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# Inuit Oral Health Survey Report

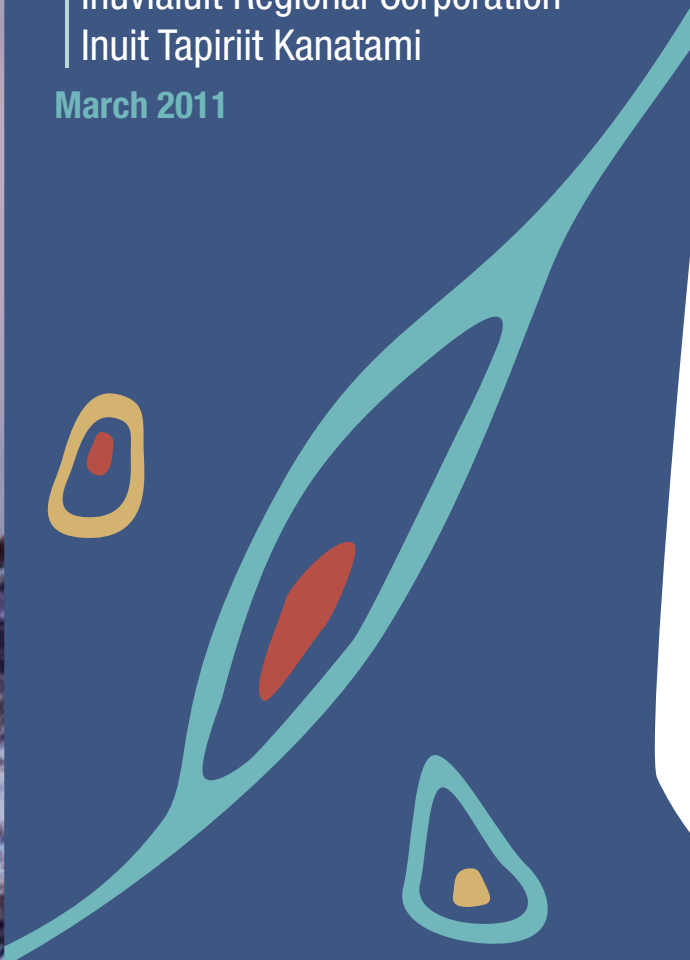
2008 – 2009



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For further information or to obtain additional copies, please contact:

Publications Health Canada  
Ottawa, Ontario K1A 0K9

Tel.: (613) 954-5995

Fax: (613) 941-5366

E-mail: [info@hc-sc.gc.ca](mailto:info@hc-sc.gc.ca)

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Sincerely,  
Dr. Peter Cooney, BDS, LDM, DDPH, MSc, FRCD(C)  
Chief Dental Officer, Health Canada  
Inuit Oral Health Survey







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# Executive Summary

This report provides the results of the Oral Health Survey of Inuit conducted by the Office of the Chief Dental Officer of Canada in conjunction with the Inuit Tapiriit Kanatami and the Government of Nunatsiavut, Department of Health and Social Development (Newfoundland and Labrador); Nunavut Tunngavik Incorporated (Nunavut); and the Inuvialuit Region Corporation (Northwest Territories). It provides estimates of the burden of oral health conditions as of 2009-10 across areas of Canada's north, except Nunavik. Although the Region of Nunavik chose not to participate in the survey, it is important to mention that they are in full support of the results of the Inuit Oral Health Survey 2008-2009. Following the standards of the oral health module of the Canadian Health Measures Survey (OHM-CHMS), trained dentist-examiners examined 1216 Inuit ranging in age from 3 to 40+ years.

Compared to southern Canadians, more Inuit reported poor oral health and higher frequency of food avoidance and oral pain. Fewer than half made a visit for dental care even though very few reported that costs were a factor in avoiding visiting or accepting recommended treatment.

The prevalence of coronal caries was very high among Inuit. Over 85% of preschoolers had had dental caries with a mean of 8.22 deciduous (baby) teeth affected. By the time of adolescence, 97.7% had been affected and among the oldest adults, the disease had affected everyone. Counts of decayed missing or filled permanent teeth (DMFT) ranged from 2 at age 6-11 years, to 9.5 for adolescents, to 15 at age 20-39 years and over 19 DMFT among older adults. The prevalence and mean DMFT counts greatly exceeded similar counts for southern Canadians.

Further, much of the disease remained untreated. As an example, the proportion of the affected teeth that remained decayed for adolescents and young adults was 38.1% and 16.7% respectively compared to 14.9% and 12.6% among southern Canadians. In addition, more of the disease is treated by extractions among the Inuit.

Among adolescents there were 20.3 extractions per 100 filled; the OHM-CHMS found that among adolescents only 1.0 tooth had been extracted per 100 filled.

Root caries was also more prevalent and less was treated compared to the findings of the OHM-CHMS. On the other hand, periodontal conditions, as demonstrated by the CPITN Index, seemed less prevalent and less severe among Inuit compared to the findings of the OHM-CHMS and to the Alaskan Native patients.

Given that more extractions are provided, more of the oldest Inuit population (21.3%) than the southern population (4.4% to 21.7%) were edentulous. However the finding that 21.3% of older Inuit, aged 40 years+, were edentulous, is demonstrably lower (better) than both Galan et al. (1993) and Rea et al. (1993) found when they surveyed just the Keewatin Region.

The finding that Inuit had more dental disease (except for periodontal conditions) than their southern compatriots is consistent with international studies that have also found that indigenous people have worse oral health status compared to that of the dominant cultures in their countries.

While caries prevalence and severity has decreased somewhat among 6 year-olds the proportion of decayed teeth successfully treated among that same age-group has improved from 20% reported in 1992 to 55% in the present survey.

Still, the oral health conditions cannot be treated away even if more resources could be applied. More emphasis on community-based primary preventive measures backed up by early detection and prompt basic treatment would appear to be the best course to make a difference. However, these two strategies cannot do the job by themselves. The threats to health such as high rates of tobacco use, crowded housing and food insecurity which have been identified in earlier studies need to be addressed for the preventive dental efforts to have maximal effect.









# 1.0 - Origins and demography

## 1.1 - Inuit origins

Bjerregaard and Young (Bjerregaard 1998) provide a comprehensive description of the origins of today's Inuit. They point out that it is generally accepted that the ancestors of Canada's aboriginal populations lived in East Asia and migrated, probably in successive waves across the land bridge that linked Asia with North America. The waves of migration occurred as the land bridge became alternately exposed and covered during the repeated glaciations of the Pleistocene ice age. The Aleut/Inuit may have crossed the land bridge as recently as 5000 BCE with the Inuit subsequently spreading along the northern coast of the North America. By 5000-2000 BCE the small tool makers known as Paleoeskimos or the people of the pre-Dorset culture, occupied the Arctic. Around 500 BCE the Dorset culture emerged; these people lived in more permanent structures made of stone and turf and enjoyed a rich artistic culture of carving ivory and stone. Between 1000 - 1500 AD people of the Thule culture displaced the Dorset culture and became the direct ancestors of the present Inuit. When, in the 1800s, the whale population declined, some of the groups moved inland, substituting caribou for sea-mammals as their main staple and the basis of their culture.

Again, according to Bjerregaard and Young (Bjerregaard 1998) contact with Europeans occurred at different times with different groups. The first occurred in Greenland where the Norse sailors encountered native people about 1000 AD. Norse may well have also encountered Inuit in Labrador and Northern Newfoundland but no record of that contact exists. Certainly after European explorers began to search for the northern passage to Asia, Inuit encountered the crews of Martin Frobisher (1576), John Davis, Henry Hudson, William Baffin and others. Contact with Europeans eventually altered the Inuit culture in a profound way. As stated in McPhail (McPhail et al. 1972), contact with the fur-trade (c 1670) and incursions of the wintering whalers began a rapid

process of cultural change. Eventually, government policies of the late 1950s decreed that people living off the land or in small groups or communities be resettled (Messer 1985) into larger communities where services could be more efficiently delivered.

## 1.2 - Demography and social conditions

Two recent publications provide detailed statistical information on Inuit (Inuit Tapiriit Kanatami 2008; Tait 2008). The following, taken from Tait (Tait 2008) describes the current Inuit population and health related social conditions.

...Today, most Inuit live in one of fifty-two communities across the north in an area known as Inuit Nunaat – the Inuit homeland. Inuit Nunaat is comprised of four regions created through the signing of land claims agreements and from west to east includes the Inuvialuit Region in the Northwest Territories, Nunavut, Nunavik north of the 55th parallel in Quebec and Nunatsiavut in northern Labrador {see following map}.

Figure 1 – Inuit Nunaat



Source: 2006 Census of Canada. Produced by the Geography Division, Statistics Canada, 2007.

To quote Tait further:

In 2006, the census counted a total of 50,485 Inuit living in Canada with over three quarters (78%) residing in Inuit Nunaat. The region with the largest Inuit population was Nunavut, home to 24,635 Inuit who accounted for about one-half of the total Inuit population in Canada. Nunavik was home to 9,565 Inuit, or 19% of the total Inuit population. The Inuvialuit Region had a population of 3,115 Inuit, accounting for 6% of all Inuit nationally. Nunatsiavut in northern Labrador had a population of 2,160 Inuit or 4% of the total Inuit population. Inuit made up the majority of the population in all four regions.

The Inuit population is young, with a median age of 22 years, compared with 39 years for the total Canadian population. Large percentages of Inuit are in the youngest age groups. In 2006, 12% of the Inuit population was aged 4 and under, more than twice the proportion of 5% for the total Canadian population. According to the 2006 Census, a growing percentage of the Inuit population is made up of seniors aged 65 and over. However, it remains small compared with the total Canadian population; only 4% of the Inuit population consisted of seniors, compared with 13% of the total Canadian population.

Tait's report identifies several factors that may impinge on the health of the Inuit. These include:

High rates of tobacco use - In 2006, the percentage of Inuit smoking daily (58%) was over three times that of all adults in Canada (17%).

Lower levels of formal education - Many do not finish elementary/high school. Education systems and curriculum designed in the south may not meet the needs of Inuit students ... Negative experiences in residential schools impacted the school outcomes of many Inuit and their children. In addition, many Inuit speak the Inuit language as their first language. Much of their formal schooling is provided in English and this can pose a barrier to some Inuit ...

Food insecurity - Three in 10 Inuit children aged 6 to 14 were reported by their parents to have experienced being hungry at some point in their lives because the family had run out of food or money to buy food. {However, on the positive side}, the majority of Inuit men and women of all ages had harvested country food – that is, food from the land and sea such as seal, caribou, fish, whale, etc. Country food makes up a large percentage of the fish and meat eaten by many Inuit families across Inuit Nunaat and is widely shared with others in the community.

Crowded housing in need of repair - 31% of all Inuit in Canada lived in crowded homes compared to 3% of the total population in the country ... Among Inuit children under the age of 15, 40% lived in crowded homes, about six times the proportion of 7% among all children in Canada. Overcrowding and extreme weather conditions result in significant wear and tear on homes and the cost of building and repairing homes in Inuit Nunaat is high ... 31% of Inuit lived in homes in need of major repairs ... Maintenance and heating costs are also high.

Lower access to health care - None of the 52 Inuit communities have year-round road access and only a few have hospitals. The others are serviced by health centres staffed by nurses. For treatment requiring physicians or for appointments with medical specialists, Inuit must be flown out of their community and weather conditions often delay the departures of these flights. Access to diagnostic testing is more limited in Inuit communities. In addition, some Inuit do not speak English and require translation services.

Inuit were much less likely than people in the general population to have seen or talked on the phone with a medical doctor in the past 12 months. While 56% of Inuit adults had contact with a medical doctor in the past 12 months, the figure for adults in the total Canadian population was 79%. Inuit adults in all age groups were less likely than those in the total Canadian population to have had contact with a doctor ... In contrast, Inuit were much more likely to have contact with a nurse in the previous year. In Inuit Nunaat, 70% of Inuit adults reported contact with a nurse compared to 39% of Inuit living outside the region. In 2006, over one-third (35%) of Inuit children aged 6 to 14 had contact with a pediatrician, general practitioner or family doctor.

Many communities in Inuit Nunaat do not have a resident dentist (Note that some communities have resident dental therapists - ed.). Instead, dentists from southern Canada fly into the communities on an irregular basis. Often, only the most serious cases are seen due to time limitations. People must be flown out of the community for treatment and for dental emergencies ... Just over six in 10 (63%) Inuit children aged 6 to 14 were reported to have received dental care in the past 12 months. Children in the Inuvialuit Region and Inuit children living outside Inuit Nunaat were the most likely to have received dental care in the past year (79% and 77%). At the other end of the spectrum, children in Nunatsiavut were the least likely (38%) to have received dental care. In Nunavik and Nunavut, the figure was about 6 in 10 (62% and 57%).





## 2.0 - Dental care delivery system

### 2.1 - Development of dental services

The evolution of health services for Inuit and for First Nations remains a work in progress. Over the period of development, there have been disparate views of the role of the Federal Government; with aboriginal people holding that the Federal Government had the responsibility to provide comprehensive health services as set out in the provisions of various proclamations, acts or treaties (Bedford 1993) and the Government stating that such provision was a matter of policy that could be altered.

For much of the period post-European contact, health services to Inuit were provided by religious or charitable organizations such as the International Grenfell Association (Jones 1968; Jones 1969) in Labrador. The Federal Government's capacity to deliver care was extremely constrained. Wien & McIntyre (Wein 1997) quoting Waldram et. al., 1995, report that:

'...In 1935, there were eleven medical officers in the Medical Branch who were employed full time, and eight Indian agents with medical training. Another 250 physicians were employed part time, or as needed, including urban-based specialists; and still others saw Indian patients privately. There was little in the way of dental services, outside of basic services such as extractions. A total of eleven field nurses were employed by the branch, supplemented by others employed by missionary or provincial organizations...'

Jones (Jones 1968) reported that in 1963, in Flowers Cove, Labrador, Grenfell Association dentists provided 3185 extractions but only 264 conservative treatments (restorations). This is 1206 extractions per 100 fillings.

Bedford and Davey (Bedford 1993) report that even as late as the 1960s:

'...there were virtually no formal dental delivery services in place in remote locations. It was not uncommon for nurses and sometimes priests, to

extract teeth. Children were often flown into larger centres ... where they would be given a general anaesthetic, have their decayed teeth extracted and their mouths packed with gauze, and be sent back home.'

In an attempt to establish primary dental care in First Nations and Inuit communities across Canada, in 1971 the Federal Government contracted with the University of Toronto to train high school graduates at the National School of Dental Therapy (NSDT), first located in the Northwest Territories, to provide primary dental health services. Admission to the program was targeted to aboriginal students, although non-aboriginal students were also admitted. After the two-year program, graduates were expected to locate in an aboriginal community, often remote, and work under the supervision of a Department of Health regional dentist. Care was also monitored annually by staff from the NSDT. Both the quality of care (Davey 1991) and the cost-effectiveness of this program have been demonstrated (Trueblood 1994). As a further evidence both Mayhall (Mayhall 1991) and McDermott (McDermott 1991) point to the graduates' success in restoring rather than extracting teeth. By 1994, Trueblood (Trueblood 1994) reported that the school had graduated 35 therapists of which 32 were employed by Health & Welfare Canada. The training program was eventually contracted to the First Nations University in Regina, Saskatchewan. Health Canada made a decision, as part of a review of all government programming, to end its annual payment to the First Nations University of Canada the National School of Dental Therapy at the end of June 2011. (Doiron 2010 a).

The number of therapists was never sufficient to meet all the needs of the communities in the North and so in the larger centres with private practitioners, dental care was provided by them on a fee-for service basis funded by Non-Insured Health Benefits. In other areas, contracts with Universities or private dental firms were drawn. Funds for these programs and contracts originally came from the Federal Government. As one example, the





University of Manitoba, Faculty of Dentistry held the contract to provide dental care for seven communities in the Keewatin District (MacDonald 1988).

Starting in the 1970s major improvements were made to the health care infrastructure such that equipped health centres were built in many communities (Quinonez 2006). These were often staffed with a community health representative and/or a nurse practitioner and provided clinic space for visiting physicians, dentists or resident dental therapists.

However development in some areas lagged, as up to the 1980's, services in the Ungava region of Quebec were provided by itinerant dentists or physicians with minimal equipment (Lambert 1994). Since that time, and as part of the James Bay treaties, the Nunavik Regional Board of Health has assumed responsibility for the administration of health services and have improved the facilities and access to care.

## 2.2 - Current dental care delivery system

Beginning in the early 1980s the Federal and Territorial Governments began to transfer the administration of all publicly funded health services to the Northwest Territories (some of which were subsequently reallocated to Nunavut) and Yukon Territories. Similarly in 2007, the responsibility for the Labrador Inuit on the northern coast of Labrador was transferred under the Nunatsiavut self-government agreement (Health Canada 2010a).

As part of the terms of transfer, territorial governments came to own the hospitals, health clinics and equipment, and employ or contract for the staff to provide the care. Thus, while some communities have resident dental therapists (6 in Nunavut), outside Iqaluit and Inuvik, where private clinics are available and the care is paid under the Non-insured Health Benefits Program (NIHB) (Health Canada 2010a), most communities receive care for a specified number of days (Kelly 2010) from contracting dentists and denturists. The contracts cover travel to the communities, as well as accommodation, meal costs and the services of a dental assistant. The treatment provided is funded through the NIHB Program. Currently, visiting dentists have free use of the territorial government owned clinical space and equipment.

Dental specialist services are not always available in Inuit communities even though specialists in orthodontics and oral surgery visit the larger communities on a periodic basis. In the interval between those visits, or

for communities where they do not visit, or for other specialties, people have to travel to receive specialist care. Often the treatment for young children includes general anaesthetic services for the extraction of severely decayed deciduous teeth. Where the patients are children, or where they need a translator, another person must accompany them, requiring fares and accommodation for two people. Consultants estimate that travel costs for patients amount to 20%-25% of the total treatment costs (Kelly 2010).

The 2008/2009 NIHB annual report (Health Canada 2010a) states that in March 2009, 39,408 Inuit were eligible for dental care. Inuit are a small minority of those eligible in all areas except Nunavut and thus the data for that area may most clearly describe the present system of care for Inuit. In Nunavut, the program spent \$8.3 M in 2008/09, \$5.7 M on fee-for-service treatment and \$0.4 M on contract dentists. In addition \$2.2 M was spent for dental care to the Government of Nunavut as part of the contribution agreements. In all this amounted to \$287 per eligible client, the highest among all regions and 36% more than the national average (for First Nations and Inuit) of \$211 per client. On the other hand, the cost per claimant in Nunavut was \$476, 93% of the \$512 national average. Utilization rates for Inuit are not reported separately in the annual report.

In addition to treatment services provided by fee-for-service or contract dentists, some community-based primary preventive services are available. These are primarily aimed at educating target groups and reducing the prevalence of early childhood caries through the Children's Oral Health Initiative (COHI) and target pregnant women and primary caregivers, pre-school children, 0-4 years of age, and school children, 5-7 years of age. The program consists of several elements with the topical application of fluoride varnish being one of the mainstays. Eleven communities from Nunavut, Nunatsiavut and Inuvialuit benefit from this program (Doiron 2010 b).

Quinonez (Quinonez 2006) has compiled a comprehensive review of the post World War I (WWI) development of dental services in Nunavut. As part of that review he has described the effects of the policy to transfer the responsibilities for providing health care from Medical Services Branch to the government of Nunavut and some of the frustration and dissatisfaction that have attended that policy and the parallel policy to privatize dental health services.





## 3.0 – Review of Inuit oral health status

### 3.1 - Early findings

Anthropologic studies show that pre-European contact, the Thule culture was largely, if not completely, caries free. Mayhall (Mayhall 1977) reports that an examination of 301 skulls from the 900-1650 AD, revealed just two dental cavities. Among the more modern studies of Inuit, Ritchie (Ritchie 1923) working with the Canadian Arctic Expedition of 1913-28 found no cavities among 34 skulls. Even up to the later contact period (1938), McEuen (McEuen 1938) found only 7 carious lesions among 6 individuals out of a population of 82 he examined in Pangnirtung.

More recent surveys (Nutrition Canada 1977) (Zammit 1994) (Leake 1992) (Health Canada 2000) show that the prevalence of the disease, at the end of the last century, was extremely high - over 93% of school-aged children had experienced dental decay. The epidemic of dental caries has been attributed to the introduction of more refined carbohydrates, especially sugar, into the traditional diet of the Inuit. The increase in the prevalence and severity of the disease had been sufficiently rapid that Mayhall (Mayhall 1975) was able to demonstrate a 66% increase in the severity over just a four-year period in two communities in the northern Keewatin District.

### 3.2 - Review of previous oral health surveys

Historically, the oral health status of Inuit has been unclear since many of the studies conducted between 1970 and 1995 were unclear due to the variability in: the study methods (few probability samples); target populations; response rates; types of examiners (dentists, dental hygienists and therapists, physicians); the health status information collected and inconsistencies in what the investigators selected to analyze and report. Further, communities are often small and sample sizes are usually quite small leading to unstable estimates. For example, the Nutrition Canada National Survey, led by Nutrition Canada and Health and Welfare Canada, Food and Drug Directorate, (Nutrition Canada 1977) reported

on the oral health of 3 year-old Inuit based on the examination of 8 children.

Nonetheless, a recent search of the literature produced a number of studies that contained data on the oral health of Canadian Inuit. All studies were examined and the data abstracted to the extent that the published information allowed. No population-based study was rejected in spite of limitations in design, measurement or analysis. To allow each study to contribute some information for this review, only the most basic indicators of oral health were abstracted from the publications.

What we can learn from these studies is shown in six tables in Appendix A1. The tables contain summary findings for preschool children, children, adolescents, young adults, adults and elders and on oral hygiene and gingival health. The age groups were selected to match those selected for reporting by the oral health module/ component of the Canadian Health Measures Survey (OHM-CHMS) and used in this present study. The findings are arranged by date of publication so that any temporal trends might be seen.

For preschool-children, the findings from ten surveys are shown in Table A1.1. The publication dates ranged from 1970 to 1994; five surveys were conducted in the Keewatin District. Three studies reported the prevalence of caries which ranged from 44.7% among the eight 3 year-old children in Nutrition Canada's 1977 report, to 80% found in children aged 49-54 months in Keewatin (Albert 1988). The mean number of teeth affected ranges from 2.85 in Igloodik and Hall Beach in 1969 (Mayhall 1975) to 11.2 in 5 year-old females in seven communities in Keewatin (MacDonald 1988). Mayhall (Mayhall 1975), using repeated surveys in the same two communities, demonstrated a 66% increase in severity between 1969 and 1973. However, the increase was not as steep in the repeated surveys conducted five years apart by Gagnon and Lambert (Gagnon 1994), but their 3-5 year-old population already had high mean counts (8.03) of caries affected teeth in 1986.



Briefly then, the data show high prevalence (70-80%) and high mean counts of caries affected teeth (up to 10 - 11 dmft per child) among preschool children. A recent interview survey of caregivers of Inuit children in Nunavut (Pacey et al. 2010), confirmed that the epidemic persisted at least into 2008, as 69.1% of children aged 3-5 years were reported to have had a decayed, extracted or filled tooth. The oral health component of the CHMS did not include preschool children so no comparison with these findings can be made with that study.

Table A1.2 shows the abstracted results of nine surveys that reported on the oral health status of school-age children between 6 and 11 years-old. As seen, the prevalence of dental decay (reported in four studies) is high, ranging from 82% to 98%. Mean counts of caries affected teeth, range from 4.55 in Igloolik and Hall Beach (Mayhall 1975) to 12.4 teeth in Labrador in 1969 (Messer 1985). Repeated surveys in the same communities show opposite trends; Mayhall (Mayhall 1975) found an increase in severity from 4.55 teeth to 7.05 teeth between 1969 and 1973 in the northern Keewatin District. In contrast, both Messer (Messer 1985) and Gagnon and Lambert (Gagnon 1994) found the severity falling (improving) in Labrador and the northern areas of Quebec. Among school children age 6-11 years examined for the 2007-09 CHMS survey, 56.8% showed evidence of dental caries and a mean count of 2.48 deciduous plus permanent teeth affected.

Two studies reported on malocclusion among the Inuit. McPhail (McPhail et al. 1972) found a high prevalence (18% - 33%) of 'trapped upper lateral incisors' and higher occurrence of posterior tooth cross-bite compared to Saskatchewan children. Zammit (Zammit 1995) found that 18% of youth in 2 communities in Labrador, aged between 5 and 22 years, had severely handicapping occlusions. The OHM-CHMS report showed that 18.5% of adolescents had less than acceptable occlusions. Depending on the adolescent's and parents' views, not all of these would need treatment as many of the conditions would be relatively minor.

Eight studies provided information on adolescent children - see Table A1.3. Only three reported prevalence of dental decay which ranged from 69% for 12-14 year-olds in the Nutrition Canada study to 95% from the other two (Leake 1992) (Zammit 1994). Mean DMFT counts ranged from 4.5 in Labrador in 1984 (Messer 1985) to 16.7 among 17 year-olds in

Ungava in 1986 (Gagnon 1994). In repeated surveys of the same communities, improvement (lower DMFT counts) was found in both Labrador (Messer 1985) and Ungava (Gagnon 1994). The results of the most recent study (Zammit 1994) showed that 95% had one or more teeth affected with a mean DMFT of 5.65. These compare to the prevalence of 58.8% and mean DMFT of 2.49 for adolescents in the 2007-09 CHMS survey.

Only three publications contained information on young adults and these data are shown in Table A1.4. Two studies provided estimates of the prevalence of edentulism which ranged from 0% in 20-29 year-olds in the Nutrition Canada (Nutrition Canada 1977) Report to 15.2% among females aged 18-34 in the Keewatin District (Rea 1993). All three studies reported mean DMFT counts and these ranged from 7.1 among males in the Nutrition Canada Report to 20.3 in the 1993/4 study from Keewatin. Much of the DMFT count was missing teeth and in the Rea et al. study, a calculated 73% of the 20.3 DMFT were still decayed. Periodontal conditions appear markedly different between studies; no adults in the Keewatin study had a pocket depth equal or greater than 4mm, whereas the Nutrition Canada survey found up to 72% of males had obvious pockets or loose teeth. Note that one study (Schuller 1994) could not be included since it used the number of teeth rather than persons to describe periodontal disease. For overall comparison, among adults examined in the OHM-CHMS, 6.4% were edentulous, mean DMFT counts equaled 10.67 (of which 2.14 were missing and 0.58 were decayed) and 21% had at least one pocket of 4mm or deeper.

Table A1.5 provides the findings of four surveys that reported on the oral health of adults and elders. Some caution is required since the age range varied from 35 to 60+ years and in one study only 7 and 8 subjects provided information (Mayhall 1975). Edentulism ranged from 0% in the 40-49 year-old males in the Nutrition Canada Report (Nutrition Canada 1977) to 60% of 55+ year-old females in the Rea et al. (Rea 1993) study. Mean counts of caries affected teeth ranged from 15 in males in Igloolik and Hall Beach in 1973 to 22.2 in the oldest female group in Keewatin in 1993. Much of the DMFT was either missing teeth or decayed teeth, the latter ranging as high as 91% in 55+ year-olds in Keewatin. Again note the wide disparity in the estimates of the prevalence of periodontal disease - Nutrition Canada found 77.2% of the eldest females had obvious pockets or loose teeth compared to Rea et al. who measured pockets deeper than 3mm only



among 9% of those 55 years or older. In the OHM-CHMS report, for those aged 40-59 and those aged 60-79 years respectively:

- 4.4% and 21.7% were edentulous; and among the dentate
- DMFT counts were 12.3 and 15.67;
- 3.7% and 2.4% of the DMFT counts were decayed; and
- 23.6% and 31% of people had at least one pocket of 4mm or deeper.

In a separate study Rea et al. (Rea 1994) found that the factors associated with edentulism were: increasing age, being female, having lower education, spending more time 'on the land', and eating a high proportion of traditional meats.

The four studies shown in Table A1.6 provided quantifiable information on oral hygiene and gingival health. The data reported varied such that the degree of severity could not be abstracted, hence only the presence of the conditions is shown. As seen, the prevalence of oral debris from the studies varies from 50% to 100%, calculus from 6.5% to 100%, and gingivitis from less than 33% to 88%.

### 3.3 - Summary

Published studies have shown that the information on the oral health of Inuit is consistent, namely that dental caries in ancient cultures was nearly non-existent but from the time of the late 1930's to the start of the 21st Century, dental decay became highly prevalent and much more severe, especially among children. For other age groups, caries were also generally more prevalent and more severe than for other Canadians as revealed by the OHM-CHMS. Decayed teeth and the number of missing teeth were higher than for Canadians living in the south as shown in the OHM-CHMS, reflecting lower levels of treatment in Inuit communities. However, information on oral hygiene, gingival and periodontal health is inconsistent between the few studies that report such findings. Inuit populations appeared to be worse off than those Canadians represented in the OHM-CHMS findings. It follows from this review that most studies: are more than 10 years old were; from selected communities and population age-groups; and do not report their findings using consistent indices. Thus, they do not describe the current oral health status of Inuit.





## 4.0 – Methods

### 4.1 – Brief Description

The Inuit Oral Health Survey (IOHS) built on the work and experience of the Oral Health Module of the Canadian Health Measures Survey (OHM-CHMS). The OHM-CHMS interview and clinical examination instruments became the core of the IOHS survey. At the same time, the protocol was tailored to address areas of specific interest to the Inuit population. For example, the oral health of Inuit children under the age of 6 years was of particular concern as historically, significant numbers of these children have had to undergo general anaesthetic in order to receive dental care. Thus after discussion with the National Inuit Committee on Health (NICOH), it was decided to include children aged 3 - 5 years in the IOHS.

The Canadian Health Measures Survey (CHMS) Cycle 1 collected health status information from 5,600 people in 15 randomly selected sites across Canada. However, people living in the north and those living on First Nations reserves, Canadian Forces Bases, and those in institutions were excluded from the CHMS sampling frame. Thus, while an individual Inuit living in southern Canada could be randomly selected as a respondent in the CHMS, there were insufficient numbers to provide any meaningful national estimates of the oral health status of Canadian Inuit.

The Inuit Oral Health Survey (IOHS) was led by the Office of the Chief Dental Officer (OCDO), Health Canada and was undertaken in partnership with Inuit Tapiriit Kanatami (ITK), the National Inuit Committee on Health (NICOH), and three of the four Inuit Regions: Government of Nunatsiavut Department of Health and Social Development (Newfoundland and Labrador); Nunavut Tunngavik Incorporated (Nunavut); and Inuvialuit Region Corporation (Northwest Territories). Support for sampling and analysis was provided by the CHMS team at Statistics Canada.

### 4.2 – Survey Operations

The communities were first selected with the assistance of Statistics Canada. Then staff from the OCDO sent a letter to the Mayor and Council explaining the reasons for the survey and seeking their endorsement. If a community declined to participate, an alternate community from the same Region was selected and the same process was used to obtain community acceptance. At that point, discussions to sort out the logistics began between the Community Health Director/head nurse/head dental contact, the Inuit partners, and officials from the OCDO. Feasible dates to conduct the survey, clinic location, hiring and training of community staff, and methods of selection/enrolment of respondents were all discussed and agreed upon.

Survey development and training occurred during 2006-2008 with data collection occurring from November 2008 to June 2009.

Data were gathered through individual interviews followed by a visit with a dental examiner.

The survey was conducted in six sites across the country. The interviews and examination occurred over a period of 8 months from November 2008 to June 2009. The survey-team's visit to each community lasted approximately two weeks.

### 4.3 – Sampling Strategy

The Regions to be surveyed included Nunavut, Nunatsiavut (Newfoundland and Labrador) and Inuvialuit (Northwest Territories). Due to limitations on resources available to the survey, the communities in those Regions with less than 500 were excluded from the sampling frame. The result meant that the Inuit Oral Health Survey represents 77% of the Inuit living in the three participating Regions. Given that the Region of Nunavik (Northern Québec) did not participate, the sampling frame represented 52% of all Inuit living in the north. Briefly, quoting from the "Sampling Options

for the Oral Health Survey of Inuit Identity Population” (Giroux 2008):

“...the strategy is aimed to provide national (not territorial or regional) estimates for each of the 5 age groups for conditions that have a prevalence of 25% for ages 3 to 19, 10% for ages 20 to 39 and 17% for those 40 years and older with a coefficient of variation of 16.5%. The 2006 Census has been used as the frame for selecting the 6 potential communities, each with a population of >500. A total of 22 communities fit the population size. Within each community, a total of 212 respondents, randomly selected, were divided to obtain sufficient numbers of people in each of the targeted age groups: 3 to 5 years of age, 6 to 11 years of age, 12 to 19 years of age, 20 to 39 years of age and; 40 years and older...”

#### 4.4 – Interview Questionnaire

The first contact with respondents was made either by telephone or in person. At that first contact, the locally hired interviewer, who could speak the native language, described the survey to the potential respondent with the help of a descriptive brochure. If verbal consent was obtained, a printed consent form was signed by the respondent/guardian/caregiver prior to the interview. The interviewer then obtained the responses to the questionnaire and recorded them in a pre-printed booklet. This first contact, which included the consent and interview, took approximately 20 minutes. Upon completion of the questionnaire, the interviewer scheduled an appointment with the dentist-examiner. After the team left the community, OCDO staff entered the information from the paper questionnaires into a database using a laptop computer.

#### 4.5 – Visiting the Dental Examination Room

At least one Health Canada employee was always on site to ensure the proper flow of the clinical component of the survey. Occasionally, the examination team moved within a community to examine older adults in a seniors’ home and young children in daycare centres. An average of 10 to 20 minutes was necessary to conduct the clinical examination.

#### 4.6 – Training of the Oral Health Survey Staff

One of Health Canada’s roles is to build community capacity and thus, OCDO-Health Canada staff trained interviewers and recorders from each participating community to support the collection of the IOHS interview and clinical components. The training covered obtaining informed consent, conducting the interview, filling in the questionnaire and using the computer software to record the clinical measurements. Health Canada staff also trained the recorders to prepare the dental room using the Infection Control protocol established for the IOHS. The training was conducted through video conference and on-site instruction prior to the examination teams’ visit.

#### 4.7 – Calibration of the Dentists Examiners

The dentist examiners for the IOHS participated in calibration sessions consisting of both a classroom and clinical component. First, the dentists learned the rationale and criteria for the oral health measures. In the clinical component, all dentists examined volunteers and completed a series of exercises to ensure that they measured the oral conditions in the same way. Standard photographs representing the categories of fluorosis and study models of various occlusal conditions were also used for calibration.

Inter- and intra-examiner calibration tests were conducted. Eight dentists conducted the examinations and all achieved high agreement (Cohen’s Kappa > 0.6) ensuring an appropriate level of reliability for the findings. The dentist-examiner calibration processes used during the IOHS were consistent with those of the Canadian Health Measures Survey.

#### 4.8 – Consent and Ethical Review

The Inuit Oral Health Survey methodology and materials were reviewed and approved by Health Canada’s Research Ethics Board. The consent form contained explanations in English, Inuktitut Syllabic and Roman. The explanations included: description of the survey, informed consent, benefits for the Inuit population, privacy protection, right to refusal, and the statement of consent. All participants under the age of 18 or 14 depending on the Inuit Region, required the consent of a parent/caregiver. The signed consent forms are securely stored at the Office of the Chief Dental Officer within Health Canada.



## 5.0 - Results of the survey

### 5.1 - Introduction

The findings of the survey are presented using some of the acknowledged determinants of health (Health Canada 1999) to illustrate their effect on oral health. In addition, retaining natural teeth - being dentate - is a strong determinant of one's ability to chew, speak and smile or interact socially, and is used to illustrate the effect of losing all natural teeth on self-reported outcomes.

One of the major determinants of oral health is age. For example, children naturally shed their primary (baby) teeth and chronic periodontitis is a condition of adulthood. Further, at their clinical stages, many dental conditions are not reversible. To illustrate, once a tooth is decayed to the extent of a cavity, that experience is evident to examiners since the tooth will be decayed, filled or extracted. Both dental caries and chronic periodontal disease, left untreated, are generally progressive and hence usually increase in prevalence and severity with increasing age.

For this reason, the data are presented according to age-groupings, mostly using the same age-groups as used in the CHMS oral health module. The exceptions are that, for this survey, examiners included preschool children (Ages 3-5 years) whereas the CHMS did not and the survey of the Inuit combined the older age-groups (Ages 40-59 years and 60-79 years) into one group, those 40 years and older.

While age is a determinant of health, the reader should keep in mind that the findings present the picture of oral health status in 2008 - 2009. Older cohorts have experienced diets, preventive behaviours and care delivery systems of an earlier time. Younger age-groups will experience different diets, preventive behaviours, and care. Accordingly, their oral health would be expected to be different when they reach the older age-groups. While the tables may appear to show that the younger persons will experience disease that progresses along the same lines as their elders, it is not necessarily the case; they could experience less or even more.

Another major determinant of health is gender. Males and females are differentially afflicted by diseases (e.g., breast cancer vs prostate cancer) and may exhibit different preventive behaviours. To determine whether those differences are evident among the Inuit population, the findings are presented by gender.

A third determinant is preventive behaviours. Personal activities such as visiting a 'dentist' regularly and removing the biofilm on teeth by dental flossing and tooth-brushing are factors that influence the incidence and progress and hence the severity of dental diseases.

In these tables, only visiting a dentist within the last year is used to demonstrate personal preventive behaviours. However, readers should keep in mind that this factor may be influenced by more than people's personal choices. Geographic accessibility or the 'busyness' of those providers, in other words the oral health care delivery system, may influence people's ability to obtain regular care. If there are no dental care providers nearby, or if they are too busy to see all those who request services, or the demand for treatment overwhelms them to the degree that they can only provide emergency care, then regular visiting may not be a matter of personal choice and further, the effect of this determinant on oral health outcomes will be muted.

Determinants that are not shown, but were used in the CHMS oral health module, include insurance status since all Inuit are or should be eligible for the services under the Non-Insured Health Benefits program or its equivalent in the various regions. Income and education, strong predictors of oral health status and care access, are also not available for analysis or display in these results. One outcome of poor oral health, edentulism, or having no natural teeth, is also a determinant of visiting a dentist and self-reported outcomes such as chewing ability or avoiding foods. In this survey the lower numbers surveyed, compared to the OHM-CHMS, and the proportion who were edentulous, precluded making valid comparisons.

## 5.2 - Orientation to detailed tables

The findings of the Inuit Oral Health Survey are displayed in the tables that accompany this text. The tables are presented in a consistent format. Outcomes are defined in the heading for the table and the values are found in each cell. Since the results come from a sample survey, each value has an estimate of its stability, the 95% confidence interval (95% CI). This statistic shows the potential range of the value 95 times out of 100 similar surveys. A common way of expressing the 95% CI is that the value would fall within that interval 19 times out of 20 surveys.

Frequently the reader will encounter an 'E' beside a value. This means that the individual scores were highly variable (also seen by the wide confidence interval) and the results should be interpreted with caution. On other occasions, the cell will contain a 'F' which means either that the sample size was too small - less than 10 cases, or the coefficient of variation (a statistic derived from the standard deviation divided by the arithmetic mean) was greater than 0.33, a limit used in the CHMS oral health module to withhold reporting the value because it is highly unstable and can not be reliably projected to the whole population.

The text will draw the reader's attention to the important parts of the tables. In most cases gender and visiting a dentist do not influence the outcomes in a statistically significant manner. Thus the commentary will mostly speak of non-significant trends. Differences in mean counts or proportions that are statistically significant, as judged by the fact that the 95% confidence intervals do not overlap, will be noted. Absolute, non-significant, differences of less than 10% are unlikely to be clinically important and will warrant no, or very limited, comment in the text unless that difference is consistent across three or more groups.

## 5.3 - Findings

### 5.3.1 - Sample size

Table 1 shows the numbers of people examined in the Inuit Oral Health Survey (IOHS). A total of 1,216 (705 females and 511 males) were examined. The difference in participation by males and females is largely accounted for by the difference in the numbers of females examined in the adolescent and adult groups and, especially, the 20-39 year-old age group.

The table also shows the weighted number that the sample will be used to represent (23,170 in total) and the percent distribution of the sample. It also shows that 49.8% of the sample visited for care in the last year, 50.2% visited over a year ago. Visiting in the last year was highest (58.0%) among the children and lowest (33.2%) among the older adults.

94% of the respondents were dentate; edentulism (having no natural teeth) increased with age from less than 1% in young adults to 21.3% among those aged 40+ years. Even so, among the older group 78.7% were dentate.

### 5.3.2 - Self-reported outcomes

As seen in Table 2, just over sixty-five percent (65.3%) of Inuit self reported good to excellent oral health. Higher proportions (40.7%) of young adults reported poor oral health than any other age-group; adolescents experienced this least frequently (29.3%). Neither gender, nor visiting dental professionals, affected that outcome significantly although there was a consistent trend for more adult men to report poor oral health.

Overall, 30.3% of respondents reported avoiding foods because of problems with their mouth (Table 3). There was a trend towards higher proportions of food avoidance among females (34.4%) than males (24.5%), but no differences between visitors and non-visitors.

As seen in Table 4, nearly thirty percent (29.8%) reported experiencing ongoing or persistent pain in their mouth. Sixteen percent (16.5%) of parents/guardians of children aged 6-11, reported that the children experienced pain. This tended to be less frequent than at any other age, but generally there were no differences by age or gender.

In Table 5 we see that 22.5% of respondents reported that they had lost time from normal activities of school, or work, because of oral health problems. Adults tended to report this less frequently (12.4%) than any other age and parents of children (29.0%) and adolescents (30.4%) tended to report lost-time most frequently.

Almost half (49.8%) (Table 6) of Inuit reported they had made a visit to a dental professional within the last year. Children tended to have the highest rates (58%) and older adults the lowest (33.2%). Male children (60.3%) and male young adults (62.4%) tended to report visiting more than their female counterparts, but overall, higher proportions of females (53.2%) than males (45.0%) reported making a visit within the last year.



The findings in Table 7 show the percent of respondents (56.2%) who reported they usually made a visit once a year for check-up or treatment. This response speaks to their preventive orientation, namely do they go for prevention rather than for episodic care, e.g., for relief of pain or infection. As seen, 56.2% of respondents claimed 'at least once per year' was their pattern of care seeking. Preventively oriented visits were most frequently reported by adolescents (69.4%) and least frequently by adults (38.3%). The greatest absolute difference was seen among male (81.8%) and female (62.5%) adolescents but these, along with other differences, were not statistically significant.

Just over four percent (4.1%, 95% CI = 2.5-5.8%) of respondents said they avoided visiting because of costs; the frequency was highest for adults (7.9%, 95% CI= 1.3-14.5) and lowest for young adults (2.1%, 95% CI=1.3-14.5%). Other response data for this question could not be provided because of small sample sizes.

Overall 3.6% (95% CI = 1.8-5.3%) said they declined care because of costs. Frequencies among adults equaled 7.1% (95% CI = 2.1-12.2%) and among young adults, 3.0% (95% CI = 0.9-5.2%). In the only other reliable comparison, there was a 0.4 % absolute difference between males and females. All other comparisons were withheld because of small sample sizes.

Table 8 shows that 41.8% reported brushing their teeth at least two times per day. The difference in the total sample between females (49.1%) and males (31.7%) almost reached statistical significance. Among adolescents, there was a tendency for a higher percentage of males (51.4%) compared to females (47.4%) to brush at least 2 times per day. It also appeared that recent visitors (52.2% E) brushed more than those who visited more than one year before the survey (31.2 E).

Over thirty-six per cent of the sample reported flossing their teeth at least 5 times per week (Table 9). There was a tendency for more females (41.7%) than males (29.0%) to report flossing at least this often, and this was consistent for all ages. The proportion reporting flossing tended to increase with increasing age, from 25.1% among children to 45.5% among older adults. Higher proportions of those visiting within the last year (42.0% E) compared to those not visiting within the last year (30.4%) also flossed.

### 5.3.3 - Clinical examination findings

A major condition of oral health is dental caries or tooth decay. The disease leaves a permanent record of its effect to that point in the life of the person being examined - the teeth are either decayed (D), missing (M) due to disease, or filled (F). The condition is readily identified by trained examiners and its prevalence and severity are recorded using the DMFT index for permanent or adult teeth, and the dmft (lower case letters) index for deciduous or baby teeth. The severity of the condition in populations or groups is measured by counting the numbers of decayed, missing and filled teeth for each subject and then reporting the population-mean counts. The disease is recorded as prevalent if the subject had at least one dmft or DMFT tooth. The missing (M or m) component of the index indicates care that was provided because: the disease had progressed so far that extractions were the only option; or extractions were all that the patient could afford; or either the dentist, or the patient, or both, preferred that form of treatment. While it may be appropriate care, extraction as a consequence of disease represents a failure in both primary (preventing the occurrence of disease) and secondary (early detection and prompt treatment to limit the consequences of disease) prevention.

Dental caries can occur on the crown (visible portion of the tooth) that is covered in enamel and is termed coronal or sometimes, enamel caries. Root caries usually occurs among older persons, since it affects the root of the tooth after periodontal diseases have exposed the tooth root.

#### Children Aged 3-5 years

Preschool children, aged 3-5 years, have only deciduous teeth. 85.3% of preschool children had experienced one or more cavities at the time of the survey (Table 10). There was no difference in prevalence by gender or by visiting pattern. Overall children aged 3-5 years, experienced 8.22 decayed, missing, or filled deciduous (baby) teeth (dmft). Severity tended to be 1.3 teeth higher in females (8.85 dmft) compared to males (7.54 dmft).

As an indicator of the care delivery system's effectiveness in treating this burden of illness, less than 30% (28.4%, 95% CI = 0.0 - 60.6%) of the dmft had been filled and nearly half (49.4%, 95%CI = 8.8-89.9%) were still decayed. Dental service providers had extracted 78.5 teeth for every 100 that they restored (1.83/2.33 X 100).

## Children aged 6-11 years

Children aged 6-11 have a mixture of deciduous (baby) and permanent (adult) teeth. As permanent teeth emerge they replace the sometimes decayed deciduous teeth resulting, by age 14, in the new permanent-tooth dentition. Table 11 shows the caries indicators for the deciduous teeth. As seen, prevalence was lower (71.4%) compared to that of the preschool children (85.3% - shown in Table 10). Prevalence tended to be much higher among males (83.7%) compared to females (60.2%). Those visiting a dental professional recently tended to have had somewhat higher prevalence.

On average these children had 5.08 dmft and mean severity counts were more than 1.5 teeth higher in males. Nearly 1 tooth was still decayed, and care providers had extracted 37.9 teeth for every 100 they had filled (1.48/2.61 X 100).

Table 12 shows the findings for permanent tooth caries among children aged 6-11. Nearly 60% had experienced dental decay on their new permanent teeth and the mean of the total decayed, missing, and filled permanent teeth (DMFT) was 2.01. Females were affected slightly more as shown by both prevalence (62.0% E) and DMFT counts (2.35 E). Providers had extracted 35.8 teeth for every 100 they restored.

The results of combining the children's (aged 6-11) experience of dental caries on both deciduous and permanent teeth are shown in Table 13. 93.4% of children had experienced decay with a slight trend for the disease to affect more of the males (97.5%) than females (89.6%). The mean number of teeth affected was 7.08 and with males (mean dmft + DMFT = 7.52) appearing to have about 0.8 more teeth affected than females (mean dmft + DMFT = 6.68).

For children aged 6-11, 32.1% of all teeth remained decayed (19.5% of the dmft and 64% of the DMFT) and 44.4% had been restored (51.4% of the dmft; 26.6% of the DMFT). The ratio of missing to filled teeth shows that the care providers had extracted 52.8 teeth for every 100 that they restored.

Not shown in any table are the prevalence and severity scores for primary and permanent teeth among 6 year olds. 86.1% (95% CI = 59.8 – 100) of 6 year olds had 1 or more dmft + DMFT, with a mean count of 8.3 (95% CI = 3.3 – 13.4) dmft + DMFT. Of these 2.0 'E' (95% CI = 0.47 – 3.6) were missing and 4.6 'E' (95% CI 0.0

- 9.14) were restored. 7.9 'E' (95% CI = 3.5 – 12.3) of the decayed, missing, or filled teeth were primary teeth.

## Adolescents

As seen in Table 14, nearly all (96.7%) adolescents, aged 12-19, had had at least one tooth affected by decay, with virtually no differences by gender or history of a recent visit to a dental professional. Adolescents had, on average, 9.49 DMFT; females had a clinically (but not statistically significant) higher count of 11.1 DMFT compared to males' 6.84 DMFT. Examiners found somewhat fewer decayed teeth (2.98 DT) and more filled teeth (5.87 FT) among more recent visitors compared to those who had not visited in the last year (4.32 DT - 3.77 FT). 38.1% of the DMFT were still decayed and 51.5% of the DMFT were filled. The ratio of filled teeth to total DMFT (FT/DMFT) was 59.4% among more recent visitors compared to 41.7% among visitors of more than one year ago, but the difference was still not statistically significant. For this age-group, the findings showed that care providers had extracted 20.3 teeth for every 100 (0.99/4.88 x 100) that they filled.

No mean counts of caries indices can be reported on 12 year-olds because of high coefficients of variation.

## Adults - edentulism and compromised dentitions

Table 15 shows the effects of disease on Inuit adults as evidenced by tooth-loss to the extent of complete edentulism - the loss of all natural teeth. As seen in the first column, 9.7% were edentulous and with females (11.1%) tending to have higher proportions compared to males (7.6%). 21.3% of those aged 40 or older were edentulous (greater than 2 times the prevalence among adults as a whole) but the proportion among the younger age-group can not be published because the result was not sufficiently stable.

The further columns of Table 15 provide three indicators of the adequacy of the natural dentition among the 90.3% of adults who were dentate: the proportions with a full complement of 28 teeth, the proportions with a 'compromised' natural dentition of fewer than 21 teeth; and the mean number of teeth present. Note that only 28 teeth were counted; third molars (wisdom teeth) were ignored in the examination. Among dentate Inuit adults, 8.7% E had all 28 teeth and 38.5% had fewer than 21 teeth. Overall, dentate Inuit adult Canadians had 20.2 teeth. Age had a statistically significant effect



on the proportion with a compromised natural dentition of fewer than 21 teeth - 20.1% of those aged 20-39 were compromised compared to 69.0% of those aged 40 or older. Similarly, age affected the mean number of teeth; younger adults retained 22.4 natural teeth - older adults 15.8.

### Adult caries

Table 16 shows the prevalence and severity of coronal dental caries among both groups of adults. Not all jurisdictions report the missing (M) component for adults as, originally, the DMFT index was developed to record just the dental caries experience and, among adults, some teeth may have been extracted to treat the effects of periodontal disease or trauma. However for this report, we followed the convention of the oral health module of the CHMS (OHM-CHMS) (Health Canada 2010b) and extended the use of the index to include all missing teeth lost to caries or periodontal diseases. The examiners did not count as 'missing due to disease' those lost to trauma or as a part of orthodontic treatment.

Among those aged 20-39, 99.1% had one or more DMFT and all (100%) of those aged 40 years or older were affected (Table 16). For adults overall, 2.28 teeth were decayed, 7.43 were missing and 7.07 were filled for a total of 16.77 DMFT. The oldest age-group had over 4 more DMFT (19.5) compared to those 20-39 years (15.1 DMFT), largely due to the statistically significant difference in the mean number of missing teeth (12.01 MT for age 40+, 4.66 MT for age 20-39 years). There were no significant differences by age, sex or recent visits to a dental professional in the mean numbers of decayed or filled teeth, nor in the mean total DMFT counts. To that point in the lives of the adult group, care providers had extracted 105 teeth ( $7.37/7.07 \times 100$ ) for every 100 they had restored.

Table 17 shows the proportion, of decayed (13.6%), missing (42.2%), and filled (44.3%) teeth relative to the total burden of illness as measured by the DMFT. Within the table, only the proportion of DMFT that were missing (MT/DMFT) differs statistically; those aged 20-39 had 30.8% missing, those aged 40+ had 61.6% of their DMFT missing. Compared to those who reported visiting more than one year ago, more recent visitors year showed a consistent trend to lower proportions missing and higher proportions filled.

The burden of untreated dental caries among adults

is displayed in Table 18. 59% had untreated coronal caries; 33.4% had untreated root caries. Among those with one or more decayed teeth, there were 3.86 coronal cavities compared to 3.25 root cavities, about 0.6 teeth more coronally decayed teeth. Males tended to have higher prevalence and counts compared to females. Older adults had lower prevalence and lower counts of untreated coronal caries but higher prevalence and counts of untreated root caries. Recent visitors had on average about one less coronally decayed tooth and one less root decayed tooth than those who visited more than one year ago.

Further detail on the prevalence and severity of root caries is shown in Table 19 where many of the cells display the cautionary 'E' to warn of the wide confidence interval of the estimate. Nonetheless, the examiners found that 44.3% of adults had one or more root decayed or filled teeth, with a tendency for higher prevalence among older adults (52.8%) compared to those aged 20-39 (39.2%). In all comparisons that are displayed, males and the older group tended to have worse prevalence and counts. The effect of recent visiting, while in the expected direction, was not sufficient to reach statistical significance in any of the measures. Overall, 71.4% (95%CI = 34.0 - 100.0%) of the root caries remained decayed and this proportion did not differ significantly by age, sex or recentness of last visit.

### Adult periodontal conditions

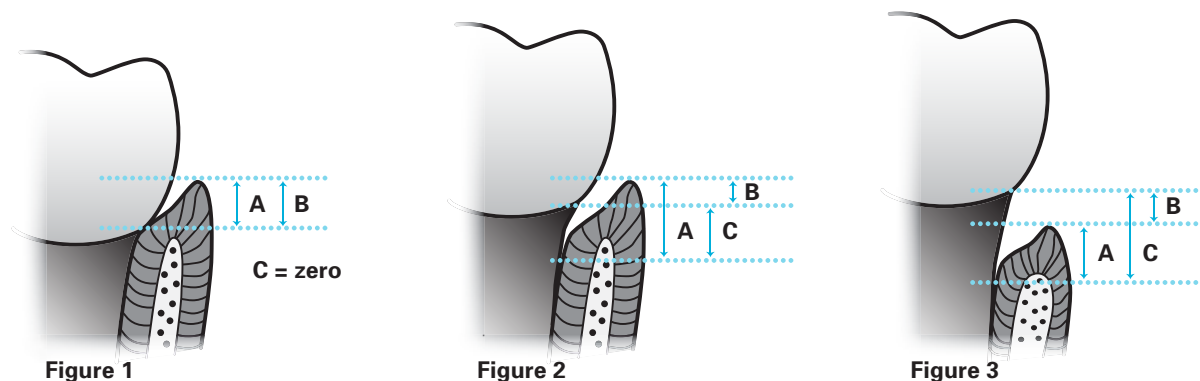
The measurement of periodontal conditions is difficult clinically and the indices in current use do not measure active disease. For background and the purposes of definition, the structures surrounding the teeth that keep them in place (gingiva, bone and the attachment mechanism - the periodontal ligament - between the teeth and bone) are referred to as the periodontium. These structures are subject to diseases and host-defense response, the effect of which is to produce inflammation of the gingiva (gingivitis), inflammation of the bone (periodontitis), and loss of attachment (LOA). In the large majority of people, the periodontal ligament does not fall away from the tooth after one disease episode, but rather the attachment migrates away from the crown along the root of the tooth in small bursts over a long period. In healthy young adults, the attachment is found at the junction of the enamel covering the crown and the beginning of the root which is covered in cementum - the cemento-enamel junction (CEJ). Others have observed (Burt 2005) (pg 268-9) that even among

dentally conscious college students and professors in Norway there is migration of the attachment down/up the root, between 0.07mm and 0.13mm annually. Thus, the examination protocol records the cumulative history of the effects of 'natural' migration, previous bouts of active disease, and periods of repair.

Using blunt probes with millimeter markings, examiners measure loss of attachment (LOA) as the distance from where the attachment is found in healthy young adults (the CEJ) to where it is found in a participant at the time of the examination. However, LOA is difficult to measure accurately since the gingiva covers the site of the attachment. Examiners are really 'sensing' the level of the attachment by gently probing and identifying the attachment point as the bottom of a so-called 'pocket' between the tooth root and the gingiva, and then, measuring the distance from that point to the CEJ. Thus, there are two measures, pocket (or probing) depth and loss of attachment.

In Figure 2, three diagrams illustrate the clinical measurements and the necessary calculations. 'A' represents the pocket depth, 'C' represents the loss of attachment, and 'B' is the distance from the crest of the gingiva to the CEJ. Diagram 1 shows a healthy periodontium with no real pocket and no loss of attachment. Diagram 2 represents one situation where the attachment has migrated down the root and the LOA has to be calculated by subtracting the distance 'B' from the pocket depth 'A'. Diagram 3 shows the LOA calculated by adding the extent of recession 'B' to the pocket depth 'A'.

**Figure 2 - Diagrams illustrating the measurement of attachment loss**



Using the World Health Organization's (World Health Organization 1997) indicator teeth, and depending on the teeth that were present, examiners probed the sulcus on up to ten teeth. If all indicator teeth were present they recorded the worst (highest) probing depths and loss of attachment measures on eight molar teeth and two anterior teeth. Then the worst score for an individual participant was used in the tables. While the scores are subject to measurement errors, the method does not capture the status of the whole mouth and therefore may over- or under-represent the severity of the disease in an individual participant. Nonetheless, these methods are deemed to provide representative information on populations and replicate the measurement of periodontal conditions and was used in the oral health module of the CHMS.

Loss of attachment (LOA) is considered as the true measure of the effects of disease (Burt 2005) (p260, p263). Conventionally, healthy individuals are defined as those with loss of attachment (LOA) of 3mm or less. Sites with LOA of 4 - 5mm are considered to have, or have had, moderate disease and teeth with LOA of 6mm or more are considered to have, or to have had, severe disease. However, chewing function is well maintained with minor loss of attachment of, say, less than 4mm, and teeth are not likely threatened until 6mm or more of attachment is lost. Clinically, pocket depths can be reduced by home care and professional treatment, but loss of attachment is largely irreversible.

Lastly readers need to consider the findings while keeping in mind the age-group. None of the standards for defining severity of disease consider attachment loss relative to age. For example, a 70 year-old with a maximum of 4mm of attachment loss on a number

of teeth should probably be regarded as having aged successfully whereas a 20 year-old with the same findings would seem to be at risk for loss of teeth.

Table 20 shows the findings on debris (soft, cream-coloured deposits or stain) and calculus (calcified, adherent material, also known as 'tartar') found on the indicator teeth. Neither of these is a measure of disease but they are seen as local factors that, if present for a sufficient interval, are associated with the development of gingivitis. Both can be prevented by home care, but calculus can only be removed with scaling by a professional.

The table provides the worst score found on the 10 indicator teeth; a score of '0' means none was found and '3' means that more than 2/3 of the crown was covered with debris or stain. For calculus, a score of 2 is recorded if between 1/3 and 2/3 of a surface were covered and/or that flecks of sub-gingival calculus were present, and 3 means that more than 2/3 of a surface was covered and/or there was a heavy band of subgingival calculus found in the 'pocket' surrounding the tooth.

Worst scores (2 or 3) for calculus were found among 19.9% of Inuit. Males (24.8% 'E') tended to have higher scores than females (16.3% 'E'). Somewhat higher proportions of the oldest age-group and infrequent visitors had higher prevalence of calculus. By subtraction, it appears that about 27% of Inuit had debris/stain scores of 2 or 3 but the small sample size limits discussion of any comparisons.

Highest scores for gingivitis are displayed in Table 21. 30.6% had their worst score as 2 or 3. Somewhat higher proportions of males and those not visiting within the last year had these worst scores.

Table 22 provides the findings on the distribution of dentate people according to their worst (deepest) probing scores ranging from 0-1mm to 6mm or more. 83.5% had their worst probing depth as 3mm or less. The prevalence of moderate disease (at least one pocket of 4 or 5mm) was found among 12.6% (7.5% + 5.1%) of Inuit.

The prevalence (16.5%) of moderate or severe scores (pockets > 4mm) is shown in the far right-hand column. Many of the estimates show wide confidence intervals or are withheld, but there was a tendency for more males and older adults to have had moderate or severe scores. Accepting the convention that worst scores of 6mm or more are of concern, then only 3.9% E have had severe

disease, but no comparisons are possible since most data are withheld.

The levels of true disease - attachment loss - are shown in Table 23. Data on the prevalence of attachment loss of 4, 5 and 6mm or more are withheld. However, as seen in the right-hand column by combining all those three levels, 17% of Inuit had attachment loss of 4mm or more in at least one tooth. In examining the column second from the right we see the prevalence (83%) of those with relative health, i.e., worst scores between 0-3mm. Females (88.7%) compared to males (75.1%), younger (94.6%) compared to older (62%) and to a slight degree, recent visitors (86.8%) compared to those who visited more than one year previous (79.0%) tended to have relative health.

The Community Periodontal Index of Treatment Needs (CPITN) (Ainamo 1982) is an index developed to measure the amount and level of periodontal care that should be provided to the adult population. For example, gingivitis alone could be treated/prevented by an oral hygiene (brushing and flossing) program delivered by dental health educators, whereas pockets of 6mm or more would need the attention of a dental professional. Although the examiners did not record CPITN per se, the data that were recorded allow for allocation of the participants into the CPITN categories.

Table 24 shows that allocation, whereby participants were assigned to their worst condition. For example a person with pockets 4-5mm could also have gingivitis and calculus but they would be allocated to the 'pockets of 4-5mm' column. Looking at the columns starting at the far right, the prevalence of pockets of 6mm or greater and 4-5mm correspond to the findings of Table 22. The middle column shows the proportion of people (44.5%) who have calculus as their worst condition, and next left, the proportion who have inflammation of the gingival tissues, or gingivitis, (19.0%) as their worst condition; 20.1% were healthy.

## Dental Fluorosis

The examiners recorded dental fluorosis among children, aged 6-12, using Dean's Index. The criteria for the index are as follows:

**Figure 3 - Dean's Index codes for recording dental fluorosis**

Code	Description	Definition
1	Normal	The enamel surface is smooth, glossy and usually a pale creamy-white colour.
2	Questionable	The enamel shows slight aberrations from the translucency of normal enamel, which may range from a few white flecks to occasional spots.
3	Very mild	Small opaque, paper-white areas scattered irregularly over the tooth, but involving less than 25% of the labial tooth surface.
4	Mild	The white opacity of the enamel of the teeth is more extensive than for code 2, but covers less than 50% of labial tooth surface.
5	Moderate	The enamel surfaces of the teeth show marked wear and brown stain is frequently a disfiguring feature
6	Severe	The enamel surfaces are badly affected and hypoplasia is so marked that the general form of the tooth may be affected. There are pitted or worn areas and brown stains are widespread; the teeth often have a corroded appearance.
7	All 4 anterior teeth absent	Could also be unavailable for assessment since banded

Dental fluorosis is one form of hypoplasia of the dental enamel, which, depending on the amount of fluoride exposure (the dose) and the period of tooth development at which the exposure occurs, can be seen as ranging from a mild white chalky discoloration of the tooth surface, to brown staining, to pitting, to enamel loss (description adapted from (National Academy of Sciences 2006)). According to Health Canada's expert panel on fluoride (Health Canada 2007), dental fluorosis is the first sign of potential excess fluoride intake and, '... the end-point of concern for fluoride (intake) is still considered to be "moderate dental fluorosis," according to Dean's Index. It was agreed (by the expert panel) that this should not be considered a toxicological end-point, but that this endpoint is significant because it correlates with cosmetic problems...'.

Examiners found that 92.9% (95% CI = 77.5-100%) of Inuit children aged 6-11, had teeth that, according to Dean's index, exhibited no signs of fluorosis. None had moderate or severe dental fluorosis. The prevalence of questionable or very mild and mild degrees of severity were too low to allow reporting but roughly 7% of children must have had these questionable or low scores. There were no significant differences in normal appearances by gender or visiting pattern.

#### **Orthodontic treatment**

Just under 3% (2.8%) of Inuit were receiving or had received orthodontic treatment at the time of the survey. This ranged from: 0.0% among preschool children;

0.6% (95%CI = 0.0 - 2.6%) among children aged 6-11; 5.6% (95% CI = 0.0-11.3%) among adolescents; 4.0% (95%CI = 1.6 - 6.5%) among adults aged 20-39; and 0.8% (95% CI = 0.0 - 2.5%) among older adults.

#### **Soft tissue lesions**

Soft tissue lesions were found among 9.9% (95% CI = 3.7 -16.2%) of adults with no differences by age, visiting pattern or edentulism.

#### **Hierarchy of needs**

We created a hierarchy of need consistent with a 1978 publication of the American Dental Association (American Dental Association 1978), previous work on an elderly population in Ontario (Otchere 1990) and the OHM-CHMS (Health Canada 2010b). Essentially the participants are triaged under a paradigm that ranges from threats to life or current severe pain, to restoration of function, to needs that could be met over a longer time period. Accordingly, the hierarchy places surgical, followed by endodontic, restorative, prosthodontic, periodontic, orthodontic, a group of miscellaneous services that were infrequently indicated for treatment (temporo-mandibular joint treatment, aesthetics, soft tissue) and no treatment needs. The hierarchy indicates the highest need for persons but they likely have other, lower order needs. For example, a person identified as needing restorations could have prosthodontic, periodontal and preventive needs as well.

Table 25 shows the distribution, according to the hierarchy, for the dentate population. 27.4% E had no treatment needs identified at examination. The percent with no treatment needs tended to be higher among the two youngest age groups and females. Nearly 40% had need for restorations but there were no clinical or significant differences by sex, age or recentness of dental care visit. Surgical services were the most important service needed by 22.9% of the Inuit. Prosthodontic services were needed by 5.7%, but that was concentrated (18.2%) in the oldest group. Few had endodontic (2.0%) needs and so few had periodontal, orthodontic or miscellaneous types of care as their most important service that those data had to be withheld.

At the end of the clinical examination the dentist-examiners recorded whether the participant needed care and, if so, what kind. That information was communicated to the participants verbally and by means of one of three take-home forms. The forms indicated whether the person required regular maintenance; attention from a dental professional in the near future; or immediate attention from a dental or medical professional.







## 6.0 - Summary and Discussion

### 6.1 - Validity of the findings

The oral health survey of Inuit provides estimates of the burden of illness as of 2008-09 across areas of Canada's north, except in Nunavik or Northern Quebec. It was conducted to a high level of quality with the sampling methodology carried out by Statistics Canada and trained dentist-examiners who were recalibrated at regular intervals. Trained staff marked the responses to the interview on pre-printed forms and recorded findings of the examination on lap-top computers at the time of the examination. The interview responses were later entered onto the database and linked to that individual's examination findings. The protocol used the indices, criteria and analyses employed by the oral health module of the Canadian Health Measures Survey (OHM-CHMS). As a result, the findings can be reliably compared to those of the OHM-CHMS. Nonetheless, the smaller sample size (1216) compared to the OHM-CHMS (5586), and perhaps more variability in the sample, produced wider confidence intervals than the national findings.

The Inuit survey protocol collected less information on the determinants of oral health than did the OHM-CHMS, limiting the examination of effects of those such as income, and education. Insurance coverage was collected but is not reported in this document. The survey did target preschoolers (ages 3-5 years), an age-group that the OHM-CHMS did not include. The Inuit survey reports results for those 40 years and older as one group whereas the OHM-CHMS reported findings for those aged 40-59 and 60-79 years.

In summary, the findings of this survey have high validity and as such allow for accurate comparisons of the oral health of Inuit with that of Canadians living in the south of the country. As discussed later, the results can be compared with the findings of earlier local or regional studies, but with somewhat less confidence since those were conducted to varying standards.

### 6.2 - Self reported outcomes

More than two times as many (34.7%) of Inuit reported they had poor oral health compared to the findings of the OHM-CHMS (15.5%). The direction and size of that relationship held for those who reported avoiding food because of problems with their mouth (30.3% Inuit; 12.2% OHM-CHMS) and pain (29.8% Inuit; 11.6% OHM-CHMS). While comparisons by age group showed the same relationships as above, the difference was most profound among adolescents who avoided foods (36.3% Inuit; 12.5% OHM-CHMS Canadians). Time lost from school, work or other normal activities for dental checkups was reported by fewer (22.5%) Inuit compared to OHM-CHMS Canadians (39.1%).

#### Visiting behaviours

About one-half (49.8%) of Inuit people visited a dental care provider in the last year; almost three-quarters (74.5%) of southern Canadians made such a visit. The difference is greatest among the adult Inuit (aged 40+) where 33.2% made such a visit compared to 76.7% of those aged 40-59 years and 68.4% of those aged 60-79 years in the OHM-CHMS. The difference in the proportions claiming to 'usually' visit once a year for a check-up or treatment are narrower - Inuit, 56.2%; OHM-CHMS, 74.3%, but still favour the southern Canadians. The difference is least among male adolescents where 82% and 84% of Inuit and southern Canadians, respectively, reported they usually visited once per year.

Consistent with their eligibility for the NIHB dental program, only 4.1% of Inuit reported they avoided visiting for dental care because of costs. Over four times as many (17.3%) southern Canadians responded similarly. Similarly, 3.6% of Inuit declined recommended care because of costs whereas 16.5% of the OHM-CHMS declined recommended care.

Lower proportions, 48%, of Inuit compared to 73.2%

of the OHM-CHMS claimed to brush at least two times a day. That difference is greatest among the older adult Inuit (26.5%) compared to 70.5% - 73.9% among Canadians living in the south. An opposite finding is that more Inuit, 36.3%, compared to other Canadians (28.3%) claimed to floss.

In summary and relative to Canadians in the south, Inuit self-reported having a higher burden of illness, more disability, and less access to care even though costs were not a factor in visiting nor in accepting care-givers' recommendations.

## 6.3 - Clinical findings

Precise comparisons of these results with those of earlier studies are difficult. While we know the methods and standards used in this study, the methods used in the others are not necessarily consistent either with this study or with each other. Differences in the methods can be seen in the sampling strategies, non-use of current epidemiologic indices, and training and calibration of examiners. A further difference occurs in the age-groups examined - earlier studies reported the results for fewer, often inconsistent, age-groups. As stated before, even between the OHM-CHMS and this survey of Inuit, there were inconsistencies - the Inuit study combined the findings for all over the age of 40 into one group whereas OHM-CHMS reported separately on 40-59 year-olds and 60-79 year-olds. A second difference is the way the findings are reported - seldom do earlier studies contain confidence intervals for their point estimates. Thus, while we are able to examine the current findings in the light of the earlier studies, conclusions about differences must be somewhat tentative.

### 6.3.1 - Preschool children

Earlier studies (see Table A1.1) dating over the previous 40 years report prevalence of caries for those at least 3 years-old ranging from 44.7% to 80% with the numbers of teeth affected ranging from 2.85 dmft to 10.38 dmft. The present study found evidence of decay among 85.3% of the children and a dmft of 8.22, well within the range of the earlier findings. Of the affected teeth 49.4% remained decayed and 28.4% had been filled with the balance (22.3%) extracted due to disease. In contrast, the Nutrition Canada study found no evidence of treatment and all 6.1 dmft were decayed. Preschool children were not examined in the OHM-CHMS survey so no comparison is possible.

### 6.3.2 - School children

In this survey, 93.4% of school children, aged 6-11 years, had one or more primary or permanent teeth affected by dental caries with a mean count of 7.08 dmft+DMFT. Again these findings are consistent with the earlier regional studies of Inuit communities (see Table A1.1) where the prevalence ranged from 82% to 100% and severity counts ranged from 3.9 (Nutrition Canada) to 10.7 in 1986 in Ungava. More recent findings from Nunavik (including Ungava) show that severity counts ranged from 7.48 to 9.51 dmft+DMFT (Belanger 2000). In the OHM-CHMS 56.8% of school children were affected with a count of 2.48 dmft + DMF teeth. Here, 44.4% of Inuit children's affected teeth remained decayed compared to 14.7% of a much lower count in the OHM-CHMS. Using the indicator of caries care from McDermott (McDermott 1991), dental care providers for Inuit children extracted 72.6 teeth for every 100 they restored - this compares to roughly 4 extracted for every 100 filled in southern Canada (calculated from Table 17 in OHM-CHMS).

Even though the findings are from about 20 years earlier, the closest comparison may be with results of the 1990-91 survey of Canada's Aboriginal Children (Leake, 1992), using the data found in the Appendices for the Northwest Territories (NWT). At that time NWT included the Nunavut territory and in the NWT 84% of the examined 6 year-old children were Inuit. In the 1990-91 survey, 95% of 6 year-olds had one or more dmft+DMFT compared to 86% in the current report. Mean counts of teeth affected were also lower from 8.9 in 1990-91 to 8.3 in 2009. In 2009, 4.5 or 55% of the teeth were successfully restored compared to 1.8 or 20% of the affected teeth in 1990/91.

Nearly 93% (92.9%) of children showed no evidence of fluorosis and none had moderate or severe signs leaving about 7% with either questionable or mild signs. This compares to Belanger's findings that 8.7% of children in Nunavik exhibited mild fluorosis on at least 2 upper front permanent teeth (Belanger 2000).

### 6.3.3 - Adolescents

The prevalence of 96.7% falls slightly outside the range of the findings of earlier studies (prevalence = 68.8% to 95%). The count of 9.49 DMFT count does fall within the range of 3.6 DMFT for 12 year-olds to 16.7 DMFT for 12-17 year-olds in Ungava in 1986, although the most recent survey (Health Canada 2000)



showed 3.6 DMFT for 12 year-olds. In comparison, 58.8% of OHM-CHMS adolescents had had one or more teeth affected by caries and a DMFT of 2.49, less than a third of the Inuit. Inuit adolescents had over 3.5 teeth still decayed and dental care providers for the Inuit had extracted 20 teeth for every 100 they had restored. For adolescents in the south of Canada, dentists had extracted 0.95 per 100 filled (calculated from Table 21 in OHM-CHMS).

The use of sealants was too low to be reported.

### 6.3.4 - Adults

For young adults (age 20-39) there are few previous studies with which to compare; Nutrition Canada (Nutrition Canada 1977) found 8.3% of females were edentulous and Rea et al. (Rea 1993) found 15.2 % of females and 3.8% of males aged 30-39 years were edentulous. In both this survey and the OHM-CHMS, the prevalence of edentulism was likely so low that the data had to be withheld - a positive finding. Both this Inuit Oral Health Survey and OHM-CHMS provide information on three other indicators of the adequacy of the natural dentition: the proportion with a full complement of 28 teeth, the proportion with a 'compromised' natural dentition of fewer than 21 teeth; and the mean number of teeth present. Lower proportions of Inuit young adults had all 28 teeth (12.9%) compared to OHM-CHMS (42.3%) more had 'compromised dentitions' of fewer than 21 teeth (20.1% vs 0.8%) in OHM-CHMS and they had fewer remaining teeth, a mean of 22.9 teeth compared to the OHM-CHMS finding of 27.1 teeth.

Relative to earlier studies, Inuit had higher mean counts of DMFT (15.1) compared to the Nutrition Canada findings but less than Rea et al. (20.5 DMFT) reported (Rea 1993). Each of the components (D, M, F) was higher than the OHM-CHMS findings which totaled 6.85 DMFT. Only somewhat more (16.7% 'E') of the DMFT teeth remained decayed compared to 11.9% in the OHM-CHMS. However, more of the disease is treated by extracting teeth as dentists had extracted 58.7 teeth for every 100 they had restored compared to 6.9 in the OHM-CHMS survey (calculated from Table 28 in the OHM-CHMS Technical Report).

Root caries was much more prevalent (39.2%) and mean counts were higher (1.52 RDFT) among the younger adult Inuit than among southern Canadians (5.8%; 0.17 RDFT - Table 19).

The younger adult Inuit periodontal conditions were equivalent to those in the south. 14.1% of younger adult Inuit (13% OHM-CHMS) had greatest probing depths of 4mm or more and only about 5 % had lost 4mm or more of attachment compared to about 7% in the OHM-CHMS survey. In fact when comparing CPITN scores, Inuit aged 20-39 had better gingival and periodontal health as 25.2% were healthy compared to 10.9% in the OHM-CHMS and the population in each of the more severe categories favoured the Inuit. Inuit have higher rates of extraction (see paragraph below) and the remaining teeth might be thought of as the 'healthy survivors'. Whether that accounts for the relatively healthy periodontal scores is open to question, but the findings seem surprising given the population's high rates of tobacco use (Inuit Tapiriit Kanatami 2008), a strong risk factor for periodontal disease (Burt 2005) (p 273-4).

Comparing the findings on older Inuit adults (aged 40+) to those of earlier studies must again be tentative, but the examiners found that 21.3% were edentulous which appears to be less (better) than both Galan et al. (Galan et al. 1993) and Rea et al. (Rea 1993) found in the Keewatin Region (see Table A1.5) and much better than 63.8% reported by Belanger (Belanger 2007) from Gagnon and Brodeur's 1992 survey in Nunavik. The finding that higher proportions of females were edentulous is consistent but perhaps less pronounced than found by three earlier studies that reported on edentulism. The prevalence is nearly identical to that of an older age-group, aged 60-79, in southern Canada.

The adequacy of the dentition among the older dentate Inuit, was shown in the remaining columns of Table 15. The percent of Inuit with fewer than 21 teeth (69%) and the mean number of teeth present (15.8) show they have less adequate dentitions than southern Canadians. The same indices for those 40-59 years and 60-79 years in the OHM-CHMS were, respectively, 16.5% & 42.2% and 24.1 teeth and 19.4 teeth.

All older Inuit have had coronal dental caries and that was virtually true for their southern compatriots. The finding that they had 19.5 DMFT was slightly fewer than Rea et al. (Rea 1993) found in 1993 but more than Nutrition Canada found in 1977 (Nutrition Canada 1977). Less than 10% were still decayed which was much lower than either Rea or Nutrition Canada found (see Tables A1.4 and A1.5). For the oldest Inuit group, dentists had extracted 214 teeth for every 100 they had filled; in the OHM-CHMS the same indicator ranged

from 26 (age 40-59 years) to 57 (age 60-79 years) extractions for every 100 teeth that had been filled.

Examiners found that root caries was prevalent in 52.8% of the older dentate Inuit. Earlier studies did not report on root caries but this compares to 24.9% (40-59 year-olds) and 43.3% (60-79 year-olds) of the adults in the OHM-CHMS study. Nearly 40% had one or more root decayed teeth still decayed compared 8.0% (40-59 year-olds) and 11.2% (60-69 year-olds) of older Canadians surveyed in the OHM-CHMS.

Earlier studies were inconsistent in the estimates of the prevalence of periodontal diseases - from less than 10% in the Rea et al. (Rea 1993) survey to 77% in Nutrition Canada (Nutrition Canada 1977)(see Table A1.5). Examiners for the Inuit survey found that 20.8% had probing depths of 4mm or more - this compares to 23.6% and 31.0% in the two older age-groups in the OHM-CHMS. 38% of dentate Inuit aged 40+ years had 4mm or more attachment loss at one or more sites. This compares to 26.1% and 47.1% of the two older age groups of southern Canadians.

Examining the CPITN scores, 14.6% of older adult Inuit were healthy compared to 5.8% and 2.9% of the two oldest groups surveyed in the OMH-CHMS. As with the younger adult Inuit, comparisons by the other categories of the CPITN favoured the Inuit population.

Signs of fluorosis were largely absent from the Inuit school children - 92.9% of children showed no signs of fluorosis and none had moderate or severe scores. This left about 7% with questionable, very mild, or mild scores. In the OHM-CHMS 59.8% of children aged 6-12 had no signs, 23.5% were scored as questionable and 16.4% had very mild or mild scores.

Soft tissue lesions are found with similar frequency in Inuit (9.9% E) and southern Canadians (11.6%).

Close to three quarters (72.6%) of older adult Inuit needed some sort of care; this compares to 37.2% and 42.8% of older adults in the OHM-CHMS. The major difference occurred in the need for restorative and lesser needed care. Nearly forty percent (39.3%) of Inuit needed restorative care compared to 20.5% and 17.2% of older southern adults.

## 6.4 - Comparisons with other countries

In other countries the oral health of indigenous peoples has been found to be lower than that of people

of European descent. Table A2.1, in Appendix 2, shows some comparisons of the oral health of indigenous children and adolescents alongside their non-indigenous compatriots. The largest study was conducted in Australia where Jamieson et al. (Jamieson 2007) compared the oral health of more than 10,000 indigenous children to that of over 317,000 non-indigenous children. Indigenous children aged 4-10 were over two times more likely to have caries in the deciduous dentition (62.5%) compared to non-indigenous children (37.2%). They had 2.86 dmft compared to 1.4 dmft among non-indigenous children. Findings consistent with these were reported by Endean et al. (Endean 2004) and Davies et al. (Davies 1997) in two other studies from Australia. Similarly in New Zealand, much higher prevalence of caries was found in Maori children compared to non-Maori children (Government of New Zealand 2010) independent of the fluoride status of the drinking water.

As for comparisons between Inuit people in Greenland and people from Europe, Petersen and Christensen (2006) found that:

‘...the percentage of caries-free children 6 years of age is 6-7 times lower than of other countries in the Nordic Region (i.e, Scandinavia - editor’s insertion) and caries experience (DMFT) among 12-year-old Greenland children is about double that of children of a similar age in the Nordic region...’.

Also seen in Table A2.1 are Jones et al.’s (Jones et al. 1992) findings from Alaska Natives and non-Natives aged 3-5, and a comparison between adolescents from the 2002 Indian Health Service (IHS) study of dental patients (Indian Health Service 2002) and the US Department of Health and Human Services (2007) report on a probability sample of United States population. In both comparisons, Alaskan Native patients have higher prevalence of caries and more than two times the mean number of affected teeth compared to the findings in the national sample.

Appendix 2, Table A2.2 provides a side-by side comparison of the results of this study with those of the IHS 2002 findings for Alaskan Natives (Indian Health Service 2002). Note that the Alaskan results are those of patients visiting clinics and therefore likely overstate the levels of care (i.e., fewer decayed teeth) than in the Alaskan Native population as a whole. The findings for three groups are matched by age as closely as the published data allow. For the children and adolescents,

Canadian Inuit had higher prevalence, higher mean severity counts, but lower proportions of caries affected teeth remaining decayed (D/DMFT). Among the young adults, the proportions of edentulous and mean DMFT were similar but again the Canadian Inuit had better periodontal health as measured by the CPITN and loss of attachment.

## 6.5 - Summary

The oral health of Inuit continued to be worse than the archeological findings and validates the findings of earlier Canadian surveys that they bear a disproportionate burden of oral health diseases.

Compared to southern Canadians, more Inuit reported poor oral health and higher frequency of food avoidance and oral pain. Less than half made a visit for dental care even though very few reported that costs were a factor in avoiding visiting or accepting recommended treatment.

In this study, the prevalence of coronal caries was high among the Inuit. Over 85% of preschoolers had had dental caries with a mean of 8.22 deciduous (baby) teeth affected. By the time of adolescence, 97.7% had been affected and among the oldest adults, the disease had affected everyone. Counts of decayed missing or filled permanent teeth increased at every age - from 2 at age 6-11 years, to 9.5 for adolescents, to 15 at age 20-39 years and over 19 DMFT among older adults. The prevalence and mean DMFT counts greatly exceeded similar counts for southern Canadians.

Further, much of the disease remained untreated. As an example, the proportion of the affected teeth that remained decayed for adolescents and young adults was 38.1% and 16.7% respectively compared to 14.9% and 12.6% among southern Canadians. In addition, more of the disease is treated by extractions among the Inuit. Among adolescents there were 20.3 extractions per 100 filled and, among young adults 58.7 teeth had been extracted for every 100 that had been filled. In contrast, the OHM-CHMS found that among adolescents 1.0 tooth had been extracted per 100 filled and among young adults there were 6.9 extractions per 100 filled teeth.

Root caries was also more prevalent and less was treated compared to the findings of the OHM-CHMS. On the other hand periodontal conditions, as demonstrated by the CPITN Index, seemed less prevalent and less severe among Inuit compared to the findings of the OHM-CHMS and to the Alaskan Native patients.

Given that more extractions are provided, more of the oldest Inuit population (21.3% for all those 40 years and older) than the southern population (4.4% for 40-59 year olds and 21.7% for 60-79 year-olds) were edentulous.

Compared to Alaskan Native dental patients, Canadian Inuit have higher prevalence of caries and higher severity counts but lower proportions of untreated (decayed) teeth. Young adult Canadian Inuit appear to have had better periodontal health than Alaskan Natives while their levels of edentulism and total DMFT counts were very similar. The finding that Canada's Inuit had more dental disease (except for periodontal conditions) than their southern compatriots is consistent with international studies that have also found that indigenous people have worse oral health status compared to that of the dominant cultures in their countries.

## 6.6 - Future steps

No doubt conditions under which care is provided have improved from those cited by Jones (Jones 1968). For example, modern treatment facilities are now available in many communities. However, there is still work to do. Others (Beltran 2009) have reported how preventive programs have worked to reduce the mean caries scores of children in Costa Rica, Jamaica, Mexico and Uruguay. Clearly the conditions cannot be treated away, utilization is too low, and among children the incidence of disease is too high, to manage the problems through treatment even if more resources could be applied. More emphasis on community-based primary preventive measures backed up by early detection and prompt basic treatment would appear to be the best course to make a difference. However, these two strategies cannot do the job by themselves. The threats to health such as high rates of tobacco use, crowded housing, and food insecurity, identified by others (Tait 2008) need to be addressed for the preventive dental efforts to have maximal effect.





## 7.0 - References

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## 8.0 - Glossary

### Adapted from:

Slade GD, Spencer AJ, Roberts-Thomson KF. 2007. "Australia's dental generations: the national survey of adult oral health 2004-06." Australian Institute of Health and Welfare. (Dental Statistics and Research Series No. 34) Canberra.

**95% confidence interval** Defines the uncertainty around an estimated value. There is a 95% probability that the true value falls within the range of the upper and lower limits.

**Absolute difference** The difference between two values calculated by subtracting one value from the other.

**Attachment loss or Loss of Attachment (LOA)** is the distance (in millimetres) from where the enamel of the tooth meets the root to the bottom of the pocket between the gum tissue and the tooth.

**Birth cohort** A group of people born during a particular period or year.

**Calculus** Hard deposit of mineralised material adhering to the tooth surface.

**Calibration** A procedure to promote standardisation between examiners performing the oral examinations.

**Cemento-enamel junction** Point on a tooth surface where the tooth crown joins the tooth root.

**Complete tooth loss** Loss of all natural teeth (also referred to as edentulism).

**Coronal** Pertaining to the crown of a tooth.

**Crown** The portion of tooth covered by white enamel that usually is visible in the mouth.

**Dental caries** The process in which tooth structure is destroyed by acid produced by bacteria in the mouth. See dental decay.

**Dental caries experience** The cumulative effect of the caries process through a person's lifetime, manifesting as teeth that are decayed, missing or filled.

**Dental decay** Cavity resulting from dental caries.

**Dental Enamel Fluorosis** Discolouration or pitting of the dental enamel caused by exposure to excessive amounts of fluoride during enamel formation.

**Dental insurance** Universal dental care is not included in Canada's provincial and territorial publicly-funded 'medicare' programs, and many employers have elected to include private dental insurance as a benefit to employees and their dependents. Publicly funded dental care is limited to First Nations people, to the elderly in the Territories and Alberta and to children in Quebec and three Atlantic provinces and to those receiving social (welfare) services

**Dental visiting** Behaviour related to the use of dental services.

**Dentate** Having one or more natural teeth.

**Dentition** The set of teeth. A complete dentition comprises 28 adult teeth with some people having an additional 4 'wisdom' teeth.

**Denture** A removable dental prosthesis that substitutes for missing natural teeth and adjacent tissues.

**Determinant of health** A characteristic that influences the health of people but usually is difficult for the individual to change; for example, air pollution, exposure to lead in paint, or socio-economic status.

**dmft** (lower case letters) An index of dental caries experience measured by counting the number of decayed (d), missing (m), and filled (f) baby (primary or deciduous) teeth (T).

**DMFT** (Upper Case Letters) An index of dental caries experience measured by counting the number of decayed (D), missing (M), and filled (F) adult (or permanent) teeth (T).

**Edentulous** A state of complete loss of all natural teeth.

**Enamel** Hard white mineralised tissue covering the crown of a tooth.

**Epidemiology** The study of the distribution and causes of health and disease in populations.

**Examination** protocol Methods and guidelines for conducting standardized oral examinations conducted in a survey.

**Extraction** Removal of a natural tooth.

**Fluoride** A naturally occurring trace mineral that helps to prevent tooth decay.

**Gingiva** Gum tissue.

**Gingivitis** Redness, swelling or bleeding of the gums caused by inflammation.

**Incisor** One of eight front teeth used during eating for cutting food.

**OA:** See "Attachment loss".

**Mandible** Lower jaw.

**Maxilla** Upper jaw.

**Mean** The arithmetic average of a set of values.

**Natural teeth** Refers to a person's own teeth as opposed to artificial teeth.

**Orofacial pain** Pain located in the face, jaw, temple, in front of the ear or in the ear.

**Periodontal disease** Disease of the gums and other tissues that attach to and anchor teeth to the jaws.

**Periodontal pocket** A space below the gum line that exists between the root of a tooth and the gum surrounding that tooth.

**Periodontal recession** The shrinkage of gum tissue away from the tooth resulting in exposure of dental roots and creating the appearance of longer teeth and increased exposure for root caries to occur.

**Periodontitis** Disease of the gums caused by bacteria, characterised by swelling and bleeding of the gums and

loss of tissue that attaches the tooth to the jaw.

**Permanent teeth** Adult teeth.

**Plaque** A film composed of bacteria and food debris that adheres to the tooth surface.

**Prevalence** The proportion of people with a defined disease within a defined population.

**Probing pocket depth** The measured depth of the periodontal pocket.

**Recorder** A person, who recorded the results of an oral examination onto a computer.

**Response rate** The proportion of people from whom survey information is collected among the total number of people selected as intended study participants.

**Restoration** A filling to repair a tooth damaged by decay or injury.

**Risk factor for health** A characteristic, often a behaviour, that reduces health that can be changed by the individual, for example, smoking, seat-belt use, tooth cleaning, obesity.

**Root** That part of the tooth below the crown which is anchored to the jaw

**Root caries** Dental caries that attacks the surface of the root of a tooth which has become exposed due to periodontal recession.

**Root surface** The surface of the root of a tooth.

**Socioeconomic determinants** Descriptive term for position in society, usually measured by attributes such as income, education.

**Statistical significance** An indication from a statistical test that an observed association is unlikely (usually less than 5% probability) to be due to chance created when a random sample of people is selected from a population.

**Trend** The general direction in which change over time is observed.

**Weights** Numbers applied to groups of study participants to correct for differences in probability of selection and in participation.

**Wisdom tooth** One of four molar teeth, each one positioned at the back of the mouth.



## 9.0 - Appendices

### 9.1 - Appendix 1 Evidence from previous studies

**Table A1.1 - Preschool children's evidence table**

Author & Yr of publication	Location of Survey	Age [n]	Prevalence of caries %	Mean severity count [deflt]
Curzon & Curzon, 1970	7 communities in Keewatin District, NWT	3-5yr [50]		9.85*
McPhail et al., 1972	Keewatin District, NWT	5yr [52]	79	7.92
Mayhall, 1975	Igloolik & Hall Beach, NWT	0-5yr 1969 [186] 1973 [98]		2.85 7.05
Nutrition Canada, 1977	nr	3yr [8] 4-6yr [24]	44.7 72.6	6.1 - all 'd' 4.1 - 3.7 d + 0.3 DMFT
Curzon & Curzon, 1979	12 communities on Baffin Island	3-5 yr [nr]		5.27
Albert et al., 1988	8 communities in Keewatin District, NWT	13-18mo 18-24mo 31-36mo 49-54mo [260 total]	20 55 65 80	
MacDonald & Mac-Millan, 1988	Keewatin District, NWT	5 yr [nr]		10.3 males 11.2 females
Houde et al., 1991	9 communities in Kativik region of Quebec	2-5 yr [244]	72.2	8.91
Gagnon & Lambert, 1994	Dental patients in 2 communities in Ungava	3-5 yr [nr]		8.03 [1986] 10.38 [1991]
Thompson et al. 1994	Keewatin District, NWT	3-5 yr [77]		8.12

nr = not reported

\* = calculated from the data in the publication

Table A1.2 - Children's evidence table

Author, Year of publication	Location of Survey	Age [n]	Prevalence of caries	Mean severity count - dmft or DMFT
McPhail et al., 1972	Keewatin District, NWT	6-7yr [155]	82%	7.25 dmft + 1.47 DMFT
Mayhall, 1975	Igloolik & Hall Beach, NWT	6-10yr 1969 [76] 1973 [139]	nr	4.55 [1969] 7.05 [1973]
Nutrition Canada, 1977**	nr	8-10 [23]	93.5%	1.6 dmft + 2.3 DMFT
Curzon & Curzon, 1979	12 communities on Baffin Island	6-9 yr [590]	nr	6.85 dmft 1.88 DMFT
Messer, 1985	3 communities in Labrador	7yr 1969 [26]  1984 [28]	nr	1969 9.7 dmft + 2.7 DMFT 1984 7.2 dmft + 0.8 DMFT
Gagnon & Lambert, 1994	Dental patients in 2 communities in Ungava, QC	6-11 yr [nr]	nr	2.3-10.7 [1986] 1.0-7.6 [1991]
Leake, 1992	17 communities in NWT 84% of subjects were Inuit	6yr [435]	95%	8.2 dmft + 0.7 DMFT
Thompson et al, 1994	Keewatin District, NWT	6-8yr [68]	nr	9.47
Zammit et al., 1994	2 communities in Labrador	5-8yr [nr]	98%*	9.29 dmft + DMFT
Health Canada, 2000	39 communities in NWT, 68% Inuit	6 yr [598 Tbl 1] 404 Inuit	94% (Tbl 6)	8.4 dmft + 0.4 DMFT (Tbl 7)
		[598 children in NWT Tbl 23]	nr	8.4 dmft + 0.4 DMFT (Tbl 26)
	22 communities from 1992 survey 73% were Inuit	[402 from 1992 communities]	nr	9.0 dmft + 0.36 DMFT
Belanger, 2000	14 communities in Nunavik QC 96 - 98% use Native language	6-8 yr [487]	97.1%	8.06 dmft + 1.45 DMFT
		11-12 yr [264]	100%	2.18 dmft + 5.30 DMFT

nr = not reported

\* = calculated from the data in the publication

\*\* = findings determined by 2 physicians

**Table A1.3 - Adolescent evidence table.**

Author Year of publication	Location of Survey	Age [n]	Prevalence of one or more caries affected teeth	Mean severity count DMFT
McPhail et al., 1972	Keewatin District, NWT	12-13yr [92] 14-15 [40]	nr nr	5.38 5.30
Nutrition Canada, 1977	nr	12-14 [22] 15 [6] 16-18 [15]	68.8% 85.0% 91.5%	4.9 6.5 11.7
Messer, 1985	3 communities in Labrador	12yr 1969 [35] 1984 [36]  15yr 1969 [17] 1984 [37]	nr	6.3 [1969] 4.5 [1984]  [9.0, 1969] [7.7, 1984]
MacDonald & MacMillan 1988	Keewatin District, NWT	13yr  15yr [946 ages 5-13]	nr	12.6 males 12.4 females 13.8 males 16.0 females
Gagnon et al., 1991	Dental patients 7 communities in Ungava	10-14yr [196]	nr	16.7 DMFS
Leake, 1992	17 communities in NWT 83% of subjects were Inuit	12yr [341]	95%	5.2
Gagnon & Lambert, 1994	Dental patients 2 communities in Ungava	12-17yr [nr]	nr	11.9 - 16.7 [1986] 9.2 - 14.6 [1991]
Thompson et al. 1994	Keewatin District, NWT	12-14yr [49]	nr	6.82
Zammit et al., 1994	2 communities in Labrador	12-14yr [nr]	95%*	5.65
Health Canada, 2000	39 communities in NWT 66% Inuit   22 communities from 1992 survey 70% of subjects were Inuit	12 yr [468 Tbl 1] 310 Inuit  [468 children Tbl 23]  [326 from 1992 communities]	86.7 %  nr  nr	3.6  3.6  3.7

nr = not reported

\* = calculated from the data in the publication

**Table A1.4 - Young adult evidence table**

Author & Year of publication	Location & age of subjects [number]	Percent Edentulous	Among Dentate				
			Number of subjects who were dentate	Periodontal indicator	Mean decayed teeth [% of DMFT]	Mean missing teeth [% of DMFT]	Mean DMFT
Mayhall 1975*	Igloolik & Hall Beach 21-40y [151 in 1969] [124 in 1973]	nr					8.72 [1969] 11.2 [1973]
Nutrition Canada, 1977	sites nr;  20-29 [36]  30-39 [42]	0 m 0 f	nr	Obvious pockets or loose teeth 21.3 m 55.0 f	2.2 m 4.0 f	3.7 m 3.1 f	7.1 m 7.9 f
		0 m 8.3 f		72.4 m 41.9 f	4.9 m 4.8 f	6.6 m 10.7 f	12.9 m 16.6 f
Rea et al., 1993 and 1994	Keewatin District 18-34 yr [217, 198 Inuit]]	9.7%: 15.2% female; 3.8% male	196	Mean pocket depth >3mm 0%	D/DF 73%*		20.3 DMFT among dentate

\* = calculated from data in the publication



Table A.1.5 - Adult and Elders Evidence Table

Author [Year]	Location [n & age of subjects]	Percent Edentulous	Among Dentate				
			Number of subjects who were dentate	Periodontal condition	Mean decayed teeth [% of DMFT]	Mean miss- ing teeth [% of DMFT]	Mean DMFT
Mayhall 1975	Igloolik & Hall Beach, NWT [8 >60y]		Males  8 [1969]  7 [1973]				Males  17 [1969]  15 [1973]
Nutrition Canada, 1977	Sites nr			Obvious pockets or loose teeth			
	40-49yr [58]	0 m, 19.1 f	nr	53.3 m 69.2 f	4.3 [39%] 7.8 [51%]	5.7 7.2	10.8 15.3
	50-59yr [37]	13.5 m, 22.6 f		70.5 m 55.7 f	8.6 [61%] 4.1 [28%]	5.6 10.4	14.1 14.9
	60+yr [33]	10.3m, 17.1f		60.5 m 77.2 f	4.2 [29%] 9.3 [45%]	10.2 11.5	14.5 20.8
Galan et al. 1993	Keewatin District [54 > 60y]	35 79% females 21% males	35	49% of subjects had CPITN = 4	2.8 [11%*]	23 [88%*]	26
Rea et al., 1993	Keewatin District			Mean pocket depth > 3mm 2%	D/DF	nr	
	35-54yr [122, 103 Inuit]	30.3% 41.4% f 15.3% m	87		52%*		20.5
	55+ yr [58, 57 Inuit]	43.1% 60.0% f 25.0% m	33	9%	91%*		22.2

nr = not reported

\* = calculated from data in the publication

**Table A1.6 - Oral hygiene and gingivitis evidence table**

Author /Year/ Region	Age Group	% with Debris Scores > 0	% with Calculus Scores > 0	% with Gingivitis Scores > 0
McPhail et al., 1972 Keewatin	6-15 yrs Coastal Inuit* Inland Inuit*	49.5 57.9	6.5 12.2	44.3 46.7
Leake, 1992	12 yrs NWT 83% Inuit	78	22	nr
Galan/1993/ Keewatin	60 + yrs*	100	nr	<33
Rea et al. 1993/94	Keewatin 18-34yr* 35-54yr* 55+ yr*	nr	80 90 100	73 67 88
Leake, 1992	6 yr-olds NWT 12 yr-olds NWT	67 78	3* 22*	55* 56*
Health Canada, 2000	6 yr-olds NWT 12 yr-olds NWT	nr nr	2.5* 17.4*	52.5* 66.9*

nr = not reported

\* calculated from the data provided in the publication

## 9.2 - Appendix 2 Comparison of IOHS findings to other surveys

**Table A2.1 Comparison of indigenous and dominant cultures**

Author, Year Country, Sample	Age (number of subjects)	Prevalence of condition	Mean Severity Count									
Health Canada, 2010, Canada Inuit OHM-CHMS	6-11 yrs (190) (1070)	dmft > 0  71.4% 47.8%	5.08 dmft 1.99 dmft									
Jamieson et al 2007 Australia Indigenous Non Indigenous	4-10 yrs (10 517) (317 525)	dmft > 0  62.5% 37.2%	2.86 dmft 1.40 dmft									
Endean et al., 2004, SW Australia Aboriginal children Australian children	5-6yrs 5-6yrs	nr nr	3.20 dmft 1.44 dmft									
Davies et al. 1997, Northern Territory Australia Aboriginal Non Aboriginal Overseas born	12 yrs (407) (696) (82)	% with DMFT > 0 (% with DMFT > 3)  57.0 (25.9) 60.3 (12.4) 54.9 ( 6.2)	Reported in graphs: Aboriginal children higher than non-Aboriginal									
Jones et al. 1992, Alaska Native Non-native	3-5 yrs (381) (163)	dmft > 0  80.5 46.8	4.88 dmft 1.65 dmft									
IHS, 2002 Native Alaskans	15-19 yrs (216)	88.5	6.63 DMFT									
USDHHS, 2007	16-19 yrs (3545)	67.5	3.31 DMFT									
Government of New Zealand 2010	5 yrs (nr)	Caries prevalence (%) at age 5 <table><tr><td></td><td>Maori</td><td>non-Maori</td></tr><tr><td>Fluoridated</td><td>60</td><td>36.3</td></tr><tr><td>No Fluoride</td><td>68</td><td>37.8</td></tr></table>			Maori	non-Maori	Fluoridated	60	36.3	No Fluoride	68	37.8
	Maori	non-Maori										
Fluoridated	60	36.3										
No Fluoride	68	37.8										

**Table A2.2 Comparison of Canadian Inuit with Alaskan Native dental patients**

Age group and index	Canadian Inuit	Alaska Native Patients
Preschool children 3-5yr		
Percent with caries	85.3	79.7
Mean dmft	8.22	5.77
d/dmft	49.4%	65.3%
Adolescents 12-19yr Can; 15-19 Alaska		
Percent with caries	96.7	91.1
Mean DMFT	9.49	6.64
D/DMFT	38.1%	47.3%
Young adults 20-39yr Can; 35-44yr Alaska		
Per cent edentulous	< 3 %	2.4
Among Dentate Mean DMFT	15.1	16.6
Percent with CPITN > 4	1.9	11.1
Percent with loss of attachment > 4mm Can; > 5mm Alaska	~ 5	37.4

### 9.3 - Appendix 3 Dentist Examiners and Coordinators

#### IOHS Dentist Examiners

Dr. Harry Ames (2 sites)  
Dr. Robert Bowes (1 site)  
Dr. Gregory Jones (2 sites)  
Dr. Hal Leitch (1 site)  
Dr. Barry Maze (1 site)  
Dr. Mary McNally (2 sites)  
Dr. Steve Patterson (1 site)  
Dr. James Rogers (2 sites)

#### IOHS Site Coordinators

Mei Chow (1 site)  
Lisette Dufour (3 sites)  
Valerie Malazdrewicz (2 sites)  
Amanda Williams (1 site)

### 9.4 - Appendix 4 Variable definitions; selected characteristics

#### Sex: Male vs Female

Age group: grouped according to the CHMS sampling plan: 3-5, 6-11, 12-19, 20-39, 40 and up. Age was measured at both the interview questionnaire and the clinic visit. For this report, age was defined based on the clinic visit except for individuals who turned 80 years old between their household interview and their clinic visit.

Visiting a dental professional in the past year:

Visited in past year

- Answered 1 (less than 1 year ago) to question on when the last time they saw a dental professional (OHM\_Q34)

More than one year ago

- Answered 2-6 on OHM\_Q34

Dentate status: Dentate versus edentulous

Dentate

- Dental status of respondent of 1-3 on OHE\_N11 (dentate-both arches, upper arch only and lower arch only)

Edentulous

- Dental status of respondent of 4-5 on OHE\_N11 (edentulous with one or more implants and edentulous)

#### TABLES (GENERAL):

- Frequencies always defined according to response
- Those with missing values (don't know, refusal, not applicable) set to missing (so not included in proportions)
- Tables for 3-5, 6-11 and 12-19-year-olds – no need to specify dentate only because none were edentulous

#### TABLES (SPECIFIC):

##### TABLE 1

- Bootstrapped frequencies of demographic variables

##### TABLE 2

- Prevalence of self reported fair or poor oral health: (respondents who answered 4 (fair) or 5 (poor) response to OHM\_Q11 – self-reported health of mouth)

##### TABLE 3

- Prevalence of persons reporting avoiding foods: (respondents who answered 1 (often) or 2 (sometimes) to OHM\_Q22 – how often have you avoided eating particular foods because of mouth problems)

##### TABLE 4

- Prevalence of persons reporting persistent pain: (respondents who answered 1 (often) or 2 (sometimes) to OHM\_Q23 – how often have you had any other persistent or ongoing pain anywhere in your mouth)

##### TABLE 5

- Prevalence of persons reporting time lost from normal activities work or school: (respondents who answered 1 (yes) to OHM\_Q24 – have you taken time away from work or school for dental check-ups etc)

##### TABLE 6

- Percent of persons reporting having visited within the last year (for any reason): (respondents who answered 1 (less than 1 year ago) to question on when the last time they saw a dental professional (OHM\_Q34))

##### TABLE 7

- Percent of persons reporting visiting at least once per year for check-ups or treatment: (respondents who answered 1 (more than once per year) or 2 (about once a year) to question on how often they usually see a dental professional (OHM\_Q33))



**TABLE 8**

- Percent of persons brushing 2 or more times per day: (based on OHM\_Q31 and OHM\_N31; respondents who answered 2+ on how often they usually brush their teeth and 1 (per day) for reporting period OR respondents who answered 14+ on how often they usually brush their teeth and 2 (per week) for reporting period)
- Dentate only

**TABLE 9**

- Percent of persons flossing at least 5 times per week: (based on OHM\_Q32 and OHM\_N32; respondents who answered 1+ on how often they usually floss their teeth and 1 (per day) for reporting period OR respondents who answered 5+ on how often they usually floss their teeth and 2 (per week) for reporting period; respondents with a 6 (full set of dentures) were considered missing/N/As)
- Dentate only

**TABLE 10**

- Ages 3-5
- Prevalence and severity of dental caries in primary teeth: (based on OHE\_N41 codes for primary teeth: 51-55, 61-65, 71-75, 81-85)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17
- dmft – sum of teeth with codes listed above

**TABLE 11**

- Ages 6-11
- Prevalence and severity of dental caries in primary teeth: (based on OHE\_N41 codes for primary teeth: 51-55, 61-65, 71-75, 81-85)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17
- dmft – sum of teeth with codes listed above

**TABLE 12**

- Ages 6-11
- Prevalence and severity of dental caries in permanent teeth: (based on OHE\_N41 codes for adult crowns: 11-17, 21-27, 31-37, 41-47)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17
- DMFT – sum of teeth with codes listed above

**TABLE 13**

- Ages 6-11
- Prevalence and severity of dental caries in primary and permanent teeth: (based on OHE\_N41 codes for baby teeth and adult crowns: 51-55, 61-65, 71-75, 81-85, 11-17, 21-27, 31-37, 41-47)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17; – summed those from tables 1 and 2
- DMFT – sum of teeth with codes listed above

**TABLE 14**

- Ages 12-19
- Prevalence and severity of dental caries in permanent teeth: (based on OHE\_N41 codes for adult crowns: 11-17, 21-27, 31-37, 41-47)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17
- DMFT – sum of teeth with codes listed above
- Same as Table 12 but different age group

**TABLE 15**

- Ages 20+
- Column for percent edentulous includes those classified as edentulous with one or more implants (OHE\_N11=4+5)
- Dentate only columns include subjects with OHE\_N11=1-3
- Number of teeth calculated based on OHE\_N41 codes for adult crowns; (teeth 11-17, 21-27, 31-37, 41-47) codes=1, 2, 7-10, 12-18, 20, 21

**TABLE 16**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Prevalence and severity of dental caries in permanent teeth: (based on OHE\_N41 codes for adult crowns: 11-17, 21-27, 31-37, 41-47)
- Decayed: codes 7-10; Missing: codes 5+19; Filled: codes 12-17
- DMFT – sum of teeth with codes listed above
- Same as Tables 15 & 21 but different age group

**TABLE 17**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Percent of DMFT: (based on OHE\_N41 codes for adult crowns)
- Proportion of DT/DMFT etc calculated as a ratio of weighted sums
- Teeth summed from previous table
- Similar to Table 18 but different age group



**TABLE 18**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Prevalence of untreated decay: (based on OHE\_N41 codes for adult crowns and roots: 11-17, 21-27, 31-37, 41-47)
- Untreated coronal caries: codes 7-10; Untreated root caries: codes 7+11

**TABLE 19**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Prevalence and severity of root caries: (based on OHE\_N41 codes for adult roots: 11-17, 21-27, 31-37, 41-47)
- RDF: codes 7, 11-17; Root decayed: codes 7+11; Root filled: codes 12-17

**TABLE 20**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Debris: (based on OHE\_32D1-D6; responses subtract 1 for a scale of 0-4; those with code 5 were teeth missing so set to missing)
- Calculus: (based on OHE\_32C1-C6; responses subtract 1 for a scale of 0-4; those with code 5 (in debris) were teeth missing so set to missing)
- Took highest score at any site

**TABLE 21**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Gingivitis: (based on OHE\_31D1-D6; responses subtract 1 for a scale of 0-4; those with code 5 were teeth missing so set to missing)
- Took highest score at any site

**TABLE 22**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Periodontal pockets: (based on OHE\_32P1-P6)
- Took highest score at any site

**TABLE 23**

- Dentate only (OHE\_N11=1-3); Ages 20+
- Attachment loss: (based on OHE\_32R1-R6)
- Took highest score at any site

**TABLE 24**

- Dentate only (OHE\_N11=1-3); Ages 20+
- CPITN score: (based on OHE\_32 responses)
- Took highest scores at any site
- CPITN=4: those with probing scores > 5mm
- CPITN=3: those with probing scores 4-5mm
- CPITN=2: those with calculus scores > 0 (after subtracting 1 from the score)
- CPITN=1: those with gingivitis scores > 0 (after subtracting 1 from the score)
- Mutually exclusive

**TABLE 25**

- Dentate only (OHE\_N11=1-3);
- Prevalence of requiring a need
- Urgent: based on yes to OHE\_N61-OHE\_N68
- Surgery: OHE\_N53=5
- Endodontics: OHE\_N53=8;
- Restorations: OHE\_N53=3;
- Prosthodontics: OHE\_N51=2-6 or OHE\_N52=2-6;
- Periodontics: OHE\_N53=6;
- Orthodontics: OHE\_N53=9;
- Miscellaneous: OHE\_N53=4, 7, 10, 11;
- No treatment needed: OHE\_N53=1;
- Mutually exclusive
- 10.0 - Detailed Tables

Table 1 : sample size

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	n	wtd n	%	n	wtd n	%	n	wtd n	%	n	wtd n	%	n	wtd n	%	n	wtd n	%
All	146	1,066	4.6%	190	3,012	13.0%	171	4,686	20.2%	443	8,191	35.4%	266	6,215	26.8%	1,216	23,170	100.0%
Male	72	518	48.6%	95	1,431	47.5%	73	1,778	37.9%	159	3,102	37.9%	112	2,766	44.5%	511	9,594	41.4%
Female	74	549	51.4%	95	1,581	52.5%	98	2,908	62.1%	284	5,089	62.1%	154	3,449	55.5%	705	13,576	58.6%
Visited a dental professional in the last year	67	503	47.7%	114	1,714	58.0%	94	2,487	55.8%	251	4,530	56.4%	96	2,039	33.2%	622	11,272	49.8%
Visited a dental professional more than a year ago	78	552	52.3%	73	1,241	42.0%	71	1,973	44.2%	186	3,502	43.6%	168	4,110	66.8%	576	11,378	50.2%
Dentate	146	1,066	100.0%	190	3,012	100.0%	171	4,686	100.0%	439	8,117	99.1%	208	4,893	78.7%	1,154	21,775	94.0%
Edentulous	0	0	0.0%	0	0	0.0%	0	0	0.0%	4	73	0.9%	58	1,321	21.3%	62	1,395	6.0%

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 2 : Prevalence of self reported fair or poor oral health because of problems with their oral health

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	34.2	E 9.3	59.1			F	29.3	16.2	42.4	40.7	E 13.1	68.4	38.6	29.4	47.7	34.7	21.9	47.5
Male	35.2	E 0.6	69.9			F				46.0	E 9.6	82.5	43.4	E 19.1	67.8	36.2	24.8	47.5
Female		F				F	33.7	E 11.3	56.1	37.4	E 11.3	63.5	34.7	E 16.2	53.1	33.6	18.4	48.9
Visited a dental professional in the last year		F				F				33.4	E 4.7	62.1	43.0	E 6.8	79.2	32.1	E 5.8	58.4
Visited a dental professional more than a year ago		F				F				50.2	E 3.3	97.1	36.4	E 24.2	48.5	37.2	13.2	61.3
Dentate	34.2	E 9.3	59.1			F	29.3	16.2	42.4	41.0	E 13.1	69.0	41.7	30.4	53.0	35.2	21.3	49.2
Edentulous		Not applicable			Not applicable			Not applicable			F			F			F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 3 : Prevalence of persons reporting avoiding foods because of problems with their mouth

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	23.5	E 0.0	48.4	F			36.3	E 3.5	69.1	28.8	16.4	41.3	35.6	24.8	46.5	30.3	E 14.0	46.6
Male		F		F				F		25.8	E 0.0	51.7	34.3	14.2	54.3	24.5	E 8.2	40.8
Female		F		F			48.7	E 4.1	93.4	30.7	19.3	42.2	36.7	17.2	56.2	34.4	16.8	52.0
Visited a dental professional in the last year		F		F				F		28.0	E 8.5	47.4		F		28.3	E 4.9	51.7
Visited a dental professional more than a year ago		F		F				F			F			F		32.3	E 0.2	64.3
Dentate	23.5	E 0.0	48.4	F			36.3	E 3.5	69.1	29.0	16.4	41.6	35.8	22.1	49.5	30.1	E 13.3	46.8
Edentulous		Not applicable		Not applicable			Not applicable				F		34.9	E 0.0	70.2		F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 4 : Prevalence of persons reporting persistent pain or ongoing pain anywhere in their mouth

Characteristic	Children 3 to 5 years				Children 6 to 11 years				Adolescents 12 to 19 years				Young Adults 20 to 39 years				Adults 40 years +				Ages 3 years +			
	%	Percentage	Low	High	95% CI	%	Percentage	Low	High	95% CI	%	Percentage	Low	High	95% CI	%	Percentage	Low	High	95% CI	%	Percentage	Low	High
All	28.4	E	5.8	51.0		16.5	E	0.0	33.4		34.2	E	11.4	57.0		32.7	E	13.7	51.6		29.5		21.5	37.6
Male		F										F				33.3	E	3.9	62.6		27.6		9.7	45.4
Female		F									45.8	E	8.5	83.1		32.3	E	14.3	50.3		31.1		13.5	48.6
Visited a dental professional in the last year		F										F				32.3	E	10.3	54.3				F	
Visited a dental professional more than a year ago		F									41.1	E	0.3	81.8							28.1		14.6	41.6
Dentate	28.4	E	5.8	51.0		16.5	E	0.0	33.4		34.2	E	11.4	57.0		32.9	E	13.9	52.0		32.5		20.1	44.9
Edentulous		Not applicable					Not applicable				Not applicable							F					F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 5 : Prevalence of persons reporting time lost from normal activities, work or school activities in the past 12 months

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	17.0	E 0.0	34.8	29.0	14.6	43.3	30.4	E 3.8	57.1	24.0	E 5.8	42.2	12.4	5.9	18.9	22.5	E 10.4	34.5
Male		F		27.8	E 6.7	48.9		F		23.2	E 3.3	43.1		F		20.1	E 8.9	31.3
Female		F		30.1	E 9.4	50.7	32.6	E 2.0	63.3	24.5	E 1.2	47.9	14.3	E 0.8	27.9	24.1	E 8.0	40.2
Visited a dental professional in the last year		F			F			F		28.5	E 2.3	54.7		F		31.8	E 2.7	61.0
Visited a dental professional more than a year ago		F			F			F						F				
Dentate	17.0	E 0.0	34.8	29.0	14.6	43.3	30.4	E 3.8	57.1	24.2	E 5.8	42.7	14.3	7.0	21.7	23.6	11.3	35.9
Edentulous		Not Applicable		Not Applicable	Not Applicable			Not Applicable			F			F			F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided



Table 6 : Percent of persons reporting having visited a dental professional within the last year for any reason

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	47.7	E	5.8	58.0	E	23.2	55.8	E	22.8	56.4	32.0	80.8	33.2	E	13.2	49.8	27.5	72.1
Male	45.9	E	0.0	60.3	E	18.9		F		62.4	E	98.4	31.3	E	1.1	45.0	20.3	69.6
Female		F		55.9	E	19.2	58.5		30.8	60.5	E	94.5	34.7	E	12.3	53.2	31.2	75.1
Dentate	47.7	E	5.8	58.0	E	23.2	55.8	E	22.8	56.9	32.0	81.9	39.3	E	15.8	52.4	28.7	76.0
Edentulous		Not Applicable		Not Applicable		Not Applicable		Not Applicable			F			F			F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 7 : Percent of persons reporting usually visiting at least once per year for check-ups or treatment

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	53.3	E 16.3	90.3	67.9	47.5	88.3	69.4	43.4	95.5	58.6	38.5	78.8	38.3	20.0	56.5	56.2	38.4	73.9
Male	48.3	E 2.1	94.4	62.4	34.4	90.5	81.8	50.1	100.0	49.7	29.2	70.2	37.0	E 15.1	58.9	53.3	41.8	64.9
Female	58.0	E 1.0	100.0	73.0	51.1	95.0	62.5	E 27.3	97.8	64.3	32.1	96.5	39.2	E 9.1	69.3	58.2	34.2	82.2
Visited a dental professional in the last year	87.5		43.6	100.0	54.5	100.0	78.9	E 32.9	100.0	72.1		99.6	68.8	E 28.4	109.3	75.8	45.1	100.0
Visited a dental professional more than a year ago	22.2	E 5.1	39.4		F		57.5	E 12.6	100.0	41.3	E 5.3	77.3	23.1	E 7.3	38.9	36.8	15.4	58.2
Dentate	53.3	E 16.3	90.3	67.9	47.5	88.3	69.4	43.4	95.5	58.8	38.4	79.2	44.2	25.1	63.3	58.7	40.6	76.8
Edentulous		Not applicable		Not applicable			Not applicable			F				F			F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 8 : Percent of dentate persons brushing 2 or more times per day

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	40.9	E 14.7	67.2	51.7	27.3	76.1	48.9	E 22.6	75.1	43.6	34.9	52.3	26.5	E 7.9	45.1	41.8	36.1	47.5
Male		F			F		51.4	E 0.0	100.0	29.6	E 1.5	57.7		F		31.7	18.3	45.2
Female	53.8	E 5.4	100.0	60.1	45.2	75.0	47.4	E 19.0	75.9	52.4	40.5	64.3	36.8	E 3.4	70.2	49.1	42.8	55.4
Visited a dental professional in the last year		F		58.3	E 18.2	98.5	56.8	E 1.2	100.0	51.7	27.0	76.5		F		52.2	23.1	81.3
Visited a dental professional more than a year ago		F			F			F			F			F		31.2	4.3	59.1

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 9 : Percent of dentate persons flossing at least 5 times per week

Characteristic	Children 3 to 5 years			Children 6 to 11 years			Adolescents 12 to 19 years			Young Adults 20 to 39 years			Adults 40 years +			Ages 3 years +		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All				25.1		E	31.0		E	41.0			45.5			36.3		
Male			F			F				30.8		E	40.8		E	29.0		
Female			F	30.0		E	35.7		E	47.2			49.8			41.7		
Visited a dental professional in the last year			F			F			F	45.6		E	51.2		E	42.0		
Visited a dental professional more than a year ago			F			F			F			F	41.8		E	30.4		
																	6.0	
																	54.9	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 10 : Prevalence and severity of dental caries in primary teeth - ages 3 to 5

Characteristic	Prevalence			Mean number of primary teeth											
	percent with dmft>0			decayed				missing				filled			
	%		95% CI	mean		95% CI		mean		95% CI		mean		95% CI	
All	85.3		63.1	4.06	E	1.03	7.08	1.83	E	0.79	2.87	2.33	E	0.33	4.34
Male	87.1		58.4	4.30	E	0.84	7.76	1.58	E	0.71	2.45		F		
Female	83.6		44.6	3.83	E	0.00	7.76	2.07	E	0.51	3.62	2.96	E	0.54	5.39
Visited a dental professional in the last year	87.7	E	39.0		F				F				F		
Visited a dental professional more than a year ago	83.2	E	55.8		F			1.57	E	0.53	2.60		F		
												7.74	E	2.12	13.37

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 11 : Prevalence and severity of dental caries in primary teeth - ages 6 to 11

Characteristic	Prevalence		Mean number of primary teeth											
			decayed				missing				filled			
	%	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI
All	71.4	57.4 85.4	0.99	0.00 2.00	1.48	0.30 2.65	2.61	0.37 4.85	5.08	2.86 7.29				
Male	83.7	63.0 100.0			1.74	0.65 2.84	2.91	0.29 5.53	5.90	3.76 8.03				
Female	60.2	32.5 88.0					2.33	0.24 4.43	4.33	1.58 7.09				
Visited a dental professional in the last year	75.1	37.6 100.0	1.19	0.04 2.33	1.26	0.53 2.00			4.62	2.75 6.48				
Visited a dental professional more than a year ago	66.6	E 29.4 100.0									F			

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided



Table 12 : Prevalence and severity of dental caries in permanent teeth - ages 6 to 11

Characteristic	Prevalence			Mean number of permanent teeth																	
	percent with DMFT>0			Decayed			Missing			Filled			Decayed, Missing & Filled								
	%		95% CI	mean		95% CI	mean		95% CI	mean		95% CI	mean		95% CI						
All	59.6	E	24.7	94.4	1.28	F				0.19	E	0.09	0.29	0.53	E	0.09	0.98	2.01	E	0.45	3.56
Male	56.9	E	24.3	89.6		F					F					F				F	
Female	62.0	E	15.6	100.0		F					F			0.60	E	0.13	1.07	2.35	E	0.11	4.59
Visited a dental professional in the last year	53.1	E	11.8	94.5	0.71	E	0.12	1.31	0.21	0.37	E	0.06			F			1.45	E	0.34	2.56
Visited a dental professional more than a year ago		F				F					F					F			F		

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided





Table 15 : Tooth loss and edentulism - adults

Characteristic	Percent Edentulous		% with 28 teeth		% with fewer than 21 teeth		Mean # of teeth present	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI
All	9.7	4.6	8.7	1.6	38.5	30.6	20.2	18.7
Male	7.6	0.0			32.0	13.4	21.1	16.1
Female	11.1	3.5	6.7	1.5	43.1	31.0	19.6	15.3
Age 20-39			12.9	1.1	20.1	10.9	22.9	22.1
Age 40 +	21.3	11.9			69.0	57.0	15.8	12.9
Visited a dental professional in the last year					32.3	6.4	21.5	12.4
Visited a dental professional more than a year ago	16.0	1.0			44.5	19.1	18.9	9.7

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 16 : Prevalence and severity of coronal caries - dentate adults

Characteristic	Prevalence		Mean number of permanent teeth											
	with DMFT >0		Decayed				Missing				Filled			
	%	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI	mean	95% CI
All	99.4	97.6	100.0	2.28	E	0.95	3.60	7.43	6.75	8.10	7.07	5.14	9.00	16.77
Male	99.2	95.9	100.0	2.96		1.84	4.08	6.62	4.29	8.94	5.84	4.76	6.92	15.42
Female	99.6	97.7	100.0	1.79	E	0.01	3.56	8.00	7.08	8.92	7.94	4.82	11.07	17.73
Age 20-39	99.1	96.4	100.0	2.52	E	0.98	4.06	4.66	3.70	5.62	7.94	5.50	10.38	15.12
Age 40 +	100.0	100.0	100.0	1.87	E	0.62	3.12	12.01	10.43	13.60	5.62	3.94	7.30	19.50
Visited a dental professional in the last year	99.5	94.9	100.0	1.64		1.08	2.19	6.07	E	2.85	8.85	E	3.68	14.02
Visited a dental professional more than a year ago	99.3	93.9	100.0	2.90	E	0.34	5.46	8.57	5.79	11.70	5.32	3.70	6.94	16.97
														11.04
														22.90

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 17 : Percent of DMF teeth that are decayed, missing or filled - dentate adults

Characteristic	Permanent teeth									
	DT/DMFT					FT/DMFT				
	%		95% CI	%		95% CI	%		95% CI	
All	13.6	E	4.6	22.6	42.2	29.9	54.4	44.3	36.9	51.6
Male	19.2		9.4	29.0	37.9	25.5	50.3	42.9	27.5	58.3
Female	10.1	E	0.0	20.7	44.8	27.9	61.7	45.1	36.3	53.9
Age 20-39	16.7	E	4.9	28.5	52.5	35.4	69.6	30.8	21.1	40.5
Age 40 +	9.6	E	2.1	17.1	28.8	18.7	38.9	61.6	53.0	70.2
Visited a dental professional in the last year		F			53.5	E	19.6	87.3	36.7	7.0
Visited a dental professional more than a year ago		F			31.4	E	12.5	50.1	51.5	30.1
										73.0

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

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Table 18 : Prevalence of untreated decay - dentate adults

Characteristic	Untreated coronal caries				Untreated root caries			
	percent with 1 or more		Mean number of untreated-teeth among those with $\geq 1$		percent with 1 or more		number of untreated teeth among those with $\geq 1$	
	%	95% CI	%	95% CI	%	95% CI	mean	95% CI
All	59.0	32.2 85.8	3.86	1.61 6.11	33.4	14.9 51.9	4.53	1.12 7.94
Male	69.2	46.3 92.1	4.28	2.65 5.91	41.6	19.8 63.4	5.46	1.21 9.70
Female	51.7	19.8 83.7	3.45	0.01 6.89	27.6	7.9 47.2	3.46	0.00 7.51
Age 20-39	61.5	36.7 86.3	4.10	1.59 6.60	29.5	9.6 49.4	4.32	1.17 7.47
Age 40 +	54.8	21.8 87.9	3.41	1.12 5.70	39.9	17.9 61.9	4.80	0.70 8.90
Visited a dental professional in the last year	52.4	23.1 81.7	3.12	2.04 4.20	F		3.14	0.00 7.04
Visited a dental professional more than a year ago	65.5	22.4 100.0	4.43	0.52 8.34	E	12.5 70.4	5.31	0.51 10.08

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

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Table 19 : Prevalence and severity of root caries - dentate adults

Characteristic	Percent with 1 or more root decayed or filled teeth			Root decayed teeth			Root filled teeth			Root decayed or filled teeth					
	%		95% CI	mean		95% CI	mean		95% CI	mean		95% CI			
All	44.3		22.2	66.4	1.09	E 0.34	1.83	0.43		0.26	0.61	1.52		0.75	2.29
Male	49.9		24.3	75.5	1.64	E 0.51	2.77		F			1.95	E	0.54	3.35
Female	40.2	E	16.6	63.9	0.69	E 0.00	1.41	0.52		0.30	0.75	1.21		0.61	1.82
Age 20-39	39.2	E	10.7	67.6	0.93	E 0.32	1.55	0.41	E	0.15	0.67	1.34	E	0.59	2.10
Age 40 +	52.8		33.8	71.8	1.34	E 0.28	2.39	0.47	E	0.16	0.78	1.81		0.92	2.70
Visited a dental professional in the last year	40.3	E	4.1	76.5	0.58	E 0.00	1.17	0.61	E	0.18	1.04	1.19	E	0.22	2.16
Visited a dental professional more than a year ago	48.1	E	17.3	79.0	1.58	E 0.32	2.84	0.26	E	0.13	0.39	1.84	E	0.62	3.06

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

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Table 20: Percent of participants by highest score for debris and calculus by highest score - dentate adults

Characteristic	Debris Score												Calculus score															
	0				1				2				3				0				1				2+3			
	%		95% CI		%		95% CI		%		95% CI		%		95% CI		%		95% CI		%		95% CI		%		95% CI	
All	13.8	E	5.7	21.8	59.6		50.2	69.0	21.4		11.3	31.4					42.2		27.0	57.4	37.9	E	16.0	59.9	19.9		10.5	29.3
Male		F			57.7		37.2	78.3	27.9		13.9	42.0		F			32.0		5.1	58.8	43.2	E	16.8	69.6	24.8	E	3.3	46.3
Female	19.1	E	7.1	31.1	61.0		48.5	73.6	16.7	E	4.3	29.0		F			49.6		36.2	63.1	34.1	E	11.4	56.7	16.3	E	7.5	25.1
Age 20-39	15.0		9.1	21.0	62.1		50.5	73.6	19.3		14.3	24.4		F			48.7		38.1	59.4	36.1		21.3	50.9	15.1		9.7	20.6
Age 40 +	11.7	E	0.0	24.0	55.5		39.4	71.6	24.9	E	1.8	48.0		F			31.1	E	6.2	55.9	41.0	E	6.2	75.7	28.0	E	10.0	45.9
Visited a dental professional in the last year		F			64.6		38.3	91.0		F				F			46.3	E	3.0	89.6	0.0	F	0.0	78.1	18.3	E	0.0	37.2
Visited a dental professional more than a year ago		F			54.5	E	21.0	88.0	26.0	E	0.0	53.5		F			38.0	E	1.8	74.3	40.5		12.4	68.7		F		

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

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Table 21: Percent of participants by highest score for gingivitis - dentate adults

Characteristic	Gingivitis									
	0					1				
	%		95% CI	%		%	95% CI	%		95% CI
All	28.0	E	8.7	47.4	41.4		29.6	53.2	30.6	E
Male		F			43.7		29.0	58.4	39.2	E
Female	35.9	E	14.3	57.4	39.7		21.4	57.9	24.4	E
Age 20-39	29.8	E	9.1	50.6	39.1		25.2	52.9	31.1	E
Age 40 +	25.0	E	6.8	43.2	45.3		29.3	61.3	29.8	E
Visited a dental professional in the last year		F			43.4	E	12.0	74.8	24.7	E
Visited a dental professional more than a year ago	24.9	E	0.0	48.6	39.3		10.2	68.4	36.2	E
									0.0	
									76.0	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 22: Prevalence and severity of periodontal pockets by highest score - dentate adults

Characteristic	0-1 mm			2 mm			3 mm			4 mm			5 mm			≥ 6 mm			0-3 mm			≥ 4 mm		
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI	
All	9.7	E 1.5	17.8	35.7	20.7	50.7	38.2	28.5	47.9	7.5	E 1.6	13.4	5.1	F 0.0	11.4	3.9	E 0.0	7.8	83.5	72.4	94.6	16.5	8.3	24.7
Male		F		26.1	E 9.8	42.4	49.7	31.3	68.1		F			F			F		77.9	63.0	92.9	22.1	E 5.7	38.4
Female	15.1	E 2.2	28.1	42.6	25.8	59.5	29.8	17.6	42.0		F			F			F		87.6	74.4	100.0	12.4	E 2.9	22.0
Age 20-39		F		36.5	18.3	54.7	40.4	27.9	53.0	7.5	E 2.8	12.1	4.0	E 0.0	8.3		F		85.9	76.6	95.2	14.1	7.1	21.1
Age 40 +	10.9	E 2.8	19.0	34.2	20.2	48.2	34.2	E 14.6	53.7		F			F			F		79.2	59.7	98.7	20.8	E 5.2	36.4
Visited a dental professional in the last year		F		40.2	E 7.4	73.0	35.3	E 10.8	59.8		F			F			F		84.1	57.7	100.0		F	
Visited a dental professional more than a year ago		F		31.0	E 5.5	56.6	41.2	E 11.3	71.0		F			F			F		82.9	56.3	100.0		F	

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 23: Prevalence and severity of attachment loss by highest score - dentate adults

Characteristic	0-1 mm		2 mm		3 mm		4 mm		5 mm		≥ 6 mm		0-3 mm		≥ 4 mm	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
All	35.3	E 9.8	60.8	25.6		14.3	36.8	22.1	E 7.4	36.8			68.7	97.2	17.0	E 1.1 32.9
Male	29.1	E 0.0	59.7	20.6	E 8.9	32.4	25.3	E 3.2	47.5				52.8	97.3		F
Female	39.8	E 15.2	64.4	29.2	E 9.7	48.6	19.7	E 5.9	33.6				74.9	102.5	11.3	E 0.1 22.5
Age 20-39	47.4	E 13.2	81.6	26.3		13.8	38.9		F				88.8	100.4		F
Age 40 +	13.6	E 0.0	27.5	24.1	E 0.0	49.7	24.3	E 8.6	40.0				30.6	93.5	38.0	E 4.0 71.9
Visited a dental professional in the last year		F			F		23.0	E 0.2	45.7				58.7	115.0		F
Visited a dental professional more than a year ago	28.4	E 3.5	53.3	32.8	E 12.8	52.8	21.2	E 0.0	49.3				51.2	100.0		F

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 24: Prevalence of periodontal conditions according to CPTN score - dentate adults

Characteristic	Healthy			Gingivitis			Calculus			Pockets 4-5 mm			Pockets > 5mm							
	%	95% CI		%	95% CI		%	95% CI		%	95% CI		%	95% CI						
All	20.1	E	6.0	34.1	19.0	E	2.5	35.5	44.5	E	20.9	68.0	12.6	E	5.5	19.6	3.9	E	0.0	7.8
Male		F				F			49.8	E	19.7	79.8	16.9	E	4.1	29.7		F		
Female	29.4	E	12.4	46.4	18.2	E	3.0	33.5	40.6	E	18.1	63.2	8.5	E	0.6	16.3		F		
Age 20-39	25.2	E	9.7	40.7	21.2	E	0.0	42.9	40.5		23.4	57.7	11.2	E	4.7	17.6	1.9	E	0.0	3.9
Age 40 +	14.6	E	0.0	29.3	15.3	E	0.5	30.1	51.1	E	16.6	85.6	13.3	E	1.9	24.7		F		
Visited a dental professional in the last year		F				F			42.4	E	0.0	87.1		F				F		
Visited a dental professional more than a year ago		F				F			46.6	E	16.8	76.3		F				F		

E Interpret with caution (high sampling variability; coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided

Table 25 : Percent of individuals by type of treatment need - dentate ages 3 year +

Characteristic	Surgery		Endodontics		Restorations		Prosthodontics		Periodontics		Orthodontics		Miscellaneous		No treatment needed	
	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
All	22.9	E 1.8 53.1	2.0	E 0.0 4.3	39.3	27.3 51.2	5.7	E 0.1 11.2	F		F		F		27.4	E 1.8 53.1
Male	26.0	E 7.1 44.8	1.9	F 0.0 4.8	39.5	22.7 56.2		F	F		F				23.0	E 0.0 46.8
Female		F	2.1	F 0.0 4.7	39.1	29.0 49.2	5.1	E 0.5 9.8	F		F		F		30.7	E 1.9 59.4
Age 3-5		F	0.0	0.0	39.6	E 18.3 61.0	0.0	0.0	F				F		41.5	E 0.0 84.7
Age 6-11	11.5	E 0.0 23.2	0.6	F 0.0 2.6	38.6	E 5.1 72.1	0.0	0.0			F				47.5	E 0.0 97.4
Age 12-19		F	4.3	F 0.0 13.5	38.7	29.0 48.3	0.0	0.0	F		F					F
Age 20-39	25.2	E 2.9 47.5	2.5	E 0.4 4.5	43.3	35.3 51.2		F	F		F		F		22.1	E 8.1 36.1
Age 40 +	24.3	E 3.6 45.1	0.4	F 0.0 1.5	33.6	E 13.4 53.8	18.2	E 5.6 30.8	F				F		19.2	E 0.0 39.2
Visited a dental professional in the last year		F		F	39.8	E 13.5 66.1		F	F		F		F			F
Visited a dental professional more than a year ago		F		F	37.1	E 8.5 65.6		F	F		F					F

E Interpret with caution (high sampling variability, coefficient of variation 16.6% to 33.3%)

F Estimate not provided because of extreme sampling variability or small sample size

On rare occasions a value is provided without a confidence interval as it could be calculated from other data provided