

Oral disorders, systemic health, well-being and the quality of life

A summary of recent research evidence

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“Oral health is integral to general health...you cannot be healthy without oral health”¹

**Donna E. Shalala
U.S. Secretary of Health and Human Services**

Summary

Recent research evidence suggests that common oral disorders can have a significant impact on systemic health and the quality of life. They affect the well-being of individuals and society as a whole.

Dental decay in childhood

- Dental decay is a disease caused by a bacterial infection. It is one of the most common disorders of childhood affecting 60 percent of 5 to 17 year-olds. A rapid form of the disease affects pre-schoolers and impacts on their lives in terms of pain, poor sleep and poor eating habits. It can be a contributing factor in 'failure to thrive' in which children exhibit low weight and height for their age.

Periodontal disease and systemic health

- Periodontal disease is a chronic infection caused by bacteria that accumulate in plaque. It is becoming increasingly evident that such infection can influence systemic health in many ways.
- Studies in animals and humans have linked oral infection in mothers to pre-term low birth-weight (PLBW) babies. One study suggested that mothers with severe periodontal disease had up to eight times the risk of PLBW deliveries.
- Prospective studies have found an association between periodontal disease and heart disease. A national study of Canadians aged 36 to 69 years found that those with severe gum or periodontal disease had between three to seven times the risk of fatal coronary heart disease.
- Periodontal infections have also been linked to stroke, aspiration pneumonia in the institutionalized elderly and chronic respiratory disease.

Malnutrition and involuntary weight loss in the elderly

- It has been estimated that between 5 and 10 percent of community dwelling elderly and 30 to 60 percent of homebound and institutionalized elderly are malnourished.
- Poor oral health and tooth loss in the elderly results in a reduction in the ability to chew and marked changes in dietary preferences. Those with no natural teeth have reduced intakes of fibre, protein, calcium and vitamin C. These reduced intakes are associated with reduced biochemical markers of nutritional status.

- Studies of hospital and nursing home populations have indicated that poor oral health and problems chewing are linked to low body mass index and involuntary weight loss. In turn, these have been associated with increased morbidity and mortality.

Oral cancer

- Oral cancers account for 3 to 4 percent of all cancers and 2 to 3 percent of all cancer deaths. In Canada in 1996, there were 3090 cases of oral cancer and 1070 deaths.
- Five-year survival rates for oral cancer are often 50 percent or less. Survival rates have not changed since the mid-1970s.
- Approximately 75 percent of all oral cancers are due to tobacco use, alcohol or both.

Oral health and the quality of life

- Canadian studies have indicated that over a four-week period 6 to 9 percent of adults experienced moderate to severe oral or facial pain. This pain affected the daily activities of one-in-seven. The most common pain affecting daily life was toothache.
- Among Canadians aged 18 years and over, 13 percent have problems chewing and 10 percent have problems with speech. One third of those aged 65 and over cannot chew a complete range of foods. For one-in-seven adults poor oral health impacts on psychological and social well-being; it detracts from the pleasure of eating and affects communication, social relationships and other daily activities.
- Among older adults, those who experience psychosocial problems related to oral disorders have scores on measures of quality of life that indicate lower morale and life satisfaction.

Inequities and inequalities in oral health

- Only 53 percent of the Canadian population are covered by dental insurance. Almost 80 percent of high-income individuals aged 25 to 44 years are covered compared to only 11 percent of low-income elderly.
- Canadians with dental insurance were 2.7 times more likely to report a dental visit in the previous year than the non-insured.

- The oral health status of low-income individuals of all ages is markedly worse than that of high-income subjects. New immigrants adolescents in Ontario were four times as likely as their Canadian-born counterparts to need dental treatment.

Costs of dental disorders in Canada

- The costs of dental care in Canada in 1989 were estimated at \$3.1 billion. Only 14 percent of these costs were paid by public funds. In 2000, it has been estimated that the costs of dental care were \$6.4 billion.
- U.S data from 1989 indicate that dental disorders and visits resulted in 2.7 million work-loss and 1.0 million school-loss days.
- In Canada in 1986, dental disorders ranked third in terms of treatment costs, after cardiovascular diseases and mental disorders.

Introduction

This document summarizes recent research evidence linking common oral diseases and disorders with systemic health, well-being and the quality of life. It aims to demonstrate the significance of oral disorders for population health in order to establish these disorders as a significant public policy issue. The issues addressed in the document are:

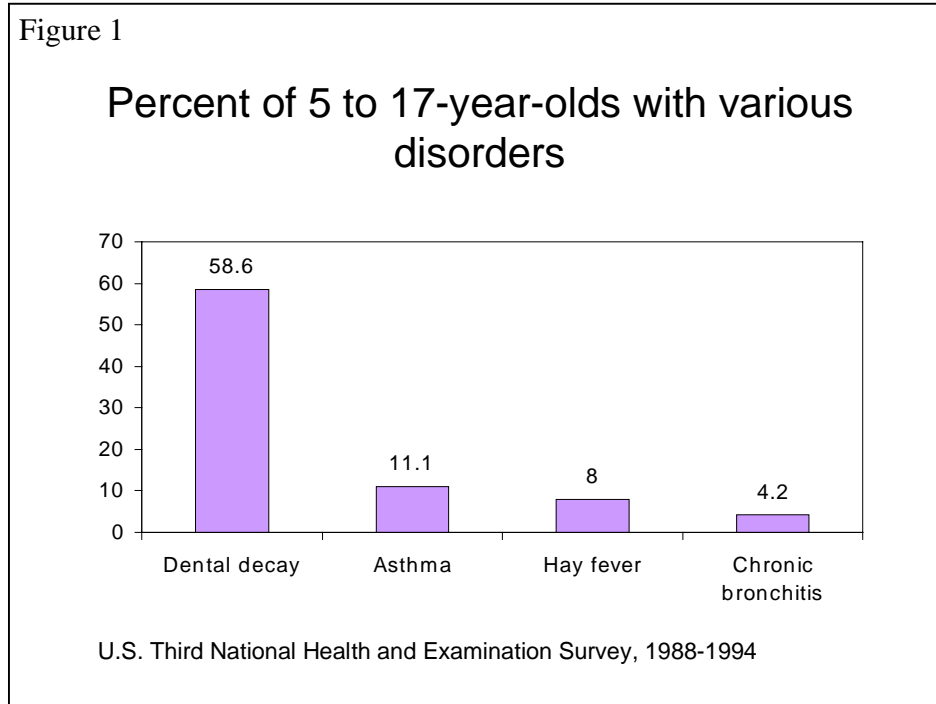
- dental decay and the growth and development of young children;
- periodontal disease and systemic disorders
 - low birth weight
 - heart disease
 - stroke
 - respiratory disease
- malnutrition and involuntary weight loss in the elderly
- oral cancer
- oral disorders and the quality of life
 - pain
 - functional well-being
 - psychosocial well-being
- inequities and inequalities in oral health
 - dental insurance coverage
 - access to dental care
 - oral health outcomes
- costs of dental care

Although much of the research linking oral disorders with major systemic disorders and quality of life outcomes is preliminary, and further research needs to be undertaken, it strongly suggests that oral conditions can have a major impact on the health and well-being of people of all ages.

Dental decay in childhood

Dental decay is a disease caused by a bacterial infection. It is one of the most common diseases in childhood.

- Among 5 to 17 year-olds dental decay is five times as common as asthma and seven times as common as hay fever¹ (Figure 1).



Early childhood caries

A particularly damaging form, early childhood caries (ECC) occurs in the primary dentition of pre-school aged children. Although not life threatening, dental caries may be contribute to long-term sub-optimal health. Other potential consequences are poor speech development, decreased facial aesthetics and lack of guidance for permanent teeth leading to malocclusion. It may be painful, imposes a significant burden on the patient and family.

- In urban areas of Canada, the prevalence of ECC in pre-school is 6-8%. In the most disadvantaged populations such as the Inuit populations of the Northwest Territories, 65% of 4-year-olds are affected².

- ECC is more common than other preventable childhood illnesses such as rubella, mumps and measles³.
- In 1992, 39% of emergency visits to Montreal Children's Hospital Dental Department were due to severe dental decay and 70% of these visits were children aged between one and 5 years⁴.

Children with ECC often need to be treated under general anaesthesia in general hospital settings. Consequently, it is expensive to treat.

- The average cost of treating one Canadian child with this condition ranges from \$700 to \$3000⁵.
- Claims data from Ontario's Children in Need of Treatment Program (CINOT) indicates that although ECC accounts for only a small proportion of claims, they are the most expensive claims³.
- It has been estimated that in Ontario the annual costs of treating ECC are \$13.8 million⁶.

Dental decay and quality of life in young children

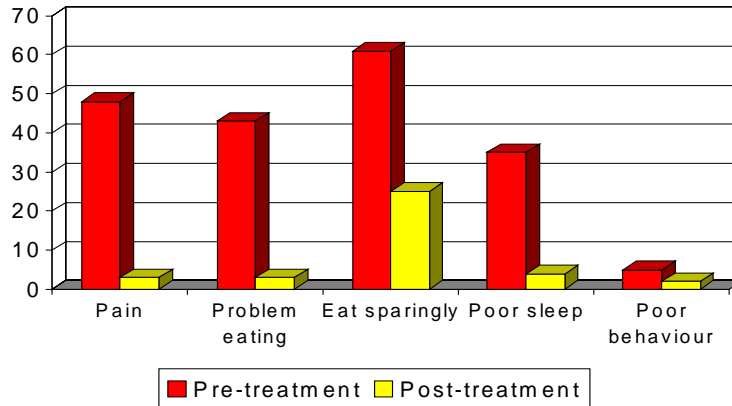
Severe dental decay can affect the lives of young children in many ways. In a Canadian study of preschoolers with the disease⁴:

- 48% complained of pain
- 61% ate sparingly or did not finish what was served
- 35% had problems sleeping
- 5% had behaviour problems

Following dental treatment, most of these problems were eliminated (Figure 2): 97% no longer complained of pain, 60% improved their eating habits and 84% showed improved sleep.

Figure 2

Percent of young children with severe decay exhibiting various problems pre- and post-treatment



Low et al, 1999

Growth and development

Failure to thrive (FTT) is an increasing symptom in the child population and is often associated with serious medical problems or nutritional deficiency. Manifestations of FTT include low weight or height for age. Severe dental decay can be a contributing factor for FTT⁷.

Studies of young children^{8,9} (Table 1; Figure 3) indicate that:

- children with ECC weighed significantly less than matched controls;
- children with ECC were more likely than controls to weigh less than 80% of their ideal weight (one of the criteria for FTT);
- children with ECC were more likely than controls to be in the bottom 10th percentile and less likely to be in the upper 75th percentile for weight;
- as ECC children age they are increasingly likely to exhibit decelerating weight gain and to fall into the lower weight percentile categories
- ECC children are more likely to fall into the lowest percentile categories for height.

Table 1

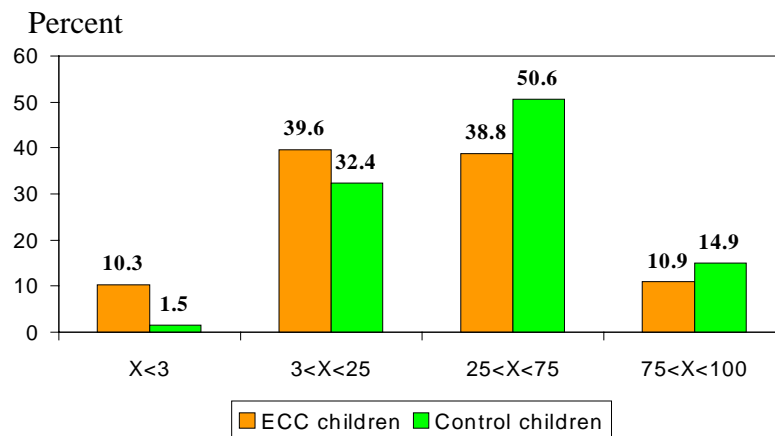
Comparison of weight of ECC patients and matched controls

	ECC patients	Controls
Weight (kg)	15.2	16.2
Less than 80% ideal weight	8.7%	1.7%
Less than 10 th percentile	19.1%	6.9%
More than 75 th percentile	26.1%	41.8%

Acs et al, 1992

Figure 3

Percentile height category distribution for ECC children and controls

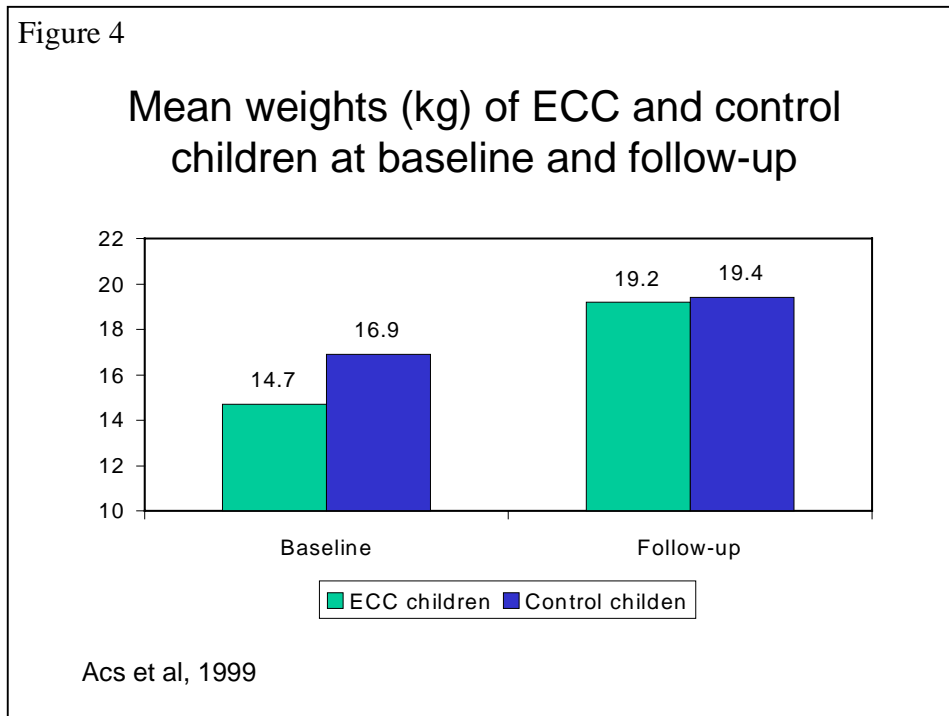


Ayhan et al, 1996

Following dental treatment, children who had ECC exhibited a significantly higher growth velocity than control children so that at 18 month follow-up¹⁰:

- there was no difference in the weights of the ECC and control children (Figure 4);
- none of the ECC children weighed less than 80% of their ideal weight.

This and studies based on case histories suggests that the effects of severe decay in young children impacts on somatic growth and development as well as quality of life. It is probable that the onset of pain and infection along with altered eating and sleeping patterns is the cause of this decrease in weight gain.



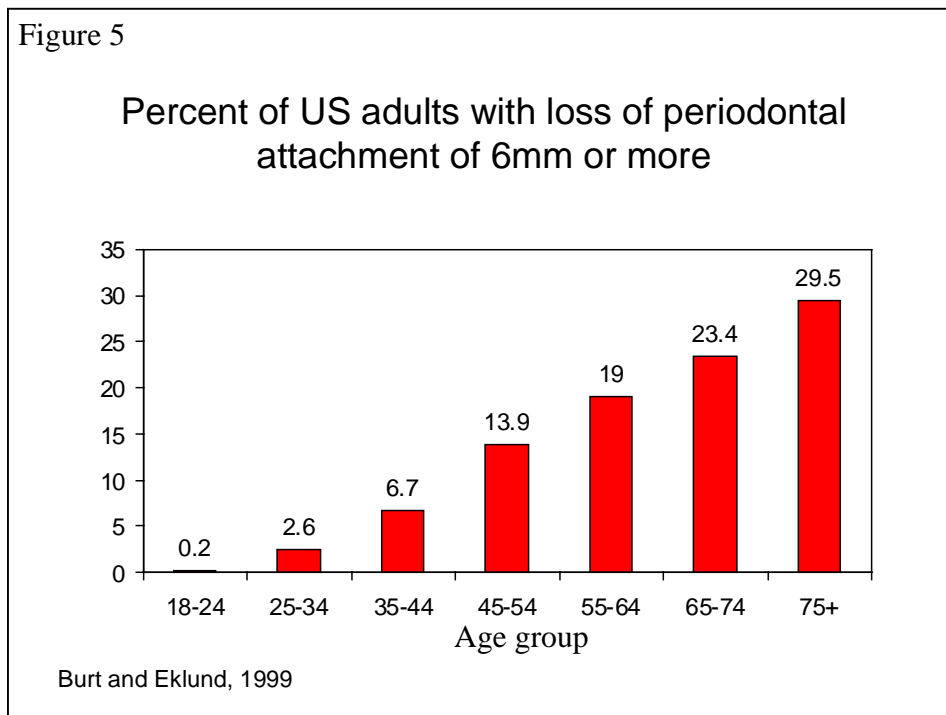
Periodontal disease and systemic health

It is becoming increasingly evident that oral infections can influence systemic health. A number of mechanisms have been identified whereby periodontal infections may have an adverse effect on systemic health and increase the risk of major medical disorders¹¹.

Prevalence of periodontal disease

Periodontal diseases are chronic infections caused by gram-negative bacteria that accumulate in plaque. Bacterial products directly injure periodontal tissues and elicit an inflammatory and immune response. Significant entry of microorganisms and their products into the blood-stream can be provoked by dental procedures, mastication and oral hygiene procedures and is directly related to the severity of gingival inflammation^{1,11}.

- U.S. data indicate that severe periodontal disease (6 mm or more loss at one or more tooth sites) increases with age and affects one in seven of those in middle age and almost one in three elderly¹²(Figure 5).
- An individual with severe disease can have an aggregated ulcerated and infected wound as large as 50 square centimetres¹³.



Periodontal disease and reproductive outcomes

Low birth weight (LBW) is defined as a birth weight of less than 2500 gms. Preterm delivery is the principal cause of LBW. Preterm LBW (PLBW) babies constitute a major public health problem since PLBW is one of the major causes of perinatal mortality and morbidity^{14,15}.

- Approximately 10% of births are preterm and the incidence appears to be rising;
- PLBW babies require prolonged hospitalization at birth and are more likely than normal birth weight babies to require hospitalization during the first year of life.
- PLBW children have high rates of abnormal growth, developmental problems and long-term disabilities.

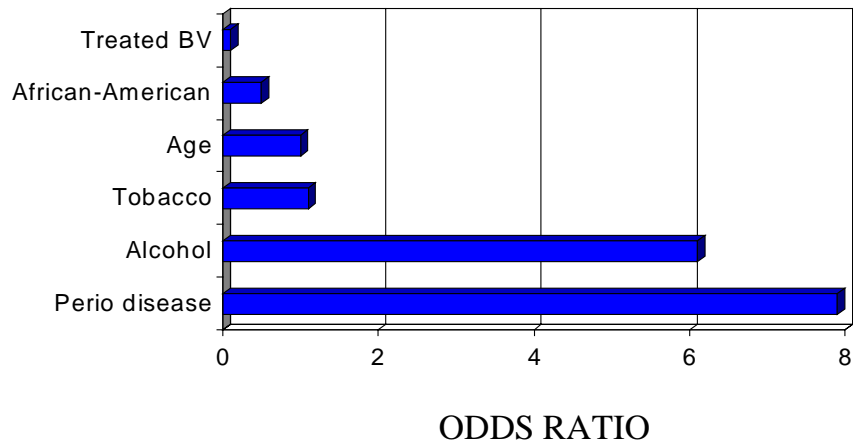
Evidence relating oral infection to low birth weight comes from animal studies and human case control studies. For example, two U.S. case control studies^{15,16} found that:

- Mothers of PLBW babies had significantly more periodontal attachment loss than normal term mothers (means of 3.10 mm vs 2.98 mm, respectively).
- After controlling for other risk factors and covariates, mothers with severe disease (3 or more mm of attachment loss at 60% or more of sites) were seven or more times at risk of PLBW. Odd Ratios were 7.5 (95% confidence interval: 2.0-28.8) for all mothers and 7.9 (95% confidence interval: 1.6-41.4) for mothers giving birth to their first baby (Figure 6).
- PBLW mothers differed from normal term mothers in the biochemical and microbial parameters of periodontal disease. The former had twice the level of prostaglandin E2 in the gingival crevicular fluid than the former and higher levels of four selected periodontal pathogens.

These differences in the periodontal status of cases and controls were confirmed by Dasanayake (1998)¹⁷ (Figure 7).

Figure 6

Adjusted odds ratios for PLBW: Primiparous mothers

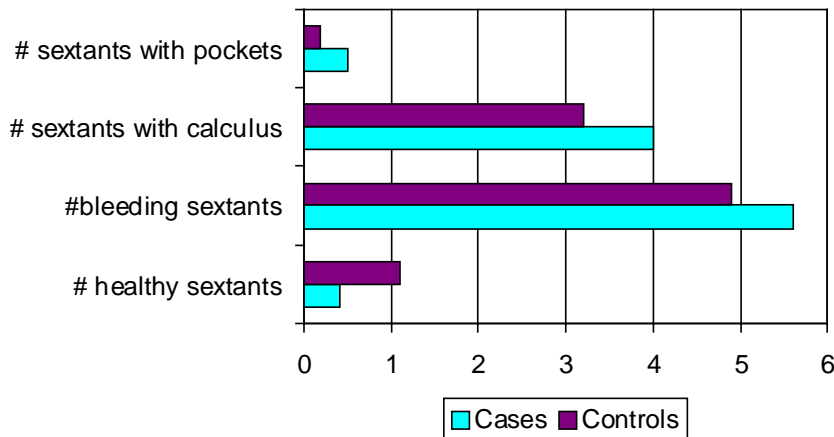


Offenbacher et al, 1996

BV – Bacterial vaginitis

Figure 7

Periodontal status of PLBW mothers and normal controls



Dasanayake, 1998

Periodontal disease, cardiovascular disease and stroke

Heart disease is the number one killer in developed countries, accounting for 50% of deaths. Infection has been recognized as a risk factor for atherogenesis and thromboembolic events. Animal and population-based studies have suggested that periodontal disease is linked to both heart disease and stroke.

- Four prospective studies have found an association between periodontal disease and heart disease with adjusted odds ratios varying between 1.5 and 2.7 (Table 2a).

Table 2a: Summary of prospective studies of periodontal disease and heart disease

Study:	Cardiovascular outcome	Adjusted odds ratio
De Stefano et al, 1993 ¹⁸	Coronary heart disease	1.72 (1.1-2.68)*
Joshiyura et al, 1996 ¹⁹	New coronary heart disease	1.67 (1.03-2.71)
Beck et al, 1996 ¹¹	New coronary heart disease	1.50 (1.04-2.14)
	Fatal coronary heart disease	1.90 (1.03-3.43)
Genco et al, 1997 ²⁰	New coronary heart disease	2.68 (1.35-5.60)**

* Men under age 50 only

** Individuals under 60

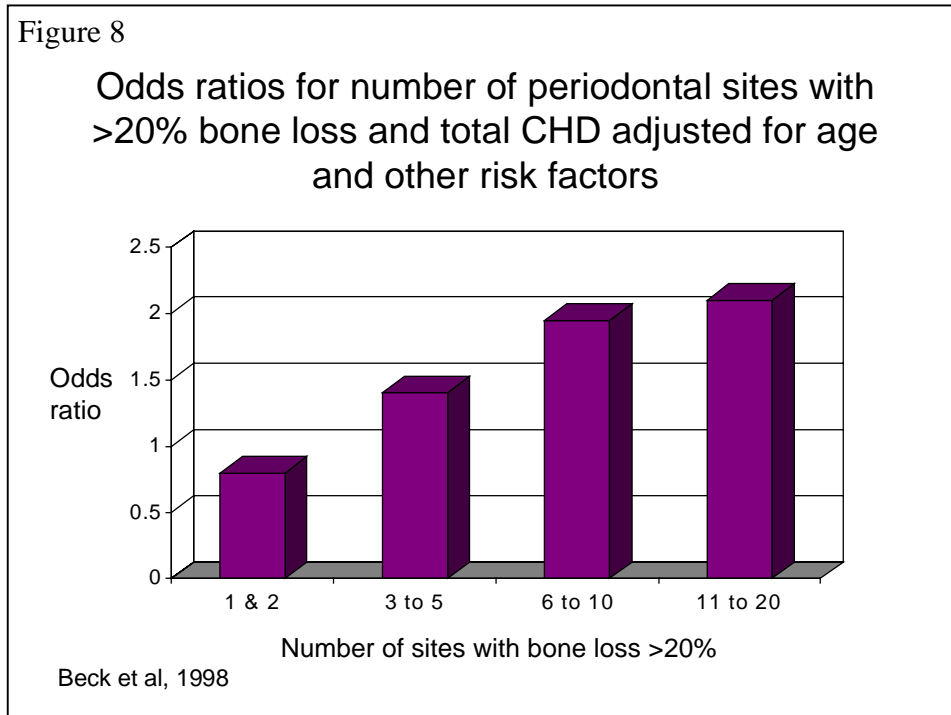
- A Canadian prospective study²¹ also found a relationship between various oral parameters and fatal coronary heart disease among persons aged 35-69 years (Table 2b).

Table 2b: Canadian study of oral health and fatal CHD: age 35-69 years

Oral parameter:	Adjusted relative risk: (95% CI)
Severe gingivitis	6.95 (2.32-20.8)
Periodontitis	3.39 (1.11-10.4)
Edentulous	4.68 (1.64-13.4)

RRs adjusted for other CHD risk factors

- The risk of cardiovascular disease increases with the severity of periodontal disease²² (Figure 8).



Stroke

- Case-control and prospective studies have also suggested that periodontal disease and tooth loss are associated with stroke¹.
- Adjusted odds ratios ranged from 1.48 to 2.80 indicating that those with poor oral health may have up to three times the risk of stroke^{11,23}.

Periodontal disease and respiratory disorders

Bacterial pneumonia is a common and costly infection and a significant cause of morbidity and mortality in patients of all ages²⁴. It is of special significance in the elderly, accounting for the majority of admissions to hospitals from nursing homes.

- Bacterial pneumonia in adults results primarily from colonization of the oral cavity by pathogenic bacteria and aspiration of these bacteria into the lower respiratory tract²⁵. Such colonization is especially likely in individuals with periodontal disease and poor oral hygiene²⁶.

- Poor oral hygiene in residents of long-term care facilities may place them at risk for colonization by respiratory pathogens²⁷. This is supported by the observation that rates of aspiration pneumonia are higher in those with natural teeth²⁸. One study reported that poor oral hygiene may be a major risk factor for respiratory tract infection in the institutionalized elderly²⁹.

Poor oral hygiene and poor oral health have also been linked to chronic respiratory disorders in the general population.

- A study using data from a U.S. national survey found that those with the poorest oral hygiene were 4.5 times (95% confidence interval 1.06-18.99) at risk of having chronic respiratory disease³⁰. A clear dose response relationship was also found.
- Periodontal disease (measured as alveolar bone loss) has also been found to be an independent risk factor for chronic obstructive pulmonary disease (Adjusted odds ratio=1.8; 95% confidence interval: 1.3-2.5)³¹.

Oral disorders, malnutrition and involuntary weight loss in the elderly

Elderly in Canada

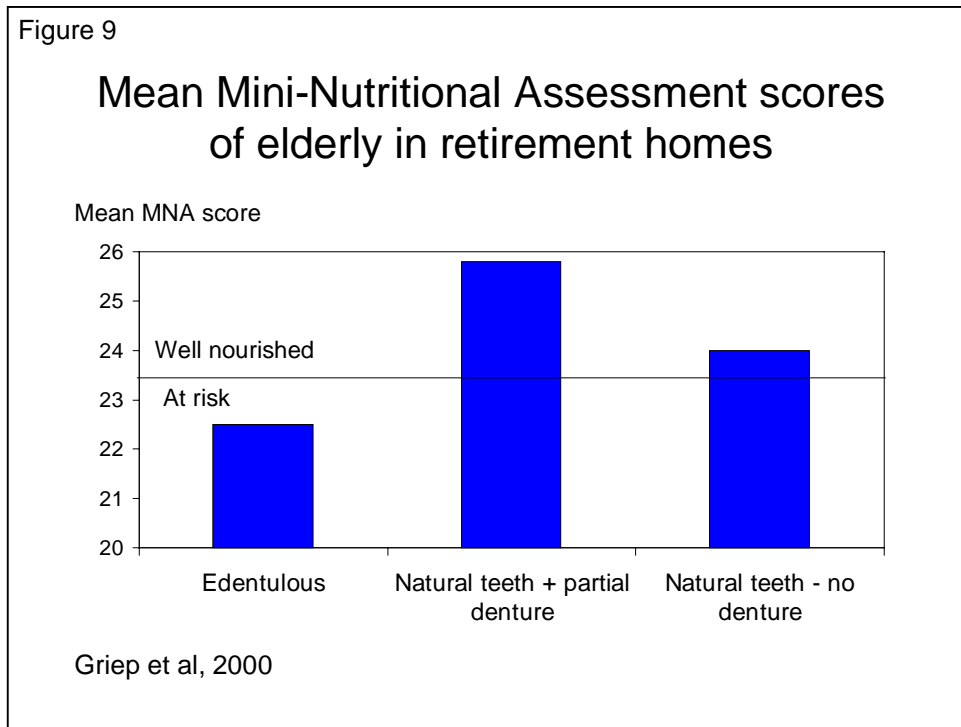
The population aged 65 and over is growing at a faster rate than any other age group. This will increase demands for medical, dental and social care.

- By 2011, one in seven Canadians will be aged 65 years and over³².
- Almost one third (28%) live in households with annual incomes of less than \$15,000 and one half (52%) in households with incomes of less than \$30,000³².
- Cost is a major barrier to accessing dental care³³.
- Needs for dental care are higher in this age group than any other, and particularly high in institutionalized elderly. Over half of the latter have been found to need restorative care and one fifth surgical treatment³⁴.

Dietary choices and malnutrition

Poor oral health in general and the loss of teeth in particular results in a reduction in chewing efficiency. As the ability to chew declines people change their dietary preferences to foods that require less mastication. In turn, this can result in marked changes in dietary intakes. Consequently, it is estimated that between 5 and 10% of community dwelling elderly and 30 to 60% of homebound and institutionalized elderly are malnourished³⁵.

- Intakes of fibre, protein, intrinsic and milk sugars, calcium, non-haem iron, and vitamin C are reduced in those with no natural teeth³⁶.
- Increased numbers of functional natural teeth is associated with increased intakes of micro-nutrients and vitamins³⁷.
- Reductions in intakes are associated with reduced biochemical markers of nutritional status. Disturbingly low levels of vitamin C have been found in edentulous people in long stay care homes³⁶.
- A study of elderly in retirement homes found that the Mini-Nutritional Assessment scores of those with no teeth indicated they were at risk of malnutrition³⁸(Figure 9).



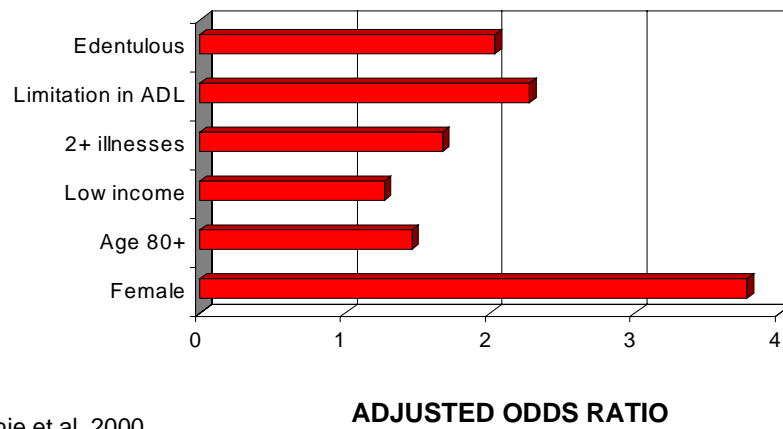
Weight loss

Many studies have demonstrated an association between weight loss and increased morbidity and mortality. This association is particularly prominent among older adults.

- Studies of hospital and nursing home populations have indicated that oral health problems, particularly problems chewing, are linked to low body mass index³⁹ and involuntary weight loss⁴⁰.
- A study of community dwelling elderly found that 6% of men and 11% of women aged 70 and over lost 10% or more of their body weight over a one-year period⁴¹.
- Those with no natural teeth were twice as likely to experience significant weight loss after controlling for other risk factors⁴¹ (Figure 10).

Figure 10

Risk factors for significant weight loss in community dwelling elderly

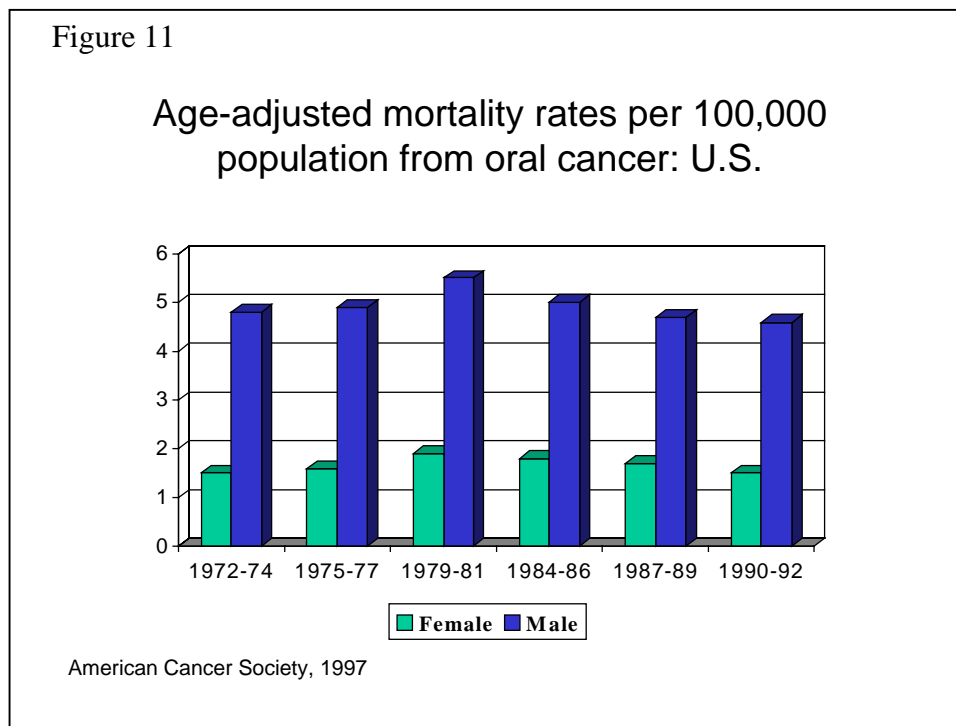


Ritchie et al, 2000

Oral cancer: Tobacco and oral health

Oral cancer is the one condition affecting the mouth that is potentially fatal. Oral cancers account for 3-4% of all cancers and 2-3% of all cancer related deaths. The disease and its treatment lead to impaired function, pain and disfigurement and the financial burden imposed by the disease is high since rehabilitation and prosthetic replacement are often necessary.

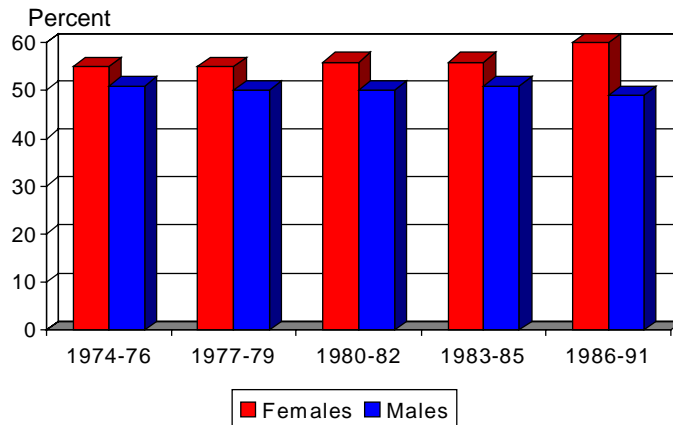
- Age-adjusted oral cancer mortality rates in the U.S. declined between the 1960s and 1970s but remained stable between the 1970s and 1990s⁴²(Figure 11).



- The estimated incidence of oral cancer in Canada was 3090 cases in 1996; the estimated number of deaths from oral cancers was 1070 (1.7% of all cancer deaths)⁴³.
- Potential years of life lost due to oral cancer were 17,000 in 1993⁴⁴.
- Five-year survival rates for oral cancer are often 50% or lower⁴⁵. Survival rates have not changed since the mid-1970s⁴²(Figure 12).

Figure 12

Five year survival rates (%) for females and males diagnosed with oral cancer: U.S.



American Cancer Society, 1997

Risk factors for oral cancer

It has been estimated that approximately 75% of all oral cancers are due to tobacco use, alcohol or both.

- Case-control studies in Canada and the U.S. have documented a four-fold or greater increase in deaths from oral cancer among smokers or alcohol abusers⁴⁴.
- One study of males found the following odds ratios for smoking, drinking and smoking and drinking combined⁴⁶:

Heavy smokers; non-drinkers	OR=7.4
Heavy drinker; non-smoker	OR=5.8
Heavy smoker and heavy drinker	OR=37.7

Blot et al, 1988

- Other risk factors include older age, exposure to sunlight and chronic inflammation.

Oral health and the quality of life

In 1948 the World Health Organization defined health as ‘a complete state of physical, mental and social well-being and not merely the absence of illness and infirmity’. Following from that definition considerable attention has been given to the way in which diseases and disorders affecting various body systems compromise the quality of life. Oral and dental diseases, though not conventionally considered serious, can undermine well being to a surprising degree.

Pain

Pain is a common consequence of oral disease. Canadian studies^{47,48} have indicated that, *in the previous four weeks*:

- between one third and two-fifths of the population experienced oral or facial pain;
- between 6% and 9% had pain that was moderately severe to severe;
- the daily activities of one in seven were affected by this pain⁴⁹ (Table 3).

Table 3: Psychosocial impacts of pain

Disturbed sleep	5.5%
Took time off from work	1.7%
Stayed home more than usual	2.0%
Stayed in bed more than usual	1.5%

- the most common pain affecting daily life was toothache.

Functional problems

Oral diseases and disorders compromise the ability to chew and the ability to speak clearly.

- Among Canadians aged 18 years and over, 13% are unable to chew a complete range of foods and 10% have problems with speech⁴⁸;
- 33% of those aged 65 years and over have problems chewing some foods⁴⁸;

- problems with chewing and speech are most common among those with no teeth and those wearing dentures⁴⁸ (Table 4).

Table 4: Functional problems by dental status

	Problem chewing	Problem speaking
Edentulous	61.3%	12.9%
Dentate with dentures	28.3%	15.2%
Dentate no dentures	3.1%	6.7%

Impact on psychological and social well-being

Oral disorders can impact on many aspects of psychological and social well-being. Loss of function may limit food choices and detract from the pleasures of eating. They may lead people to restrict social contacts and avoid intimacy. They can also result in low self-image and self-esteem.

- In a study of Canadians aged 18 years and over⁴⁸, 14% reported experiencing one or more psychological and social impacts *very often* or *all the time* in the previous year. Eight per cent had problems with respect to eating, 4% with communication-social relationships and 2% with other activities of daily living. The most common problems are listed in Table 5.

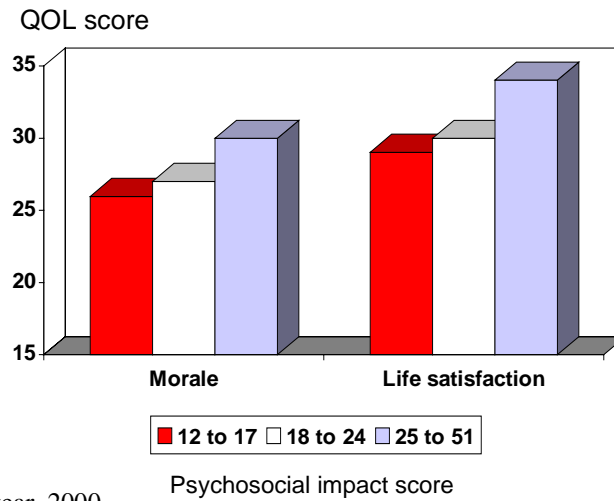
Table 5: Psychosocial outcomes of oral disorders

Prevented from eating foods you would like to eat	4.7%
Enjoyment of food less than it used to be	3.2%
Takes longer to finish a meal than other people	6.4%
Avoided eating with others	2.0%
Embarrassed by appearance or health of teeth/mouth	2.9%
Avoided conversation with others	1.0%
Avoided laughing or smiling	2.3%

- Studies of community dwelling older adults and the elderly living in geriatric care centres have found that those who experience psychosocial problems related to oral disorders have scores on measures of quality of life that indicate *significantly lower morale* and *significantly lower levels of life satisfaction*^{50,51} (Figure 13).
- These effects remain after controlling for other influences on quality of life such as general health status, adequacy of income and marital status⁵¹.

Figure 13

Quality of life scores by psychosocial impact scores



Locker & Matear, 2000

Inequities and inequalities in oral health

In spite of Canada's commitment to equity in health, the oral health sector in Canada is characterized by marked inequities and inequalities. Disparities by province, household income and immigration status exist with respect to insurance coverage, access to dental care and oral health outcomes.

Dental insurance coverage

The National Population Health Survey of 1996/97 indicated that only 53% of the Canadian population were covered by private or public dental health insurance plans and programs⁵².

- The percentage of the population covered varied across Canada, from 60% in Ontario to 39% in Quebec and 39% in Newfoundland (Figure 14).
- High income individuals aged 25 to 44 years (those least likely to need dental care) were seven times more likely to have dental insurance cover than low income individuals aged 65 years and over (those most likely to need dental care): 79% percent of the former had insurance compared with 11% of the latter (Table 6).

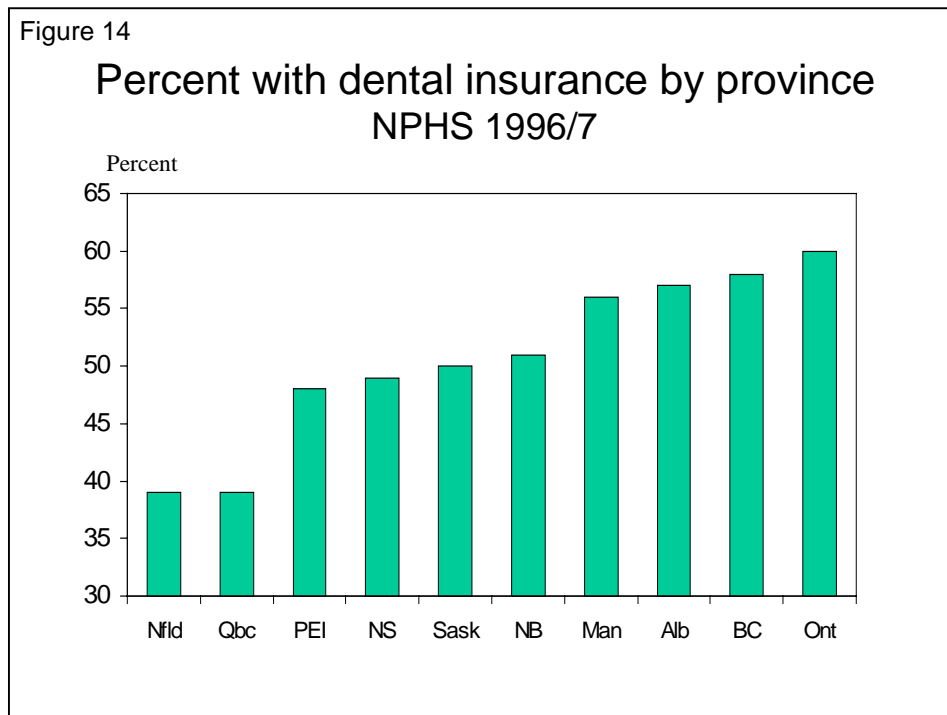


Table 6

Percent with dental insurance by
income and age

Income:	25-44 yrs	65+ yrs
Lowest	28	11
Lower middle	49	19
Upper middle	75	32
Highest	79	31

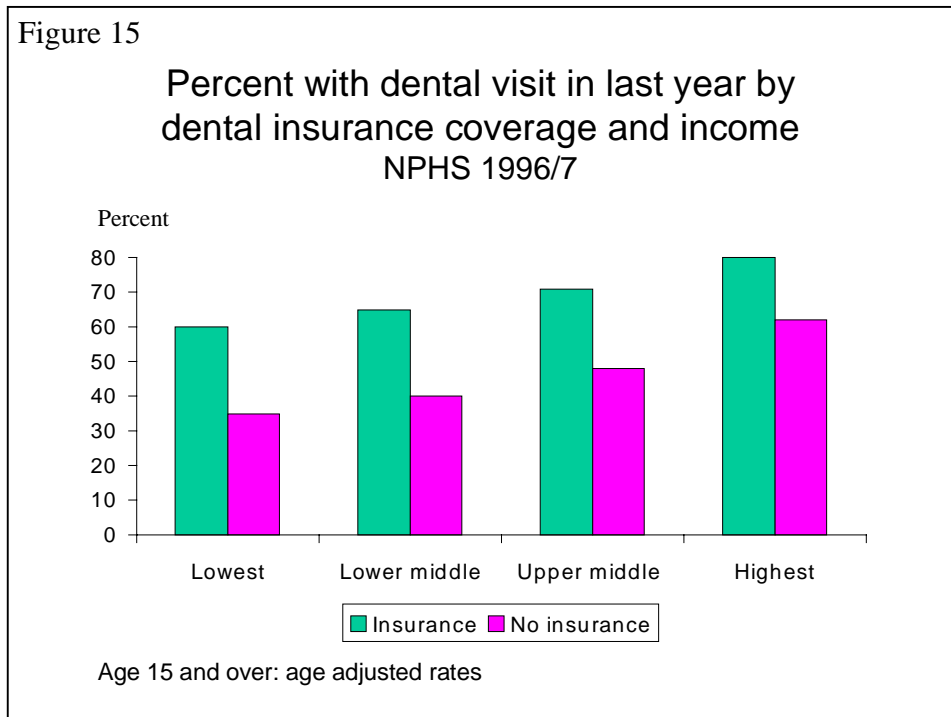
NPHS 1996/7

Access to dental care

Within Canada's predominantly private system of dental care, dental visits are largely determined by the ability to pay. Consequently household income and insurance coverage are powerful determinants of dental care visits⁵². They also influence the volume of care received by those who make dental visits.

National data

- The NPHS 96/97 data indicated that only 39% of Newfoundlanders reported a dental visit in the previous year compared with 68% in Ontario. Provincial differences in dental visiting largely mirror provincial differences in dental insurance coverage.
- Canadians with dental insurance coverage were 2.7 times more likely to report a dental visit in the previous year than the non-insured. Seventy-eight percent of Canadians in the highest income group reported a dental visit, while only 41% of Canadians in the lowest income group did so. The combined effects of household income and insurance are shown in Figure 15.

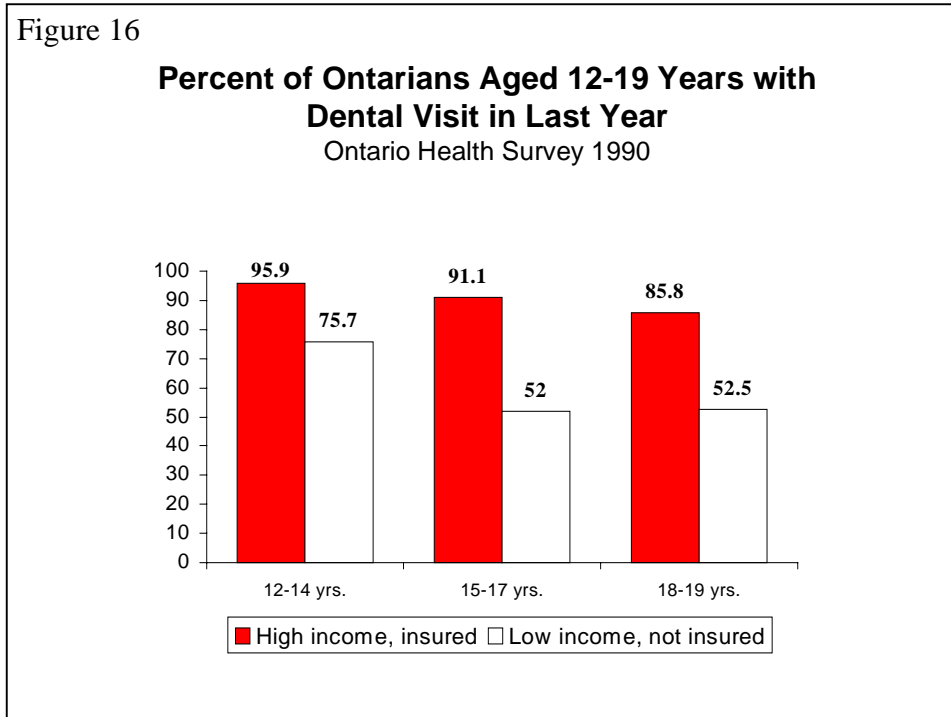


Older adults in Ontario

- Among older adults in Ontario high-income individuals made more visits and received an average of 26% more services than low-income individuals³³.
- The value of care (RVU's) received by high-income individuals was 70% higher than that of low-income individuals after controlling for dental needs³³.

Dental visits by adolescents in Ontario

- Following the cessation of eligibility for Ontario public dental health programs, inequities in access to dental care among adolescents widened⁵³. At age 12-14 years there was a 20% difference in visiting rates between those from advantaged (high income with dental insurance) and those from disadvantaged (low-income without insurance) households. At age 18-19 years, 52% of the latter had seen a dentist in the previous year compared to 85% of the former, a difference of 33% (Figure 16).
- More than one third (37%) of adolescents from disadvantaged households only visited a dentist when having pain or other trouble, compared with 7% of those from the most advantaged backgrounds.



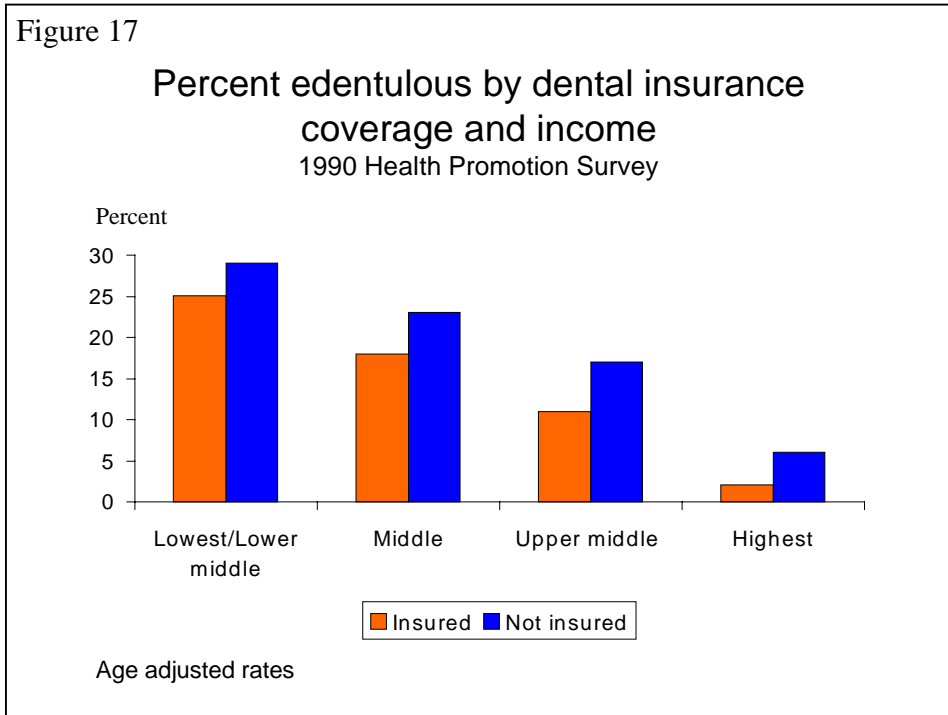
- 73% of Canadian born adolescents reported regular preventive dental visits compared with 43% of those who had immigrated; 82% of the former and 61% of the latter had visited a dentist in the last year⁵⁴.

Oral Health Status

Although the use of dental services is only one of many determinants of oral health, the limited data that are available on the oral health of Canadians reveal that patterns of inequality mirror inequities in access to dental care. National and provincial studies indicate that there are provincial differences in oral health and that, within provinces, poor oral health is concentrated within low income and other disadvantaged groups such as new immigrants and those without dental insurance coverage.

Edentulism in Canada

- In 1990, 17% of Canadians were edentulous. Quebec had the highest rate of tooth loss, at 28%, while Ontario had the lowest, at 11%⁵².
- National data indicate that in 1990 rates of edentulism were substantially higher in lower income groups than higher income groups. Within each income group, the uninsured had a higher rate of total tooth loss than the insured (Figure 17). Even among the insured, there was a 12-fold difference in rates of edentulism between the highest and lowest income groups⁵².
- Within Ontario, the province with the lowest rate of edentulism, rates of edentulism among those 12 years and above were 22% in the lowest income group and 5% in the highest income group⁵⁵.

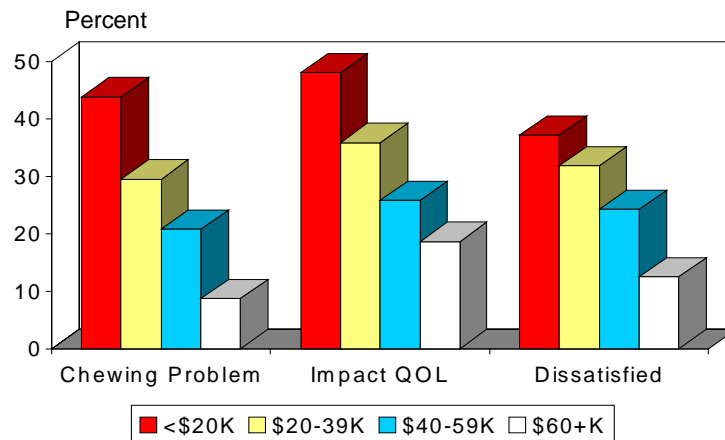


Dentate older adults in Ontario

- Among dentate older adults in Ontario, the lowest income group had fewer teeth, fewer functional pairs of teeth, more decayed crown and root surfaces and more periodontal attachment loss than the highest income group. They also had poorer self-perceived oral health, were more likely to report that oral health impacted on quality of life and were more dissatisfied with their oral health status³⁴ (Figure 18).
- Over a three-year period 33% of those living in households with an annual income of less than \$20,000 lost one or more teeth compared to 19% of those in households with incomes of \$40,000 or more. The former lost on average three times as many teeth as the latter⁵⁶.

Figure 18

Self-reported Oral Health Status in Ontario Older Adults by Income



Locker, 1992.

Adults aged 35 to 44 years in Quebec

- In Quebec adults 73% of decayed tooth surfaces were concentrated in only 14% of the people⁵⁷.
- The main risk factors for high levels of dental decay (4 or more decayed crown surfaces) were low family income, no visit to a dentist in the last year and no insurance (Table 7). The lowest income group had four times the risk of severe disease than the highest income group.

Table 7

Predictors of 'severe' decay in Quebec adults aged 35 to 44 yrs

Variable:	%	Adjusted OR
Income:		
Low	21	3.8
High	5	
Last dental visit:		
More than 1 yr	28	3.6
Less than 1 yr	8	
Insurance:		
No	19	1.6
Yes	10	

Brodeur et al, 2000

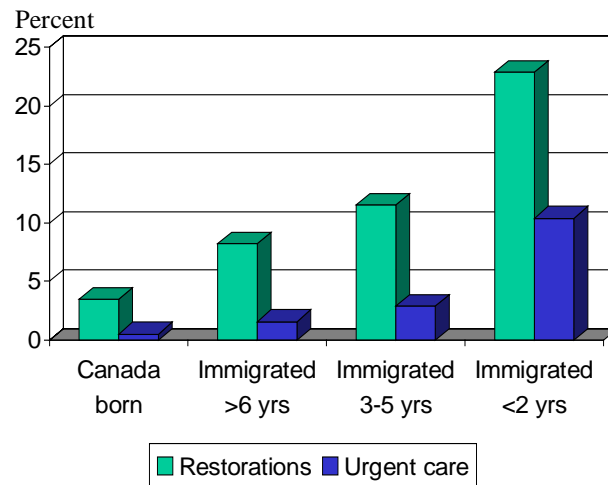
New immigrants in Ontario

- In a group of 13 to 14 year-olds, 3.5% of those born in Canada needed restorations compared with 13.6% of those born outside Canada. Urgent care was needed by 0.5% and 3.5% respectively⁵⁴.

- The most disadvantaged group was new immigrants; 22.9% needed restorations and 10.4% need urgent care (Figure 19).

Figure 19

Adolescents in North York, Ontario:
Percent needing dental care by immigration status



Costs of dental disorders in Canada

Direct costs

Because the majority of costs of dental care paid for by private sources, direct expenditures have to be estimated by combining information from numerous sources.

- The costs of dental care in Canada in 1989 were \$3.1 billion⁵⁸.
- Public funds accounted for only 14% of these expenditures. This varied from 3% in Ontario to 28% in Manitoba and 75% in the Territories.
- In 1996/7, private dental insurance companies paid \$2.3 billion for dental plans covering 13.6 million beneficiaries⁵⁹. Total private expenditures on dental care in 1999 have been estimated at \$6.4 billion.

Indirect costs

The indirect costs of health problems can be measured using work loss days, school loss days, reduced activity days and bed disability days. Since Canadian data are not available, these must be estimated from U.S. sources. Data from 1989⁶⁰ suggests that on an annual basis *dental problems and visits* resulted in:

- 2.7 million work loss days
- 1.0 million school loss days, and
- 4.1 million restricted activity days.

Data from 1996 pertain to days lost due to *acute dental conditions* only¹. On an annual basis, there were 1.9 work-loss days, 1.7 bed loss-days and 3.7 restricted activity days per 100 employed persons aged 18 and older. In addition, 3.1 days of school were lost per 100 persons aged 5-17 years of age. Although this indicates that loss is relatively small on an individual basis, it becomes significant when the population as a whole is considered.

Relative costs

In 1986, dental disorders ranked third in terms of treatment costs⁵⁸:

Cardiovascular diseases	\$4.9 billion
Mental disorders	\$2.6 billion
Dental disorders	\$2.4 billion
Respiratory diseases	\$2.4 billion
Digestive diseases	\$2.1 billion
Injuries	\$2.0 billion
Cancer	\$1.9 billion

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