalhousie University and a master's student of Athabasca University, ethics approval was granted through Athabasca University (Appendix C) and the IWK Health Centre (Appendix D). Dalhousie University ethics approval falls under the

acceptance of the IWK REB approval. To be granted IWK REB approval, the IWK Chief of Dentistry was required to sign a letter of support for this study.

Participant consent. The participant online consent form explained the purpose of the study, the participant's involvement in the study, the rights of the participant, and the use of the data. The consent explicitly stated that choosing to or not to participate in this study would not have any impact on their child's treatment. By completing the questionnaire, the participant's Consent was implied (Appendix B).

Participant anonymity. A detailed electronic consent form was presented to the participant at the beginning of the questionnaire. Participants were assured anonymity throughout the informed consent. There is no paper trail as all data collection was done electronically. The consent and responses to the questionnaire were collected using the secure LimeSurvey™ software. Participants were not asked to provide any identifiable information. The data was exported to the SPSS™ statistical analysis software and each data set was assigned an unidentifiable participant number.

Relationship of Manuscripts to Overall Thesis

Due to the requirements for an academic manuscript thesis, and the need each manuscript to be comprehensive and understood independent from the thesis, information may overlap between the main document and the manuscripts.

The first manuscript "Unmet Dental Needs Among Children and Barriers to Seeking Care" describes the background, objectives, method, results and discussion of the study. This study supports the existing evidence that the socioeconomically disadvantaged are more susceptible to oral diseases. It is essential that the oral health inequalities of the

socioeconomically disadvantaged in Nova Scotia be addressed. The Health Impact Pyramid framework ought to guide Provincial oral health policy and programming.

The second manuscript "Using The Health Impact Pyramid to demonstrate and guide recommendations to reduce the inequities in oral health status of socioeconomically disadvantaged children" investigates using The Health Impact Pyramid to guide oral health policy and programing to deliver preventive strategies with high impact, and shifting the approach to alternate settings for oral care where midlevel oral health care and allied health care providers can easily access and deliver care to vulnerable populations.

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Chapter IV – Manuscript 1

Unmet Dental Needs Among Children and Barriers to Seeking Care

Abstract

Background - Dental caries continues to be the most chronic childhood disease, and experienced most by the socioeconomically disadvantaged. The goal of this study was to add to the limited body of knowledge on children's oral health in Nova Scotia, and to investigate if disparities in access to oral care for children persist despite the current initiatives.
Objectives - The objectives were to determine the barriers to accessing dental care for children, the profile of both children with unmet dental needs seeking tertiary dental care at the Izaak Walton Killam (IWK) Health Centre and their caregivers, and the caregiver's perception of the oral health care system in Nova Scotia.
Method - The study utilized a quantitative cross-sectional descriptive design. The research tool, a questionnaire for caregivers of children, was adapted from a previously tested questionnaire based on Aday and Andersen's Framework for the Access to Care. The data were analyzed using descriptive and inferential statistical tests. Low income status was classified using a Statistics Canada's Low Income Cutoffs (LICO) table.
Results - Over half (53.8%) of the participants were below the LICO threshold. The proportion of children of Aboriginal descent was disproportionately high (9.7%). Many (47.4%) of the families lived in rural communities or small towns. Less than a quarter (23.2%) of the children visited a dentist by the recommended age of one. Cost was the most common barrier to care for caregivers (35.5%) and their children (17.7%). Alternate dental care settings were chosen by over half (50.9%) of caregivers for children's dental care over private dental clinics.
Conclusion - This study supports the existing evidence that the socioeconomically disadvantaged are more susceptible to oral diseases. Reducing the inequalities in the oral health status of the socioeconomically disadvantaged needs to be addressed.

Keywords: Allied health care, alternate care settings, dental caries, early childhood caries, Framework for the Study of Access, midlevel oral health care providers, Nova Scotia, oral health inequities, social determinants of health, vulnerable populations

Despite the advances in oral health because of the use of fluorides and a shift to a focus on prevention (Peterson & Ogawa, 2016), dental caries continues to be the most chronic childhood disease (Canadian Institute for Health Information (CIHI), 2013; Divaris et al., 2014; Rowan-Legg, 2016), and those who are socioeconomically disadvantaged still suffer the most and experience the most barriers to care (Canadian Academy of Health Sciences (CAHS), 2014; Health Canada, 2010). Among the most vulnerable children in Canada are those living in low income (CAHS, 2014), or poorly educated families (CAHS, 2014; Camargo, et al., 2012; Heima, Lee, Milgrom, & Nelson, 2015); those of aboriginal descent; refugees and immigrants; and those living in rural areas (CAHS, 2014). Aside from the detrimental impact to the dentition, dental caries can result in acute or chronic pain that may affect the child's ability to eat, sleep, communicate, socialize, and ultimately influence optimal growth and development (i.e. failure to thrive) (Canadian Dental Association (CDA), 2010a; CIHI, 2013; Rowan-Legg, 2016)

The most recent publication in a peer-reviewed journal on the oral health status of children in Nova Scotia is Ismail and Sohn (2001). This study used the data of a 1995-96 province wide oral screening. The key findings from the Ismail and Sohn (2001) cross-sectional study included: 1) improving access to care through public insurance programs alone cannot eliminate the burden of oral disease among vulnerable populations; and 2) professional dental care cannot be the sole delivery mechanism for oral health. The authors recommended :1) a multifactorial approach to prevention and treatment of oral disease that addresses social determinants of health; 2) community-based preventive services; and 3) health promotion programs such as school-based education, and media promotion. Despite Ismail and Sohn's recommendations, publicly funded children's dental insurance, the Children's Oral Health Program (COHP), has continued while human resources have declined in dental public health

(Oral Health Advisory Group, 2015), and despite the existence of more recent and compelling evidence for other caries prevention methods such as fluoride varnish, the primary initiative of public health hygienists in Nova Scotia is the Fluoride Mouthrinse Program (Oral Health Advisory Group, 2015).

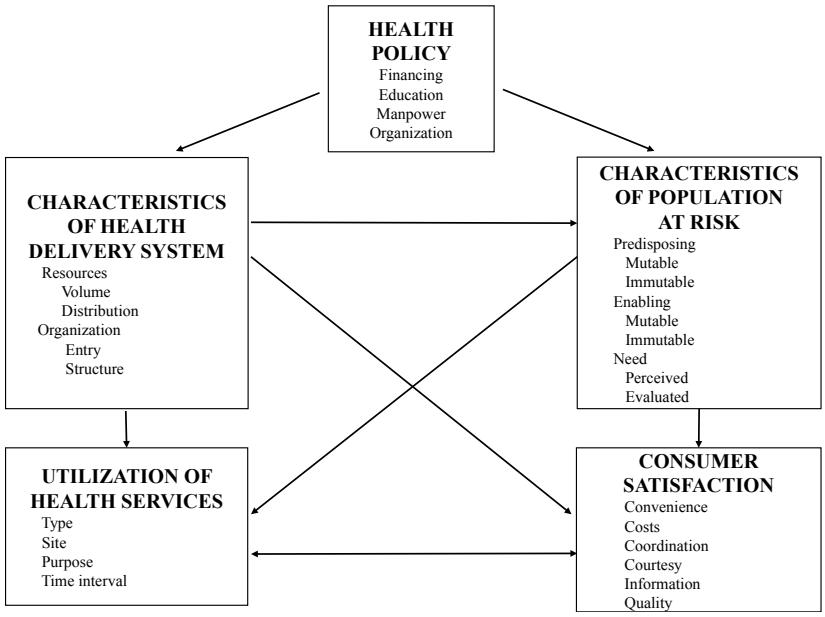
The purpose of this cross-sectional descriptive study is to add to the limited body of knowledge on children's oral health in Nova Scotia. In a recent report to the Minister of Health and Wellness, the Oral Health Advisory Group (2015) proposed 11 recommendations to improve the COHP. This study addresses recommendation seven: "Nova Scotia should undertake research to understand our population and the barriers that are preventing eligible children from accessing the COHP, especially in the early years" (Oral Health Advisory Group, 2015, p. 17). This study focuses on the barriers to oral health care; the profile of both caregiver and the child seeking dental care at the Izaak Walton Killam (IWK) Health Centre; and the perception of oral health care in Nova Scotia. Ultimately, the goal is to determine if disparities in access to oral care continue to exist in Nova Scotia, and, if so, to identify contributors to those disparities.

Framework

The study's conceptual framework is based on the Aday and Andersen's (1974) Framework for the Study of Access. This widely accepted model has also been used as the framework for numerous recent studies that focus on the access and utilization of oral health care services (e.g., Beil & Rozier; 2010; Crowder & Chinchar, 2014; Jang, Yoon, Park, Chiriboga, & Kim, 2014; Lai, Milano, Roberts, & Hooper, 2012; Lai, Milano, & Hooper, 2011). The framework for the study of access is conceptualized as the interrelations between health policy objectives, inputs and outputs; inputs including characteristics of health delivery system and characteristics of population at risk, and outputs including utilization of health services and

consumer satisfaction. The Aday and Andersen (1974) framework is graphically presented below:

Figure 1. Framework for the Study of Access



(Aday & Andersen, 1974)

Each element of the Aday and Andersen (1974) conceptual model was used to inform the study's questionnaire. As the primary goal of this study was to determine if barriers to care and inequities to oral health exist despite the oral health policies and programs implemented by the Provincial Government, the health policy framework (Aday and Andersen, 1974) that informs health care decisions, including oral population health, was the best choice to inform the study.

Methods

Setting and Population

The research site, The IWK Health Centre in Halifax, Nova Scotia permitted access to families from across Nova Scotia. The IWK Health Centre treats oral disease in children who are unable to be treated in private dental clinics because of a variety of medical and dental concerns.

While the children were the focus of the study, their caregivers, as the responsible decision-makers, were the study's eligible participants.

Inclusion and Exclusion Criteria

Caregivers were eligible to participate in the study if their child was: entitled to coverage under the COHP (Nova Scotia's public dental insurance program for children), and seeking or had sought care at the clinic for unmet needs such as visible carious lesions, dental abscesses, or facial cellulitis. Excluded were caregivers whose child's general health or behavior was the primary inhibitor to seeking care in a private dental clinic.

Design

The study was a cross-sectional descriptive design. The research tool was a questionnaire adapted from a previously tested questionnaire (Lai et al., 2011) based on Aday and Andersen's Framework for the Access to Care (1974). The Lai et al. (2011) questionnaire was adapted to meet the needs of the current study while considering the elements of the Aday and Andersen (1974) framework.

While at the IWK pediatric dental clinic or day surgery clinic for their child's dental appointment in August of 2016, eligible caregivers were invited to complete a questionnaire on a portable computer tablet with Internet access, using LimeSurvey^{TM}. LimeSurvey^{TM} is an online secure survey software that enables users to create and distribute surveys, and collect survey responses. LimeSurvey^{TM} provides basic statistical analysis and allows data to be exported to statistical analysis software such as SPSS$^{TM.}$ (LimeSurvey, 2017).

The questionnaire consisted of 52 items that covered the following topics: caregiver and child demographics, use of oral health services, barriers to oral health care for both the caregiver and child, and the caregiver's perception of Nova Scotia's oral health care system.

Analysis

The data were exported from LimeSurvey™ to the IBM SPSS™ Statistics v23 software. Data analysis was conducted using the SPSS™ file once downloaded to the researcher's computer. Participants were classified as low income using Statistics Canada's Low Income Cut-offs (LICO) (2013 base) before tax table, which combines family size and community size to determine the low income threshold (Statistics Canada, 2015a). Descriptive statistics (frequencies, measures of central tendency and variance) were calculated for each variable. A series of bivariate inferential comparisons were run using the chi-square test to examine whether demographic variables (such as community size, education level, or income level) had an impact on respondents' perceptions of availability of dental services. Independent samples t-tests were used to look for differences in child's age of first visit between each of the following: respondents with different insurance status; respondents with differing perceptions of the importance of dental care; and respondents whose children had different oral health status at first visit.

Results

A total of 62 caregivers were recruited to participate in the study.

Demographic Profile (Table 2)

- 9.7% of the children were of Aboriginal descent.
- 41.1% of the caregivers had a high school education or less
- 47.4% of families lived in towns or communities with a population of less than 30,000 people (21.1% in towns and 26.3% in rural communities)
- 61.7% of the family's total household income was less than $50,000
- 53.8% of the families were below the LICO threshold

Utilization of Oral Health Care Services (Table 3)

The mean age that caregivers perceived to be the recommended age for a child's first dental visit was 2.29 +/- 1.36. The mean age that caregivers first sought dental care for their children was 2.69 +/- 1.29 and 44.1% of children had caries at that time. A toothache (pain) was experienced by 72.9% of children and 23.3% missed school because of this pain. Only 23.2% of children visited a dental professional by the recommended age of one. A toothache (pain) had been experienced by 86.4% of caregivers, and 36.7% of caregivers had missed work because of tooth-related pain. Nearly half (42.1%) of caregivers did not seek dental care in the past year.

A medical professional instructed less than one third (27.4%) of caregivers about the recommended first visit by age one; only 1.6% were advised by a prenatal instructor; and 14.5% of individuals had never been informed of the recommended age. The importance of oral hygiene homecare for children was discussed with a medical professional by 22.6% of the caregivers and with a prenatal instructor by only 4.8% of caregivers; 8.1% of individuals had never received oral hygiene instruction. Less than one third (27.4%) of caregivers had been advised by a medical professional about cariogenic foods and drinks, only 4.8% by a prenatal instructor, and 8.1% of individuals had never been informed of cariogenic foods and drinks. A lack of oral health education through advertising media was reported by 29% of caregivers.

Barriers to Care (Table 4)

Difficulty in seeking oral health care for both their children and themselves was experienced by 45.8% of caregivers. The most common barriers to seeking oral health care for children were cost (17.7%), lack of cooperation by the child (16.1%), and inability for the caregiver to miss work (9.7%). The most common barriers to caregivers seeking oral health care for themselves were cost (35.5%), no insurance or uncertain of insurance coverage (14.5%),

inability to miss work (8.1%), and anxiety regarding dental treatment (8.1%).

Perception of Oral Health Care in Nova Scotia (Table 5)

Alternate dental care settings were chosen by 50.9% of caregivers for children's dental care over private dental clinics: community-based clinics (28.1%), children's school-based clinics (7%), and primary health care based clinics (15.8%).

Discrimination by dental care providers can be a barrier to care. Perceptions given by the caregivers included their income level (11.3% of respondents) and insurance status (4.8% of respondents). One caregiver (1.6%) felt dental care providers discriminated based on parenting style.

Bivariate Comparisons

No statistically significant differences in perceptions of availability of dental services were found between respondents from different community sizes, education levels, genders, income levels or immigration status (Chi-square tests; $p>0.05$). No statistically significant differences in child's age of first visit were found between respondents with different insurance status, respondents with differing perceptions of the importance of dental care, or respondents whose children had different oral health status at first visit (Independent samples t-tests; $p>0.05$).

Limitations

Purposive sampling is a common form of non-probability sampling. Children with unmet dental needs seeking care at the IWK Dental Clinic are a subpopulation of the children in Nova Scotia with unmet needs. However, due to the nature of non-probability sampling, it is difficult to make inferences about the children in Nova Scotia with unmet needs based on the sample population (Lund Research Ltd, 2012). Not all children in Nova Scotia who have unmet dental

needs are treated at the IWK Dental Clinic. Many are treated in private dental offices. Some may not be seeking treatment at all.

This study utilized a quantitative cross-sectional descriptive design. The aim of this design is to answer the research questions by describing variables. Descriptive research allows data to be summarized in a meaningful way to detect emergent patterns. The limitation of this design is that it is difficult to make inferences about the children in Nova Scotia with unmet needs (Lund Research Ltd, 2012).

While the results of this study show disparities in oral health for a portion of children in Nova Scotia, the results of this study may lack generalizability. Due to scale of this study, further research is needed.

Discussion

The Aday and Andersen (1974) Framework informed the design of the research instrument; the results of this study demonstrate the utility of the Framework in identifying the key elements that address the research question.

Characteristics of Health Delivery System & Utilization of Health Services

Only 23.2% of the children visited a dental professional by the recommended age of one year despite the recommended age of first visit being within six months of the eruption of the first tooth or by age one (CDA, 2017; Canadian Dental Hygienists Association (CDHA), n.d.), This finding suggests that a first visit after the age of one is associated with the presence of unmet dental needs. Although studies have shown the oral health benefits of initiatives that involve both medical and dental professions (Biordi, et al., 2015; Braun & Cusick, 2016; Clark, Kent, & Jackson, 2016), few received any oral health instruction by a medical professional or a

prenatal instructor. The evidence speaks to the need to facilitate early oral health screening, education and intervention for children and their caregivers.

Characteristics of Population at Risk & Consumer Satisfaction

The percentage of participants below the LICO threshold (53.8%) was eight times higher than the 2011 provincial average (7%) and four times higher than the 2007-11 national average (12.9%) (Province of Nova Scotia Department of Community Services, 2016; Statistics Canada, 2013). The barriers demonstrated in this study clearly signify that the financial burden of oral health care is a concern and a barrier to care for caregivers and their children, regardless of public insurance.

The portion of children who identified as Aboriginal was disproportionately high by twofold; 9.7% were Aboriginal, while only 4.3% of the children in Nova Scotia identify with this descent (Statistics Canada, 2015b; Statistics Canada, 2008). This finding is consistent with The First Nations Regional Health Survey, which states that First Nations children have a disproportionately high rate of caries; 18.7% of infants and 30.9% of preschoolers have teeth affected by ECC. In part, the Survey attributes the high burden of oral disease to socioeconomic and geographic challenges (First Nations Information Governance Centre (FNIGC), 2012). Dental insurance for First Nations and Inuit populations is primarily the responsibility of the federal Non-Insured Health Benefits (NIHB) program for First Nations and Inuit populations (Health Canada, 2016); and despite publicly financed care, utilization of oral health care services is lower among First Nations people than the general Canadian population (CAHS, 2014; Davy, Harfield, McArthur, Munn, & Brown, 2016; FNIGC, 2012).

The study was overrepresented by families living in small towns or rural communities (47.4%) since only 38% of 25 to 64 year olds live in Nova Scotian communities or towns with

populations less than 30,000 people. Similarly families living in medium sized population centres overrepresented (12.3%) the study's sample population compared to the two percent of 25 to 64 year olds living in Nova Scotian towns with a population between 30,000 and 99,999 (Statistics Canada, 2015b; Statistics Canada, 2013). The sample population was underrepresented by families living in large centres; which speaks to the strong relationship between urbanization and a high concentration of dental professionals (Emami, Khiyani, Habra, Chassé, & Rompré, 2016). Though many of the participants lived in rural, small or medium sized towns, realistically, the sample population was still likely underrepresented by those living outside the city centre (Halifax, NS) because the challenges of travelling may have prohibited some families from seeking necessary dental care at the IWK Health Centre.

It is important to note that while only 7% of the participants identified as immigrants, implications of oral disease among this population needs to be a priority as the immigrant population in Canada continues to surge with the arrival of the Syrian refugees (Statistics Canada, 2016). The unique needs of this population must be considered in the delivery of oral health services. Immigrant and refugee populations may not value oral health, and the language barrier and proximity to oral health care professionals may be problematic (Reza et al., 2016).

The results of this study support the evidence that vulnerable populations including low income families, Aboriginal populations, those residing in rural communities, and those with a lower education level are more susceptible to oral diseases. Most dental treatment is provided in private dental offices (Health Canada, 2010); yet contrary to public policy, alternate dental care settings for children's dental care were chosen by over half (50.9%) of the caregivers. Quiñónez (2012) suggests that the private dental practice model of delivery is a major contributor to unequal access to care.

Conclusion

This study has shown that providing insured dental services for children in private settings is a limited approach for children with inequitable needs. It is evident that disparities in income, education, and geography impact oral health and exist in children and their caregivers in Nova Scotia. If vulnerable populations continue to bear the burden of unmet dental needs, government policy considering the social determinants of health could better meet the needs of children most vulnerable.

As Ismail and Sohn (2001) indicated, policy decisions must factor the need for equity in oral health status for vulnerable populations. Equity is the absence of preventable differences among groups of people. To achieve equity in health, an unequal distribution of services may be necessary (World Health Organization (WHO), 2017). To achieve equity in health, health policy and distribution of services should be based on the needs of the population.

There is a foreseeable problem with the way, or lack thereof, in which oral public health policy and programming is managed in Nova Scotia. Public policy needs to focus not only on reducing the disparities to access to care, but also on reducing the inequalities in the oral health status of the socioeconomically disadvantaged. The current initiatives may not be enough. Further research is needed to determine the oral health status of children in Nova Scotia and to incorporate that information along with what is well known regarding effective public oral health programs in the evaluation of the effectiveness of the current policies and programs to reduce or eliminate oral disease among children in Nova Scotia.

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Table 2
Demographic Profile

Child			
	Mean	SD	Range
Age (N=62)	6.21	3.06	13
	% (n)		
Gender			
Female`	47.5 (29)		
Male	52.5 (32)		
Ethnicity			
Asian	4.8 (3)		
African	4.8 (3)		
First Nations/ Aboriginal	9.7 (6)		
Caucasian	75.8 (47)		
Other	4.8 (3)		
Insurance status			
Private insurance	48.4 (30)		
Dual private insurance	11.3 (7)		
Public insurance	61.3 (38)		
No dental insurance *	1.6 (1)		
Caregiver			
	% (n)		
Age			
20-25	12.7 (7)		
26-30	21.8 (12)		
31-35	18.2 (10)		
36-40	20.0 (11)		
41-45	12.7 (7)		
46-50	7.3 (4)		
50 or older	7.3 (4)		
Gender			
Female	86 (49)		
Male	14 (8)		
Immigrant status	7 (4)		
Household			
2-parent	75 (42)		
Single parent	16.1 (9)		
Extended family	8.9 (5)		
Marital status			
Single	22.8 (13)		
Married	43.9 (25)		
Common-law	26.3 (15)		
Divorced	7 (4)		

Table 2 continued
Demographic Profile

Caregiver	
	% (n)
Population	
Rural (1000 or less)	26.3 (15)
1,000-29,999	21.1 (12)
30,000-99,999	12.3 (7)
100,000-499,999	15.8 (9)
Unsure	24.6 (14)
Education	
< high school	12.5 (7)
High school or equivalent	28.6 (16)
College	37.5 (21)
Undergraduate	14.3 (8)
Postgraduate, doctoral or post-doctoral	7.1 (4)
Insurance status	
Private insurance	54.8 (34)
Dual Private insurance	6.5 (4)
Income assistance dental program	8.1 (5)
Military personal dental care coverage	1.6 (1)
Indigenous status dental care coverage	6.5 (4)
No dental insurance	22.6 (14)
Household income	
Less than $25,000	32.9 (17)
$25,000 - $49,999	28.8 (15)
$50,000 - $74,999	13.4 (7)
$75,000 - $99,999	9.5 (5)
$100,000 or more	15.4 (8)
Low income households (N=52)	53.8 (28)

* All children eligible for the study qualified for MSI COHP, therefore lack of knowledge about coverage

Table 3
Utilization of Oral Health Care Services

Children			
	Mean	SD	Range
Age of child at 1st visit (N=56)	2.69	1.29	4
Perceived recommended age for 1st visit (N=55)	2.29	1.36	5
			% (n)
Children who sought dental care by age 1 (N=56)			23.2 (13)
Children with caries/ abscesses at 1st visit (N=59)			44.1 (26)
Children not seeking regular preventive care (N=59)			16.9 (10)
Children who experienced a toothache (pain) (N=59)			72.9 (43)
Children who missed school because of a toothache (pain) (N=43)			23.3 (10)
Caregivers who missed work because of a child's toothache (pain) (N=44)			36.4 (16)
Caregivers			
			% (n)
Caregiver's who experienced a toothache (pain) (N=59)			86.4 (51)
Caregiver's who missed time from work because of a toothache (pain) (N=49)			36.7 (18)
Caregivers who have not sought preventive dental care in the past year (N=57)			42.1 (24)
Educated caregivers about recommended age of 1st visit			
Dentist			58.1 (36)
Dental hygienist			21 (13)
Family doctor			25.8 (16)
Nurse			1.6 (1)
Prenatal instructor			1.6 (1)
No one			14.5 (9)
Other			3.2 (2)
Educated caregivers about oral hygiene homecare for their children			
Dentist			66.1 (41)
Dental hygienist			38.7 (24)
Family doctor			21 (13)
Nurse			1.6 (1)
Prenatal instructor			4.8 (3)
No one			8.1 (5)
Other			1.6 (1)

Table 3 continued
Utilization of Oral Health Care Services

	% (n)
Educated caregivers about cariogenic foods and drinks	
Dentist	67.7 (42)
Dental hygienist	32.3 (20)
Family doctor	25.8 (16)
Nurse	1.6 (1)
Prenatal instructor	4.8 (3)
No one	8.1 (5)
Other	1.6 (1)
Media that provided education to caregivers about oral health	
Television	56.5 (35)
Radio	11.3 (7)
Internet	25.8 (16)
Social media	19.4 (12)
Print	8.1 (5)
None	29 (18)

Table 4

Barriers to Care

	% (n)
Caregivers who experienced difficulty seeking oral health care for their child (N=59)	45.8 (27)
Barriers to care:	
Could not afford	17.7 (11)
Dentist does not accept MSI *	1.6 (1)
No insurance or uncertain of insurance coverage**	4.8 (3)
Transportation problems	4.8 (3)
There were other things to be taken care of	1.6 (1)
Could not miss work	9.7 (6)
Appointments take too long	1.6 (1)
Difficulty getting an appointment	6.5 (4)
Child uncooperative or too young for treatment	16.1(10)
Nervous of dental treatment	3.2 (2)
Other	3.2 (2)
Caregivers who experienced difficulty seeking oral health care for themselves (N=59)	45.8 (27)
Barriers to care:	
Could not afford	35.5 (22)
No insurance or uncertain of insurance coverage	14.5 (9)
Transportation problems	4.8 (3)
Could not miss work	8.1 (5)
Appointments take too long	1.6 (1)
Difficulty getting an appointment	3.2 (2)
Nervous of dental treatment	8.1 (5)
Don't like/ trust/ believe in dental professionals	3.2 (2)

Note. * All dentists in Nova Scotia accept MSI COHP insurance

** All children eligible for the study qualified for public insurance, therefore lack of knowledge about coverage

Table 5
Perception of Oral Healthcare in Nova Scotia

	% (n)
Perception of availability of dental services in NS for children	
Excellent	14 (8)
Very good	21.1 (12)
Good	40.4 (23)
Fair	17.5 (10)
Poor	7 (4)
Preference of delivery for children's dental care	
Private dental clinic	49.1 (28)
Community-based clinic	28.1 (16)
Children's school-based clinic	7 (4)
Primary health-care based clinic	15.8 (9)
Other (IWK)	4.8 (3)
Perceived caregiver's oral health status	
Excellent	10 (6)
Very good	23.3 (14)
Good	33.3 (20)
Fair	21.7 (13)
Poor	11.7 (7)
Perception of availability of dental services in NS for caregivers	
Excellent	17.5 (10)
Very good	33.3 (19)
Good	29.8 (17)
Fair	12.3 (7)
Poor	7 (4)
Perception of discrimination by dental care providers	
Income level	11.3 (7)
Insurance status	4.8 (3)
Other (parenting style)	1.6 (1)
No perceived discrimination	67.7 (42)
Importance of dental care / health	
Very important	73.3 (44)
Important	23.3 (14)
Somewhat important	1.7 (1)
Somewhat unimportant	1.7 (1)
Importance of medical care / health	
Very important	80 (48)
Important	16.7 (10)
Somewhat important	1.7 (1)
Somewhat unimportant	1.7 (1)

Chapter V – Manuscript 2

Using The Health Impact Pyramid to demonstrate and guide recommendations to reduce the inequities in oral health status of socioeconomically disadvantaged children

Abstract

Dental caries continues to be the most chronic childhood disease, and is experienced most by the socioeconomically disadvantaged. Based on the 1995-1996 oral screening, Ismail and Sohn (2001) published the most recent data on the oral health status of Children in Nova Scotia. Ismail and Sohn's (2001) study and the current cross-sectional descriptive study found that children from disadvantaged socioeconomic backgrounds experienced a higher rate of oral disease than their more fortunate counterparts. The results of both the Ismail and Sohn (2001) and the current study indicate a foreseeable problem with the way in which oral public health policy and programming is managed in Nova Scotia. This study investigated using The Health Impact Pyramid to guide oral health policy and programing to deliver preventive strategies with high impact, and shifting the approach to alternate settings for oral care where care providers can easily access vulnerable populations. Aside from improving the social determinants of health, oral health policy is most impactful as "default healthy decisions" such as water fluoridation. Followed by "long-lasting protective" interventions such as sealants and fluoride varnish. The impact of prevention is dependent on the ability to offer services in settings that are easily accessed by vulnerable populations, such as community and school-based clinics, and primary care settings. Public policy and programming to reduce the inequalities in the oral health status of the socioeconomically disadvantaged should be guided by The Health Impact Pyramid. Utilizing midlevel oral health care and allied health care providers in alternate practice settings should be considered.

Keywords: Allied health care, alternate practice settings, dental caries, early childhood caries, midlevel oral health care providers, Nova Scotia, oral health inequities, social determinants of health, The Health Impact Pyramid, vulnerable populations

Though it is widely believed that universal insurance improves access to care, Ismail and Sohn (2001) found that despite a highly-utilized children's dental insurance program, children from disadvantaged socioeconomic backgrounds experienced a higher rate of oral disease than those more fortunate. The authors established that increasing access to care through public insurance is one factor in reducing the inequities, but that it alone does not eliminate the burden of oral disease. This most recent publication (Ismail and Sohn, 2001) in a peer-reviewed journal on the oral health status of children in the Province of Nova Scotia analyzed data from a 1995-1996 cross-sectional study of first grade children in Nova Scotia.

The current study utilized a quantitative cross-sectional descriptive design and purposive sampling to determine the barriers to oral health care; the profile of the caregiver and the child seeking tertiary dental care at the Izaak Walton Killam (IWK) Health Centre, a pediatric hospital; and the caregiver's perception of oral health care in Nova Scotia. This study applied the Aday and Andersen Framework for Access to Care (1974). Each element of this widely accepted conceptual model informed the design including the research tool, a questionnaire for caregivers of children. The primary goal was to determine if barriers to care and inequities to oral health exist despite the oral health policies and programs implemented by the Provincial Government. The data were analyzed using descriptive and inferential statistical tests. Low income status was classified using a Statistics Canada's Low Income Cutoffs (LICO) table. The Health Impact Pyramid, informed the study of the impact of various oral health initiatives. The results of the study found the majority of children seeking care at the IWK for unmet dental needs are children of vulnerable populations (Health Canada, 2010) including low income families, Aboriginal populations, those residing in rural communities, and those with a lower education level. Over half (54%) of the participants were below the LICO threshold. The proportion of children of

Aboriginal descent was disproportionately high (10%). Many (47%) of the families lived in rural communities or small towns. Forty-one percent of the caregivers had a high school education or less. Less than a quarter (23%) of the children visited a dentist by the recommended age of one. Cost was the most common barrier to care for caregivers (36%) and their children (18%). Alternate dental care settings were chosen by over half (51%) of caregivers for children's dental care over private dental clinics. This study supports the existing evidence that the socioeconomically disadvantaged are more susceptible to oral diseases. Reducing the inequalities in the oral health status of the socioeconomically disadvantaged needs to be addressed.

While the results of this study show disparities in access to care and oral health status for a portion of children in Nova Scotia, it is difficult to make inferences about the all children in the Province with unmet needs (Lund Research Ltd, 2012). The current study did not include an investigation of oral health status. Further research to determine the oral health status of children, along with a review of evidenced-based public oral health programs, and an evaluation of the effectiveness of current policies and programs, is required to prevent, reduce or eliminate oral disease among children in Nova Scotia.

The results of both the Ismail and Sohn (2001) and the current study indicate a foreseeable problem with the way in which oral health public policy and programming is managed in Nova Scotia. Public policy can be redirected to focus not only on reducing the disparities to access to care, but also on reducing the inequalities in the oral health status of the socioeconomically disadvantaged. The Health Impact Pyramid (2010) provides a framework for conceptualizing the impact of public health interventions on improved health. The author, Thomas Frieden, states that this model includes the determinants of health that are fundamental to public health initiatives that are often overlooked in other models. It is recommended that The

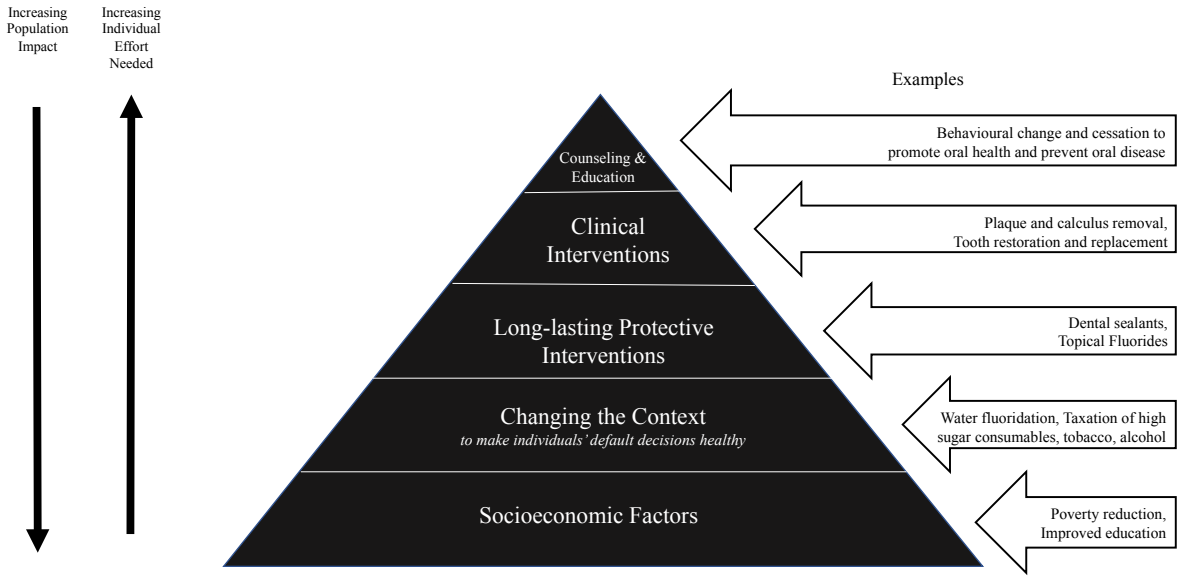
Health Impact Pyramid (2010) guide oral health prevention strategies to reduce the inequalities in oral health (Sheiham et al., 2011).

In this context, The Health Impact Pyramid (2010) is used to demonstrate and guide recommendations to manage and reduce the problem of access to oral care, and to improve the oral health status of children in NS who are socially and economically disadvantaged. Stakeholders and Policymakers may be persuaded to consider a shift in approach from *how can vulnerable populations access care?* to *how can care providers access vulnerable populations*? In other words, how can The Health Impact Pyramid (2010) guide oral health policy and programing to deliver preventive strategies with high impact, and in what settings can care providers easily access vulnerable populations to provide preventive care. A combination of prevention strategies that are easily accessed by those who need them most is essential (Biordi et al., 2015; Canadian Dental Association (CDA), 2010; Divaris et al., 2014; Frieden, 2010; Hakim, Babish, & Davis, 2012; Mathu-Muju, Friedman, & Nash, 2013; Pahel, Rozier, Stearns, & Quiñonez, 2011; Quiñonez, Figueiredo, Azarpazhooh, & Locker, 2010; Rowan-Legg, 2016; Simmer-Beck et al., 2015; Taylor et al., 2014).

The Health Impact Pyramid

Following the recommendation of Sheiham et al. (2011), this study clearly illustrates an adaptation of The Health Impact Pyramid for oral health (Frieden, 2010; Nathe, 2017).

Figure 1. The Health Impact Pyramid



Adapted from: Frieden (2010)

Socioeconomic Factors

The base of the pyramid is the widest, which indicates the interventions that have the greatest impact to improve health. Examples of change at this level are reducing poverty and improving education levels (Frieden, 2010). Intervening at this level may be beyond the scope of specific oral health policies, though the social determinants of health that affect oral health (e.g., "income and social status; social support networks; education; employment/working conditions; social environments; physical environments; personal health practices and coping skills; healthy child development; gender; and culture" (Government of Canada Public Health Agency, 2016, para 1) should be considered in all levels of the Pyramid.

Changing the Context to Make Individuals' Default Decisions Healthy

The second level represents healthy choices offered to populations that are difficult to

avoid. Interventions at this level are typically the most effective public health actions. Water fluoridation is one of the great public health achievements of the 20th century (Centers for Disease Control and Prevention (CDC), 2013a), and is endorsed by many health organizations including CDC (2015), Health Canada (2016), and the World Health Organization (WHO) (Petersen & Ogawa, 2016). Despite recent Canadian studies demonstrating the effectiveness of water fluoridation for caries (cavity) prevention, and increased caries rates on cessation of fluoridation (McLaren and Singhai, 2016a; McLaren et al., 2016b; McLaren et al., 2016c; Podgorny & McLaren, 2015), 48.8% of Nova Scotians do not benefit from water fluoridation (Oral Health Advisory Group, 2015).

Long-Lasting Protective Interventions

All levels of the pyramid can impact health. Though the levels nearer to the peak of the triangle are more suited for change in individual health. The three levels near the top "long-lasting protective interventions", 'clinical interventions', and "counselling & education" can be integrated into both public and private delivery. Though "long-lasting protective interventions" only involves single or infrequent interventions that do not require ongoing care. These interventions can be easily adapted into public programs designed to improve the oral health of vulnerable populations. This level has less impact on health than "socioeconomic factors" and "changing the context to make individuals' default decisions healthy" because it is necessary to reach individuals. To reach vulnerable populations consideration must be given to the settings in which these individuals can easily access care providers (Frieden, 2010). Divaris et al. (2014) suggest community-based inventions using school, family, or health promoter-based strategies to reduce the caregiver's barriers to accessing oral health care for their children.

As an alternative or adjunct option to community water fluoridation, the CDC (2015)

recommends community fluoride varnish and dental sealants as viable options to prevent dental caries. The effectiveness of fluoride varnish to prevent caries and reverse incipient caries is well documented in clinical trials and systematic reviews (Lenzi, Fernandes Montagner, Zovico Maxnuck Soares, & de Oliveira Rocha, 2016; Marinho,Worthington, Walsh, & Clarkson, 2013; Memarpour, Fakhraei, Dadaein,& Vossoughi, 2015). The evidence strongly supports fluoride varnish programs as a viable option to reducing caries in children. School-based sealant programs are an effective way to reach and prevent caries among children and are well supported by strong evidence (CDC, 2013b; Griffin, Wei, Gooch, Weno, & Espinoza, 2016), particularly among among children in low socioeconomic areas (Muller-Bolla, Pierre, Lupi-Pégurier, & Velly, 2016). Fluoride varnish and sealants may be delivered in private dental practice, however community or school-based based programs typically target vulnerable populations who may not otherwise receive preventive care.

A more historical form of fluoride delivery is through fluoride mouthrinse programs. Much of the research on fluoride mouthrinse programs was prior to this decade and was most prevalent before the 21st century (Marinho, Yee Chong, Worthington, & Walsh, 2016). Nova Scotia has been offering a fluoride mouthrinse program to select schools since 1998 (Nova Scotia Fluoride Mouthrinse Program Ad Hoc Fluoride Mouthrinse Review Committee, 2004). To ensure children of vulnerable populations are receiving evidence-based prevention strategies with the greatest impact, a review including process, impact, and efficiency evaluation of the current program and other viable options (sealants and fluoride varnish) is recommended (Pal L. A., 2014).

Clinical Interventions

The fourth level of The Health Impact Pyramid is clinical interventions. Evidence-based clinical care can improve health but the impact "is limited by lack of access, erratic and unpredictable adherence, and imperfect effectiveness [especially for vulnerable populations]" (Frieden, 2010, p. 592); this is true even in systems with universal public insurance (Frieden, 2010). Dental insurance programs offer little benefit to families who for other reasons have difficulties accessing care (CDA, 2010; Hakim et al., 2012).

Nova Scotia has offered universal public dental insurance to children since 1974 (Kraglund & Cooney, 2008). Based on the most recent published data from a 1995-96 oral health screening in Nova Scotia, low socioeconomic status was still a risk factor for children despite the universal public dental insurance (COHP) (Ismail & Sohn, 2001). A current oral health screening survey of children in Nova Scotia is needed to determine the impact of the COHP in improving the oral health status of vulnerable populations.

Public insurance does increase access to care, but it may not be enough to eliminate the inequity in oral health status for those who need it most (Liao, Ganz, Jiang, & Chelmow, 2010; McKenzie, 2011). A collaboration among public schools, outreach programs, primary care programs, community centres, dental organizations, child advocacy agencies, allied health care providers, and government is recommended (CDA, 2010; Hakim et al., 2012). These recommendations are consistent with The Health Impact Pyramid as Frieden (2010) suggests that successful comprehensive public health programing involves a synergistic approach of various intervention strategies (Frieden, 2010).

Counselling and Education

Education at the peak of The Heath Impact Pyramid (2010) is the least effective

mechanism to influence change in population health. However in keeping with a synergistic approach recommended by Frieden (2010), counselling and education can be incorporated into comprehensive public health programing.

The Health Impact Pyramid demonstrates mechanisms to prevent oral disease that have high impact among vulnerable populations, and socioeconomic factors should be considered at every level. The evidence is well documented supporting water fluoridation as a high impact "default decision" to prevent oral disease, especially for vulnerable populations. The impact of "long-lasting protective interventions"; "clinical interventions"; and "counselling and education" is dependent on the ability to offer preventive services in settings that are easily accessed by vulnerable populations. Evidence suggests that direct delivery of dental care, integrating oral health into primary care, and utilizing midlevel oral health care providers can reduce the inequities in the oral health status among children (Hakim et al., 2012; Mathu-Muju et al., 2013).

Alternate Delivery

Direct Delivery via School and Community-Based Programs

Rather than publicly funded, privately delivered oral health care, some social activist groups would prefer that government provide direct delivery of oral health care to better access socioeconomically disadvantaged populations to reduce the inequities in the oral health (Quiñonez et al., 2010). Since those who are higher risk are less likely to receive needed care in a private dental clinic (Canadian Academy of Health Sciences (CAHS), 2014; Health Canada, 2010; Siegal & Richardson, 2010), bringing oral health services to those who are most in need can help to alleviate the barriers to oral health care.

Services provided in school-based and community programs can improve the oral health status of low income children who would not otherwise receive care (CDA, 2010; Divaris et al.,

2014; Hakim et al., 2012; Simmer-Beck et al., 2015). While school-based programs are effective, it is imperative for children to be screened at a much earlier age to prevent and control ECC. Collaboration with allied health professionals can increase access for both toddlers and school-aged children.

Integrated Approach for the Earliest Intervention Possible

Despite the recommendation to see a child for their first visit within six months of the eruption of their first tooth or no later than age one (American Dental Association (ADA), n.d.; Canadian Dental Hygienists Association (CDHA), n.d.; CDA, 2017), many dental offices continue to see children for their first visit between the ages of three and five, which evidence shows is not effective at preventing caries in high risk populations (Rowan-Legg, 2016). Rowan-Legg (2016) called on pediatric and family physicians to identify and advocate for children who are at high risk for oral diseases. In Nova Scotia, only 13 percent of children utilized the COHP by age one (Oral Health Advisory Group, 2015). This indicator speaks to the need to reach children of low income families in non-dental settings, such as wellness clinics, to promote preventive oral care visits and the importance of establishing a dental home, an ongoing relationship with an oral health care provider. The first visit by age one and establishing a dental home are especially important for children who are at higher risk for oral diseases. Children who have early preventive visits are more likely to continue to seek preventive care and less likely to need costly restorative or emergency treatments (American Academy of Pediatric Dentistry, 2016/2017; Olley, Hosey, Renton, & Gallagher, 2011; Rowan-Legg, 2016).

Taylor et al. (2014) suggested that interprofessional collaboration with allied health care as a successful model to address the unmet oral health care needs of socioeconomically disadvantaged children (Taylor et al., 2014). The following are recommendations for integrating

oral health into allied health practice: 1) provide inexpensive and readily available training resources for students and practitioners; 2) select practice settings that offer preventive services for children and are suitable for oral health services; 3) collaborate with and utilize allied health care practitioners who work in the community to expand oral health capacity; 4) incorporate oral health training into allied health academic programs; 5) encourage recent allied health graduates to share and implement their oral health knowledge and skills in the working environment; and 6) initiate policies that expand and support oral health services by allied health practitioners in community health settings (Taylor et al., 2014). These recommendations could be operationalized to reduce the inequities in oral health in Nova Scotia.

Integrating oral health services into primary care facilitates screening and referrals to a dental home, parental counselling, and fluoride varnish application for vulnerable populations (Pahel et al., 2011). Such interprofessional collaboration has been found to increase access to care for vulnerable children at an early age (Biordi et al., 2015). Dental therapists and dental hygienists are ideal liaisons for such programs.

Utilize Dental Midlevel Providers to Increase Access to Care for Vulnerable Populations

Dental therapists and dental hygienists are skilled dental professionals who can improve access to care and reduce oral health care inequities for vulnerable populations (Mathu-Muju, Friedman, & Nash, 2016; Mathu-Muju et al., 2013; Sen et al., 2013; Siegal & Richardson, 2010; Simmer-Beck et al., 2015). While the scope of practice varies across the globe, dental therapists are trained to perform assessments, diagnostics, planning, prevention, instructional care, restorative and surgical procedures (Wright et al., 2013). Canada has had two dental therapy programs, which no longer exist due to lack of government support. One program was designed

to serve Aboriginal children in remote northern Canada. The other was a school-based program in Saskatchewan (Mathu-Muju et al., 2016; Mathu-Muju et al., 2013).

Dental hygienists providing oral health services in school settings has improved the oral health status of low income children (Sen et al., 2013; Siegal & Richardson, 2010; Simmer-Beck et al., 2015). In the Simmer-Beck et al. (2015) study, dental hygienists offered comprehensive evidence-based preventive oral health care including: removal of deposit, radiographs, fluoride application, sealants, oral health instruction, nutritional counseling, and coordination of referral to a dentist. The services provided by dental hygienists improved the oral health status of low income children who would not otherwise receive care.

In Nova Scotia, Dental Hygiene is a self-regulated profession with independent practitioners. Dental Hygienists are trained to provide therapeutic, preventive and maintenance services and programs for the promotion of optimal oral health. Dental Hygienists can collaborate with allied health professionals to educate and promote oral health, and to integrate preventive oral health care into general health care (Province of Nova Scotia, 2009). Hakim et al. (2012) and the CDA (2010) recommend collaboration among public schools, outreach programs, primary care programs, community centres, dental organizations, child advocacy agencies, allied health care providers, and government (CDA, 2010; Hakim et al., 2012). As prevention specialists, dental hygienists are an asset to oral health policy and programing to deliver high impact preventive strategies in easy to access alternate settings for vulnerable populations.

Conclusion

For many Nova Scotians, the oral health system is working well and the rate of oral disease continues to decline. Although the publicly funded, privately delivered oral health care model is failing the children who are most in need of preventive dental services (CAHS, 2014;

CIHI, 2013; Health Canada, 2010. The realities of vulnerable populations and evidence-based oral health strategies are disconnected from current decision making. Stakeholders and Policymakers are encouraged to shift the perspective to an approach that offers oral health strategies with high impact to reduce the inequities in the oral health of vulnerable populations. A collaborative approach among oral and allied health care providers, educators and the public sector is needed to reduce the dichotomy in oral health between the rich and the poor.

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Appendix A. Permission to Use and Adapt the Research Tool

On Wed, Jul 15, 2015 at 1:10 AM, Shauna Hachey <Shauna.Hachey@dal.ca> wrote:

> Hello Bien Lai,
>
> I am a faculty member of the School of Dental Hygiene at Dalhousie University, and Master of Health Studies student at Athabasca University. I am in the midst of my thesis proposal. My topic is: what are the barriers to utilization of oral healthcare services by children who are eligible for the Nova Scotia Children's Oral Health Program.
>
> I have come across your work while reviewing the literature. I was wondering if I could have your permission to access the questionnaire that is referenced in the article: Unmet Dental Needs and Barriers to Dental Care Among Children with Autism Spectrum Disorders that was adapted from the Behavioural Model of Health Services Use. If so, I would like to use and adapt this tool to suit the needs of my study.
>
> Much regard,
> Shauna Hachey
> School of Dental Hygiene
> Dalhousie University
> 5981 University Avenue, Halifax, Nova Scotia
> PO Box 15000, Halifax, NS B3H 4R2

BI Bien <bienlai@gmail.com>
To: Shauna Hachey;

Reply all
Tue 7/14/2015 2:42 PM

Deleted Items

You replied on 7/14/2015 3:11 PM.

Hi Shauna,

Sure! As long as it is cited, there shouldn't be a problem for you to adapt the survey tool. Are you able to download from research gate?

Thanks,
Bien

On Wed, Jul 15, 2015 at 1:10 AM, Shauna Hachey <Shauna.Hachey@dal.ca> wrote:

Appendix B. Informed Consent and Questionnaire

Unmet Dental Needs and Barriers to Seeking Dental Care among Children Despite Universal Public Insurance

Welcome and thank you very much for taking the time to participate in this study. Your opinion is both valued and appreciated.

ONLINE INFORMATION CONSENT FORM

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Funding

The Athabasca University Graduate Student Research Fund and the Dalhousie Faculty Research Fund have provided funding for this study.

Introduction and Purpose

You are invited to participate in a research study. It is about dental health and barriers to seeking dental care for children in Nova Scotia. This study is being conducted as part of a Master of Health Studies degree from Athabasca University.

Dental decay is the most chronic childhood disease. This research study is looking at the barriers to accessing dental services for your children. It will also look at the perception of the Nova Scotia children's public dental insurance

program.

How will the researchers do the study?

This survey will be completed in the IWK Dental Centre or in Day Surgery. A minimum 46 caregivers will be recruited. The survey will be done on an electronic tablet computer during your child's dental appointment.

What will I be asked to do?

You are asked to complete a short survey about your child's and your own dental health, and your experience with professional dental care. Once completed, please return the tablet to a team member. The survey will take approximately 15 minutes of your time. You may skip any question you do not wish to answer.

Potential Harms and Burdens

There are no potential risks to you or your child by participating in this study.

Potential Benefits

There are no direct benefits to you or your child by participating in this study. Although as a participant, you will be a part of a study that may benefit the future oral health of children in Nova Scotia.

Can I withdraw from the study?

Involvement in this study is entirely voluntary. You may refuse to answer any questions that you are not comfortable with. You will not be asked to provide any identifiable information. Your decision to participate will have no impact on your child's treatment at the IWK Health Centre.

You may choose to no longer participate in this study at any time by simply choosing the 'exit and clear survey' button.

Costs and reimbursements

There will be no costs to you. There will be no payment for time spent completing the survey.

How will my privacy be protected?

The anonymous data will be kept secure on a password protected secure internet site. The password will only be known to the primary researcher and her supervisor. The data will be removed from the site when the study is complete.

The information will be transferred to a storage software program and will only have a number attached to it. Your name will not be associated in any way. The information will be stored on a portable electronic storage device that will be kept in the primary researcher's office in a locked cabinet for at least five years.

What if I have study questions or problems?

If you have questions about this study or research in general, you can contact the student researcher (Shauna Hachey) or her supervisors.

The contact information for Athabasca University Research Ethics Board and the IWK Ethics Board are included in this letter. They have both approved this study. You may contact them about your treatment in this study.

What are my Research Rights?

Completing this survey means that you have agreed to take part in this research and for your responses to be used. In no way does this remove your legal rights. It does not release the investigators, or involved institutions from their legal responsibilities.

You will be provided with a printed copy of this consent form.

How will I be informed of study results?

If you would like a copy of the results of this study, you will have the opportunity at the end of the survey to give the email address at which you wish to be reached. Also, the results will be accessible on the Athabasca University DThesis database, and may be published in health journals.

CONSENT:

It is your decision whether or not you take part. By answering the questions, you are agreeing to give permission to use your data (anonymously). The participation in this survey is viewed as your consent.

You are free to no longer participate in this study at any time by simply choosing the 'exit and clear survey' button.

A decision to stop participating at any time, or a decision not to take part, will not affect you, or your child and their dental care.

Thank you for your assistance in this project.

There are 52 questions in this survey

Unmet Dental Needs and Barriers to Seeking Dental Care among Children

1

How old is your / this child?

Please write your answer here:

2

What is your / this child's gender?

Please write your answer here:

3

What is your / this child's race/ethnicity?

Please choose **all** that apply:

- ☐ Asian
- ☐ Black/African Canadian
- ☐ First Nations/Aboriginal
- ☐ Inuit
- ☐ White/ Caucasian
- ☐ Other: _____

4

How would you rate your / this child's dental health?

Please choose **only one** of the following:

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

5

Who referred your child to the IWK dental clinic?

Please choose **only one** of the following:

- ○ Dentist
- ○ Medical doctor

If you are unsure Shauna or a member of the IWK dental team can find out for you

6

Before today's appointment, has your / this child ever been to a dentist?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "2"))

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

7

How old was your / this child the FIRST time s/he ever went to a dentist?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1")) or ((**6.NAOK** == "A1"))

Please write your answer here:

8

Why did your / this child go to the dental office for their FIRST visit?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1")) or ((**6.NAOK** == "A1"))

Please choose **only one** of the following:

- ○ Check-up, examination, or cleaning
- ○ Something was wrong, bothering or hurting
- ○ Don't know / don't remember
- ○ Other

9 Did your / this child have cavities or abscesses at their FIRST dental visit?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1")) or ((**6.NAOK** == "A1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

10

Does your / this child have regular checkups and cleanings?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1")) or ((**6.NAOK** == "A1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No

11

Has your / this child been to a dentist while waiting for this appointment?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1")) or ((**6.NAOK** == "A1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No

12

Why did your / this child visit the dentist while waiting for this appointment?

Only answer this question if the following conditions are met:
° ((**5.NAOK** == "1") and (**11.NAOK** == "Y")) or ((**11.NAOK** == "Y") and (**6.NAOK** == "A1"))

Please choose **all** that apply:

- ☐ Check up and / or cleaning
- ☐ Fluoride
- ☐ Dental pain
- ☐ Fillings or extractions
- ☐ Other: _____

13

Was there ever a time that you found it difficult or were unable to take your / this child to the dentist?

Please choose **only one** of the following:

- ○ Yes
- ○ No

14 Which of the following has made it difficult or prevented you from taking your / this child to the dentist?

Only answer this question if the following conditions are met:
° ((13.NAOK == "Y"))

Please choose **all** that apply:

- ☐ Could not afford it
- ☐ Dentist does not accept MSI - MEDICAL SERVICES INSURANCE
- ☐ No insurance or uncertain of insurance coverage
- ☐ No way to get there (transportation problems)
- ☐ There were other things to be taken care of
- ☐ Could not miss work
- ☐ Appointments take too long
- ☐ Didn't know where to go / no dentist available
- ☐ Difficulty getting an appointment
- ☐ My child is uncooperative or too young for treatment
- ☐ Don't like/ trust/ believe in dental professionals
- ☐ I didn't know it was important or that there was a problem
- ☐ I / we speak a different language
- ☐ Other: _____

15 Out of the reasons that you have chosen above, what is the MAIN reason that made it difficult or prevented you from taking your / this child to the dentist?

Only answer this question if the following conditions are met:
° ((13.NAOK == "Y"))

Please choose **only one** of the following:

- ○ Could not afford it
- ○ Dentist does not accept income assistance insurance (Quickcard / Greenshield)
- ○ No insurance or uncertain of insurance coverage
- ○ No way to get there (transportation problems)
- ○ There were other things to be taken care of
- ○ Could not miss work
- ○ Appointments take too long
- ○ Didn't know where to go / No dentist available
- ○ Difficulty getting an appointment
- ○ Nervous of dental treatment
- ○ Don't like/ trust/ believe in dental professionals
- ○ I didn't know it was important or that there was a problem
- ○ I / we speak a different language
- ○ Other reason [ ]

16

Why was your / this child was sent to the IWK dental clinic?

Please choose **all** that apply:

- ☐ Too much or too difficult dental work to be done
- ☐ Dental office does not regularly treat young children
- ☐ My child could not cooperate
- ☐ Dental office does not accept MSI - MEDICAL SERVICES INSURANCE
- ☐ Needs sedation, general anesthetic, or to go to sleep for dental treatment
- ☐ Other reason: [ ]

17

Has your / this child ever had a toothache (pain)?

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

18

Did your / this child miss school because of a toothache?

Only answer this question if the following conditions are met:
° ((**17.NAOK** == "1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

19

Did you or another caregiver miss work because of your / this child's toothache?

Only answer this question if the following conditions are met:
° ((**17.NAOK** == "1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

20

What best describes your / this child's dental insurance:

Please choose **all** that apply:

- ☐ Private insurance- such as through an employer or an individual/family policy you purchased on your own
- ☐ Dual private insurance
- ☐ Public insurance (MSI - Medical Services Insurance)
- ☐ No dental insurance

21

In Nova Scotia, do you think the availability of dental services for your / this child is:

Please choose **only one** of the following:

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

22

If you could choose, where would you like your / this child to go for dental care?

Please choose **only one** of the following:

- ○ Private dental clinic
- ○ Community-based clinic
- ○ Children's school-based clinic
- ○ Primary health-care based clinic
- ○ Mobile clinic
- ○ Other [ ]

23

Before today, who has talked to you about the age at which a child should start going to the dentist for check ups?

Please choose **all** that apply:

- ☐ Dentist
- ☐ Dental hygienist
- ☐ Family doctor
- ☐ Nurse
- ☐ Prenatal class instructor
- ☐ No one has talked to me about this
- ☐ Other : [ ]

24

Before today, who has talked to you about how and when to brush and floss your / this child's teeth?

Please choose **all** that apply:

- ☐ Dentist
- ☐ Dental hygienist
- ☐ Family doctor
- ☐ Nurse
- ☐ Prenatal class instructor
- ☐ No one has talked to me about this
- ☐ Other: _____

25

Before today, who has talked to you about the foods and drinks that cause cavities in children's teeth?

Please choose **all** that apply:

- ☐ Dentist
- ☐ Dental hygienist
- ☐ Family doctor
- ☐ Nurse
- ☐ Prenatal class instructor
- ☐ No one has talked to me about this
- ☐ Other: _____

26

Have you ever learned about oral / dental health through advertising?

Please choose **all** that apply:

- ☐ Television
- ☐ Radio
- ☐ Internet
- ☐ Social media
- ☐ Print
- ☐ None of above
- ☐ Other: _____

27

What age do you think that children should START going to the dentist for check ups?

Please write your answer here:

_____

28

What type of dental insurance do you have for YOURSELF?

Please choose **all** that apply:

- ☐ Private insurance- such as through an employer or an individual/family policy you purchased on your own
- ☐ Dual private insurance
- ☐ Employment Support and Income Assistance Dental Program (Quickcard / Greenshield)
- ☐ Military personal dental care coverage
- ☐ Indigenous status dental care coverage
- ☐ Veterans dental care coverage
- ☐ Federal prison dental care coverage
- ☐ Refugee dental care coverage
- ☐ No dental insurance

29

How important is dental care / health to you?

Please choose **only one** of the following:

- ○ Very important
- ○ Important
- ○ Somewhat important
- ○ Somewhat unimportant
- ○ Unimportant
- ○ Very unimportant
- ○ No opinion

30

How important is medical care / health to you?

Please choose **only one** of the following:

- ○ Very important
- ○ Important
- ○ Somewhat important
- ○ Somewhat unimportant
- ○ Unimportant
- ○ Very unimportant
- ○ No opinion

31

How would you rate YOUR dental health?

Please choose **only one** of the following:

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

32

Have YOU ever experienced a toothache?

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

33

Did you miss time from work because of YOUR toothache?

Only answer this question if the following conditions are met:
° ((32.NAOK == "1"))

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

34

Have you ever been to the dentist for YOURSELF?

Please choose **only one** of the following:

- ○ Yes
- ○ No
- ○ Don't know / don't remember

35

About how long has it been since YOU had a dental cleaning or check up?

Only answer this question if the following conditions are met:
° ((34.NAOK == "A1"))

Please choose **only one** of the following:

- ○ 6 months or less
- ○ More than 6 months, but not more than 1 year ago
- ○ More than 1 year, but not more than 3 years ago
- ○ More than 3 years ago
- ○ Never had a dental cleaning
- ○ Don't know / don't remember

36

Was there ever a time that YOU found it difficult or were unable to see a dentist?

Please choose **only one** of the following:

- ○ Yes
- ○ No

37

Which of the following has made it difficult or prevented YOU from seeing a dentist?

Only answer this question if the following conditions are met:
° ((**36.NAOK** == "Y"))

Please choose **all** that apply:

- ☐ Could not afford it
- ☐ Dentist does not accept income assistance insurance (Quickcard / Greenshield)
- ☐ No insurance or uncertain of insurance coverage
- ☐ No way to get there (transportation problems)
- ☐ There were other things to be taken care of
- ☐ Could not miss work
- ☐ Appointments take too long
- ☐ Didn't know where to go / No dentist available
- ☐ Difficulty getting an appointment
- ☐ Nervous of dental treatment
- ☐ Don't like/ trust/ believe in dental professionals
- ☐ I didn't know it was important or that there was a problem
- ☐ I speak a different language
- ☐ Other reason: _____

38 Out of the reasons that you have chosen above, what is the MAIN reason that has made it difficult or prevented YOU from seeing a dentist?

Only answer this question if the following conditions are met:
° ((36.NAOK == "Y"))

Please choose **all** that apply:

- ☐ Could not afford it
- ☐ Dentist does not accept income assistance insurance (Quick card / Green shield)
- ☐ No insurance or uncertain of insurance coverage
- ☐ No way to get there (transportation problems)
- ☐ There were other things to be taken care of
- ☐ Could not miss work
- ☐ Appointments take too long
- ☐ Didn't know where to go / No dentist available
- ☐ Difficulty getting an appointment
- ☐ Nervous of dental treatment
- ☐ Don't like/ trust/ believe in dental professionals
- ☐ I didn't know it was important or that there was a problem
- ☐ I speak a different language
- ☐ Other reason: _____

39

Do you feel that your dental care providers have ever treated you or your family differently in any way because of any of the following:

Please choose **all** that apply:

- ☐ Immigrant status
- ☐ Race/ethnicity
- ☐ Education level
- ☐ Income level
- ☐ Insurance status
- ☐ I don't think dental care providers treat people differently
- ☐ Other: _____

40

In Nova Scotia, do you think the availability of dental services for YOURSELF is:

Please choose **only one** of the following:

- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

41

Did you immigrate to Canada?

Please choose **only one** of the following:

- ○ Yes
- ○ No

42 How many years ago did you immigrate to Canada?

Only answer this question if the following conditions are met:
° ((41.NAOK == "Y"))

Please write your answer here:

43

What is your gender?

Please write your answer here:

44

What is your relationship to the child visiting the IWK today?

Please choose **only one** of the following:

- ○ Parent
- ○ Legal Guardian
- ○ Grandparent
- ○ Other

45

How many children 16 years old and younger are in your family?

Please write your answer here:

46

How many people are in your family?

Please write your answer here:

47

Describe your household:

Please choose **only one** of the following:

- ○ 2-parent
- ○ Single parent
- ○ Extended family
- ○ Other

48

What is your marital status?

Please choose **only one** of the following:

- ○ Single
- ○ Married
- ○ Common-law
- ○ Divorced

49

What is the population of the community, town, or city that you live in?

Please choose **only one** of the following:

- ○ Rural (1000 or less)
- ○ 1,000-29,999
- ○ 30,000-99,999
- ○ 100,000-499,999
- ○ I don't know

50

What is YOUR education level?

Please choose **only one** of the following:

- ○ Did not complete high school
- ○ Completed high school or graduate-equivalent diploma
- ○ Completed college (including community college, technical school)
- ○ Completed university (undergraduate degree)
- ○ Completed postgraduate education, doctoral, or post-doctoral education

51

How old are YOU?

Please choose **only one** of the following:

- ○ 19 or younger
- ○ 20 to 25
- ○ 26 to 30
- ○ 31 to 35
- ○ 36 to 40
- ○ 41 to 45
- ○ 46 to 50
- ○ 50 or older

52

What is your best estimate of your TOTAL household income received by all household members BEFORE taxes and deductions?

Please choose **only one** of the following:

- ○ Less than $5, 000
- ○ $5,000 -$9, 999
- ○ $10,000-$14,999
- ○ $15,000 - $19,999
- ○ $20,000 - $24,999
- ○ $25,000 - $29,999
- ○ $30,000 - $34,999
- ○ $35,000 - $39,999
- ○ $40,000 - $44,999
- ○ $45,000 - $49,999
- ○ $50,000 - $54,999
- ○ $55,000 - $59,999
- ○ $60,000 - $54,999
- ○ $55,000 - $59,999
- ○ $60,000 - $64,999
- ○ $65,000 - $69,999
- ○ $70,000 - $74,999
- ○ $75,000 - $79,999
- ○ $80,000 - $84,999
- ○ $90,000 - $94,999
- ○ $95,000 - $99,999
- ○ $100,000 or more

Thank you for participating in this survey.

Your opinion is much valued and appreciated.

Thank you and have a great day!

Register to Win a Tablet and to Receive the Results of this Study

There are 2 questions in this survey

Registration for results and tablets

1

As an incentive for participation, our team is randomly selecting participants to win one of the two tablets that are being used for this survey.

If you wish to be entered into the draw to win one the tablets, kindly leave us your contact information (first name and email or telephone number).

This information will not be linked in any way to your survey answers or will not be used in any other way. If you do not wish to be entered simply proceed to the last question of the survey.

Good Luck!

Please write your answer here:

2

If you wish to receive a copy of the results of this study, kindly leave us your email address.

This information will not be linked in any way to your survey answers or will not be used in any other way.

If you do not wish to receive a copy, simply proceed to the end of the survey by pressing 'submit".

Please write your answer here:

Appendix C. AU Research Ethics Board Letter of Approval

Mrs. Shauna Hachey
Faculty of Health Disciplines\Centre for Nursing & Health Studies
Athabasca University

November 17, 2015

File No: 22011

Expiry Date: November 16, 2016

Dear Shauna Hachey,

The Faculty of Health Disciplines Departmental Ethics Review Committee, acting under authority of the Athabasca University Research Ethics Board to provide an expedited process of review for minimal risk student researcher projects, has reviewed you project, 'Unmet dental needs despite universal public insurance thesis proposal: Descriptive quantitative research'.

Your application has been **Approved on ethical grounds** and this memorandum constitutes a ***Certification of Ethics Approval***. You may begin the proposed research.

Friendly suggestions: On your Information letter/consent form: Paragraph 5: You may wish to change the wording of "closing out of your browser" - not sure that all participants will understand this language. Also, sentence 3, para 5, should read "consent form".

AUREB approval, dated November 17, 2015, is valid for one year less a day.

As you progress with the research, all requests for changes or modifications, ethics approval renewals and serious adverse event reports must be reported to the Athabasca University Research Ethics Board via the Research Portal.

To continue your proposed research beyond November 16, 2016, you must apply for renewal by completing and submitting an Ethics Renewal Request form. Failure to apply for **annual renewal** before the expiry date of the current certification of ethics approval may result in the discontinuation of the ethics approval and formal closure of the REB ethics file. Reactivation of the project will normally require a new Application for Ethical Approval and internal and external funding administrators in the Office of Research Services will be advised that ethical approval has expired and the REB file closed.

When your research is concluded, you must submit a Project Completion (Final) Report to close out REB approval monitoring efforts. Failure to submit the required final report may mean that a future application for ethical approval will not be reviewed by the Research Ethics Board until such time as the outstanding reporting has been submitted.

At any time, you can login to the Research Portal to monitor the workflow status of your application.

If you encounter any issues when working in the Research Portal, please contact the system administrator at research_portal@athabascau.ca.

If you have any questions about the REB review & approval process, please contact the AUREB Office at (780) 675-6718 or rebsec@athabascau.ca.

Sincerely,
Sherri Melrose, Chair, Faculty of Health Disciplines Departmental Ethics Review Committee
Athabasca University Research Ethics Board

Appendix D. IWK Health Centre Research Ethics Board Letter of Approval

IWK Health Centre
Research

5850/5980 University Avenue
PO Box 9700, Halifax
Nova Scotia B3K 6R8
Canada
tel: 902.470.8888
www.iwk.nshealth.ca

Approval – Delegated Review
August 02, 2016

Principal Investigator: Mrs. Shauna Hachey
Co-Principal Investigator: Dr Jennifer MacLellan
Title: Unmet Dental Needs and Barriers to Seeking Dental Care Among Children despite Universal Public Insurance: Descriptive Quantitative Research
Project #:1021493

On behalf of the IWK Research Ethics Board (IWK-REB) I have reviewed the documents included in this study. I am pleased to confirm the Board's full approval for this research study, effective today.

Best wishes for a successful study.

Yours truly,

Adam Huber
Co-Chair, Research Ethics Board

This approval includes the following study documents:

Document Name	Version Date
Timeline	2016/06/10
Research Protocol	2016/07/25
Information and Consent Form and Survey	2016/07/25
Research Team Contacts Page	2016/07/25
Responses to the reviewers' comments	2016/07/20

The Board's approval for this study will expire one year from the date of this letter (August 02, 2017). To ensure continuing approval, submit a Request for Continuing Review to the Board 2 - 4 weeks prior to the renewal date. If approval is not renewed prior to the anniversary date, the Board will close your file and you must cease all study activities immediately. To reactivate a study, you must submit a new Initial Submission (together with the usual fee, if applicable) to the IWK-REB and await notice of re-approval.

Please be sure to notify the Board of any of the following:

- Proposed changes to the initial submission (i.e. new or amended study documents)

- Additional information to be provided to study participants
- Material designed for advertisement or publication with a view to attracting participants
- Serious adverse events experience by local participants
- Unanticipated problems involving risks to participants or others
- Sponsor-provided safety information
- Additional Compensation available to participants
- Upcoming audits/inspections by a sponsor or regulatory authority
- Closure of the study (within 90 days of the event)

Approved studies may be subject to internal audit. Should your research be selected for audit, the Board will advise you and indicate any other requests at that time.

Important Instructions and Reminders
Submit all correspondence to Ethics Manager Bev White or Ethics Coordinator, Joanne Street at the address listed at the top of this letter (do not send your response to the IWK-REB Chair or Co-Chair)

Be sure to reference the Board's assigned file number, 1021493 on all communications.

Highlight all changes on revised documents and remember to update version numbers and version dates, include a clean copy of all revised documents.

Research Ethics Board Committee Members		
Sarah	Belong	Legal
Kelly	Cameron	Lay Representative
Jill	Chorney	Psychology (Clinical Researcher)
Eleanor	Fitzpatrick	Nursing (Clinical Researcher)
Isabelle	French	Legal
Ron	George	Anaesthesia (Clinical Researcher)
Kevin	Gordon	Neurology (Clinical Researcher)
Linda	Hamilton	Obstetrics and Gynecology, Co-Chair
Adam	Huber	Rheumatology (Clinical Researcher), Co-Chair
Victoria	Price	Hematology/Oncology (Clinical Researcher)
Erna	Snelgrove-Clarke	Nursing (Clinical Researcher)
Marilyn	Tiller	Pharmacy
Julie	Walsh	Privacy

* REB members are not in attendance during review of their own proposed research involving human subjects or where there is conflict of interest with the proposed research

This statement is in lieu of Health Canada's Research Ethics Board Attestation: *The Research Ethics Board for the IWK Health Centre operates in accordance with:*
- Food and Drug Regulations, Division 5 "Drugs for Clinical Trials involving Human Subjects"
- The Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans - TCPS(2)
- International Conference on Harmonization - Good Clinical Practice Guidelines - ICH-GCP
- FWA #: FWA00005630 / IORG #: IORG0003102

Appendix E. AU Research Ethics Board Letter of Approval Renewal

November 04, 2016

Mrs. Shauna Hachey
Faculty of Health Disciplines\Centre for Nursing & Health Studies
Athabasca University

File No: 22011

Certification of Ethics Approval Date: November 17, 2015

New Renewal Date:

Dear Shauna Hachey,

Your Renewal Form has been received by the AU REB Office.

Athabasca University's Research Ethics Board (REB) has **approved** your request to renew the *certification of ethics approval* for a further year for your project entitled “Unmet dental needs despite universal public insurance thesis proposal: Descriptive quantitative research”.

As you progress with the research, all requests for changes or modifications, ethics approval renewals and serious adverse event reports must be reported to the Athabasca University Research Ethics Board via the Research Portal.

To continue your proposed research beyond November 3, 2017, you must apply for renewal by completing and submitting an Ethics Renewal Request form before expiry. Failure to apply for **annual renewal** before the expiry date of the current certification of ethics approval may result in the discontinuation of the ethics approval and formal closure of the REB ethics file. Reactivation of the project will normally require a new Application for Ethical Approval and internal and external funding administrators in the Office of Research Services will be advised that ethical approval has expired and the REB file closed.

When your research is concluded, you must submit a Project Completion (Final) Report to close out REB approval monitoring efforts. Failure to submit the required final report may mean that a future application for ethical approval will not be reviewed by the Research Ethics Board until such time as the outstanding reporting has been submitted.

If you encounter any issue with the Research Portal’s online submission process, please contact the system administrator via research_portal@athabascau.ca.

If you have any questions about the REB review & approval process, please contact the AUREB Office at (780) 675-6718 or rebsec@athabascau.ca.

Sincerely,

Office of Research Ethics