

Original article

# Epidemiology of insomnia: Prevalence, self-help treatments, consultations, and determinants of help-seeking behaviors

C.M. Morin<sup>a,b,\*</sup>, M. LeBlanc<sup>a,b</sup>, M. Daley<sup>a,b</sup>, J.P. Gregoire<sup>c,d</sup>, C. Mérette<sup>e,f</sup>

<sup>a</sup>École de psychologie, Université Laval, Québec City, Québec, Canada

<sup>b</sup>Centre d'étude des troubles du sommeil, Centre de recherche Université Laval-Robert-Giffard, Québec City, Québec, Canada

<sup>c</sup>Faculté de pharmacie, Université Laval, Québec City, Québec, Canada

<sup>d</sup>Unité de recherche en santé des populations de l'Université Laval, Centre de recherche du CHA-Hôpital du Saint-Sacrement, Québec City, Québec, Canada

<sup>e</sup>Centre de recherche Université Laval Robert-Giffard, Québec City, Québec, Canada

<sup>f</sup>Département de Psychiatrie, Université Laval, Québec City, Québec, Canada

Received 6 April 2005; received in revised form 25 July 2005; accepted 8 August 2005

## Abstract

**Background and purpose:** To estimate the prevalence of insomnia symptoms and syndrome in the general population, describe the types of self-help treatments and consultations initiated for insomnia, and examine help-seeking determinants.

**Patients and methods:** A randomly selected sample of 2001 French-speaking adults from the province of Quebec (Canada) responded to a telephone survey about sleep, insomnia, and its treatments.

**Results:** Of the total sample, 25.3% were dissatisfied with their sleep, 29.9% reported insomnia symptoms, and 9.5% met criteria for an insomnia syndrome. Thirteen percent of the respondents had consulted a healthcare provider specifically for insomnia in their lifetime, with general practitioners being the most frequently consulted. Daytime fatigue (48%), psychological distress (40%), and physical discomfort (22%) were the main determinants prompting individuals with insomnia to seek treatment. Of the total sample, 15% had used at least once herbal/dietary products to facilitate sleep and 11% had used prescribed sleep medications in the year preceding the survey. Other self-help strategies employed to facilitate sleep included reading, listening to music, and relaxation.

**Conclusions:** These findings confirm the high prevalence of insomnia in the general population. While few insomnia sufferers seek professional consultations, many individuals initiate self-help treatments, particularly when daytime impairments such as fatigue become more noticeable. Improved knowledge of the determinants of help-seeking behaviors could guide the development of effective public health prevention and intervention programs to promote healthy sleep.

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**Keywords:** Epidemiology; Insomnia; Prevalence; Referral and Consultation; Sleep

## 1. Introduction

Numerous epidemiological studies have been conducted to document the prevalence and correlates of insomnia. Depending on the definitions of insomnia (i.e. insomnia symptoms, with or without daytime consequences, dissatisfaction with sleep, and insomnia syndrome), prevalence rates have varied extensively from as

low as 5% to as high as 50% [1]. About one-third of the adult population is estimated to suffer from insomnia symptoms alone (i.e. difficulty in initiating or maintaining sleep) [2,3], but this figure decreases to about 10% when daytime consequences (e.g. fatigue) are also considered [3–5]. The sole criterion of sleep dissatisfaction yields prevalence estimates between 9 and 18%, [1,3] while strict application of diagnostic criteria from the Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition (DSM-IV) [6] produces a rate of about 6% [3,7]. The extensive variability of prevalence rates underscores the need to use a standardized definition and methodology when conducting epidemiological studies of insomnia [8,9].

\* Corresponding author. Tel.: +1 418-656-3275; fax: +1 418-656-5152.  
E-mail address: cmorin@psy.ulaval.ca (C.M. Morin).

Aside from prevalence, other dimensions of insomnia epidemiology are still poorly documented, including the types of interventions used for insomnia, healthcare providers consulted, and the determinants of help-seeking behaviors. Previous surveys have reported that between 5 and 36% of insomnia sufferers have consulted a physician specifically for sleep problems, while 27–55% have discussed sleep problems in the course of a medical consultation for another problem [10–12]. Estimates of the use of prescription medicine for sleep have varied from a low of 2.4% in Germany and about 5% in the United States to a high of 9.8% in France [3,13,14]. In addition, studies conducted in the United States indicate that between 3 and 10% of the adult population use over-the-counter (OTC) medication and 13% use alcohol to improve sleep [11,13,14].

Several studies have examined the types of factors associated with medical consultations and treatments for insomnia. More severe and more chronic insomnia, poorer physical health, older age, and lower income have been reported as the main predictors of medical consultations [11, 15,16]. To our knowledge, no study has directly asked individuals who have consulted for insomnia what factors led them to do so. Improved knowledge of the main determinants of help-seeking behaviors would be helpful to guide the development of effective public health prevention and intervention programs to promote healthy sleep.

There is still little information available about the use of complementary and alternative therapies, including self-help methods, natural and homeopathic products, and other services (e.g. acupuncture) that individuals with insomnia may use prior to seeking professional treatment. Since the utilization of self-help remedies is apparently fairly common [11,13], and given that some individuals rely on these remedies for extended periods of time (despite little knowledge of their risks and benefits), it is crucial to gather more information on this issue as well.

The goals of the present study were to estimate the prevalence of insomnia symptoms and insomnia syndrome in the general population, and describe the types of consultation initiated for insomnia and products and strategies used to promote sleep.

## 2. Methods

### 2.1. Sample selection

A telephone survey was conducted to randomly select a community sample for a longitudinal study of risk factors for insomnia. The target population consisted of all French-speaking residents, aged 18 years or older, of the province of Quebec (Canada). A representative sample was obtained using a random digit dialing method programmed to generate geographically stratified phone numbers according to the last Canadian census. This approach ensures

exhaustive and proportional coverage of every demographic area (listed and unlisted phone numbers). In a second stage, the Kish method [17] was used to identify the person to be interviewed in each household. This method allows for the random selection of participants within households while taking into consideration the number of residents in the household, their gender, and their age. This procedure further maximizes sample representativeness. When there was no answer in a household, the same phone number was dialed again up to eight times at different times of the day and of the week before being replaced by another number. Individuals who declined to participate in the survey upon first contact were called a second time before being eliminated from the study. Exclusion criteria included being less than 18 years of age, not speaking French well enough to complete the interview, or suffering from any medical or psychiatric condition that might prevent the person from completing a telephone interview. Of the 5991 persons solicited 2001 (33.4%) completed the interview.

### 2.2. Interview

Telephone interviews were conducted by a communication firm that specializes in telephone surveys. Approximately 50 trained interviewers administered the interview from a call center equipped with computerized telephone stations. Data collection was done with a software package designed specifically for this type of computer-assisted phone survey. Each interviewer received training and a pilot test was conducted on 25 participants to improve the wording of items and to provide feedback on the flow of the interview. These 2001 interviews were completed over a period of one month (Fall 2002).

After a brief description of the aims of the study and after obtaining verbal consent to proceed with the interview, data were collected on the following variables: demographics, sleep and healthcare consultations for sleep problems, use of sleep-promoting products or self-help strategies, and physical and mental health. Average interview time was 13 min.

### 2.3. Sleep

The first part of the interview concerned sleep habits and quality during the preceding month; the primary goal being to identify insomnia symptoms and insomnia diagnosis as defined by the DSM-IV [6] and the International Classification of Diseases, 10th Edition (ICD-10) [18]. Sleep satisfaction was evaluated on a four-point scale (i.e. very satisfied to very dissatisfied), followed by two questions about difficulty initiating sleep (i.e. number of minutes to fall asleep and weekly frequency of sleep latency periods exceeding 30 min). Next, several questions addressing sleep maintenance difficulty were asked, including (a) the typical number of awakenings per night, (b) the total estimated time spent awake per night, (c) weekly frequency of nights

characterized by difficulty maintaining sleep (i.e. nocturnal awakenings lasting 30 min or more), (d) weekly frequency of early morning awakenings (defined as awakening at least 30 min earlier than desired), and (e) estimated total nightly sleep time. The principal reasons for awakening were also noted (e.g. anxiety, children), as well as the methods (e.g. reading, television, eating) used to induce sleep at bedtime or for returning to sleep after an awakening. Finally, for individuals reporting sleep difficulty, the duration (in months), the consequences (i.e. impairment of daytime functioning, occupational or social activities, fatigue, and mood disturbance) and the level of concern about the difficulty were investigated. Participants were also asked if a healthcare professional had ever diagnosed a sleep disorder such as sleep apnea, insomnia, or restless legs syndrome.

#### 2.4. Health

The second part of the interview assessed participants' health status. Respondents were asked to rate their physical and mental health on four-point scales. Then they were asked if they had experienced psychological/emotional problems in the last year (yes–no question); symptoms of anxiety (i.e. 'In the last month, have you been worrying or nervous most of the time?') and depression (i.e. 'In the last month, has there been a period of two weeks or more during which you felt depressed most of the time?') over the last month were also assessed by key questions (yes–no answer) taken from the Structured Clinical Interview for DSM-IV [6]. Additional questions were asked about help-seeking behaviors, utilization of sleep-promoting products, and type of strategies used to alleviate sleep problems. Respondents were asked if they had ever consulted a healthcare provider for sleep problems and, if so, what type of provider had been consulted and what prompted them to seek treatment. Participants who reported sleep problems but who had never consulted were asked why they had not done so.

Participants were then asked if they had taken any of the following products specifically to promote sleep in the preceding 12 months: prescription medications, non-prescription medications (i.e. OTC), natural or homeopathic products, and alcohol. If the response was affirmative, they were asked to estimate their weekly use during the preceding month. They were also asked to list other strategies they had used to facilitate sleep onset or to improve sleep (e.g. relaxation, acupuncture, hypnosis). The interview concluded with the usual sociodemographic questions required to describe the sample characteristics, and participants were asked if they were willing to participate in a longitudinal study evaluating sleep and general health.

#### 2.5. Definition of insomnia

An algorithm based on a combination of the DSM-IV [6] and the ICD-10 [18] insomnia diagnostic criteria was used

to identify subgroups of individuals with an insomnia syndrome. Participants included in this subgroup were dissatisfied with their sleep (combination of very dissatisfied and dissatisfied) and presented symptoms of initial, maintenance or late insomnia at least three nights per week for a minimum duration of one month. Initial insomnia was defined by sleep onset latency greater than 30 min, maintenance insomnia was defined by awakenings during the night lasting more than 30 min and late insomnia was defined by an awakening in the morning more than 30 min before the desired final wake time. Psychological distress or daytime impairment related to sleep difficulties was also reported by those individuals.

#### 2.6. Data analysis

Data were weighted to adjust for potential differences between gender representation in the sample and that of the last national census. Sample sizes reported in tables and figures refer to the actual number of respondents, and percentages refer to weighted data. Ninety-five percent confidence intervals (CI) were calculated for prevalence rates. Most of the analyses are descriptive. However, when between-group comparisons were performed,  $\chi^2$  test and univariate odds ratios were calculated to evaluate the association between insomnia and the utilization of sleep aids. A standard logistic regression was also performed to identify predictors of insomnia syndrome. Analyses were performed using SAS (version 8.2) and the alpha level was set at a two-tailed 5%.

### 3. Results

#### 3.1. Demographic characteristics

Participants were between 18 and 91 years of age, with a mean age of 44.7 (SD=16.1). After weighting, the sample included 51% women and 49% men (compared to 58 and 42%, respectively, before the weighting procedure). A majority of the participants (80.3%) had completed at least a high school degree, were married or living with a partner (53.1%), working (69.2%) and living in an urban area (62.8%). The sample was representative of the general population of the French-speaking adults of Quebec according to age, gender, and living area.

#### 3.2. Prevalence of insomnia symptoms and syndrome

Figure 1 shows that 25.3% (CI: 23.4–27.2) of the total sample were dissatisfied with their sleep, and 29.9% (CI: 27.9–31.9) presented at least one insomnia symptom (i.e. initial, middle, late insomnia) for a minimum of three nights a week. For those individuals, the combination of two insomnia symptoms (i.e. mixed insomnia) was the most frequent symptomatology condition (12.8% of the overall

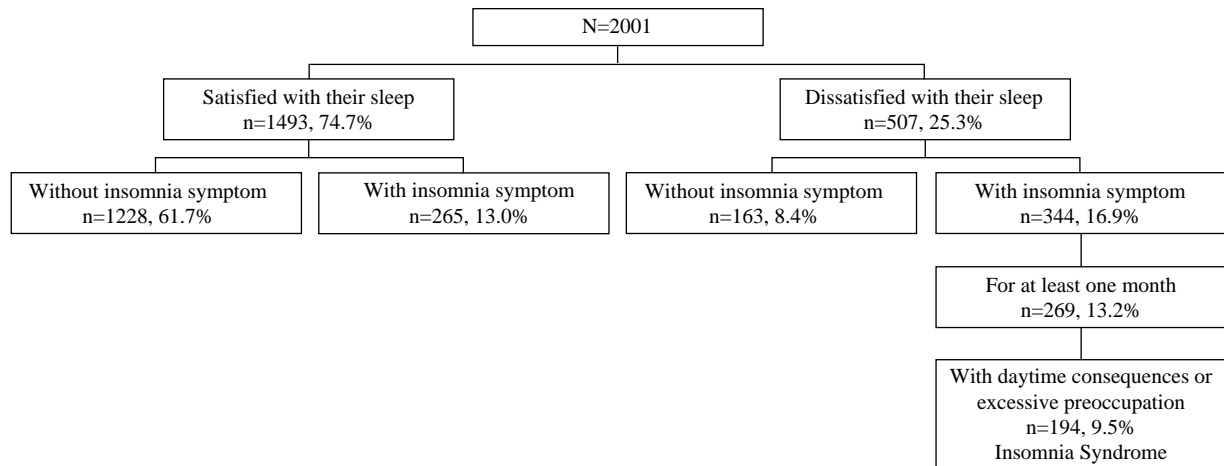


Fig. 1. Insomnia symptoms and syndrome prevalence in the general population.

sample), followed by initial insomnia (8.7%) (see Table 1 for the distribution of subtypes of insomnia symptoms in the total sample). The combination of sleep dissatisfaction with the presence of one insomnia symptom was reported by 16.9% (CI: 15.3–18.6) of the sample. Conversely, 61.7% (CI: 59.6–63.8) of the sample were satisfied with their sleep and had no insomnia symptoms, while 13% (CI: 11.6–14.5) reported being satisfied with their sleep despite the presence of at least one insomnia symptom. Finally, 9.5% (CI: 8.2–10.8) of the sample met criteria for an insomnia syndrome as defined by DSM-IV [6] and ICD-10 [18].

### 3.3. Correlates

Table 2 presents prevalence rates of insomnia syndrome as a function of several subgroups. There were significant differences in the proportion of insomnia syndrome sufferers according to gender, marital status, family income, self-rated physical and mental health, and self-reported anxiety and depression. In contrast, age, education, occupation, and living area were not associated with insomnia prevalence rates.

A logistic regression was performed to identify predictors of insomnia syndrome. Variables entered into the equation included gender, age group, marital status, occupation, education level, living area (rural versus urban), self-rated physical health, self-rated mental health,

presence of anxiety symptoms and presence of depressive symptoms. This analysis was based on 1384 participants (i.e., participants without missing data only). A moderate adjustment level was obtained between predicted and observed data ( $R^2=0.31$ , Goodness of fit  $\chi^2(8)=6.67$ , ns). Results indicate that six variables were significantly associated with the presence of an insomnia syndrome (Table 3). Together, these variables correctly classified 88% of the participants (sensitivity=25%; specificity=98% with the usual 0.5 probability level cut-off). However, to optimize sensitivity, it would be preferable to use a 0.1 cut-off probability level (classification=76%, sensitivity=71%; specificity=76%). Variables that increased the odds to meet diagnostic criteria for insomnia syndrome were increased age (OR=1.2), poor physical health (OR=5.3), poor mental health (OR=1.6), symptoms of anxiety (OR=4.8), and symptoms of depression (OR=2.1). In this equation, one last variable seemed to have a protective effect: widowhood (OR=0.4; as compared to being married).

### 3.4. Healthcare consultations for sleep-problems

Almost 13% (CI: 11.2–14.2) of all respondents had consulted a healthcare provider for sleep problems at least once in their lifetime. Of those, 15.6% (i.e. 2% of total

Table 1  
Distribution of insomnia symptoms

	<i>n</i>	% of sample with insomnia symptoms (n=609)	% of overall sample (n=2001)	95% CI
Initial insomnia	176	28.9	8.7	7.4–9.9
Middle insomnia	129	21.2	6.4	5.3–7.4
Late insomnia	43	2.2	2.1	1.5–2.8
Mixed insomnia	261	42.9	12.8	11.3–14.2
Initial + middle + late	74	12.2	3.6	2.8–4.4
Initial + middle	110	18.1	5.3	4.3–6.3
Initial + late	24	3.9	1.2	0.7–1.7
Middle + late	53	8.7	2.7	2.0–3.4

Note: *n* refers to actual number of respondents and % refers to weighted data. CI, confidence interval.

Table 2  
Prevalence of insomnia syndrome as a function of selected demographic and clinical variables ( $N=2001$ )

		Insomnia prevalence					
		$N$	$n$ (%)	$\chi^2$ (df)	$P$	Relative Risk	95% CI
Gender	Women	1156	127 (11.0)	5.4 (1)	0.02	1.38	1.05–1.82
	Men	844	67 (7.9)				
Age groups	18–29	381	28 (7.3)	4.9 (5)	0.43		
	30–39	411	39 (9.2)				
	40–49	501	54 (10.7)				
	50–59	326	38 (11.4)				
	60–69	213	21 (9.5)				
Marital status	70 and over	168	14 (8.1)	17.0 (3)	<0.01		
	Single	560	63 (11.1)				
	Married/common-law relationship	1053	82 (7.6)				
	Divorced/separated	248	39 (15.5)				
Education	Widowed	136	10 (7.1)	4.0 (3)	0.26		
	Primary or less	389	43 (10.8)				
	Secondary	711	73 (10.1)				
	Junior College	415	42 (10.1)				
Occupation	University	478	36 (7.3)	4.4 (3)	0.22		
	Working	1364	125 (9.0)				
	Student	83	10 (11.4)				
	Non-working	188	24 (13.4)				
Living area	Retired	343	30 (8.3)	1.3 (1)	0.26	.85	0.63–1.13
	Rural	733	65 (8.5)				
	Urban	1255	127 (10.0)				
Family income	Less than 15 000	286	38 (12.9)	11.7 (5)	0.04		
	15,000–30,000	395	44 (11.1)				
	30,000–45,000	357	29 (7.8)				
	45,000–60,000	297	31 (10.6)				
	60,000–80,000	219	14 (6.5)				
Self-rated physical health	Over than 80,000	243	17 (6.5)	108.4 (1)	<0.01	4.01	3.08–5.23
	Poor	240	68 (28.0)				
Mental health problems	Good	1760	126 (7.0)	59.6 (1)	<0.01	2.85	2.18–3.73
	Yes	364	75 (20.4)				
Self-reported anxiety	No	1633	119 (7.2)	145.1 (1)	<0.01	4.60	3.52–6.02
	Yes	459	111 (24.2)				
Self-reported depression	No	1813	138 (7.4)	106.9 (1)	<0.01	4.20	3.20–5.51
	Yes	185	56 (30.9)				

Note:  $n$  refers to actual number of respondents and % refers to weighted data.  $\chi^2$ , chi-square and (df), degrees of freedom.

sample) had consulted within the month preceding the interview. For the individuals with an insomnia syndrome ( $n=194$ ), the lifetime consultation rate increased to 42.3% and was significantly higher than lifetime consultations reported by the rest of the sample (9.6%),  $\chi^2(1, N=1998)=165.1, P<0.01$ . The demographic (e.g. gender, age group, occupation) and clinical (e.g. self-rated physical and mental health, depression) variables significantly associated with consultation rates were identical to those found to be associated with insomnia prevalence rates, with the exception of age,  $\chi^2(5, N=1998)=23.7, P<0.01$ , and occupation,  $\chi^2(3, N=1976)=10.2, P<0.05$ . Thus, increased age was associated with higher rates of consultation, with non-working individuals apparently consulting more often than working and retired participants.

General practitioners were consulted more frequently than any other health professional for sleep problems. Of those participants who had consulted, 82.7% (CI: 78.1–87.4)

had seen a general practitioner, 17.0% (CI: 12.4–21.7) a medical specialist (other than psychiatrist), 5.9% a psychologist (CI: 3.0–8.8), and 3% a psychiatrist (CI: 0.1–5.1). Pharmacists, acupuncturists, and homeopaths were each consulted by less than 1% of the sample. Participants could

Table 3  
Logistic regression results for the diagnosis of insomnia syndrome versus good sleepers ( $N=1384$ )

Predictor	B	Wald $\chi^2$	OR	95% CI
Age	0.22	5.38*	1.25	1.03–1.51
Widowhood (versus married)	–0.85	5.57*	0.37	0.14–0.95
Self-rated physical health (poor)	1.66	42.85**	5.26	3.19–8.62
Self-rated mental health (poor)	0.48	4.69*	1.61	1.05–2.48
Anxiety symptoms (yes)	1.57	58.76**	4.78	3.21–7.14
Depressive symptoms (yes)	0.75	7.50**	2.11	1.24–3.60

Note: \* $P<0.05$ ; \*\* $P<0.01$ ; OR, odds ratio; CI, confidence interval.



report consultations with more than one healthcare provider and, consequently, categories are not mutually exclusive. Gender was the only demographic variable associated with consultation of different healthcare providers: a higher proportion of women reported consulting general practitioners (86.5 versus 75.0% for men)  $\chi^2(1, N=254)=5.2$ ,  $P<0.05$ , and a higher proportion of men reported consulting specialists compared to women (26.4 versus 12.4%)  $\chi^2(1, N=254)=7.7$ ,  $P<0.01$ .

Of the 265 individuals who reported having consulted for a sleep problem, the main determinants of help-seeking were fatigue (48.1% [CI: 42.0–54.3]) and psychological distress (39.7% [CI: 33.7–45.7]), followed by physical discomfort (21.6% [CI: 16.5–26.6]), suggestion by a significant other (13.7% [CI: 9.5–17.9]), reduced work productivity (13.4% [CI: 9.2 to 17.6]), suggestion by another health professional (11.1% [CI: 7.2–14.9]), significant sleep loss (10.7% [CI: 6.9–14.6]), self-referral (3.5% [CI: 1.2–5.7]) and stress (3.3% [CI: 1.1–5.5]).

### 3.5. Products and strategies used to promote sleep

In the 12 months preceding the interview, 15% (CI: 13.5–16.6) of the overall sample had used natural products (herbal/dietary) at least once to alleviate insomnia symptoms. Prescribed medications were utilized with the second highest frequency, with 11% (CI: 9.6–12.4) of respondents having used such products during the last year. Finally, OTC medications (3.8% [CI: 2.9–4.6]) and alcohol (4.1% [CI: 3.2–5.0]) were each used by about 4% of the population to improve sleep. People had also used several other strategies to promote sleep, such as reading (32.5% [CI: 30.4–34.5]), listening to music (25.2% [CI: 23.3–27.1]), and relaxation (20.7% [CI: 19.0–22.5]). Strategies like massotherapy (3.5% [CI: 2.7–4.3]), acupuncture (0.6% [CI: 0.3–0.9]), and hypnosis (0.2% [CI: 0.0–0.4]) were used much less frequently.

For the subgroup of individuals with insomnia syndrome, the utilization rates of these products and strategies were higher. Compared to the rest of the sample, this subgroup was more likely to have used natural products (35.7% utilization rate; OR=3.7), prescribed medications (33.2%; OR=5.2), OTC medications (8.7%; OR=2.8), and alcohol (10.7%; OR=3.2) over the previous year. They were also more likely to have used other strategies such as reading (45.2% utilization rate; OR=1.8), listening to music (43.6%; OR=2.6), relaxation (38.2%; OR=2.6), massotherapy (10.1%; OR=4.2), and acupuncture (1.9%; OR=4.2) (see Fig. 2).

Respondents who had used any sleep-promoting product at least once in the last 12 months were asked to estimate weekly frequency of use for the previous month. Except for prescribed medications, which were used by nearly half of product users (48.5%) three nights or more per week, most products were used infrequently. OTC medications were the least regularly used products (21.3%). There was no

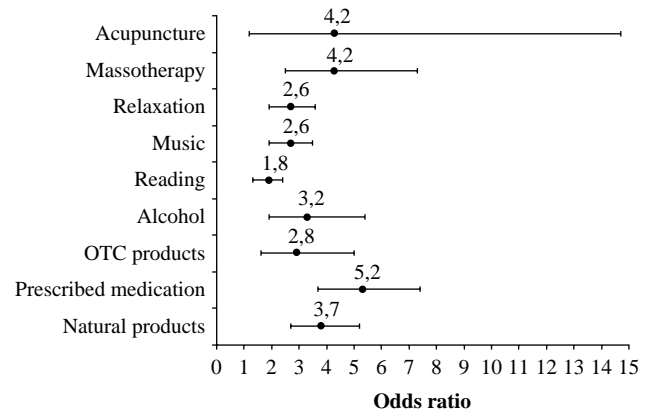


Fig. 2. Likelihood of using sleep-promoting products and strategies among the insomnia syndrome sufferers.

significant difference between regular ( $n=209$ ) and occasional users ( $n=334$ ) of sleep-promoting products regarding gender, living area, self-reported mental-health, and presence of anxiety and depressive symptoms. Conversely, there were significant group differences in age and age-related variables (i.e. widowhood, level of education, and retirement) with regular users being older ( $\chi=52.2$ ;  $SD=17.5$ ) than occasional users ( $\chi=42.9$ ;  $SD=15.7$ )  $F(1, 541)=40.85$ ,  $P=0.000$ . Regular users also reported poor physical health (33.7%) more often than occasional users (15.2%);  $\chi^2(1, N=532)=24.9$ ,  $P=0.000$ . Last, there were significant differences between non-users and users (combining occasional and regular users), with the latter group including more women, more individuals living in an urban area, presenting a poorer self-reported physical and mental health, and presenting anxiety and depressive symptoms ( $ps=0.000$ ).

## 4. Discussion

The goals of the present study were to estimate the prevalence of insomnia symptoms and syndrome in the general population, to examine consultation patterns and determinants of consultation for insomnia, and to describe the types of products and strategies used to promote sleep.

The decision tree used to estimate the point prevalence of insomnia (Fig. 1) leads to estimates comparable to those obtained in previous epidemiological studies and highlight the extensive variability in prevalence rates based upon insomnia definitions. Similar to previous studies [2,3], insomnia symptoms were fairly common in the general population, with one-third of the sample presenting at least one symptom (i.e. initiating or maintaining sleep, or early morning awakening) three nights or more a week. The use of more conservative DSM-IV [6] and ICD-10 [18] diagnostic criteria for insomnia syndrome produced a prevalence rate of 9.5% for the general population. This algorithm, which included frequency, severity, and

duration criteria, may yield a more precise prevalence rate of insomnia syndrome [1,19,20]. Despite this more stringent definition, the rate of insomnia syndrome observed in this study was higher than rates obtained in European studies (4.4–6%) that relied approximately on the same criteria [3,7,10,20]. On the other hand, our results are quite similar to estimates observed in several American studies, which used more liberal diagnostic criteria [4,11]. These differences across studies could reflect cultural differences, subtle methodological differences related to question formulation, types of interview, or even the period of the year the study was undertaken [21]. For example, two factors may have slightly inflated the prevalence figures in the present study. First, with a response rate of 33.4%, it is plausible that people with sleep problems were more likely to accept completing the interview than those without sleep problems. Second, respondents were asked if they had ever been diagnosed with a sleep disorder other than insomnia. It is possible that some individuals with an undiagnosed sleep disorder (e.g. restless legs syndrome, sleep apnea) reported insomnia symptoms, which could have reflected the presence of another sleep disorder [10].

There were strong associations between insomnia and self-reported physical and mental health, with individuals who reported poor health status being more likely to report insomnia. Although this finding is consistent with previous epidemiological surveys [4,7,10,12,22], the retrospective and cross-sectional nature of the data precluded reliable differentiation between primary insomnia and insomnia secondary to another mental, medical, or another sleep disorder. While insomnia can be a diagnostic entity unto itself, it can also be symptomatic of another disorder, and making the distinction between these two conditions can be a considerable challenge not only in epidemiological surveys but even in clinical practice.

Almost 13% of the overall sample had previously consulted a healthcare provider (mostly general practitioners) for sleep problems at least once, with the rate rising considerably to 42.3% among individuals suffering from an insomnia disorder. Although this consultation rate is higher compared to figures previously reported [10–12, 23], these data indicate that the majority of individuals reporting insomnia do not seek help for their sleep difficulties. The most frequently cited reasons for consulting were the perceived daytime consequences of fatigue and various psychological symptoms (e.g. depression and anxiety). Although it is likely that some individuals do not perceive insomnia symptoms as problematic or troublesome, or do not experience daytime consequences during the initial episode, persistent insomnia has been shown to increase the risk for major depression [4]. It may be important then to educate both the general public and healthcare practitioners about early intervention programs for insomnia. One study found that knowledge about treatments available for insomnia was very limited in the general population [11]. The issue of low consultation rate

may also be in part due to under-recognition and under-diagnosis by healthcare practitioners as well as due to limited resources available to treat insomnia complaints. Public education programs in addition to the dissemination of effective training programs for of healthcare providers would be welcome.

Use of herbal and dietary supplements was fairly common in the general population (15%), with higher rates reported than for use of prescribed sleep medications (11%). Use of prescription medications was comparable to rates obtained in France (9.8%) and higher than rates in the UK (3.6%) and in Germany (2.4%) [3]. In the subgroup of individuals with an insomnia disorder, use of prescription medications was lower than in France (33.2 and 48.4%, respectively) but higher than in Germany (11%) [3]. In the United States, 23% of insomniacs use OTC products and 28% use alcohol, compared to 8.7% (OTC) and 10.7% (alcohol) of the insomnia syndrome subgroup identified in this study [10]. Whether these differences across countries, in medication usage or in healthcare consultation, reflect cultural or economic differences related to various social security programs remains unclear and warrants further investigation. Finally, many individuals initiate a variety of self-help strategies to alleviate insomnia. These include reading, listening to music, and relaxation. The use of such strategies, be they behavioral or product-related, is much more prevalent in individuals suffering from insomnia than in any other sleep subgroup of the general population. In fact, these individuals may experiment with a variety of such self-help remedies for a considerable period of time before seeking professional help.

This study provides new information about several areas of the epidemiology of insomnia, particularly with the use of a detailed algorithm in the definition of several forms of insomnia complaints. In addition, novel information about types of consultations and determinants of help-seeking behaviors was provided. Further research is needed to continue refining survey assessment methodology in order to obtain the most accurate epidemiological data on insomnia and to advance our understanding of help-seeking behaviors and methods used to promote sleep. Longitudinal follow-ups are currently being conducted to gather more information about the natural history and risk factors of insomnia.

## Acknowledgements

This research was supported by a Canadian Institutes of Health Research grant (#42504).

## References

- [1] Ohayon MM. Epidemiology of insomnia: what we know and what we still need to learn. *Sleep Med Rev* 2002;6:97–111.

- [2] Klink ME, Quan ST, Kalterborn WT, Lebowitz MD. Risk factors associated with complaints of insomnia in a general adult population: influence of previous complaints of insomnia. *Arch Intern Med* 1992; 152:1572–5.
- [3] Ohayon MM. Prevalence, diagnosis and treatment of chronic insomnia in the general population. In: Proceedings of the satellite symposium new developments in the treatment of insomnia—do they really have impact on the primary care settings? Medical Forum International, Zeist, 2001.
- [4] Ford DE, Kamerow DB. Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention. *J Am Med Assoc* 1989;262:1479–84.
- [5] Léger D, Guilleminault C, Dreyfrus JP, Delahaye C, Paillard M. Prevalence of insomnia in a survey of 12 778 adults in France. *J Sleep Res* 2000;9:35–42.
- [6] American Psychiatric Association (APA). Diagnostic and statistical manual of mental disorders. 4th ed. Washington, DC: Author; 1994.
- [7] Ohayon MM. Prevalence of DSM-IV diagnostic criteria of insomnia: distinguishing insomnia related to mental disorders from sleep disorders. *J Psychiatr Res* 1997;31:333–46.
- [8] Edinger JD, Bonnet MH, Bootzin RR, et al. Derivation of research diagnostic criteria for insomnia: report of an American Academy of Sleep Medicine Work Group. *Sleep* 2004;27:1567–96.
- [9] NIH. State-of-the-science conference statement. Manifestations and management of chronic insomnia in adults 2005 [cited 2005 August 18, Available from: <http://consensus.nih.gov/2005/2005InsomniaS0S026PDF.pdf>].
- [10] Ohayon MM, Caulet MC, Priest RG, Guilleminault C. DSM-IV and ICSD-90 insomnia symptoms and sleep dissatisfaction. *Br J Psychiatry* 1997;171:382–8.
- [11] Ancoli-Israel S, Roth T. Characteristics of insomnia in the United States: results of the 1991 national sleep foundation survey. *Sleep* 1999;22:347–53.
- [12] Ohayon MM, Hong SC. Prevalence of insomnia and associated factors in South Korea. *J Psychosom Res* 2002;53:593–600.
- [13] Johnson EO, Roehrs T, Roth T, Breslau N. Epidemiology and medication as aids to sleep in early adulthood. *Sleep* 1998;21:178–86.
- [14] Mellinger GD, Balter MB, Uhlenhuth EH. Insomnia and its treatment: prevalence and correlates. *Arch Gen Psychiatry* 1985;42:225–32.
- [15] Hohagen F, Rink K, Kappler C, Riemann D, Weyerer S, Berger M. Prevalence and treatment of insomnia in general practice. *Eur Arch Psychiatry Clin Neurosci* 1993;242:329–36.
- [16] Shochat T, Umphress J, Israel AG, Ancoli-Israel S. Insomnia in primary care patients. *Sleep* 1999;22(Suppl 2):359–65.
- [17] Kish L. Survey sampling. New York: Wiley; 1995.
- [18] World Health Organization (WHO). The ICD-10 classification of mental and behavioral disorder: diagnostic criteria for research (10th revision). Geneva: World Health Organization; 1992.
- [19] Harvey AG. Insomnia: symptom or diagnosis? *Clin Psychol Rev* 2001;21:1037–59.
- [20] Ohayon MM, Shapiro C. Tenses of insomnia epidemiology. *J Psychosom Res* 2002;53:525–7.
- [21] Pallesen S, Nordhus IH, Nielsen GH, Havik OE, Kvale G, Johnsen BH, et al. Prevalence of insomnia in the adult Norwegian population. *Sleep* 2001;25:49–56.
- [22] Ohayon MM, Roth T. What are the contributing factors for insomnia in the general population? *J Psychosom Res* 2001;51:745–55.
- [23] Hajak G. Epidemiology of severe insomnia and its consequences in Germany. *Eur Arch Psychiatry Clin Neurosci* 2001;251:49–56.