

A Macroeconomic Review of Dentistry in Canada in the 1990s

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A b s t r a c t

Objectives: To document the trends in expenditures on dental health care services and the number of dental health care professionals in Canada from 1990 to 1999.

Methods: Information on dental and health expenditures, numbers of dentists, hygienists and dental therapists, and the population of Canada and the provinces were obtained from the Canadian Institute for Health Information; data on numbers of denturists were obtained from regional bodies and from Health Canada. Information on the costs of other disease categories was taken from studies by Health Canada (1993 and 1998). International comparisons were made on the basis of data published by the Organisation for Economic Co-operation and Development (OECD). Indices of change over the decade (in which the 1990 value served as the baseline [100]) were calculated.

Results: By 1999, the supply of all types of dental care providers had increased to 1 for every 904 people. Dental expenditures during the 1990s increased by 64% overall and by 49% per capita, a rate of increase that exceeded both inflation and costs of health care. Although the public share of dental costs decreased from 9.2% to 5.8%, the direct costs of dental care increased to rank second (\$6.30 billion) after those for cardiovascular diseases (\$6.82 billion). Among the OECD nations, Canada had the fourth highest per capita dental expenditures and the second lowest per capita public dental expenditures.

Conclusions: The direct economic costs of dental conditions increased during the 1990s from \$4.13 billion to \$6.77 billion. Over the same period, the public share for expenditures on dental health care services declined.

MeSH Key Words: Canada; dental care/economics; health expenditures

© J Can Dent Assoc 2004; 70(9):604-9
This article has been peer reviewed.

According to Merriam Webster, macroeconomics is the study of the economics of whole systems, especially with reference to general levels of output and income and to the interrelations among sectors of the economy. This review sets out to provide information on the resources used in the dental health care sector in Canada during the decade ending in 1999.

In Canada, dental health care services are largely excluded from the publicly administered, universal health care system, and most remain privately financed and privately delivered. As such, the economics of the dental health care sector is often not described adequately in the public reporting of the costs of Canada's health care services. Consequently, the profession, society and health planners in government may not appreciate the economic

burden of illness attributable to dental diseases. Given the increasing evidence that oral health is an important component of general health,¹ an understanding of the resources used in providing dental health care is critical to understanding the relative importance of the oral health care system and to determining future oral health care policy.

This review follows 2 similar reviews, the first covering the period from 1960 to 1980² and the second covering the 1980s.³ This paper describes trends in the supply of dental care service providers and their distribution, as well as dental care utilization in terms of expenditures, over a period of 10 years, from 1990 to 1999. Canadian dental health care expenditures are compared with those for other health care sectors in Canada and with those of other developed countries.

Methods

The Canadian Institute for Health Information (CIHI) has maintained health care information for Canada since 1994. CIHI provides health data to qualifying graduate students through the Graduate Student Data Access Program. Through this program, CIHI provided the authors with information for the years 1990 to 1999 on the following topics: total health care expenditures; total, private, public and per capita dental health care expenditures; numbers of licensed dentists, dental hygienists and certified dental specialists; and the population of Canada and its provinces and territories. Numbers of denturists were obtained from several sources, specifically, through direct requests to the licensing bodies in each jurisdiction and, where no response to such a request was received, a separate report on national association membership in 2003 (personal communication between JL and provincial denturist licensing bodies and associations). Numbers of dental therapists were obtained directly from the First Nations and Inuit Health Branch of Health Canada (personal communication between JL and the First Nations and Inuit Health Branch, July 2003). CIHI does not maintain data on dental assistants or dental technologists, and obtaining this information was beyond the scope of this project. During the decade some of the definitions changed: in 1990 information on dentists related to active, licensed dentists who were working full- or part-time. For subsequent years, the CIHI numbers represent dentists and hygienists who were registered but may not have been working. Similarly, information on the numbers of denturists and dental therapists relates only to those who were registered, not necessarily those who were working.

CIHI data for health care spending are contained in the National Health Expenditures database. The information is extracted manually from diverse public documents, including national and provincial or territorial public accounts and other financial reports. Other sources include private insurance companies, A.C. Nielsen Canada and Statistics Canada. Most private sector expenditures are estimated from survey data. Before 1996, the Survey of Family Expenditures by Statistics Canada, an important source of private sector data, was not carried out annually (the surveys before 1996 were conducted in 1990 and 1992); therefore, trend data have been imputed by CIHI for years between surveys.⁴ Expenditures on dental care are obtained mostly from the income tax files of dentists. Because the incomes of denturists and dental hygienists practising independently are not tracked by Statistics Canada, expenditures on their services may not be fully captured in the CIHI database. In addition, the direct hospital costs associated with dental care provided for, say, oral cancer patients or young children with early childhood caries are captured

under hospital costs. Thus, the expenditures reported here understate the full costs of dental care.

Household expenditures and annual inflation rates were obtained from Statistics Canada.⁵ Household expenditures are based on the Survey of Family Expenditures until 1996 and the Survey of Household Spending⁶ after that. Values of the gross domestic product (GDP) for Canada were obtained from the Saskatchewan Bureau of Statistics.⁷ For international comparisons, health data released by the Organisation for Economic Co-operation and Development (OECD)⁸ were used.

Additional analyses were performed on the data from the above sources. Ratios of population to providers and indices of change (in which the 1990 value served as the baseline [100]) were calculated. Dental expenditures were compared with the national indicator of economic output, the GDP, and with total expenditures on health care.

Findings

The findings of this study must be considered against the background of economic and health expenditure changes in Canada. For example, from 1990 to 1999, the consumer price index increased by 18.4% and total health care expenditures rose by 47.1%.⁵

In the interest of brevity, the results for only 3 years are shown, for the start, middle and end of the decade under study. Table 1 provides the numbers of licensed dentists and licensed dental hygienists in each province or territory and the whole of Canada, as well as the ratio of the population per professional for each category and indices of change in number of professionals.

The largest overall absolute increase (5,704) and rate of increase (65%) occurred among dental hygienists. This greatly exceeded the 18% increase in licensed dentists and the 10% increase in the population. The number of dentists increased in all provinces except Saskatchewan, and the number of hygienists increased in all jurisdictions. The national ratio of population per dentist fell from 1,943:1 in 1990 to 1,805:1 in 1999, which indicates an increase in the relative supply of dentists. Again, this change was dwarfed by the increase in the supply of dental hygienists. Combining both groups resulted in a population to dentist or hygienist ratio of 971:1 at the end of the decade. The increase in the relative supply of dentists and hygienists occurred in all provinces and territories.

Dental specialists are included in the data for dentists. The number of dental specialists increased by 18%, from 1,597 in 1990 to 1,884 in 1999; specialists represented a constant 10% of all dentists (detailed data not shown in table).

Dental therapists provide primary oral health care to First Nations and Inuit communities through the First Nations and Inuit Health Branch or local arrangements with Band councils. In Saskatchewan, therapists can also

Table 1 Numbers of dentists and dental hygienists in Canada in the 1990s^a

Province	No. of dental professionals (and population per professional)								
	1990			1995			1999		
	Dentist	DH ^b	Total	Dentist	DH ^b	Total	Dentist	DH ^b	Total
B.C.	2,270 (1,471)	960 (3,478)	3,230 (1,034)	2,276 (1,685)	1,562 (2,593)	3,838 (999)	2,586 (1,557)	1,788 (2,252)	4,374 (920)
Alta.	1,363 (1,887)	830 (3,099)	2,193 (1,173)	1,476 (1,870)	1,046 (2,638)	2,522 (1,094)	1,588 (1,863)	1,251 (2,365)	2,839 (1,042)
Sask.	370 (2,709)	148 (6,773)	518 (1,935)	343 (2,963)	232 (4,384)	575 (1,768)	349 (2,938)	267 (3,840)	616 (1,664)
Man.	528 (2,095)	413 (2,679)	941 (1,175)	543 (2,082)	498 (2,271)	1,041 (1,086)	553 (2,066)	550 (2,077)	1,103 (1,036)
Ont.	5,781 (1,792)	3,857 (2,686)	9,638 (1,075)	6,323 (1,744)	5,170 (2,010)	11,493 (959)	6,911 (1,668)	6,322 (1,823)	13,233 (871)
Que.	3,134 (2,244)	2,100 (3,349)	5,234 (1,344)	3,707 (1,958)	2,951 (2,653)	6,658 (1,090)	3,922 (1,874)	3,565 (2,061)	7,487 (982)
N.B.	228 (3,260)	133 (5,588)	361 (2,059)	247 (3,046)	194 (3,878)	441 (1,706)	260 (2,905)	240 (3,147)	500 (1,511)
N.S.	420 (2,172)	317 (2,873)	737 (1,237)	431 (2,157)	374 (2,486)	805 (1,154)	441 (2,134)	420 (2,241)	861 (1,093)
P.E.I.	49 (2,663)	23 (5,673)	72 (1,812)	48 (2,826)	30 (4,518)	78 (1,739)	57 (2,416)	38 (3,624)	95 (1,450)
Nfld.	146 (3,960)	37 (15,248)	183 (3,159)	144 (3,919)	54 (10,511)	198 (2,850)	158 (3,423)	69 (7,838)	227 (2,382)
Y.T.	16 (1,760)	14 (6,276)	66 (1,331)	9 (3,499)	22 (4,475)	82 (1,206)	16 (1,940)	26 (1,694)	100 (440)
N.W.T.	36 (1,659)			51 (1,313)			58 (706)		
Total for Canada	14,341 (1,943)	8,832 (3,155)	23,173 (1,191)	15,598 (1,892)	12,133 (2,432)	27,731 (1,058)	16,899 (1,805)	14,536 (2,099)	31,435 (971)
Index of change for Canada^a	100	100	100	108	137	120	118	165	136
Population of Canada		27,700,860			29,353,850			30,509,320	
Index of population change^a		100			106			110	

Source: Canadian Institute for Health Information, through Graduate Student Data Access Program.

^aCalculated as (1990 or 1995 or 1999 value/1990 value) × 100.

^bNumbers of dental hygienists for 1999 were taken from the preliminary release of Health Personnel Trends in Canada, 1993–2002.¹⁴

work for private dentists and most (188) work in that setting. Their numbers were relatively constant over the decade, totalling 240 in all of Canada in 1999. The information obtained for denturists was inconsistent for the period under review, and the authors' best estimate is that there were 1,925 denturists at the start of the decade and 2,075 at its close. Denturists were registered in every province and territory but, by 1999, most were located in Quebec (939), Ontario (459) and Alberta (234). If the numbers of dental therapists and denturists are added to the 1999 figures for dentists and hygienists, the national total rises to 33,750 providers, the index of total providers increases to 133, and the final ratio of population to providers becomes 904:1.

As defined by CIHI, dental expenditures are the professional fees of dentists (including care provided by dental assistants and hygienists) and denturists, as well as the cost of dental prostheses (including dentures and laboratory charges for crowns and other dental appliances).⁴ Table 2 presents the expenditures on dental services in total and

relative to other economic measures. Over the decade, dental expenditures increased from \$4.13 billion to \$6.77 billion, a 64% increase. Dental expenditures as a proportion of the GDP increased from 0.61% to 0.69%; as a percentage of total health care costs, they rose from 6.8% to 7.6% by 1996 but then fell slightly to 7.5% in 1999.

The proportion of total dental expenditures that was paid privately increased from 90.8% (\$3.7 billion) in 1990 to 94.1% (\$6.4 billion) in 1999. At the same time, the privately insured fraction of total private expenditures rose only slightly, from 53.2% to 55.0% (index of change 103), an increase in the actual amount (not shown in the table) from \$2.0 billion in 1990 to \$3.5 billion in 1999. Per capita dental expenditures increased from \$149.42 in 1990 to \$222.03 in 1999.

The proportion of total expenditures for dental health care services paid by public funds was highest in the Northwest Territories, Yukon Territory and Nunavut (44% to 65%) and lowest in Ontario (2%) (Table 3). For

Table 2 Expenditures for dental health care services in Canada in the 1990s in relation to gross domestic product (GDP), total health care expenditures and private health care expenditures

Year	Total dental expenditures (\$ billion)	% of GDP	% of total health care expenditures	Private expenditures (\$ billion and % of total)	% of private expenditures insured	Per capita expenditures (\$)
1990	4.13	0.61	6.8	3.7 (90.8)	53.2	149.42
1991	4.46	0.63	6.7	4.0 (90.9)	55.7	159.38
1992	4.69	0.66	6.7	4.3 (91.1)	57.1	165.29
1993	4.92	0.67	6.9	4.5 (91.4)	56.5	171.65
1994	5.21	0.68	7.1	4.8 (91.6)	55.2	179.65
1995	5.48	0.68	7.4	5.1 (92.2)	54.9	186.86
1996	5.66	0.68	7.6	5.3 (93.1)	54.8	190.87
1997	5.89	0.67	7.5	5.5 (93.5)	55.6	196.64
1998	6.27	0.69	7.5	5.9 (94.1)	57.2	207.59
1999	6.77	0.69	7.5	6.4 (94.1)	55.0	222.03
Index of change (1990 = 100)^a	164	113	111	170	103	149

^aCalculated as (1999 value/1990 value) × 100, on the basis of non-rounded data.

Table 3 Total expenditures for dental care in Canada in the 1990s and proportion paid through public funds

Province	1990		1995		1999	
	\$ million	% public	\$ million	% public	\$ million	% public
B.C.	644.5	6.9	875.6	7.9	1099.3	6.0
Alta.	476.8	18.6	567.9	10.1	739.0	8.5
Sask.	109.2	22.1	140.8	18.7	142.4	17.5
Man.	155.9	11.8	199.2	14.7	216.3	11.5
Ont.	1,741.6	2.0	2,410.5	2.1	2,927.8	1.6
Que.	770.0	16.7	981.7	15.4	1,287.7	10.2
N.B.	65.2	8.6	83.6	8.1	105.0	6.2
N.S.	106.2	17.2	129.9	11.4	153.6	9.2
P.E.I.	15.2	15.1	22.3	10.3	21.3	11.8
Nfld.	40.2	21.9	55.9	12.8	59.0	11.5
Y.T.	2.6	54.8	5.1	46.0	6.9	44.1
N.W.T.	11.2	47.8	13.1	54.7	12.0	56.9
Nun.	—	—	—	—	3.6	64.6
Total for Canada^a	4,138.9	9.2	5,485	7.7	6,773.9	5.8

^aTotal may differ from the sum of provincial values because of rounding.

the country as a whole, the proportion of expenditures paid by public sources declined steadily, from 9.2% in 1990 to 5.8% in 1999. This decreasing trend in the public contribution to total dental expenditures was observed for all provinces and territories except the Northwest Territories, where the public share increased from 48% to 57%, and in Ontario, where it remained constant.

Per capita expenditures for dental health care services in Canada increased by 49%, and the trend to higher per capita expenditures was observed in every province and territory except Saskatchewan (Table 4). The greatest per capita increase occurred in the Yukon (153%). Among the provinces, the greatest increase occurred in Quebec (61%);

in contrast, Saskatchewan had a reduction to 70% of the 1990 levels.

Estimates of direct (out-of-pocket) expenses for dental health care (excluding expenses covered by insurance) were collected as part of the Survey for Family Expenditure (for 1990, 1992 and 1996) and the annual Survey of Household Spending (annually from 1997).⁷ Mean direct dental expenses increased from \$183 to \$214 per family between 1990 and 1999. However, as a proportion of all out-of-pocket family health care expenditures, they decreased from 33% in 1990 to 25% in 1999, a finding consistent with families experiencing increases in out-of-pocket nondental health care expenses over the decade.

Table 4 Mean per capita expenditures for dental care in Canada in the 1990s

Province	Per capita expenditure (\$)			Index of change (1990 = 100) ^a
	1990	1995	1999	
B.C.	195	231	272	139
Alta.	187	207	249	133
Sask.	198	138	138	70
Man.	141	176	189	134
Ont.	169	219	253	150
Que.	109	135	175	161
N.B.	88	111	138	157
N.S.	116	142	163	141
P.E.I.	116	165	154	133
Nfld.	69	97	109	158
Y.T.	92	164	233	253
N.W.T.	190	196	293	154
Nun.	—	—	131	—
Overall for Canada	149	186	222	149

^aCalculated as (1999 value/1990 value) × 100.

Table 5 Direct costs of illness in Canada by diagnostic category in 1993 and 1998

Disease category	Cost of illness (\$ billion)		Rank	
	1993 ⁹	1998 ¹⁰	1993	1998
Cardiovascular disorders	7.35	6.82	1	1
Dental disorders ¹¹	4.93	6.30	3	2
Mental disorders	5.05	4.68	2	3
Digestive disorders	3.79	3.54	4	4
Respiratory disorders	3.33	3.46	5	5
Injuries	3.22	3.22	6	6
Cancer	3.12	2.46	7	7

Table 5 compares the direct economic costs of dental health care to the costs of other disease categories based on studies by Health Canada.^{9,10} The direct costs of illness are defined as the value of goods and services for which payment was made and resources used in treatment, care and rehabilitation.¹⁰ Indirect costs, which are not included here, are defined as the value of economic output lost because of illness, injury-related work disability or premature death.¹⁰ In 1993, the direct cost for care of dental conditions (\$4.93 billion) ranked third after cardiovascular diseases (\$7.35 billion) and mental disorders (\$5.05 billion) and was higher than those for cancer, respiratory diseases, digestive diseases and injuries. In 1998, the costs of dental care (\$6.30 billion) surpassed those for mental disorders (\$4.68 billion) and rose to second position after those for cardiovascular diseases (\$6.82 billion).

In terms of total per capita health care expenditures, Canada ranked third in 1998 among the OECD nations, after the United States and Germany. With respect to total per capita dental health care expenditures, Canada ranked fifth, after Germany, Japan, Switzerland and the United States. However, the public share of per capita dental expenditures in Canada was second lowest (greater only than the United States); in this regard, Germany ranked highest, followed by Japan.^{8,11}

Discussion

The trend to increases in human resources and expenditures for dental health care, observed since 1960,^{2,3} continued during the 1990s. The increase in the number of dental care service providers has so surpassed the rate of population growth that by 1999 there was one dental health care provider for every 904 people in the country. Relative to 1990, the index of expenditures on dental health care services in 1999 (164) exceeded that of the increase in the population (110), the consumer price index (118) and the effects of these 2 factors combined (about 130). Over the decade, dental health care made up an increasing share of total health care expenditures (index of change 111), although the latter also increased greatly (index of change 147). By 1999, dental care expenditures made up 0.69% of the country's GDP, an increase of 13%. The trend to less public funding of dental care, already evident in the 1980s,² continued, so that by 1999 less than 6% of costs were publicly financed.

Even with the understatement of direct costs for dental care inherent to this analysis, expenditures on dental care rose from third position in 1993 to second in 1998 relative to the costs of other diseases. In 1998, they were second only to expenditures on cardiovascular diseases.

New to this review are the OECD comparisons. Although different countries may have different definitions of what is included in their health care accounts, it appears that Canada ranks fourth in total per capita health care expenditures and in total per capita dental expenditures, following Germany, Switzerland and the United States. However, in terms of public per capita dental expenditures, Canada ranks next to last.

This review had several limitations. It is a secondary analysis of data provided by CIHI and other sources and is subject to the quality of the data provided. The estimates reported here likely underestimate the true costs because they may omit costs of dental services rendered in hospitals and because of the problems in identifying the practice revenues of denturists. Differences in the quality of data may be particularly problematic for the OECD comparisons, where consistency among nations in the definitions and assembly of data could not be assured. Nonetheless, the review is consistent with the methods used for the 2 previous reports,^{2,3} and the findings should have the same quality as findings in those publications. In addition, because the smallest unit of analysis was the province or territory, more detailed analysis (e.g., by population group or by urban and rural areas) was not possible.

Consistent with the 2 previous reviews,^{2,3} the types and distribution of dental health care services provided to Canadians and the health outcomes produced by these extensive human and financial resources cannot be reported. Although these findings indicate that Canadians are spending more on dental health care than ever before and although others¹² have shown that oral health appears to be improving, questions about the extent to which those Canadians most in need of services have access to oral health care and the effectiveness and efficiency of the system remain unexamined. These issues and others were not addressed in the most recent review¹³ of health care policy in Canada. ♦

Acknowledgements: We would like to express our thanks to the Graduate Student Data Access Program at the Canadian Institute for Health Information (CIHI) for providing the data and to Ms. Joan Porter at the Toronto Office of CIHI for her advice.



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The authors have no declared financial interests.

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