

Dental Caries in Quebec Adults Aged 35 to 44 Years

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A b s t r a c t

Background: The purpose of this study was to assess the prevalence of dental caries in Quebec adults aged 35 to 44.

Methods: A stratified sample was used. The participation rate was 77% for the questionnaire and 44.5% for the oral examination. A total of 2,110 people were examined. The World Health Organization's caries criteria were used. Examiner agreement with gold standard dentist was excellent at the end of the nine-day training session (Kappa index > 0.8).

Results: The level of caries experience is very high in Quebec adults aged 35 to 44. Almost half of dental surfaces (65 of 148) have been affected. These surfaces are mostly missing (39.3) or filled (23.9). However, there were 1.8 decayed surfaces in need of treatment per adult, and more than half the people (55.5%) had no untreated decayed surfaces. Almost three-quarters of decayed surfaces were present in only 14% of the people; lower family income and lower education are risk factors.

Conclusion: Comparison between Quebec and industrialized countries (United States, England and the Netherlands) shows that in adults 35 to 44, the mean number of decayed teeth is low (between 1.0 and 2.2) and the mean number of filled teeth is relatively similar (between 9.6 and 11.1); however, Quebec has a higher percentage than the United States of edentulous people. As well, in dentate adults, there are 1.6 times more missing teeth among Quebecers than among Americans.

MeSH Key Words: adult; Canada; dental caries; Quebec; socioeconomic factors

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Despite the general decrease in dental caries,¹ caries continues to be an important disease in most industrialized countries, particularly for adults aged 35 and over. Yet, very few studies have been conducted that allow us to follow the evolution of this disease in adults.

In Canada, the only source of data at the national level is the Nutrition Canada Study done in 1971/72.² Among Canadian adults aged 19 and over having at least one natural tooth, 96% of subjects had untreated caries and 89% had a DMFT > 10. Although we must be cautious when examining provincial data (because of insufficient examiner calibration and the small-size samples of some subgroups), it is important to note that the global Quebec DMFT is very similar to that

of the other provinces for all age groups. The DMFT is 17.9 for the Quebec group of 30 to 39 years, and 18.6 for people aged 40 to 49 years.

In the United States, two recent studies looked at the dental health of adults. In 1985, the U.S. Department of Health and Human Services³ examined 15,132 employees aged 18 to 64 years (3,720 of whom were between 35 and 44). Among adults aged 35 to 44, there were averages of 1 decayed surface, 26.8 filled surfaces and 3.6 missing teeth (dentate people only, third molars excluded). The second study was conducted in the context of the National Health and Nutrition Examination Survey (NHANES) III⁴ between 1988 and 1991. In the first phase of this study, 1,415 adults aged 35 to 44 were examined

and had averages of 1.9 decayed surfaces, 21.4 filled surfaces and 3.7 missing teeth.

The current study evaluates the prevalence of coronal and roots caries in a representative sample of Quebec adults aged 35 to 44 years. As well, it aims to identify the characteristics associated with a high level of caries to determine which groups of individuals are at most risk.

Methods

Prior to this study, a telephone survey conducted on the adult population of Quebec indicated that 14.0% of Quebecers aged 35 to 44 are edentulous.⁵ Results presented in this article concern only dentate people.

This cross-sectional study was conducted using a stratified sample of randomly selected census areas and households in Quebec (complete sampling strategy is published elsewhere).^{6,7} A total of 2,110 people aged 35 to 44 years were examined between September 1994 and July 1995. The participation rate was 77.0% for the questionnaire on socio-demographic characteristics, dental care utilization and edentulism, and 44.5% for oral examinations. The sample was weighted to represent Quebec's adult population aged 35 to 44 (**Table 1**).

The 10 dentist examiners participated in a nine-day training and standardization session. The session focused on the interpretation of indices measuring pathologies sought during clinical examinations. For coronal caries, the World Health Organization's caries criteria were used.⁸ Inter-examiner reliability and agreement with gold standard dentist were assessed during and at the end of the session. For caries indices, levels of concordance were excellent (Kappa index > 0.8).

Results

To examine if the fall-off in response rate for clinical examination biased the finding, we compared people who participated in the examination and people who only answered the socio-demographic characteristic questionnaire. There were no significant differences in age or last dental visit, but examined people were more often women (54.3% versus 50.8%) and more often had a university degree (27.7% versus 21.6%). Weighting of the data took these differences into account.

The level of caries experience is very high in Quebec adults aged 35 to 44. Close to half of dental surfaces (65 of 148) are affected. These surfaces are largely missing (MS = 39.3) or filled (FS = 23.9); however, only 1.8 surfaces are decayed (**Table 2**), and more than half of the people (55.5%) have no decayed surfaces.

Level of education, language spoken, age, area of residence and sex are associated with the DMFS index. To better understand the relations between socio-demographic characteristics, dental care utilization and caries experience, it is necessary to break down the DMFS.

The difference between women and men lies in the higher number of filled surfaces (25.2 versus 22.6) and missing surfaces (40.5 versus 38.0) among women. In contrast, the number of decayed surfaces is higher in men (2.2 versus 1.4).

Table 1 Socio-demographic characteristics of people (weighted sample), *n* = 2,110

Variables	%
Ages	
35-39 years	51.7
40-44 years	48.3
Sex	
Male	48.7
Female	51.3
Education	
Primary/High school	43.9
Vocational training/College	30.4
University	25.7
Family income	
Less than \$30,000	33.4
\$30,000 to \$59,999	40.1
\$60,000 and more	26.5
Language spoken	
French	84.0
English/Other	16.0
Area of residence	
Metropolitan	33.3
Urban	41.4
Rural	25.3

The mean number of filled surfaces does not vary much between subjects aged 35 to 39 and those aged 40 to 44; however, the mean number of missing teeth in those aged 40 to 44 years is 8.9, whereas it is 7.4 in people aged 35 to 39. It is difficult to determine whether this difference is due to a cohort effect or to the effect of age; in the lapse of five years, adults of this group lose on average 1.5 teeth.

Similar to age, the difference in the DMFS between anglophones and francophones is due to the mean number of missing teeth: 5.9 in anglophones and 8.5 in francophones.

Analysis of the components of the DMFS indicate an association between high family income and frequent use of dental services for restorative treatment. The average number of filled surfaces climbs from 20.5 for people with a family income below \$30,000 to 29.0 for people with a family income above or equal to \$60,000. For decayed surfaces, this phenomenon is reversed, as people with a low family income have close to three times as many decayed surfaces as people with a high family income (2.6 versus 0.9). Finally, people whose family income exceeds or is equal to \$60,000 have fewer missing teeth than people in the lower income groups (7.0 versus 8.3 to 8.9).

Level of education is linked to the different components of the DMFS in the same way as family income. People with primary or secondary levels of education have more missing teeth (9.8 versus 5.8), more decayed surfaces (2.3 versus 1.3) and fewer filled surfaces (19.6 versus 30.0) than people with university training.

Table 2 Mean number of decayed, missing or filled coronal surfaces according to people characteristics^a

	DS	MS (MT)	FS	DMFS
Dentate people ^a	1.8	39.3 (8.2)	23.9	65.0
Sex				
Male	2.2	38.0 (7.9)	22.6	62.8
Female	1.4 ^e	40.5 (8.3) ^b	25.2 ^e	67.1 ^e
Ages				
35-39 years	1.9	35.8 (7.4)	23.7	61.4
40-44 years	1.6 ^b	43.3 (8.9) ^e	24.1 ^{NS}	69.0 ^e
Language spoken				
French	1.8	4.3 (8.5)	23.6	66.7
English/Other	1.9 ^{NS}	28.8 (5.9) ^e	25.7 ^c	56.4 ^e
Family income				
Less than \$30,000	2.6	43.0 (8.9)	20.5	66.1
\$30,000 to \$59,999	1.7	40.3 (8.3)	23.8	65.8
\$60,000 and more	0.9 ^e	34.0 (7.0) ^e	29.0 ^e	63.9 ^{NS}
Level of education				
Primary/High school	2.3	47.4 (9.8)	19.6	69.3
Voc. training/College	1.5	37.7 (7.8)	24.6	63.8
University	1.3 ^e	28.4 (5.8) ^e	30.0 ^e	59.7 ^e
Private dental insurance				
With insurance	1.2	38.1 (7.9)	26.2	65.5
No insurance	2.3 ^e	40.2 (8.3) ^{NS}	22.1 ^e	64.5 ^{NS}
Last visit to a dentist				
One year or less	1.1	36.1 (7.4)	26.7	63.9
More than one year	3.3 ^e	45.7 (9.5) ^e	17.6 ^e	66.5 ^b
Area of residence				
Metropolitan	2.2	34.0 (7.0)	25.1	61.3
Urban	1.4	38.3 (7.9)	25.4	65.1
Rural	1.9 ^e	48.2 (10.0) ^e	19.7 ^e	69.8 ^e

^a = Among dentate people (third molars included)
^b = $p < 0.1$
^c = $p < 0.05$
^d = $p < 0.01$
^e = $p < 0.001$
^{NS} = non significant

Having private dental insurance and the use of dental services within the last year are also factors linked to the mean number of filled and decayed surfaces. People covered by dental insurance have, on average, 26.2 filled surfaces, compared to 22.1 for those without insurance. Similarly, for people who have visited a dentist in the last year, the mean number of filled surfaces is 26.7, whereas those whose last visit occurred over a year previously have a mean number of only 17.6 filled surfaces. Uninsured people have, on average, two times as many decayed surfaces (2.3 versus 1.2) as people with insurance. For dental care utilization, differences are even more pronounced: People who have not used dental services in the last year have an average of three times more decayed

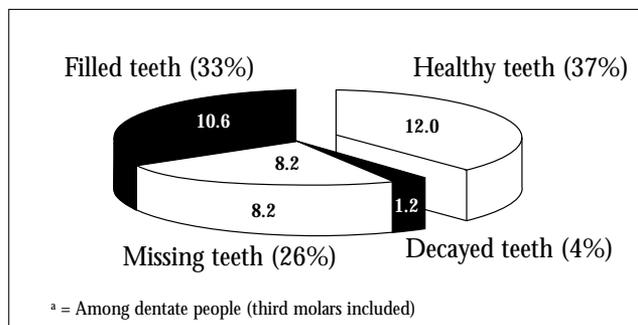


Figure 1: DMFT Components^a

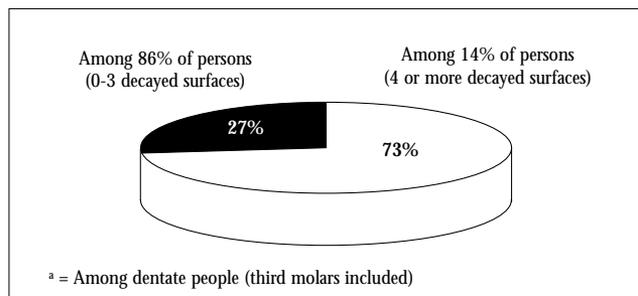


Figure 2: Distribution of decayed surfaces (DF)^a

surfaces (3.3 versus 1.1) than those with regular dental attendance patterns.

Finally, people living in rural areas have more missing teeth (10.0 versus 7.0 and 7.9), and fewer filled surfaces (19.7 versus 25.1 and 25.4) than people residing in urban or metropolitan areas.

Analysis of the DMFT indicates that, on average, 20 teeth (62.5%, third molars included) have experienced caries in Quebec adults aged 35 to 44 years (1.2 decayed teeth, 8.2 missing teeth and 10.6 filled teeth) (Fig. 1).

As in children, there is a high-risk group in adults where there is a concentration of untreated caries. Figure 2 shows the distribution of untreated decayed surfaces for all adults together; 73% of decayed surfaces occur in only 14% of the people (adults having at least 4 decayed surfaces).

To determine factors associated with the presence of several untreated decayed surfaces, a logistic regression was done using the dependent variable of having 4 decayed surfaces or more versus having 0 to 3 decayed surfaces (Table 3).

Individuals with a low family income have close to four times more risk (OR = 3.8) of having 4 decayed surfaces or more than people with a high family income. The same phenomenon can be observed in people who have not visited a dentist in the last year compared to those who have (OR = 3.6).

Males (OR = 2.4) and people without dental insurance (OR = 1.6) are also at higher risk of having 4 or more decayed surfaces. On the other hand, the number of teeth present in the mouth, language spoken, age, level of education and the area of residence are not related in a statistically significant manner to the number of untreated decayed surfaces once all the factors have been assessed.

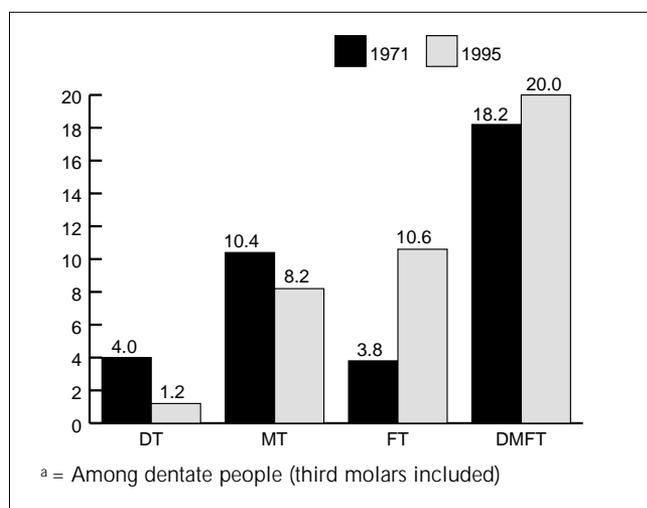


Figure 3: Comparison of DMFT components between 1971 and 1995^a

The average numbers of radicular decayed and filled surfaces in this age group are low (0.3 and 0.4 respectively), and 81.3% of people have no affected radicular surfaces. But it must be noted that more than 50% of people have at least one tooth with an attachment loss of 4 mm or more and that the DF index for root surfaces increases according to the number of teeth having an attachment loss. This finding indicates that the number of radicular surfaces at risk is high and that root caries prevalence could increase with ageing.

Before comparing the results of the Nutrition Canada Study of 1971² with the results of this study, it is important to note that the age groups are slightly different (30 to 49 years versus 35 to 44 years). Between 1971 and 1995, the DMFT in this population rose from 18.2 to 20.0. By examining the components of this index, we observe important changes in the mean number of filled teeth, which jumps from 3.8 to 10.6; however, the mean number of untreated decayed teeth decreases from 4 to 1.2, and the mean number of missing teeth lowers from 10.4 to 8.2 (Fig. 3).

Table 4 lists the DMFT components among adults in the United States in 1985³ and in 1988-91,⁴ in England in 1988,⁹ in the Netherlands in 1986¹⁰ and in Quebec in 1994/95. It is important to note that the Quebec study was conducted four to 10 years after the other four studies. It is probable that the mean numbers of decayed, absent and filled teeth in people aged 35 to 44 in the United States, the Netherlands and England would be lower in 1994 than they were between 1985 and 1991.

In these four countries, the mean number of untreated decayed teeth is low (between 1.0 and 2.2) and the mean number of filled teeth is relatively similar (between 9.6 and 11.1). It is with the number of missing teeth that differences are more significant (between 3.6 and 6.9). Quebec has the highest percentage of edentulous people, and Quebec's dentate adults of this age group have 1.6 times more missing teeth than Americans.

Table 3 Logistic regression: Prediction of people with 4 or more decayed surfaces (versus 0 to 3 decayed surfaces)^a

Variables	%	Adjusted OR	Confidence Interval 95%
Family income			
Less than \$30,000	20.9	3.8	2.19 - 6.48
\$30,000 to \$59,999	13.8	2.9	1.72 - 4.86
\$60,000 and more	4.8		
Last visit to a dentist			
One year or less	8.1		
More than one year	27.5	3.6	2.66 - 4.94
Sex			
Male	18.6	2.4	1.77 - 3.35
Female	10.2		
Private dental insurance			
With insurance	8.7		
No insurance	19.2	1.6	1.12 - 2.22
Number of teeth in mouth			
21 to 32 teeth	12.9		
1 to 20 teeth	19.2	1.4	0.97 - 1.96
Language spoken			
French	14.0		
English/Other	14.7	1.2	0.73 - 1.84
Ages			
35-39 years	14.8		
40-44 years	13.6	1.0	0.74 - 1.36
Level of education			
Primary/High school	17.4	1.2	0.75 - 1.81
Voc. training/College	13.9	1.1	0.69 - 1.71
University	9.9		
Area of residence			
Metropolitan	17.1	1.4	0.90 - 2.09
Urban	12.1	1.3	0.90 - 2.00
Rural	13.8		

^a = Among dentate people (third molars included)

Discussion

The high prevalence of coronal dental caries observed in this adult population is characterized by a very high global DMFS index, low treatment needs and an excessive number of dental extractions.

If we compare the results from the Nutrition Canada Study² with the results of this study, it appears that the mean DMFT is higher in 1994/95 than in 1971/72 in adults aged 35 to 44; however, as we have stressed above, oral data from the Nutrition Canada Study are subject to caution; as well, the age groups are not quite the same. On the other hand, this comparison shows an important change in dental care utilization,

Table 4 Percentage of edentulous people and DMFT (DMFS) components among adults 35-44 years of age in the United States, England, the Netherlands and Quebec

Component	USA (1985)	USA (1988-91)	England (1988)	Netherlands (1986)	Quebec (1994-95)
% of edentulous	2.8%	4.1%	4.0%	9.4%	14%
DT (DS) ^a	-- (1.0)	-- (1.9)	1.0	2.2	1.0 (1.5)
MT (MS) ^a	3.6	3.7 (16.2)	6.9	4.6	5.9 (27.5)
FT (FS) ^a	-- (26.8)	-- (21.4)	11.1	10.6	9.6 (22.3)
DMFT (DMFS) ^a	--	-- (39.5)	19.0	17.4	16.5 (51.3)

^a = Among dentate people (third molars excluded)

with three times fewer untreated decayed teeth and three times more filled teeth in 1994/95.

Therefore, the problem of coronal caries appears well detected in this population, with more than half the people having no caries in need of treatment. Nonetheless, the concentration of caries treatment needs in a limited group of adults (73% of decayed surfaces among 14% of people) indicates that it is necessary to better target these people and to prioritize their access to dental services.

We also note that people with a low family income and those with a low level of education have their teeth extracted more often. It is important to encourage these people to choose conservative treatment more often by promoting dental care utilization and by facilitating financial accessibility to these services.

These results show that the dental care system in Quebec needs to be reorganized. Considering the low need for caries treatment (1.8 surfaces per person), dentists should focus on rehabilitation treatment where the needs are extensive, with an average of 8.2 missing teeth per person (or 5.9 missing teeth excluding third molars). As well, this reorganization should be conducted in a manner that better reaches the people at risk. Finally, the relatively high number of missing teeth in adults indicates a need for dental caries prevention initiatives not only with children but also with adults.

When we compare the Quebec data on coronal caries with the data from the same age group in the United States⁴ (results for dentate people, third molars excluded), we observe a very slight difference when using the DFS, which stands at 23.3 in the United States and 23.8 in Quebec. Thus, once we remove the missing-teeth component from the analysis, Quebec is comparable to the United States. However, the difference widens if we use the DMFS. This index is 39.5 for American adults and 51.3 for Quebec adults. The main difference therefore appears to be the number of extracted teeth: 5.9 in Quebec and 3.7 in the United States. In fact, in 1994/95,

Quebec experienced a tooth extraction rate almost identical to that of United States found in the NHANES study of 1971-74.

We can assume, in the comparison with the United States, that differences in health behaviour, water fluoridation, treatment philosophy and the level and severity of other pathologies (such as periodontal problems) could have had an influence on the intensity of caries experience and be responsible for the higher rate of extraction in the cohort of Quebec adults. Several studies have underlined the benefits of fluoridation on coronal and root caries in adults.¹¹

The high level of the DMFT in adults aged 35 to 44 is explained, in part, by the fact that the fluoridation of toothpaste became commonplace only at the beginning of the 1970s. Thus, adults aged 35 to 44 in 1995 did not benefit from the effect of these fluoride toothpastes during the first 10 to 20 years of their life. In fact, the study by Stamm and others¹² shows that children 14 years of age in 1977 already had a DMFT of 9.4. Twenty-one years later at age 35, those same people have a DMFT of 19.2. The fact that in 20 years almost 10 new teeth in these people experienced caries shows that there is an urgent need for adult prevention programs for dental caries. ♦

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C D A R E S O U R C E
C E N T R E

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