

# Cigarette Smoking, Stages of Change, and Major Depression in the Canadian Population

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**Objective:** To describe the 12-month prevalence of major depression in relation to smoking status, nicotine dependence levels, commitment to quit, attempts to quit, and maintenance of smoking cessation in the Canadian general population.

**Method:** Data from Public Use Microdata File of the Canadian Community Health Survey: Health and Well-Being were used. The Composite International Diagnostic Interview—Short Form (CIDI-SF) for major depression was used to assess depressive disorder status. The survey also included a smoking module. There were 49 249 respondents assessed by the CIDI-SF, of whom 10 236 were administered the smoking module. Analyses used appropriate measures to deal with survey design effects.

**Result:** The prevalence of major depression was highest in current smokers, followed by ever smokers, former smokers, and was lowest in the never smokers. This pattern persisted after stratification for age and sex. For quitting, the prevalence of major depression was highest among people who tried to quit, followed by those who considered quitting, those who quit in the past year, and lowest among those who maintained their smoking cessation status for longer than 1 year. The prevalence of depression among those with a high nicotine dependence level, as assessed by the Fagerstrom Tolerance Questionnaire, was about twice that of people with a low nicotine dependence level.

**Conclusion:** The strikingly high prevalence of major depression among current smokers who are young, trying to quit, and with high nicotine dependence levels in the general population indicates that further longitudinal exploration of this topic is urgently needed. Can J Psychiatry. 2009;54(3):204–208.

### Clinical Implications

- People wanting to quit or attempting to quit smoking have an elevated prevalence of major depression.
- Poor smoking cessation outcomes may be related to elevated prevalence of major depression within the first year of smoking cessation.
- Smokers with high levels of nicotine dependence have an increased prevalence of major depression.

### Limitations

- Due to the cross-sectional nature of the survey, causal inferences cannot be made.
- Due to the small number of observations in some of the cells (less than 30 observations), age- and sex-specific estimates could not be evaluated for all strata.
- Further research will be required to fully determine the implications of these findings for smoking cessation treatment.

**Key Words:** major depression, 12-month prevalence, cross-sectional studies, nicotine dependence, Fagerstrom Tolerance Questionnaire

The role of major depression as an impediment to smoking cessation has received attention since the late 1980s.<sup>1</sup> Numerous studies have explored the association of depression with smoking cessation,<sup>2-4</sup> and many hypotheses have been put forward about the influence of depression on smoking cessation, abstinence, and relapse.<sup>5-8</sup> Few population-based studies,<sup>2-9</sup> and no Canadian studies, have been reported.

Cigarette smoking has long been found to be more prevalent in the psychiatric population than the general population<sup>10</sup>; however, cigarette smoking may be related to major depression in the general population in important ways. The current study provides descriptive data about the relation between smoking, nicotine dependence, stages of change (contemplation of quitting, attempting to quit, and maintenance of quitting), and major depression prevalence in the Canadian general population.

## Methods

The CCHS is a cross-sectional household survey conducted by Statistics Canada (CCHS methods described elsewhere<sup>11</sup>). Cycle 2.1 of the CCHS interviewed a representative sample of Canadian household residents between January 2002 and December 2003. The CCHS incorporates the CIDI-SF for assessing major depression prevalence. This is a brief adaptation of the major depression module of the full CIDI,<sup>12</sup> which is currently the standard structured diagnostic interview in psychiatric epidemiologic studies.<sup>13</sup> The CIDI-SF identifies respondents with a high probability of past-year episodes of major depression according to diagnostic criteria from the DSM-III-R, which closely resemble those of DSM-IV.<sup>14</sup> The CCHS 2.1 also included a smoking module that assessed smoking status, a stages of change questionnaire (based on the Transtheoretical Model of Change<sup>15</sup>), and the Fagerstrom Tolerance Questionnaire.<sup>16</sup> Another indicator of high nicotine dependence is smoking even when sick,<sup>17</sup> which was also assessed by the CCHS 2.1 smoking module. Both the CIDI-SF and smoking modules were optional content that could be selected by individual provinces and health regions. These items and instruments were administered to a sizable subset (shown below), but not all of the ( $n = 134\ 072$ ) sample members.

A total of 49 249 respondents were assessed by the CIDI-SF ( $n = 46\ 271$  nondepressed and  $n = 2978$  depressed). Within this group, 10 236 respondents were administered the smoking module. The Fagerstrom Tolerance Questionnaire is only relevant to those who were current smokers, and was administered to a subset of 2306 of these respondents. There were 2481 responses to the item about smoking when sick. All estimates were weighted to adjust for unequal selection probabilities, multistage and clustered sampling, and nonresponse. Confidence intervals were calculated using CV from tables provided by Statistics Canada for this purpose.<sup>18</sup> All estimates adhere to release cut-offs and guidelines provided by Statistics Canada.<sup>18</sup>

## Results

As shown in Table 1, an elevated prevalence of major depression was observed in current smokers (10.6%) with former smokers (5.3%) having a prevalence that fell between this value and that of never smokers (3.9%). The results were similar after stratification for age and sex. However, within the current and former smoking categories, the estimates tended to be higher in a younger age group (aged 12 to 44 years) than an older group (45 years and older). The prevalence of major depression among current smokers was higher in the younger age category than in the older one: PD = 4.7% (95% CI 2.7 to 6.7). As the 95% confidence interval does not extend into the negative range, the difference is unlikely to be due to sampling variability. Among the current smokers, the PD between those who smoked daily and those who smoked occasionally was 3.4% (95% CI 1.2 to 5.5). Again, the confidence intervals indicate that the difference is unlikely to be due to sampling variability. Among ever smokers, prevalence of major depression was lowest among those who had successfully quit smoking for longer than 1 year (4.8%), a prevalence that closely resembles that of the general population. In contrast, it was higher among people who reported that they were trying to quit (12.5%), had quit in the past year (9.7%), or had not considered quitting (10.7%). The PD between those who tried to quit unsuccessfully, and those who successfully quit for a period longer than a year was 7.7% (95% CI 5.5 to 9.9).

As shown in Table 1, the PD for major depression among smokers with a high nicotine dependence level, compared with those with a low nicotine dependence level, was 7.8% (95% CI 0.8 to 14.9). This is a large PD, but the confidence intervals approach a null value of one, indicating that the actual difference in the population may be small. Owing to the small number of observations in some of the cells, age- and sex-specific estimates could not be further evaluated. The prevalence of major depression was higher among people who reported smoking even when sick (21.9%), than for those who reported that they would not smoke when sick (9.7%), for a PD of 12.2% (95% CI 5.8 to 18.6).

### Abbreviations used in this article

CCHS 2.1	Canadian Community Health Survey: Health and Well-Being
CIDI-SF	Composite International Diagnostic Interview—Short Form
CV	coefficient of variation
DSM	Diagnostic and Statistical Manual of Mental Disorders
PD	prevalence difference

**Table 1 Unadjusted, age-specific, and sex-specific estimates (%) of the frequency of major depression in relation to smoking category, attempting to quit smoking, nicotine dependence levels,<sup>a</sup> and smoking even when sick<sup>b</sup>**

Category	Unadjusted 12-month Prevalence	Age <sup>c</sup> group (12 to 44 years)	Age <sup>c</sup> group (45+ years)	Women <sup>c</sup>	Men <sup>c</sup>
Never smoked, <i>n</i> = 18 117 Not depressed, <i>n</i> = 17 416 Depressed, <i>n</i> = 701	3.9	4.3	3.1	4.6	2.8
Current smoker, <i>n</i> = 11 787 Not depressed, <i>n</i> = 10 522 Depressed, <i>n</i> = 1265	10.6	12.2	7.5	14.8	7.2
Daily smoker, <i>n</i> = 9478 Not depressed, <i>n</i> = 8425 Depressed, <i>n</i> = 1053	11.4	13.4	7.9	15.5	8.0
Occasional smoker, <i>n</i> = 2309 Not depressed, <i>n</i> = 2097 Depressed, <i>n</i> = 212	8.0	8.9	5.1 <sup>d</sup>	12.4	4.5 <sup>d</sup>
Former smoker, <i>n</i> = 19 345 Not depressed, <i>n</i> = 18 333 Depressed, <i>n</i> = 1012	5.3	6.9	4.0	7.4	3.6
Did not try to quit, <i>n</i> = 2132 Not depressed, <i>n</i> = 1917 Depressed, <i>n</i> = 215	10.7	12.6	7.7 <sup>d</sup>	15.5	6.8
Tried to quit, <i>n</i> = 2731 Not depressed, <i>n</i> = 2363 Depressed, <i>n</i> = 368	12.5	14.0	8.8 <sup>d</sup>	17.75	8.5
Quit last year, <i>n</i> = 535 Not depressed, <i>n</i> = 474 Depressed, <i>n</i> = 61	9.65 <sup>d</sup>	10.8 <sup>d</sup>	— <sup>e</sup>	17.4 <sup>d</sup>	— <sup>e</sup>
Quit > 1 year, <i>n</i> = 4838 Not depressed, <i>n</i> = 4589 Depressed, <i>n</i> = 249	4.8	6.8	3.7	6.4	3.6
Low-dependence, <sup>a</sup> <i>n</i> = 1354 Not depressed, <i>n</i> = 1209 Depressed, <i>n</i> = 145	11.6	14.75	— <sup>e</sup>	— <sup>f</sup>	— <sup>f</sup>
High-dependence, <sup>a</sup> <i>n</i> = 624 Not depressed, <i>n</i> = 509 Depressed, <i>n</i> = 115	19.4	23.9	— <sup>f</sup>	27.8	— <sup>f</sup>
Smokes when sick, <sup>b</sup> <i>n</i> = 648 Not depressed, <i>n</i> = 516 Depressed, <i>n</i> = 132	21.9	25.75	14.8 <sup>d</sup>	30.6	12.6
Do not smoke when sick, <i>n</i> = 1833 Not depressed, <i>n</i> = 1655 Depressed, <i>n</i> = 178	9.7	13.0	— <sup>e</sup>	12.1	7.9

<sup>a</sup> Nicotine dependence levels were measured using the Fagerstrom Tolerance Questionnaire<sup>16,17</sup>

<sup>b</sup> Smoking even when sick is another measure of high nicotine dependence.<sup>8</sup>

<sup>c</sup> Calculated directly from the Approximate Sampling Variability Table by Canada provided by Statistics Canada

<sup>d</sup> CV of the estimate was found to be marginally acceptable according to Statistics Canada release guidelines owing to high sampling variability (CV = 16.6 to 33.3).

<sup>e</sup> The CV of the estimate was found to be unacceptable according to Statistics Canada release guidelines owing to CV > 33% and does not meet the quality standards set forth by Statistics Canada.

<sup>f</sup> The number of people on which an estimate is based is less than 30. Hence, the weighted estimate was not released.

## Discussion

We observed a high prevalence of major depression among current smokers in the general Canadian population. This prevalence was especially elevated among smokers in the younger age groups. This may have important public health implications. Specifically, identification of adolescents at risk for smoking may allow more efficient targeting of intensive education resources. Further, effective management of depression in these people may contribute to reduced rates of smoking, a possibility that deserves exploration in future longitudinal studies.

This analysis also provides important data on the relation of depression to smoking cessation patterns and nicotine dependency. On the stages of change questionnaire, the highest prevalence of major depression was found among people who tried to quit unsuccessfully in the last year. These results run contrary to the common belief among health care providers that depressed smokers are less interested or less willing to quit smoking. However, the high prevalence of major depression among unsuccessful quitters suggests that they may be less able to successfully quit. This finding is in agreement with other studies in the literature, which showed that depressive symptoms tend to be exacerbated after smoking cessation.<sup>19,20</sup> For people who successfully quit in the last year, the prevalence of major depression was surprisingly high, compared with the prevalence among those who had quit successfully for more than a year, which have prevalence levels that resemble those among the never smokers.

People having evidence of nicotine dependence had an elevated prevalence of major depression. This is in agreement with findings in the literature that reported stronger association between major depression and nicotine dependence than cigarette smoking,<sup>21</sup> and with studies suggesting that nicotine dependence may be related to the etiology of major depression through shared genetic or environmental factors.<sup>22,23</sup>

One limitation of this study is the potential lack of specificity of the CIDI-SF, which could result in the overestimation of the prevalence of major depression.<sup>24</sup> This may arise from an inability to distinguish major depression from dysthymia, adjustment disorder, organically induced depressive syndromes, and bereavement. For example, the CIDI-SF does not distinguish between major depressive disorder, major depressive episodes that occur as part of a bipolar disorder, those that occur as part of substance use disorder, or those that occur in the course of psychotic disorders. Therefore, the issue of comorbidity of major depression with other mental disorders in cigarette smokers was not accounted for in this analysis and deserves further investigation.

Existing literature suggests that causal mechanisms are likely to go in both directions: long-term smoking may contribute to the etiology of major depression by altering brain

neurochemistry.<sup>25</sup> Additionally, major depression can influence the course of cigarette smoking.<sup>26</sup> The cross-sectional nature of the data represents another limitation of this analysis, as directional causation cannot be addressed. The extent to which smoking may influence the development or persistence of depression, as opposed to an effect of depression on smoking initiation or persistence, cannot be fully determined, nor can an effect of nonspecific psychiatric symptoms, such as distress, be excluded as a causal mechanism. We also had limited data on other factors that may influence the initiation or maintenance of smoking such as educational or socio-economic factors.

## Conclusions

As an appreciable number of people in the general population who are trying to quit smoking are depressed, smoking cessation programs should have the capacity to deal with this clinical reality. This is further reinforced by the possibility that attempts to quit may increase the risk of major depressive episodes. Smoking cessation services need to coordinate their activities with suitable mental health services. Elucidation of the directionality of these associations by longitudinal studies deserves further attention.

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### Résumé : Le tabagisme, les phases du changement, et la dépression majeure dans la population canadienne

**Objectif :** Décrire la prévalence de 12 mois de la dépression majeure relativement au statut de fumeur, aux niveaux de dépendance à la nicotine, à la décision de cesser, aux tentatives de cesser, et au maintien de l'abandon du tabagisme dans la population canadienne générale.

**Méthode :** Les données du fichier de microdonnées à grande diffusion de l'Enquête sur la santé dans les collectivités canadiennes, cycle 2.1, ont été utilisées. La forme abrégée de l'entrevue diagnostique composite internationale (CIDI-SF) pour la dépression majeure a été utilisée pour évaluer l'état du trouble dépressif. L'enquête comportait aussi un module sur le tabagisme. Il y a eu 49 249 répondants évalués par la CIDI-SF, desquels 10 236 ont répondu au module de tabagisme. Les analyses utilisaient les mesures appropriées pour traiter des effets de la méthode de l'enquête.

**Résultat :** La prévalence de la dépression majeure était la plus élevée chez les fumeurs actuels, suivie des personnes ayant déjà fumé, des anciens fumeurs, et elle était la plus faible chez les personnes n'ayant jamais fumé. Ce modèle persistait après la stratification pour l'âge et le sexe. En ce qui concerne l'abandon du tabac, la prévalence de la dépression majeure était la plus élevée chez ceux qui tentaient de cesser de fumer, suivie de ceux qui songeaient à cesser, de ceux qui avaient cessé dans l'année précédente, et elle était la plus faible chez les personnes qui avaient maintenu leur abandon du tabac pendant plus d'un an. La prévalence de la dépression chez les personnes ayant un niveau de dépendance à la nicotine élevé, tel qu'évalué par l'échelle de Fagerstrom, était environ deux fois celle des personnes ayant un faible niveau de dépendance à la nicotine.

**Conclusion :** La prévalence étonnamment élevée de la dépression majeure chez les fumeurs actuels qui sont jeunes, chez ceux qui tentent de cesser, et chez ceux ayant un niveau de dépendance à la nicotine élevé dans la population générale indique qu'il est urgent de mener plus de recherche longitudinale à ce sujet.