

**ORAL-HEALTH STATUS OF CHILDREN AND ADOLESCENTS WITH
ADVERSE CHILDHOOD EXPERIENCES: A PILOT STUDY WITH THE ELIZABETH
FRY SOCIETY OF GREATER VANCOUVER**

by

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Abstract

Objectives: Adverse childhood experiences (ACE) such as poverty, parental substance use and parental incarceration can have negative influences on the physical and mental growth and development of children. The Elizabeth Fry (EFry) Society of Greater Vancouver, which provides a variety of services to children impacted by ACE in British Columbia, expressed interest in knowing about the oral health status of the clients they serve, so that appropriate support and services could be developed as needed. The objectives of this study were to document oral-health-related behaviours of children and youth who receive services from EFry, assess and describe their current oral-health status and explore relationships between a variety of study variables including demographics (age, gender, ethnicity), social characteristics (parent in justice system), and health behaviours and oral health status.

Methods: Children and adolescents from a summer camp operated by EFry completed socio-demographic and oral-health-behaviour questionnaires. A clinical examination including an assessment of dental status (dmft/DMFT), oral hygiene status (DI-S) and gingival status (GI) was conducted on each participant. Analysis included descriptive statistics, as well as bivariate tests to determine relationships between dental health status and a variety of study variables.

Results: The 67 participants of this study, aged 6 to 16 years of age, had a mean dmft/DMFT of 3.64 with 78% having at least one decayed, missed or filled tooth. About one-fifth (19%) of children and one-third of adolescents (35%) had received fissure sealants. Of the participants, 21% and 75% had mild or moderate gingival inflammation respectively. The majority of children and adolescents (69%) had minimal tooth debris and 28% had moderate debris. No statistically significant relationship was found between dmft/DMFT and any of the study variables, including oral health behaviours.

Conclusion: For this limited small volunteer sample of EFry children and adolescents, no relationship was found between any participant characteristics and oral health status. The participants appear to be receiving needed definitive dental care however, preventive measures, specifically fissure sealants were lacking. A greater emphasis on preventive care for these children may help to ensure future oral health.

Lay Summary

The Elizabeth Fry (EFry) Society of Greater Vancouver provides a variety of services to children with challenging childhood experiences. Upon EFry's request, we attended a summer camp to examine these children's mouths to check for cavities or gum disease. We asked 67 participants aged 6 to 16 a number of questions regarding their brushing habits, living/school situations and snacking habits and we also completed a clinical examination.

Three-quarters of the 67 participants of this study had at least one tooth that was decayed, filled, or missing. Three-quarters had moderate gum inflammation. About one-fifth of children and one-third of adolescents had received protective sealants on teeth. We found that participants appeared to be receiving needed dental care; however, preventive care, specifically sealants, was lacking. A greater emphasis on preventive care for these children will help to ensure their future oral health.

Preface

EFry of Greater Vancouver initiated this project. The principal investigator was Dr. Leeann Donnelly, with Tila Bahri as co-investigator. Ethics approval for this research was obtained from the University of British Columbia's Behavioral Research Ethics Board (H15-00975). I verified on August 17, 2017, that all the links for Internet references in this thesis are active.

Parental consent for screening children and adolescents in Blue Sky summer camp, organized by Elizabeth Fry Society of Greater Vancouver, was obtained through EFry staff. This study was under the supervision of Dr. Leeann Donnelly. The analysis of the research data was conducted with the assistance of the UBC Statistical Consulting and Research Laboratory, Dr. Batoul Shariati and Dr. Jolanta Aleksejuniene.

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List of Abbreviations

ACE: Adverse Childhood Experience

EFry: Elizabeth Fry Society of Greater Vancouver

DMFT/dmft: Decayed, Missing, Filled Teeth/ decayed, missing, filled teeth

DI-S: Simplified Oral Debris Index

OHI-S: Simplified Oral Hygiene Index

GI: Gingival Inflammation Index

SES: Socioeconomic Status

MCP: Mother-Child Program

HPA: Hypothalamo-Pituitary-Adrenal

BC: British Columbia

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Chapter 1: Introduction

Oral health and overall health are interconnected; changes in general health affect oral health and oral disease impacts overall wellbeing (Gift & Atchison, 1995). Caries can cause pain and infection in children, with negative effects on their general health and quality of life, including their ability to eat and sleep. Furthermore, growth and development may be delayed as a result of malnutrition, pain and sleep disturbances (Acs et al.,1992). Adverse childhood experiences (ACE) such as poverty, low socio-economic status, parental substance use and incarceration can have a significant impact on the overall wellbeing of children; however, few studies have examined the oral health status of children who have had ACE, especially in Canada.

The Elizabeth Fry (EFry) Society of Greater Vancouver is a gender-focused organization that provides services to women, and the children of women, with a history of poverty, drug abuse and incarceration or who are at risk of being affected by the justice system. For this research, individuals who are in jail, who have an incarceration history, who have been found not guilty but are on remand, those are awaiting trial or bail, as well as their children and close relatives are all considered to be “affected by the justice system” (Correctional Service Canada, 2017). EFry aims to provide support that transforms the lives of these women for the better.

In September 2015, in collaboration with the UBC Dental Hygiene Degree program, a preventive dental program was established at EFry that focuses on the women receiving services at the New Westminster location of the Maida Duncan Drop-In Centre. The program provided much needed information about the oral health status of their clients and EFry expressed interest in learning more about the oral health status of children and adolescents who also attend many of

their programs and utilize services. In response to this request, a needs assessment of these clients was determined the best approach so that, if indicated, similar services and supports could also be developed, focusing on the children and adolescents.

Chapter 2: Literature Review

2.1 Importance of Oral Health in Children

The World Health Organization (WHO) defines health as a state of complete physical, mental and social well-being (WHO, 1948). It defines oral health as a “state of being free from chronic mouth and facial pain, oral and throat cancer, oral sores, birth defects such as cleft lip and palate, periodontal (gum) disease, tooth decay and tooth loss, and other diseases and disorders that affect the oral cavity” (WHO, 1982). Oral health and overall wellbeing are intertwined. Oral health infections, such as dental caries and gum disease, can affect the functional, social and physiological aspects of a child’s general health. Any discomfort in the oral environment, such as toothache, can have devastating effects on children, including compromised sleep quality, nutritional intake and learning or behavioural problems (Rowan-Legg, 2013). Oral health problems can affect communications and social confidence, resulting in reduced school attendance (Rowan-Legg, 2013). Furthermore, non-oral specific health conditions, such as bacterial, viral and fungal infection, and systemic disease can manifest in oral conditions (Holmstrup, 1999). Numerous diseases such as diabetes, autoimmune disorders and gastrointestinal problems may have oral manifestations including gingivitis and periodontitis, caries, salivary dysfunction, candidiasis and xerostomia (oral dryness). These manifestations might be due to the alteration in the individual’s immune system, carbohydrate, fat and protein metabolism and medication use (Lankarani et al., 2013; Ship, 2003).

Dental caries and periodontal disease, the most common oral health conditions, are two of the most prevalent chronic diseases impacting children and adolescents. Dental caries are five times as prevalent as asthma among individuals aged five to seventeen years of age (Cooney, 2010). According to the 2010 Canadian Health Measures Survey, 57% of Canadian children six

to eleven years old have had a cavity, with an average of 2.5 teeth affected by decay. Dental caries is a multifactorial chronic disease impacted by diet, cariogenic bacteria, individual oral conditions and the social determinants of health (Rowan-Legg, 2013). Periodontal diseases, including gingivitis and periodontitis, are inflammatory diseases that affect the soft and hard structures that support teeth. The early stage, when only soft tissue is involved, is considered gingivitis; when the hard tissue is involved, it is periodontitis (Tatakis & Kumar, 2005). Children and adolescents experience varying degree of gingivitis (Tatakis & Kumar, 2005). The prevalence of periodontitis is much lower in children than adults (Tatakis & Kumar, 2005). Risk factors for periodontal diseases include poor systemic health and inadequate oral hygiene. Both caries and periodontal diseases are manageable and preventable through community, professional and individual efforts such as water fluoridation, improved oral hygiene, healthy diet, topical fluoride application, fissure sealant placement and regular dental examinations and care (Rowan-Legg, 2013) .

The health and oral health of individuals in a community is influenced by many factors, described by the WHO as the “social determinants of health” (WHO, 2003). In Canada, fourteen such social determinants of health have been proposed: income and income distribution; education; unemployment and job security; employment and working conditions; early childhood development; food security; housing; social exclusion; social safety network; health service; Aboriginal Status; gender; race; and disability (Mikkonen & Raphael, 2010). Social determinants of health such as low income and poverty shape health by affecting the quality of the food consumed, the extent of exercise undertaken, living conditions, stress levels and substance use (Mikkonen & Raphael, 2010). Social determinants of health affect not only adults,

but can also negatively impact children resulting in lifelong health conditions that can span generations (Metzler et al., 2017).

2.2 Adverse Childhood Experience

An adverse childhood experience (ACE) is a potentially traumatic event in a child's life that can have negative, permanent impacts on the health and well-being of an individual (Felitti et al., 1998). One of the largest studies undertaken to explore the role of ACE on health and well-being surveyed 13,494 members of Kaiser Permanente Health in 1995-96. Participants from Oakland, California, completed a medical evaluation of their childhood experiences and their updated health status and behaviour (Felitti et al., 1998). Participants also completed a questionnaire about their adverse childhood experiences. Seven categories of ACE were considered in this study, including physical abuse, psychological abuse, sexual abuse, violence against a mother, living with family members with drug or alcohol abuse, and history of incarceration or mental illnesses. The categories of ACE were compared with prevalence and risk diseases in adulthood such as, stroke, cancer, diabetes and heart disease. Robust relationships were found between ACEs and diseases that lead to death in adults (Felitti et al., 1998). The long-term health outcome of individuals who had ACE may also be explained by epigenetic mechanisms (Murgatroyd & Spengler, 2011).

Epigenetics is the study of heritable modification in gene expression such as environmental exposures and lifestyle changes in early development. It is believed to be a causative factor in increasing the likelihood of disease in adulthood. Environmental changes can impact the gene expression and function, leading to disease phenotype even though the DNA sequence remains the same. Some of these changes due to environmental exposures might also be passed on through the subsequent generation (Jirtle & Skinner, 2007).

Adverse experiences at a very young age can alter neuroendocrine function, such as the hypothalamo-pituitary-adrenal (HPA) system. This system controls stress reactions and regulates the immune system, and mood in later life (Murgatroyd & Spengler, 2011). Adverse childhood experience has fundamental impacts on biological processes resulting in long-lasting epigenetic modification, which increases susceptibility to both psychiatric and physical disorders including diabetes and heart and lung disease, possibly via prolonged influences on the immune system (Mehta et al., 2013). Similarly it has been shown that any adverse childhood experience, such as poverty and low socioeconomic status, parental substance abuse and incarceration, can have a negative impact on a child's oral health, specifically increased incidence of caries (Bright et al., 2015). Furthermore, children who had more than one ACE had poorer dental health than those who had fewer such experiences, indicating a potential cumulative effect (Bright et al., 2015).

2.2.1 Poverty and Low Socioeconomic Status

Low socioeconomic status and poverty have been associated with low levels of child well-being related to family functioning and children's experience of their environment. Poverty, for instance, can affect a child's health indirectly through "housing instability", resulting from difficulty in rent payment that leads to eviction, and families being forced to undergo frequent moves (da Fonseca, 2012). Crowded and inadequate housing can also negatively affect the health of children and has been associated with increased hospital admissions for conditions such as respiratory tract disease (Waterston et al, 2008). More than half of the children and youth visits to the emergency room at an Ottawa, Ontario hospital in 2005 lived in such housing conditions (Waterston et al., 2008). In Canada, approximately 33% of families live in substandard conditions or in housing instability. British Columbia is among the provinces with the highest level of housing need (Waterston et al., 2015).

Poverty can cause stress that negatively impacts a child's life (Shonkoff, 2010). For instance, poverty can contribute to declining health by reducing access to a healthy diet that includes meat, fish and vegetables. As result of stress-related food insufficiency, parents develop anxiety and depression, which indirectly impacts their children's health (da Fonseca, 2012). Furthermore, social, emotional and cognitive development of children is compromised by food deprivation, leading to poor school performance and behavioural issues (da Fonseca, 2012). Moreover, poverty can negatively impact oral health both because of poor nutrition that includes frequent consumption of highly processed, high-carbohydrate foods and limited access to oral health care. Children in low-income families experience more dental disease and are more likely to miss daily activities such as school as a result of dental discomfort than those in higher-income families. Children's uncooperative behaviour in the dental setting has also been associated with the anxiety and stress of living in poverty (da Fonseca, 2012).

2.2.1.1 Effects of “Toxic Stress” on Young Children

Changes in the environment can cause stress; the body develops different response mechanisms to cope with different types of stress. There are three types of stresses that are defined in the literature: positive stress, tolerable stress and toxic stress. Positive stress is a necessary part of normal and healthy development resulting from activities such as moving to a new home (Shonkoff, 2010). Its symptoms are a brief elevation in heart rate and hormone levels. When children are exposed to longer-lasting hardships, such as losing family members, the immune system is suppressed by a prolonged increase in the levels of certain hormones, such as cortisol. This stress is tolerable and the resulting damage to the brain and other organs will be temporary if children receive sufficient support from caregivers. Long-term activation of the immune system results from exposure to toxic stress (Shonkoff, 2010). This robust and constant

stress is related to such ACE as household substance abuse, accumulated stress of family economic difficulties and physical or emotional abuse without adequate protection from adults. Such toxic stress results in compromising damage to growth and development of the brain and other organs, increasing the likelihood of lifelong chronic physical and mental disease (Shonkoff et al., 2012). Toxic stress in childhood has a strong association with an unhealthy adult lifestyle. Youngsters with multiple adverse experiences in childhood are more prone to start drinking alcohol at a younger age or to use alcohol to cope with stress compared to those who have not had any ACE exposure (Rothman et al., 2008). Tobacco use is also more common (Anda et al., 1999) than in children without ACE exposures. Furthermore, parental substance use is one of the ACEs that negatively affects the well-being of children and adolescents, increasing the likelihood of the substance use in adulthood (Anda et al., 2002).

2.2.2 Parental Substance Use

Parental substance use, a type of ACE, increases the likelihood of child maltreatment (Neger & Prinz, 2015) and drug addiction in adulthood (Anda et al., 2002). Parental substance use can have a significant negative impact on a child's well-being throughout their development from infancy to adulthood. It can compromise the quality of a child's parenting skills, increasing the likelihood of child abuse or neglect. Prenatal maternal addiction to alcohol can result in multiple problems in infants, such as difficult temperament including sleep and feeding disturbance and physical issues such as gastrointestinal problems, fever and seizures. Substance abuse can also negatively impact mother-child attachment as well as speech and language development in the first three years of life (Neger & Prinz, 2015).

Aggressive behaviours and hyperactivity have been shown in school age children living with a parent who uses drugs or alcohol. These children may have fewer friends and have more

peer conflict (Barnard & McKeganey, 2004; Chronis et al., 2003). Adolescents who grew up in a home with alcohol using parents are more likely to experience depression and alcoholism as adults (Anda et al., 2002). Postnatal parental substance use increases the likelihood of children's maltreatment and foster care placement transitions; such children can experience foster care placements six to eighteen times above average (Smith et al., 2007). Substance use can also lead to increased risk of incarceration, another ACE that can have detrimental effects on children's health-related quality of life (Gjelsvik et al., 2014).

2.2.3 Parental/Relative Incarceration

Parental and relative incarceration has been shown to have a long-lasting negative impact on child and adolescent well-being. Children who have been brought up by an incarcerated family member are at an increased risk of a poor health-related quality of life (HRQoL) (Gjelsvik et al., 2014). Adolescents residing with previously incarcerated family members experience increased socioeconomic strain, decreased cognitive skills and more frequent home difficulties, compared to counterparts without experience of incarcerated household members. Youth with household family member incarceration show poorer school performance, including extended absence and higher dropout rates, than peers without this experience. Moreover, adolescents who live with released, non-immediate family members, such as uncles, aunts or grandparents, show the poorest school performance. Their school performance can be even worse than that of children with parental or sibling incarceration, indicating that the damage to children is not limited to immediate family member incarceration (Nichols & Loper, 2012). The details of incarceration rates in Canada are highlighted in subsequent sections.

2.3 Incarceration in Canada and BC

According to the Statistics Canada report of 2015/2016, there were 40,147 adults in custody in Canadian federal and provincial prisons on an average day. Among all of the Canadian provinces, Manitoba and British Columbia reported the highest and lowest adult incarceration rates, respectively. In British Columbia (BC), 13,584 individuals were in custody in both the provincial (sentences of less than two years) and the federal (sentences longer than two-years) correctional system. In 2015/2016, Aboriginal people comprised 27% of adults in provincial and territorial custody and 24% of those in federal custody. This rate is about seven to eight times higher than the proportion of Aboriginal people (3%) in the total Canadian adult population. In the same year, 38% of incarcerated women were Aboriginal, while Aboriginal males represented 24% of the prisoners (Statistics Canada, 2016).

In 2015/2016, women represented 15% of all prisoners in provincial or territorial correctional facilities, a 1% increase compared to the previous five years. Adults under 35 years of age comprised more than half (58%) of those admitted to the provincial and territorial correctional system, and (54 %) to the federal correctional system(Statistics Canada, 2016).

2.4 Reasons Why Women Are Incarcerated in Canada

The majority of incarcerated women are housed in provincial prisons. A quarter (25%) of these female prisoners are incarcerated for non-violent crimes such as theft, fraud, drug and property offences, and sex trade activities(Correctional Service Canada, 2017). While a mother is incarcerated, the bond between child and mother will be compromised, resulting in negative impacts on the child's growth and development (Schore, 2002).

2.4.1 Mother-Child Separation and the Mother-Child Program

The secure attachment that is created between child and mother in the first two to three years of life plays a significant role in the child's growth and development. This bond is built through communication, interaction and emotional relations between the child and the primary caregiver, usually the mother (Schoore, 2002). The bonding and attachment during the first two years of life can also have a significant impact on child behaviour. Any separation of seven days or beyond, within the first 24 months, has been demonstrated to result in increased child aggression between three and five years of age (Howard et al., 2011). The right hemisphere of the human brain, which processes information related to social interaction and adult emotions, develops during the first two to three years of life. The optimum growth of the right brain is associated with the security of infant primary caregiver attachment. The effects of this lack of attachment can last a lifetime. Children who fail to develop a secure bond with their primary caregiver over the first twelve months of life are less tolerant of stress and frustration than children raised in a secure environment (Schoore, 2002; Toth & Cicchetti, 1998). Insecure attachment can also increase the likelihood of substance use, depression, anxiety and aggression in future years (Miller, 2005).

Breastfeeding promotes mother-child attachment. It significantly enhances the immunologic system of the neonate and boosts defense mechanisms against infective and foreign agents. Human milk contains significant nutrients such as protein, fat, vitamins and minerals, hormones and growth factors that may reduce the incidence of infant disease (Oddy, 2002).

Mothers also benefit from nursing their babies. Some of the hormones released as a result of suckling such as oxytocin, prolactin and cholecystokinin, have anti-stress and relaxing effects on

mothers. Oxytocin also increases maternal love and promotes mother-child attachment (Gribble, 2006).

British Columbia pioneered the Mother–Child Program (MCP) in 1973 to allow mothers to keep babies born while in prison. This program offers a full-time, co-residence for women in prison with children less than four years old and a part-time program for children aged six and under. The MCP was implemented across Canada in 2001 and then canceled in 2008. British Columbia reversed the decision through the Supreme Court; it is currently the only province in Canada with a MCP (Whitford, 2008).

2.5 Health of Prison Inmates

2.5.1. Medical

In general, incarcerated individuals experience more physical and mental health problems than the population at large. Problems include chronic conditions (Wilper et al., 2009), infectious diseases (Fazel & Seewald, 2012) and mental health issues (Fazel & Danesh, 2002). Factors contributing to these health issues include poverty, low income, low education, and unemployment (Fazel & Seewald, 2012). Research also suggests that features of the prison environment such as violence, overcrowding and isolation can have an impact on inmates' physical and mental health (Bernier & MacLellan, 2011).

A recent study investigated the health status of male and female inmates in provincial jails in Atlantic Canada. The most frequently reported physical health issues among all prisoners were brain and nervous system disorders, skin problems, musculoskeletal, mouth and eating problems, gastrointestinal issues, physical pain, injury and sexual or reproductive problems (Bernier & MacLellan, 2011). Ethnicity was associated with health status; that is, the mental and physical health of Aboriginal inmates rated more poorly than non-Aboriginal inmates. Most of

the incarcerated women in this study were mothers of children and were younger than the general population (Bernier & MacLellan, 2011).

In British Columbia, a higher prevalence of physical and mental health issues were observed among women inmates compared to males as well as to the general population. Blood born infectious diseases, such as HIV and Hepatitis C, as well as mental illnesses, such as post-traumatic stress disorder, depression, anxiety and phobias, were also more prevalent in female inmates (Martin et al., 2012). Further, approximately 80% of incarcerated women in BC have been diagnosed with a psychiatric disorder (Martin et al., 2012).

More than 30% of BC prisoners present with substance use other than alcohol use (Somers et al., 2008). Psychotic illness has been diagnosed in about 4% of male and female inmates in BC (Fazel & Seewald, 2012). Major depression occurs in 10% and 12% of male and female inmates, respectively. The prevalence of mental disorders in prisoners, such as psychosis and depression, is two to four times more than in the general population (Fazel & Seewald, 2012).

2.5.2. Dental Health

Oral health problems in inmates of both sexes have been partially attributed to use of poor quality oral hygiene aids such as toothbrushes and toothpaste (Bernier & MacLellan, 2011). However, limited access to dental care both prior to incarceration and while in prison may also contribute to oral health status. Inmates in the United Kingdom have been reported to have almost two times more caries compared to the general population for all age groups. Smoking, excessive alcohol consumption and illegal drug usage, more common among prisoners, were factors related to poor oral health status (Heidari et al., 2014). Other factors, such as inadequate nutrition, consumption for sugary foods, irregular dental visits and masking dental pain with

medication, all increase caries risk and periodontal disease among drug- using inmates (Sheridan et al., 2001).

2.6 The Effects of Incarceration on Children of Prisoners

The number of children with parents in the prison system is increasing throughout the US, Canada and other western countries. These children experience many negative mental health effects ranging from increased levels of depression and anxiety to antisocial behaviour and substance use. Causative factors include the trauma of separation from the parent, the social/economic strain and the stigma of having an incarcerated parent (Murray & Farrington, 2008).

Many children of incarcerated parents also experience educational challenges. When a non-incarcerated parent's needs to move or a child is removal from the family home, children have to change schools. This separates the child from peers, teachers and a familiar support system at the time they most need support. These children may find adjusting to a new school difficult, leading to poor performance and/or behavioural problems (Sullivan et al., 2010). Such problems can range from disengagement to poor attendance, acting out in class, or even dropping out (Trice & Brewster, 2004).

Children of incarcerated parents can also face stigma. They might be overtly or covertly labeled by their classmates, school teachers, neighbors and the criminal justice system. The non-incarcerated parent and/or other family members also may feel stigmatized, leading to lessened contact with the incarcerated parent, or even termination of contact. Furthermore, the non-incarcerated parent may urge the child to keep the incarceration a "family secret," increasing the child's stress (McCormick et al., 2014).

A history of parental incarceration can also have a negative effect on the health of young adults. Such a history increases the likelihood of physical and mental health issues, such as post-traumatic stress disorder, anxiety, asthma, migraines and HIV. For young adult women in particular, family-member incarceration increases the chance of depression (Lee et al., 2013)

Maternal incarceration has a significant impact on a child's mental and physical development and increases the likelihood of antisocial behaviour. The level of disruption in children's lives, and its effects on such things as school attendance increases with maternal incarceration. Since the mother is usually the primary caregiver, the impact of maternal incarceration is greater than paternal. (Dallaire et al., 2014).

2.7 Care of Children when Parents/Primary Caregivers Are Not Present

Over 67,000 Canadian children do not live with their biological parents, with approximately 11,000 of them in BC. Among those 11,000, 70% live in foster care, nearly 25% live with a relative and about 5% have a Youth Agreement (an agreement between the Ministry of Child and Family Development [MCFD] and individuals between the ages of 16 to 18 who need support to live independently)(Canadian Child Welfare Research Portal, 2011). The number of children who are staying with other family members, such as an uncle or aunt, are increasing, although the exact numbers are unknown (Mulcahy & Trocmé, 2007).

In BC, the MCFD becomes involved in the care of incarcerated mothers' children only when no identified caregiver is available. Due to data shortage, and resulting protocol lapses, it is unclear what provisions are made for the care of children when their mothers are arrested (McCormick et al., 2014). Usually mothers can suggest where their children should be placed, but it is often at the discretion of the police whether the selected caregiver is considered suitable. If the police are satisfied about suitability, they usually will not notify the MCFD and there will

be no follow-up on the child's care (McCormick et al., 2014). This lack of follow-up not only results in information gaps about the location of care for children of incarcerated mothers, but it prevents the gathering of data on any developmental, emotional, psychological and physical challenges faced by the children in this kind of care (McCormick et al., 2014).

2.7.1. Children in Foster Care

When a family member is unable to provide care, the child is often placed in foster care. Parental incarceration, poverty, substance abuse of the parent or caregiver, neglect, emotional maltreatment and exposure to domestic violence or physical or sexual abuse are common reasons for children to be placed in foster care (Oswald et al., 2010; Swann & Sylvester, 2006). Children and adolescents who live in foster care are approximately eight times more at risk of a mental health diagnosis than the general population. Multiple foster home placements and the potential for abuse and neglect in the foster care system increase the likelihood of susceptibility to mental health problems in this population, with depression being the most common diagnosis (Dallaire et al., 2014). Genetics, persistent maltreatment, loss of parents or extended family members, stigma of living in foster care and the challenges involved in relationships with foster families are contributing factors to the increased prevalence of depression (Munson & McMillen, 2010; Pecora, 2010). The likelihood of drug abuse, academic and employment challenges and risky sexual behaviour by youth are among the long-term adverse outcomes of this depression (Munson & McMillen, 2010).

Placement in foster care does not necessarily have a negative impact on children. Some adolescents have found living in a foster home to be a positive experience and have been reluctant to return to their own families, because they were worried that past problems might recur (Johnson et al., 1995).

2.8 Oral Health Benefits for Children in BC

The Medical Services Plan (MSP) in British Columbia provides coverage primarily for medically required services provided by physicians. MSP covers only dental emergencies; for instance, a child with a life-threatening tooth abscess. Approximately one-third of Canadians and half of low-income families have no dental coverage, either by private insurance or public benefits (Medical Services Plan-British Columbia, 2017). Therefore, any needed general dental care must be funded out-of-pocket. First Nations and Inuit peoples receive up to \$600 yearly dental coverage for basic dental care, which includes diagnostic, preventive, restorative, endodontic, periodontic, and oral surgical procedures through Non-Insured Health Benefits (NIHB) and an additional \$100 through Pacific Blue Cross (PBC). Low-income children whose families receives MSP premium assistance in BC are funded up to \$1400 every two years for basic dental care by a government-funded program called Healthy Kids (Rowan-Legg, 2013). Foster children receive the same amount of coverage as Aboriginal and the low-income families through MCFD/Pacific Blue Cross (PBC) (Ministry of Children and Family Development, 2016). Children are entitled to receive an additional \$1,000 for general anesthesia in hospital or private facilities every two years through the Healthy Kids program (Ministry of Children and Family Development, 2016).

2.9 Support for Children and Women Affected by the Justice System

Many services are available through agencies and societies such as the Salvation Army, LINC (Long-Term Inmates Now in the Community), the John Howard Society and the Elizabeth Fry Society to support prisoners and their families in British Columbia (The Family Guide for Federal Corrections in BC, 2013).

2.9.1 The Elizabeth Fry Society

The Elizabeth Fry (EFry) Society established in Vancouver in 1993 was the first EFry in Canada. Its mission was the transformation of the conditions of women and girls in custody, and their children. Two-thirds of female inmates are parents and the vast majority are their children's sole caregivers (Elizabeth Fry of Greater Vancouver, 2017).

EFry offers more than twenty-four programs, including Blue Sky camps and the Saturday Club, to help children aged six to sixteen years of age to improve their leadership and problem-solving skills while building strong friendships. Mother-child bonds are also supported through the Storybook program in which the incarcerated mother's voice is recorded while reading a storybook, which is then sent to the child (Elizabeth Fry of Greater Vancouver, 2017). There are residential facilities available through EFry for women after they are released from jail. For example, Cynthia's Place supports homeless, single females. Firth Residence, located in Abbotsford, provides temporary housing and support services for single women with or without children. Other services are also available such as the Maida Duncan drop-in center in New Westminster that provides for basic needs, such as lunches, showers, laundry, free clothing and social activities. Similarly, the Surrey Cornerstone provides services, such as clothing and free Internet. The Pathway Program offers onsite advocacy, computer access and resources, clothing, healthy snacks, and social activities for at-risk women in the Surrey area. The Pat Ware Fund helps women find jobs by covering the costs for training and necessary equipment to aid clients in bettering their lives, (Elizabeth Fry of Greater Vancouver, 2017).

Currently, the society has 25 member associations across Canada that aim to help criminalized and marginalized women and girls achieve their full potential. EFry supports women involved in the justice system at all levels, from the at-risk to the incarcerated. It helps

them establish independent living after release. Many female inmates struggle with addiction and mental illness, and virtually all of them live below the poverty line. Some are also homeless.

Women convicted of non-violent transgressions in Canada do not have equal access to the counseling, educational opportunities and transitional housing options that are available to men. As the only gender-focused support organization for women, EFry aims to remedy this lack of services for women in the justice system (Elizabeth Fry of Greater Vancouver, 2017)

2.10 Knowledge Gap and Purpose

ACEs such as poverty, parental substance abuse and parental incarceration have negative influences on the physical and mental growth and development of children. Oral health is essential to overall health; as a result, any adverse changes in general health may compromise its maintenance. The EFry Society provides a variety of services to both women and children who have been affected by or are at risk of being affected by the justice system. Recently, in collaboration with the UBC Dental Hygiene Degree Program, a preventive dental program was established for women who receive services from EFry. There is a paucity of research that describes the oral health status and dental needs of children and youth who receive services from organizations such as EFry.

The purpose of this study was to explore and assess the oral health status of children and adolescents who receive services from EFry.

2.11 Objectives

For children and adolescents who receive services from EFry, the specific objectives of this study were:

- 1)** To document their oral-health related behaviours
- 2)** To assess and describe their current oral health status
- 3)** To explore the relationship between their characteristics, including oral health behaviours and their oral health status.

Chapter 3: Material and Methods

EFry approached the UBC Faculty of Dentistry to assist their organization in gaining a better understanding of the oral health status of the children and youth that they support through their programming. For our purposes, 174 ethnically diverse boys and girls between the ages of seven and sixteen who participated in EFry programs were potentially available for recruitment. These children live in a variety of settings including with the parent, with a relative or in foster care. EFry suggested that the study be conducted in conjunction with one of the EFry programs, the Blue Sky summer camps. This was done in order to facilitate participation, as children were already at the camps in the summer and thus would not need to be brought to other locations for the sake of this study.

3.1 Recruitment

Ethical approval for this study was attained in May 2015 from the University of British Columbia, Clinical Research Ethics Board [CREB]. A Participant Information and Consent form (Appendix A) along with the Adolescent Assent and Children Consent forms were developed for recruitment (Appendices B and C). These documents included details on the purpose of the study, confidentiality, and the risk and benefits of participation and terms of withdrawal. An opt-out consent, which is giving consent by not declining to give consent, had been proposed; however, the CREB rejected its use due to the vulnerability of our population. The Participant Information and Consent Form was sent to parents/legal guardians of the children along with a package that had been prepared by EFry, which contained the summer camp participation consent forms. Both parents and participants were required to sign the consent and the assent forms respectively in order to be included in the study. Signed consents were collected on

Mondays by the EFry staff when parents or family were dropping off children at the camps. We offered EFry help to obtain consent; however, EFry suggested that our presence and contact with families was not necessary. Further, they requested that we not be in attendance at drop-off time in order to protect the privacy of this sensitive and marginalized population.

3.2 Questionnaire

A questionnaire for collection of participant data, including demographic, medical history (medical conditions, medications and any known drug allergies), history of parental involvement in the criminal justice system, children's legal custody and people with whom children live, along with fourteen questions related to the child's dental and diet history, was prepared (Appendix D). Most of the questions related to oral health and diet were those used in the Canadian Health Measures Survey (CHMS) (Canadian Health Measures Survey, 2009). One added question, as per EFry's request, related to the number of schools the participants had attended in the past year; this was to see how moving frequently and changing schools might interact with other variables.

3.3 Intra-rater Reliability

In June 2015, three children were assessed in EFry's New Westminster office by the examiner (TBI) on a test basis. Data collection charts were modified afterwards for the purpose of efficiency and the children's comfort. Prior to the data collection in June 2015, TBI completed an intra-rater reliability test, weighted Cohen's Kappa, for both the oral hygiene and dental caries assessment. This involved viewing the image of 37 individual teeth as well as intraoral pictures of 12 teeth with different degrees of debris and gingival inflammation. These images were then coded for each tooth and gingival unit. The intra-rater reliability test was completed at two

different times with a difference of seven days. The Cohen's Kappa scores for gingival inflammation, plaque and caries were 0.810, 0.821 and 0.872 respectively.

3.4 Data Collection

A gift bag of a toothbrush, toothpaste, dental floss, a disposable hand mirror, sunglasses (for eye protection during dental screenings) and a sticker were prepared for each participant. The package was given to all the children attending the camp, including those not involved in the study.

EFry offered the free summer Blue Sky camp for four weeks during July 2015. Thirty-five children between the ages of seven and sixteen along with four counselors attended each week of camp. The dental "team" including a dentist (TBI), a dental hygienist and an assistant, collected all the data in the study. The team reviewed the socio-demographic questionnaire with the children. The children were then divided into three groups. The first and second group received either oral hygiene instructions or dental education from the dental hygienist while the dentist examiner was reviewing the health history and performing the clinical assessments on the third group. It was designed that way to increase efficiency as well as to alleviate any anxiety the children might have about the oral assessments. The dental education sessions were prepared in such a way that invited the children to actively participate in the activities and to have fun while learning and retaining the information. After the clinical examination, a letter was sent to the legal guardian if any conditions such as cavities, tooth abscess, severe malocclusion or other issues were identified that required further assessment and treatment (Appendix F).

A code was assigned to each participant and no identifying information was recorded on the data collection forms. A list of participant names and codes was developed and stored with all other collected data in a locked file cabinet at UBC and was accessible only to the principal

and co-investigator of this project. A digital copy of the data was stored on a password-protected encrypted computer.

3.4.1 Assessment of Dental Health Status

A dental mirror, a periodontal probe and a headlight were used in the clinical examination. The headlight was the standard Univet dental headlight. All examinations were performed in a designated area arranged by the EFry staff to increase efficiency as well as to protect children's privacy. Children were seated in a chair; the examiner either stood or sat in a chair to complete the examination. The assistant was seated close to the examiner, so the instructions and codes could be easily heard and the dentist could verify the data entry efficiently.

The clinical examination was conducted in a systematic manner, starting with recording of the number of teeth that were present followed by recording dmft/DMFT scores, oral hygiene and gingival inflammation assessment (Appendix E).

Two caries indices, dmft and DMFT (WHO, 1962) were used to assess dental status to measure prevalence and intensity of clinical caries of the population. A DMFT (D: decayed, M: missing, F: filling) tooth with a minimum score of zero and a maximum score of 32 was used for the permanent dentition and dmft (d: decayed, m: missing, f: filled) tooth with the minimum and maximum score of 0 and 20 respectively were used for the primary dentition. Clinical caries was defined as caries that could be diagnosed by dental examination using mouth mirror and a dental probe. Teeth considered sound and excluded from scoring were those with White and/or chalky spots; discolored or rough spots; and hard, stained pits or fissures in enamel that did not have a detectable softened cavity floor, undermined enamel or a breakdown in walls of the pit and fissure. In both dmft and DMFT indices, each tooth was counted only once. If the tooth was

filled and also had recurrent caries, it was considered as a carious tooth. Existing fissure sealants and preventive tooth-coloured resin-based material was also recorded to evaluate the extent of preventive treatment that had been received. The missing (m/M) code was used for teeth that had been extracted because of caries and when the participant was at an age when normal exfoliation would not be a sufficient explanation for a tooth absence.

Both the dmft and DMFT indices were calculated as the following:

- 1- Counting the total number of teeth with existing dental decay (d/D), missing (m/M) or filling (f/F).
- 2- Summing the numbers of recorded decayed, missing and filled teeth.
- 3- For children who have both primary and permanent teeth, the dmft and DMFT was recorded separately and the sum of dmft and DMFT was considered as the total dmft/DMFT score for that individual.
- 4- At the end, caries status was measured and reported as the following outcome:
 - Prevalence of clinical caries: Percent of children who have had at least one tooth affected (decayed, missing or filled) by dental caries.
 - The intensity of caries in order to find the number of affected teeth by individual (mean of DMFT or combination of dmft and DMFT).
 - Care index reported as percentage, which is a ratio of filled teeth to total decayed, missing and filled teeth to indicate the extent of the restorative treatment each individual has received. The score is between 0 and 1; the closer to 0, the higher the proportion of untreated teeth (Walsh, 1970).

3.4.2 Oral Hygiene (OH) Status

Oral hygiene was assessed through clinical examination by using the CHMS oral hygiene index. This index is based on Debris Index Simplified (DI-S), Calculus Index Simplified (CI-S) (Greene & Vermillion, 1964) and gingival index, Loe and Silness, 1963 (Loe & Silness, 1963) scoring systems.

3.4.2.1 Plaque and Calculus Indices

The CHMS indices were chosen as they include both debris and a calculus index, with a convenient four-point scoring system for both measurements. A head light, a hand mirror and a periodontal probe were used. The tip of the probe was placed perpendicular to the tooth surface and dragged along the surface of the tooth to observe if “piling up” of debris occurred. To obtain debris and calculus indices, each dental arch was divided into three segments; anterior, left and right posterior. The amount of plaque was recorded for buccal/labial surfaces of one tooth in each maxillary segment; buccal/lingual surface of one tooth in the mandibular anterior segment; and the lingual surfaces of two teeth in the posterior segment of the mandible, specifically the molars. Scores of 1- 4 were given to each tooth depending on the severity of the debris accumulation:

- 1- No debris or stain present
- 2- Soft debris covering less than 1/3 of the tooth surface or presence of extrinsic stains without other debris regardless of surface area covered
- 3- Soft debris covering more than 1/3 and less than 2/3 of the exposed tooth surface
- 4 –Soft debris covering more than 2/3 of the exposed tooth surface

A similar scoring system was used for calculus for both buccal/labial and lingual surfaces:

- 1- No calculus present
- 2- Supra gingival calculus covering less than 1/3 of the exposed tooth surface
- 3- Supragingival calculus covering more than 1/3 and less than 2/3 of the exposed tooth surface
- 4- Supra gingival calculus covering more than 2/3 of the exposed tooth surface or a continuous heavy band of subgingival calculus around the cervical portion of the tooth or both.

The debris scores were totaled and divided by the number of examined teeth to calculate debris index: $\text{Debris index} = (\text{buccal scores} + \text{lingual scores}) / \text{total number of examined teeth}$. The average of the individual scores were computed to obtain the group score, which is known as the simplified debris score. The same method was used to calculate the calculus index. Individuals who scored between 1 and 2 were considered to have mild debris or calculus. Those whose scores were between 2 and 3 and between 3 and 4 had moderate or severe debris and calculus respectively.

3.4.2.2 Gingival Index (GI)

We used the gingival index (GI) of Loe and Silness (1963) similar to the Canadian Health Measure Survey; however, gingival probing was excluded because it is usually not necessary for children. A total of six teeth, one in each sextant, was selected for the examination. The surface (distal/buccal/labial/mesial and lingual) with the most severe inflammation was recorded. Only fully erupted permanent teeth were scored. Corresponding

primary teeth were used if a permanent index tooth was missing. Scores between 1 and 4 were given to each tooth depending on the severity of the gingival inflammation:

- 1- No inflammation, bleeding or edema
- 2- Mild inflammation: slight change in color or slight edema
- 3- Moderate inflammation: redness, edema, or glazing
- 4- Severe inflammation: marked redness and edema, or ulceration

The mean of gingival inflammation was measured and reported for each individual as well as the group the same way the debris and calculus were calculated.

3.5 Data Analysis

The program SPSS version 24 was used for statistical analysis. Overall caries prevalence measured with dmft/DMFT-the dependent variable. To understand the current oral health of the children and adolescents, descriptive statistics such as mean, frequencies and standard deviation were used to describe participant variables and oral hygiene status including gingival inflammation, debris and calculus scores. The distribution of the outcome variable, dmft/DMFT did not approximate the normal distribution; therefore, non-parametric statistical tests were used. Bivariate analyses (Mann-Whitney U test, Kruskal-Wallis test and Kendall's correlation test) were used to test if there was any relationship between a participant's characteristics and the dependent variable. Statistical differences were considered significant only when the p-value was less than 0.05.

Chapter 4: Results

4.1 Descriptive Statistics

The descriptive statistics are presented in tables 1 to 5.

4.1.1 Demographic Characteristics

Out of possible 174 children and adolescents, ranging in age from 6 to 16 years (Mean \pm SD = 10 \pm 2) receiving services from EFry, 61 provided consent and were included in this study, making the response rate 35%. The assessment examinations were completed over four weekly sessions of the Blue Sky summer camp. Six more children were recruited through the Saturday Club at EFry in New Westminster in April 2016 (Table 1). Sociodemographic and medical information was gathered from the camp and Saturday Club registration forms completed by parents/guardians. The proportion of participants was relatively even between the genders.

Of the 67 participants, 92.5% reported their ethnicity. Caucasians (38.8%) and Aboriginals (23.9%) were the most common ethnic groups. The remaining participants (29.9%) identified as South Asian, Asian or African. They were grouped as “others” for the purpose of analysis. The majority of the participants (65.6%) had family members affected by the justice system. Fathers (22.4%) were slightly more than twice as likely to be affected as mothers (10.4%).

Approximately one-third (32.8%) of the children and adolescents were living with both parents, an equal number (32.8%) lived solely with their mother and 28.4% lived with foster parents. The remainder of the children specified that they were living with either their father or grandparents (Table 1). The MCFD had the legal guardianship of the majority of the children and adolescents who lived in foster care (Table 1).

Table 1 Participant Characteristics by Age, Sex, Ethnicity and Social History

	N	%
All	67	100
Age (years)		
6-11	53	79.1
12-19	14	20.9
Sex		
Female	34	50.7
Male	33	49.3
Ethnicity		
Caucasian	26	38.8
Aboriginal	16	23.9
South Asian	9	13.4
Asian	8	11.9
African	3	4.5
Unknown	5	7.5
History of family involvement in justice system		
No involvement	23	34.3
Father	15	22.4
Others (relatives)	14	20.9
Both Parents	8	11.9
Mother	7	10.4
Child's caretaker		
Both parents	22	32.8
Mother	22	32.8
Foster parents	19	28.4
Grandparents	3	4.5
Father	1	1.5
Legal custody		
Mother	23	34.3
Guardian (Ministry)	20	29.9
Both parents	17	25.4
Other	4	5.9
Foster parents	2	3.0
Father	1	1.5

4.1.2 Medical History

Of the participants, 62% declared that they had visited a family physician at least once in the last year. Nearly one third (30%) of the children and adolescents reported at least one medical condition (physical, behavioural or psychiatric); examples are Attention Deficit Hyperactivity Disorder (ADHD), asthma, depression and anxiety. More than one-fifth (22.5%) were taking medication on a regular basis.

4.1.3 Dental History

The majority of the participants 41/67 or 61.2 %, in this study had seen a dentist within the last year; 30/67 or 44.8% visited the dental office twice a year (Table 2). Four children stated that they had never been to the dentist. More than half the dental visits, 50.7%, were to receive treatment including fillings, extractions and orthodontics. Examinations and cleanings comprised 28.4% of the visits to dental offices. Only two children declared that they saw a dentist due to a toothache and 9/ 67, 13.4%, reported that they missed school due to a toothache. About half of the children reported a history of toothache or having difficulty eating hot, cold and sweet food.

The proportion of children who reported brushing their teeth twice a day or more was more than triple the proportion of children who were brushing only once a day: 76% compared to 22%. Just over half of the children and adolescents, 45/67, reported using products such as dental floss, mouthwash or both to take care of their teeth; however, over one third of the participants 24/67 had not used any other products except a toothbrush and toothpaste.

Of the 67 participants, 35.8 % or 24, reported eating snacks once or twice a day while 23.9 % or 16 of the participants reported they ate snacks three or more times a day. The remaining children could not remember.

More than half of the children and adolescents, 39/67 or 58.2%, stayed in one school over the last year, 17/67 or 25.4%, had been in two different schools in the last year and 11/67 or 16.4% had been in more than two schools (Table 2).

Table 2 Self-reported Dental History

	N	%
All	67	100
Have you ever been to a dentist?		
Yes	63	94.0
No	4	6.0
Time since the last dental visit		
In the last year	41	61.2
More than a year ago	14	20.9
Do not know or remember	12	17.9
Frequency of dental visit		
Once/year	16	23.9
Twice/year	30	44.8
When there is a problem	8	11.9
Do not know or remember	13	19.4
Reasons for dental visits		
Check-ups	19	28.4
Dental treatment	34	50.7
Toothache	2	3.0
Do not know or remember	12	17.9
History of a toothache in the last year		
Yes	34	50.7
No	30	44.8
Do not know or remember	3	4.5
	N	%
Difficulty eating hot, cold and sweet food		
Yes	33	49.3
No	33	49.3
Do not know or remember	1	1.5
Missed school due to toothache		
Yes	9	13.4
No	53	79.1
Do not know or remember	5	7.5

Table 2. Continued

	N	%
All	67	100
History of chipped tooth		
Yes	23	34.3
No	43	64.2
Do not know or remember	1	1.5
Brushing frequency		
Once/day	15	22.4
Twice/day	36	53.7
>2 times/day	15	22.4
Do not know or remember	1	1.5
Snack frequency		
1-2 times/day	24	35.8
≥3 times/day	16	23.9
Do not know or remember	27	40.3
Number of changed schools in the past year		
Stayed in the same school	39	58.2
One	17	25.4
Two to six	11	16.4

4.1.4 Oral Hygiene Status

The CHMS has reported the oral hygiene status for participants above the age of twenty years, without breaking it into age groups. That is the reason why in this study we did not break the results of oral hygiene status in age groups (Table 3); however, we did break the dmft/DMFT into age groups. Of all participants, 20.9% and 74.6% had mild or moderate gingival inflammation, respectively. Most children and adolescents in this study (68.6%) had mild debris. Calculus was not detected in the majority of the participants (86.4%); however, mild calculus was observed in 13.6 % of the examined individuals.

Table 3 Oral Hygiene Status of Children and Adolescents

	N	%	Mean ±SD
All	67	100	
Gingival inflammation			2.0± 0.3
No	3	4.5	
Mild	14	20.9	
Moderate	50	74.6	
Severe	0	0	
Plaque			1.7 ± 0.3
No	2	3	
Mild	46	68.8	
Moderate	19	28.4	
Severe	0	0	
Calculus			1.0 ± 0.1
No	58	86.4	
Mild	9	13.6	
Moderate	0	0	
Severe	0	0	

4.1.5 Prevalence and Intensity of Caries

The overall mean dmft/DMFT for all of our participants was 3.64 with 78% having at least one decayed, missing or filled primary or permanent tooth. Prevalence and intensity of dental caries for both primary and permanent dentitions are shown in Table 4. Our sample is reported for the same age groups as used in the CHMS report. The majority of our participants had caries experience: 79.2% in the 6 to 11 age group and 71.4% in the 12 to 19 age group. The mean DMFT/dmft score for the above age groups was 3.86 and 3.42 respectively.

Table 4 Dental Status of Participants with Mixed Dentition

Age Groups (N)	Caries prevalence	Caries intensity (number of teeth in mixed dentition with caries experience) Mean \pm SD				Care index
	dmft+DMFT>0 (%)	dt+DT*	mt+MT*	ft+FT*	dmft+DMFT*	
6-11 (53)	79.2	0.5 \pm 1.2	0.5 \pm 1.1	2.8 \pm 2.8	3.9 \pm 3.2	0.7
12-19 (14)	71.4	0.1 \pm 0.3	0.4 \pm 1.3	2.9 \pm 3.1	3.4 \pm 3.4	

* “dt/DT”-decayed teeth, “mt/MT”-missing teeth, “ft/FT- filled teeth, “dmft/DMFT”-decayed, missing and filled teeth#

Prevalence and intensity of dental caries, i.e., DMFT for the permanent dentition are illustrated in Table 5. Less than half (41.9%) of the 6 to 11 group and more than one half (64.2%) of the adolescents in this study had caries experience in the permanent dentition. The mean DMFT for the age groups 6 to 11 and 12 to 19 was 0.9 and 2.1, respectively.

Table 5 Dental Status of Participants with Permanent Dentition

Age Groups (N)	Caries prevalence	Caries intensity (number of teeth in permanent dentition with caries experience) Mean± SD				Care index
	DMFT >0 (%)	DT*	MT*	FT*	DMFT*	
6-11 (53)	41.9	0.0 ± 0.1	0.2 ± 0.8	0.7 ± 1.1	0.9 ± 1.4	0.8
12-19 (14)	64.2	0.1 ± 0.3	0.3 ± 1.3	1.7 ± 2.9	2.1 ± 3.4	

* “DT”-decayed teeth, “MT”-missing teeth, “FT- filled teeth, “DMFT”-decayed, missing and filled teeth

4.2 Bivariate Analyses

The results of the bivariate analyses are presented in Table 6. No statistically significant relationships were found between oral health status and any of the study variables. The mean dmft/DMFT of children who changed school in the last year was higher than the participants that stayed in the same school, but differences were not statistically significant.

Table 6 Dental Health Status with Regard to Study Variables

Study Variables (N)	Dental Health Status	P-Value
	dmft+ DMFT (Mean± SD)	
Gender¹		0.934
Male (33)	3.7 ± 3.1	
Female (34)	3.8 ± 3.4	
Age³		0.608
6-11	3.8 ± 3.2	
12-19	3.4 ± 3.4	
History of family involvement in justice system¹		0.942
Yes (44)	3.8 ± 3.2	
No (23)	3.7 ± 3.3	
People whom child lives with¹		0.866
Family members/Relatives (48)	3.8 ± 3.2	
Foster (19)	3.7 ± 3.5	
Ethnicity²		0.946
Caucasian (26)	3.8 ± 3.2	
Aboriginal (16)	3.6 ± 3.3	
Others (20)	4.0 ± 3.3	
Missing (5)		
Frequency of dental visits²		0.855
Once/year (16)	4.0 ± 3.3	
Twice/year (30)	3.7 ± 3.3	
Do not remember (21)	3.5 ± 3.4	
History of a toothache in the last year¹		0.990
Yes (34)	3.7 ± 3.3	
No/do not remember (33)	3.7 ± 3.2	
Brushing frequency²		0.547
Once/ day (15)	3.4 ± 3.6	
≥Twice/ day (51)	3.2 ± 3.2	
Missing (1)		
Snacks frequency²		0.989
1-2 times/ day (24)	3.6 ± 3.0	
> 3 times/ day (16)	3.8 ± 3.5	
Do not know or remember (27)	3.8 ± 3.5	
Number of changed schools in the past year¹		0.209
Stayed in the same school (39)	3.3 ± 3.0	
One or > one (28)	4.3 ± 3.5	

¹-Mann-Whitney U Test, ² Kruskal-Wallis Test, ³ Kendall's Correlation Test

4.3 Preventive Dental Behaviour

Of the 6 to 11 year olds, 19% had had a fissure sealant on their first permanent molars and of the 12 to 19 year olds, 35% had received sealants.

Chapter 5: Discussion

This pilot study was undertaken at the request of the EFry Society of Greater Vancouver so that they could better understand the oral health status and potential needs of the children and adolescents for whom they provide services. Overall, we found that the majority of our participants had received definitive dental treatment such as restorations and extractions; however, fewer children had received the benefit of a preventive treatment like pit and fissure sealants.

We found that Caucasians and Aboriginals were the most prevalent ethnic groups among the participants, followed by South Asians, Asians and Africans. The distribution of our sample differed from the overall ethnic make-up of the Greater Vancouver population in which Caucasians and Asians are the most prevalent ethnic groups (Statistics Canada, 2016). This difference likely reflects the fact that Aboriginal people are overrepresented in prison in the Canadian justice system (LaPraire, 2002; Rudin, 2006). Most of the Aboriginal children in our sample had a social history of family members affected by the justice system.

About two-thirds of children and adolescents in our sample had a history of family involvement with the justice system, one of the acknowledged ACEs. Children with a history of ACE are at a higher risk of poor health conditions such as depression, anxiety and antisocial behaviour (Dallaire et al., 2014), poor school performance and increased socioeconomic strain (Nichols & Loper, 2012). Similar to previous studies, almost all the children who were diagnosed with either depression or anxiety in our study were those who had history of family involvement in the justice system (Dallaire et al., 2014).

About one-third of the participants lived in foster homes, a situation which could be explained by a number of conditions including: parental involvement in the criminal justice

system (Swann & Sylvester, 2006), parental substance abuse and poverty or neglect (Oswald et al., 2010). The likelihood of mental illness such as depression is eight times higher in children and adolescents who live in foster homes compared to the general population (Dallaire et al., 2014). Further, children in foster care are at higher risk of drug abuse and poor school performance due to depression (Dallaire et al., 2014). One half of our participants living in foster care were suffering from either depression or Attention Deficient Hyperactivity Disorder (ADHD).

Depression and anxiety were mental health concerns reported by some of our participants. These results echo those of previous reports (Lee et al., 2013) in which incarceration had a negative impact on children's mental health. About 15% of Canadian children and adolescents are diagnosed with mental illnesses at any given time, with anxiety being the most prevalent (Upshal, 2009). Given our small sample size, we cannot conclude that the prevalence of mental illness reported by our participants is above and beyond that of other Canadian children.

The majority of the participants who changed schools at least once over the last year had a history of family involvement with the justice system. A recent systematic review revealed that residential mobility can have a negative impact on children and adolescent health and wellbeing including levels of behavioural and emotional issues, adolescent depression and reduced continuity of health care (Jelleyman, T, Spencer, 2008). A small proportion of our children who changed schools over the last year reported depression and anxiety. The mean dmft/DMFT of children who changed school in the last year was also higher than the participants that stayed in the same school, but differences were not statistically significant.

The majority of the participants had visited a dental office at least once a year. The children reported that the dental visits were predominately for treatment such as dental fillings and extractions. Approximately one third of the visits to dental offices were reported by the children to be for examinations and cleanings. Given the young age of our subjects, this recall of dental treatment may be subject to reporting bias. Even though all the data collected was based on self-reporting, it suggests that basic dental care was accessible. Dental benefits available to children through government-funded programs such as Healthy Kids, NIHB for Aboriginal children and funding from the MCFD for individuals who are in foster care may decrease the financial barriers to access (Ministry of Children and Family Development, 2016). However, other non-financial barriers such as beliefs and attitudes about dental care among parents and foster parents may have prevented some of the children from receiving preventive care, for example fissure sealants (Bellettiere et al., 2017).

At least three quarters of participants in this study reported brushing at least twice a day with fluoridated toothpaste. This positive finding suggests that the majority of children have the knowledge of expected home oral hygiene care. Brushing frequency is associated with caries prevalence (Tinanoff, 2017) and brushing once or twice a day is sufficient to maintain gingival health (de Freitas et al., 2016). More than half of the participants reported using other hygiene products such as dental floss and mouth rinse. Flossing in addition to tooth brushing can reduce biofilm accumulation, which enhances gingival health (Ciancio, 2003). Regular supervised use of fluoride mouth rinse by children and adolescent has been associated with caries reduction in the permanent dentition (Marinho et al., 2016). However, the cost of regular use of fluoride mouth rinse was likely prohibitive for some of our families.

The frequency of consuming sugar-containing beverages and foods has a positive correlation with prevalence of dental caries (Punitha et al., 2015). About one quarter of the children reported that they snacked three or more than three times a day between meals. The reported types of foods comprised both “healthy snacks”, such as vegetables, and other snacks, such as chocolate bars, cookies and chips. The frequency of snacking and the types of consumed snacks by the children in this study was likely similar to the general population, and this was an expected finding. Families with low socioeconomic status are often not able to afford healthy foods such as fresh meat, chicken or fish (protein) and fruits and vegetables and instead are more prone to consume less costly processed, high-sugar and carbohydrate-rich food (da Fonseca, 2012). However, our children self-reported that they were actually consuming fresh fruit, vegetables and meat to some extent, along with the expected “junk food” such as cookies, chocolate bars and chips. Most likely, children in our study are consuming a diet similar to that of the children of the general population. We did not have sufficient data to conclude otherwise, but given the residential mobility reported by some of the children (Cutts et al., 2011) and their life in foster care (Ehrle & Green, 2002) some of our children may have the possibility of experiencing food insecurity.

One of the main concerns indicated by EFry was that over time they saw “sweaters” on the teeth of the children, indicating potentially heavy biofilm. Most participants had mild plaque deposits, which is relatively “normal” for school age children (Albandar & Tinoco, 2002). While the plaque levels were low, moderate gingival inflammation was observed in about three quarters of our participants, a situation most often related to insufficient and ineffective tooth brushing (de Freitas et al., 2016). Dental biofilm is the primary cause of gingival inflammation (Mariotti, 1999). Prevalence of gingivitis may exceed 90% in children and adolescents between the age of

eight and seventeen years (Jenkins & Papapanou, 2001). Based on this data, the prevalence of gingivitis in this sample is similar to that of the children of the general population. The discrepancy between the quantity of plaque and severity of gingivitis in our study might be due to the timing of the clinical examinations, which were scheduled after the participants had their breakfast and brushed their teeth. Furthermore, the frequency of brushing was also reflective of the established routine in the summer camp, which again might have resulted in a reduction in the amount of recorded dental plaque. However, since most of the examinations took place on the second day of camp, the discrepancy could also be due to inaccurate self-reporting of brushing frequency in general. Brushing before the screening would have reduced the amount of biofilm, but would have not allowed enough time for any inflammation to have subsided if less than adequate tooth brushing was occurring at home before camp. The discrepancy between the amount of plaque deposits and extent of gingivitis in teenage years may also be related to hormonal influences (Jenkins & Papapanou, 2001).

Pit and fissure sealants are recommended for caries prevention of occlusal surfaces of permanent molars (Ahovuo-Saloranta & Forss, 2013). The frequency of fissure sealants in the CHMS report was almost doubled that of the participants examined in our study. We did not do any statistical comparisons between our data and that of CHMS, as the sample sizes were significantly different. This low prevalence of fissure sealants in EFry children was most likely due to limited dental coverage and can hopefully be increased by the UBC hygiene program.

Exposure to fluoride, micro-flora and diet are among the main biological factors contributing to dental caries. ACEs such as parental incarceration, parental separation and low socioeconomic status have also been reported to be associated with increased prevalence of dental caries in children (Bright et al., 2014). The participants in our study, who we believe to be

representative of the children who receive services from EFry, experience some of these ACEs. Caries prevalence of both dentitions in children and adolescents examined in our study was slightly higher compared to the participants in the CHMS (79.1% and 64.2% for children and adolescents respectively), but given the differences in sample size between the CHMS and our study, no valid comparisons can be drawn. Our reported care indices for both primary and permanent dentitions indicate the major contribution that filled teeth make to our reported dmft/DMFT. This positive finding shows that these children do not have outstanding treatment needs and instead have received timely dental treatment done. The timely treatment for some of the children could be due to their being under the care of the Ministry, being eligible for dental funding not accessible to other children and/or living with parents or other caregivers who valued oral health. The children's various "pathways" to dental care were not explored in this study, but could be an area of interest in future studies.

Overall, the dental health of children who volunteered to participate seemed satisfactory. They had knowledge of oral home care, brushed their teeth regularly and had access to dental care. One can speculate that our participants were most likely used to regular dental visits and may have had no hesitancy about volunteering for our research. We know nothing about the dental experience of the children whose parents declined to participate. It may be that the non-participants from the Blue Sky camp had higher treatment needs or more dental fears. Their parents or caregivers may have had similar dental fears or were concerned of running afoul of the Ministry if their children were found to have need extensive dental treatment.

5.1 Limitations

This pilot study is the first in British Columbia to explore the oral health status of children whose oral health may have been influenced by parental incarceration. At the study's outset, the sample size was anticipated to be close to 200; however, the ultimate sample was much smaller due to the challenges of recruitment and getting parental consent. The sample size in this study was too small to conduct any statistical tests other than bivariate analysis.

Some reasons that have been suggested for parental refusal for their children's participation in research studies include inability to understand the consent forms and inability to understand the research objectives (Hawes, 1989). Parents who refuse to give consent are more likely either single parents or parents who are disadvantaged socioeconomically (Fletcher & Hunter, 2002). Based on EFry's report and supported by the literature, parents also avoided providing consent for screening because they were afraid to lose custody of their children if dental negligence were suspected (Devoe & Smith, 2017). In this context, our volunteer sample is likely biased, thus the results cannot be generalized (Boughner, 2017). The "research team" was recommended by EFry not to be present at the campsite on the Mondays when parents would drop off their children. Our absence protected the privacy and identity of the families; however being able to be more involved in the recruitment process so that questions and concerns about the research could be addressed might have improved our sample size (Boughner, 2017). The inability to conduct adequate intra-rater reliability testing in the field with a few of our participants was another limitation of this study.

5.2 Significance

Access for research involving any marginalized groups of children and youth is not easy, since gatekeepers usually protect such a population. This situation may help explain why little is known about the oral health of children and youth who have experienced ACE.

In our study, we could only see those children whose parents provided consent, and they were most likely used to seeing the dentist and receiving dental treatment. We failed to see those children who might have greater dental-treatment needs. Our experience highlights the mistrust that parents of this population may have for health care providers. As a result of our study, it is hoped that parents who participated may relay their experience to those who did not allow their children to participate and help alleviate some of their fears so that participation in a dental screening or oral health project may improve in the future.

As a result of this study, a preventive oral care program that provides dental exams, oral hygiene education, cleanings and pit and fissure sealants has been established for the EFry to help meet the identified oral health needs of the children and adolescents that they serve.

Chapter 6: Conclusion

Little is known about the oral health status of Canadian children who are impacted by ACE and in particular those who are affected by the criminal justice system. The participants in this study had reasonable access to dental care and have received dental rehabilitative care; however, there was a need for more preventive care, primarily fissure sealants. The participants also appeared to have reasonable knowledge of oral home care including regular tooth brushing and non-cariogenic snacking. However, there is still room, as there is for all children, to improve preventive measures such as tooth-brushing efficiency, diet counseling and fissure sealant placement. No relationships were found between the measured variables and the oral health status; however, this could be due to the small sample size.

6.1 Future Recommendations

Provision of preventive measures such as fissure sealants, for the participants of this study and for those children who receive services from EFry, is a recommendation of this study. Establishment of dental homes for those who do not see a dentist for regular check-ups is also a future recommendation. In future studies, it would be beneficial for the research team to meet with parents or legal guardians of children and adolescents in person to explain the study. Educational sessions to enhance children's and their parent or caregiver's oral-health-related knowledge should also be established.

The EFry camps are held every year; it would be beneficial for similar oral screenings to take place on an annual basis for attending children. These camps can also provide an opportunity to hold educational sessions about dental health for parents/caregivers and children.

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Appendix A: Participant Assent form



UBC DENTISTRY



DEPARTMENT OF ORAL BIOLOGICAL AND MEDICAL SCIENCES

PARTICIPANT ASSENT FORM **Title of Study** **The Oral Health of Children Study**

Invitation

I am being invited to be part of a research study. A research study tries to find better treatments to help children like me. It is up to me if I want to be in this study. No one will make me be part of the study. Even if I agree now to be part of the study, I can change my mind later. No one will be mad at me if I choose not to be part of this study.

Why Are We Doing This Study?

This study is trying to find out about the health of children's mouths so that scientists and the Elizabeth Fry Society of Greater Vancouver can make programs to help children have healthy teeth and gums.

What Will Happen in This Study?

If I choose to be in the study, I will come to the communal hall at the Justkids Blue Sky camp to see the doctors for 15 minutes. At this visit a Dentist will look at my teeth, gums and plaque and ask me some questions about my teeth and how I take care of them. After the check-up, I will then take part in a 15 minute group or private lesson on how to take care of my teeth and gums.

Who Is Doing This Study?

Dr. Leeann Donnelly and other doctors from the University of British Columbia will be doing this study. They will answer any questions I have about the study. I can also call them at **604 822-5064**, if I am having any problems or if there is an emergency and I cannot talk to my parents.

Can Anything Bad Happen to Me?

There is nothing in the study itself that should cause anything bad to happen to me.

What Should I Do If I Am Not Feeling Well?

If I feel sick or if I notice any strange or bad feelings during the study, especially if they are unexpected or severe, I will let the Dentist know right away.

Could I Get Better By Being in the Study?

No one knows whether or not I will benefit from this study. The study doctors hope that the information learned from this study can be used in the future to benefit other children people who attend programs at the Elizabeth Fry Society of Greater Vancouver.

Version 2: The Oral Health of Children

May 20, 2015

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Study Title: The Oral Health of Children

Who Will Know I Am in the Study?

Only my doctors and people who are involved in the study will know I am in it. When the study is finished, the doctors will write a report about what was learned. This report will not say my name or that I was in the study. My parents and I do not have to tell anyone I am in the study if we don't want to.

When Do I Have To Decide?

I have as much time as I want to decide to be part of the study. I have also been asked to discuss my decision with my parents.

Signatures:

If I put my name at the end of this form, it means that I agree to be in the study.

Participant's Signature

Printed name

Date

Appendix B: Adolescent Assent Form



UBC DENTISTRY



DEPARTMENT OF ORAL BIOLOGICAL AND MEDICAL SCIENCES

Adolescent Information and Assent Form

Title of Study

The Oral Health of Children Study

WHO IS IN CHARGE OF THE STUDY?

The doctor in charge of the study is Leeann Donnelly. She is being helped by Dr. Tila Bahri. They will answer any questions I have about the study. If I am having an emergency and cannot talk to my parents or legal guardians, or if I am having any problems, I can call them at ~~604-822-5069~~ for help.

INVITATION

I am being invited to take part in this research study because I am attending the Justkids Blue Sky Camp. The following pages explain the study so that I can decide if I want to take part or not. It is up to me if I want to be in this study. No one will make me be part of the study and no one will get mad at me if I don't want to be a part of this study.

DO I HAVE TO BE IN THIS STUDY?

I do not have to participate in this study if I don't want to. If I choose to participate, I can stop being in it at any time. The doctors and nurses will take care of me as they have in the past, regardless of whether I am in the study or not.

If I want to participate in this study, I will be asked to sign this form. My parent/guardian will need to provide consent before I am enrolled in the study; but I do not have to participate even if they sign the consent form. The researchers will not enrol me into the study unless I agree to do so.

I should take time to read the following information carefully and to talk it over with my family, and if I wish, my doctor, before I decide. I understand that I should feel free to talk to the study doctors if anything below is not clear. I can choose to be in the study, not be in the study, or take more time to decide. Even if I agree now to be part of the study, I can change my mind later. I can ask the study doctor or study coordinator any questions I may have at any time during my study participation.

WHY ARE WE DOING THIS STUDY?

The Elizabeth Fry Society of Greater Vancouver (EFry) and UBC Dentistry offer a weekly preventive dental hygiene program for women to help them take care of their teeth. The EFry wants to know more about the oral health needs of the children and adolescents who they provide service to. This study is being done to assess the oral health status and contributing factors of children and adolescents who receive services from the EFry so that appropriate oral health programs can be developed as needed.

WHY ARE YOU INVITING ME TO BE IN THIS STUDY?

I am being invited to be in the study because I am one of the 200 kids who go to the Justkids programs at EFry and by knowing the health of my mouth may help the doctors and EFry to design oral health programs that might help me and others who go to the JustKids programs.

WHAT WILL HAPPEN TO ME IN THIS STUDY?

If I choose to be in the study, I will come to the communal hall at the Justkids Blue Sky camp to see the doctors for 15 minutes. At this visit a Dentist will look at my teeth, gums and plaque and ask me some questions about my teeth and how I take care of them. After the check-up, I will then take part in a 15 minute group or private lesson on how to take care of my teeth and gums.

CAN ANYTHING BAD HAPPEN?

There is nothing in the study itself that should cause anything bad to happen to me.

If I feel sick or if I notice any strange or bad feelings during the study, especially if they are unexpected or severe, I will let the Dentist know right away.

CAN I GET BETTER BY BEING IN THE STUDY?

No one knows whether or not I will benefit from this study. I may feel worse from participating in this study. The study doctors hope that the information learned from this study can be used in the future to benefit other people who attend programs at EFry.

WHO WILL KNOW I AM IN THIS STUDY?

My privacy will be respected. Unless I allow them to, the study team will not tell anybody else I am or have been a part of this study. They will not release any information to anybody else that could be used to identify me, unless they are required to do so by law. For example, researchers are required to report if a participant is believed to be at risk for harming him/herself or others.

In order to protect my privacy, the study team will remove any information that may be used to identify me from any study documents, and instead of my name appearing on them, I will be identified by a specific study code number that applies only to me. Only this code number will be used on any research-related information collected about me for this study, so that my identity as part of the study will be kept completely private. Only Dr. Leeann Donnelly and Dr. Tila Bahri will have the ability to link this code number with my personal information, and the linking information will be kept in a locked cabinet [REDACTED] at UBC under the supervision and control of [REDACTED].

WHAT WILL THE STUDY COST ME?

There are no costs for participating in this study and I will not be paid for participating. I will receive free dental products to help me take care of my teeth.

WHO DO I CONTACT IF I HAVE QUESTIONS ABOUT THE STUDY DURING MY PARTICIPATION?

If I have any questions or desire further information about this study before or during participation, or if I experience any side effects that were not outlined in this assent form, I can contact Dr. Leeann Donnelly at [REDACTED].

WHO DO I CONTACT IF I HAVE ANY QUESTIONS OR CONCERNS ABOUT MY RIGHTS AS A PARTICIPANT?

If I have any concerns or complaints about my rights as a research participant and/or my experiences while participating in this study, I should contact the Research Participant Complaint Line in the University of British Columbia Office of Research Ethics at [REDACTED] (604-681-2200).

FUTURE STUDIES

There is a chance that during or after this study the study team will find other questions needing answers that require future studies. If I am willing to hear about these future studies I will mark the "yes" box. This does not mean that I will have to take part in a new study, just that the study team will let me know about it. If I do not want to be contacted about new studies I will mark the "no" box."

Are you willing to be contacted by the researchers for future studies?

YES

Study Title: The Oral Health of Children

ASSENT TO PARTICIPATE

SIGNATURE

Participant Assent

My signature on this assent form means:

- *I have read and understood this adolescent information and assent form.*
- *I have had enough time to consider the information provided and to ask for advice if necessary.*
- *I have had the opportunity to ask questions and have had acceptable answers to my questions.*
- *I understand that all of the information collected will be kept confidential and that the results will only be used for scientific objectives.*
- *I understand that my participation in this study is voluntary and that I am completely free to refuse to participate or to withdraw from this study at any time without changing the quality of care that I receive.*
- *I understand that I can continue to ask questions, at any time, regarding my participation in the study.*
- *I understand that if I put my name at the end of this form, it means that I agree to be in this study.*

I will receive a signed copy of this assent form for my own records.

I agree to participate in this study.

Participant's Signature

Printed name

Date

Appendix C: Children's Consent form:



UBC DENTISTRY

DEPARTMENT OF ORAL BIOLOGICAL AND MEDICAL SCIENCES

PARTICIPANT INFORMATION AND CONSENT FORM Assessing the Oral Health Status of Children Who Receive Services from the Elizabeth Fry Society of Greater Vancouver

WHO IS CONDUCTING THE STUDY

Principal Investigator: Dr. Leeann Donnelly, Assistant Professor, [REDACTED]

Co-Investigator: Dr. Tila Bahri, [REDACTED]

Co-investigator: Shawn Bayes, [REDACTED]

If you are a parent or legal guardian of a child who may take part in this study, permission from you and the assent (agreement) of your child may be required. When we say "you" or "your" in this consent form, we mean you and/or your child; "we" means the doctors and other staff.

1. THE INVITATION

You and your child are being invited to take part in this research study conducted by the University of British Columbia because your child is attending the Justkids Blue Sky Camp organized by the Elizabeth Fry Society of Greater Vancouver (EFry).

2. YOUR PARTICIPATION IS VOLUNTARY

Participation is entirely voluntary. Before you decide, it is important for you to understand what the research involves. This consent form will tell you about the study, why the research is being done, what will happen to you during the study and the possible benefits, risks and discomforts. If you decide to participate, you or the child may still choose to withdraw from the study at any time without any negative consequences to the medical care, education, or other services to which you are entitled or are presently receiving from the EFry.

If you wish to participate, please sign on Page 5. You do not have to provide any reason for your decision not to participate. You are still free to withdraw your child at any time without giving any reasons for your decision by contacting the Principal Investigator

Please take time to read the following information carefully and to discuss it with your child, family, friends, and doctor/dentist before you decide.

Version 2 Assessing the Oral Health Status of Children Who Receive Services from the Elizabeth Fry Society of Greater Vancouver: May 20, 2015 Page 1 of 6

3. BACKGROUND

The EFry and UBC Dentistry currently offer a weekly preventive dental hygiene program for women. The EFry has expressed interest in better understanding the oral health needs of the children who they provide service to. This study is being done to assess the oral health status and contributing factors of children and adolescents who receive services from the EFry so that appropriate oral health strategies can be developed as needed.

4. WHAT IS THE PURPOSE OF THE STUDY?

The purpose of this study is to assess oral health status and behaviors of children and adolescents who are receiving services from the EFry.

5. WHO CAN PARTICIPATE IN THE STUDY?

Children and adolescents attending the Justkids Blue Sky Camp hosted by the EFry can participate in this study.

6. WHAT DOES THE STUDY INVOLVE?

This study will take place at the Justkids Blue Sky Camp. A total of approximately 200 children from the five different camp weeks will be enrolled for the entire study. The amount of time that you will give to this study is approximately 15 minutes.

The procedures and visits will include the following:

- A review of your medical history and background information from the camp registration form.
- You will be asked oral health related questions
- A visual dental exam to check teeth, gums and plaque
- Interactive group oral hygiene session (brushing, flossing, rinsing)

The collected information will remain confidential and will be used for research and service planning purposes only. Any dental conditions that might need follow-up will be brought to your attention and a list of dental providers will be made available to you if you need one.

7. WHAT ARE THE POSSIBLE HARMS AND DISCOMFORTS?

There are no risks or harms expected other than that typically experienced during a regular dental examination.

8. WHAT ARE THE BENEFITS OF PARTICIPATING IN THIS STUDY?

No one knows whether or not you will benefit from this study. There may or may not be direct benefits to you from taking part in this study.

We hope that the information learned from this study can be used in the future to benefit other people in a similar situation.

9. WHAT HAPPENS IF I DECIDE TO WITHDRAW MY CONSENT TO PARTICIPATE?

You may withdraw from this study at any time without giving reasons. If you choose to enter the study and then decide to withdraw at a later time, you have the right to request the withdrawal of your information collected during the study. This request will be respected to the extent possible. Please note however that there may be exceptions where the data will not be able to be withdrawn for example where the data is no longer identifiable (meaning it cannot be linked in any way back to your identity) or where the data has been merged with other data. If you would like to request the withdrawal of your data, please let your study doctor know.

10. HOW WILL MY TAKING PART IN THIS STUDY BE KEPT CONFIDENTIAL?

Your confidentiality will be respected. However, research records and health or other source records identifying you may be inspected in the presence of the Investigator or his or her designate and by representatives of UBC Clinical Research Ethics Board for the purpose of monitoring the research. No information or records that disclose your identity will be published without your consent, nor will any information or records that disclose your identity be removed or released without your consent unless required by law. Only limited confidentiality can be offered in the interactive group oral health session, as participants are publically identifying themselves as a research participant.

You will be assigned a unique study number as a participant in this study. This number will not include any personal information that could identify you (e.g., it will not include your Personal Health Number, SIN, or your initials, etc.). Only this number will be used on any research-related information collected about you during the course of this study, so that your identity will be kept confidential. Information that contains your identity will remain only with the Principal Investigator and/or designate. The list that matches your name to the unique study number that is used on your research-related information will not be removed or released without your consent unless required by law.

Your rights to privacy are legally protected by federal and provincial laws that require safeguards to insure that your privacy is respected. You also have the legal right of access to the information about you that has been provided to the sponsor and, if need be, an opportunity to correct any errors in this information. Further details about these laws are available on request to your study doctor.

11. WHAT HAPPENS IF SOMETHING GOES WRONG?

By signing this form, you do not give up any of your legal rights and you do not release the study doctor, participating institutions, or anyone else from their legal and professional duties. If you become ill or physically injured as a result of participation in this study, medical treatment will be provided at no additional cost to you. The costs of your medical treatment will be paid by your provincial medical plan.

12. WHAT WILL THE STUDY COST ME?

There are no costs for participating in this study and you will not be paid for your participation.

13. WHO DO I CONTACT IF I HAVE QUESTIONS ABOUT THE STUDY DURING MY PARTICIPATION?

If you have any questions or would like further information about this study before or during participation, you can contact, the Principal Investigator, B [REDACTED]

14. WHO DO I CONTACT IF I HAVE ANY QUESTIONS OR CONCERNS ABOUT MY RIGHTS AS A SUBJECT DURING THE STUDY?

If you have any concerns or complaints about your rights as a research participant and/or your experiences while participating in this study, contact the Research Participant Complaint Line in the University of British Columbia Office of Research Ethics by e-mail at [REDACTED] or by phone [REDACTED].

STUDY TITLE: Assessing the Oral Health Status of Children Who Receive Services from the Elizabeth Fry Society of Greater Vancouver

15. PARTICIPANT CONSENT

- I have read and understood the information in this consent form.
- I have had enough time to think about the information provided.
- I have been able to ask for advice if needed
- I have been able to ask questions and have had satisfactory responses to my questions.
- I understand that all of the information collected will be kept confidential and that the result will only be used for scientific purposes.
- I understand that my participation in this study is voluntary.
- I understand that I am completely free at any time to refuse to participate or to withdraw from this study at any time, and that this will not change the quality of care or services that I receive.
- I authorize access to my health records as described in this consent form.
- I understand that I am not waiving any of my legal rights as a result of consenting to have my child participate.
- I understand that there is no guarantee that this study will provide any benefits to me or my child.
- I have read this form and I am giving consent to my child's participation by signing this form.

The parent(s)/guardian(s)/substitute decision-maker (legally authorized representative) and the investigator are satisfied that the information contained in this consent form was explained to the child/participant to the extent that he/she is able to understand it, that all questions have been answered, and that the child/participant assents to participating in the research.

SIGNATURES

Participant's Signature	Participant's Printed Name	Date	

Parent/Guardian Signature	Parent/Guardian Printed Name	Date	

Signature of Person Obtaining Consent	Printed name	Study Role	Date

Appendix D: Questionnaire

UBC DENTISTRY



DEPARTMENT OF ORAL BIOLOGICAL AND MEDICAL SCIENCES

Socio-Demographic Information and Oral Health Questionnaire

Date : _____

Participant code: _____

Gender: () Male () Female

Years of age: ____

Ethnicity: _____

Family involvement in the Criminal Justice System:

() No () Grandparent () Mother () Father () Sibling or family member

Child lives with:

() Both parents

() Mother

() Father

() Grandparents

() Guardians

() Other

If you don't live with your parents. Do you see them? () Y () N

How often? _____

Who else's live with you? _____

Legal Custody:

() Mother

() Father

() Grandparents

() Guardian

() Foster Parent

() Other

Medical Conditions: _____

Medications: _____

Allergies: _____

1. **Have you been to the medical doctor in the last year?**
 Yes, why? _____
 No,
 I do not know or remember
2. **Have you ever been to a dentist?**
 Yes, why? _____
 No
 I do not know or remember
3. **When was the last time you went to the dentist?**
 In the last year
 More than a year ago
 I do not know or remember
4. **How often do you usually go to the dentist?**
 1x/year
 2x/year
 When there is a problem
 I do not know or remember
5. **Have you had a toothache in the last year?**
 Yes
 No
 I do not know or remember
6. **Have you ever had or do you have difficulty eating hot, cold, sweet food?**
 Yes, please explain _____
 No
 I do not know or remember
7. **Have you ever-missed school because of a toothache?**
 Yes, please explain _____
 No
 I do not know or remember
8. **Have you ever chipped a tooth?**
 Yes, please explain
 No
 I do not know or remember
9. **Do you have your own toothbrush?**
 Yes
 No
10. **How many times do you brush your teeth?**
 Never
 Once /day
 Two times / day
 More than two times /day
11. **Do you do anything else to take care of your teeth?** _____
12. **What type of snacks do you eat?** _____
13. **How often do you eat those snacks?** _____
14. **How many schools have you been to in the past year?** _____

Appendix E: Screening form

Date: _____ Participant code: _____

Dentition: Primary () Mixed () Permanent () Occlusion: _____

Calculus (Sextant-B/L)																	
Debris (Sextant-B/L)																	
Gingivitis																	
DMFT																	
	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28	
	dft			55	54	53	52	51	61	62	63	64	65				
				85	84	83	82	81	71	72	73	74	75				
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38	
DMFT																	
Gingivitis																	
Debris (Sextant-B/L)																	
Calculus (Sextant-B/L)																	

DMFT/dft Not Present=L Sound=S Decay=D Missing=M Filling=F Sealed=SL White lesion=W

Trauma	12	11	21	22	32	31	41	42
Score								

Notes: _____

Gingival index		
Code	Description	Definition
1	No inflammation	No inflammation, bleeding or edema
2	Mild inflammation	Slight change in color or slight edema
3	Moderate inflammation	Redness, edema, or glazing
4	Severe inflammation	Marked redness and edema, or ulceration

Debris		Calculus	
1	No soft debris or stain	1	No calculus
2	Less than 1/3 of surface covered	2	Less than 1/3 of surface covered
3	1/3 to 2/3 of surface covered	3	1/3 to 2/3 of surface covered
4	More than 2/3 of surface covered	4	More than 2/3 of surface covered

Date: _____ Participant code: _____

Number of teeth: Decayed: Primary Permanent
Missing: Primary Permanent
Filled: Primary Permanent

Total: Primary Permanent

Total # of the existing teeth:

Referrals For:

Notes:

Appendix F: Parents' letter

Date:

Patient Name:

Dear Parent or Guardian,

We did a dental screening for your child at the Blue Sky summer camp today. Upon screening, the following conditions were noted that should have further assessment /treatment.

- Cavity on tooth #
- Broken tooth #
- Broken filling on tooth #
- Infection on tooth #
- Gum disease
- Others

We recommend that you contact your dentist or if you do not have one, we are happy to provide you with dental provider options. Delaying treatment may cause the above condition to get worse, resulting in further damage, more expensive treatment, and discomfort. Please feel free to contact me if you need assistance or if you have any questions or concerns. .

Sincerely,

Dr. Tila Bahri