

# Insomnia

Michael Tjepkema

## Abstract

### Objectives

This article estimates the prevalence of insomnia among Canadians aged 15 or older, and factors related to it. Associations between insomnia and coping ability, work status, two-week disability days and life dissatisfaction are analyzed.

### Data sources

The data are from the 2002 Canadian Community Health Survey: Mental Health and Well-being.

### Analytical techniques

Cross-tabulations were used to estimate the prevalence of insomnia by selected characteristics. Associations between these characteristics and insomnia, and between insomnia and selected negative situations, were examined in multivariate logistic regression models.

### Main results

In 2002, an estimated 3.3 million Canadians (13.4% of the household population aged 15 or older) had insomnia. Factors independently associated with insomnia included painful chronic conditions, activity limitations, mood and anxiety disorders, life stress, frequent use of alcohol or cannabis, obesity, and low education. Compared with those who did not have insomnia, people with insomnia were more likely to report negative situations such as difficulty coping and not having a job.

## Keywords

sleep, sleep problems, chronic conditions, mood disorders, anxiety disorders, stress, alcohol, drug abuse, physical activity

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For a substantial number of Canadians, a good night's sleep is an elusive and frustrating goal. Many suffer from insomnia, the most common sleep disorder.<sup>1</sup> Insomnia may involve difficulty falling asleep, difficulty remaining asleep, early morning awakenings or non-restorative sleep.<sup>2-5</sup> People with insomnia may have trouble concentrating, remembering or accomplishing daily tasks.<sup>2,6-9</sup> They also have a relatively high risk of accidents.<sup>10</sup> The economic consequences include the costs of increased use of health care services,<sup>7,11,12</sup> work absences, and work-related injuries.<sup>2,13,14</sup> Insomnia has been associated with physical and mental illnesses; however, because insomnia can be both a symptom of another condition or a disorder in itself,<sup>15</sup> the direction of these relationships is not always clear.<sup>2</sup>

Based on data from the 2002 Canadian Community Health Survey (CCHS): Mental Health and Well-being, this article presents prevalence rates of insomnia for the household population aged 15 or older (see *Methods*). Factors associated with insomnia are explored in multivariate models (see *Definitions*). Associations between insomnia and coping skills, work status, disability days and life satisfaction are examined.

## Methods

### Data sources

The analysis in this article is based on cycle 1.2 of the Canadian Community Health Survey (CCHS): Mental Health and Well-being, which began in May 2002 and was conducted over eight months. This cycle covered people aged 15 or older living in private dwellings in the 10 provinces. Residents of the three territories, Indian reserves, institutions, certain remote areas and Canadian Armed Forces bases, and full-time members of the Forces were excluded.

The sample was selected using the area frame designed for the Canadian Labour Force Survey. A multi-stage stratified cluster design was used to sample dwellings within this area frame. One respondent aged 15 or older was randomly selected from the sampled households. Most interviews (86%) were conducted in person; the remainder, by telephone. Proxy responses were not accepted. The responding sample consisted of 36,984 people aged 15 or older; the response rate was 77%. More detailed descriptions of the design, sample and interview procedures can be found in other reports and on the Statistics Canada Web site.<sup>16,17</sup>

### Analytical techniques

Cross-tabulations based on data from the 2002 CCHS were used to estimate the prevalence of insomnia by age and sex.

To investigate factors associated with insomnia, correlates were selected based on the literature and on availability in the CCHS

(Appendix Table A). A bivariate analysis then determined if a statistical relationship existed between each correlate and insomnia. If there was no association, the correlate was not used in the multiple logistic regression models.

This analysis used a series of six cascading multiple logistic regression models to examine insomnia in relation to an increasing array of independent variables. The first model included only socio-demographic variables. In the second, body mass index, physical activity levels, heavy weekly drinking and weekly illicit drug use were added. Shift work was added in the third model; life stress and work stress, in the fourth. The fifth model added chronic conditions and activity limitations. Mood and anxiety disorders were added in the sixth (see *Definitions*).

Separate analyses for men and women yielded similar odds ratios for independent factors. Therefore, the sexes were combined, and tests for sex interactions with each independent factor were conducted. There were no statistically significant interactions by sex, except that anxiety had higher odds for men than women, and bronchitis and “a bit” of life stress had higher odds for women than men.

To account for the effects of survey design, the variance on prevalence, on differences between prevalence rates, and on odds ratios was calculated using the bootstrap technique.<sup>23-25</sup>

### Difficult to define

There are no standard criteria for defining insomnia.<sup>18-20</sup> Consequently, estimates of its prevalence vary, with each definition yielding a different figure.<sup>5,21,22</sup>

Insomnia may be classified by presence of a symptom (yes/no), level of severity (mild, moderate, severe), frequency (once a week, 3 to 4 times a week, etc.) and/or duration (less than a month, 6 months or longer). The most common criteria use frequency,<sup>5</sup> as was the case in the CCHS, which asked, “How often do you have trouble going to sleep or staying asleep?” Respondents had five choices: none of the time; a little of the time; some of the time; most of the time; all of the time. Those who answered either “most of the time” or “all of the time” were considered to have insomnia.

### More than 3 million

According to the CCHS criteria, in 2002, an estimated 13.4% of the household population aged 15 or older—that is, 3.3 million Canadians—had insomnia (Chart 1). On average, they slept 6.5 hours a night, compared with 7.5 hours for those without insomnia. But many insomniacs got far less than 6.5 hours of sleep. For example, 18% of them averaged less than 5 hours a night, whereas this amount of sleep was reported by just 2% of those who did not have insomnia (Table 1).

As might be anticipated, a substantial proportion of people with insomnia used sleep medication. In 2002, close to a third (29%) of them reported that they had taken sleep medication at least once in the previous 12 months. The percentage was much lower—7%—among people who did not have

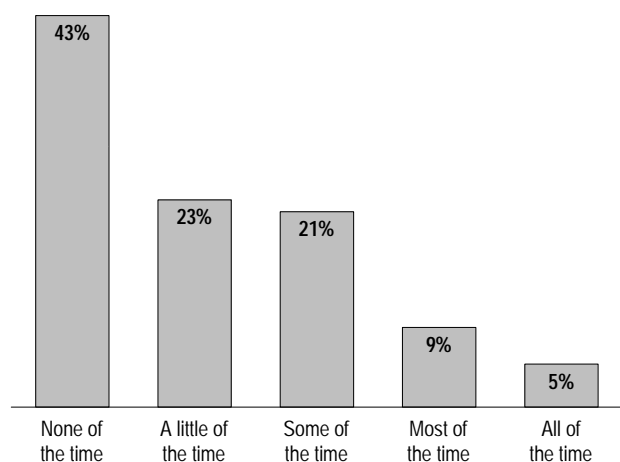
insomnia. Most of the sleep medication taken by insomniacs was prescribed: 23% had used prescription medication in the past year; 6.5% had used medication that was not prescribed.

And when they did sleep, over a third (36.5%) of insomniacs often did not feel refreshed after

awakening. This was far less common for people who did not have insomnia (9%).

Research has shown a long list of factors to be related to insomnia, ranging from physical and emotional disorders to demographic and socio-economic characteristics. However, many of these factors are interrelated, so what seems to be a direct association may disappear when the effects of the others are taken into account.

Chart 1  
Frequency of having trouble going to or staying asleep, household population aged 15 or older, Canada excluding territories, 2002



Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being

Table 1  
Percentage of people reporting selected sleep characteristics, by presence of insomnia, household population aged 15 or older, Canada excluding territories, 2002

	Insomnia	
	Yes	No
	%	
<b>Hours of sleep per night</b>		
Less than 5	17.9*	2.2
5 to < 6	19.5*	7.2
6 to < 7	26.2*	23.4
7 to < 8	20.1*	35.8
8 to < 9	11.0*	24.8
9 or more	5.3*	6.6
<b>Took sleep medication in past 12 months</b>	<b>29.0*</b>	<b>7.3</b>
Prescribed	22.6*	4.7
Not prescribed	6.5*	2.6
<b>Usually do not find sleep refreshing</b>	<b>36.5*</b>	<b>9.2</b>

Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being  
\* Significantly different from estimate for those without insomnia (p < 0.05)

### Body and soul

Links between poor physical health and insomnia have repeatedly been demonstrated,<sup>4,15,26-29</sup> as many diseases involve pain and/or distress that can interfere with sleep. Indeed, people with each of the 13 chronic conditions considered in this analysis were more likely to report problems sleeping than were those without the conditions (Table 2). For instance, in 2002, over 20% of people with asthma, arthritis/rheumatism, back problems or diabetes reported insomnia, compared with around 12% of people who did not have these conditions.

When demographic, socio-economic, lifestyle and several psychological factors were held constant, the conditions that remained independently related to insomnia were fibromyalgia, arthritis/rheumatism, back problems, migraine, heart disease, cancer, chronic bronchitis/emphysema/chronic obstructive pulmonary disease, stomach/intestinal ulcers, and bowel disorders. On the other hand, associations between insomnia and asthma, high blood pressure, diabetes and the effects of stroke disappeared.

Even beyond chronic conditions, people who had a long-term activity limitation that affected their hearing, vision, communication, cognition or mobility were more likely to have insomnia than were those who did not have such a limitation.

Echoing earlier research,<sup>3-5,11,26-28,30-33</sup> the analysis of CCHS results shows mental and emotional health to be strongly associated with insomnia. Around a third of people who reported having had an anxiety or mood disorder (panic or depression, for instance) in the past year had insomnia, compared with 12% of those who did not have such disorders (Table 2). Even when the effects of socio-economic status, lifestyle and physical health were taken into account,

Table 2  
Prevalence of and adjusted odds ratios for insomnia, by selected characteristics, household population aged 15 or older, Canada excluding territories, 2002

	%	Adjusted odds ratio	95% confidence interval		%	Adjusted odds ratio	95% confidence interval
<b>Total</b>	<b>13.4</b>	...	...				
<b>Chronic conditions</b>				<b>Work stress<sup>†</sup></b>			
Asthma				None/A little <sup>†</sup>	9.8	1.0	...
Yes	21.1*	1.2	1.0, 1.4	A bit	9.0	0.8*	0.7, 0.9
No <sup>†</sup>	12.7	1.0	...	Quite at bit/Extreme	16.6*	1.1	0.9, 1.3
Fibromyalgia				<b>Shift work<sup>†</sup></b>			
Yes	42.3*	1.9*	1.4, 2.5	Yes	13.0*	1.3*	1.1, 1.4
No <sup>†</sup>	13.0	1.0	...	No	10.9	1.0	...
Arthritis/Rheumatism				<b>At least weekly</b>			
Yes	23.9*	1.3*	1.1, 1.4	Heavy drinking			
No <sup>†</sup>	11.1	1.0	...	Yes	16.2*	1.5*	1.2, 1.8
Back problems				No	13.2	1.0	...
Yes	22.6*	1.4*	1.2, 1.5	Illicit drug use			
No <sup>†</sup>	11.0	1.0	...	Yes, cannabis only	18.4*	1.5*	1.1, 1.9
High blood pressure				Yes, other illicit drugs (with or without cannabis)	15.9	1.1	0.7, 1.7
Yes	18.9*	1.0	0.9, 1.1	No <sup>†</sup>	13.2	1.0	...
No <sup>†</sup>	12.4	1.0	...	<b>Body mass index</b>			
Migraine				Underweight	12.9	0.9	0.7, 1.2
Yes	25.6*	1.6*	1.4, 1.8	Normal weight <sup>†</sup>	12.1	1.0	...
No <sup>†</sup>	11.9	1.0	...	Overweight	13.1	1.0	0.9, 1.1
Diabetes				Obese class I	16.7*	1.1	1.0, 1.3
Yes	22.4*	1.1	0.9, 1.4	Obese class II/III	22.4*	1.4*	1.1, 1.7
No <sup>†</sup>	12.9	1.0	...	<b>Leisure-time physical activity level</b>			
Heart disease				High	12.0*	1.0	0.9, 1.1
Yes	26.4*	1.4*	1.2, 1.6	Moderate	11.8*	0.9*	0.8, 1.0
No <sup>†</sup>	12.6	1.0	...	Low	13.8*	1.0	0.9, 1.1
Cancer				Sedentary <sup>†</sup>	15.6	1.0	...
Yes	23.3*	1.4*	1.1, 1.7	<b>Sex</b>			
No <sup>†</sup>	13.2	1.0	...	Men <sup>†</sup>	11.6	1.0	...
Stomach/Intestinal ulcers				Women	15.1*	1.1*	1.0, 1.2
Yes	27.9*	1.3*	1.1, 1.6	<b>Age group</b>			
No <sup>†</sup>	12.8	1.0	...	15-24 <sup>†</sup>	10.0	1.0	...
Effects of stroke				25-34	9.7	1.0	0.8, 1.2
Yes	28.6*	1.1	0.8, 1.5	35-44	12.6*	1.2	0.9, 1.4
No <sup>†</sup>	13.2	1.0	...	45-54	15.9*	1.4*	1.2, 1.8
Bowel disorders				55-64	15.7*	1.3*	1.0, 1.6
Yes	27.8*	1.4*	1.2, 1.7	65-74	15.6*	1.2	0.9, 1.5
No <sup>†</sup>	13.0	1.0	...	75+	19.7*	1.2	0.9, 1.5
Chronic bronchitis/Emphysema/ Chronic obstructive pulmonary disease				<b>Marital status</b>			
Yes	29.4*	1.2*	1.0, 1.5	Married <sup>†</sup>	12.9	1.0	...
No <sup>†</sup>	12.7	1.0	...	Widowed	21.8*	1.2*	1.0, 1.4
<b>Activity limitation</b>				Separated/Divorced	18.9*	1.1	0.9, 1.3
Never <sup>†</sup>	9.3	1.0	...	Single	11.1*	1.0	0.8, 1.1
Sometimes	18.5*	1.5*	1.3, 1.7	<b>Education</b>			
Often	29.9*	2.1*	1.8, 2.4	Less than secondary graduation	17.3*	1.4*	1.2, 1.6
<b>Anxiety disorder (past year)</b>				Secondary graduation	13.7*	1.2*	1.1, 1.4
Yes	31.0*	1.5*	1.3, 1.8	Some postsecondary	12.1	1.0	0.9, 1.2
No <sup>†</sup>	12.2	1.0	...	Postsecondary graduation <sup>†</sup>	11.3	1.0	...
<b>Mood disorder (past year)</b>				<b>Household income</b>			
Yes	36.5*	2.1*	1.8, 2.5	Lowest	19.9*	1.1	0.9, 1.3
No <sup>†</sup>	12.0	1.0	...	Lower-middle	15.5*	1.1	0.9, 1.2
<b>Life stress</b>				Upper-middle	12.3*	1.0	0.9, 1.1
None/A little <sup>†</sup>	9.2	1.0	...	Highest <sup>†</sup>	11.0	1.0	...
A bit	11.5*	1.4*	1.2, 1.6				
Quite at bit/Extreme	23.2*	2.3*	2.0, 2.7				

**Data source:** 2002 Canadian Community Health Survey: Mental Health and Well-being

**Notes:** A "missing" category for household income, body mass index and anxiety disorder was included in the model to maximize sample size, but the odds ratios are not shown. A "not applicable" category for shift work and work stress was included in the model, but the odds ratios are not shown.

<sup>†</sup> Reference category

<sup>‡</sup> Respondents aged 15 to 75 who were currently working or who had worked at job or business in past 12 months

\* Significantly different from estimate for reference category ( $p < 0.05$ )

... Not applicable

the odds that people with anxiety or mood disorders would have difficulty sleeping were significantly high.

Chart 2  
Percentage of people reporting insomnia, by stress level, household population aged 15 or older, Canada excluding territories, 2002



Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being

† Reference category

‡ Respondents aged 15 to 75 who were currently working or who had worked at job or business in past 12 months

\*Significantly different from estimate for reference category ( $p < 0.05$ )

Table 3  
Percentage of people reporting insomnia, by main source of stress, household population aged 15 or older, Canada excluding territories, 2002

Main source of stress	%
<b>Overall prevalence of insomnia</b>	<b>13.4</b>
Own physical health problem	31.2*
Death of loved one	24.6*E
Own emotional/mental health problem	24.0*
Personal and family's safety	16.6
Other personal/family responsibilities	16.4*
Personal relationships	15.8*
Caring for others	15.6
Employment status (unemployment)	14.6
Financial situation	14.5
Health of family members	14.4
Other	14.2
Caring for own children	12.1
Own work situation	11.9*
Time pressures/Not enough time	8.1*
None	8.0*
School	7.5*

Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being

\* Significantly different from overall insomnia rate ( $p < 0.05$ )

E Coefficient of variation 16.6% to 33.3% (interpret with caution)

### Life stress

Close to a quarter (23%) of people who described most of their days as being either “quite a bit” or “extremely” stressful reported insomnia; this was more than twice the percentage for people who reported little or no life stress. Even among those whose days were “a bit” stressful, the prevalence of insomnia was elevated (Chart 2). Consistent with earlier research,<sup>28,34</sup> these differences persisted when physical and emotional/mental health, along with demographic, socio-economic and lifestyle factors, were taken into account (Table 2).

The type of stress, not simply the presence of stress, also made a difference. People whose main source of stress was a physical health problem, the death of a loved one, an emotional/mental health problem, personal/family responsibilities or a personal relationship had high rates of insomnia, compared with the overall rate (Table 3).

### Work stress

At first glance, work stress also seems to be associated with insomnia: 17% of employed people aged 15 to 75 who said that most days at work were “quite a bit” or “extremely” stressful reported insomnia, compared with fewer than 10% with no or little work stress (Chart 2). However, when the effects of all the other variables were taken into account, these relationships did not hold. In fact, people reporting “a bit” of work stress actually had low odds of insomnia, compared with those with little or no work stress (Table 2).

While work stress was not associated with insomnia, an individual’s work schedule was.<sup>35,36</sup> Employed people who had a non-regular shift were more likely to report insomnia than were those who worked during the day. Even when the other factors were held constant, the odds that shift workers would report insomnia were high, compared with other workers (Table 2).

### Alcohol and drugs

Alcohol, which is a sedating agent, can aid the onset of sleep. However, it can also lead to increased arousal later in the sleep cycle, and with continued

## Definitions

*Insomnia* was determined in the Canadian Community Health Survey (CCHS) by the question, "How often do you have trouble going to sleep or staying asleep?" Five response categories were read to the respondent: none of the time; a little of the time; some of the time; most of the time; all of the time. Respondents who answered either "most of the time" or "all of the time" were considered to have insomnia.

To calculate *usual hours of sleep per night*, respondents were asked, "How long do you usually spend sleeping each night?" Interviewers were instructed not to include time spent resting. Twelve one-hour response categories from "less than 2 hours" to "12 hours or more" were available for interviewers to record respondents' answers. To calculate average hours of sleep, each response category was assigned the midpoint value. For example, respondents who answered "6 to less than 7 hours" were given a value of 6.5 hours. Those who answered "less than 2 hours" were given a value of 1.5, and respondents who answered "12 or more hours" were given a value of 12.5 hours.

Use of *sleep medication* was measured by asking, "In the past 12 months, did you take any medication to help you sleep (such as Imovane, Nytol or Starnoc)?" Follow-up questions asked if the medication was taken under the supervision of a health professional and who prescribed the medication.

Respondents were considered to find *sleep not refreshing* if they answered "none of the time" or "a little of the time" to the question, "How often do you find your sleep refreshing?"

To measure *chronic conditions*, individuals were asked about conditions that had lasted or were expected to last six months or longer and that had been diagnosed by a health professional. Interviewers read a list of conditions. Those used in this analysis are: asthma; fibromyalgia; arthritis or rheumatism; back problems; high blood pressure; migraine; diabetes; heart disease; cancer; stomach or intestinal ulcers; effects of stroke; bowel disorder; chronic bronchitis, emphysema or chronic obstructive pulmonary disease.

To determine *activity limitation*, interviewers asked: "Do you have any difficulty hearing, seeing, communicating, walking, climbing stairs, bending, learning or doing any similar activities?" and "Does a long-term physical condition or mental condition or health problem reduce the amount or the kind of activity you can do: at home, at work, or at school or other activities (e.g., transportation or leisure)?"

*Anxiety disorder* in the past year consisted of at least one of the following: panic disorder, social anxiety disorder, or agoraphobia. *Mood disorder* in the past year consisted of either a major depressive episode and/or mania (bipolar 1). For a complete list of questions and algorithms used by the CCHS to measure these disorders, based on the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV)*,<sup>18</sup> see the Annex in the 2004 annual *Health Reports* supplement. Questions and a general description are available at the following URL: <http://www.statcan.ca/english/freepub/82-617-XIE/index.htm>.

*Life stress* was determined by asking, "Thinking about the amount of stress in your life, would you say that most days are: not at all stressful, not very stressful, a bit stressful, quite a bit stressful, extremely stressful?" For this analysis, "not at all stressful" and "not very stressful" were combined, and "quite a bit stressful" and "extremely stressful" were combined.

*Main source of stress* was determined by asking, "Thinking about stress in your day-to-day life, what would you say is the most important thing contributing to feelings of stress you may have?" Interviewers could choose from 16 categories to record the response.

*Work stress* was determined by asking respondents aged 15 to 75 who were working or who had worked at a job or business during the previous year about their main job: "Would you say that most days at work were: not at all stressful, not very stressful, a bit stressful, quite a bit stressful, or extremely stressful?" For this analysis, "not at all stressful" and "not very stressful" were combined, as were "quite a bit stressful" and "extremely stressful."

*Shift work* was determined by asking respondents aged 15 to 75 who were working or who had worked at a job or business during the previous year: "Which of the following best describes the hours you usually work(ed) at this job?" Eight responses were possible: regular daytime schedule or shift; regular evening shift; regular night shift; rotating shift; split shift; on call; irregular schedule; or other. Shift work was defined as anything but a regular daytime schedule.

Respondents were asked if they had had a drink of beer, wine, liquor or any other alcoholic beverage in the past year. They were told that a "drink" meant one bottle or can of beer or glass of draft, one glass of wine or wine cooler, or one drink or cocktail with 1 1/2 ounces of liquor. *Heavy drinking* was determined by asking respondents how often in the past 12 months they had had 5 or more drinks on one occasion. Those who answered at least weekly were considered to be *frequent heavy drinkers*.

Respondents were asked if they had used an *illicit drug* in the past 12 months. Those who said "yes" were asked how often: less than once a month, 1 to 3 times a month, once a week, more than once a week, or every day. This question was asked for each of the following drugs: marijuana, cannabis or hashish; cocaine or crack; speed (amphetamines); ecstasy (MDMA) or similar drugs; hallucinogens, PCP or LSD (acid); glue, gasoline or other solvents (sniffing); and heroin. Respondents were assigned a frequency for the drug they used most often. Therefore, someone who used cannabis (but no other illicit drugs) once a week was assigned a frequency of at least weekly cannabis only use. Someone who used cannabis once a week and cocaine 1 to 3 times a month was assigned a frequency of at least weekly use of other illicit drugs (with or without cannabis).

Weight was defined in terms of *body mass index (BMI)*, which was calculated by dividing weight in kilograms by the square of height in metres. BMI was grouped into five categories: underweight (less than 18.5), normal weight (18.5 to 24.9), overweight (25.0 to 29.9), obese class I (30.0 to 34.9), and obese class II/III (35.0 or more).

## Definitions - concluded

To derive *leisure-time physical activity level*, respondents' energy expenditure (EE) was estimated for each activity they engaged in during leisure time. This was calculated by multiplying the number of times a respondent engaged in an activity over a 12-month period by the average duration in hours and by the energy cost of the activity (kilocalories expended per kilogram of body weight per hour of activity). To calculate average daily EE for the activity, the estimate was divided by 365. This calculation was repeated for all leisure-time activities reported, and the resulting estimates were summed to provide an aggregate average daily EE. The frequency (or regularity) of physical activity was based on the number of times in the previous three months that respondents had participated in a physical activity that lasted more than 15 minutes: regular (12 or more times per month) or irregular (11 or fewer times per month). The following *physical activity categories* were defined:

- High – high (3 or more kcal/kg/day) energy expenditure during regular physical activity
- Moderate – medium (1.5 to 2.9 kcal/kg/day) energy expenditure during regular physical activity
- Light – low (less than 1.5 kcal/kg/day) energy expenditure during regular physical activity
- Sedentary – irregular physical activity regardless of energy expenditure

Seven *age groups* were used: 15 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, 65 to 74, and 75 or older.

Four categories were used for *marital status*: married or living common-law; widowed; divorced or separated; and never married.

Respondents were grouped into four *education* categories based on the highest level attained: less than secondary graduation, secondary graduation, some postsecondary, and postsecondary graduation.

*Household income* was based on the number of people in the household and total household income from all sources in the 12 months before the interview.

Household income group	People in household	Total household income
Lowest	1 or 2	Less than \$15,000
	3 or 4	Less than \$20,000
	5 or more	Less than \$30,000
Lower-middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

Respondents' ability to handle *day-to-day demands* was determined by the question, "In general, how would you rate your ability to handle day-to-day demands in your life, for example, handling work, family and volunteer responsibilities? Would you say your ability is: excellent, very good, good, fair, poor?"

Respondents were also asked about *unexpected and difficult problems*: "In general, how would you rate your ability to handle unexpected and difficult problems, for example, a family or personal crisis? Would you say your ability is: excellent, very good, good, fair, poor?"

Respondents aged 25 to 54 were classified as *not currently employed* if they did not work in the week before the interview and did not have a job or business from which they were absent.

*Two-week disability* was measured in terms of bed-days and "cut-down" days over the previous two weeks. Respondents were asked about days they stayed in bed because of illness or injury (including nights in hospital) and about days they cut down normal activities because of illness or injury.

*Dissatisfaction with life* was based on the question, "How satisfied are you with your life in general: very satisfied, satisfied, neither satisfied nor dissatisfied, dissatisfied, very dissatisfied?" The last two categories were used to classify respondents as being dissatisfied with life.

use, its benefit as a sleep aid is reduced.<sup>37</sup> According to the results of the CCHS, 16% of frequent heavy drinkers reported insomnia, compared with 13% of those who were not frequent heavy drinkers. This association persisted, even allowing for the effects of the other factors (Table 2). The association may result from prolonged and excessive self-medication of sleep problems with alcohol, or from chronic heavy alcohol consumption affecting the brain's regulation of sleep or being associated with co-

morbid physical and psychiatric conditions that can contribute to insomnia.<sup>38</sup>

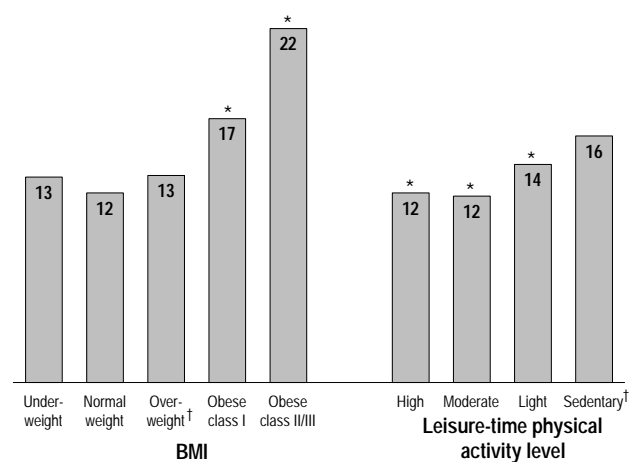
About one in five (18%) people who used cannabis, but no other illicit drugs, at least once a week reported insomnia, significantly higher than the 13% reported by those who did not use illicit drugs or used them less frequently. When the other factors were taken into account, frequent cannabis users still had significantly high odds of reporting insomnia (Table 2).

### Obesity and physical activity

High proportions of people who were obese suffered from insomnia. And the heavier they were, the more likely they were to have trouble sleeping.<sup>29</sup> According to the CCHS, 17% of people whose weight put them in obese class I and 22% who were in obese class II/III reported insomnia; this compared with 12% of people in the normal weight range (Chart 3). But when the effects of the other factors were controlled, only those in obese class II/III had high odds of insomnia (Table 2). This association might be a by-product of sleep apnea, which is related to obesity and is also a risk factor for insomnia,<sup>39,40</sup> but was not measured in the CCHS (see *Limitations*).

Physical activity is generally thought to be beneficial to sleep by contributing to psychological well-being, muscle relaxation, thermal effects and energy conservation, although little epidemiological evidence supports this claim.<sup>32,41-43</sup> Some studies have found exercise to be a modest and fragile protective factor,<sup>32-34,44,45</sup> or not to be associated with insomnia,<sup>28</sup> depending on the definitions, age group and study design. CCHS results show that physically active people had a lower prevalence of insomnia than did sedentary individuals (Chart 3). But when

Chart 3  
**Percentage of people reporting insomnia, by body mass index (BMI) and leisure-time physical activity level, household population aged 15 or older, Canada excluding territories, 2002**



**Data source:** 2002 Canadian Community Health Survey: Mental Health and Well-being  
 † Reference category  
 \*Significantly different from estimate for reference category ( $p < 0.05$ )

the effects of the other factors were taken into account, only people who were moderately active had low odds of insomnia, compared with sedentary individuals; neither high nor light physical activity was significantly associated with insomnia (Table 2).

### Limitations

Epidemiological research contains no standard definition of insomnia.<sup>5</sup> Therefore, while the prevalence reported in this analysis (13.4%) falls within a range of previously reported figures,<sup>5</sup> comparisons with other findings should be cautious, because of differences in question wording, response categories and collection methods.

Important factors known to be associated with insomnia were not available in the Canadian Community Health Survey (CCHS): past history of insomnia, other sleep disorders such as sleep apnea, sleep hygiene habits, and nicotine and caffeine intake.<sup>5,15</sup> Because these variables could not be included in the multivariate models, CCHS results may overestimate associations between some factors and insomnia.

This analysis did not differentiate between acute, sub-acute and chronic states of insomnia. Primary, secondary and self-induced insomnia could not be disentangled, nor was it possible to distinguish between incident and prevalent cases. Therefore, important differences between these types of insomnia, which have been shown to have different risks and outcomes, could not be ascertained.<sup>4,8,46</sup>

CCHS results were based on self-reports; answers were not validated by an independent source. For example, self-reported weight and height are known to underestimate the prevalence of overweight and obesity.<sup>47-49</sup>

The measure of energy expenditure likely underestimated respondents' total physical activity because it did not account for activity at work or while doing household chores.

Because the analysis of CCHS data is cross-sectional, associations between variables can be examined at only one point in time. Neither causality nor the temporal ordering of events can be inferred. For instance, whether a chronic condition is a cause or a result of insomnia, or if both share a common pathology, is not clear.<sup>2</sup> As well, the literature suggests that the relationship between insomnia and emotional problems is bi-directional, and that there may be a common source.<sup>13,15,50</sup> And whether frequent heavy drinking and drug use led to insomnia or insomnia led to frequent heavy drinking and drug use could not be determined.



## A problem of middle age

It is hardly surprising that painful physical conditions, mental and emotional problems, stress, and alcohol and drug use are related to insomnia. Even obesity and lack of physical activity might logically be associated with the inability to get a good night's sleep. But beyond these factors, a number of less obvious relationships exist.

The prevalence of insomnia rises with age, doubling from 10% at ages 15 to 24 to almost 20% at age 75 or older (Table 2). It has been suggested that, with age, circadian rhythms change and melatonin (a hormone involved in the sleep-wake cycle) declines.<sup>8,28,51</sup> But old age is associated with chronic conditions, and once chronic conditions were taken into account, seniors no longer had high odds of insomnia (Table 2, Appendix Table B Model 5). This suggests that the elevated prevalence of insomnia among seniors is largely attributable to poorer health.

By contrast, even allowing for the effects of the other factors, middle-aged people (45 to 54 or 55 to 64) had significantly high odds of reporting insomnia, compared with 15- to 24-year-olds. Such results were unexpected, as in other research,<sup>15,28</sup> this association between age and insomnia disappeared when the influence of physical and mental health was controlled. However, one study did find the highest prevalence of insomnia among 55- to 64-year-olds.<sup>12</sup> Furthermore, it is possible that variables not available in the CCHS are driving the association between insomnia and middle-age.

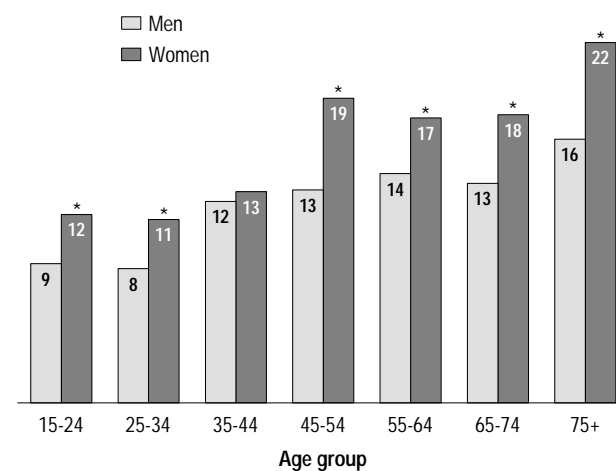
## Women at risk

Women were more likely than men to report insomnia: 15% versus 12% (Table 2). This discrepancy prevailed among all age groups except 35-to-44, among whom rates were similar (Chart 4).

The higher prevalence of insomnia among women may, in part, be due to hormonal changes related to menstruation, pregnancy and menopause.<sup>52,53</sup> As well, in general, psychiatric illness tends to be more common among women than men.<sup>54</sup> Yet even when physical and mental health were controlled for, the odds that women would

Chart 4

Percentage of people reporting insomnia, by sex and age group, household population aged 15 or older, Canada excluding territories, 2002



Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being

\*Significantly different from estimate for men ( $p < 0.05$ )

report insomnia were still slightly higher than men's (Table 2, Appendix Table B Model 6). This suggests that women's elevated insomnia rates are related, in part, to factors other than health, lifestyle and socio-economic differences between men and women.

## Marital status, education and income

According to the 2002 CCHS, 22% of widowers and 19% of separated/divorced people had trouble sleeping, both percentages significantly above the figure for married people (13%). Among those who had never been married, the prevalence of insomnia was lower (11%), mirroring other research.<sup>12,55</sup> Since marital status and age are related, the high insomnia rates among widowers and divorced/separated individuals might be a result of differences that reflect age, not marital status. Indeed, when adjustments were made to control for chronic conditions, the associations between marital status and insomnia disappeared for every group except those who were widowed (Table 2, Appendix Table B Model 5). The persistence of the relationship between widowhood and insomnia may be tied to one of the forms of stress that was also a factor in insomnia: death of a loved one.

People with little formal education or lower income have been shown to have a higher prevalence of insomnia.<sup>28,55</sup> CCHS results support these findings in that those whose education had not advanced beyond high school graduation and residents of low-income households were more likely to report insomnia than were postsecondary graduates or residents of high-income households. When the other factors were taken into account, people with secondary graduation or less still had high odds of reporting insomnia, but the association with household income was no longer statistically significant (Table 2, Appendix Table B Model 6).

### Negative associations

With cross-sectional data such as those from the CCHS, it is not possible to trace causal pathways between insomnia and particular outcomes. Nonetheless, a number of significant associations did emerge from the analysis.

Substantial numbers of insomniacs had trouble coping. While 12% rated their ability to handle day-to-day demands, such as work and family responsibilities, as fair or poor, the corresponding figure for people who did not have insomnia was 4% (Table 4). An even larger share of insomniacs—17%—rated their ability to deal with unexpected and difficult problems, such as a family or personal crises, as fair or poor, compared with 8.5% of those who did not have insomnia.

Table 4  
Percentage of people reporting selected problems, by presence of insomnia, household population aged 15 or older, Canada excluding territories, 2002

	Insomnia	
	Yes	No
	%	
Fair/Poor ability to handle:		
Day-to-day demands	11.8*	4.3
Unexpected problems	16.7*	8.5
Not currently employed†	25.2*	15.7
Two-week disability	23.8*	11.7
Dissatisfied with life	12.2*	3.4

**Data source:** 2002 Canadian Community Health Survey: Mental Health and Well-being

† Respondents aged 25 to 54

\* Significantly different from estimate for those without insomnia ( $p < 0.05$ )

A quarter (25%) of insomniacs aged 25 to 54 were not employed; the figure was 16% for their contemporaries who did not have trouble sleeping. The large percentage of insomniacs who did not have a job may, to some extent, explain the previously noted lack of association between insomnia and work stress.

People with insomnia were also more likely to report having had days in the previous two weeks when they were confined to bed or had to cut back on their normal activities: 24% versus 12%.

And more globally, the percentage of insomniacs who reported that they were dissatisfied or very dissatisfied with their life (12%) was much higher than the figure for those who did not have insomnia (4%).

Of course, many factors besides insomnia are related to coping, employment, illness and general dissatisfaction with life. For instance, since people with insomnia are in poorer physical health than those without insomnia, their greater likelihood of reporting a disability day or not having a job may be a result of their health, not necessarily insomnia. Nonetheless, when chronic conditions and the other health, lifestyle and socio-economic variables were taken into account, those with insomnia still had significantly higher odds of reporting a disability day and not working (Appendix Table C). The other differences, too, persisted when the effects of the demographic, socioeconomic, lifestyle and physical and mental health factors were considered.

### Concluding remarks

In 2002, 13% of Canadian adults (more than three million individuals) met the criteria for insomnia; that is, they had difficulty going to sleep or staying asleep most or all of the time.

Physical and psychological problems can interfere with sleep. Painful conditions such as arthritis, migraine and fibromyalgia were associated with insomnia, as were anxiety and mood disorders and stressful life events. As well, alcohol and cannabis use were significant factors. Obesity, too, was related to having problems with sleep.

On the other hand, moderate physical activity and a bit of work stress were protective. The lack of a

positive association between work stress and insomnia may reflect the relatively large proportion of insomniacs who do not work.

Some less obvious factors were associated with insomnia. When physical and mental health status, lifestyle, and demographic and socio-economic variables were controlled for, being female, middle-aged, widowed, and having a low education were significantly related to insomnia.

Even allowing for a series of physical, mental, lifestyle and socio-economic factors, insomnia was related to some adverse situations. Relatively large percentages of insomniacs had difficulty coping with day-to-day demands and unexpected problems. They were also more likely than other people to have had a recent disability day and to express overall dissatisfaction with life. As well, a significantly large proportion of people in the prime working age range who suffered from insomnia were not employed. ●

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## Appendix

Table A  
Distribution of selected characteristics, household population aged 15 or older, Canada excluding territories, 2002

	Sample size	Estimated population			Sample size	Estimated population	
		'000	%			'000	%
<b>Insomnia</b>							
Yes	5,612	3,346	13.4				
No	31,364	21,647	86.6				
<b>Sex</b>							
Men	16,771	12,284	49.2				
Women	20,205	12,708	50.8				
<b>Age group</b>							
15-24	5,673	4,136	16.6				
25-34	5,770	4,054	16.2				
35-44	7,042	5,453	21.8				
45-54	5,702	4,442	17.8				
55-64	5,055	3,181	12.7				
65-74	4,112	2,191	8.8				
75+	3,622	1,534	6.1				
<b>Marital status</b>							
Married	19,181	15,409	61.7				
Widowed	3,814	1,363	5.5				
Separated/Divorced	4,152	1,843	7.4				
Single	9,797	6,351	25.4				
Missing	32	28 <sup>E</sup>	0.1 <sup>E</sup>				
<b>Education</b>							
Less than secondary graduation	10,589	6,306	25.2				
Secondary graduation	6,496	4,692	18.8				
Some postsecondary	3,049	2,078	8.3				
Postsecondary graduation	16,612	11,678	46.7				
Missing	230	240	1.0				
<b>Household income</b>							
Lowest	4,953	2,299	9.2				
Lower-middle	8,079	4,737	19.0				
Upper-middle	11,781	8,099	32.4				
Highest	8,716	7,482	29.9				
Not stated	3,447	2,376	9.5				
<b>Body mass index</b>							
Underweight	1,061	763	3.1				
Normal weight	16,991	11,995	48.0				
Overweight	11,980	7,984	31.9				
Obese class I	4,476	2,819	11.3				
Obese class II/III	1,714	1,003	4.0				
Missing	753	429	1.7				
<b>Leisure-time physical activity level</b>							
High	9,515	6,526	26.1				
Moderate	9,622	6,500	26.0				
Low	5,557	3,651	14.6				
Sedentary	12,277	8,314	33.3				
Missing	5	F	F				
<b>At least weekly heavy drinking</b>							
Yes	2,491	1,630	6.5				
No	34,303	23,252	93.0				
Missing	182	111	0.4				
<b>At least weekly illicit drug use</b>							
Cannabis only	1,019	669	2.7				
Any illicit drug	456	321	1.3				
No illicit drug used on a weekly basis	35,391	23,927	95.7				
Missing	110	75	0.3				
<b>Shift work</b>							
Yes	7,915	5,675	22.7				
No	16,245	12,254	49.0				
Not applicable	12,607	6,894	27.6				
Missing	209	170	0.7				
<b>Life stress</b>							
None/A little	14,246	9,090	36.4				
A bit	14,702	10,121	40.5				
Quite a bit/Extreme	8,014	5,778	23.1				
Missing	14	4 <sup>E</sup>	0.0 <sup>E</sup>				
<b>Work stress</b>							
None/A little	7,522	5,397	21.6				
A bit	9,624	6,979	27.9				
Quite a bit/Extreme	6,863	5,479	21.9				
Not applicable	12,743	6,989	28.0				
Missing	224	149	0.6				
<b>Activity limitation</b>							
Never	24,447	17,637	70.6				
Sometimes	6,899	4,233	16.9				
Often	5,587	3,094	12.4				
Missing	43	29 <sup>E</sup>	0.1 <sup>E</sup>				
<b>Chronic conditions</b>							
<b>Asthma</b>							
Yes	3,357	2,131	8.5				
No	33,616	22,861	91.5				
Missing	3	F	F				
<b>Fibromyalgia</b>							
Yes	595	366	1.5				
No	36,369	24,622	98.5				
Missing	12	F	F				
<b>Arthritis/Rheumatism</b>							
Yes	8,244	4,383	17.5				
No	28,714	20,601	82.4				
Missing	18	9 <sup>E</sup>	0.0 <sup>E</sup>				
<b>Back problems</b>							
Yes	8,396	5,212	20.9				
No	28,573	19,778	79.1				
Missing	7	F	F				
<b>High blood pressure</b>							
Yes	6,640	3,702	14.8				
No	30,303	21,273	85.1				
Missing	33	18 <sup>E</sup>	0.1 <sup>E</sup>				
<b>Migraine</b>							
Yes	3,984	2,680	10.7				
No	32,985	22,309	89.3				
Missing	7	F	F				
<b>Diabetes</b>							
Yes	2,130	1,210	4.8				
No	34,835	23,778	95.1				
Missing	11	F	F				
<b>Heart disease</b>							
Yes	2,717	1,359	5.4				
No	34,236	23,622	94.5				
Missing	23	12 <sup>E</sup>	0.0 <sup>E</sup>				
<b>Cancer</b>							
Yes	863	492	2.0				
No	36,102	24,497	98.0				
Missing	11	F	F				
<b>Stomach/Intestinal ulcers</b>							
Yes	1,700	1,033	4.1				
No	35,251	23,950	95.8				
Missing	25	10 <sup>E</sup>	0.0 <sup>E</sup>				
<b>Effects of stroke</b>							
Yes	521	251	1.0				
No	36,446	24,739	99.0				
Missing	9	F	F				
<b>Bowel disorder</b>							
Yes	1,236	697	2.8				
No	35,726	24,291	97.2				
Missing	14	F	F				
<b>Chronic bronchitis/Emphysema/Chronic obstructive pulmonary disease</b>							
Yes	1,783	977	3.9				
No	35,164	23,996	96.0				
Missing	29	20 <sup>E</sup>	0.1 <sup>E</sup>				
<b>Anxiety disorder (past year)</b>							
Yes	1,803	1,162	4.6				
No	34,065	23,199	92.8				
Missing	1,108	632	2.5				
<b>Mood disorder (past year)</b>							
Yes	2,122	1,309	5.2				
No	34,556	23,524	94.1				
Missing	298	159	0.6				

Data source: 2002 Canadian Community Health Survey: Mental Health and Well-being

Note: Eight respondents did not answer the question on insomnia.

E Coefficient of variation between 16.6% and 33.3% (interpret with caution)

F Coefficient of variation greater than 33.3% (suppressed because of extreme sampling variability)

Table B  
Adjusted odds ratios relating selected characteristics to insomnia, household population aged 15 or older, Canada excluding territories, 2002

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
<b>Sex</b>												
Men <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Women	1.3*	1.2,1.4	1.4*	1.2,1.5	1.3*	1.2,1.5	1.3*	1.1,1.4	1.1*	1.0,1.3	1.1*	1.0,1.2
<b>Age group</b>												
15-24 <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
25-34	1.2	1.0,1.4	1.1	0.9,1.3	1.2	1.0,1.4	1.1	0.9,1.3	1.0	0.8,1.2	1.0	0.8,1.2
35-44	1.5*	1.3,1.8	1.5*	1.2,1.8	1.5*	1.2,1.8	1.4*	1.1,1.7	1.2	0.9,1.4	1.2	0.9,1.4
45-54	2.0*	1.6,2.4	1.9*	1.6,2.3	1.9*	1.6,2.4	1.8*	1.5,2.2	1.4*	1.1,1.7	1.4*	1.2,1.8
55-64	1.8*	1.5,2.2	1.8*	1.5,2.2	1.7*	1.4,2.1	1.8*	1.4,2.2	1.2	1.0,1.5	1.3*	1.0,1.6
65-74	1.6*	1.3,2.0	1.6*	1.3,2.0	1.4*	1.1,1.7	1.5*	1.2,1.9	1.1	0.8,1.4	1.2	0.9,1.5
75+	1.8*	1.5,2.3	1.9*	1.6,2.4	1.6*	1.2,2.0	1.9*	1.5,2.3	1.0	0.8,1.4	1.2	0.9,1.5
<b>Marital status</b>												
Married <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Widowed	1.2*	1.1,1.4	1.2*	1.0,1.4	1.2*	1.0,1.4	1.2*	1.0,1.4	1.2*	1.0,1.5	1.2*	1.0,1.4
Separated/Divorced	1.4*	1.2,1.5	1.3*	1.2,1.5	1.3*	1.2,1.5	1.2*	1.1,1.4	1.2	1.0,1.3	1.1	0.9,1.3
Single	1.0	0.9,1.2	1.0	0.9,1.2	1.0	0.9,1.2	1.0	0.9,1.2	1.0	0.9,1.2	1.0	0.8,1.1
<b>Education</b>												
Less than secondary graduation	1.5*	1.3,1.7	1.4*	1.3,1.6	1.4*	1.2,1.5	1.4*	1.3,1.6	1.4*	1.2,1.6	1.4*	1.2,1.6
Secondary graduation	1.2*	1.1,1.4	1.2*	1.0,1.3	1.2*	1.0,1.3	1.2*	1.1,1.4	1.2*	1.1,1.4	1.2*	1.1,1.4
Some postsecondary	1.2	1.0,1.4	1.1	0.9,1.3	1.1	0.9,1.3	1.1	1.0,1.3	1.1	0.9,1.3	1.0	0.9,1.2
Postsecondary graduation <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>Household income</b>												
Lowest	1.6*	1.4,1.9	1.5*	1.3,1.8	1.4*	1.2,1.6	1.3*	1.1,1.5	1.1	1.0,1.3	1.1	0.9,1.3
Lower-middle	1.3*	1.1,1.4	1.2*	1.1,1.4	1.2*	1.0,1.3	1.2*	1.0,1.3	1.1	0.9,1.3	1.1	0.9,1.2
Upper-middle	1.1	0.9,1.2	1.0	0.9,1.2	1.0	0.9,1.1	1.0	0.9,1.2	1.0	0.9,1.1	1.0	0.9,1.1
Highest <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>Body mass index</b>												
Underweight			1.0	0.8,1.3	1.0	0.8,1.3	1.0	0.8,1.3	1.0	0.8,1.3	0.9	0.7,1.2
Normal weight <sup>†</sup>			1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Overweight			1.1	1.0,1.2	1.1	1.0,1.2	1.1	1.0,1.2	1.0	0.9,1.1	1.0	0.9,1.1
Obese class I			1.4*	1.2,1.6	1.4*	1.2,1.6	1.3*	1.2,1.6	1.2	1.0,1.4	1.1	1.0,1.3
Obese class II/III			1.9*	1.6,2.3	1.9*	1.6,2.3	1.9*	1.5,2.3	1.4*	1.1,1.7	1.4*	1.1,1.7
<b>Leisure-time physical activity level</b>												
High			0.9*	0.8,1.0	0.9*	0.8,1.0	0.9	0.8,1.0	1.0	0.9,1.1	1.0	0.9,1.1
Moderate			0.8*	0.7,0.9	0.8*	0.7,0.9	0.8*	0.7,0.9	0.9*	0.8,1.0	0.9*	0.8,1.0
Low			0.9	0.8,1.0	0.9	0.8,1.0	0.9	0.8,1.0	1.0	0.8,1.1	1.0	0.9,1.1
Sedentary <sup>†</sup>			1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>At least weekly</b>												
Heavy drinking			1.4*	1.2,1.7	1.5*	1.2,1.8	1.5*	1.2,1.8	1.5*	1.2,1.8	1.5*	1.2,1.8
Cannabis only			1.8*	1.4,2.2	1.8*	1.4,2.2	1.8*	1.4,2.3	1.5*	1.2,2.0	1.5*	1.1,1.9
Other illicit drug (with or without cannabis)			1.6*	1.1,2.3	1.6*	1.1,2.3	1.4	0.9,2.1	1.3	0.8,1.9	1.1	0.7,1.7
<b>Shift work<sup>†</sup></b>												
					1.2*	1.1,1.4	1.3*	1.1,1.5	1.3*	1.1,1.4	1.3*	1.1,1.4
<b>Life stress</b>												
None/A little <sup>†</sup>							1.0	...	1.0	...	1.0	...
A bit							1.6*	1.4,1.8	1.4*	1.3,1.6	1.4*	1.2,1.6
Quite at bit/Extreme							3.5*	3.0,3.9	2.6*	2.3,3.0	2.3*	2.0,2.7
<b>Work stress<sup>†</sup></b>												
None/A little <sup>†</sup>							1.0	...	1.0	...	1.0	...
A bit							0.7*	0.6,0.9	0.8*	0.7,0.9	0.8*	0.7,0.9
Quite at bit/Extreme							1.0	0.9,1.2	1.0	0.9,1.3	1.1	0.9,1.3
<b>Activity limitation</b>												
Never <sup>†</sup>									1.0	...	1.0	...
Sometimes									1.5*	1.4,1.8	1.5*	1.3,1.7
Often									2.3*	2.0,2.6	2.1*	1.8,2.4

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
<b>Chronic conditions</b>												
Asthma									1.2	1.0,1.4	1.2	1.0,1.4
Fibromyalgia									1.9*	1.4,2.6	1.9*	1.4,2.5
Arthritis/Rheumatism									1.3*	1.1,1.4	1.3*	1.1,1.4
Back problems									1.4*	1.2,1.5	1.4*	1.2,1.5
High blood pressure									1.0	0.9,1.1	1.0	0.9,1.1
Migraine									1.7*	1.5,1.9	1.6*	1.4,1.8
Diabetes									1.1	0.9,1.4	1.1	0.9,1.4
Heart disease									1.4*	1.2,1.6	1.4*	1.2,1.6
Cancer									1.4*	1.1,1.7	1.4*	1.1,1.7
Stomach/Intestinal ulcers									1.4*	1.1,1.7	1.3*	1.1,1.6
Effects of stroke									1.1	0.8,1.5	1.1	0.8,1.5
Bowel disorders									1.4*	1.2,1.7	1.4*	1.2,1.7
Chronic bronchitis/ Emphysema/Chronic obstructive pulmonary disease									1.3*	1.1,1.6	1.2*	1.0,1.5
<b>Anxiety disorder (past year)</b>											1.5*	1.3,1.8
<b>Mood disorder (past year)</b>											2.1*	1.8,2.5
<b>Model information</b>												
Sample size	36,730		36,459		36,276		36,043		35,867		35,617	
Sample with insomnia	5,568		5,524		5,495		5,461		5,413		5,352	
Records dropped because of missing values	254		525		708		941		1,117		1,367	

**Data source:** 2002 Canadian Community Health Survey: Mental Health and Well-being

**Note:** A "missing" category for household income, body mass index and anxiety disorder was included in the models to maximize sample size, but the respective odds ratios are not shown. A "not applicable" category for shift work and work stress was included in the models, but the respective odds ratios are not shown.

† Reference category. When not noted, reference category is absence of characteristic; for example, reference category for asthma is no reported diagnosis of asthma.

‡ Respondents aged 15 to 75 who were currently working or who had worked at job or who had business in past 12 months

\* Significantly different from estimate for reference category ( $p < 0.05$ )

... Not applicable

Table C  
Adjusted odds ratios relating insomnia and selected characteristics to selected problems, household population aged 15 or older, Canada excluding territories, 2002

	Fair/Poor ability to handle day-to-day demands		Fair/Poor ability to handle unexpected problems		Not currently employed <sup>†</sup>		At least one disability day in past two weeks		Dissatisfied with life	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
<b>Insomnia</b>										
Yes	1.2*	1.0, 1.4	1.2*	1.0, 1.3	1.3*	1.1, 1.6	1.3*	1.2, 1.5	1.6*	1.3, 1.8
No	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>Sex</b>										
Men <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Women	0.8*	0.7, 0.9	1.2*	1.0, 1.3	2.4*	2.1, 2.8	1.2*	1.1, 1.4	0.8*	0.7, 0.9
<b>Age group</b>										
15-24 <sup>†</sup>	1.0	...	1.0	...	...	...	1.0	...	1.0	...
25-34	0.6*	0.5, 0.8	0.9	0.7, 1.0	1.0	...	0.9	0.7, 1.0	1.8*	1.4, 2.4
35-44	0.8	0.6, 1.0	0.9	0.7, 1.1	0.7*	0.6, 0.8	0.7*	0.6, 0.8	1.9*	1.4, 2.5
45-54	0.7*	0.5, 0.9	0.9	0.7, 1.1	0.8*	0.7, 0.9	0.5*	0.4, 0.6	2.0*	1.5, 2.7
55-64	0.7*	0.5, 0.9	1.0	0.8, 1.3	...	...	0.4*	0.4, 0.5	2.0*	1.4, 2.8
65-74	0.7*	0.5, 0.9	0.8	0.6, 1.1	...	...	0.3*	0.3, 0.4	1.0	0.7, 1.6
75+	0.8	0.5, 1.1	0.9	0.7, 1.2	...	...	0.3*	0.2, 0.4	1.0	0.7, 1.6
<b>Marital status</b>										
Married <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Widowed	0.9	0.7, 1.2	0.7*	0.6, 0.9	0.8	0.3, 2.6	1.1	1.0, 1.4	1.4*	1.0, 1.9
Separated/Divorced	1.3	1.0, 1.7	1.0	0.8, 1.2	0.6*	0.5, 0.7	1.1	1.0, 1.3	2.5*	2.0, 3.1
Single	1.2	1.0, 1.4	1.2*	1.0, 1.3	1.0	0.8, 1.2	1.1	1.0, 1.3	2.3*	1.8, 2.8
<b>Education</b>										
Less than secondary graduation	1.7*	1.4, 2.0	1.7*	1.5, 2.0	1.4*	1.2, 1.7	0.9	0.8, 1.0	1.0	0.8, 1.2
Secondary graduation	1.2	1.0, 1.5	1.2*	1.0, 1.4	1.0	0.8, 1.2	1.0	0.9, 1.2	1.0	0.8, 1.3
Some postsecondary	1.4*	1.0, 1.8	1.2	1.0, 1.5	1.2	0.9, 1.6	1.1	0.9, 1.3	1.2	0.9, 1.6
Postsecondary graduation <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>Household income</b>										
Lowest	1.7*	1.3, 2.3	1.6*	1.3, 2.0	9.1*	7.0, 11.9	0.8*	0.7, 0.9	1.7*	1.2, 2.2
Lower-middle	1.3*	1.0, 1.6	1.5*	1.2, 1.7	3.4*	2.7, 4.2	0.8*	0.7, 0.9	1.6*	1.2, 2.1
Upper-middle	1.1	0.9, 1.4	1.3*	1.1, 1.5	1.7*	1.4, 2.1	0.8*	0.7, 0.9	1.1	0.9, 1.4
Highest <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>Body mass index</b>										
Underweight	1.3	0.9, 1.8	1.0	0.8, 1.3	1.0	0.7, 1.4	1.0	0.8, 1.2	1.0	0.7, 1.6
Normal weight <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Overweight	1.0	0.8, 1.1	0.9	0.8, 1.0	1.0	0.8, 1.1	1.0	0.9, 1.1	0.9	0.8, 1.1
Obese class I	0.9	0.7, 1.2	0.8*	0.7, 1.0	0.8*	0.7, 1.0	1.1	1.0, 1.3	0.9	0.8, 1.2
Obese class II/III	0.9	0.7, 1.3	0.7*	0.5, 0.9	0.9	0.7, 1.2	1.2	1.0, 1.4	0.9	0.6, 1.2
<b>Leisure-time physical activity level</b>										
High	0.6*	0.5, 0.7	0.7*	0.6, 0.8	1.3*	1.1, 1.5	1.2*	1.1, 1.4	0.6*	0.5, 0.7
Moderate	0.8*	0.6, 0.9	0.9	0.8, 1.0	1.2	1.0, 1.4	1.0	0.9, 1.2	0.7*	0.5, 0.8
Low	0.7*	0.6, 0.9	1.0	0.8, 1.2	1.3*	1.1, 1.6	0.9	0.8, 1.1	0.8*	0.6, 1.0
Sedentary <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
<b>At least weekly</b>										
Heavy drinking	1.1	0.8, 1.5	1.3*	1.0, 1.6	0.9	0.7, 1.3	0.9	0.8, 1.1	1.2	0.9, 1.7
Cannabis only	1.1	0.7, 1.7	1.1	0.8, 1.5	1.5*	1.0, 2.3	1.1	0.9, 1.5	1.5*	1.0, 2.1
Other illicit drug (with or without cannabis)	0.8	0.4, 1.3	1.0	0.7, 1.5	1.5	0.8, 2.7	1.6*	1.1, 2.5	1.4	0.9, 2.4



	Fair/Poor ability to handle day-to-day demands		Fair/Poor ability to handle unexpected problems		Not currently employed <sup>‡</sup>		At least one disability day in past two weeks		Dissatisfied with life	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
<b>Shift work<sup>§</sup></b>	1.0	0.8, 1.2	1.0	0.9, 1.2	0.3*	0.3, 0.4	1.0	0.9, 1.2	1.2*	1.0, 1.5
<b>Life stress</b>										
None/A little <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
A bit	1.8*	1.5, 2.2	1.6*	1.4, 1.9	1.3*	1.1, 1.5	1.2*	1.0, 1.3	2.0*	1.6, 2.5
Quite a bit/Extreme	3.0*	2.4, 3.7	2.2*	1.9, 2.6	1.1	0.8, 1.3	1.2*	1.1, 1.4	5.2*	4.1, 6.6
<b>Work stress<sup>§</sup></b>										
None/A little <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
A bit	1.1	0.8, 1.5	1.0	0.8, 1.2	0.1*	0.1, 0.1	1.0	0.9, 1.2	1.1	0.8, 1.3
Quite a bit/Extreme	1.0	0.8, 1.4	0.9	0.8, 1.1	0.1*	0.1, 0.2	1.1	0.9, 1.3	1.0	0.8, 1.4
<b>Activity limitation</b>										
Never <sup>†</sup>	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Sometimes	1.2*	1.0, 1.5	1.4*	1.2, 1.7	1.4*	1.1, 1.6	1.9*	1.7, 2.2	1.5*	1.2, 1.8
Often	2.0*	1.6, 2.4	1.6*	1.3, 1.9	2.1*	1.7, 2.6	4.0*	3.5, 4.6	2.0*	1.6, 2.4
<b>Chronic conditions</b>										
Asthma	1.0	0.8, 1.2	1.1	0.9, 1.3	0.9	0.7, 1.2	1.1	0.9, 1.2	1.0	0.7, 1.3
Fibromyalgia	1.5	1.0, 2.2	1.0	0.7, 1.3	1.2	0.8, 1.8	1.8*	1.3, 2.3	1.4	0.9, 2.1
Arthritis/Rheumatism	1.2	1.0, 1.5	1.1	1.0, 1.3	1.2	1.0, 1.5	1.3*	1.2, 1.5	0.9	0.8, 1.1
Back problems	1.1	0.9, 1.3	1.1	0.9, 1.2	1.0	0.8, 1.2	1.5*	1.3, 1.6	1.3*	1.1, 1.5
High blood pressure	1.1	0.9, 1.4	1.0	0.8, 1.2	1.2*	1.0, 1.5	1.1	1.0, 1.3	1.0	0.8, 1.2
Migraine	1.1	0.9, 1.3	1.0	0.9, 1.2	1.0	0.8, 1.2	1.3*	1.2, 1.5	1.1	0.9, 1.4
Diabetes	1.0	0.8, 1.4	1.2	1.0, 1.5	1.3	1.0, 1.9	1.0	0.8, 1.2	1.4*	1.0, 1.9
Heart disease	1.0	0.8, 1.3	1.0	0.8, 1.3	1.2	0.9, 1.7	1.4*	1.2, 1.7	1.0	0.8, 1.3
Cancer	1.0	0.6, 1.5	0.8	0.6, 1.1	1.2	0.7, 2.1	1.5*	1.2, 2.0	1.2	0.8, 1.9
Stomach/Intestinal ulcers	1.1	0.8, 1.6	1.3*	1.0, 1.7	1.2	0.9, 1.7	1.3*	1.1, 1.5	1.0	0.7, 1.4
Effects of stroke	1.8*	1.2, 2.7	1.2	0.8, 1.7	1.7	0.8, 3.7	1.6*	1.2, 2.2	1.7*	1.0, 2.7
Bowel disorders	1.3	0.9, 1.7	1.3*	1.0, 1.6	1.1	0.7, 1.5	1.7*	1.4, 2.1	0.8	0.6, 1.2
Chronic bronchitis/ Emphysema/Chronic obstructive pulmonary disease	1.2	0.9, 1.5	1.0	0.8, 1.2	1.6	0.9, 2.6	1.4*	1.2, 1.7	1.1	0.8, 1.5
<b>Anxiety disorder (past year)</b>	2.4*	1.9, 3.0	2.2*	1.8, 2.6	1.4*	1.1, 1.9	1.2*	1.0, 1.5	1.8*	1.4, 2.3
<b>Mood disorder (past year)</b>	3.2*	2.6, 4.0	2.7*	2.3, 3.2	1.2	0.9, 1.5	1.5*	1.3, 1.8	3.2*	2.6, 4.0
<b>Model information</b>										
Sample size	35,511		35,545		17,883		35,589		35,614	
Sample with outcome	2,119		3,627		3,275		5,142		1,928	
Records dropped because of missing values	1,473		1,439		636		1,395		1,370	

**Data source:** 2002 Canadian Community Health Survey: Mental Health and Well-being

**Notes:** A "missing" category for household income, body mass index and anxiety disorder was included in the models to maximize sample size, but the respective odds ratios are not shown. A "not applicable" category for shift work and work stress was included in the models, but the respective odds ratios are not shown.

<sup>†</sup> Reference category. When not noted, reference category is absence of characteristic; for example, reference category for asthma is no reported diagnosis of asthma.

<sup>‡</sup> Respondents aged 25 to 54

<sup>§</sup> Respondents aged 15 to 75 who were currently working or who had worked at job or business in past 12 months

\* Significantly different from estimate for reference category ( $p < 0.05$ )

... Not applicable