EXPLORING THE INFLUENCE OF ORAL HEALTH LITERACY AND ORAL HEALTH CHRONIC DISEASE KNOWLEDGE ON OLDER ADULTS ORAL CARE BEHAVIOURS

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Alison C. MacDougall

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ABSTRACT

Unlike previous generations, baby boomers are keeping their own natural teeth as they enter into older age. There is a growing body of research demonstrating the link between oral diseases and common chronic diseases. Therefore, it is imperative that older adults possess the necessary skills and knowledge, and participate in preventive oral health behaviours to remain healthy. The purpose of this exploratory, mixed-methods online study was to explore the influence of oral health literacy (OHL) and oral health chronic disease knowledge (OHCDK) on oral care behaviours (OCBs). A convenience sample of 69 community dwelling men (n=19) and women (n=50) was recruited to participate in the Oral Health Chronic Disease Knowledge Study. This Internet based study utilized 4 separate questionnaires: The Oral Health Literacy-Adult Questionnaire, The Oral Health Chronic Disease Knowledge Questionnaire, The Background Information Questionnaire, and The Oral Care Behaviours Survey. Findings from The Oral Care Behaviours Survey were further categorized to create the dependent variable: dental care behaviours, and the independent predictor variable: home dental aid use behaviour group. In addition, qualitative data was collected through the use of 9 open-ended questions. Participants ranged in age from 50 to 69 years, and were further subdivided into early boomers (n=34) with an average age of 63.9, and late boomers (n=35) with an average age of 54.4. All participants had achieved higher than high school education; over half of all participants (52 %) reported living in an urban setting, and 46 % had an annual household income of greater than $75,000. All participants had some natural teeth and 72 % had access to private dental insurance. The mean OHL score for the total sample was 13.36, 95% CI [12.62, 14.10] and the mean OHCDK score was 10.01, 95% CI [9.13, 10.89]. Based on a

Pearson product moment correlation co-efficient procedure there was a low but positive correlation between total population OHL and OHCDK scores [r = 0.31, n =69, p = 0.008]. A dental care behaviours score was determined by adding together individual's total points related to the self-reported frequency of dental visits plus frequency of brushing and frequency of flossing. Scores could range from a maximum of 10 to a minimum score of 3, and higher scores denote less participation in positive dental care behaviours. The mean dental care behaviours score was 5.60, 95% CI [5.36, 5.84]. A backward step regression analysis determined the significant predictor model for dental care behaviours included: (1.46) dental insurance + (0.85) age cohort + (0.6) level of education. ($F(3) = 311.87$, $p = < 0.0001$, $R2 = 93.5\%$). Early boomers with some college/trade school education and access to private dental insurance had better dental care behaviours scores. Qualitative content analysis revealed five major themes: relying on dental professionals, knowing part of the story, living with the consequences, practicing and valuing oral health, and identifying barriers to care. Triangulation of both data sets supported the findings that participants had adequate OHL, yet were lacking in OHCDK. Comparing and contrasting of the data further highlighted the influential role that private dental insurance has on dental care behaviours. Future research should focus on a larger sample sizes from diverse socioeconomic backgrounds with equal numbers of men and women. It would be beneficial to conduct focus groups to gain further insight into what factors baby boomers believe will impact their future access to dental care.

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GLOSSARY

Baby boomer is a term used to define a generation of individuals born between 1946 and 1965.(1)

Chronic disease(s) are often caused by a complex interaction of factors. They have a long latent period where disease is not manifested, they do not resolve spontaneously and they are rarely cured completely. The following are common chronic diseases: cardiovascular disease, diabetes, arthritis and other musculo-skeletal diseases, cancers, chronic lung diseases, and chronic neurological disorders. (2)

Convergent parallel design: In this mixed methods design, qualitative and quantitative data are collected simultaneously and with equal priority. The researchers' job is to link the two data sets often at the interpretation stage of the project. (3)

Dental caries or tooth decay is an infection that is, bacterial in origin and, causes demineralization and destruction of the hard tissues (enamel, dentin and cementum) of the teeth. (4)

Edentulism means total tooth loss. (5)

Health is defined as a complete state of mental, physical and social well-being, not only the absence of disease. (6)

Healthy aging is a lifelong process of optimizing opportunities for improving and preserving health and physical, social and mental wellness, independence, quality of life and enhancing successful life-course transitions. (7)

Health literacy has been defined as the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions. (8)

Mixed methods research is an approach to inquiry involving collecting both quantitative and qualitative data, integrating the two forms of data, and using distinct designs that may involve philosophical assumptions and theoretical frameworks. (9)

Older adult for the purpose of this study will refer to individuals aged 50 and older.

Oral care behaviours are activities undertaken by individuals to maintain or promote dental health. (10)

Oral health is defined as a state of the oral and related tissues and structures that contribute positively to physical, mental and social well-being and enjoyment of life's possibilities, by allowing the individual to speak, eat and socialize unhindered by pain, discomfort or embarrassment. (11)

Oral health literacy can be defined as the degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services needed to make appropriate health decisions.(12)

Oral health related quality of life (OHRQoL) is a term used to describe the impact of oral health on a patient's everyday personal experiences.(13)

Oral cancer is any abnormal growth and spread of cells occurring in the mouth cavity including the lips, cheeks, tongue, gums, floor of mouth, salivary gland, tonsil, oropharynx, back of throat and roof of mouth. (14)

Oral disease(s) is the most common of the chronic diseases and are important public health problems because of their prevalence, impact on individuals and society, and the expense of their treatment. Chronic oral diseases of the mouth include: dental infections (e.g., dental caries, periodontitis), tooth loss, benign mucosal lesions and oral cancer.(15)

Periodontal disease is a complex, inflammatory disease initiated by oral microbial biofilm and host immune inflammatory response. (16)

Senior is a person over 65.(17)

Systemic refers to something that is spread throughout, system-wide, affecting a group or system, such as a body, or health as a whole (18)

Techno-research refers to any empirical enquiry that uses technology as part of its data collection. (19)

Xerostomia is the reduction of salivary flow as well as a change in the quality of saliva.(20)

CHAPTER 1: INTRODUCTION

Oral health is more than the absence of disease. To better understand the complex relationship between oral health and aging requires a holistic lens whereby the personal, physical, social and overall well-being of individuals is considered. In this chapter I will explore the following topics: the importance of oral health, baby boomers and oral health, factors influencing oral care utilization including: dental insurance, income and education and health and oral health literacy, and oral health and chronic disease association.

1.1 The Importance of Oral Health

Oral health and its impact on overall health is an important yet regularly overlooked component of healthy aging. (21-23) Unmet oral health needs impose both direct and indirect costs on society in terms of reduced quality of life, activity limitations and financial hardship for certain populations. (5) The relationship between general health and oral health is dynamic and complex (Figure 1) and achieving oral health means more than having clean, white teeth. (24,25)

The word oral refers to the mouth, and the mouth includes not only the teeth, gums and supporting tissues but also the hard and soft palate, the mucosal lining of the mouth and throat, the tongue, lips, salivary glands, chewing muscles and the upper and lower jaws.(26) Oral health can be broadly defined as a comfortable and functional dentition that allows individuals to continue in their desired social role. (27) In plain terms, oral health is a state of being free from mouth and facial pain, oral and throat cancer, oral infection and sores, gum disease, tooth decay and other diseases that limit an individuals capacity in biting, chewing, smiling, speaking and psychosocial well being. (6) Achieving oral health means more than having clean, white teeth, because oral health

can also have social impacts on quality of life by affecting our ability to speak, smile, kiss, touch, smell, chew, swallow and communicate. (23,24) Our mouths are the ”portal into the body” and keeping them disease free is essential for maintaining adequate nutrition, communication, and positive self -esteem. (24,26)

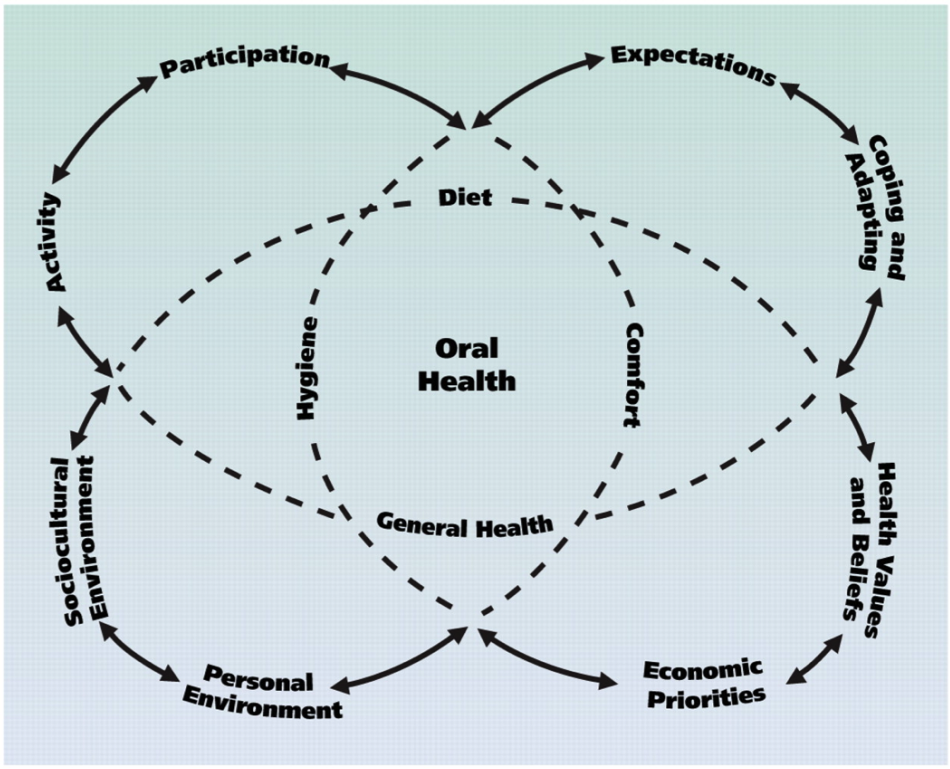

Figure 1. Model of oral health (13)

1.2 Baby Boomers and Oral Health

In Canada, we are facing an era of population aging with the number of older adults rapidly increasing due to low fertility rates, longer life expectancy, and the effects of the large baby boom generation. (7,28,29) Some hypothesized social and economic challenges associated with an aging population include uncertainty about the availability and sustainability of health care resources due to the potential long-term increase in

health care costs. (29,30) Many of today's aging population are expected to live well past eighty-five, and many will retain natural teeth due to better access to restorative and preventive oral care throughout their lifetimes. (21)

The aging Canadian population is influenced by two key factors. First, there is a large baby boom cohort reaching older adulthood. There are two distinct groups within the baby boomer cohort referred to as early boomers (those born between 1946 and 1955) and late boomers (those born between 1956 and 1964). (1,21,31) By 2031, all of the baby boomers will reach the age of 65, accounting for 23% to 25% of the Canadian population. (1,28,29) In addition to a large baby boom cohort, the second key factor influencing our aging population is that Canadians have a relatively long life expectancy at 81 years, the fourth longest life expectancy in the world. (32) The age structure of the population varies greatly from one province to another with the proportion of seniors increasing faster in the Atlantic Canadian provinces and Quebec compared to the rest of the country. (33)

More than any other cohort before them, baby boomers as a collective have had access to oral care, oral health promotion initiatives, and dental insurance throughout their lives, and as a result they have retained more of their own teeth than previous generations. (21,24) General improvements in education and income levels of the Canadian population has resulted in baby boomers being healthier, more aesthetically conscious, and politically savvy than previous cohorts which may have a significant impact on their future expectations and needs from the health care system. (17,24,30) Unlike previous generations, individuals are keeping more of their own teeth well into old age. (21,28) According to the 2007-2009 Oral Health Measures Survey, (5) only

6.4% of Canadians are edentulous compared to 23% in the 1970-1972 Nutrition Canada Survey. One potential factor that could cause a difference in the oral health of early versus late boomers, is that those born between 1946 to 1955 reached adulthood before the introduction of preventive measures such as water fluoridation, fluoride toothpastes, public oral health promotion initiatives, increased access to oral health professionals, and a greater standard of living due to an era of economic growth. (31,34) It is important to note that as a result of living longer and keeping more natural teeth, older adults who neglect their oral health may be at greater risk for increased oral and general health problems resulting in potentially complex treatment needs. (28) As we learn more about the association between oral and general health and as more people keep their teeth into old age, it is critical to help older adults learn about and practice preventive oral health care.

1.3 Factors Influencing Oral Care Utilization

Older adults' dental care utilization can be diminished by a number of factors including changing expectations about what good oral health means, general health status, health literacy levels, and the lack of dental benefits. (22,25,35) Historical events such as the introduction of social and health policies, private dental insurance plans, and the evolution of prevention based dental care have all had an impact on whether aging Canadians perceive oral health as an important part of healthy aging. (21)

Our aging population is a very heterogeneous group with varying views about the importance of maintaining lifelong function and appearance of their teeth. (21) Older people who place more importance in oral health, who view it as valuable, and who perceive a need for dental care are more likely to access regular dental care. (34,36-38)

Like general health, oral health status and access to care tends to be influenced by various factors such as age and gender, race and ethnicity, education and income, access to dental insurance, health literacy levels, and chronic disease status. (36-38) In the next section I will focus on a number of key factors that include dental insurance, income and education and health and oral health literacy levels.

1.3.1 Dental insurance. One of the recognized enablers of dental service utilization is having access to dental insurance, as the lack of insurance or the inability to afford to pay out-of-pocket for dental care can negatively influence a person's efforts to obtain dental care. (5,23,34,35) One Canadian study reported that those who had to pay for dental care out-of-pocket were more likely to report mouth pain and aches and were not able to participate in regular daily activities as a result of dental pain. (39)

In Canada, approximately 60% of dental care is privately funded through employment-based third party insurance plans, 35% is financed through out-of-pocket personal spending and only a meagre five percent is publicly funded. (40) Canada ranks second last amongst the Organization for Economic Co-operation and Development (OECD) nations when it comes to using public funds to finance dental care. (39) Approximately 62.6% of the Canadian population has private dental insurance, however this falls to 38.6% among adults aged 60 to 79, and the decrease is associated with losing dental benefits upon retirement. (5)

Although adequate dental services exist in most parts of Canada, the private nature of oral health services contributes to disparities among underserved segments of the population, including older adults. (23) Socially marginalized groups, such as

seniors, experience more than their share of oral disease, illness and disability, and are the least likely to visit a dental professional or have dental insurance. (39)

1.3.2 Income and education. Income is considered by some to be the most important social determinant of health due to its ability to shape overall living conditions, affect psychological functioning and influence health related behaviours. (41) Having an adequate amount of disposable income and private dental insurance helps to reduce the financial barriers to accessing oral care. (42) Income is a strong predictor of health services utilization (36,37) and older individuals, especially those with low income, bear the greatest burden of chronic disease. (43)

Education is an important social determinant of health because people with higher educational attainment tend to be healthier than those with lower educational attainment. (41) Education increases overall literacy and knowledge of how to live healthier lifestyles, and it is directly related to other social determinants of health such as level of income, employment security and working conditions. (41,44)

Older adults with lower levels of income and education have been found to have lower expectations of good health in their old age, and such acceptance of poor health is even more striking with regards to oral health. (34) Research shows that individuals who continue their education beyond age eighteen are 1.85 times more likely to have visited a dentist in the past year than those who had never attended school or had quit at age fifteen. (34)

In everyday life, individuals are exposed to an overwhelming amount of complex health information, and learning to live with and manage chronic disease is perhaps the greatest health challenge facing aging Canadians. (43) In the next section, I will define

the relatively new concepts of health literacy and oral health literacy and explore their impact on achieving and maintaining overall health.

1.3.3 Health literacy, and oral health literacy. Health literacy is a relatively new concept in the field of health promotion, and it is related to the ability to read, act upon written health information, to communicate needs to health professionals, and to understand health instructions. (8,45) It is estimated that 60% of adults in Canada lack the health literacy skills to make appropriate health decisions on their own, and average health literacy varies significantly by geographic area and age, especially among older adults. (8)

Oral health literacy is defined as the degree to which individuals have the ability to obtain, process, trust in, and understand basic oral health information and services that enable them to take control over and improve their own health outcomes. (46) Inadequate oral health literacy has been recognized as a deterrent to oral care, a barrier to obtaining dental health information and preventive services, and reduces active patient engagement during discussions regarding treatment options and decision-making. (47)

1.4 Oral Health and Chronic Disease

The US Surgeon General's Report in 2000 was instrumental in exposing the lack of public awareness about the importance of oral health and in particular it highlighted the concept of oral health being essential to general health and well-being. (26) This report was a catalyst for research about the impact of oral disease on chronic diseases, and the impact of periodontal inflammation, on chronic disease. The diseases for which an association with periodontal disease has been reported include cardiovascular disease (CVD), stroke, respiratory disease, rheumatoid disease, pancreatic cancer, diabetes

mellitus (types 1 and 2), preterm delivery, low birth weight delivery, preeclampsia, osteoporosis and osteoarthritis. (16,48-51)

According to the World Health Organization (WHO), oral diseases share common risk factors with four leading chronic diseases: cardiovascular disease, cancer, chronic respiratory diseases and diabetes. (52) Oral diseases impact upon one's ability to eat and speak properly, nutritional status, body mass index and self-image, as well as overall resistance to chronic disease. (52,53) This reinforces the importance of older adults being aware that oral health is not limited to just having healthy teeth, but it can also negatively impact their ability to maintain general health as they age.

1.5 Research Problem

Research in dentistry has predominately been quantitative in nature to support the shift towards evidence-based dentistry.(54) While the broad topic of oral health has been extensively studied there is relatively little research examining how oral health literacy and oral health chronic disease knowledge influences the oral care behaviours of older adults. The focus of my study is to contribute to our knowledge about the level of oral health literacy and oral health chronic disease knowledge of older adults and explore how both of these factors influence oral care behaviours.

1.6 Life Course Theory

My research is guided by life course theory. (55,56) When conducting research with older adults, it is important to look at how chronological age, relationships, common life transitions, and social change shape people's lives from birth to death. Life course theory calls attention to how historical time, social location, and culture affect the individual experience of each life stage. (38,55,57) Life course theory links biography

and history to consider the individual as an existential being and unravels the effects of age, history and social structure on everyday life. (25)

A hallmark of this theory is that early life course decisions, opportunities, and conditions affect later outcomes or in simpler terms, the past can significantly affect future socio-economic status, mental health, physical functioning and marital patterns. (55) Life course theory lends itself well to research that looks at cumulative advantage and cumulative disadvantage, adding to our knowledge about the impact of power and privilege, and subsequently suggesting strategies for social justice. (55)

1.7 Worldview

All research is interpretive; it is guided by the researcher's set of beliefs and feelings about the world and how it should be understood and studied. (58) To further explore the knowledge that older adults possess about the important association between oral health, chronic disease and general health, this study will be guided by the pragmatic worldview. Pragmatism as a worldview arises out of actions, situations, and consequences rather than antecedent conditions, and instead of focusing on methods, researchers emphasize the research problem and use all approaches available to understand the problem. (9,59,60)

Pragmatism is a practical approach to a problem whereby researchers in this paradigm consider the question more important than the methods used, and utilize whatever works best to generate good evidence. (3) For the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as different forms of data collection and analysis. (9)

1.8 Assumptions

Since I have worked as an oral health professional for over twenty years, I feel that it is important to explore my own assumptions and biases regarding this topic before I conduct any original research. I acknowledge the following statements:

1. Most dental professionals lack the knowledge, training, time and/or interest to explain the oral health/general health connection to their clients.

2. Most oral health promotion in Canada is industry driven with more emphasis on selling products than creating oral health awareness.

3. Many allied health care professionals do not have the training or expertise to understand the impact that oral health challenges can create for an aging population. Often, they do not discuss oral health as part of client's chronic disease management plan.

4. Most people view oral health in terms of teeth and gums and are not aware of the social and systemic effects of unmet oral health needs.

5. Without access to private dental insurance or public coverage, some of the aging population will be less likely to seek out preventive oral health care.

6. Those aging clients who continue to access preventive oral health care may do so at less frequent intervals than recommended by their dental professional.

7. If clients are not able to attend traditional dental/dental hygiene clinics due to mobility or transportation issues, they will experience huge barriers/challenges in accessing dental care.

8. Many older adults residing in long term care facilities (i.e. nursing homes and assisted living) have unmet oral health needs, and most of these facilities are not equipped to help their residents deal with oral health issues

CHAPTER 2: LITERATURE REVIEW

The literature reviewed in this chapter provides a broad contextual discussion about the many factors that are at play when it comes to exploring the complex issue of older adults' oral health literacy and knowledge about the oral health chronic disease association. The following topics included in this review include 1. healthy aging and oral health; 2. oral health related quality of life; 3.common oral conditions of older persons; 4.dental care utilization; 5.the cost of oral disease; 6. literacy, health literacy and oral health literacy; and 7. the link between oral disease and chronic diseases.

2.1 Healthy Aging and Oral Health

Healthy aging can be defined as: a lifelong process of optimizing opportunities for improving and preserving physical, social and mental health, as well as maintaining independence, adequate quality of life, and cultivating favourable life course transitions.(7,21,22,25) Improved environmental conditions, better access to healthcare throughout life, and increased access to educational and employment opportunities have contributed to many older adults achieving healthy aging into advanced old age. (21)

With Canada facing an unprecedented era of population aging, many people and governments are looking for ways to achieve and sustain healthy aging. (7,22) For some older adults, living with chronic disease is accepted as an inevitable, or worse, a normal part of the aging process. (25) Healthy aging has been linked to an individual's social support network, income adequacy and functional health. (21) Research shows that older adults with strong interpersonal ties are more apt to participate in health screenings and maintain their health better than peers who are isolated. (22,34) The goal of health promotion activities should be to reduce, delay and manage chronic diseases and pain

associated with chronic conditions, including oral diseases, and ultimately enhance older adults' ability to continue living in the community. (7)

It is important for older adults to understand that developing oral disease is not necessarily a consequence of aging, but can be influenced by the presence of multiple chronic conditions. These chronic conditions and their treatments may become more prevalent with aging, can have a negative impact on both oral health and general health, and can negatively impact the quality of life of older persons. (22,61)

2.2 Oral Health Related Quality of Life

Quality of life has been defined as a dynamic and subjective blend of biological and psychosocial experiences influenced by our own personal and sociocultural experiences. (13) While the term quality of life is used extensively in the literature, it is challenging to measure, because it has different components, and unique significance and meaning to individuals. (62) Achieving optimal quality of life seems to be influenced by the extent to which one can feel capable of participating in activities that meet ongoing needs and expectations. (13) Many of the factors that contribute to quality of life, whether good health or ill health, are clearly related to the interdependence between people's lifestyle and their social environment. Increasingly, there is more recognition that oral disease impacts individuals' ability to achieve healthy aging, and these diseases are important public health problems because of their prevalence, their negative impact on quality of life, and high treatment costs. (18,63)

Oral health related quality of life (OHRQoL) has been defined as the extent to which oral disorders affect physical functioning and psychosocial well-being. (13,28,62) Despite a growing body of research demonstrating the substantive effect that poor oral

health can have on overall health and quality of life, oral health has remained largely overlooked, and many individuals live with the physical and social burdens of oral and craniofacial diseases and conditions. (23,26,46) Our mouths are the ”portal into the body” and keeping them disease free is essential for maintaining adequate function, nutrition, communication, and positive self-esteem. (24,26)

2.2.1 Physical impact. Dental pain, problems with chewing and eating, and embarrassment about discoloured, missing and damaged teeth can have an impact on people’s daily lives by negatively affecting their overall health and well-being. (52) Having access to medical and dental care has been shown to reduce premature morbidity and mortality, preserve oral function, and enhance overall quality of life. (35) Oral diseases contribute to physical impairment such as mouth infections and tooth loss, but they also result in people avoiding social interaction due to embarrassment or pain thereby decreasing important peer interactions. (22,46,64)

2.2.2 Psychosocial impact. There is evidence to support the phenomenon that older adults with strong interpersonal ties maintain their OHRQoL better than their peers who are isolated, and a high self-concept has been recognized as an important predictor of positive health behaviour across the lifespan. (22,38) A social effect of oral disease that negatively impacts OHRQoL is the withdrawal of those affected from interpersonal interaction due to embarrassment caused by oral conditions such as missing teeth, ill - fitting dentures, bad breath and facial disfigurement as a result of oral cancer surgery. (65) Research shows that health initiatives that focus on and raise awareness about the impact that oral health has on improving self-image and social interactions can positively affect attitudes towards dental care.(24,28,64)

The negative impact of poor oral health on the quality of life of older adults needs to be brought to the attention of society in general, health and social policy-makers, and addressed as an important public health issue. (52) As the baby boomer generation continues to age, our health care systems including dentistry will need to shift the focus away from focusing solely on treating or eliminating disease, but instead focus on the prevention of oral disease in an attempt to improve both quality of life and OHRQoL for an older population with more complex health and oral care needs. (7,24,28)

2. 3 Common Oral Conditions in Older Adults

Achieving good oral health is more than just having healthy teeth; it requires the absence of disease and disorder of all oral, dental and craniofacial tissues. (6) Due to improvements in oral health an increasing number of older adults have some or all of their natural teeth. However, this population is at risk of chronic diseases of the mouth including dental infections such as dental cavities and periodontal disease, tooth loss, benign oral lesions, oral infectious diseases, oral trauma from injuries, and oral cancer. (6,15) For some older individuals, oral diseases are lifelong conditions that compromise quality of life, and unmanaged oral disease can manifest as bleeding gums, impacted, loose and decayed teeth.(66)

Oral health status appears to be strongly associated with age, income, country of birth, employment status as well as risk factors such as smoking, stress, literacy levels, and accessing regular dental care. (63) Poor oral health and premature tooth loss can cause chronic oral pain which results in reduced chewing and swallowing thereby leading to malnutrition and unplanned weight loss for older persons. (23,65) Age associated physiologic changes, underlying chronic diseases, and the use of various medications can

place older adults at greater risk for developing oral conditions and diseases. (35,61) Common oral conditions of older persons are summarized in Table 1.(13)

Many chronic diseases also have oral manifestations that increase older adults' risk of developing oral disease, and some examples include medication induced side effects, malnutrition, osteoporosis, eating disorders, anemia, HIV/AIDS, thyroid disorders and even stress. (18,65) Oral diseases such as periodontal disease and dental caries share common preventable and modifiable risk factors with other chronic diseases including unhealthy diet, tobacco use, and harmful alcohol use and poor oral hygiene. (29,52,65)

Increasing physical limitations such as diminished cognition, vision, and manual dexterity can impact older adults' ability to properly clean their mouths resulting in greater prevalence of chronic oral diseases such as periodontal disease and dental decay. (23) Despite many gains made with regards to improving the oral health of Canadians, these oral diseases remain widespread particularly among poor underserviced populations.(46) The following section will review periodontal (gum) disease, dental caries (tooth decay), Xerostomia (dry mouth) and oral cancer—common, chronic conditions and diseases that can be recurring, long-lasting, and impact the dental and overall health of older adults.

2.3.1 Dental caries and periodontal disease. There is a pervasive perception that losing one's natural teeth is a normal and expected consequence of aging, however premature tooth loss happens most often as the result of uncontrolled dental diseases such as dental caries and periodontal disease. (23)

Table 1.Common Oral Conditions in Older Persons (15)

Condition	Clinical Presentation	Treatment	Comments
Dental caries	Coronal (above the gum) or root; painful brownish discoloration with cavitation	Root caries may be treated with fluoride gels, varnishes or toothpastes; effective for some shallow caries	Infection can be reduced with good oral hygiene and professional dental care; patients should avoid sugary foods and drinks
Gingivitis	Red, swollen, bleeding gums	Good oral hygiene, including daily brushing and flossing	
Periodontitis	Gingivitis, gingiva recession, loose or shifting teeth	Good oral hygiene, including daily brushing and flossing; professional dental scaling; adjunct antibiotic therapy	Associated with cardio vascular disease, worsening diabetes, and aspiration pneumonia
Xerostomia	Swollen, dry, red tongue; burning sensation; difficulty with speech and swallowing; change in taste	Saliva substitutes; sugar free gum or Salagenand Evovac drops may stimulate saliva production	Risk factors include: head & neck radiation, medication use, Sjorgen's syndrome and smoking
Candidiasis	Adherent white plaques that can be wiped off (thrush) Red macular lesions often with a burning sensation (denture stomatitis) Angular cheilitis; red scaling fissures at the corners of the mouth	Topical anti-fungals (nystatin oral suspension) or Systemic antifungals (fluconazole)	Diagnosis can be confirmed with oral exfoliative cytology, biopsy, or culture
Denture stomatitis	Varying erythema, occasionally accompanied by petechial hemorrhage; localized to the denture-bearing areas of removable appliances; usually asymptomatic	Removal of dentures at night; topical antifungals (see Candidiasis) placed inside the denture-fitting surface	Dentures should be removed and cleaned at least once daily
Oral cancer	Non healing ulcer or mass	Refer for biopsy, staging, surgery, and other treatment	

Oral cavity bacteria are involved in the progression of dental diseases such as dental caries and periodontal disease, and research points to a connection between poor oral health and chronic diseases such as diabetes, respiratory diseases; heart disease, and stroke. (24,47,48,67,68) Periodontal diseases and dental caries are the most prevalent chronic diseases. Dental caries affects 60% to 90% of schoolchildren and the vast majority of adults in most industrialized countries. (65)

While there has been a decline in dental caries rates from the effective use of fluorides, changing living conditions, lifestyles and improved self-care practices, and access to dental care services, this disease has not been eradicated but only controlled to a certain degree. (5,65) Despite the many advances in oral health, older people still continue to lose teeth due to oral diseases. Based on 2009 data, 42% of Canadians aged 60-79 years, had fewer than 21 natural teeth, and from a functional perspective this is considered to be an insufficient dentition. (5)

Periodontitis is an inflammatory disease of the periodontal tissues supporting the teeth-periodontal ligament, alveolar bone or dental cementum, and is caused mainly by infection with gram-negative bacteria and their by-products, but also by host response to the bacterial challenge. (69) The local and systemic effects of periodontal infections, and inflammation are usually exerted for many years typically among those who are middle aged or older.(67) It is hypothesized that the link between periodontitis and systemic diseases may be caused by an oral-hematogenous (spread by blood) spread of oral bacteria, whereby subgingival plaque organisms are passively transported via the blood vessels to distant sites of the body. (16)

2.3.2 Xerostomia. Dry mouth also referred to as salivary hypo-function and xerostomia causes significant oropharyngeal disorders, pain and an impaired quality of life for older adults. (70) Salivary hypo-function is a common health concern for older people because 30% of the population 65 and older report having this condition. (52,70) Complaints of a dry mouth and reduced saliva flow are common in older people, and are associated with salivary gland disorders, medication use, and medical conditions. (52,70) *Common* treatments for chronic diseases such as cancer radiation treatment and daily medication use can cause oral side effects such as loss of saliva and dry mouth which affect the integrity of the oral cavity. A large number of medications used by older adults can cause dry mouth, and this can result in taste disturbances, difficulty swallowing, constant sore throat, problems speaking, and may contribute to increased food and plaque retention leading to dental caries and periodontal disease progression. (52,70) The lack of saliva and lubrication in the mouth can result in ill-fitting dental prostheses, increased incidence of candidal infections, mouth sores, and ulcers. (70) It is important to note that salivary function remains remarkably intact in healthy older people. (70)

2.3.3 Oral cancer. Oral cancer is an ignored and often overlooked disease, yet in Canada oral cancer is the 13th most common cancer out of the 23 reported cancers. (71,72) While oral cancer can occur at any age, the incidence increases sharply over 40 and individuals that are over the age of 60 have the highest incidence of oral cancer. (52,72) Life style behaviours play a significant role in the incidence of oral cancer with tobacco use associated with over 90% of cancers in the oral cavity, and the risk for oral cancer increases when tobacco is used in combination with alcohol. (65) Advanced oral cancers and their side effects cause chronic pain, loss of function and irreparable socially

disfiguring impairment. (71) The poor overall survival rate of oral cancer patients is the result of not being diagnosed until the lesions are advanced, and this outcome could be changed if people had an oral cancer screening done during regular, routine dental visits. (26,35,65,71) Individuals 65 years and older are considered at higher risk for oral cancer, because they tend to access dental services less frequently than other populations. (71)

2.4. Dental Care Utilization and Older Adults

The problem of inadequate dental care utilization for some segments of the population is complex and cannot be solved simply. Oral health disparities have been shown to be greater in underserviced populations such as frail institutionalized older adults, children, people who are developmentally disabled, medically compromised, and the uninsured. (66) There are many characteristics in older adult's lives that impact their oral health status such as general health status, social support, behaviour and communication abilities, previous dental experiences, access to regular dental care, and personal oral care behaviours. (24,37)

The incidence of oral problems associated with untreated oral diseases are disproportionately high among those populations with lower incomes, less education, the uninsured and underinsured, the elderly, and racial and ethnic minorities. (46) Untreated oral disease has been described as a silent epidemic affecting the most vulnerable members of society. In general, socially marginalized groups bear a greater burden of oral disease, illness and disability, and are less likely to seek out dental care or have private dental insurance, thereby the people that need the most care access it the least. (23,39) While the oral health status of Canadians has improved over the last forty years,

not all population groups have achieved equal access to care with the greatest burden of disease experienced by less advantaged individuals such as the elderly and low -income individuals. (23,35)

Degenerating health status and ill health associated with chronic conditions can deplete resources and interfere with an individual's ability to optimize their oral health. (29,61) Individuals who make frequent medical visits, and pay out of pocket for medications and medical services are less likely to use dental services. (34) It is hypothesized that if dealing with chronic diseases takes up a majority of their time and energy, older adults may neglect other day-to-day activities of daily living, such as participating in oral care behaviours. (34,35) Research shows that individuals' utilization of dental services depends upon an array of factors including: the ability to pay for care, age and gender, and attitudes toward dental care.(23,36,37)

2.4.1 Ability to pay for dental care. Utilization of dental services is strongly associated with income, and access to dental insurance. (23,34) Limited discretionary income, the cost of dental care, public health cutbacks, and the absence of dental insurance are all recognized barriers to dental care. (34) In one study pertaining to access to care, of those respondents reporting an unmet dental need, the primary reason cited for not obtaining care was financial limitations with 72 percent reporting they could not afford care. (35)

Research shows that lower income families, and those with no insurance are 3 to 4 times less likely to obtain dental care than those with higher incomes or private dental insurance. (5) Data collected in the Oral Health Component of the 2007-2009 Canadian Health Measures Survey (5) show that having a higher income and access to dental

insurance were directly related variables due to the fact that Canadian households with incomes greater than $79,999 are four times more likely to have private insurance. Poorer families are twice as likely to not have insurance and experience worse oral health outcomes as measured by increased rates of edentulism, self-reported fair or poor health, highest debris and calculus scores, having one or more soft tissue lesions, and experiencing untreated coronal or root caries. (5) Lower income older adults spend a greater proportion of their household income on health care than higher income older adults. (21,39)

Until 1967, there was minimal private dental insurance in Canada and most Canadians paid for dental treatment out of pocket. (39) The rise of private insurance financing to cover dental expenditures occurred due to oral health being left out of the national health care insurance system, and the emergence of unionization that offered workers dental benefits as a part of employer-employee benefit packages. (39) The economic recession of the 1980s brought about a decline in wages and salaries; however this did not affect non-wage benefits such as insurance benefits. (39) Between 1967 and 1989, the incidence of companies offering dental benefits to employees as part of work compensation packages rose from 23.8 5% to 30 percent. (39)

The economic down turn of the 1990s had a huge impact on the willingness of many companies to offer workers employment-based benefits such as dental coverage, because many companies were looking for ways to cut costs. (39) This was a time of reduction in dental insurance plan coverage that resulted in limits to yearly maximums and covered services, and the introduction of employee paid deductibles and co-payments. (39) According to the 2007-2009 Canadian Health Measures Survey, of those

individuals in the 60 to 79 age group, 53.2% reported not having dental insurance. (5) Changes in dental coverage whether public or private are strongly linked to a household's ability to access dental care, and having dental insurance coverage plays a large role in determining frequency of dental visits. (39,40) The more insurance a household has the less discretionary income must be spent to pay for dental care, and poor Canadians must sometimes make budgetary trade-offs involving basic necessities such as not buying food, to fulfill their dental needs. (39)

2.4.2 Age and gender. In previous studies about oral health behaviour that focused on gender differences, most studies have supported the finding that females have more frequent utilization of dental services, more positive response in oral hygiene behaviour, and higher dental anxiety than males. (73) In one study (74) that explored the influence of gender and age on oral health behaviour in an independent elderly population, younger subjects and women, were more likely to have accessed dental treatment in the previous year. In another study, females self-rated their dental health as being better, reported more frequent use of dental services, and indicated that dental care was more important than did males.(37)

2.4.3 Attitudes toward dental care. It is important to recognize the distinction between the need for dental care and the demand for dental care exhibited by older adults. Attitudes developed over a lifetime, expectations, and previous history of dental care utilization can have a significant impact upon whether a person will seek dental care. (38,64) Negative attributes such as decreased cognitive ability, medications and their side effects, and limited physical ability to tolerate procedures may influence the willingness of older adults to seek dental care. (64)

There are known advantages to maintaining oral health such as improved nutrition, less pain and enhanced appearance, yet some older adults do not access dental care on a regular basis. (22) Dental professionals must not underestimate the influence of patients' life experiences and personal histories on an individuals' decision to pursue dental treatment. The difficulties people experience when trying to comply with dental health advice may have their roots in earlier times thereby affecting current feelings, beliefs and attitudes about dental care. (38) Dental care utilization can also be affected by the individual's changing expectations about what constitutes good oral health and access to affordable dental care. (22) For some, with health complications, seeking dental care may require too much coordination and effort.(34) People in advanced age may be more accepting of some restrictions and difficulties in daily functioning and despite the presence of illness many older adults may adjust to a less than ideal state of health to continuously enjoy life. (25)

According to Bailit (75) one of the main reasons that older individuals from lower socioeconomic groups do not visit the dentist is their lack of knowledge about dental disease. No perceived need for care has been identified as a cause of low utilization of dental services among older adults, and this strengthens the argument that there is a need for increased oral health promotion initiatives for older adults. (34-36,64)

2. 5 The Cost of Oral Disease

Treating dental disease results in both direct and indirect costs for individuals and societies. Direct costs are realized in the form of fees paid for the provision of oral health care services, and in Canada, these services are primarily offered in the private sector. In 2009, Canadians spent approximately $13 billion on dental services compared to $9.94

billion in 2007. Of these expenditures, $12.2 billion (95%) were private sector expenditures and $608 million (5%) were public sector expenditures. (40)

As well as direct costs, oral disease is associated with indirect costs to society. Approximately 39.1% of Canadians experience time lost (approximately 40.36 million hours) from normal day–to-day activities due to oral health reasons. (40,65)An estimated 2.26 million school days and 4.15 million working days for adults are lost annually due to dental visits and dental sick days. (5,40) In Canada, approximately 3.54 hours per person, per year, is lost due to dental disease. (40)

Older people are valuable to society and contribute to the national economy through formal and informal participation in the workforce and through volunteer work. (7,52) It is estimated that 69% of older Canadians provide assistance to friends, family, and neighbours, and in 2001 more than 300,000 people 65 and older were part of the labour force. (7) If oral disease prevents older adults from participating in the volunteer and paid economy, all Canadians are impacted. Individuals need to be aware of how to effectively manage the severity of chronic diseases, including oral disease, to reduce the economic and social burden on an already taxed health care system. (7)

2. 6 Literacy, Health Literacy and Oral Health Literacy

2.6.1 Literacy.

Literacy has been defined as the ability to understand, process, and obtain knowledge, and subsequently put the information to practical use. (76)Adult literacy is measured on a scale from one to five with Level 4 to 5 being the most advanced and Level 1 the lowest. A person should have at least Level 3 literacy to function well in Canadian society. (76) On Prince Edward Island, approximately 51% of people aged 16 years and older have a literacy score of Level 3 or above, which is on par

with the Canadian national average.(76) According to one report, 8 out of 10 Canadians aged 65 and over have serious literacy limitations so this means that many older adults need easy-to-understand health information in order to manage their health and make healthy lifestyle choices. (77)

2.6.2 Health literacy. Health literacy has been defined as the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions. (12) It is a shared function of individual patient skills, the provider's ability to communicate effectively and accurately and the informational demands placed on patients by healthcare systems.(78) Health literacy is more than just being able to read, it also involves being-aware of the available services, knowing where to access them, and knowing how to use them appropriately. (8,79,80) Health literacy is recognized as an important determinant of health because the more health literate a person is the better able they are to navigate the health care systems and to experience more favourable health outcomes. (46,81) Inadequate and low health literacy contributes to disease that results in increased costs for all members of society. It is estimated that in the United States low health literacy costs the economy between $106 and $238 billion annually. (80,82)

Low health literacy is a problem for persons from all socioeconomic backgrounds with inadequate levels of health literacy being documented in well-educated, higher income individuals as well as in socially disadvantaged persons.(78) Some population groups can be marginalized when it comes to health literacy, such as older people with low income and low level of education**.** (45) With respect to older adults, limited health literacy has been linked to worse knowledge and self-management skills, increased health

disparities, poor health outcomes, increased use of health care services, and several health care safety issues, including medical and medication errors. (43,83)

It has been suggested that individuals with low health literacy are unable to communicate effectively with health care providers and this gap in communication may account for their worse health status. (8,80,84) Inadequate patient-provider communication and low health literacy are associated with increased use of emergency care, poor adherence to health care advice, lower utilization of preventive programs and screenings, and difficulties with decision making compared to higher literacy counterparts. (47,52) Raising health literacy levels requires a variety of initiatives, including modifications to the delivery of health information and services. The development and maintenance of health literacy skills over one's lifetime can be accomplished through the use of adult education, seminars, self-study, Internet use, daily reading and engagement in social networks. (28)

Healthcare providers need to be knowledgeable about the impact of health literacy on the ability of individuals to make informed healthcare decisions and navigate the healthcare system. (80,82) Much health information is in print form and uses language and vocabulary that are beyond the ability of most Canadians to understand. (8) Governments, institutions and health care providers need to do more to simplify the presentation of health information. The use of plain language, visual models and asking patients to repeat back information and instructions are all strategies that can be employed to help address the issue of inadequate health literacy. (85)

2.6.3 Oral health literacy Oral health literacy is the process of acquiring oral health information, appraising concepts and appropriately applying oral health prevention

and treatment recommendations. (46,86) The growth in information technology and rapid advances in scientific dental knowledge require that the public have an ever increasing understanding of oral diseases to make good decisions about their oral health. (87) Maintaining oral health and managing chronic disease requires more than just accessing professional care. Individuals must be able to access, understand, interpret and act on the health information they receive. (46,82)

Research shows that low oral health literacy may contribute to oral health disparities since those with low oral health literacy are more likely to be poor, not well educated, older and have limited English language skills.(78,80,84) Inadequate oral health literacy can act as a deterrent to care, be a barrier to obtaining information and preventive services, and reduce active patient engagement during decision-making regarding treatment options. (46) In one Iranian study (86) low oral health literacy level, independent of education and other socioeconomic determinants, was a predictor for poor self-reported oral health. Literacy skills may also have a strong impact on a person's awareness of the importance of oral health and its relation to general health and knowledge of specific health promoting behaviours. Preventive dental services may be less effective in patients with low knowledge and literacy levels because they do not understand the instructions or the importance of the preventive procedures resulting in less compliance with recommended practices. (87)

An important factor influencing oral health literacy is the ability of dental professionals to use effective communication that reflects the varying and sometimes limited oral health literacy of their patients.(28,46) Dental professionals need to be aware that some clients may require extra assistance with understanding their oral health needs,

and to not rely solely on readily available material, which for those with low literacy may be difficult to understand. Oral health information is also shared verbally, and it is imperative to speak using clear, jargon free language and present information in a clear manner to clients to facilitate healthy decision-making and avoid miscommunication. (80) One study highlighted that clients preferred to receive communication from healthcare providers that was easy to understand and act upon because dealing with the vast amount of disease care management instruction was overwhelming.(47)

Another component of the oral health literacy problem is that allied health professionals such as doctors, nurses, and dieticians also lack oral health literacy. Older adults still visit their medical doctor the most frequently of all age groups; yet visit the dentist the least frequently of all age groups. (24) This phenomenon supports the concept of using other health care professionals to help educate older adults about the importance of oral health in chronic disease management.

2. 7 Association between Oral Diseases and Chronic Diseases

Discussion regarding the association between oral and systemic health emerged in 2000 with the release of the US Surgeon General's Report on Oral Health that described oral health as a "neglected epidemic." (26,66) This report highlighted the fact that despite being the portal to the body, the mouth and oral health in general needed to be recognized as an integral part of all health programs. Despite the numerous implications of oral health on general health and risk of infection, it is often overlooked.(88)

One of the identified concerns about having an aging population is the strain that will be potentially placed on future health care resources. (29) As people age, they are more likely to have multiple chronic conditions and coping with chronic conditions is

challenging and costly. Chronic diseases have serious impact not only because they cause premature death, but also because they have major adverse effects on families, communities and societies in general.(43) Over the past twenty years, there have been great advances made in the treatment of chronic disease, including dental disease, however this has resulted in people requiring complex treatment, medication, diet, exercise, and self-management strategies (43) One chronic disease risk factor, increased longevity, has been associated with the need for informal support, medical care, medications, and in some cases institutionalization. (29,61) It is important to note that aging and disease are distinct processes, and with appropriate prevention and treatment a lifelong healthy state can be possible. (10)

The four main chronic diseases causing death worldwide are cardiovascular disease, cancer, chronic respiratory disease and diabetes and there is evidence to show an association between oral diseases and each of these chronic diseases. (65,89) Chronic diseases share common risk factors with oral diseases and these are preventable factors related to lifestyles. With more research demonstrating an association between oral and chronic diseases, and more people keeping their natural teeth well into old age, it is critical for older adults to be knowledgeable about the total health benefits associated with practicing preventive oral care behaviours. (10,73,90)

2.7.1 Cardiovascular disease. Cardiovascular disease(s) is used as a broad term for all conditions involving the cardiovascular system-conditions of the heart, the pericardium, and the circulatory system. (69) Cardiovascular diseases are progressive, chronic problems that are the leading cause of death and disability in Canada and worldwide. ((48,67) The most important determinant of cardiovascular health is a

person's age, and by 2030, cardiovascular diseases will result in 40% of all deaths and rank as the leading cause of death of individuals 65 or older. (91) Risk factors for cardiovascular disease include advancing age, gender, race, smoking, hypertension, diabetes, socioeconomic status, stress, obesity and lipid rich diet. (69)

Periodontal diseases have been defined as all inflammatory, pathological processes involving the periodontium-gingiva, periodontal ligament, alveolar bone or dental cementum. (69) Periodontal diseases are also progressive, chronic diseases and are similar to cardiovascular diseases in that they are multi factorial, of high prevalence and share multiple risk factors. (67) According to data collected in the Oral Health Component of the Canadian Health Measures Survey, 24 percent of older persons, 60-79 had moderate periodontal disease with periodontal pockets measuring 4 or 5 millimeters. (5)

Meta-analysis of studies published between 2003 and 2009 showed a weak but statistically significant association between cardiovascular disease and periodontal disease.(67,69) What this means is that periodontal diseases can increase the probability that cardiovascular diseases will occur, irrespective of the effect of other causal or risk factors. (48,67,69) There has been research conducted to examine whether periodontal therapy alters the risk for cardio vascular disease, however a causative association has not been established and this remains a controversial subject. (67,69,92)

2.7.2 Oral cancer. Oral cancer can occur on the lips, inside the mouth, on the back of the throat, the tonsils or salivary glands and there are many risk factors associated with developing oral cancer. (72) Advancing age plays a significant role with individuals over 40 having the highest risk of developing oral cancer, and those over 60 having the highest

incidence rates. (93) Tobacco and alcohol users over 40 are at highest risk for this disease, and according to 2009 Canadian data, the number of new cases and death due to oral cancer is predicted to be almost three times higher than that of cervical and double the rates of liver cancer. (72,93)

Oral cancer is a disease that has a profound impact on the quality of life of individuals and their families due to the resulting functional and cosmetic problems associated with treatment. (94) Older adults, regardless of their dentate status are still at risk of developing this life changing oral disease. Of all the interventions available for cancers, research shows that detecting oral cancer at an early stage is the most effective means of improving survival and reducing morbidity from the disease. (4,71,93,95) Previous studies assessing oral cancer knowledge, opinions, and practices of health care providers suggest that many physicians and dentists do not detect oral lesions in the early stages because of inappropriate attitudes or lack of knowledge. (71)

The incidence of oral cancer is on the increase across the world in both developed and developing countries, yet public awareness about the risk factors and methods of early detection of oral cancer are quite low. (71,93) One study involving 184 English-speaking adults highlighted that 20 percent of participants had never heard of oral cancer, and 77 percent knew little or nothing about it. (95) Another study examining oral cancer risk perception of over 800 diverse participants found that despite their high-risk profile, participants felt relatively invulnerable to developing oral cancer. (93) It is important for older adults to be aware of the importance of having oral cancer screenings because early stage oral cancer rarely causes pain or other symptoms and delay in diagnosis, resulting in more advanced lesions and poorer long-term outcomes. (4)

2.7.3 Aspiration pneumonia. Aspiration pneumonia is a multifactorial disease that is influenced by oral-related factors such as difficulty swallowing, dependency on feeding tubes, and presence of cariogenic bacteria and periodontal pathogens. (96) With aspiration pneumonia, oral microorganisms that are not ordinarily pathogenic tend to develop into infectious agents as a result of opportunistic infections. (97)

The most significant oral-systemic association that impacts the health of the elderly residing in long term care facilities is aspiration pneumonia. It is the leading cause of death and second leading reason for hospitalization from long-term care facilities. (97,98) Aspiration of oral bacteria has been implicated in the occurrence of healthcare associated pneumonia and exacerbation of chronic obstructive pulmonary disease. (96)

Poor oral hygiene has been associated with an increased risk for aspiration pneumonia among institutionalized adults. (98) Studies demonstrate good evidence for the reversibility of pneumonia by providing professional dental scaling, and through the establishment of regular oral care practices such as daily brushing, and applying chlorhexidine gels and rinses. (48) One Canadian study showed that a single session of professional debridement combined with adequate daily mouth care were effective means for reducing pneumonia rates for a group of dependent long-term care residents. (98) One systematic review recommended that community-based oral health programs for the elderly or medically compromised should include information about the link between respiratory disease and periodontal disease to reduce the economic and social burden of aspiration pneumonia. (96)

2.7.4 Diabetes. Diabetes mellitus is a chronic disease with serious oral health implications. (68,99) The cost of diabetes to the Canadian healthcare system, and

economic impact of the disease is estimated to rise to 16.9 billion annually by 2020. (100) The biggest driver of this escalating cost is the growth and aging of the Canadian population, as well as lifestyle choices that make individuals more susceptible to developing this disease. (100) People with diabetes, especially with poorly controlled and uncontrolled diabetes have an increased susceptibility to chronic infections and inflammation of oral tissues, including periodontal disease, dental caries, and oral candidiasis. (16,47,53,68)

Research shows that patients with diabetes are at two to three times higher risk for developing chronic periodontitis, and experience greater severity and extent of periodontal disease. (16) There is evidence to support an association between diabetes and periodontal disease with a moderate treatment effect size on improvement in glycemic control associated with periodontal therapy. (48,99)

Qualitative studies have been conducted to explore patient awareness of the link between oral health needs and diabetes.(47,53) Study participants were shown to be mostly unaware of the link between oral health and diabetes, and that they perceived patient-provider communication about this association to be inadequate. (47) Another study investigating the perception of certified diabetes educators about the adequacy of their diabetes education curricula in providing oral health information showed that 93.8 percent reported their curricula did not include an oral health module, and that certified diabetic educators do not routinely provide comprehensive oral health education to diabetic clients. (68)

A secondary finding of one study was to highlight the role that inadequate oral health literacy plays as a barrier to the lack of understanding, inadequate processing and

use of oral health related information to make informed diabetes care management decisions. (47) Additional research is needed in order to better understand the relationship between oral health literacy and older adults' knowledge about the association between oral health and common chronic diseases.

Increasingly, there is more attention being paid to the association between oral health and overall health, and to the concept that oral diseases are chronic diseases in their own right. (18) Older adults need to be aware of these associations and must possess the appropriate knowledge, general health and oral health literacy skills to ensure their health care choices support healthy aging.

2.8 Personal Reflection

No research is value free, and all researchers bring a worldview to their research that will influence the design of, and how they will conduct research. (58) As my research unfolded, I realized that my findings and interpretations were shaped by my own personal, cultural, professional, and life experiences.

In addition to obtaining a Diploma in Dental Hygiene from Dalhousie University, I have also completed a Bachelor of Science Degree (Dental Hygiene Specialization) from the University of Alberta. My own experiences working as a clinical dental hygienist have allowed me to work one-on-one with clients of all ages, including older adults, to assess their oral health literacy and to create client specific dental hygiene care plans that educate the individual about the importance of oral health and its connection to general health. I have worked in large urban and small rural dental practices, and also for a provincial public health department that provided preventive services in schools and

long term care facilities. It is my opinion that the many people are not aware of the impact that oral diseases and conditions can have on their general health and well-being.

I became interested in exploring aging Canadians awareness and knowledge about oral health being an integral part of general health when I noticed that some of my older clients were postponing or not scheduling preventive dental hygiene visits once they no longer had dental insurance, or after they experienced an acute chronic disease incident. Many of these individuals were experiencing poor oral health and unmanaged dental disease in addition to their chronic systemic conditions, yet they were choosing to disregard oral health as an important part of their healthy aging plan. This phenomenon made me realize that there is a genuine need for research to explore older adults' knowledge about the relationship between oral health and chronic disease.

2.9 Purpose of the Study

While there is a large body of research exploring the link between oral health and its impact on general health and chronic disease, there is a gap in the literature about the influence of oral health literacy and oral health chronic disease knowledge on older adults' oral care behaviours.

The purpose of this study is to explore the influence of oral health literacy and oral health chronic disease knowledge on older adults' oral care behaviours. This research study is justified because there is limited study into topic. The goal of conducting a descriptive study is to examine a situation by describing important factors associated with that situation, such as demographic, socio-economic, and health characteristics, events, behaviours, attitudes, experiences and knowledge. (101)

2.10 Research Questions

1. To what extent do baby boomers possess oral health literacy and oral health chronic disease knowledge?

2.What is the relationship between oral health literacy and oral health chronic disease knowledge?

3. Does cohort and gender influence the relationship between oral health literacy and oral health chronic disease knowledge?

4. What variables predict higher scores of oral health literacy and oral health chronic disease knowledge?

5. What variables or factors predict positive oral care behaviours?

6. How do baby boomers describe their oral care behaviours, oral health literacy and oral health chronic disease knowledge?

7. How do the qualitative results extend additional insight into the quantitative results?

CHAPTER 3. METHODOLOGY

This chapter describes the methods used to conduct this study including: the study design, data collection tools, ethics process, pilot study, study 1 and study 2 overview, sample and recruitment, and methods for data analysis related to the research questions.

3.1 Study Design

This study utilized a concurrent parallel mixed-methods design (Figure 2). In a concurrent study, a researcher collects both quantitative and qualitative data, analyzes them separately, and then compares the results to see if the findings confirm or disconfirm each other. (9) The goal of a convergence design is to converge on the reality about a problem or phenomenon by allowing the weaknesses of one approach to be offset by the strengths of the other. (3)

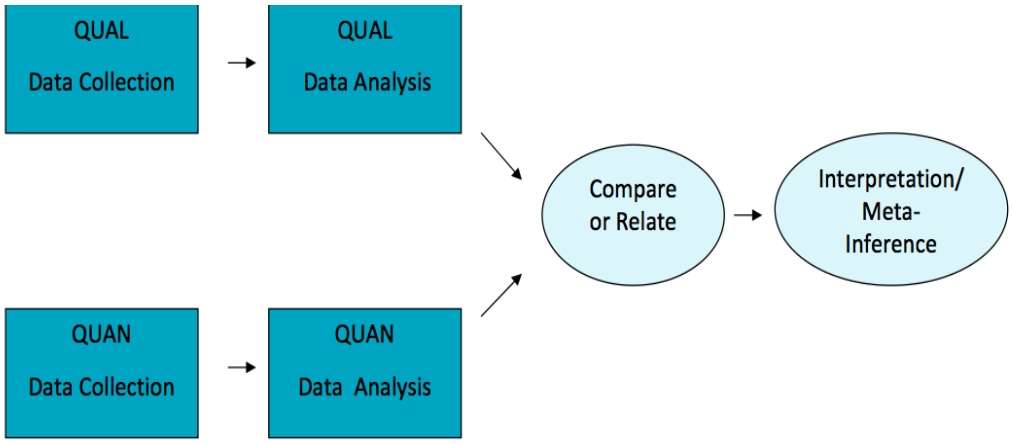

Figure 2. Convergent parallel design (9)

Qualitative (open-ended comments of participants) and quantitative (scores on instruments) data were collected simultaneously with equal priority given to each data set. Results from the separate analyses were compared and contrasted, leading to an overall interpretation of both sets of results. This design allowed for the collection of

different, but complimentary data to develop a more complete understanding about older adults' knowledge regarding the oral health chronic disease association.

3.2 Internet-Based Research

Using the Internet was a reasonable choice for conducting this study because it allowed for greater potential access to busy, geographically dispersed participants who may not have taken the time to participate in a face-to-face study. This Internet-based approach assured anonymity to participants who were being asked to share personal experiences about their oral health knowledge and behaviours. Research shows that respondents may be less inhibited online, and reveal more personal information and deeper feelings than in face-to-face interviews due to increased anonymity, and higher levels of private self-awareness offered in an online environment. (102).

3.3 Data Collection Tools

All participants in the Oral Health Knowledge pilot study, study 1, and study 2, described below, were given the URL for the study website. The study site consisted of 4 sections including demographic information, oral health literacy, oral health chronic disease knowledge and oral care behaviours data.

3.3.1. Qualitative data. The primary purpose for using a qualitative approach in this study was to further elaborate upon quantitative results. This study utilized 9 open-ended questions (Appendix 1) to explore participant's views regarding their oral health literacy, oral health chronic disease knowledge, and oral care behaviours.

3.3.2 Quantitative data. The Background Information Questionnaire (Appendix 2) was used to collect descriptive information about the sample. The Oral Health Literacy Adult Questionnaire (103) (Appendix 3) was used to assess oral health literacy. The Oral

Health Chronic Disease Knowledge Questionnaire (Appendix 4) was used to assess oral health chronic disease knowledge. The dependent variable, dental care behaviours was measured via the Oral Care Behaviours Survey (Appendix 5).

3.3.2.1 Background Information Questionnaire. This 13-question background information tool was used to collect socio-demographic and health characteristics of study participants. The tool included questions related to demographic characteristics such as age, gender, race, income, dental insurance coverage and education. It also collected general health information about self -reported general and oral health, presence of chronic disease and smoking status.

3.3.2.2 Oral Health Literacy-Adult Questionnaire (OHL-AQ). The OHL-AQ (103) is a validated instrument, consisting of four sections: reading comprehension, numeracy, listening and decision-making. To design this instrument, the authors Naghibi Sistani and colleagues (103) reviewed existing oral health literacy questionnaires prior to creating an initial 21 item questionnaire. To ensure content validity, they utilized eight experts to appraise the questionnaire by scoring relevancy, clarity, simplicity, and necessity of the items in order to calculate the content validity index (CVI) and content validity ratio (CVR). Overall they determined that the scale CVI was 0.90 and the CVR was 0.85 with 17 items showing acceptable values. To assess face validity, the authors piloted the questionnaire to five laypersons to determine whether the items appeared to be valid, and to assess readability of the items. Questions from the OHL-AQ were of different formats: including multiple choice, and questions with dichotomous answers like “true” or “false”, and “yes” or “no”. The authors developed this functional, short format OHL instrument specifically for use with adults in community or population-

based studies. The scoring strategy implemented for this questionnaire was: correct answers were scored 1 and incorrect answers scored -1, and questions answered "don't know" were scored 0. The OHL-AQ has a maximum score of 17 and higher scores suggest higher oral health literacy. An oral health literacy score was determined by summing the correct scores and subtracting incorrect scores so a negative score can result.

3.3.2.3 Oral Health-Chronic Disease Knowledge Questionnaire (OH-CDKQ). The author developed the Oral Health Chronic Disease Knowledge Questionnaire to determine a participant's working knowledge of the links between oral health and four (cardiovascular disease, oral cancer, pneumonia and diabetes) chronic diseases. Questions for this knowledge survey were developed based upon a literature review of current research into the association between oral health and four common chronic diseases including pneumonia, oral cancer, cardio-vascular disease and diabetes. (Appendix 6) This knowledge questionnaire consisted of 19 questions that could be answered true, false or unsure, and the scoring strategy was: correct answers received a 1, incorrect a -1, and unsure received a 0. A composite score was derived from adding all scores together to generate a final score.

3.3.2.4 Oral Care Behaviours survey. Oral care behaviours are defined as oral self-care activities undertaken by individuals to maintain or promote dental health. (10) The Oral Care Behaviours survey was comprised of four questions related to specific oral care behaviours of the respondents including: the number of visits to the dentist, frequency of brushing, frequency of flossing, and home dental aid use. Data from this survey were further categorized into two separate variables: the dependent variable:

dental care behaviours (DCBs) and the independent variable: home dental aid use (HDAU) behaviour group. (Figure 3)

The dependent variable dental care behaviours was based upon the frequency of dental visits plus the frequency of brushing plus the frequency of flossing. The DCBs score was calculated by summing the frequency of dental visits points plus the frequency of brushing points plus the frequency of flossing points. For dental visit frequency a group wise scoring system was used whereby if a person visited a dentist 1 or more times per year they received a maximum of 2 points. If a person visited a dentist less than 1 time per year or only for a problem they received a maximum of 4 points. The scoring strategy for frequency of brushing and flossing awarded 1 point for "2 or more times a day", 2 points for "1 time per day" and 3 points for "less than daily." Individuals' points from these 3 questions were tallied and given a score out of 10, and higher scores denote less frequent participation in dental care behaviours. The sum of these scores was used to create the study's dependent variable "dental care behaviours".

The independent variable HDAU behaviour group was created based upon individuals' self-reported use of home dental aids. Participants were asked to select which of the following home dental aids that they used: interdental brushes, Stimudents, floss picks or sticks, toothpicks, or none of the above. Participants were then categorized based upon those who used one or more home dental aids (HDAU behaviour group 1) versus those who reported no use of home dental aids (HDAU behaviour group 2). Based on this data a class variable "HDAU behaviour group" was created. This independent grouping variable was created to determine if there was separation between individuals

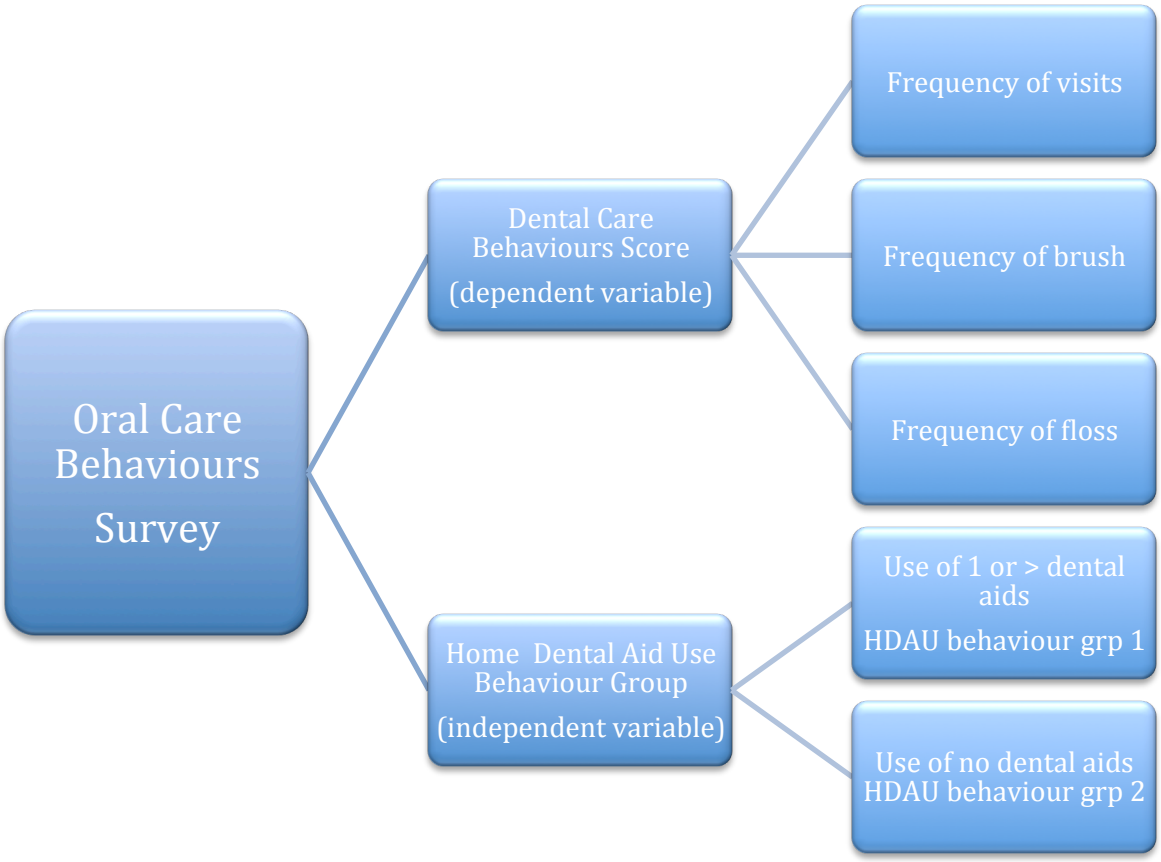

Figure 3. Categorization of Oral Care Behaviours Survey into Separate Variables based upon their self-reported use of home dental aids, and was used as a predictor variable in regression analysis.

3.4 Ethics

This Oral Health Knowledge Study received approval from both the UPEI Faculty of Science Ethics Committee and the UPEI Research Ethics Board in October 2014. Prior to any data collection potential participants were required to review and accept the Study Information and Consent Form (Appendix 7) that was integrated into the study homepage. The Study Information and Consent Form provided potential participants with critical information about the study including: the purpose of the research study, the

criteria for participant inclusion, the potential consequences of study participation, and that participation in this anonymous study was completely voluntary and participants could withdraw at any time. After the completion of the pilot study and study 1, an amended Ethics approval certificate to proceed with Study 2 was received in February 2015.

3.5 Pilot Study

To add credibility to my research, a pilot study was conducted prior to the main research study. To ensure the validity of the pilot study, similar procedures used in the main survey were followed in order to highlight any potential problems, assess the clarity of instructions or item wording, and facilitate the administration of the Internet based study. (101,104,105) This was also an opportunity to test out the data collection tools prior to conducting the main study.

For the pilot study, participants were recruited from the UPEI Senior's College students. The UPEI Seniors College is a not-for-profit organization affiliated with the University of Prince Edward Island and the Office of Skills Development and Learning. The College is open to anyone age 50 or older and has approximately 500 students. Non-credit courses are taught by seniors for seniors and are offered in all 3 counties. The goals of Seniors College are to provide stimulating peer learning opportunities for members; to be responsive to the needs and interests of seniors 50 years and over; and to initiate and participate in research on subjects that affect seniors' way of life.

Once approval was received from the UPEI Research Ethics Board, in the Fall of 2014, an email was sent to the Executive Director of the University of Prince Edward Island (UPEI) Seniors College (Appendix 8) outlining the purpose of the proposed

research study and requesting permission to utilize the Senior's College students as study participants. The Executive Director referred the request to the organization's Board of Directors, and permission was granted in November 2014 to proceed with the study. A Seniors College instructor was contacted and asked if their class could be used to recruit pilot study participants.

The author visited the class and delivered a short presentation about the proposed research study. As a result, eight participants agreed to participate in the pilot study. Prior to participating in the pilot study, participants were asked to sign a Consent Form (Appendix 9) and to provide the researcher with their email address. In addition, each participant was given a Feedback Questionnaire (Appendix 10) that was to be completed and mailed back to the primary researcher within one week post completion of the online study. The Feedback Questionnaire addressed the following domains: ease of use, unnecessary use of jargon or unclear terminology, time necessary to complete the study, and identification of any unclear instructions or questions. Each participant was personally emailed the URL for the Oral Health Knowledge Study and all 8 participated in the study and returned their completed Feedback Questionnaire.

Based on the findings from the pilot study, questions on the website were revised to ensure that the data would be a more accurate reflection of the participant's response. Another benefit of using the pilot study was that it estimated potential study drop-out rates, response rate, and time required to complete the study.

3.6 Oral Health Knowledge Study 1.

Once the pilot study was completed, an email containing the study purpose, a request for their participation, and a hyperlink to the Oral Health Knowledge Study was distributed to all Senior's College students via their list serve. A follow-up reminder email was circulated one week later. Although over 40 participants were recruited, the data collected could not be used to answer the study research questions. In an attempt to offer complete confidentiality to study participants, the research team did not link the questionnaires within the study, or add any unique identifiers to the data collection program. As a result of this oversight, data from different pages of the survey could not be matched. Once this was realized, a change to the study site ensured that once a participant completed one questionnaire they were automatically directed to the next one and that the date and time for each participant's entry was recorded. The Senior's College was not willing to redistribute the study link, therefore the research team decided to recruit participants from the community at large. To avoid confusion with study 1, study 2 was given a new URL address and renamed the Oral Health Chronic Disease Knowledge Study.

3.7 Oral Health Chronic Disease Knowledge Study 2.

3.7.1 Sample and recruitment. Community dwelling men and women from Prince Edward Island who were aged 50 and older, able to read and write in English, and had access to a computer with Internet service were recruited to participate in this study. To recruit participants to take part in the Oral Health Chronic Disease Knowledge Study 2, the research team partnered with the Communication Department at the University of Prince Edward Island (UPEI) to develop a multi-media distribution campaign. Study

promotion materials including printed posters and postcards were distributed to community venues such as grocery stores, pharmacies, churches and a local farmers market. UPEI posted study information on the University's homepage and emailed the study link to UPEI alumni.

The local CBC radio station conducted a radio interview with the author, and the story was also featured on the CBC website. Social media was utilized through posting information about the study on Facebook and Twitter. A local dentist offered to help promote the study by displaying study posters and postcards in their office. A snowballing technique was also utilized whereby study participants were encouraged to share the study link with others whom they felt may be interested in participating.

3.8 Data Analysis

3.8.1 Qualitative analysis.

Transcripts of responses were analyzed by qualitative content analysis. Qualitative content analysis goes beyond merely counting words and instead focuses on examining language for the purpose of classifying large amounts of text into an efficient number of categories that represent similar meanings. (106) The overall analysis focused on explicit, manifest content that deals with the content aspect and describes the visible, clearly evident, and obvious components of the communication or text. (107) Manifest content is focused on accurately representing the information that the participants provide without imposing preconceived categories or interpretations of the data invented by the inquirer. (3) This was useful for allowing the researcher to discover and describe the actual opinions of study participants. To shorten the text a process of condensation was conducted. All responses to the open-ended questions were read by the primary investigator, recorded in a Word document and analyzed for

commonalities and differences among the responses. The principle investigator (PI) performed initial line-by-line coding on participant responses to the open ended questions, and the goal was to identify keywords and phrases. The data was repeatedly read and words and phrases having similar meanings were highlighted and formed into emerging themes. (Appendix 11) This was a process of constructing meaning units from words or statements in the text, and condensing the text while still preserving the core meaning. The PI discussed the condensed summaries in person and via email with the research supervisor to ensure the core meaning of participants' responses were preserved. Discussion between the two investigators resulted in agreement about how to sort the participant responses and these revisions resulted in the creation of six emerging themes. The concept of theme is considered to be a thread of an underlying meaning based upon interpretation of participant responses. After receiving feedback from other research committee members, the themes were further condensed into five core themes and definitions. (Table 9)

3.8.2 Quantitative analysis. All quantitative data were analyzed using the *SAS*: *The Statistical Analysis System, version 9.* (108) An alpha value of $p = 0.05$ was set as the criterion for accepting the null hypothesis and statistical significance with respect to the evaluation of comparisons. Descriptive statistics (means, medians, modes, standard deviations, and confidence intervals) were calculated to describe the sample characteristics, and scores on the OHL-AQ the OHCDKQ, and the Oral Care Behaviour survey. Pearson product moment correlation coefficients were used to determine the relationship between oral health literacy and oral health chronic disease knowledge scores. Paired t-tests and analysis of variance were used to determine any differences in

oral health literacy scores, oral health chronic disease knowledge scores, and dental care behaviours scores. Regression analysis was used to explore the relationships between dental care behaviours, oral health literacy, oral health chronic disease knowledge and independent variables such as cohort, gender, access to private dental insurance, income, and education.

3.8.3.Comparing and contrasting of the data. To converge the findings from this study the researcher compared the quantitative and qualitative data to answer the question "How do the qualitative results extend additional insight into the quantitative results?"

CHAPTER 4: RESULTS

This chapter focuses on the results from the Oral Health Chronic Disease Knowledge Study. The first section presents demographic information collected from the background information tool. The second section presents the quantitative findings related to five research questions. Research questions one to four describe baby boomer's oral health literacy and oral health chronic disease knowledge and explore the relationship between these two variables. Research question five explores the association of eight independent variables on baby boomers' dental care behaviours. The fourth section highlights five themes that reflect how baby boomers describe their oral care behaviours, oral health literacy and oral health chronic disease knowledge. The last section presents a triangulation of findings by looking to see what additional insights the qualitative data lend to the quantitative findings.

4.1 Response Rate.

Data collection occurred from late January, 2015 to late April, 2015. Overall, 82 respondents completed the online survey. Nine respondents were excluded because of missing or incomplete data. Baby boomers, defined as those individuals born between 1946 and1965 inclusive, were the target group for this study. Data from four respondents were excluded because the individuals were born prior to 1946. The results of this study were based on a final sample of 69 respondents from Prince Edward Island born between 1946 and 1965.

4.2 Sample Characteristics

Demographic characteristics by total population and cohort are summarized and presented in Table 2. The total sample of participants ranged in age from 50 to 69 years with a mean age of 59.07 *(SD = 5.39)* with more women (n=50) than men (n=19) completing the study. Participants were further subdivided into two cohorts with cohort 1 representing the early boomers (i.e. individuals born between 1946 and 1955) (n=34) and cohort 2 representing the late boomers (i.e. individuals born between 1956 and 1965) (n=35). The average age of participants in cohort 1 was 63.9 years *(SD = 2.71)* and 54.48 years *(SD= 2.54)* in cohort 2.

This sample included individuals with a variety of educational backgrounds with all participants reporting their minimum educational attainment as having some college or trade school. Approximately 24% of respondents reported having a graduate level education with almost twice as many early boomers (32.35%) reported having a graduate level education compared to late boomers (17.14%). Over half (52.17%) of all study participants reported living in an urban setting. This sample was comprised of baby boomers from middle to high socioeconomic status families with 46.38% reporting an annual household income of greater than $75,000. Late boomers were more likely to report a total household income of greater than $75,000 (60%) than early boomers (32.35%). All participants reported having natural teeth (100%) and over 72.46% stated that they had private dental insurance. One noticeable difference between the two cohorts was related to self-rated dental health. Late boomers were more likely to report "excellent" (37.14%) on the self-rated dental health scale. Slightly less than 18% (17.65%) of early boomers reported excellent on the self-rated dental health scale.

Table 2. Demographic Characteristics by Age Cohort

	Overall n=69	Early Boomers n=34	Late Boomers n=35
Gender n (%)			
female	50 (72.46)	25 (73.53)	25 (71.43)
male	19 (27.54)	9 (26.47)	10 (28.57)
Age in years M (SD)	59.07 (5.39)	63.9 (2.71)	54.48 (2.54)
Age category n (%)			
65-69	15 (21.74)	15 (44.12)	-
60-64	19 (27.55)	19 (55.18)	-
55-59	18 (26.11)	-	18 (51.42)
50-54	17 (24.60)	-	17 (48.58)
Education n (%)			
graduate work	17 (24.64)	11 (32.35)	6 (17.14)
university degree	30 (43.48)	13 (38.24)	17 (48.57)
some college or trade school	22 (31.88)	10 (29.41)	12 (34.29)
Income n (%)			
>74,999	32 (46.38)	11 (32.35)	21 (60.00)
52,000 - 74, 999	14 (20.29)	11 (32.35)	3 (8.57)
26,000 - 51,999	11 (15.94)	7 (20.59)	4 (11.43)
< 26,000	6 (8.70)	2 (5.88)	4 (11.43)
not reported	6 (8.70)	3 (8.82)	3 (8.57)
Community of residence n (%)			
urban	36 (52.17)	17 (50.00)	19 (54.29)
small town	13 (18.84)	7 (20.59)	6 (17.14)
rural	20 (28.99)	10 (29.41)	10 (28.57)
Private dental insurance n (%)			
yes	50 (72.46)	23 (67.65)	27 (77.14)
no	19 (27.54)	11 (32.35)	8 (22.86)
General health n (%)			
excellent	28 (40.58)	10 (29.41)	18 (51.43)
good	33 (47.83)	20 (58.82)	13 (37.14)
fair	7 (10.14)	4 (11.76)	3 (8.57)
poor	1 (1.45)	-	1 (2.86)
Dental health n (%)			
excellent	19 (27.54)	6(17.65)	13 (37.14)
good	37 (53.62)	21 (61.76)	16 (45.71)
fair	9 (13.04)	7 (20.59)	2 (5.71)
poor	4 (5.80)	-	4 (11.43)
Have natural teeth n (%)	69 (100.00)	34 (100.00)	35 (100.00)

4.3 Statistical Analysis

4.3.1 OHL and OHCDK. Research Question 1 asked: "*To what extent do older adults possess oral health literacy and oral health chronic disease knowledge?"* Descriptive statistics were used to determine the sum of scores on both the OHL-AQ and OHCDKQ for the total sample. The mean oral health literacy score for the total sample was *13.36, 95% CI [12.62, 14.10]* and scores ranged from *-1 (n= 1, (1.45%) to 17 (n=8, 11.59 %*) with *15 (n=20, 28.99 %)* being the most frequently occurring score. (Figure 4)

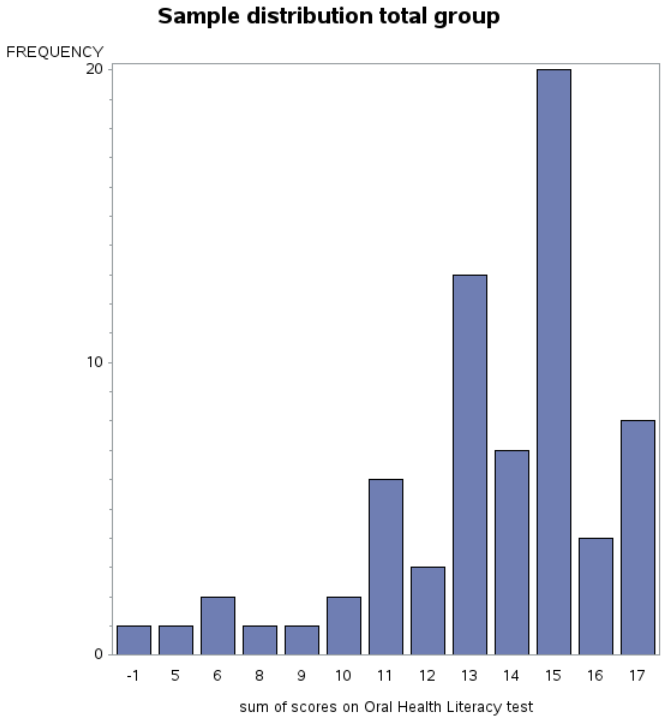

Figure 4. Distribution of Scores on Oral Health Literacy Questionnaire- Total Sample

The mean oral health chronic disease knowledge score for the total sample was *10.01, 95% CI [9.13, 10.89]* and scores ranged from *2 (n= 1, 1.45%) to 16 (n=3, 4.35%)* with the most frequently occurring score being *10 (n=9, 13.04%).* (Figure 5) As with the

oral health literacy questionnaire, higher scores suggest greater levels of oral health chronic disease knowledge.

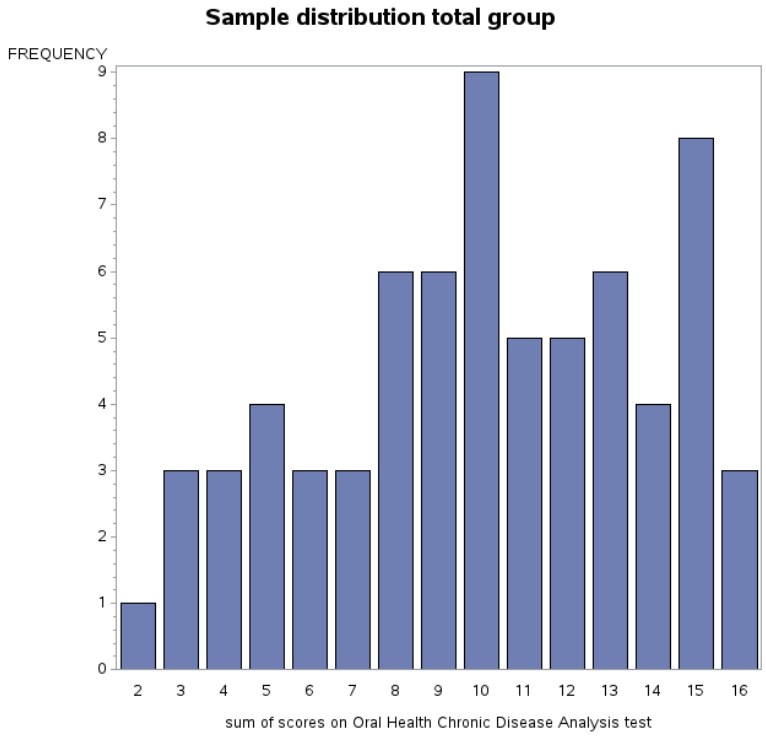

Figure 5. Distribution of Scores on Oral Health Chronic Disease Knowledge Questionnaire- Total Sample

Next between cohort differences were examined to determine if the variable cohort had any influence on oral health literacy score. A paired samples t-test was used to compare the oral health literacy average scores in early boomers versus late boomers. There was no significant difference in the oral health literacy scores (Figure 6) between early boomers *M = 13.21, 95% CI [11.89, 14.53]* and late boomers *M =13.51,95% CI [12.77, 14.25]; t(67) = -0.40, p =0.69.* Therefore we accept the null hypothesis that

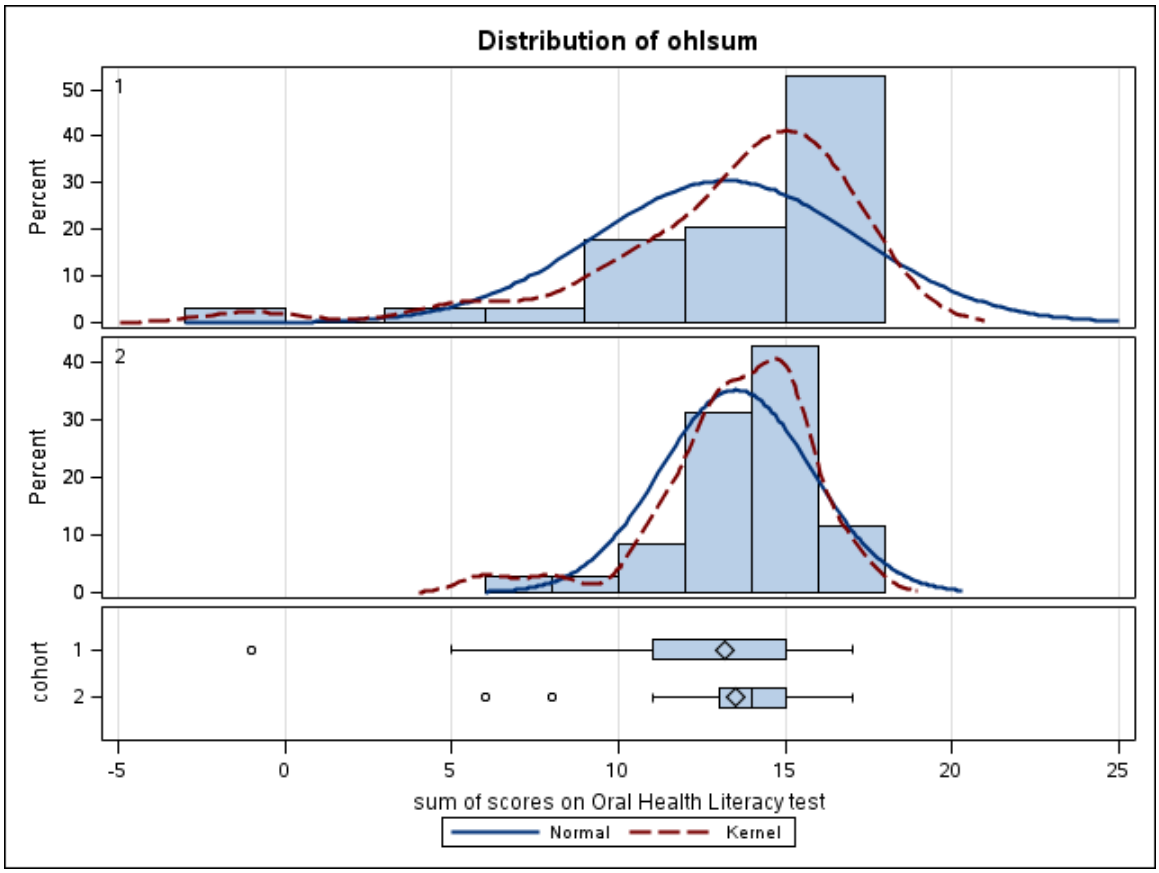

Figure 6. Distribution of Sum of Scores on OHL Questionnaire by Age Cohort

the mean for early boomers is equal to mean for late boomers. These results indicate that there was no significant difference in oral health literacy scores between the two cohorts.

A paired t-test was used to compare oral health chronic disease knowledge sum of scores (Figure 7) between the two cohorts. There was no significant difference in the scores for early boomers *M= 10.15, 95% CI [8.96, 11.34]* and late boomers *M = 9.88, 95% CI [8.55, 11.21]; t(67)= 0.28, p =0.78.* Therefore we accept the null hypothesis that mean for early boomers is equal to mean for late boomers. These results indicate that there was no significant difference in oral health chronic disease knowledge scores between the two cohorts.

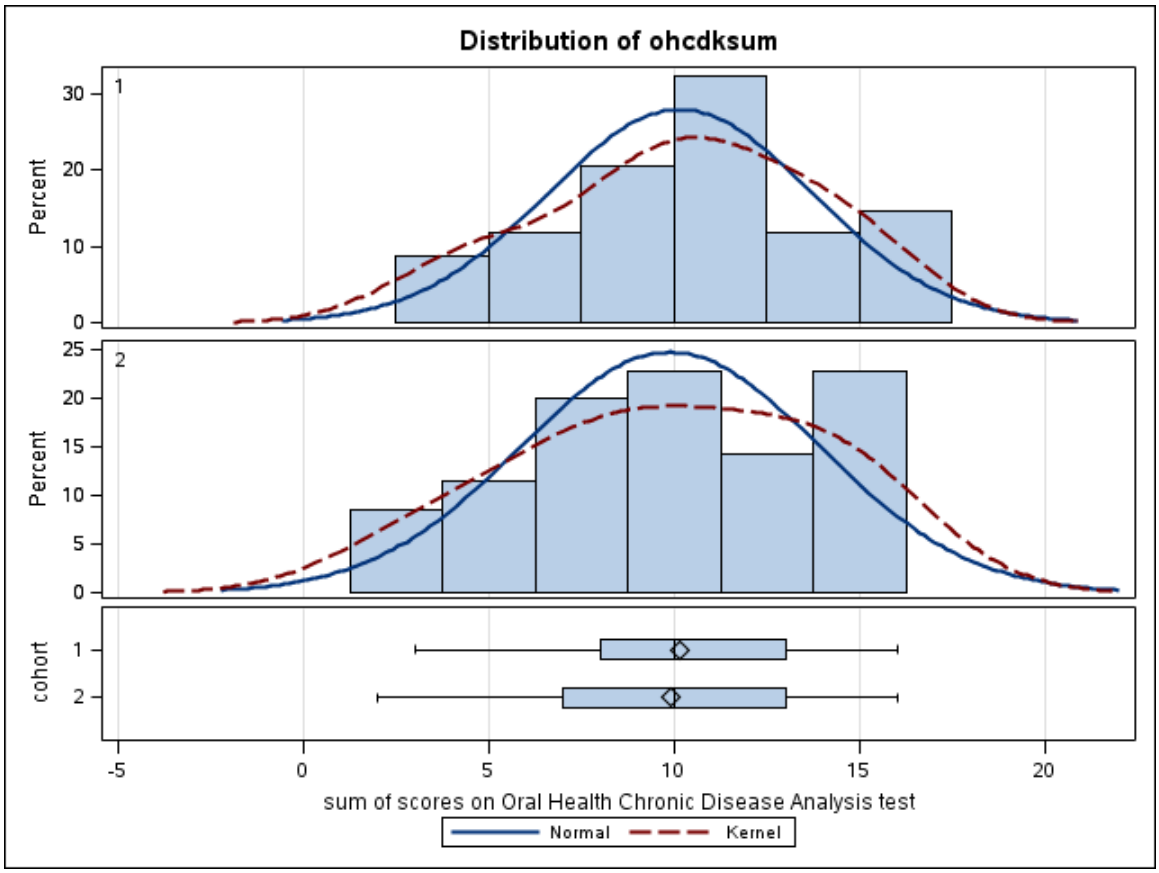

Figure 7. Distribution of Sum of Scores on OHCDK Questionnaire by Age Cohort

Research Question 2 asked: "*What is the relationship between study participants' OHL scores and OHCDK scores?"* A Pearson product moment correlation coefficient procedure was used to evaluate the relationship between an individual's oral health literacy score and their oral health chronic disease knowledge score. The average oral health literacy sum score in the total sample (N = 69) was *13.36, 95% CI [12.62, 14.10]* and the oral health chronic disease knowledge scores was *10.01, 95% CI [9.13, 10.89]*. The measure of relationship between these two variables was $r = 0.31$, $n = 69$, $p = 0.008$, indicating a low but positive correlation between the oral health literacy sum score and the oral health chronic disease knowledge scores.

Research Question 3 asked: *"Does cohort and gender influence the relationship between oral health literacy and oral health chronic disease knowledge?"* To further explore the relationship between oral health literacy and oral health chronic disease knowledge scores a Pearson product moment correlation coefficient was used to determine between group differences based on cohort and gender. Cohort was positively correlated with scores in that late boomers ($r = 0.47, n = 35, p = .005$) versus early boomers $(r = 0.24, n = 34, p = .16)$ exhibited low but positive correlations between oral health literacy scores and oral health chronic disease knowledge scores. Gender was also positively correlated with scores in that females ($r = 0.36, n = 50, p = 0.009$) versus males $(r = 0.17, n = 19, p = 0.49)$ exhibited low but positive correlations between oral health literacy scores and oral health chronic disease knowledge scores.

Research Question 4 asked: *"What variables predict higher scores of oral health literacy and oral health chronic disease knowledge?"* To answer this question the research team entered into a backward stepwise regression to establish models of best fit. Table 3 shows the variables included in both the oral health literacy and oral health chronic disease knowledge regression models. The significant predictive model (Table 4) that resulted from the oral health literacy backward elimination regression procedure was comprised of gender, education, income and oral health chronic disease knowledge scores on oral health literacy score. The summary statistics for the final predictive equation are presented below.

Table 3. OHL and OHCDK Predictor Variables

1. age cohort
2. behaviour group(home dental aid use)
3. income
4. education
5. gender
6. private dental insurance
7. frequency of dental visits
8. OHL sum score
9.OHCDK sum score

Oral health literacy score = 2.13(gender) + 1.23(education) + 0.59(income) + 0.29(oral health chronic disease knowledge score); ($F(4) = 343.63$, $p = <.0001$, $R^2 = 0.955$) This means that females with higher educational attainment, higher annual household income, and higher scores on the Oral Health Chronic Disease Knowledge Questionnaire are more likely to have higher oral health literacy scores. The significant predictors in this model explained 95.5% of the variance in the dependent variable oral health literacy score as denoted by the R^2.

The significant predictive model (Table 5) that resulted from the oral health chronic disease knowledge backward elimination regression procedure was comprised of private insurance and oral health literacy score on oral health chronic disease knowledge scores. The summary statistics for the final predictive equation are presented below.

Table 4. Predictive Model for Oral Health Literacy

Variable	Parameter Estimate	Standard Error	Type 11 SS	F Value	Pr> F
gender	2.13	0.635	101.47	11.23	0.001
education	1.23	0.394	87.86	9.72	0.003
income	0.59	0.318	30.66	3.39	0.070
ohcdk sum	0.29	0.095	81.47	9.02	0.004

Oral health chronic disease knowledge score = 1.89 (private insurance coverage {y/n}) + 0.56 (oral health literacy score); *(F(2) = 263.67 p = <.0001,* R^2 *= 0.89)* This means that study participants with access to private dental insurance and higher scores on the Oral Health Literacy Adult Questionnaire are more likely to have higher oral health chronic disease knowledge scores. The significant predictors in this model explained 89.0% of the variance in the dependent variable chronic disease knowledge score as denoted by the R^2.

Table 5. Predictive Model for Oral Health Chronic Disease Knowledge

Variable	Parameter Estimate	Standard Error	Type 11 SS	F Value	Pr >F
Private insurance	1.89	0.767	80.47	6.06	0.016
OHL sum	0.56	0.075	732.59	55.15	< .0001

4.3.2 Oral Care Behaviours. Research Question 5: "*What variables or factors predict positive oral care behaviours?"* The overall findings from the oral care behaviours survey are summarized in Table 6 and include information about the frequency of dental visits, the frequency of brushing and flossing, and the use of home dental aids.

Table 6. Oral Care Behaviour by Age Cohort

Oral Care Behaviour	Total sample n (%)	Early Boomers n (%)	Late Boomers n (%)
Dental visit frequency n=69			
1 time per year	13 (18.84)	3(8.82)	10 (28.57)
>1 time per year	49 (71.01)	28 (82.35)	21 (60.00)
< 1 time per year	-	-	-
Only for a problem	7 (10.14)	3 (8.82)	4 (11.43)
Brushing frequency n=68			
2 or more times per day	51 (75.00)	26 (78.79)	25 (71.43)
1 time per day	15 (22.06)	7 (21.21)	8 (22.86)
< 1 time per day	2 (2.94)	-	2 (5.71)
Flossing frequency n=68			
2 or more times per day	12 (17.65)	7 (21.21)	5 (14.29)
1 time per day	23 (33.82)	10 (30.30)	13 (37.14)
< 1 time per day	33 (48.53)	16 (48.48)	17 (48.57)
Home dental aid use n=66			
interdental brush	13 (18.84)	6 (17.65)	7 (20.00)
stimudent	3 (4.35)	1 (2.94)	2 (5.71)
flosspicks	35 (50.72)	18 (52.94)	17 (48.57)
toothpicks	15 (21.74)	6 (17.65)	9 (25.71)
Used at least 1 home dental aid	46 (66.67)	23 (67.65%)	23 (65.71%)
Used no home dental aids	23 (33.33)	11 (32.35%)	12 (34.29%)

Seventy one percent of study participants reported visiting a dental professional more than 1 time per year, and 75% reported brushing 2 or more times per day. Almost half of the sample surveyed, 48.53%, reported that they did not floss on a daily basis, and 33.33% reported not using any home dental aids.

The following results focus specifically on the dependent variable dental care

behaviours which was created based upon individual's frequency of dental visit plus frequency of brushing plus frequency of flossing. The results indicate that in the total sample (n = 68) the average dental care behaviours score was M = *5.60, 95% CI [5.36, 5.84*]. (Figure 8) The maximum score was 10 and the minimum score was 3 with higher scores indicating less frequent participation in positive dental care behaviours. Further, the average dental care behaviours score in the early boomers was *M = 5.5,8 95% CI [5.15, 6.0*] (n=68) compared to *M = 5.62, 95% CI [5.09, 6.16]* in the late boomers. Finally, a backward regression analysis was performed to determine the association between a set of independent (predictor) variables (Table 7) on dental care behaviours.

Table 7. Independent Dental Care Behaviours Predictor Variables

1. age cohort
2. (home dental aid use) behaviour group
3. income
4. education
5. gender
6. private dental insurance
7. OHCDK sum score
8. OHL sum score

A backward method starts with all the variables in the model and successively removes the variable with the smallest F-to-remove statistic. To create the "F-to-remove statistic" the computer program computed a t-statistic for each independent variable's estimated coefficient, and squared the resulting number. The program then removed the variable with the lowest F-to-remove statistic.

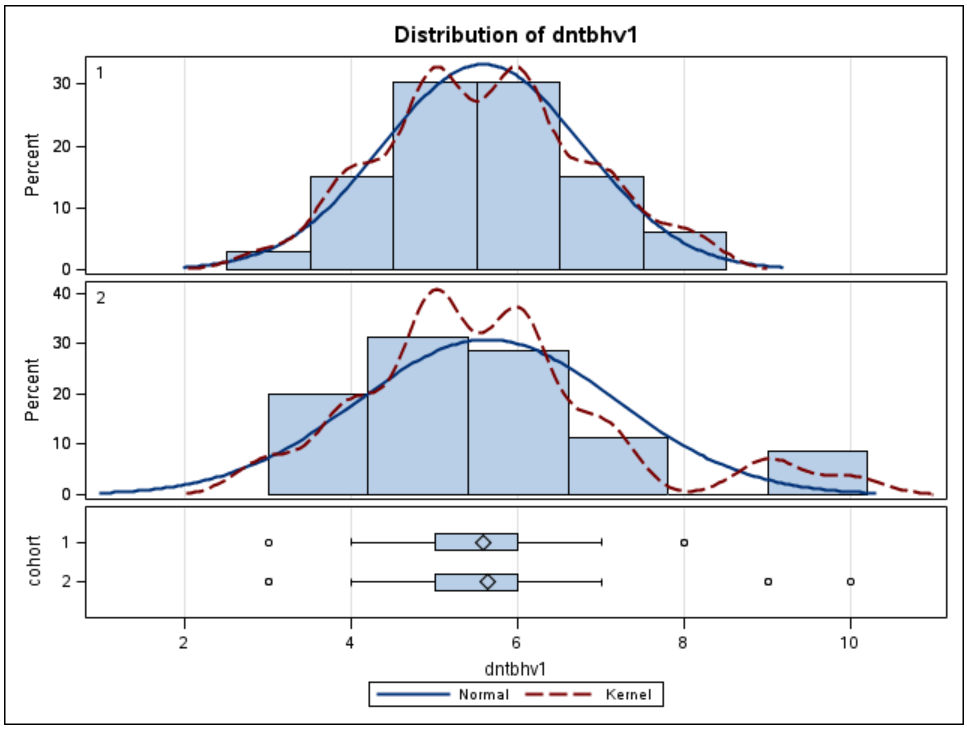

Figure 8. Distribution of Dental Care Behaviours Sum of Scores by Age Cohort

The significant predictive model (Table 8) that resulted from the backward regression and the summary statistics for the final predictive equation are presented here: Dental care behaviours = 1.46 (private insurance coverage {y/n}) + 0.85(age cohort) + 0.599 (level of education), ($F(3) = 311.87$ $p = <.0001$, R^2= 93.5%) This equation shows that late boomers without access to private dental insurance and higher levels of education are less likely to have lower dental care behaviours scores. The significant predictors in this model explained 93.5% of the variance in the dependent variable dental care behaviours score as denoted by the R^2.

Table 8. Predictive Model for Dental Care Behaviours

Variable	Parameter Estimate	Standard Error	Type 11 SS	F Value	Pr>F
cohort	0.854	0.305	17.72317	7.84	0.0067
private dental insurance	1.455	0.361	36.71949	16.24	0.0001
education	0.599	0.149	36.47029	16.13	0.0002

4.4 Qualitative Analysis

This section focuses on the results of Research Question 6: *"How do older adults describe their oral care behaviours, oral health literacy and oral health chronic disease knowledge?"* Five major themes emerged: Relying on Dental Professionals; Knowing Part of the Story; Living with the Consequences; Practising and Valuing Oral Health; and Identifying Barriers to Care. The themes and supporting definitions are shown in (Table 9). The following section uses participant quotes to further explain the themes and to add context to the quotes, each one is followed by the participant's unique identification number (ID), cohort to which they belong (C1 or C2), and gender identification (M or F).

4.4.1 Relying on Dental Professionals. Overall participants were not inclined to personally search out oral health information, and when they did search it tended to be in response to needing answers to specific questions or problems they were experiencing. As their main source for oral health information, many participants cited their dental provider as their preferred information source.

"I expect my dental team to inform me of necessary changes"[ID 26 C2 M]

"I rely on my dentist to provide what is needed"[ID 32 C2 F]

Table 9. Core Qualitative Themes and Definitions

Core Themes	Definition
1. Relying on Dental Professionals	- Expecting professionals to provide information - Consulting with dental professionals - Trusting in professional advice
2. Knowing Part of the Story	- Lacking the knowledge to answer - Wanting more information - Not making the mouth/body connection
3. Living with the Consequences	- Wanting to turn back the clock - Wishing for a second chance - Looking after what you have
4. Practicing and Valuing Oral Health	- Managing and preventing disease - Impacting self confidence - Preventing infection and disease - Affecting chewing and nutrition
5. Identifying Barriers to Care	- Cost of dental care restricts access to needed/wanted care - Having dental insurance means more regular dental care

Some participants felt no need to self-search for oral health information because they were accessing regular, professional dental care and not experiencing any acute issues.

> *"For the most part none. I have been having regular check up and cleanings for the last 40 years and currently (last several) have had no issues so not inclined to search out information"[ID 62 C2 F]*
>
> *"Not very often...I always cross-examine my Dentist or his assistant at least"[ID 18 C1 M]*

In addition to looking to dental providers for information, many participants reported having trust in their dental providers' advice and treatment recommendations.

"I have trust in the information provided by my dentist"[ID 12 C1 M]

"I would trust my dentist over something I found on the internet or heard from a non medical source."[ID 62 C2 F]

A reoccurring theme amongst respondents was tailoring their dental visit frequency based upon recommendations made by their dental professional.

"I visit the dentist at least every nine months. I follow this schedule because my dentist recommends it." [ID 84 C2 M]

"Twice a year. It is recommended, and I am fortunate to have a dental plan."[ID 25 C1 F]

4.4.2 Knowing Part of the Story. While most of the older adults expressed the opinion that good oral health is part of a healthy lifestyle, a knowledge gap was evident in that few participants had a clear understanding or appreciation of the specific link between oral health and common chronic diseases. Knowledge deficits were apparent in that some participants had not heard about this link before participating in this study.

"Simply put what is the link? I know nothing about how oral health and other diseases are related. The dentist never mentions this at regular visits. The family doctor never mentions this whenever I visit him. Older adults should know exactly what to do to prevent other diseases from developing as a result of poor oral health and they should be taught just what proper oral health encompasses" [ID 89 C1 M]

For some participating in this study, completing the surveys was an eye opening experience that highlighted their own personal knowledge deficits about the oral health chronic disease link. Some participants expressed an interest in wanting to learn more about this topic as evidenced by the following comments:

"I saw information that I was not aware of earlier in this survey, and would need to learn more about it in order to understand it" [ID 40 C2 F]

"Based on my unsure response, I need to better educate myself "[ID 66 C2 F]

"I could say that today with this survey, I was stumped by most of the questions" [ID 69 C2 F]

Some participants expressed concern that older adults may not possess the necessary knowledge or understanding about the link between oral health and chronic diseases:

"Older adults may not know the link between good oral health and heart disease."[ID 49 C1 F]

"Older adults should be aware that there is a link, and that there are things they can do to prevent oral ill health from causing other problems."[ID 73 C2 F]

Other respondents were forward thinking and felt that taking a preventive approach such as increasing awareness about the oral health and chronic disease link would be beneficial to older adults.

"Oral health care is as important as your physical health care. More awareness is needed."[ID 28 C1 F]

"I would think that a list of chronic diseases that can be affected by poor oral health would be helpful. A clear explanation of the link and simple preventive measures that the person should take to minimize the risk."[ID 62 C1 F]

One male respondent identified a potential reason to explain older adults' knowledge gap. He felt that healthcare professionals, including dentists and doctors were not doing enough to ensure that older adults were aware of the link between oral health and chronic diseases.

> *"I have always known that good oral hygiene was a necessary part of good overall health. I have just never known of the link to chronic diseases. Family doctors and dentists should be given tools to emphasize these links. It should also start before adults become older." [ID 38 C2 M]*

4.4.3 Living with the Consequences. When asked what they would change about their mouths, an overwhelming majority of respondents wanted to go back in time and make better oral care decisions.

> "*I would have to turn the clocks back and take better care in past, as I have gum recession, some sensitivity, many fillings"[ID 5 C1 F]*
>
> "*better care when I was a child - got a time machine?"[ID 12 C1 M]*
>
> *"I wish I had taken better care of my teeth as a kid so I didn't have so many fillings. I wish my teeth were straight. I wish I would floss more so my gums are healthier" [ID 63 C2 F]*

At one point in time dental care may not have been recognized as part of a preventive lifestyle. According to one woman, she only went to a dentist when she had a problem, but she made sure that her own child did not have the same negative dental experience:

> *"I would go back and have regular dental check-ups from the time I was a young child. I have lots of fillings and a few crowns. I believe these are the result of poor dental care when I was young. I grew up in a rural area where you only went to*

the dentist when something was really bad. My daughter on the other hand had regular dental check up all her life and has no problems at this time. By the time I was her age I had numerous extractions and big fillings."[ID 62 C1 F]

While some individuals took full responsibility for past dental choices and experiences,

"*I should have started to take care of my gums and teeth much earlier than I did." [ID 14 C1 M]*

Others attributed present day issues with causes such as parental values and inferior care from dental professionals.

"*That when I was young I could have recognized the dentist I went to was drilling more teeth than needed drilling. Now all of my molars and premolars have fillings" [ID 27 C1 M]*

"I would go back in time to my early youth and insist on good dentistry, and not allow my parents to request that teeth be extracted"[ID 59 C1 F]

Participants were very conscious of the physical appearance of their smiles and many people discussed options such as having their teeth replaced, straightened or whitened to improve appearance, self-confidence and self-esteem.

"my four front teeth removed and replaced would give me back my self esteem. molars pulled or fixed. to stop the reoccurring infections in pockets"

[ID 55 C2 F]

"Have teeth straightened as front ones are crooked. More aesthetically pleasing" [ID 72 C1 F]

"[I would] whiten teeth, just for my vanity" [ID 60 C1 M]

Having dentures was viewed as very undesirable, and was not looked upon as a reasonable replacement for having one's own teeth. It is important to note that while all participants reported having natural teeth, some may still wear a complete or partial denture.

"I would have straighter, whiter, less sensitive teeth without fillings and crowns. I wish I had known about flossing when I was younger. I know people that had dentures from a fairly young age and would like to prevent ever having them" [ID 73 C2 F]

"From what I hear false teeth are no fun to have and not as pleasant to eat with and limits what one can eat/chew. Disease is not something anyone needs in their mouth or other body parts" [ID 50 C1 F]

"real teeth are better than other man made options - should be an important part of everyone's personal health care regime"[ID 12 C1 M]

"I would like it if I did not have a denture."[ID 84 C2 M]

While some people appeared wistful for change, others were accepting of and happy with their present oral health status.

"*Alignment is not perfect, but I live with it. Lots of fillings, but I live with them." [ID 26 C1 M]*

"I would change nothing"[ID 42 C1 F]

"[I am] quite happy about my teeth"[ID 23 C2 F]

4.4.4 Practicing and Valuing Oral Health. The older adults in this study held an intrinsic value for oral health and oral health care. Value statements were apparent when

participants expressed the *importance* of oral health and *need, want* and *should* statements about accessing oral care.

> *"It is important for everyone to look after their mouth and teeth because there is a link between oral health problems and other diseases"[ID 84 C2 M]*
>
> *"I want to be able to eat when I am in the nursing home!!!"[ID 74 C1 F]*
>
> *"Keeping my mouth germ and cavity free will make me feel better and be more healthy" [ID 31 C1 F]*
>
> *"Individuals should have six month check-ups at the dentist and daily brushing is important" [ID 56 C1 F]*

Maintaining overall health, preventing disease, and preserving oral function were regularly cited as reasons why study participants viewed oral health as being important. One respondent also commented on the social implications of poor oral health.

> *"It is important for a number of reasons including: (1) Proper chewing of food which enhances digestion and nutrition; (2) if some problems are caught early more serious problems such as tooth extraction, cancer or heart disease may be prevented or lessened;(3) It can also affect how you feel about yourself .If your teeth look good you may smile more and not be self conscious about how you look when you talk etc." [ID 62 C2 F]*

When describing the relationship between oral health and overall health many participants talked about oral health and its' impact on one's ability to eat and chew properly. Many participants talked about how losing teeth had a negative impact on quality of life.

"*Our general health is linked to our oral health. If we lose teeth, it affects our nutritional health and health in general." [ID 49 C1 F]*

Other respondents took it one step further and made the association between oral health and cardiovascular disease.

"*I know it affects our overall nutrition because if you have bad teeth and gums and there is pain, you wont feel like eating or you choose food that may not be best for you. Also I feel it impacts heart health."[ID 63 C2 F]*

"You need to eat and drink to survive. You need a healthy mouth to maintain a healthy diet and to reduce the risk of heart disease as you age" [ID 19 C2 F]

"For proper chewing with food and prevention of tooth loss and prevention of heart disease"[ID 22 C2 F]

Overall, participants were active in managing their oral health and reported receiving regular dental care. Some participants reported that accessing regular dental care was a valuable life-long practice.

"*I visit my dentist every six months. It was a habit developed by and with my parents. The receptionist schedules my next visit before I leave"[ID 38 C2 M]*

"*Get my teeth cleaned every 6 months. Dentist x-rays and exam once per year. Even without dental insurance at the moment, this is important to me for consistent ongoing dental health" [ID 35 C1 M]*

Oral health self-care practices and frequency of these practices was fairly consistent in this sample. The most commonly reported self-care practices were brushing, flossing, eating well, and rinsing.

"*Brushing, flossing and drinking lots of water"*

[ID 19 C2 F]

"Brushing, flossing and eating fruits and vegetables" [ID 38 C1 M]

In addition, some respondents reported using mouthwash as part of their daily routine to care for their teeth and gums.

"Brushing three times, flossing in the morning and using mouthwash once or twice a day.*"[ID 51 C1 F]*

While there was a strong commitment to daily brushing, daily flossing was still not part of some participants oral care regime.

"Brush in the morning sometimes brush after eating anything that may stick in teeth during the daytime meals and at night before bed. Floss once in a blue moon" [ID 89 C1 M]

"You would see me eating healthy foods, brushing and most of the time flossing my teeth."[ID 84 C2 M]

4.4.5 Barriers to Accessing Care. For some respondents who wanted to make changes to their mouth, the cost of dental treatment was cited as a barrier.

"*I wish I had the money to fix my teeth properly. They are somewhat crooked and I have lots of fillings, the teeth get more yellow as I age. I need serious dental work but I can't afford it. When I was a kid, the option seemed to be to yank them if you couldn't repair cavities and this has ruined both function and any aesthetic presentation when I open my mouth. Back then it may have been lack of technology to repair and save teeth, now its just too expensive to do anything" [ID 89 C1 M]*

"[I want to] *keep all my teeth healthy, get implants if I could afford* it."[ID 50 C1 F]

"*I would replace my crooked front tooth with a veneer, but I can't afford it!!" [ID 45 C1 F]*

It is important to acknowledge the influential role that having dental insurance played in how frequently participants accessed dental services. For some participants who did not have dental insurance, this meant they did not access preventive dental care.

"Only whenever there is a problem because I do not have insurance and cannot afford dental care."[ID 58 C2 F]

Dental insurance was recognized to be an enabling factor that assisted some participants in being able to follow dental professionals' treatment recommendations.

"twice a year. for my health benefits, BUT I have a plan to cover this. If I had to pay the full cost I would not go as often or be as knowledgeable on causes and prevention and the importance of good dental care." [ID 50 C1 F]

4.5 Comparing and Relating the Data

This section focuses on Research Question 7: *"How do the qualitative results extend additional insight into the quantitative results?"* This section describes how the qualitative findings build upon the knowledge gained from the quantitative findings of this study. Overall the qualitative analysis revealed that participants in this study depicted oral health as an important part of their lives, and perceived it as a valuable component of general health. The central purpose of conducting this study was to explore the influence of oral health literacy and oral health chronic disease knowledge on oral care behaviours.

4.5.1 Oral health literacy. Through the use of open-ended questions, participants were asked to answer: "What oral health information do you search for?"; "How often do you come across oral health information that you do not understand?"; What is your preferred source(s) for getting oral health information?"; and "When you come across conflicting oral health information, how do you decide which information to believe?" When participants were asked how often they came across oral health information they did not understand, an overwhelming majority of participants reported not having any problems understanding any oral health information as demonstrated by the following responses:

"very rarely if at all" [ID 35 C2 M] or "not very often." [ID 76 C2 M]

It is interesting to note that while they reported being able to understand oral health information, many reported not actively searching for this type of information.

"I do not search for oral health information" [ID 84 C2 M]

This concept was also echoed in the words of one woman who said:

"I have not searched for oral health information recently."[ID 19 C2 F]

Of those who did search, it was usually to find out information about a specific problem they were experiencing.

"Not much. When one of my molars had to be extracted or crowned, I searched for info about options, costs, importance of the work."[ID 40 C2 F]

If participants felt inclined to find oral health information many reported being adept at using the Internet or consulting with health professionals to obtain the required information.

"Any problem that I may feel needs attention from a dentist. I search for symptoms online sometimes if I feel the need"[ID 50 C1 F]

"Usually discuss with dentist or periodontist, but have researched on Internet as well" [ID 80 C2 M]. Many participants relied primarily upon dental professionals to supply them with any necessary oral health information.

"If I did need to get information, I would go talk to my dentist or dental hygienist."[ID 62 C1 F]

This reliance was based upon a strong sense of trust in advice from dental professionals

"[I would] talk to my dentist who I respect and trust"[ID 51 C 1 F]

This recurring theme of trusting in and looking to dental professionals for oral health information was captured in the qualitative theme "Relying on Dental Professionals"

The quantitative data also supported the concept that study participants did not experience difficulties in finding and understanding oral health information. The median score of study participants on the oral health literacy adult questionnaire was 13.36 and the most frequently occurring score on the questionnaire was 15. The highest score possible was 17, so this shows that as a whole the sample did exhibit a high level of oral health literacy skills.

4.5.2 Oral health chronic disease knowledge. Overall, many participants appeared aware that it was important to maintain good oral health, however when asked what key information older adults should know about the link between oral health and chronic diseases many were not knowledgeable. Only seven respondents were able to directly link oral disease and inflammation with specific chronic diseases such as heart disease and oral cancer.

"Good oral health is part of a healthy lifestyle which helps to decrease chronic health issues."[ID 42 C2 F]

" It is important to have regular dental check ups regardless of whether or not they still have their natural teeth. Oral problems can affect seemingly unrelated body systems such as the heart."[ID 58 C2 F]

Other participants acknowledged that they had a knowledge deficit about this link as evidenced by one man's comment:

"This is something I wish I knew more about."[ID 54 C2 M]

Some respondents raised the point that more awareness was needed regarding the link between oral health and chronic diseases:

"Older adults should know more about the co-relation between oral health and chronic diseases as this appears to be a topic that is not widely talked about. Better public awareness campaign is needed."[ID 22 C2 F]

Both early and late boomers expressed having limited to no knowledge about the link between oral health and chronic diseases.

"I honestly do not know enough about this subject to answer any questions or even offer an opinion."[ID 69 C2 F]

"I need to find useful, established information on the topic" [ID 10 C1 F]

This lack of knowledge about the oral health chronic disease link was reflected in the qualitative theme "Knowing Part of the Story."

The quantitative data further supported this fact through paired t-test analysis that showed no difference in OHCDK scores between cohorts [$t(67) = 0.28$, $p = 0.78$]. A lack of oral health chronic disease knowledge was also supported by the quantitative data that

showed that the mean oral health chronic disease knowledge score for the total sample was 10.01 95% CI [9.13, 10.89] and the most commonly occurring score was 10. The highest score possible on this questionnaire was 19, so this shows that as a whole the sample did not exhibit high levels of oral health chronic disease knowledge.

4.5.3 Oral care behaviours. This sample of older adults demonstrated a high frequency of daily brushing with 75% reporting that they brushed two or more times per day. Similar to the quantitative data, the majority of participants cited brushing as their most frequent dental care behaviour. An exception to this trend was noted in the late boomers where two individuals (5.71%) reported brushing less than once a day. In responses to the open-ended question about daily oral care practices one late boomer woman's comment supported this finding.

"[I would be] flossing, using dental picks and occasionally brushing. I am bad for brushing."[ID 33 C2 F]

The frequency of daily flossing was not as high with almost 49% of early and late boomers reporting that they flossed less than once a day. This lack of daily flossing was equally distributed across both cohorts. Qualitative data also supported this finding with some participants sharing that they were less inclined to use dental floss on a daily basis.

"Brush, use mouth wash, floss when I remember."[ID 27 C1 F]

"I brush every morning and sometimes more frequently. I floss every now and again."[ID 63 C2 F]

"Brush daily, floss weekly."[ID 28 C2 F]

This study also explored the use of home dental aids, and almost 67% of study participants reported using at least one home dental aid. This finding was echoed in the

qualitative data whereby some participants mentioned specific home dental aids when discussing their typical daily oral care practices.

> *"Brush three times, floss once, use electric tooth brush once a day, use mouth guard at night and use a pick once a day."[ID 13 C1 F]*
>
> *"Floss and brush in the morning. Rinse before bed. Remove particles after eating with toothpicks." [ID 80 C2 M]*

Some individuals appeared to be very dentally motivated because they brushed, flossed and used multiple home dental care aids.

> *"Brush after every meal and before bed- floss, use a proxabrush and a rubber tip along the gum line plus sometimes mouthwash." [ID 40 C2 F]*

A unique finding from the qualitative data that was not explored as part of the oral care behaviours survey was the number of individuals who discussed the importance of making healthy food choices and rinsing as part of their daily mouth care habits. In particular, respondents mentioned avoiding sugar and rinsing after eating as a regular habit for maintaining a healthy mouth.

> *"Rinsing after eating; eating well; avoiding sugars; brushing and flossing."[ID 26 C1 M]*
>
> *"Avoiding sugar, rinsing after snacks, brushing and flossing every night before bed."[ID 35 C2 M]*

Results of the oral care behaviours survey showed that 71% of the baby boomers in this study visit a dental professional more than once a year, In addition to acknowledging the importance of personal oral care habits many participants acknowledged the importance of accessing regular professional care as an essential part of keeping their mouth healthy.

"[I visit] every nine months. It is good for my health. In addition to taking care of our own teeth, we get the added inspection from these professionals."[ID 63 C2 F]

"Once a year for a full dental check up and at the 6 month mark for a dental cleaning. The appointment for these is automatically made at the end of each visit. I agree to this schedule as I feel it is a good way to stay ahead of any problems that may be starting but not showing any symptoms that I can see or feel." [ID 62 C1 F]

Having access to private dental insurance was an important factor that was raised in both the quantitative and qualitative data. Access to private dental insurance was the strongest predictor variable in the regression model for predicting dental care behaviours and this model showed that individuals with access to dental insurance were more apt to participate in more frequent dental care behaviours than those without private dental insurance. In this sample, approximately 73% of baby boomers had access to private dental insurance, and research shows that having access to private dental insurance is an enabling factor for whether or not individuals access dental services. (39,40)

Many participants openly shared the fact that their dental visit frequency was impacted by whether or not they had private dental insurance, and how often insurance covered dental services.

"Since I have no dental insurance I only visit when I have an issue."[ID 33 C2 F]

"Twice a year as well as for any problems between visits because I want to have good oral health into old age. Having a dental plan definitely helps me do that." [ID 31 C1 F]

CHAPTER 5: DISCUSSION

In this chapter, I include sections on a discussion of the key findings in relation to prior research, limitations of the study, suggestions for further research, and conclusions.

5.1 Discussion of Key Findings

Study results highlight that access to private dental insurance, level of education and age cohort had an influence on the dental behaviours of baby boomers in our sample. Education was shown to be a predictor variable in the dental care behaviours model, however higher education was correlated with worse dental care behaviours scores. While educational attainment has been shown to correlate strongly with both general literacy and health literacy, (109) findings from this study demonstrate that having higher education does not necessarily translate into more positive behaviour. These specific relationships discussed below are useful to researchers, community members, dental and allied health professionals, and government agencies who are interested in trying to understand the complex oral health needs of an aging population. Previous research has shown that individuals' utilization of dental services depends upon an array of factors such as the ability to pay, age, gender and attitudes toward dental care. (23,36,37) Obtaining a greater knowledge of the characteristics of baby boomers for which to target educational efforts toward is an important outcome of this study.

Both qualitative and quantitative results indicated that having dental insurance is an important enabler of accessing regular dental care. Approximately 76% of study respondents reported having access to private dental insurance, which is higher than the Canadian average of 62.6%.(5) Findings from this study indicate a relationship between having access to private dental insurance and higher levels of oral health chronic disease

knowledge and more positive dental care behaviours. This finding is supported by considerable evidence that shows the use of dental services is strongly correlated with income, education and existence of dental insurance. (34,36) Previous research suggests that people with private dental insurance are more likely to have more frequent dental visits than individuals without private dental insurance and having extended access to dental insurance has been shown to increase the likelihood of older adults being able to maintain their teeth over their lifetime. (35,36,110) While many respondents reported visiting their dental professional based upon professional recommendations, many also acknowledged that having dental insurance was an enabling factor. For those study participants who did not access regular oral care, cost and lack of dental insurance were identified as the primary barriers to accessing dental care. Baby boomers are getting older and will eventually leave the workforce. For some, this may result in a loss of private insurance coverage due to losing employee benefits after retirement. Because having dental insurance has been demonstrated to be a strong predictor of oral care behaviours, this change could potentially have a negative impact upon future dental care utilization by baby boomers. This trend was highlighted by a Canadian study that showed individuals aged 65 and older were less likely to have dental insurance or visit a dentist as frequently as individuals aged 45 to 64. (111) A possible suggestion to enable older adults to maintain post retirement access to dental insurance coverage is to provide tax incentives for employers who provide extended dental coverage options for retirees. Another option would be to lobby both industry and governments to implement subsidized dental care plans similar to programs that has been put in place to assist older adults with prescription drug costs. Since unmet oral health needs impact overall health

and quality of life it is important to ensure our aging population do not neglect their mouths as they attempt to achieve successful aging.

Higher education was correlated with worse dental care behaviours scores. While educational attainment has been shown to correlate strongly with both general literacy and health literacy, findings from this study demonstrate that having higher education did not necessarily translate into more positive dental care behaviours. (109) One possible explanation is related to the personality of this sample whereby many participants had a high intrinsic motivation for maintaining their oral health regardless of formal educational achievement. While not a factor of interest in this study, the construct of self -efficacy may have had an influence on study results. Self-efficacy reflects confidence in the ability to exert control over one's own motivation, behaviour, and social environment. (112) Because self-efficacy has been identified as a significant determinant of health-related actions initiated or avoided by individuals, it is important to further explore its role in the oral health behaviour context. (113,114)

Participants in this study had relatively high educational attainment and annual household incomes. The lack of difference across socioeconomic status may be related to the self-selected nature of this sample. This sample had higher levels of education than the general population of baby boomers as everyone had obtained at minimum of some college or trade school training. In comparison, a Canadian health literacy study (115) conducted with well-educated, adults 60 and older reported 11% of their participants had not achieved high school graduation. According to 2012 national data (116), 59.2% of Canadians aged 45 to 64 had obtained some form of post secondary certification and this is lower than the attainment rate of the present study's sample. In 2011, 50 % of

Canadian boomer households had an income over $60,000, and this is lower than the reported income of study participants. (117)

Results from this study provide us with a glimpse into what factors influence the dental care behaviours of a community-dwelling sample with relatively high socioeconomic status. Many other oral health studies have been conducted with convenience samples of various ages and lower socioeconomic status that have been recruited primarily from health clinics, hospital, university, and private dental clinics. (84,86,103,118-120) The problem with these samples is that they may represent lower users of oral health care services and they often exhibit lower levels of oral health. For the purposes of this study it was important to explore the oral health knowledge, skills, and behaviour of independent, dentate older adults to better understand what factors influence a continuum of participation in positive oral care behaviours.

The present study demonstrated that there were cohort differences between early and late boomers with regards to their dental care behaviours. In the predictive dental care behaviours model of this study, it was early boomers rather than late boomers who were more likely to have better dental care behaviours scores. This may be due in part to early boomers having more access than late boomers to employment-based dental coverage throughout their careers, thereby allowing them to access more regular dental services. Late boomers entered the labour force after the prosperity peak had passed and many of the best positions had been taken and employers were scaling back on non-wage benefits such as dental benefits. (31,39) Late boomers were more likely to report visiting a dental professional only when there is a problem, and they were less likely to floss two or more times a day than early boomers.

One of the key findings from this study is that while some participants knew about the link between oral health and chronic disease, their level of knowledge was quite low in general. Other studies that explored diabetic client's awareness of the link between oral health and diabetes found that participants were mostly unaware of the link between the two health conditions. (47,53) A possible explanation for low knowledge is that dental and other health professionals are not providing clients with current oral health promotion information regarding the oral health and chronic disease association. In a study that examined diabetic educators perception of the adequacy of their training to prepare them to provide clients with information about the link between oral health and diabetes determined that 93.8% of curricula offered did not include an oral health module. (68)

One of the key OHCDK themes that emerged from the qualitative data is that older adults need and want more information about the specific links between oral health and chronic diseases. Results from this study have implications for patient education efforts, because they highlight the fact that some older adults may be at risk for having limited knowledge about the link between oral health and chronic diseases. Some study participants acknowledged that as a result of participating in this study, they gained increased awareness about the link between oral health and chronic disease, and would follow up by obtaining more information about this topic. According to Payne & Locker (10), client counselling has been demonstrated as an effective way of increasing knowledge, therefore this maybe a strategy that dental and primary care providers can employ to increase awareness especially for at risk individuals. Since not all older adults visit dental professionals on a regular basis, initiatives such as engaging other primary

healthcare providers and creating community based oral health promotion programs to help raise awareness about these links need to be explored.

All of the participants in this study reported having natural teeth and this is most likely attributed to significant improvements in access to preventive dental treatment over their lifetimes. For the most part, respondents participated in regular oral care activities and acknowledged that maintaining their oral health was an important part of a healthy lifestyle. Our findings lend further credence to the view that higher socioeconomic status and the presence of natural teeth are more closely linked with accessing preventive care. (74) The majority of respondents reported brushing two or more times a day and visiting a dentist more than once a year. These are encouraging findings because unlike previous generations, many aging Canadians are expected to keep their own natural teeth over their entire lifespan and this will require a commitment to regular personal and professional oral care. One study speculated that dental attendance patterns established in younger years continue into old age. (74) This finding was echoed through participant comments that explained how their oral care behaviours were based upon habits that had been developed earlier in their lives. Approximately 67% of the total sample reported using at least one home dental aid dental, and 49% of participants reported flossing less than once per day This is similar to previous research that hypothesized that while tooth-brushing behaviour may be determined during childhood the use of other dental preventive methods may be established later and may be more susceptible to the interventions of dental practitioners. (34,73) As a result of keeping their natural teeth, aging baby boomers that do not participate in positive oral care behaviours increase their risk for requiring more complex dental treatment than previous generations.

Some participants believed that their present day dental issues and oral care behaviours were influenced by past causes such as parental dental values and in some cases inferior care from dental professionals. It is important to acknowledge that the difficulties people experience when trying to comply with dental health advice are not conjured up for the here and now but have their roots in earlier times. (38) Factors that raise disease risk or promote good health may accumulate gradually over the life course, although there may be developmental periods when their effects have greater impact on later health than at other times. (121) This study's findings support the fact that both early and late boomers would benefit from targeted education about the benefits of using floss and home dental aids on a daily basis.

Primary sources of dental information were dental professionals and the Internet. One study found that people who used the Internet to gain health information were more apt to have higher health literacy. (122) The encounter with a dentist or dental hygienist was viewed as an opportunity for patients to receive professional guidance and learn skills for oral self-care. There was also a great sense of trust in the information obtained from dental hygienists and dentists. Dental care providers must be willing to provide more than just dental treatment to patients. They need to be skilled in recognizing patients' oral health literacy levels and knowledge deficits and in particular educating patients regarding the link between oral disease and chronic disease. Health knowledge, self-management skills, and compliance with health care appointments have been shown to improve when education and awareness programs are specifically tailored to the target audience. (43)

In this study it was females with higher educational attainment, income levels and oral health chronic disease knowledge scores that demonstrated higher levels of oral health literacy. The influence of gender on oral health literacy has been demonstrated in previous research. In a cross sectional study from Iran that measured oral health literacy by also using the OHL-AQ, researchers found that women had higher oral health literacy scores than men. (103) Another study demonstrated that the effect of gender was highly significant at the bivariate and multivariate levels with females demonstrating greater oral health literacy. (84) An important note to remember when interpreting gender related findings from this study is that more females (n=50) than males (n=19) participated in the study.

Both qualitative and quantitative results suggest that participants had adequate levels of oral health literacy as evidenced by scores on the OHL-AQ, and few participants reported having experienced any difficulty understanding or finding oral health information. The high socio-economic profile of this sample may have had an influence on study outcomes. It has been suggested that poor oral health literacy is more likely found in individuals who are poor, not well educated, older, and with limited English language skills. (82) Similar to findings from two other studies, (84,87) the present study's findings did not find a relationship between oral health literacy and dental care behaviours. While there has been considerable study into health literacy in medicine, health literacy in dentistry is a relatively new area of research. (84) In interpreting this result it is important to recognize that the concept of oral health literacy is a relatively new one and the exact pathways between literacy and oral health outcomes have not yet been established through rigorous studies. (123) Further research is required to better

understand what if any relationship exists between oral health literacy and oral care behaviours and to identify any possible confounding factors.

5.2 Limitations

Many factors limit the generalizability of the results of this study. These findings should be viewed in the context of a small sample size (n=69) of primarily English speaking participants that may not reflect the population overall. It would have been beneficial to attract a larger sample size with special emphasis in recruiting a greater number of males (n=19) for participation in this study since males in PEI represent approximately 48 % of the population. (124) Participants were also fairly well educated and may have had higher oral health literacy skills than the general population so care must be taken when generalizing findings to all older adults. Conducting data through the Internet may have excluded some people from participating in this study. Not all households may have access to the Internet, and some people may not possess the computer skills required to participate in this type of study. Sampling bias may also have been a limitation. Qualitative analysis highlighted that the older adults in this study held an intrinsic value for maintaining their oral health and participating in regular oral care. This study may have attracted participants who were more highly dentally motivated and cared more about oral health.

The correlations found between oral health literacy and oral health chronic disease knowledge were positive but low, so these results need to be interpreted with caution. Oral health chronic disease knowledge was assessed through the use of an invalidated, questionnaire. This might have contributed to discrepancies in the oral health chronic disease knowledge scores of participants.

5.3 Suggestions for Future Research

There is a clear need for additional research to add to the body of evidence on this topic. Larger studies should be conducted with randomly selected participants from more varied ethnic and socioeconomic backgrounds. The participants from this study were quite dentally motivated, and had a relatively high socioeconomic status, thereby not being representative of the general population. It would be important to include a more diverse population to explore if factors such as differences in dental care access, culture and attitudes, communication and literacy, income, and education have an impact upon older adults' oral care behaviours. It would be beneficial to conduct focus groups to gain further insight into what factors baby boomers believe will impact their access to preventive care after retirement and to further explore upon what role losing dental coverage will have on their future dental care access. By using a focus group, the researcher could utilize impromptu questions to further ascertain perspectives and personal experiences from older adults. It would allow the participants a chance to speak in greater depth about these topics, provide greater access to consensus and diversity of experiences, and allow the researcher to develop a real sense of an individual's understanding of what influences their oral care behaviours. It would be beneficial to conduct psychometric testing on the Oral Health Chronic Disease Knowledge Questionnaire to test for reliability and validity of the items.

5.4 Conclusions

To the best of my knowledge this is the first study on PEI to explore the impact of both oral health literacy and oral health chronic disease knowledge on older adults' oral care behaviours. Our study shows that while older adults may have the skills to obtain, process and understand oral health information, they are quite unaware of the link between oral health and chronic disease. Similar to other studies we did not find a relationship between oral health literacy and oral health behaviours. However, this study further demonstrated the influential role that having access to private dental insurance has on older adults' oral care behaviours.

APPENDIX 1: QUALITATIVE QUESTIONS

1.Tell me in your own words what key information older adults should know about the link between oral health and chronic diseases.

2. What oral health information do you search for?

3. What is your preferred source(s) for getting oral health information?

4.How often do you come across oral health information that you do not understand?

5. When you come across conflicting oral health information how do you decide which information to believe?

6. If you could change anything about your mouth, teeth, or gums what would it be and why?

7. Why do you think it is important for older adults to look after their mouth and teeth?

8. If I followed you through your typical day, what would I see you doing to care for your mouth and teeth?

9. How often do you visit a dentist or dental hygienist? Why do you follow this schedule for dental visits?

APPENDIX 2: BACKGROUND INFORMATION QUESTIONNAIRE

1. What is your gender?

   Male

   Female

2. In what year were you born?

3. What is your primary language

   English

   French

   Other

4. What is the highest level of education you have completed?

   Some high school;

   high school graduate;

   trade school or community college graduate;

   university degree,

   graduate work

5. What is your annual household income?

   0-25,999;

   26-51,999;

   52-74,999;

   75,000 and greater;

   Would rather not say

6. What type of community do you live in?

   Urban (Charlottetown, Summerside)

Small town or village (Montague, Kensington)

Rural (Brackley, Richmond)

7. How would you rate your general health?

Excellent

Good

Fair

Poor

8. How would you rate your mouth health?

Excellent

Good

Fair

Poor

9. Do you have any natural teeth?

Yes

No

10. Do you have private dental insurance?

Yes

No

11. How often do you use tobacco products?

Daily use

Occasional use

Never use

12. Have you previously used tobacco?

Yes or No

If so, for how many years did you use tobacco?

13. Have you been diagnosed with any of the following chronic diseases? (check all that apply)

Cancer

Cardiovascular (heart & stroke) disease

Respiratory disease (pneumonia or COPD)

Diabetes (Type 1 & 2)

APPENDIX 3: ORAL HEALTH LITERACY QUESTIONNAIRE

(OHL-AQ)

(Mohammed Mehdi Naghibi Sistani 2011)

In this part you will see a passage about oral health knowledge. Choose one word that completes the sentence.

1. Research shows that there may be a link between oral diseases and other health problems such as_____
   A) skin disease
   B) heart disease
   C) mental illness
   D) muscular dystrophy
   E) Don't know

2. One of the most common mouth diseases is tooth decay.
   i. To prevent tooth decay one should brush with a toothpaste that contains _____.
   A) flavors
   B) whitening
   C) detergents
   D) fluoride
   E) Don't know

   ii. It is recommended to brush and floss at least twice a _____.
   A) month
   B) mealtime
   C) day
   D) week
   E) Don't know

   iii. Individuals should avoid diets high in _____ .
   A) salt
   B) spices
   C) fat
   D) sugar
   E) Don't know

3. Every adult person should have 32 of this type of teeth_____.
   A) incisor
   B) deciduous
   C) molar
   D) permanent

E) Don't know

At six years old, on average, people will get _____.

A) most of them
B) the first one
C) the last one
D) all of them
E) Don't know

In this part you will see a prescription for use of antibiotics. Please answer the following questions based on this information.

Diagnosis: Tooth infection and dental abscess Treatment: Amoxicillin (500mg) 21 tablets. Take one tablet orally three times a day (every 8 hours) for 7 days

4.If you take the first tablet at 1PM, when should you take the next one?
A) 10:00 PM
B) 12:00 AM
C) 9:00 PM
D) 8:00 PM
E) Don't know

5.If your symptoms are gone by the 4th day of taking the medication, should you stop taking the medication?
Yes No Don't know

In this part you will see instructions for using a mouth rinse. Please answer the following questions based on this information

Sodium fluoride mouth rinse 0.2 % Swish once a week with 20 milliliters (mls) for 1 minute and then spit. Do not swallow the rinse. Do not eat, drink, or swish your mouth for 30 minutes after use.

6. With regard to this prescription rinse, can you drink water after use?
Yes No Don't know

7. If you use it at 12 AM, when can you eat or drink?
A) 1:00 PM
B) 12:30 AM
C) 11:30 AM
D) 12:30 PM
E) Don't know

In this part you will read some sentences about care after tooth extraction. Please answer the following questions based on this information.

Bite down on a moist gauze pad for 30 minutes on the area of the tooth extraction site Do not rinse your mouth for 12 hours Eat cold and soft food like ice cream or cold soup for 12 hours after tooth extraction

8. If your tooth was extracted at 8 am, when should you take the gauze out of your mouth?
A) Next day at 8AM
B) Same day at 12PM
C) Same day at 8PM
D) Same day at 12 AM
D) Don't know

9. If your tooth was extracted at 8am, can you eat hot food at 2PM?
Yes No Don't know

In this part you will be presented with questions about oral health problems and filling out dental office forms. Please choose one correct answer per question.

10. What should you do if you notice bleeding occurring after brushing or flossing?
A) Stop daily brushing and flossing
B) Chew gum instead of brushing or flossing
C) Continue daily brushing and flossing
D) Use a toothpick instead of brushing and flossing
E) Don't know

11. What should you do if pain or swelling occurs in the mouth?
A) Take antibiotics
B) Take pain medicine

C) Consult with family members or friends
D) Visit a doctor or dentist
E) Don't know

12. Which of the following is the best way to remove tartar and stains from a person's teeth?
A) Eat hard foods like an apple
B) Rinse with a mouthwash
C) Use a tartar control or extra whitening toothpaste
D) Have a professional dental cleaning
E) Don't know

13. In your opinion what is the meaning of the following term " Informed Consent"?
A) I agree that I understand the risks involved in a proposed dental procedure and have had the opportunity to discuss such risks with the dentist.
B) I give my permission to my dentist to do any treatment as necessary without prior discussion of the risks involved with the procedure.
C) My dentist is not responsible for unintentional complications of treatment.
D) I trust my dentist to make all dental treatment choices for me.
E) Don't know

14. In your opinion, what is the meaning of the following statement "Do you have a history of allergy to certain medications and/or drugs?"
A) I experience an anaphylactic shock reaction as a result taking certain medications/drugs
B) I experience unpleasant, non- life threatening side effects as a result of taking certain medications/drugs
C) I am unable to take certain medications/ drugs because my parent is/was allergic to those medications/ drugs.
D) I choose not to take certain medications /drugs in case I may have an allergic reaction.
E) Don't know

Please provide written answers to the following questions.

1. What oral health information do you search for?

2.How often do you come across oral health information that you do not understand?

3. What is your preferred source(s) for getting oral health information?

4. **When you come across conflicting oral health information, how do you decide which information to believe?**

APPENDIX 4: ORAL HEALTH

CHRONIC DISEASE KNOWLEDGE QUESTIONNAIRE

Please select True, False or Unsure for each statement below.

1. Oral cancer is a rare cancer in Canada?

2. Older adults especially those 60 and older, are at greater risk of developing oral cancer.

3. Oral cancer screening is an successful way to find oral cancer in the early stages.

4. Oral cancer affects the quality of life for individuals and their families.

5. Using tobacco puts people at higher risk for developing pre-cancerous and cancerous head and neck tumors.

6. Eating fruits and vegetables can protect against oral cancer.

7. A person with early stage oral cancer usually experiences pain or discomfort.

8. Only people with their own natural teeth benefit from having yearly mouth exams.

9. People with poorly managed diabetes are at greater risk of developing oral health problems than people who do not have diabetes.

10. Maintaining regular dental visits is an important part of diabetes management.

11. Diabetes only causes mouth problems for people with natural teeth.

12. There is evidence to show that blood levels of HbA1c can be reduced as a result of providing periodontal therapy (dental scaling and root planing) to people with Type 2 diabetes.

13. Poor oral health is a risk factor for developing aspiration pneumonia.

14. Providing daily mouth care such as brushing and flossing to older adults can prevent aspiration pneumonia

15. Aspiration pneumonia is the most significant mouth-body association that impacts the health of older adults living in long term care.

16. Gum disease causes heart disease.

17. Having dental treatment can put individuals with certain heart defects and conditions at higher risk for developing a condition called infective endocarditis.

18.People with heart disease who receive gum disease treatments such as scaling and root planing can lessen the risk of heart attack or stroke.

19. Individuals taking certain heart medications may experience mouth side effects.

1. Tell me in your own words what key information older adults should know about the link between oral health and chronic diseases.

APPENDIX 5: ORAL CARE BEHAVIOURS SURVEY

Please select a single response to each question.

1. How often do you visit a dentist?

A) 1 time per year

B) Greater than 1 time per year

C) Less than 1 time per year

D) Only when there is a problem

2. How often do you brush your teeth?

A) 2 or more times a day

B) 1 time daily

C) Less than daily

3. How often do you use dental floss?

A) 2 or more times per day

B) 1 time per day

C) less than daily

4. Which of the following dental home care aids do you use? Please select all that apply.

A) Interdental brushes i.e. proxabrush

B) Stimudents

C) Floss picks or sticks

D) Toothpicks

E) Other

F) None of the above

Please provide written answers to the following questions.

1. If you could change anything about your mouth, teeth, or gums, what would it be and why?

2. Why do you think it is important for older adults to look after their mouth and teeth?

3. If I followed you through your typical day, what would I see you doing to care for your mouth and teeth?

4. How often do you visit a dentist or dental hygienist? Why do you follow this schedule for dental visits?

APPENDIX 6: ORAL HEALTH CHRONIC DISEASE KNOWLEDGE QUESTIONNAIRE (OH-CDKQ) BACKGROUND DOCUMENT

The oral health chronic disease knowledge questionnaire (OH-CDKQ) has been developed as a tool to assess older adults' knowledge of the association between oral health and four types of chronic disease. Cardiovascular disease, cancers, chronic obstructive pulmonary disease and diabetes kill an estimated 153,000 Canadians every year, account for nearly three quarters of all deaths and major causes of hospitalization. (63) Oral diseases are also chronic diseases, and share risk factors with a number of chronic diseases including poor diet and hygiene practices, smoking, harmful alcohol use, participating in risky behaviours causing injuries, and stress. (26)

There is a rapidly growing literature base on the impact of oral diseases on chronic diseases of aging. Research points to an oral-systemic connection between chronic oral infections and diabetes, respiratory diseases, heart disease, cancer, and stroke. (18)

Following a review of related literature on the oral health and chronic disease association, I have created a series of questions to explore older adults' knowledge about this topic.

Oral Cancer

Item 1. Oral cancer is a rare cancer in Canada. False

Rationale: If not caught in the early stages, oral cancer can be fatal with an overall five-year survival rate of approximately 63 percent. (71,72)In Canada, oral cancer is the 13th most common cancer of the 23 reported cancers and in 2009, the number of new cases and death due to oral cancer was almost three times higher than that of cervical cancer and double the rates of liver cancer.(72)

Item 2. Older adults especially those 60 and older, are at greater risk of developing oral cancer. True

Rationale: Age-specific rates for cancer of the oral cavity increase progressively with age, most cases occurring in the groups above 60 years.(52)Oral cancer can occur at any age but the incidence increases sharply over 40 and individuals that are over the age of 60 have the highest incidence of oral cancer. (4,72) Research shows that populations at high risk for oral cancer tend to utilize dental services less frequently than medical services with 80 percent of individuals 65 years and older reporting an annual physician visit compared to 43 percent visiting a dentist.(71)

Item 3. Oral cancer screening is an effective way to find oral cancer in the early stages. True

Rationale: As with other cancers, survival improves when the cancer is diagnosed at an early stage rather than a later more advanced stage. (4,71,95) Detecting an early oral cancer is primarily dependent upon a health care professional providing a comprehensive oral cancer examination.(4)The rationale for health care providers to perform routine oral cancer screening is based upon the following: the disease is serious yet treatable in the early stages; treatment in the early stages of oral cancer is usually acceptable to asymptomatic patients and provides benefit over late treatment of symptomatic patients; and the screening exam is relatively inexpensive and poses limited discomfort or embarrassment for the patient.(71)

Item 4. Oral cancer has a profound impact on the quality of life for patients. True

Rationale: The mouth is an important organ for speech, swallowing chewing, taste and salivation and even with reconstructive procedures, major surgery in this region can

result in poor functioning and be cosmetically disfiguring. (94) Extensive disfigurement has been found to lead to changed self -image, problems with partners, decreased sexuality and increased social isolation. (71,125) Patients with head and neck cancers have been found to have high levels of depressive symptoms. (94) The negative side effects of being treated for oral cancer are long lasting with psychological distress and reduced health related quality of secondary to late effects of radiotherapy treatment being found in long-term survivors.(94)

Item 5. Using tobacco puts people at higher risk for developing pre-cancerous and cancer lesions in the mouth. True

Rationale: Tobacco use is the most important determinant of oral cancer and premalignant lesions and compared with non-smokers, smokers have a 2-18 times increased risk of developing oral cancer. (95,126) Non-smoking status has been found to predict for less recurrence and better survival in head and neck cancer patients.(94)Smoking or using tobacco products increases the risk of oral cancer especially if combined with high alcohol consumption.(15,72,93)

Item 6. Eating fruits and vegetables can protect against oral cancer. True

Rationale: Studies show that high fruit and vegetable intake are protective factors because of the high content of carotenoids and vitamin C. (72,127)Similar to other cancers such as colorectal, eating fruits and vegetables that contain essential vitamins (A,C,E) and other nutrients may provide protection against the development of oral cancers.(71)

Item 7. A person with early stage oral cancer usually experiences pain or discomfort. False

Rationale: Patients with early oral cancer rarely have pain or other symptoms. (4)The poor overall survival rate of oral cancer patients occurs because most lesions are not diagnosed until they are advanced.(71)

Item 8. Only people with their own natural teeth benefit from having yearly oral exams. False

Rationale: Oral cancer can occur whether or not an individual is dentate or edentulous. Oral cancer refers to cancers affecting the mouth, lip, tongue, salivary glands, oropharynx, tonsil and throat. (72,95) According to the oral component of the 2009 Canadian Health Measures Survey, oral and soft tissue lesions were present in approximately 40.9% of edentulous as opposed to 9.6 % of dentate individuals. (5)

Diabetes

Item 9. People with poorly managed diabetes are at greater risk of developing oral health problems than people who do not have diabetes. True

Rationale: Persons with uncontrolled diabetes experience higher incidence of periodontal diseases (periodontitis and gingivitis), dental caries, oral candidiasis, and tooth loss. (128-130) There is a substantial body of evidence showing that persons with diabetes are at two to three -fold risk for developing chronic periodontitis, and those with elevated HbA1c have a significantly higher prevalence of periodontitis and more tooth loss than those with better metabolic control. (50,99,131) Patients with diabetes often experience reduced saliva rate and xerostomia and this dryness of the mouth can lead to irritation of the oral soft tissues thereby contributing to periodontal infection, traumatic lesions, and tooth decay. (130,131) Oral candidiasis or thrush has been reported in patients with diabetes, and candida associated lesions include denture induced stomatitis, angular

chelitis, and median rhomboid glossitis. (129,130) Poor soft tissue regeneration and delayed bone healing are known complications for diabetic clients undergoing oral surgery. (130)

Item 10. Maintaining regular dental visits is an important part of diabetes management. True

Rationale: Diabetes has many oral manifestations and diabetic patients must be under regular oral health evaluation. (129) Most periodontal diseases are caused by bacterial biofilm which initiates an acute inflammatory response. (129)When dental plaque is not removed regularly, the bacteria in the plaque can cause the gums to become infected, and if left untreated the infection will attack the supporting bone resulting in eventual tooth loss. (16,130) Periodontal treatment is a high priority in patients for which periodontal disease may pose a health risk, and this includes patients with diabetes. (131) Diabetes is a risk factor for periodontal disease development and progression, and poor glycemic control can accelerate the progression of periodontal diseases. (129) Conventional periodontal therapy includes professional scaling and rootplaning by a dental hygienist or dentist, and studies show the beneficial effect of periodontal therapy on metabolic control of diabetes mellitus. (129) Prevention and management of oral complications, especially periodontal disease, in patients with diabetes is important due to the possible adverse effect on glycaemic control. (130)

Item 11. Diabetes only causes mouth complications for people with natural teeth. False

Rationale: Oral manifestations of diabetes mellitus may be broadly categorized into two types: those affecting the hard tissues (teeth and bone) and those affecting the soft tissues

of the oral cavity. (128) Several soft tissue oral mucosal lesions and diseases are more prevalent in individuals with diabetes including salivary and taste dysfunction, oral fungal and bacterial infections, recurrent apthous stomatitis, geographic tongue, angular chelitis, delayed wound healing, fissured tongue, and oral lichen planus. (130) Candidial infection is reported to be more prevalent in patients with diabetes especially patients who smoke, wear dentures, have poor glycaemic control and use steroids and broad spectrum antibiotics. (130) Oral dysesthesia or burning mouth syndrome is a painful condition of the oral cavity (palate, tongue and gingivae) that has been reported to occur as a result of diabetic neuropathy in patients with diabetes. (130)

Item 12. There is evidence to show that HbA1c can be reduced as a result of providing periodontal therapy (dental scaling and root planing) to people with Type 2 diabetes. True

Rationale: Haemoglobin A1c (HbA1c) reflects serum glucose levels during the 120day life of the red blood cell, is adversely affected by systemic inflammation and is a robust measure of glycaemic control. (16,99,129) Periodontal diseases are caused by bacterial biofilm comprised of gram-negative microorganisms which initiates an acute inflammatory response. (129) Since acute and chronic infections may adversely influence glycemic control, a biologically plausible link between metabolic control and periodontitis has been investigated. (99) Based on evidence from randomized clinical trials that studied the effect of periodontal treatment for persons with type 1 and 2 diabetes, it can be concluded that periodontal therapy may improve metabolic parameters, as measured by HbA1c. (132,133)

Aspiration Pneumonia

Item 13. Poor oral health is a risk factor for developing aspiration pneumonia. True

Rationale: Probably the most common infectious sequelae of poor oral health in seniors-particularly those who live in nursing homes is aspiration pneumonia. (88) The dental risk factors of aspiration pneumonia include dental decay, periodontal disease, high levels of S. aureus in the saliva, salivary flow, infrequent visits to the dental hygienist and generally poor oral hygiene. (48,88) Poor oral hygiene and conditions that alter the microflora of the oral cavity have been associated with an increased risk for aspiration pneumonia among institutionalized adults. (98) Aspiration is caused primarily by the inhalation of oropharyngeal secretions colonized with pathogenic bacteria into the lower respiratory tract. (96)

Item 14. Providing daily oral care for older adults can prevent aspiration pneumonia. True

Rationale: Micro-aspiration pneumonia which is the aspiration of microorganisms into the trachea, can be prevented by cleaning the oral cavity.(97)According to findings of systematic reviews on this topic, there is evidence to show that rates of pneumonia among high -risk populations were reduced by interventions that improve oral hygiene. (48,134,135) One recent Canadian study demonstrated that a single session of professional debridement combined with adequate daily mouth care were effective means for improving oral health and for reducing the pneumonia rate for a population of dependent adults with dysphagia. (98)

Item 15. Aspiration pneumonia is the most significant oral-systemic association that impacts the health of dependent adults and elderly living in long term care. True

Rationale: Older adults frequently experience major consequences of poor oral health, with high rates of local infection, infectious endocarditis, and aspiration pneumonia. (88) For dependent adults and elderly long term care residents, the most common infectious sequelae of poor oral health is aspiration pneumonia.(88)Aspiration pneumonia is the leading cause of death and second leading reason for hospitalization from long term care. (136) This is a worldwide problem with pneumonia being the leading cause of death among elderly Japanese long term care residents and 30% of those who die are diagnosed with aspiration pneumonia.(97)

Cardiovascular Disease

Item 16. Periodontal diseases (gum diseases) cause cardiovascular diseases. False

Rationale: Research has documented the presence of a weak but statistically significant association between periodontal and cardiovascular diseases. (48,135,137) It is important to note that association does not mean causation. Another association between these diseases is that they share common risk factors including advancing age, gender, race, smoking, hypertension, diabetes, education and socioeconomic status. (135)At a minimum, periodontal infections are epidemiologically associated with cardiovascular disease, however the critical question of whether periodontal infections are a risk factor for or contribute causally to cardiovascular disease remains unanswered. (137)

Item 17. Having dental treatment can put individuals with certain heart defects and conditions at higher risk for developing a condition called infective endocarditis.

True

Rationale: Infective endocarditis (also called bacterial endocarditis) is an uncommon but serious life-threatening condition resulting in infection of the heart's inner lining or the

valves which occurs when bacteria or other organisms enter the bloodstream and build up in damaged tissues. (138) During dental procedures such as dental scaling and extractions, oral microbes can gain access to the circulatory system and this can induce bacteremia. (137) The American Heart Association has developed guidelines defining the patient population at high risk for cardiac endothelial injury and procedures with high risk for bacteremia. (139)Persons with existing heart problems and conditions may require antibiotic prophylaxis to reduce the risk of developing infective endocarditis, and should advise their dental professional of their heart issues prior to having invasive dental procedures. (138)

Item 18.People with cardiovascular disease who receive gum disease treatments such as scaling and root planing can lessen the risk of heart attack or stroke.

False

Rationale: There is no peer-reviewed evidence to suggest that treating or preventing periodontal infections leads to fewer clinical cardiovascular events. (137) A meta-analysis of studies conducted between 1966 and 2005 concluded that periodontal treatment had no effect on serum levels of C-reactive protein at 2 months after the treatment. (140)

Item 19. Individuals taking certain heart medications may experience oral side effects. True

Rationale: Cardiovascular medications such as anti-hypertensives, diuretics, angiotensin-converting enzyme inhibitors and calcium channel blockers can cause Xerostomia or dry mouth. (52,70,141) Patients with xerostomia suffer from an increase of coronal and root surface caries, excess plaque formation, oral candidiasis and patients with dentures

experience denture retention problems. (20,70,141) Gingival enlargement, which is associated with higher rates of gingivitis, is a negative side effect related to the use of calcium channel blockers. (20,141) Anti coagulants and anti-thrombic agents such as warfarin and NSAIDs can interfere with platelet function or decrease coagulation which can cause excessive bleeding (abnormal hemostasis) during and after dental procedures. (141)

APPENDIX 7: STUDY INFORMATION AND CONSENT FORM

Introduction to the Study

Welcome to the online Oral Health and Chronic Disease Knowledge Study. My name is Alison MacDougall and I am a Master's of Science student at the University of Prince Edward Island. I am working under the direction of my supervisor, Dr. Lori Weeks and committee members Dr. William Montelpare and Dr. Sharon Compton. If you have any questions or comments about this study, you are welcome to contact me at 1-902-894-2841or by email amacdougall@upei.ca. I have received no external funding to complete this study.

There is limited research into what influences older adults' knowledge about the link between oral health and chronic diseases such as cardiovascular disease, cancer, aspiration pneumonia and diabetes. We would like to learn from your insights and experiences about what influences Prince Edward Island's older adults' oral health and chronic disease knowledge.
Oral health is defined 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.
Chronic disease is defined as disease that is long-lasting or recurring;
Oral health literacy is defined as the degree to which individuals have the ability to obtain, process, understand and apply basic oral health information and services needed to make suitable health decisions

Purpose of the Study

The purpose of this online study is to explore the influence of oral health literacy and oral health chronic disease knowledge on older adults' oral care behaviours.

If you choose to participate, you will be asked to complete a 4 section Internet based study which may take approximately 30 minutes depending upon your responses.
The first part is a 13 item survey used to collect personal information such as year of birth, level of education, and gender.
The second section is the Oral Health Literacy Questionnaire that has 14 fill in the blanks and select the correct answer questions as well as 4 written questions that will be used to measure oral health literacy.
The third section is the Oral Health Chronic Disease Knowledge Questionnaire a 19 question true and false questionnaire and 1 written question that will be used to measure participant's knowledge about the link between oral health and cardio vascular disease, oral cancer, aspiration pneumonia and diabetes.
The fourth section is the Oral Care Behaviours Survey which contains 4 select the best answer and 4 written questions about oral care behaviours.
To participate in this anonymous, online study, you need to be 50 or older, able to read and write in English, and have access to the Internet. The webpage for this study will be

accessible for the 3 weeks and you will be invited to complete the study within this period.

If you are interested in volunteering to participate in this on-line study, I invite you to click on the bottom of this page to enter the study. The length of time it will take you to complete it will depend on how much detail you provide but we expect that it will take about 30 minutes.

Do I have to take part in this Study?
Please understand that participation in this research is completely voluntary, and you are under no obligation to participate. If you do agree to participate, there will be no negative consequences to you if you can choose to not answer or skip any question.

Will my participation be kept confidential?
Data will be stored on the University of Prince Edward Island firewall protected secure server that is only accessible via password for security and safety. After finishing this study the data will be stored in a password protected computer of Dr. William Montelpare for 5 years and then destroyed according to the University policy on data protection.

There are approximately 500 people in our target population and the information that you provide will be combined with the others who participate in the study. During the study the chief investigator and members of the research team will have access to your study data. Since this an anonymous study no identifying information such as name, mailing address, email address, or date of birth will be collected from participants.

What will happen to the results of the research project?
A summary of the study findings will be sent to the Executive Director of the Senior's College to be distributed electronically to all seniors college students. Study findings may be submitted for publication in peer reviewed journals and presented at academic and professional conferences.

What are the possible benefits of taking part?
While there are no direct or immediate benefits to you for participating in the study, you are helping us to better understand what influences older adults' knowledge of oral health and chronic disease.

By completing the on-line study, I give my consent to the following items:

- I have read and understood the material about the study.
- I understand that my participation is voluntary, and that I have the freedom to not complete this survey. I also have the freedom to choose to not answer any question.

- I understand that I can print a copy of this information for my files.

- I understand that by submitting the letter of informed consent with this study I am agreeing to participate in this study.
- I understand that the researcher will use direct quotations obtained from this study.

- I understand that I can contact the following organizations if I have any concerns about the ethical conduct of this study
  UPEI Research Board: 902-620-5104 or email at reb@upei.ca
  PEI Research Board: 902-569-0576 or email at reb@ihis.org

APPENDIX 8: ACCESS TO PARTICIPANTS LETTER

Department of Applied Human Sciences
University of Prince Edward Island
550 University Avenue, Charlottetown
Prince Edward Island, Canada
C1A 4P3
October 10, 2014

Dear Ms Davis:

My name is Alison MacDougall, and I am a Master's student in the Department of Applied Health Sciences at the University of Prince Edward Island. Presently, I am working on my thesis under the supervision of Dr. Lori Weeks and my area of interest is aging and oral health.

Despite efforts to promote oral health as an important part of healthy aging, there has been little study into what older adults know about the social, physical, and financial costs that unmet oral health needs can cause in regard to their general health. For my research project, I would like to conduct a pilot study and an online study with the Senior's College students to explore their knowledge and awareness of the connection between oral health and general health and well being.

Involvement in this survey would be entirely voluntary and there are no known or anticipated risks to participation in this survey. If people agree to participate, the survey should not take more than 15-20 minutes to complete. I would also like to use the survey to recruit individuals who would be willing to participate in a 1hour personal interview to further explore the topic of oral health and aging.

All information provided by participants will be considered confidential and pseudonyms will be used to further protect individuals' identity. Further, participants will not be identified by name in the thesis, report or publication resulting from this study. The data collected will be kept for a period of 7 years in a locked cabinet in my office at the University of Prince Edward Island. I would like to assure you that this study will be submitted for ethics clearance from the University of Prince Edward Island Ethics Review Board.

If you have any further questions about this study, or would like additional information to assist you in reaching a decision about allowing my survey to be distributed to your members, please email me, and we can schedule a telephone or in person meeting.

Thank you for your consideration in this matter.
Sincerely
Alison MacDougall, Master's student
UPEI, Department of Applied Health Sciences
alisonmacdougall@hotmail.com

APPENDIX 9: PILOT STUDY CONSENT FORM

Introduction to the Study

Welcome to the pilot study of the Oral Health and Chronic Disease Knowledge Study. My name is Alison MacDougall and I am a Master's of Science student at the University of Prince Edward Island. I am working under the direction of my supervisor, Dr Lori Weeks and committee members Dr. William Montelpare and Dr. Sharon Compton. If you have any questions or comments about this study, you are welcome to contact me at 1-902-894-2841, toll free 1-855-738-4792, or by email amacdougall@upei.ca or my Supervisor Dr. Lori Weeks 1-902-894-2841, or lweeks@upei.ca. I have received no external funding to complete this study.

There is limited research into what influences older adults' knowledge about the link between oral health and chronic diseases such as cardiovascular disease, cancer, aspiration pneumonia and diabetes. We would like to learn from your insights and experiences about what influences Prince Edward Island's older adults' oral health and chronic disease knowledge.

Oral health is defined 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.

Chronic disease is defined as disease that is long-lasting or recurring;

Oral health literacy is defined as the degree to which individuals have the ability to obtain, process, understand and apply basic oral health information and services needed to make suitable health decisions

Purpose of the Pilot Study

The purpose of this pilot study is to help the researcher gain feedback about your experience with completing the study.

1. Is the online study visually appealing and easy to use?
2. Are study instructions clear?
4. Is the wording of research questionnaires clear and easy to understand?
5. Are there any difficult or confusing questions?
6. How much time does it takes to complete the study?

If you choose to participate, you will be asked to complete an anonymous 4 section Internet based study that may take approximately 30 minutes depending upon your responses.

The first part is a 13 item survey used to collect personal information such as year of birth, education and income levels etc.

The second section is the Oral Health Literacy Adult Questionnaire that has 14 fill in the blanks and select the correct answer questions as well as 4 written questions that will be used to measure oral health literacy.

The third section is the Oral Health Chronic Disease Knowledge Questionnaire a 19 question true and false questionnaire and 1 written question that will be used to

measure participant's knowledge about the link between oral health and cardio vascular disease, oral cancer, aspiration pneumonia and diabetes.

The fourth section is the Oral Care Behaviours Survey that contains 4 select the best answer and 4 written questions about oral care behaviours.

To participate in this pilot study, you need to be 50 or older, able to read and write in English, and have access to the Internet. The link to the study webpage will be emailed to you and will be accessible for 3 weeks. You are invited to complete the study within this period.

If you are interested in volunteering to participate in this pilot study, I invite you to date and sign at the bottom of this page. You will also need to provide an email address so that the link to the study website can be emailed to you. The length of time it will take you to complete the study will depend on how much detail you provide but we expect that it will take about 30 minutes.

Do I have to take part in this Study?

Please understand that participation in this research is completely voluntary, and you are under no obligation to participate. If you do agree to participate, there will be no negative consequences to you if you can choose to not answer or skip any question.

Will my participation be kept confidential?

Data will be stored on the University of Prince Edward Island firewall protected secure server that is only accessible via password for security and safety. After finishing this study the data will be stored in a password protected computer of Dr. William

Montelpare for 5 years and then destroyed according to the University policy on data protection.

There are approximately 10 people in this pilot study. The information that you provide will be combined with the others who participate in the pilot study. During the pilot study the chief investigator and members of the research team will have access to your study data. If you participate in the pilot study, you will not be able to participate again in the main study.

What will happen to the results of the pilot study?

Data collected during the pilot study will be used to make improvements to the main study.

What are the possible benefits of taking part?

While there are no direct or immediate benefits to you for participating in the study, you are helping us to better understand what influences older adults' knowledge of oral health and chronic disease.

By participating in this pilot study, I give my consent to the following items:

- I have read and understood the material about this pilot study.
- I understand that my participation is voluntary, and that I have the freedom to not complete this pilot study. I also have the freedom to choose to not answer any question.

- I understand that I will receive a copy of this consent form for my files.
- I understand that by signing the pilot study consent form I am agreeing to participate in this pilot study.
- I understand that the researcher will use direct quotations obtained from this study.
- I understand that I can contact the following organization if I have any concerns about the ethical conduct of this study:

UPEI Research Board: 902-620-5104 or email at reb@upei.ca

_____

Name of Study Participant

_____

Email address of Study Participant

_____

Date

_____

Name of Researcher

_____

Email address of Researcher

_____

Date

APPENDIX 10: PILOT STUDY FEEDBACK QUESTIONNAIRE

Thank you for volunteering to participate in this pilot study. The purpose of this feedback questionnaire is to gain feedback about the online study: Oral Health Chronic Disease Knowledge Study. The information gained from your input is important to our research, and will be used to make improvements to the study. All information that you share will be kept confidential. This questionnaire should take approximately 10 minutes to complete and should be completed **after** you have finished participating in the online study. Once completed, please return your completed questionnaire using the postage paid, addressed envelope provided. **Please return your completed questionnaire no later than by October 31, 2014.**

Please indicate your level of agreement or disagreement with each of the following statements by placing an "X" in the box of your answer. Please print or write clearly.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1. The online study was easy to access and use.					
2. The directions for the online study were clear and easy to follow.					
3. The appearance of the online study was visually appealing.					
4. The length of the online study was right for me.					
5. The online study asked questions that were easy to understand.					
6. The words used throughout the online study were easy to read.					
7. How would you rate your overall experience participating in the online-study.					

8. How long did it take you to complete the online study?

_____

_____

9. Were any questions difficult to interpret or understand what is being asked? If yes, please identify them here.

_____

_____

_____

_____

_____

_____

_____

10. What could we do to make this online study experience better?

_____

_____

_____

_____

_____

APPENDIX 11: ORAL HEALTH CHRONIC DISEASE KNOWLEDGE STUDY EMERGING THEMES DOCUMENT

Topic	**Oral Health Literacy**			
Question	**1. What oral health information do you search for?**	**2. How often do you come across oral health information that you do not understand?**	**3. What is your preferred source(s) for getting oral health information ?**	**4. When you come across conflicting oral health information, how do you decide which information to believe?**
Extracted Transcript Phrases	*ID 10- I have never searched for any. Whenever I have had a specific question I have asked my dentist. *ID 30 Not a lot, actually. I get most of it from my dentist. *ID 32 none. I rely on my dentist to provide what is needed. *ID 51 Info concerning oral health issues that arise in my life or in a family member.....usually prior to a dental appt so I can be better informed *ID 54	*ID 5-rarely *ID 49 I have a science degree, major in nutrition, therefore I understand most oral health information. *ID 84 Very seldom. *ID 87 not often *ID 88 not often *ID 40 Seldom, though I saw information that I was not aware of earlier in this survey, and would need to learn more about it in order to understand it *ID 22 Occasionally.	* ID 16 Consultation with dental professional. *ID 23 from my dentist and hygienist *ID 35 Internet - professional medical blogs (not just ordinary everyday folks), medical websites, my dentist and dental hygienist *ID 62 If I did need to get information I would go talk to my dentist or dental hygienist. *ID 49 My dental	*ID 62 I would trust my dentist over something I found on the internet or heard from a non medical source. *ID 63 I talk to my dentist or hygienist *ID 73 I would try to Google it first, then read research articles. If I still did not have a clear understanding I would ask my dentist *ID 76 I can check with my dentist or dental hygienist.. Consult the internet and question the inconsistencies.. *ID 87 I assess the information, and the sources

	Information on plaque build up and cleanings		hygienist and my dentist provide oral health information. *ID 74 Health professional or internet	and go with what makes sense and the most trustworthy source
Emerging Themes	*Searching for a specific reason *Relying on dental professionals *Managing and preventing oral disease *Not searching for oral health information	*Possessing the necessary skills *Lacking compre-hension	* Consulting with dental professionals Searching the Internet	*Trusting in professional advice *Considering the source *Investigating further
Topic	**Oral Health Chronic Disease Knowledge**			
Question	**1. Tell me in your own words what key information older adults should know about the link between oral health and chronic diseases.**			
Extracted Transcript Phrases	*ID 38 I have always known that good oral hygiene was a necessary part of good overall health. I have just never known of the link to chronic diseases. Family doctors and dentists should be given tools to emphasize these links. It should also start before adults become older. *ID 47 There is a greater need for education and Promotion. *ID 49 Older adults may not know the link between good oral health and heart disease.			

	*ID 63 Although there are amazing medications available for the treatment of chronic diseases, the best thing to do by far is reduce the risk factors to PREVENT these conditions. One simple step is to take care of your own oral health and have regular mouth/dental checks.			
Emerging Themes	*Recognizing a knowledge gap *Preventing chronic disease *Not making the mouth/body connection *Lacking the knowledge to answer *Reducing the risk for oral disease			
Topic	**Oral Care Behaviours**			
Question	**1.If you could change anything about your mouth, teeth, or gums, what would it be and why?**	**2. Why do you think it is important for older adults to look after their mouth and teeth?**	**3. If I followed you through your typical day, what would I see you doing to care for your mouth and teeth?**	**4. How often do you visit a dentist or dental hygienist? Why do you follow this schedule for dental visits?**
Extracted Transcript Phrases	*ID 26 Alignment is not perfect, but I live with it. Lots of fillings, but I live with them. *ID 84 I would like it if I did not have a denture. *ID 34 Would	* ID 40 For good general health, good oral health, comfort, vanity, avoid bad breath, avoid expensive dental procedures. My dentist also	* ID 18 Brushing, flossing, fluoride tooth paste and mouth wash and careful not to break teeth on hard candies and food	* ID 41 Once a year. That is what my dental plan allows as long as everything is okay *ID 25 Twice a year. It is recommended, and I am fortunate to have a dental plan.

	have better oral care in my younger years *ID 12 better care when I was a child - got a time machine? *ID 51 I wish I had looked after them better. I wish they were straighter, whiter and that I had them all.	looks for lesions related to my IBD, and had helped me find ways to relieve them *ID 59 Because unhealthy teeth and gums causes other medical issues. And wearing dentures is not pleasant. *ID 88 Good dental health contributes to eating well and general health *ID 35 Higher risk of oral disease (especially gum disease) and associated other illnesses as we get older. *ID 57 because chewing is important part of eating in getting nutrition and aiding digestion Gives variety of foods to eat versus dentures with softer foods *ID 32 appearance and confidence	*ID 19 Brushing, flossing, drinking lots of water. *ID 26 rinsing after eating; eating well; avoiding sugars; brushing and flossing *ID 54 Brush my teeth in the mornings and use a toothpick or floss occasionally *ID 65 Brush first thing in the morning, brush after breakfast, brush before bed. Floss when I feel food stick in my teeth. *ID 59 brushing, sometimes flossing, chewing sugarless gum when brushing is not possible.	*ID 76 3 times per year.. That is the schedule that they recommended.. *ID 40 Every 4 month. Recommended by my dentist, due to history of gum disease. *ID 18 2x per year, because I like clean teeth *ID 88 About once a year for check up but more often if a problem occurs *ID 45 only if a problem,there 2 yrs ago,can,t afford one on my income!!!

Emerging Themes	*Living with the consequences *Wishing for a second chance *Wanting aesthetically pleasing, healthy teeth	*Maintaining overall health & well being *Preventing infection & disease *Being able to chew and eat properly *Impacting self confidence *Preserving natural function	*Practicing healthy oral care behaviours: brushing flossing & interdental aids *Rinsing *Making healthy food choices *Chewing gum	*Accessing care based on dental coverage *Following professional recommendations *Valuing oral care *Visiting on a regular basis *Avoiding due to cost

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