

# Functional and Psychosocial Impacts of Oral Disorders in Canadian Adults: A National Population Survey

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## ABSTRACT

**Background:** In Canada, national health surveys do not usually include questions pertaining to self-perceived oral health. Those that do use ad hoc sets of questions rather than standardized and validated measures of the functional and psychosocial impacts of oral disorders.

**Aims:** To collect national data on the impacts of oral disorders from a representative sample of Canadian adults and to compare the results with similar national surveys conducted in the United Kingdom and Australia.

**Methods:** Data were collected from adults by means of a telephone interview survey based on random-digit dialing. Oral health was measured with the short-form Oral Health Impact Profile (also known as the OHIP-14 questionnaire), which asks about the frequency of 14 functional and psychosocial impacts that people have experienced in the previous year as a result of problems with their teeth, mouth or dentures.

**Results:** Of 3,033 interviews conducted, data were sufficient for analysis for 3,019 respondents. Just under one-fifth of the 3,019 respondents (19.5%) reported 1 or more of the 14 impacts "fairly often" or "very often" in the previous year. The prevalence was higher among edentulous respondents (30.7%) than among dentate respondents (18.6%), as were the extent and severity scores. The prevalence of impacts was lowest in Atlantic Canada (16.1%) and highest in the Prairies (23.3%), although the difference was not statistically significant. Prevalence rates and extent and severity scores were highest among those who wore dentures, recipients of public dental care and irregular dental visitors. Considerable income disparities were also observed, with 34.9% of those from the lowest-income households reporting impacts. The prevalence of effects and the extent and severity scores in Canada were similar to those reported from the United Kingdom and Australia.

**Conclusions:** One in 5 Canadian adults experienced adverse impacts from oral disorders. Further work is needed to identify the material and psychological determinants of these impacts.

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Measures of subjective oral health are now widely employed in oral health research. These include single-item self-ratings of oral health and self-perceived need for dental treatment and multi-item,

multidimensional scales such as the Geriatric Oral Health Assessment Index,<sup>1</sup> the Oral Health Impact Profile<sup>2</sup> and the Child Oral Health Quality of Life Questionnaires.<sup>3</sup> These measures document the functional and

psychosocial impacts of oral disorders and assess issues such as pain, problems with eating and sleeping, concerns about appearance and difficulties in social situations. In Canada, these measures have been used in randomized clinical trials<sup>4</sup>; studies of clinical populations such as children with malocclusion, orofacial conditions<sup>5</sup> and dental trauma<sup>6</sup>; and population-based studies of specific subgroups such as elderly people.<sup>7</sup>

More recently, these measures have been used in studies of national population samples. For example, the 14-item short-form Oral Health Impact Profile (OHIP-14)<sup>8</sup> was used in the 1998 Adult Dental Health Survey in the United Kingdom<sup>9</sup> and the 1999 National Dental Telephone Interview Survey in Australia.<sup>10</sup> The results of these 2 studies were remarkably similar, with 1 in 6 dentate adults reporting 1 or more functional or psychosocial impacts “fairly often” or “very often” in the previous year.<sup>11</sup> The Australian study included edentulous respondents, of whom about one-quarter reported impacts.<sup>10</sup>

Comparable data are not available for Canadians at either the national or the provincial level. Although the 2003 Canadian Community Health Survey had a module concerning subjective oral health, it was an elective component of the survey and was administered in only 3 provinces (Ontario, Saskatchewan and British Columbia) and only 42 of 125 health regions. Consequently, it represented only 35% of respondents to the survey. Moreover, it used an ad hoc set of questions about oral symptoms, difficulty chewing and the social impact of oral disorders, rather than a standardized, theoretically based questionnaire such as the OHIP-14.<sup>8</sup>

Therefore, a large-scale survey of Canadian adults was undertaken with the dual aim of providing data on the prevalence of the functional and psychosocial impacts of oral disorders and collecting data in a manner that would facilitate comparison with the results of national surveys in the United Kingdom and Australia.

## Methods

### Study Design

The study was a telephone interview survey, based on random-digit dialing, of a sample of the Canadian adult population aged 18 years and over. The survey was undertaken on behalf of the research team by a large commercial social research organization, according to the following sampling design.

Canada was divided into 6 regions (Atlantic Canada, Quebec, Ontario, the Prairies [consisting of Manitoba and Saskatchewan only], Alberta and British Columbia), and telephone numbers for households were randomly sampled from these strata. From each participating household, a person aged 18 years or over was selected to be the respondent. Within the strata, quotas were set

**Table 1** Characteristics of respondents to survey of self-reported dental health (*n* = 3,019)

Characteristic	No. (%) of respondents <sup>a</sup>
Sex, male	1,458 (48.3)
Edentulous	242 (8.0)
Wearing one or more dentures	628 (20.8)
Interviewed in French	634 (21.0)
With dental insurance coverage	1,772 (58.7)
Making regular preventive dental visits	2,310 (76.5)
Mean age (SD) (years)	47.9 (16.9)

*SD* = standard deviation.

<sup>a</sup>Except where indicated otherwise.

to ensure accurate representation of respondents by age and sex. The interviews were conducted by fully bilingual (French and English) interviewers, in the language of each respondent’s choice. Because the population sizes of the Yukon, Nunavut and Northwest Territories were very small, accounting for only 0.3% of the Canadian population, these jurisdictions were not included in the survey. The target number of completed interviews was set at 3,000 to allow for precise estimates at the provincial level.

### Measures

The subjective oral health instrument used for the survey was the OHIP-14.<sup>8</sup> As noted above, this survey has been used in other national surveys, specifically surveys done in the United Kingdom<sup>9</sup> and Australia,<sup>10</sup> so it was the measure of choice for the Canadian survey. Its use facilitated comparisons of the outcomes of oral disorders across these 3 national populations.

The OHIP-14, a short form of the OHIP-49,<sup>2</sup> consists of 2 items for each of the 7 subscales in the source instrument (functional limitation, physical pain, psychological discomfort, physical disability, psychological disability, social disability and handicap). The construction of the original version of the survey was guided by a theoretical model of disease, and its outcomes were derived from the International Classification of Impairments, Disabilities and Handicaps, adapted for use with oral disorders.<sup>12</sup> The items for the short form were selected using a controlled regression procedure.<sup>8</sup> Each item asks about the presence of a functional or psychosocial impact associated with problems involving the teeth, mouth and dentures. Items are scored on a Likert-type frequency scale, as follows: never, hardly ever, occasionally, fairly often and very often (coded 0 through 4, respectively). The reference period was the previous year.

**Table 2** Prevalence, extent and severity of effects of self-perceived dental health

Variable	Respondent group; estimate (95% confidence interval)		
	All	Dentate	Edentulous
Prevalence (%)	19.5 (17.9–21.1)	18.6 (16.5–19.4) <sup>a</sup>	30.7 (24.5–35.2)
Extent (mean score)	0.49 (0.44–0.55)	0.45 (0.40–0.50) <sup>b</sup>	0.86 (0.63–1.11)
Severity (mean score)	4.9 (4.6–5.2)	4.6 (4.3–4.8) <sup>b</sup>	7.2 (6.1–8.3)

<sup>a</sup>For difference between dentate and edentulous groups,  $p < 0.0001$  ( $\chi^2$  test).

<sup>b</sup>For difference between dentate and edentulous groups,  $p < 0.0001$  (t-test for independent samples).

### Data Analysis

Before analysis, the data were subjected to a 2-stage weighting process. During the first stage, relative weights were calculated to take account of disproportionate sampling from the 6 strata. Post-stratification weights were then calculated on the basis of actual age and sex distributions within the regions, using data from the census of 2006. These 2 weights were multiplied, and the product was used to weight the data.<sup>13</sup> This weighting process made the sample more representative of the Canadian adult population.

Responses for individuals with 2 or more missing values on the OHIP-14 were deleted from the data file. Any remaining missing values were replaced with the mean value for that item, computed from the values for respondents who gave valid responses. These data were used to calculate 3 summary variables as suggested by Slade and colleagues<sup>11</sup>:

- Prevalence: the percentage of respondents reporting 1 or more impacts “fairly often” or “very often.” This variable identifies those whose oral health impacts are chronic rather than transitory.
- Extent: the number of items reported “fairly often” or “very often.”
- Severity: the sum of the response codes for the 14 items. This takes into account impacts experienced at all levels of frequency. Given the response codes, this score can range from 0 to 56, higher values indicating more frequent impacts.

These summary variables were used in descriptive analyses of the functional and psychosocial consequences of oral disorders within the target population. Associations between OHIP-14 impacts and independent variables were tested using one-way analysis of variance, Spearman’s rank correlation coefficients and  $\chi^2$  tests. The data were analyzed using the data analysis procedures for surveys provided in Stata 10 data analysis and statistical software (Stata Corp LP, College Station, TX). These procedures allow adjustment of standard errors to take account of the stratified sampling design.

### Results

#### Respondents’ Characteristics

Interviews with 3,033 respondents were completed, and 3,019 of the respondents were included in the analyses (Table 1). About half of the respondents were male. Respondents ranged in age from 18 to 95 years (mean age 47.9 years). Four-fifths of respondents were interviewed in English, and the remainder in French. Just under 10% were edentulous, and one-fifth wore one or more dentures. Almost 60% of respondents had dental insurance, and three-quarters reported making regular preventive dental visits.

#### Prevalence, Extent and Severity of Impacts

Overall, just under 20% of the respondents reported 1 or more impacts “fairly often” or “very often” in the previous year (Table 2). However, the mean number of impacts reported was very low (0.49). This result was partly a reflection of the fact that among those who reported any impacts, half (49.1%) reported only a single impact. Five or more impacts were reported by 88 respondents or 2.9% of the sample overall. The mean severity score was also low, at 4.9, which represented 9% of the scale range of 56.

Prevalence, extent and severity were significantly higher among edentulous respondents than among dentate respondents, with 30.7% of the former group reporting that 1 or more impacts had occurred frequently in the previous year (Table 2). Among edentulous respondents, the mean severity score (7.2) represented 13% of the scale range.

The individual OHIP items most commonly reported involved the physical pain and psychological discomfort subscales of the measure, with feeling self-conscious and painful aching in the mouth being reported by more than 5% of the sample (Table 3). More severe impacts such as difficulty doing usual jobs and total inability to function were uncommon (each reported by about 1% of the sample). In terms of mean item scores, painful aching in the mouth, discomfort while eating foods and feeling self-conscious were the most frequently reported.

**Table 3** Prevalence<sup>a</sup> and mean score of OHIP-14 items

OHIP subscale and item	Prevalence (%)	Mean item score
<b>Functional limitation</b>		
Had trouble pronouncing words ( <i>n</i> = 3,011)	1.9	0.18
Felt that sense of taste had worsened ( <i>n</i> = 2,992)	3.2	0.25
<b>Physical pain</b>		
Had painful aching in mouth ( <i>n</i> = 3,017)	5.4	0.61
Was uncomfortable eating foods ( <i>n</i> = 3,019)	3.9	0.59
<b>Psychological discomfort</b>		
Has been feeling self-conscious ( <i>n</i> = 2,998)	6.9	0.51
Has felt tense ( <i>n</i> = 2,992)	4.4	0.39
<b>Physical disability</b>		
Diet has been unsatisfactory ( <i>n</i> = 3,008)	3.6	0.34
Has had to interrupt meals ( <i>n</i> = 3,012)	1.8	0.23
<b>Psychological disability</b>		
Finds it difficult to relax ( <i>n</i> = 3,018)	3.3	0.36
Has been a bit embarrassed ( <i>n</i> = 3,006)	2.8	0.35
<b>Social disability</b>		
Has been irritable with other people ( <i>n</i> = 3,012)	2.7	0.35
Has had difficulty doing usual jobs ( <i>n</i> = 3,003)	1.1	0.16
<b>Handicap</b>		
Has found life less satisfying ( <i>n</i> = 3,009)	3.1	0.30
Has been totally unable to function ( <i>n</i> = 3,013)	0.6	0.01

<sup>a</sup>Percent of respondents reporting item fairly often or very often.

Although there were no differences in prevalence, extent or severity by age or language group, there were small but significant differences in the extent and severity scores by sex, with women having higher scores for both measures (Table 4). Some regional differences were evident, the Prairies, Alberta and British Columbia having prevalence rates 5%–7% higher than those in Atlantic Canada. However, these differences were not significant.

Differences by household income were statistically significant and substantial (Table 4). The prevalence of

**Table 4** Prevalence, extent and severity by selected characteristics of respondents

Characteristics	Prevalence (%)	Extent (mean score)	Severity (mean score)
<b>Sex (<i>n</i> = 3,019)</b>			
Male	19.0	0.44 <sup>a</sup>	4.6 <sup>a</sup>
Female	20.0	0.56	5.2
<b>Age group (<i>n</i> = 3,019)</b>			
18–34 years	21.4	0.50	5.1
35–54 years	18.3	0.47	4.8
≥55 years	19.5	0.52	4.9
<b>Language (<i>n</i> = 3,019)</b>			
English	20.4	0.52	5.0
French	16.5	0.41	4.4
<b>Region (<i>n</i> = 3,019)</b>			
Atlantic	16.1	0.39	3.8
Quebec	16.9	0.40	4.4
Ontario	19.9	0.51	4.9
Prairies <sup>b</sup>	23.3	0.50	5.0
Alberta	22.3	0.64	5.5
British Columbia	21.0	0.54	5.5
<b>Income category (<i>n</i> = 2,649)</b>			
<\$20,000	34.9 <sup>c</sup>	1.09 <sup>c</sup>	8.2 <sup>c</sup>
\$20,000–39,999	24.6	0.65	6.2
\$40,000–59,999	19.4	0.50	5.0
\$60,000–79,999	15.1	0.33	4.6
\$80,000–120,999	16.3	0.24	3.2
>\$120,000	12.4	0.24	3.0
<b>Wearing dentures (<i>n</i> = 3,006)</b>			
Yes	27.4 <sup>c</sup>	0.87 <sup>c</sup>	7.1 <sup>c</sup>
No	17.3	0.39	4.3
<b>Payment for dental care (<i>n</i> = 3,019)</b>			
Private insurance	15.4 <sup>c</sup>	0.32 <sup>c</sup>	6.0 <sup>c</sup>
Out of pocket	24.2	0.71	8.5
Public plan	36.4	1.20	10.6
<b>Dental visits (<i>n</i> = 3,019)</b>			
Never or irregular	26.1 <sup>c</sup>	0.83 <sup>c</sup>	9.1 <sup>c</sup>
Regular	17.3	0.39	6.1

<sup>a</sup>*p* < 0.05

<sup>b</sup>Manitoba and Saskatchewan.

<sup>c</sup>*p* < 0.001

impacts was almost 3 times higher in the lowest-income group than in the highest-income group. A similar pattern was observed for both extent and severity scores.

Prevalence rates and extent and severity scores were higher among those who wore one or more dentures, and these differences persisted when responses for edentulous individuals were excluded from the analysis. There was a clear gradient in prevalence rates and severity scores according to how respondents paid for dental care: the lowest rates and scores were observed for those covered by private dental insurance plans, and the highest for those whose care was paid for by public plans. The prevalence of impacts among the latter group was twice that of the former group. Out-of-pocket payers had rates and scores between these 2 extremes. Similarly, those who never visited a dentist or visited irregularly had higher rates and scores than those who reported regular preventive dental visits.

## Discussion

This survey was the first large-scale, population-based study of Canadian adults to document subjective oral health using a theoretically grounded, standardized measure, in this case, the OHIP-14. Although the Yukon, Nunavut and Northwest Territories were excluded from the survey, these jurisdictions represent only 0.3% of the Canadian population. Consequently, for all intents and purposes, the study provides data at a national level. Although data were collected in all 10 provinces, the sample sizes for some provinces were too small to provide reliable provincial level estimates, so only national estimates have been reported.

The main finding of the study was that 19.5% or 1 in 5 Canadian adults reported experiencing 1 or more functional and psychosocial impacts as a result of oral disorders fairly often or very often in the previous year. As expected, there were significant differences in prevalence between dentate (18.6%) and edentulous (30.7%) respondents. The prevalence rate for dentate respondents was similar to that reported from national surveys in the United Kingdom (15.9%)<sup>9</sup> and Australia (18.2%).<sup>10</sup> Among edentulous respondents, the prevalence in Canada was 7 percentage points higher than that in Australia (23.9%), although the 95% confidence limits for these estimates overlapped. Another similarity among the 3 national surveys was the regional differences in prevalence (5 to 7 percentage points). In Australia the range was from 14.8% in Western Australia to 22.3% in the Australian Capital Territory, whereas in the United Kingdom, prevalence ranged from 13.6% in Wales to 19.8% in Scotland. In Canada, the range was from 16.1% in Atlantic Canada to 23.3% in the Prairies (Manitoba and Saskatchewan combined). However, since all these differences were not statistically significant, they might have resulted from sampling error. Extent and severity scores were broadly similar across the 3 populations; where differences were observed, they were small, with overlapping 95% confi-

dence intervals. However, conclusions about similarities and differences among the 3 national populations are difficult to draw, given that the data collection methods differed to some extent; because of these methodological differences, the data might have shown differences that did not in fact exist or masked differences that were in fact present. Nevertheless, the overall picture suggests remarkable consistency in the prevalence and severity of oral impacts as documented by the OHIP-14.

Examination of prevalence rates and scores for individual items indicated that the most common impacts were those related to physical pain and psychological discomfort, with feeling self-conscious and painful aching in the mouth being the most prevalent. This pattern was also observed in the surveys done in the United Kingdom and Australia. That the first of these 2 impacts was the most prevalent item overall may reflect the increasing emphasis on dental appearance and the promotion by the dental profession and commercial organizations of cosmetic procedures such as bleaching. Prevalences and scores for functional limitation items were lower, perhaps because this subscale does not contain an item related to difficulties chewing, which is one of the more common outcomes of conditions such as tooth loss and an impact that tends to be prevalent among older populations and denture wearers. This represents one of the limitations of the OHIP-14.

As in the United Kingdom and Australian studies, there were large “floor effects,”<sup>11</sup> whereby most respondents reported no impacts at a frequency of fairly often or very often; as a result, mean extent and severity scores were low. This was to be expected in a population-based study where most respondents were likely to have acceptable levels of oral health and high rates of dental insurance coverage and regular dental visiting. These low scores also reflect the content of the OHIP-14. About half of the items in this instrument are concerned with relatively severe impacts, such as difficulty doing usual jobs and total inability to function, which are most likely to be seen in populations with relatively severe compromise, such as those requesting treatment with implant-supported dentures<sup>4</sup> and those with chronic facial pain.<sup>14</sup> In a general population sample, the percentage of respondents reporting such impacts could be expected to be very low.

Certain subsections of the population, such as respondents from low-income households and those who received dental care through public dental care programs, manifested fewer “floor effects” and more substantial mean severity scores. Here, prevalence rates were about 35% for low-income respondents and those without private dental insurance, and the severity scores for these groups were significantly higher than those for individuals from high-income households and respondents with private dental insurance coverage. Health disparities like

these are currently of concern from both a research perspective and an oral health policy perspective. Since such disparities have been observed for the majority of health indicators, it is not surprising that they emerged in this study. The origins of disparities in subjective oral health need to be identified, to allow implementation of interventions to reduce the gap between socioeconomically advantaged and disadvantaged groups.

This simple descriptive study has filled a gap in current Canadian data on oral health by providing preliminary national estimates of subjectively perceived oral health, as documented by the OHIP-14 instrument. The OHIP-14 is a self-reported survey, so no clinical data were collected, which is a limitation of the study design. However, associations between clinical indicators, other than tooth loss, and subjective measures tend to be weak and provide little in the way of explanations for variations in OHIP-14 scores.<sup>15</sup> The next step will be to identify variables that explain the observed variations in self-perceived oral health. Other studies have suggested that socioeconomic position and tooth loss are the main determinants of the prevalence and severity of oral impacts.<sup>16</sup> However, since the relative effect of these variables is likely to differ between and within national populations,<sup>16</sup> further analysis is warranted to determine if this is the case for Canadian adults. ♦

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