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THE IMPACT AND ECONOMIC COSTS OF INSOMNIA
Health-care utilisation, work function and accidents

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RÉSUMÉ

L'insomnie est le trouble de sommeil le plus prévalent. Elle est caractérisée par des difficultés à s'endormir, à rester endormi et/ou des réveils précoces. Près d'un tiers de la population souffre de l'insomnie occasionnellement, et dix pour cent s'en plaignent d'une façon chronique. Pour y remédier, ceux-ci consomment des médicaments prescrits, de l'alcool, et des produits sans ordonnance, naturels et homéopathiques. De plus, l'insomnie est associée à différents problèmes d'ordre psychosocial et occupationnelle, ce qui peut occasionner des coûts importants du point de vue de la société. Présentement, nous savons très peu de ces coûts, faute de données. Par exemple, nous savons très peu sur les différents types de professionnels de santé consultés ou sur la gamme de produits utilisée pour soulager les symptômes. Le rôle de l'insomnie dans l'absentéisme et les baisses de productivité au travail, ainsi que dans les accidents au travail reste également peu exploré. Finalement, les évaluations du coût de l'insomnie sont, pour la plupart, rudimentaires et limitées. L'objectif de la présente étude était donc (a) d'identifier le lien entre l'insomnie et l'utilisation du système et des produits de santé; (b) de décrire le lien entre l'insomnie, le fonctionnement au travail, et les accidents; (c) d'estimer les coûts directs et indirects de l'insomnie du point de vue globale (e.g. de la société); et (d) d'identifier les variables associées à l'utilisation du système et produits de santé, au fonctionnement au travail, et aux accidents. Un échantillon aléatoire de 956 adultes de la province du Québec a été utilisé. Les résultats démontrent que l'insomnie est associée aux consultations plus fréquentes chez une vaste gamme de professionnels de santé, une consommation plus élevée de médicaments prescrits et sans ordonnance, ainsi qu'une utilisation importante de l'alcool pour dormir. Les absences et les baisses de productivité sont également plus élevées chez les mauvais dormeurs. Les coûts directs et indirects de l'insomnie s'élèvent à 6.3$ milliards par année pour la province dont 90 pour 100 serait dû aux baisses de productivité. Combinant les coûts directs et indirects, le coût moyen annuel pour les personnes avec un syndrome d'insomnie est estimé à 4,394$, comparativement à 1,302$ pour les personnes qui présentent des symptômes et à 603$ pour les bons dormeurs.

ABSTRACT

Insomnia is the most prevalent of the sleep disorders, and is characterized by difficulties falling asleep, remaining asleep, or waking too early in the morning. It affects about a third of the population on an occasional basis and about 10% in a more chronic manner. Along with prescription medications, individuals with insomnia may resort to remedies such as alcohol, over-the-counter medications, and natural or homeopathic products. In addition, chronic difficulties initiating and maintaining sleep are often associated with psychosocial and occupational impairments, all of which may be costly to society. While researchers have examined the links between insomnia, health-care and product use, and psychosocial impairment (in particular, work function and accidents), we know little about the Canadian context. In addition, we know little regarding whether insomnia status is associated with different patterns of consultations with various *types* of health-care professionals or with the use of different *types* of medications or other products. Furthermore, research into work function has not measured participants' perceptions regarding the role insomnia plays in their absences, reduced productivity and accidents, or whether these perceptions differ according to insomnia status. Finally, much-needed cost estimates are rare, limited and rather preliminary. The present study attempted to address some of these issues, establishing the following four objectives: (a) to identify the relationship between insomnia status and health-care system and product use; (b) to describe the relationship between insomnia status, functional capacity at work and accidents; (c) to estimate the cost of insomnia to Quebec society; and (d) to identify the variables most closely associated with health-care service and product use, work function and accidents. Data were obtained using a survey of a sample of 956 French-speaking adults from Québec, Canada. Results suggest that insomnia symptomatology is associated with an increased use of the health-care system and decreased work function. Health system differences were present across a range of consultation categories and products. Alcohol was also used as a sleep aid by more participants with insomnia. Accidents, however, were not more frequent in the insomnia group, but fatigue was positively associated with accidents for all insomnia categories. Furthermore, insomnia was perceived as playing an important contributing role in work function deficits. Finally, this study provides data suggesting that insomnia is very costly to Quebec society ($6.3 billion annually), with costs associated with reduced productivity and absenteeism comprising about 90% of all insomnia-related costs.

To my children

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The completion of this thesis would not have been possible without the input and support of several people. First, I would like to thank my supervisor, Dr. Charles Morin, for his critical eye, thoroughness, sound judgement and constant support and encouragement. I am equally grateful to have had the chance to work in such a vibrant laboratory setting where challenges and opportunities for stimulating pursuits abounded. In addition, I would like to thank the members of my thesis committee, Dr. Josée Savard, Dr. Jean-Pierre Grégoire and Dr. Janel Gauthier, for their valuable suggestions during the planning, execution and writing up of this doctoral thesis. The expertise of Dr. Guy Lacroix and Dr. James Walsh, who came on board for my thesis defence was greatly appreciated, as was the input of Dr. Lucie Baillargeon and Dr. Chantal Mérette during the crucial planning stages of the research. Thanks also to the Canadian Institutes for Health Research (CIHR) who provided the financial support to conduct this research (#MT42504).

This research would also not have been possible without the diligent work of Mélanie LeBlanc, who coordinated the umbrella epidemiological study of which this research was an offshoot. In addition, I would like to mention the tireless work of the research assistants who painstakingly entered all the cost data – a very long and thankless job that required perseverance, resourcefulness and an eye for detail. Thanks also to Hans Ivers for his expertise and counsel regarding the merging of large amounts of data from various sources and other data management mysteries.

It has been a special personal challenge for me to complete this research, and the rest of the Ph.D. requirements. The exercise has been one of juggling family life, work and, of course, sanity! Many friends and colleagues have supported me along the journey, and a short mention can not begin to express my feelings of thankfulness at having been surrounded by their endless encouraging words and supportive deeds: Cara and Jon, Mom and Doug, Janet, Jacinthe, Lisa, Louise, Manoj, Dan, Marie-Christine, Célyne, Lynda, and many more. The journey would not have been the same without you. And to everyone in the lab, you all have a special place in my heart and in my "souvenirs" - each one of you for your own unique contribution to my experience in the program and in the lab.

Finally, I wish to express my profound gratitude for the patience, support and generosity provided to me over the last seven years by my husband, Bernard Beaudreau, and my children, Nicholas, Alex, Eric, Pierre and Annique. Thank you for standing by me, endlessly "picking up the slack" and bearing with my preoccupation and "busy-ness" during this entire endeavour. Kids, I hope I haven't turned you off the idea of graduate studies!

AVANT-PROPOS

This thesis was written in partial fulfilment of the requirements for the PhD in clinical psychology (research and intervention) at Laval University. The research was undertaken when the candidate was a full-time student in the program. The study presented in this article figures as part of a larger epidemiological study that began in 2001 and that was funded by the Canadian Institutes for Health Research (#MT42504). The candidate was co-author on the initial research grant proposal, and was involved in various phases of project conceptualization and execution, including the choice, development and pretesting of questionnaire material, the coordination of the initial population survey project, and the supervision of research assistants responsible for data entry. The in-house questionnaire used to obtain health-care service/product use and cost data was developed and pilot tested by the candidate. Data analysis and interpretation were also carried out by the candidate.

The thesis is submitted as a series of three articles for each of which the thesis candidate is the first author. The first article is a review of the literature on the costs associated with insomnia. It addresses health economic cost terminology and methodology as well as the current state of knowledge on the direct and indirect costs of insomnia. The second article is an empirical study of the relationship between insomnia symptomatology and the use of the health-care system and products, work function and accidents. The final article estimates the direct and indirect costs associated with insomnia. While none of the articles has been published yet, they are to be submitted for publication in the months following defence of the thesis. A list of the co-authors appearing on each of the articles is presented below, along with each co-author's specific contribution to the research.

Dr. Charles Morin, PhD

Dr. Morin served as the candidate's thesis advisor. He is professor at Laval University's School of Psychology and Director of the Centre for Research on Sleep Disorders.

Mélanie LeBlanc, MPs

Ms. LeBlanc was project coordinator for the mother study from which the present research was generated. She oversaw major project operations such as participant and material management, the training and supervision of research assistants, and interfacing with technological support personnel.

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Introduction: The impact of insomnia and its costs to society

Insomnia is an important health problem that affects significant numbers of people and can have serious consequences (Ford & Kamerow, 1989; Gallup, 1991). While it is the most prevalent of sleep disorders, individuals may go undiagnosed and thus untreated for many years, often resorting to self-help remedies such as alcohol, over-the-counter medications, natural products and untested treatments in the interim, the effectiveness of which is dubious if not deleterious (Morin, Leblanc, Daley, Grégoire & Merette, 2006). Chronic difficulties initiating and maintaining sleep are often associated with psychosocial and occupational impairments such as daytime fatigue, mood disturbances, performance impairments, and reduced quality of life, all of which are costly on a number of levels, both to individuals as well as to society (Ancoli-Israel & Roth, 1999; Simon & Vonkorff, 1997; Walsh & Engelhardt, 1999; Zammit, Weiner, Damato, Sillup & McMillan, 1999). The purpose of this thesis, which takes the form of three scholarly articles, was to investigate the health and health-care utilisation correlates of insomnia, as well as the relationship between insomnia severity and daytime function (absenteeism, productivity and accidents). The cost of this illness to Quebec society was also estimated. In this introduction to the three thesis articles, the following topics will be addressed: (a) the definition of insomnia; (b) the prevalence and risk factors associated with insomnia; (c) the relationship of insomnia to quality of life, functional impairment, mental health, and use of healthcare resources; (d) the cost of insomnia to society; and (e) the rationale for the present research.

Definition of insomnia

Insomnia complaints are heterogeneous in nature, and involve reduced quality, duration, or efficiency of sleep. Patients may present difficulties in initiating sleep (sleep onset insomnia), staying asleep because of frequent or prolonged awakenings during the night, or waking up too early in the morning without being able to go back to sleep (sleep maintenance insomnia). The term insomnia can also refer to non-restorative or poor quality sleep leading to daytime fatigue, loss of energy, distress or social, occupational or functional impairment. These different manifestations of insomnia are not mutually

exclusive as one patient may simultaneously have difficulties in initiating and maintaining sleep. Insomnia may be situational, as in periods of stressful life-events, episodic, with recurring periods of disturbed sleep, or may persist over months or years (Edinger, Bonnet, Bootzin et al., 2004; Morin & Espie, 2003).

Three major classification systems exist to aid in the diagnosis of insomnia. These include the International Classification of Sleep Disorders (ICSD; American Academy of Sleep Medicine, 2005), the International Classification of Diseases-9 (ICD-9; World Health Organization, 1992) and the Diagnostic and Statistical Manual of Mental Disorders-IV-TR (DSM-IV-TR; American Psychiatric Association, 2000). The emphasis on frequency, severity and duration of symptoms varies according to the nosology used (see Edinger, 2004 and Ohayon, 2002 for a discussion of the use of these classification systems). Although insomnia may be a syndrome in itself (i.e., primary insomnia), it is most commonly encountered as a symptom of a medical, psychiatric, or other sleep disorder. For example, it can be caused by pain, alcohol or drug abuse, or be due to the use of certain medications (e.g., bronchodilators, beta-blockers or antidepressants).

Prevalence and risk factors

Estimates of the prevalence of this disorder vary according to the operational definition used. For example, when symptoms such as difficulty falling asleep or maintaining sleep (either during the night or early in the morning) are considered, it is estimated that around a third of the population suffers from the condition. If other symptoms such as dissatisfaction with sleep quality/quantity or daytime consequences are considered, this figure is reduced by at least one half. Strict application of DSM-IV criteria leads to the most conservative prevalence estimate of between 4.4% and 6.4% (Ohayon, 2002, provides a review of the epidemiology research and the definitions used).

Several demographic, psychosocial, and health variables have been associated with insomnia complaints. Surveys have consistently found higher rates of insomnia complaints among women (Klink, Quan, Kaltenborn & Lebowitz, 1992; Ohayon, 2002) older adults (Bliwise, King, Harris & Haskell, 1992; Foley, Monjan, Izmirlian, Hays & Blazer, 1999;

Mellinger, Balter & Uhlenhuth, 1985; Vitiello, 1997) and individuals who are unemployed, separated or widowed, living alone and/or homemakers (Ford & Kamerow, 1989; Mellinger et al., 1985). While women appear to be about 1.5 times more likely to suffer from insomnia, it is unclear whether this rate reflects true differences or rather gender differences in reporting and/or sleep perception. Insomnia is also associated with a wide array of medical problems. These include respiratory, heart and gastrointestinal difficulties (Katz & McHorney, 1998; Vollrath, Wicki & Angst, 1989), asthma, arthritis, headaches, ulcers, and high blood pressure (Lavie, 1981) and cancer (Davidson, Maclean, Brundage & Schulze, 2002; Savard & Morin, 2001), and early death (Shapiro & Dement, 1993; Wingard & Berkman, 1993). Cognitive, behavioural and other factors such as stress, hyperarousal, faulty beliefs about sleep or poor sleep habits are often the mediating variables that contribute to the development and maintenance of insomnia.

In addition, it would appear that insomnia breeds insomnia. A study of possible risk factors for insomnia revealed that, from among variables such as health problems, gender, obesity, snoring and socio-economic status, the strongest predictor of insomnia was reports of insomnia in the period 10 to 12 years preceding evaluation (Klink, Quan, Kaltenborn & Lebowitz, 1992). In a study by Ford and Kamerow (1989), 31% of individuals reporting insomnia at first interview reported continued insomnia at one-year follow-up. Family history has also been demonstrated to be a risk factor in several studies. For example, in a study by Bastien and Morin (2000), 26.6% of participants were found to have at least one relative with insomnia complaints. This familial relationship was the strongest for individuals reporting the following: sleep-onset insomnia, primary insomnia or early age of onset. Dauvilliers, Morin, Cervena et al. (2005) corroborated and extended this study by including a control group and by looking at first-degree relatives and their insomnia diagnoses. They found an even higher familial incidence – 73% for individuals with primary insomnia – with mothers being the family member most likely to have insomnia. The relative contribution of genetics and environment has yet to be elucidated.

Epidemiological, cross-sectional, and longitudinal evidence indicate a high rate of comorbidity between sleep disturbances and psychopathology (for a review, see Morin &

Ware, 1996, or Benca, Obermeyer, Thisted, & Gillin, 1992, for a meta-analysis of sleep and psychiatric disorder research based on EEG readings). This is no surprise given that sleep disturbance is a diagnostic criterion or a clinical feature in several psychiatric disorders, particularly anxiety (e.g., generalized anxiety disorder) and affective disorders (e.g., major depression). In practice, it is not always easy to distinguish between primary insomnia and insomnia secondary to psychiatric disorder, a reality that is particularly problematic when attempting to estimate the costs uniquely due to insomnia. Many authors have emphasized the importance of using standardized classification tools to clearly distinguish the two groups and facilitate appropriate treatment planning, an ideal that may prove difficult to realize.

Impact of insomnia

The impact of insomnia on individuals and society can be felt on a number of levels, including decreased quality of life, difficulties with social and occupational functioning, and increased risk of developing psychological problems. Increased healthcare use, public safety concerns and economic costs are also issues associated with the disorder.

Quality of life

A number of studies describe the negative impact which insomnia may have on health-related quality of life. In particular, several authors have used the Medical Outcomes Study Short Form Health Survey (SF-36; Ware, Snow, Kosinscki & Gandek, 1993) and found significantly lower scores on measures of cognitive function and on multiple domains including social, emotional and physical functioning in adult insomniacs as compared to controls (Leger, Scheuermaier, Philip, Paillard & Guilleminault, 2001; Zammit et al., 1999). Similar results have been found in elderly insomnia sufferers (Schubert, Cruickshanks, Dalton et al., 2002) and in managed-care organization enrollers (Hatoum, Kong, Kania, Wong & Mendelson, 1998). Katz and McHorney (2002) found that insomniacs with chronic illnesses had lower quality of life scores than good sleepers, even after controlling for anxiety, depression and medical illness (see Leger et al., 2002, for a further discussion of quality of life in insomnia).

Functional impairment

Insomnia may also have a serious impact on various aspects of daytime functioning, including work performance and accidents. One study estimates that individuals reporting poor sleep miss at least 5 more days of work per year than good sleepers (Schweitzer, Engelhardt, Hilliker, Muchlbach & Walsh, 1992). Other preliminary descriptive studies also suggest that insomnia sufferers have higher absenteeism rates (Jacquinet-Salord, Lang, Fouriaud, Nicoulet & Bingham, 1993) as well as lower work productivity, satisfaction and performance levels (Godet-Cayre, Pelletier-Fleury, Le Vaillant, Dinet, Massuel, and Leger, 2006; Kupperman, Lubeck, Mazonson et al, 1995; Schweitzer et al., 1992) and reduced promotions and access to upper pay scale ranges (Johnson & Spinweber, 1983). Similarly, difficulties on the job such as problems concentrating, memory, effectiveness, decision-making and on-the-job accidents are also more frequent in individuals with sleep problems (Leger, Guilleminault, Bader, Levy & Paillard, 2002; Schweitzer et al., 1992). Finally, in a cross-sectional investigation of 1,308 workers that examined the relationship between various job characteristics, health factors, insomnia and absenteeism, Leigh (Leigh, 1991) found that, from among 37 independent variables studied, insomnia came second only to being a mother with small children as far as its predictive value for absences from work. Of course, one can also see the possibility of a close correlation between being the mother or father of small children and having insomnia, at least during the period of early infancy when children's sleep may be fragmented.

Various dimensions of cognitive function (e.g., impairments in attention, memory, reaction time) have a demonstrated association with poor sleep. These decrements can produce serious consequences when individuals are carrying out tasks that require optimal cognitive function, such as driving. Aldrich (1989) found that automobile accidents occur two and a half times more frequently in individuals with insomnia than in those without. In a large-scale epidemiological study by Balter & Uhlenhuth (Balter & Uhlenhuth, 1992), the prevalence of motor vehicle or other serious accidents was four times more frequent in individuals reporting untreated insomnia as compared to normal controls and insomniacs treated with medication. Elsewhere, it has been demonstrated that experiencing an average

of 16 nights of poor sleep per month puts people at a three times greater risk of an accident than if they do not experience sleep difficulties (Schweitzer et al., 1992). Study methodologies and results are heterogeneous and therefore this issue requires further investigation. In addition, interpreting results is often complicated by the fact that the largest proportion of sleep-disorder-related accidents occurs in people suffering from narcolepsy and sleep apnea. As a result, the relationship between insomnia alone and accident rates is less clear.

Nevertheless sleepiness and fatigue, which can be directly linked to insomnia, appear to be responsible for some of these accidents. Individuals with insomnia for instance are more than twice as likely as good sleepers to report fatigue as having been a factor in their motor vehicle accident (5% versus 2%) and more than 50% of night workers acknowledge having fallen asleep on the job at least once. Sleepiness has also been implicated in several major industrial accidents (e.g., Chernobyl nuclear accident), all occurring in the middle of the night. Although these accidents are probably related more to sleep deprivation than insomnia *per se*, it does highlight the potential impact of lack of sleep on public health safety.

Mental Health

Results from prospective research indicate that insomnia is a risk factor for the development of depression, anxiety disorder and psychiatric problems in general (Breslau, Roth, Rosenthal & Andrescki 1996; Chang, Ford, Mead, Cooper-Patrick & Klag, 1997; Ford & Kamerow, 1989; Roberts, Shema, Kaplan & Strawbridge, 2000; Weissman, Greenwald, Nino-Murcia & Dement, 1997). Riemann & Voderholzer (2003) reviewed eight longitudinal epidemiological studies looking exclusively at the link between insomnia and its predictive value for depression. The authors state that "almost unambiguously" the presence of insomnia at baseline predicted an increased risk of depression at one- to three-year follow-up. While no causal link has been established, Hall, Platt and Hall (1999) found global or partial insomnia to be one of the predictors of a severe suicide attempt. Despite some weaknesses in methodologies, the link between insomnia and suicide attempts, seriousness of attempts, and suicide completions has been identified by others as well

(Fawcett, Scheftner, Fogg et al, 1990; Paffenbarger, Lee & Leung, 1994; Robbins & Alessi, 1985), albeit predominantly in psychiatric patients.

Health-care Resource Use

Several studies suggest that insomnia sufferers have poorer general health and that they use health care services more frequently than good sleepers, even after controlling for higher levels of mood, anxiety and medical illnesses (Ford & Kamerow, 1989; Simon & VonKorff, 1997). Research also suggests higher hospitalization rates in insomniacs. When it comes to consultations related to sleep difficulties, surveys suggest that between 5% and 36% of insomnia sufferers have consulted a physician specifically for these problems, while 27% to 55% have discussed sleep problems with a physician in the course of a consultation for another problem (Ancoli-Israel & Roth, 1999; Ohayon, Caulet, Priest & Guilleminault, 1997; Ohayon & Hong, 2002). Another study found that 32% of survey respondents with insomnia syndrome had consulted a health-care practitioner sometime in their life (Morin et al, 2006).

People with insomnia often use prescription medications, alcohol, or over-the-counter products such as Nytol, Sominex, Unisom, analgesics, and cough and cold remedies in an attempt to improve their sleep. The 1991 Gallup (1991) survey revealed that 40% of Americans with insomnia had self-medicated with over-the-counter products or alcohol, with 20% having taken a prescription medication to help them sleep. Ohayon & Caulet (1996) found more conservative prescription trends, suggesting that between 2% and 10% of people with insomnia use prescribed medication for their sleep difficulties. Of course, the definition of insomnia can influence these figures. A recent population-based survey of 2001 Quebec residents revealed that 36% of respondents with insomnia syndrome had used natural products, 33% had used prescribed medications, 11% had used alcohol, and 8% had used over-the-counter (OTC) products in the previous year. Smaller proportions had used alternatives such as massage therapy (10%) and acupuncture (2%, Morin et al., 2006).

Johnson, Roehrs, Roth, & Breslau (1998) looked at the length of time during which substances were taken and found that 9% of OTC users, 15% of alcohol users and 36% of prescription medication users had used these substances for a period exceeding one month. The fact that a full two thirds of this same group reported having an insufficient understanding of available treatments makes self-medication a potentially worrisome phenomenon. This is made particularly salient if we consider one study's findings that revealed that individuals with occasional insomnia consume alcohol as a sleep aid an average of 3.6 times a week and that individuals with chronic insomnia complaints do so 6.8 times per week (Ancoli-Israel & Roth, 1999). Finally, the elderly population, already over represented for insomnia, are also important consumers of sedative, hypnotic and anxiolytic drugs (Morgan & Clarke, 1997) and may be at increased risk of suffering from effects related to drug interactions. Research using a sample of Canadian elderly people suggests that 48% of this population use some kind of sleep aid, with 50% of these cases involving the use of an OTC product and 17% involving the use of a prescription medication (Sproule, Busto, Buckle, Herrmann, Bowles, 1999). More data on long-term substance use and abuse are necessary.

The cost of insomnia

The prevalence of insomnia and the apparent chronicity and morbidity of this condition lead to the important question: What are the costs associated with this condition? In fact, little research has been conducted to address this question. Probably in partial response to shrinking budgets, demands of third-party payers and increased pressure for accountability and accessibility of treatments, estimates of the economic burden of certain physical and mental illnesses have been produced, along with estimates of the costs associated with treating them. While cost research in mental health has been slower to evolve than cost research in physical health, some data do exist. For example, Dupont, Dupont & Rice (2002) report that the overall cost of all mental disorders in the U.S. is about $204.4 billion per year, with anxiety disorders among the most costly at $65 billion. Furthermore, the costs associated with some psychological disorders, such as depression, anxiety and schizophrenia, have received considerably more research attention than

insomnia, as a quick Medline or PsychInfo search will demonstrate (see Rush, 1999; Hofmann & Barlow, 1999, and Goldstein, 1999, for reviews of this literature).

Authors typically make reference to two broad categories of costs: direct and indirect. Direct costs refers to the value of all goods, services and other resources consumed as a result of the application of an intervention, as well as any present and eventual side-effects or consequences of the intervention. Examples are medications and other products, tests (e.g., x-rays, sleep lab monitoring), consultations, transportation to and from consultations, and overhead costs. Resource use is the important factor, regardless of whether or not money is actually exchanged. Indirect costs typically refer to an illness-induced reduced capacity to work or to participate in other activities, or to the economic losses associated with death resulting from a given illness. Absenteeism and productivity losses on the job are most typically considered in this category (see Drummond, Schulpher, Torrance, O'Brien, & Stoddard, 2005, Miller & Magruder, 1999, and Petitti, 2000 for in depth discussions of cost analysis terms and methodology).

The first estimates of direct costs associated with insomnia were based on data assembled for the National Commission on Sleep Disorder Research in the United States and were estimated at about $15.4 billion for the year 1990. Walsh and Engelhardt (1999) later undertook another cost analysis with the goal of evaluating costs for 1995. The results of that study provide the most recent direct cost estimate available for the United States - $13.9 billion. Most existing estimates are based on different modes of interpreting predominantly the same databases and sources. The exception to this is the only European study on the direct costs of insomnia. This study, conducted by Leger, Levy and Paillard (1999) used a number of published surveys to estimate costs associated with outpatient visits to health-care practitioners, sleep lab visits and treatment by sleep specialists, and products, be they prescription or not, for inducing sleep. They arrived at a figure of about 10 million francs (or about $2 billion US). In the Walsh and Engelhardt (1999) study, substances used for insomnia accounted for $1.96 billion; prescription medications accounted for $809 million, non-prescription medications cost $325 million, alcohol costs amounted to $780 million; and melatonin expenditures totalled $50 million. Health care

services used for insomnia made up the remainder of the total at $11.96 billion. The greatest expenditures were for outpatient physician visits ($660 million), psychologist visits ($122 million), mental health organizations ($153 million) and nursing home admissions due to sleep difficulties ($10.9 billion). This last figure is contested by some as being too liberal; however, the literature suggests that between 62% and 70% of caregivers place the elderly person in a nursing home facility at least in part because of sleep problems, and that if it weren't for these difficulties they would keep the elderly person at home (Pollak & Perlick, 1991; Sanford, 1975). While transportation costs for visits to and from appointments are typically considered as direct costs, to our knowledge, no estimates exist for insomnia-related transportation costs.

The indirect costs associated with insomnia (i.e., absenteeism, reduced productivity, accidents) have been given only passing mention in the literature, their conspicuous absence most likely being due to several factors: first, these costs are more difficult to estimate and quantify; second, there is no single, definitive database from which to draw; and finally, measurement of these variables is subject to interpretation bias as well as well-documented distortions of memory. Nonetheless, Stoller (1994) attempted to quantify work-related deficits by combining data obtained in a study of workplace performance in Navy servicemen (Johnson & Spinweber, 1983) with her own insomnia prevalence estimate of 33% and a performance decrement estimate of 4%. Her calculations placed the monetary value of absenteeism and lost productivity at $41.1 billion annually (1995 US dollars). A per person estimate was attempted by Chilcott & Shapiro (1996), who suggest a decrease in work productivity due to insomnia of 10%. This amounts to $3000 per insomnia sufferer per year.

Stoller (1994) also looked at a number of other indirect costs; she placed the cost of insomnia-related accidents between $26.42 billion and $38.43 billion annually (based on 1988 accident rate figures, a 3%3 insomnia prevalence rate and the assumption that accidents occur 2 to 3 times more frequently in insomniacs). Finally, she also estimated insomnia-related alcoholism at between $8.5 and $11.6 billion, insomnia-related depression at $1 billion and insomnia-related accidents at about $26.5 to $38.6 billion. Her overall

estimate of indirect costs is thus situated between $77.05 and $92.13 billion, a figure that Walsh and Engelhardt (1999) suggest is inflated. Indeed, this figure is difficult to fathom if one accepts an estimate proposed by Dupont et al. (2002) that situates the overall cost of mental disorders at about $204 billion (similar time frame). In fact Walsh (as cited in Walsh and Engelhardt), suggest a downward-revised overall estimate of between $30 and $35 billion (i.e., direct and indirect costs combined). It may be the case, however, that Dupont et al. considerably underestimated the combined cost of mental disorders. Stoller's work has been viewed as a liberal estimate because of the high prevalence rate used. It has also been criticised on the basis of some unsupported assumptions, such as the assumption that insomnia is inevitably associated with excessive sleepiness. Nonetheless, her data are still frequently used to describe the indirect economic consequences of insomnia.

A recent study published by Hillman, Murphy, Antic and Pezzullo (2006) estimated the economic costs, both direct and indirect, of all sleep disorders combined for the country of Australia. The authors used existing data banks (Australian Institute of Health and Welfare data for health system expenditures on disease and injury for 2000-2001). They estimated the combined cost of insomnia, obstructive sleep apnea, and periodic limb movement to be about $4,524 million, or 0.8% of the Australian gross domestic product. While the authors use an innovative approach to estimate fractions of other health impacts attributable to sleep disorders, their data presentation does not permit the teasing out of costs associated with individual sleep disorders. Furthermore, their reasons for not including narcolepsy, a disorder associated with increased accident risk (and thus high costs) are unclear.

It is clear that more studies are required to evaluate the economic burden of insomnia. Furthermore, the research described above is an example of what is referred to as cost-of-illness or burden-of-illness research. This type of research is conducted in order to identify costs associated with an untreated disorder during a given time period (Miller & Magruder, 1999). To our knowledge, no insomnia treatment *cost-effectiveness* studies have been conducted. These studies would allow the comparison of the relative costs of administering different insomnia treatments (as measured by a ratio of cost per unit of

change on the same outcome measure). While preliminary analysis has been conducted to describe the costs of treating insomnia with the newer hypnotic drugs such as zaleplon, zolpidem and zopiclone versus the costs of treating with benzodiazepines, the research reported does not allow cost-effectiveness conclusions given the lack of direct comparison across medications in an individual study and given the lack of adequate outcome measures (see the systematic review and economic evaluation by Dündar et al. 2004).

Cost-effectiveness analysis (CEA) is the model most frequently used in mental health, as it does not require that outcome variables of interest (e.g., improvement in sleep/depression/global functioning) be expressed in monetary terms; original measurement units may be maintained (see Drummond et al., 2005 and Hargreaves, Shumway, Hu & Cuffel, 1998, for more). The end goal in conducting CEA is to obtain a cost-effectiveness ratio that expresses the costs relative to the health benefits of an intervention of interest. This is done by calculating the difference in cost between two interventions, and dividing it by the difference in their effectiveness (measured using the same outcome instrument). In fact, CEA is the logical follow-up to a burden-of-illness study and produces the type of data that is increasingly required (e.g., by insurance companies) to justify the use of one therapy modality over another (i.e., which therapy can offer the best results at the lowest cost). It should also be the kind of data that *practitioners* seek out and weigh when making treatment recommendations. Note that many studies make reference to "cost-effectiveness" of a given treatment for a given disorder, without providing any actual cost data to support this claim. Until actual burden-of-illness and cost-effectiveness data are available, assumptions will continue to be made based on common sense and logic.

Rationale for the thesis

The present research attempted to address several weaknesses in the existing literature. First, while several studies exist that examine health-care service and product utilisation, work function and accidents in relation to insomnia, we know little about this relationship in the Canadian context. Hard data are necessary to make valid and meaningful cross-cultural comparisons. Second, the existing data do not permit analysis of the nuances of these relationships. For example, to date, we know little regarding whether

insomnia severity is associated with different patterns of consultations with various types of health-care professionals consulted or the use of different types of medications or other products. Similarly, we have very little data concerning people's perceived reasons for absences, reduced productivity and accidents or whether these reasons differ according to insomnia status. Third, there are but a handful of studies on the costs associated with insomnia, and none of them provides global estimates for Canada or its provinces. The development of sound health-care policy must rest on an understanding of the impact illnesses have on a number of levels, including an economic one. Furthermore, it is important to measure the *layers* of economic impact (e.g., consultations, medications, work function) to facilitate the development and implementation of education and intervention strategies for the appropriate targets. In addition, furnishing burden-of-illness data is a necessary step if cost-effectiveness research is to be conducted. The combination of ever-increasing budgetary constraints with demands from governments and insurance companies for greater accountability and responsibility means that data from cost-effectiveness analyses is increasingly being required to justify treatment choices. The fourth weakness identified in the literature concerns the definition of insomnia. While study objectives typically dictate the choice of criteria to be used, the present variability in definitions makes cross-study comparisons difficult. We believe that, wherever possible, it is advisable to provide data based on a clearly operationalized, conservative, and, ideally, standardized definition of insomnia. The clarity of definition would facilitate eventual comparisons to other research findings while the use of a standardized definition, such as that found in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR; APA, 1994) would reinforce the nomenclature system in place that, while not without drawbacks, constitutes the basis of the discipline's common communication tool and thereby greatly facilitates understanding. Taking a conservative stance helps guard against criticism of inflating the severity of a disorder and its consequences. The research presented in the following articles attempted to address these weaknesses.

Thesis objectives and format

The objectives of this thesis were fourfold: (a) to identify the relationship between insomnia status (i.e., no insomnia symptoms, some insomnia symptoms, insomnia

syndrome) and health-care system and product use; (b) to describe the relationship between insomnia status, functional capacity at work and accidents; (c) to estimate the cost of insomnia to the Quebec society; and (d) to identify the variables most closely associated with health-care service and product use, work function and accidents.

The thesis is presented in the form of three articles. The first article will present a discussion of cost evaluation in mental health, and more particularly as it pertains to insomnia. The current challenges in conducting cost evaluations will be explored, along with the current state of knowledge on the economic consequences of insomnia and the research methods necessary to carry out economic evaluations. The second article will present results from a study that assessed the relationship between insomnia, health-care system and product use, work function and accidents. This includes consultations with health-care professionals of all types; the use of prescription medications, over-the-counter products, and alcohol as a sleep aid; hospitalisations; absenteeism and reduced productivity, and different types of accidents, including motor vehicle, work-related or domestic accidents. The third article will present estimates of the economic burden of insomnia to society. The cost of insomnia-driven consultations and medication use will be presented, as will cost estimates of other products, including alcohol, that are used to enhance sleep. The study also attempts to estimate insomnia-related absenteeism and reduced productivity costs, taking into consideration when producing the estimates, the study participants' perception of the relative contribution of insomnia to these events. Finally, cost estimates associated with insomnia-related accidents will be discussed.

The Cost of Insomnia: Research incentives, methods and findings

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RÉSUMÉ

Aujourd'hui, il est de plus en plus important de pouvoir chiffrer les coûts des troubles mentaux et de leurs traitements afin de bien cibler les interventions en matière de santé publique. En dépit de la prévalence de l'insomnie, l'analyse des coûts de l'insomnie est toujours au stade embryonnaire. Alors que les analyses de problèmes médicaux (ex., asthme, maladies du cœur) et de problèmes psychiatriques (ex., schizophrénie, anxiété) sont plus nombreuses, il n'existe que quelques études sur les coûts directs et indirects de l'insomnie. Cet article se veut une revue de la littérature sur l'évaluation des coûts en santé mentale en général et en insomnie en particulier. Nous allons : (a) examiner les définitions de l'insomnie et les traitements disponibles; (b) survoler les modèles et les méthodes de l'analyse des coûts; (c) survoler la recherche sur les coûts en santé mentale; (d) discuter des coûts directs, indirects et autres de l'insomnie; et (e) conclure en identifiant les pistes pour la recherche future.

Entre autres, nous constatons que plus de recherche serait nécessaire, idéalement en se servant d'échantillons de population d'envergure qui permettraient d'étudier en profondeur l'utilisation de ressources. De plus, nous constatons qu'il serait souhaitable de développer et de se servir d'un éventail d'outils d'évaluation standardisés, ce qui faciliterait de beaucoup la comparaison entre études ainsi que les échanges entre chercheurs. Sur le plan de l'évaluation, il serait souhaitable de distinguer l'insomnie primaire de l'insomnie secondaire afin de mieux comprendre l'impact des troubles comorbides sur les coûts. Finalement, la recherche coût-efficacité, devrait être effectuée afin d'identifier les interventions thérapeutiques les plus efficaces du point de vue des coûts.

Bien que ces méthodes soient pour la plupart inconnues des chercheurs en santé mentale, nous croyons qu'il soit primordial que la société investisse les sommes nécessaires afin de comprendre et d'utiliser ces techniques, et ce pour mieux faire face aux demandes accrues sur notre système de santé, et pour offrir les meilleurs soins aux malades au moindre coût possible.

Abstract

It is becoming increasingly important to identify the costs of mental disorders and their treatment. Knowledge of costs is associated with funding and policy decisions, accessibility issues, treatment development, patient satisfaction, and many other important questions. Despite its importance, cost analysis of insomnia is still at its early infancy stages. While economic analyses of medical health problems (e.g., asthma, heart disease) and a small number of psychiatric problems (e.g., schizophrenia, anxiety) are fairly common, only a handful of studies exist that estimate the direct and indirect costs of insomnia to society. This article is a review of the literature on cost evaluation, especially as it pertains to mental health and, more specifically, insomnia. The purpose of this chapter is to discuss the current state of knowledge concerning the impact of insomnia and its associated costs. The discussion takes the following format: (a) definition of insomnia and a brief presentation of current treatment options; (b) overview of cost analysis models and methods; (c) overview of cost research in mental health; (d) discussion of the direct, indirect and related costs of insomnia; and (e) conclusion and directions for future research.

The review reveals that more "burden of illness" research is required, ideally using a broad, population-based approach that attempts to look more closely at some of the resource consumption behaviour than has previously been attempted. Furthermore, an effort to produce and consistently use a more standardized range of evaluation tools would facilitate comparison across studies and communication amongst researchers. In addition, an effort to distinguish between primary and secondary insomnia would contribute to a better understanding of the role comorbid disorders play in costs. Finally, cost-effectiveness research should be conducted in order to determine which therapeutic interventions achieve the best results at the least cost.

While the methods for conducting these analyses are for the time being relatively foreign to our arsenal of analytic techniques, we must invest the energy necessary to understand and begin using these techniques if we want to respond not only to the demands of an increasingly market driven health-care system, but, most importantly, if we want to offer patients the best treatments available at the lowest cost possible.

Introduction

Insomnia is a condition that affects one third of the adult population occasionally and between 9% and 12% on a chronic basis (Ford & Kamerow, 1989; Gallup, 1991; Mellinger, Balter & Uhlenhuth, 1985; Morin, LeBlanc, Daley, Grégoire and Mérette, 2006). It is more frequently reported among women, older adults, shift workers, and patients with medical and psychiatric disorders. Chronic difficulties initiating and maintaining sleep are often associated with psychosocial and occupational impairments such as daytime fatigue, mood disturbances, performance impairments, and reduced quality of life, all of which are costly on a number of levels, both to the individual as well as to society (Ancoli-Israel & Roth, 1999; Ford & Kamerow, 1989; Simon & VonKorff, 1997; Walsh & Engelhardt, 1999). Significant costs may also be incurred from the use of prescription, over-the-counter sleep medications, and alcohol, as well as from visits to health-care providers (Chilcott & Shapiro, 1996; Ohayon & Caulet, 1996; Simon & VonKorff, 1997; Walsh, Engelhardt, & Hartman, 1995).

The purpose of this paper is to discuss the current state of knowledge concerning the impact of insomnia and its associated costs. This discussion will take the following format: (a) definition of insomnia and a brief presentation of current treatment options; (b) overview of cost analysis models and methods; (c) overview of cost research in mental health; (d) discussion of the direct, indirect and related costs of insomnia; and (e) conclusion and directions for future research.

Insomnia, its treatment, and health-seeking behaviour

A review of the literature on the epidemiology of insomnia reveals a variety of approaches to its definition. The Diagnostic and Statistical Manual IV-TR (DSM-IV-TR; American Psychiatric Association, 1994) and the International Classification of Sleep Disorders (ICSD-10; American Sleep Disorders Association [ASDA], 1990) provide criteria to diagnose insomnia; according to these nosologies, insomnia is defined as a problem involving difficulties either falling asleep, maintaining sleep, or waking up too early in the morning, which may be associated with an overall feeling of dissatisfaction with sleep quality, all of which must have been present for at least one month. The sleep

disturbance is associated with significant distress and/or social, occupational and functional impairment and, in the case of primary insomnia, is not due to a psychological or physical problem, or the physiological effects of a substance. Differential diagnosis should also distinguish it from other sleep disorders such as circadian rhythm sleep disorder, sleep apnea, restless legs syndrome, periodic limb movement and a range of parasomnias. Specific insomnia symptoms, as described in the International Classification of Sleep Disorders manual or the DSM-IV may be present without meeting all of the diagnostic criteria for insomnia syndrome.

Despite significant advances in both pharmacological and behavioural treatments for insomnia, less than 15% of chronic insomnia sufferers actually receive any treatment for this condition, with pharmacological intervention being the treatment most frequently offered. Estimates of prescription medicine use vary extensively. American studies reported that about 5% of the general population had taken a prescribed medication to promote sleep (Johnson, Roehrs, Roth, & Breslau, 1998; Mellinger, Balter, Uhlenhuth, 1985) which can be compared to 21% of respondents reporting insomnia (Ancoli-Israel & Roth, 1991). Comparisons of samples from different European countries indicate that rates of prescribed sleep promoting medication use vary from 2.4% (Germany) to 9.8% (France), with female gender and advanced age associated with increased utilization (Ohayon, 2001). Mellinger et al. (1985) report that 61% of sleep-promoting agents used are hypnotics, 27% are anxiolytics, and 11% are antidepressants. Other interventions are available, but are not as widely utilised as pharmacotherapy. Such alternative interventions are based on the understanding that cognitive and behavioural factors play an important role in perpetuating insomnia. With this in mind, these therapies aim to reduce arousal levels, educate individuals as to sleep hygiene and maladaptive sleep habits, and address misconceptions held about sleep. Examples of nonpharmacologic interventions that have been validated using clinical trials are cognitive-behaviour therapy, stimulus control therapy, sleep restriction, relaxation-based therapy, and sleep hygiene education (see Morin & Wooten, 1996, for a discussion of the separate and combined effects of psychological and pharmacological approaches). While the efficacy of a variety of insomnia interventions has

been demonstrated, further evidence of their effectiveness in less controlled environments is needed. In addition, knowledge of their cost-effectiveness is still at a hypothetical stage.

The fact that individuals with insomnia complaints exhibit low consultation rates may be influenced by a number of barriers to treatment, including their costs and limited accessibility, unwillingness on behalf of patients to acknowledge their problem or minimization of its impact, lack of insomnia recognition and diagnosis by practitioners, patients' ignorance or negative perceptions about drug and other treatment interventions, and lack of knowledge on the part of practitioners about effective treatments (National Institutes of Health, 1994; Rothenberg, 1992). Those individuals who do seek help wait an average of 10 years before consulting a professional for their sleep problem, often relying on self-help remedies such as alcohol, over-the-counter medications, natural products and untested treatments in the interim, the effectiveness of which is dubious if not deleterious. Data are scarce regarding the nature of health-seeking behaviours (e.g., who consults or doesn't, when, and why; what professionals are consulted, when, and why), self-help measures employed to alleviate symptoms, attitudes and beliefs held about insomnia, and relapse and chronicity rates (see Morin et al., 2006 for a discussion of health-seeking behaviours). As in the case of any illness, in addition to personal suffering, long-term costs and risks may increase the longer the illness in question is left untreated or ineffectively treated. Effective, accessible, low cost treatment must continue to be tested, refined and promoted.

Overview of cost analysis in mental health

In fact, assessment of the costs and accessibility of treatments is on the rise. Docherty (1999) suggests that the market-based health reform of the past two decades is at least in part behind recent efforts to better understand dimensions such as cost, quality and access to health care. Cost analysis is particularly important in entirely state-supported health-care systems where the market does not play a role in weeding out ineffective and/or overly costly treatments. More precisely, interest in these areas has been prompted because of the vast expansion and concurrent rise in costs of mental health services available, as well as the increased investment in these services by government and mental health

organizations. Furthermore, concerns about the quality of diagnostic practices (e.g., misdiagnosis) and appropriateness of treatment options offered have been raised (Docherty, 1999; Hofmann & Barlow, 1999). Finally, several studies have addressed concerns about how many and which individuals receive adequate care, underscoring the reality that access to services is weighted in favour of some and not others. For example, of individuals with either a lifetime or a 12-month history of at least one mental health disorder, only 26.2% and 11.5%, respectively, obtained any professional care (Kessler et al., 1994). The reasons for this may be system- (e.g., health care system organization) or individual-based (or a mixture of both) and must be studied more closely. Possibly compounding this problem may be a reluctance on the part of clinicians to base their treatment decisions on efficacy research, due to legitimate questions regarding the generalizability of research findings to the real-world clinical setting (i.e., external validity; see Docherty, 1999, for more details).

Despite this possible reluctance, as Yates points out (1994, 1995), in this age of dwindling budgets, increasingly discerning clients, and third party payers, evaluation of efficacy and justification of costs is becoming a necessary part of treatment elaboration. Furthermore, conducting cost analyses is important in developing a complete theoretical and empirical model of the entire treatment process. Yates (1994) describes several studies that support the notion that it is not necessarily the most expensive intervention that produces the most effective outcome, or the highest level of satisfaction. In fact, contrary to expectations, in some cases, it has been found that the amount of time and energy necessary to invest in a treatment is *inversely* related to outcome (e.g., Bandura, Blanchard, & Ritter, 1969; Yates, 1987). Clinicians should thus be concerned not only with treatment outcome, but also with the time, energy investment, monetary costs and patient satisfaction associated with the treatments they offer. Unfortunately, the scarcity of these data hinders their consideration when elaborating treatment plans. In addition, the application of economic models in cost analysis of mental health interventions may be alienating or intimidating for some researchers and may explain, in part, the paucity of investigations of this nature.

The models and the methods of cost analysis

Models used in health economics. A variety of models exist to carry out cost investigations [see Drummond, Schulpher, Torrance, O'Brien & Stoddart (2005), Hargreaves, Shumway, Hu and Cuffel (1998), and Petitti (2000), for in depth discussions]. Hargreaves et al. (1998) describe the most frequently used strategies. These include (a) *cost-identification analysis*, also known as "burden of illness" or "cost of illness" analysis (i.e., used to identify costs associated with a disorder during a given time period) or "cost-minimisation" or "cost-cost" analysis (i.e., used to identify costs associated with given treatments); (b) *cost-effectiveness analysis* wherein the costs associated with two or more treatments and their outcomes are assessed; (c) *cost-benefit analysis*, wherein both costs and their benefits are expressed in monetary terms; and (d) cost-utility analysis, often referred to as a subtype of cost-effectiveness analysis, wherein cost effectiveness is expressed in terms of changes in utility measures, usually expressed in terms of quality adjusted life years gained (see explanation on p. 28). An additional subtype of analysis, *cost-offset analysis*, investigates the extent to which receiving some form of mental health services leads to a reduction in other health costs (Miller & Magruder, 1999).

Cost-effectiveness analysis (CEA) is the model most frequently used in mental health, as it does not require that outcome variables of interest (e.g., improvement in sleep/depression/global functioning) be expressed in monetary terms; original measurement units may be maintained. The end goal in conducting CEA is to obtain a cost-effectiveness ratio that expresses the costs relative to the health benefits of an intervention of interest. This is done by calculating the difference in cost between two interventions, and dividing it by the difference in their effectiveness (as measured by using the same outcome instrument). As Luce, Manning, Siegel and Lipscomb (in Gold et al., 1996) explain,

> An ideal cost-effectiveness analysis begins by identifying all of the consequences of adopting one intervention or another, including use of resources (medical services use, public health program costs, informal caregiving, and patient time costs) ... and the effects of the intervention on health status. The amount or magnitude of each change is measured. Finally, these changes are valued: Changes in resource use are converted into a summary cost using dollar values for each input. The incremental difference in input and product costs forms the basis for the cost element in the CEA. The

> changes in health status and life expectancy are converted into QALYS or another summary health effect measure. The ratio of the increment in the cost summary to the increment in the effect measure is the cost-effectiveness ratio (p.178).

The QALY concept, used in both CEA and cost-utility analysis, refers to a measure of utility expressed as quality-adjusted life years. While an in depth discussion is beyond the scope of this paper, suffice it to say that this is an alternative outcome measure that is used more frequently in medical than in mental health research, as it makes reference not just to the impact on survival rates of a given intervention, but also to the quality of the years of additional life gained as a result of that same intervention. The estimated number of years of life remaining for a patient are multiplied by a utility score that ranges from 0.0 to 1.0 and that has either been previously determined by empirical research on a specific illness, or is evaluated using methods like visual analogue scales or time trade-offs. Utility scores can be used in the denominator of cost-effectiveness ratios. In fact, a method for transforming SF-12 scores (SF-12; Ware & Sherbourne, 1998) into utility scores has recently been developed and may have a significant impact on our ability to conduct cost-effectiveness analyses in mental health (Brazier, Roberts, Deverill, 2002).

Methods: Counting and valuation. In the context of CEA or any of the other models, estimation of costs associated with different medical and psychological interventions can be a complex task, involving the counting and valuation of tests, drugs, supplies, personnel, equipment, rent, depreciation, utilities, maintenance, support services, productivity, transportation, lost wages, etc. The variables that contribute to overall cost must be clearly and exhaustively identified before being valued. However, common sense should prevail: when costs are minor or differ little across interventions being compared, or when the effort required to count and value the act outweighs its usefulness, the researcher's discretion should be used.

At the outset of a cost analysis, it is important to identify the perspective from which costs will be considered (Gold et al., 1996; Petitti, 2000). For example, costs can be considered from the point of view of society, insurance companies, programs, hospitals, research institutions, individuals, etc. All approaches, save the societal approach, take a

subset of all costs that are particularly relevant to that sector. Typically, in CEA the societal and program perspectives are adopted (Petitti, 2000). The societal approach, considered to be the gold standard in cost analysis, aims to identify *all* costs and effects associated with an illness and its treatment for everyone who could be implicated (patients, family members, citizens, agencies, institutions, etc.). This is clearly an exhaustive, and therefore costly evaluation model to use, but remains the one that speaks the loudest in public policy debates.

In any cost analysis, then, costs of interest must first be identified. The vocabulary in use to categorize cost variables (direct, indirect, opportunity, and productivity costs) must also be clarified. Authors typically make reference to two broad categories of costs: direct and indirect. A summary definition of direct costs is: the value of all goods, services and other resources consumed as a result of the application of an intervention, as well as any present and eventual side-effects or consequences of the intervention (e.g., transportation to and from treatment appointments is typically considered a direct cost). Resource use is the important factor, regardless of whether or not money is actually exchanged, such as the case of consultation of a health-care professional whose fees are covered by a government insurance programme. Indirect costs typically refer to an illness-induced reduced capacity to work or to participate in other activities, or to the economic losses associated with death resulting from a given illness. Absenteeism and productivity losses on the job are most typically considered in this category. Table 1 contains a breakdown of the various types of direct and indirect costs to be considered in cost analyses.

Insert Table 1 about here

In fact, vocabulary usage varies across studies and can lead to confusion. For example, investigations by Walsh and others (1995, 1999) into the costs of insomnia (see below) distinguish between direct, indirect and related costs. An example of a related cost, in their view, is costs accumulated due to transportation to and from consultations. For

other investigators (Gold et al., 1996; Petitti, 2000), however, transportation costs are considered to be direct costs. Other researchers (e.g., Petitti, 2000) have substituted the term "productivity cost" for "indirect cost" without clearly classifying costs due to insomnia-related accidents and comorbidity in this category as the "indirect cost" category does. This is likely due to the predominant emphasis on treatment-related costs as opposed to costs that arise as effects of the illness. While the importance of terminology should not be overestimated (i.e., what is most important is that the costs are valued and included, not what they are called), there is certainly value in trying to reduce confusion and facilitate cross-study comparisons through the use of a common language. In fact, recommendations for terminology use were recently made by a special Panel on Cost-effectiveness Analysis of the U.S. Public Health Service (Gold et al., 1996) but have yet to be universally adopted.

Once acts/costs of interest have been identified, a method must then be found to count the number of occurrences of the cost-incurring event and to assign a monetary value to it (see Gold et al., 1996 or Hargreaves, et al., 1998 for a detailed discussion of this process). Administrative databases, questionnaires and financial reports are examples of sources of utilisation data. The subsequent task of costing each unit of utilisation can be arduous. Governments, professional associations, institutional accounting records and payment receipts can be used to identify unit costs for professional services and items. All costs should be considered in terms of actual amount paid (i.e., including taxes, mark-ups, professional fees, etc.), and in the case of shared responsibility (e.g., insurance or other third-party payers), the proportional contribution of the various contributors should be enumerated.

Finally, valuing time for the calculation of indirect costs has not been without challenge or controversy. The human capital approach (assigning a value to time based on what the individual in question would earn in the market according to gender, age and education level) is often used, but is frequently criticized for its failure to assign value to the time of persons who don't or who can't earn wages (such as homemakers, volunteers, retired or disabled individuals, etc.). One way around this problem is to keep data on indirect costs in their original units (i.e., days or hours of productivity lost due to an

illness). The human capital approach has also been criticized as producing too liberal an estimate of monetary losses associated with work absences and productivity losses. It is argued that short-term losses are often compensated for by other workers or by a greater effort made by the worker in question upon return to work to catch up on missed responsibilities. In this case, the friction cost method can be applied wherein only costs (typically administrative) associated with the replacement of a worker are considered. Researchers must be aware of the various options available, and choose and justify their choices according to research their objectives.

In situations where costs for given services or items may vary considerably, it is recommended to conduct sensitivity analyses. This is done by producing a low-end estimate, using the lowest identified cost for a service or product, and a high-end estimate, using the highest identified cost. A range within which the costs are likely to fall can then be produced and the target readers or audience can use the figures most appropriate for their interests. Briggs, Sculpher and Buxton (1994) provide a helpful discussion of the different types of sensitivity analyses and their appropriate applications.

Burden of illness and cost-effectiveness figures from mental health research

While the past two decades have seen a significant increase in the literature on cost-analysis applications in medicine, interest in costs and, more particularly, cost-effectiveness in mental health care has been more recent (see Hargreaves, Shumway, Hu, & Cuffel, 1998; Miller and Magruder, 1999; Spiegel, 1999), especially when it comes to evaluation of non-pharmacological interventions. To illustrate, a preliminary search using the PsychInfo database and the key words "cost-effectiveness" in the title revealed the following trend: an average of 3.5 articles per year from 1977 to 1983; 9 articles per year from 1984-1987; 9.7 articles per year from 1988 to 1991; 13 articles per year from 1992 to 1995; 31 articles per year from 1996 to 1998; 40.2 articles per year from 1999 to 2002; and 53.3 articles per year from 2003 to the present. Of these, about two thirds make comparisons across different types of pharmacological or other medical interventions, with the remainder evaluating non-pharmacological treatment options.

With the rising costs of drug therapy and the increasing concerns about the safety and side effects of pharmacological interventions, a strong argument can be made in favour of conducting more cost evaluations of non-pharmacological interventions. Addressing concerns about the future of research on the costs of administering psychotherapy, Hargreaves, Shumway & Hu (1999) point out:

> At present, a large percentage of cost and outcomes research in mental health is being mounted by pharmaceutical firms. It is not relevant to the marketing concerns of these firms to compare medication treatments to psychosocial interventions such as psychotherapy. Governments of several industrialized nations have recently begun defining standards for cost-effectiveness evidence that pharmaceutical firms must produce regarding new compounds, further spurring commercial cost-effectiveness research efforts. These forces threaten to produce a rather unbalanced literature on the cost-effectiveness of mental health interventions ... Therefore cost-effectiveness research on psychotherapy will probably depend on the interest of university psychotherapy researchers and their funding agencies (p. 85-86).

This being said, a brief overview of the state of cost research in mental health will be presented.

The "burden of illness" approach, described above, aims to describe the overall economic impact of a given disorder, which can then serve as a springboard for eventual comparative or cost-offset studies. Dupont, Dupont & Rice (2002) reported that the overall cost of all mental disorders in the U.S. is about $204.4 billion per year, with anxiety disorders among the most costly at $65 billion. Lost or reduced productivity is estimated to be responsible for about 3/4 of total costs (Dupont et al., 1996). Estimates of the economic burden of individual disorders such as depression (e.g., Percudani, Fattore, Strada, & Contini, 1995) and anxiety (e.g., Greenberg, Stiglin, Finkelstein, Berndt et al., 1993) have been undertaken, with indirect cost estimates typically being restricted to the cost of reduced work productivity. For example, Greenberg et al. estimated the cost of major mood disorders, including major depressive disorder, bipolar disorder and dysthymia, in the U.S. to be $47 billion per year. A very large proportion of this was due to disability costs associated with chronicity. Once again, a lack of consistency exists in the present literature, wherein a clear distinction between the cost of treating a disorder, the cost of *not*

treating it, and the *total* cost of the problem is often not made. Furthermore, it is rare to see analysis of costs associated with the various levels of impact felt by loved ones and caregivers, in part due to the difficult and time-consuming nature of operationalising these costs. Nonetheless, the exclusion of these costs from many cost analyses means that estimates underestimate overall costs.

Recent contributions to the cost-analysis literature in mental health are seen most predominantly in cost-effectiveness and cost-benefit evaluations of interventions for individuals suffering from depression (e.g., Brown, van Loon, & Guest, 2000; Henry, & Rivas, 2000), severe psychosis/schizophrenia (e.g., Byford, Barber, Fiander, Marshall & Green, 2001; Chan, Mackenzie, & Jacobs, 2000; Karki, Bellnier, Patil, & Oretega, 2001; Meltzer, 1999), or in prevention or treatment programs for HIV infection (e.g., Pinkerton, Johnson-Masotti, Holtgrave, & Farnham, 2002; Sweat, O'Donnell & O'Donnell, 2001; Varghese, Peterman, Holtgrave, 1999). To a lesser extent, these types of evaluations have also been conducted for interventions offered to patients with borderline personality (Heard, 2000), to drug-involved offenders (Petersilia & Turner, 1992), to individuals with severe intellectual disabilities (Shearn, Beyer, & Felce, 2000), to alcoholics (Stout, Rubin, Zwick, Zywiak, & Bellino, 1999), to detoxified alcoholics (Palmer, Neeser, Weiss, Brandt, Comte, & Fox, 2000), and to Alzheimer's disease patients (Neumann et al., 1999). Once again, these examples combine investigations of a wide range of intervention types, including pharmacological interventions, group therapy, individual therapy, community programs, educational programs, etc. While several burden-of-illness studies exist, to our knowledge, not one true cost-*effectiveness* study has been conducted for insomnia treatment of any kind. It should be noted that many studies make loose reference to "cost-effectiveness" of a given treatment for a given disorder, without providing any actual cost data to support this claim.

The cost of sleep disorders in general

A recent study published by Hillman, Murphy, Antic and Pezzullo (2006) estimated the economic costs, both direct and indirect, of all sleep disorders combined for the country of Australia. The authors used existing data banks (Australian Institute of Health and

Welfare data for health system expenditures on disease and injury for 2000-2001). They estimated the combined cost of insomnia, obstructive sleep apnea, and periodic limb movement to be about $4,524 million, or 0.8% of the Australian gross domestic product. While the authors use an innovative approach to estimate fractions of other health impacts attributable to sleep disorders, their data presentation does not permit the teasing out of costs associated with individual sleep disorders such as insomnia. Furthermore, their reasons for not including narcolepsy, a disorder associated with increased accident risk (and thus high costs) are unclear.

Research on the direct costs of insomnia

The first estimates of direct costs associated with insomnia were based on data assembled for the National Commission on Sleep Disorder Research (NCSDR; 1993) in the United States and were estimated at about $15.4 billion for the year 1990.

Insert Table 2 about here

Walsh, Engelhardt and Hartman (1995) subsequently revised that figure downwards to $10.9 billion. Walsh and Engelhardt (1999) later undertook another cost analysis with the goal of evaluating costs for 1995. The results of that study provide the most recent direct cost estimates available for the United States: $13.9 billion. Ventilation of this figure can be found in Table 2, alongside the data contributing to a more conservative estimate that was provided by Chilcott and Shapiro (1996): $1.79 billion. In fact, most existing estimates are based on different modes of interpreting predominantly the same databases and sources. The exception to this is the only European study on the direct costs of insomnia. This study, conducted by Leger, Levy and Paillard (1999) used a number of published surveys to estimate costs associated with outpatient visits to health-care practitioners, sleep recordings and treatment by sleep specialists, and products, be they prescription or not, for inducing sleep. They arrived at a figure of 10.23 billion francs (or $2.07 billion US). While Leger et al.'s data will not be discussed in detail here, they are provided in Table 2 alongside the

data from the two other studies discussed in this paper. Detailed Canadian estimates have not yet been produced.

To facilitate comprehension of the presentation that follows, the data sources used in the Walsh and Elgelhardt (1999) study will be briefly described. This will also help the reader better understand some of the options available for obtaining unit data. First, data regarding physician visits was obtained from unpublished registers of the 1994 National Ambulatory Medical Care Survey (NAMCS). This is a national (US) probability sample survey of office visits to non-federally employed physicians. Information on primary complaints, diagnoses and medications prescribed are available. Visits to psychologists, social workers, sleep specialist centres and HMO's were estimated using extrapolation methods described in detail in the original article. Nursing home estimates were based on data from other studies (Pollack & Perlick, 1991; Sanford, 1975) citing the importance of the elderly patient's sleep disruption in the caregivers' decision to seek nursing home placement. Based on these studies, the authors estimated that 20.4% of nursing home admissions were due to the elderly person's sleep problems. Prescription medication costs were obtained from two major databases: (a) the Retail/Provider Perspective Audit and (b) the National Disease and Therapeutic Index. The first database contains information regarding purchases of medications (e.g., by drug stores, hospitals, HMO'S, etc.) while the second tracks prescription patterns in a random sample of participating physicians. Data regarding non-prescription sleep aids were obtained by consulting a firm called Information Resources regarding utilisation of pre-identified products. Finally, costs associated with alcohol use were calculated by combining data obtained from different sources (Gallup, 1995; Johnson, Roehrs, Roth & Breslau, 1998) on the prevalence of using alcohol as a sleep aid and multiplying the estimated frequency (number of nights) by a cost of $1.50 per night of alcohol use.

The following section will present a breakdown of the direct costs of insomnia into several categories: consultations, prescription medications, and non-prescription products.

Consultations. Only about 5% of insomnia sufferers report their sleeping difficulties to their physicians (Gallup, 1995). Of those who find themselves in a doctor's office for another purpose, it is estimated that 26% of patients mention their sleep problem, while 69% do not (Dement & Netzer, 2000). As far as visits to psychologists are concerned, approximately 0.9% of visits are related to complaints of insomnia (Chilcott & Shapiro, 1996). Table 2 includes a comparison of consultation direct cost estimates provided by Walsh & Engelhardt (1999), $11.96 billion, and the more conservative figures of Chilcott & Shapiro (1996), $674 million. The large discrepancy between the two studies' estimates is primarily due to different estimating procedures for nursing home costs ($10,900, or 90% of the total cost for Walsh & Engelhardt, as compared to $7 million, or 1% for Chilcott & Shapiro). The considerable differences that exist between all categories of estimates (as well as the very question as to whether and how to calculate certain costs) further highlight the need for a unified approach to identifying and valuing costs that can be consistently applied across studies and thereby allow meaningful and valid comparisons.

It should be pointed out that while costs of standard consultation modes are described in these studies, the costs of consultations with practitioners using other methods such as acupuncture, homeopathy, exercise, relaxation therapy, meditation, biofeedback, or light therapy have not been investigated or incorporated into current analyses. While this may be due to the assumption that this represents a very minor proportion of insomnia-related costs, this assumption remains largely untested and there is thus little way of estimating costs associated with their use.

The discussion thus far makes it clear how reliance on national surveys and databases can only provide a very rough estimate of product and service costs. In addition, as already mentioned, medical costs attributed to insomnia are often entangled with costs related to co-existing disorders. These problems, and others, which can add further bias to cost estimates, can be thwarted by prospectively tracking individuals taken from a representative sample over time. This may reduce estimate error and allow a more precise description of the frequency and nature of consultations and product use, thus leading to a

greater generalizability regarding insomnia-related consumer behaviour. It also allows the gathering of valuable qualitative data regarding the reasons for using a given product or instigating contact with a given service provider.

Transportation. Costs are also accumulated in terms of transportation to and from appointments with health care providers. These are usually, but not always, considered as direct costs. A transportation cost estimate can be derived by multiplying the total number of visits (available from large databases or reported by individuals), by an average transportation cost estimate, according to the mode of transportation. This is what Walsh and Engelhardt (1999) did to arrive at an estimate of $20 million in 1990 (10 million visits at $2/visit). Chilcott & Shapiro (1996) suggest a lower figure (based on the same $2/visit cost but a lower estimate of frequency of visits) of $12.7 million spent annually. Wear and tear on vehicles can also be included, but in these studies, was not.

Prescription medications. Of the less than 15% of insomnia sufferers who seek treatment, most consult a general physician for their problem. In the majority of these cases, the treatment most frequently proposed is pharmacotherapy. Benzodiazepines, non-benzodiazepine hypnotics, and antidepressants are the prescription medications most frequently used. It is estimated that between 2% and 10% of insomnia sufferers are prescribed medication (Ohayon & Caulet, 1996). Mellinger, Balter & Uhlenhuth (1985) determined the past year prevalence of prescription medication use for insomnia, including anxiolytics and antidepressants, to be 4.3%, with 11% of hypnotic users consuming these medications for at least one year. Given the widespread use of prescription sleep medication, their uncertain efficacy in the long term, and their potential secondary effects such as rebound insomnia and dependence, understanding their costs (monetary and otherwise) is important when making comparisons to other treatment options and making cost-related intervention decisions.

In a survey conducted by the National Institutes of Health (NIH; 1994), it was estimated that $285 million is spent by outpatients and within hospitals for the three most frequently prescribed benzodiazepine hypnotics (triazolam, temazepam and flurazepam),

and $170 million is spent on anxiolytics and antidepressants (e.g., trazodone, amitriptyline, doxepine). Combined, these figures suggest a total of $455 million (U.S.) spent on prescription medications. Walsh and Engelhardt (1999) estimated the total annual amount of spending on prescription medications to be $810 million (U.S.). Assumptions regarding which medications to include, prevalence rates and unit costs likely explain the gap in these estimates.

Nonprescription products. A number of medications and other products that can be obtained without prescription are frequently used as sleep aids. Examples of these products are over-the-counter antihistamine sleep aids such as Nytol (Block Drug, Jersey City, NJ), Sominex (SmithKline Beecham, Philadelphia, PA), and Unisom (Pfizer, New York, NY), as well as analgesics, and cough and cold remedies. Due to questions surrounding clinical efficacy, tolerance and potential residual daytime effects (Balter & Uhlenhuth, 1991) there is some question as to whether their use is in some ways more costly than their benefit. Nonetheless, estimates of the use of over-the-counter remedies for sleep difficulties range from 22% to 29% in individuals with insomnia (Ancoli-Israel & Roth, 1999; Gallup Organizations, 1991, 1995). Walsh and Engelhardt (1999) estimated that in 1995, $326 million was spent on traditional non-prescription sleep aids, non-prescription nighttime analgesics, and cough and cold medicines (used as a sleep aids) combined. Chilcott and Shapiro (1996) reported the more conservative NIH study (1994) figure of $84 million for OTC product costs.

Valerian root and melatonin are two OTC products used for sleep difficulties. Valerian root is an herbal product with a mild hypnotic effect that is used by some individuals for their sleep difficulties. Cost estimates are not available for this product. Melatonin is an OTC product sometimes used to treat circadian sleep problems related to jet lag and shift work. Its synthetic, commercialised version mimics the natural substance produced by the pineal gland in the brain. American estimates place its cost at somewhere between $50 and $125 million. Questions that have arisen concerning the efficacy, safety and potential side effects of both valerian root and melatonin have not been definitively answered, which is why they have yet to be approved and regulated in Canada.

Finally, alcohol is also frequently used as a self-help sleep aid, whether in the context of treated or untreated insomnia. The Gallup Organization's report "Sleep in America" (1995) indicates a national prevalence rate of use of alcohol as a sleep aid of 7.9%. An earlier poll conducted by the same organization had revealed that approximately 10% of people with sleep complaints drank alcohol at least once a week as a sleep aid (Gallup, 1995). Ancoli-Israel and Roth (1999) report that 28% of insomniacs in their telephone survey of 1,000 Americans had used alcohol as a sleep aid, with rates in chronic insomnia sufferers higher than in occasional insomniacs (6.8 versus 3.6 nights per week, respectively).

In terms of cost, Walsh and Engelhardt (1999) propose that, based on the census data of 1995 for the United States, the annual cost of alcohol used as a sleep aid is $780 million. This figure is based on an estimate of about 520 million nights of sleep-promoting alcohol use, which was then multiplied by a per-unit cost of $1.50. Chilcott and Shapiro used an earlier Gallup survey (1991) and a more conservative per-drink estimate ($1.00) to arrive at an estimate of $574.6 million to describe the amount spent annually on alcohol as a sleep aid. These differences highlight the effects that researchers' decisions and simple availability of data issues can have on cost estimates.

To conclude, using the Walsh & Engelhardt (1999) figures, an estimate of the cost of substances used to treat insomnia is $1.97 billion, with about 41% being spent on prescription medications, 40% on alcohol, 17% for OTC products and 3% on melatonin. Chilcott and Shapiro offer a more conservative estimate of $1.1 billion U.S., with about 40% of that being spent on prescription medications, 52% on alcohol, and 7% on OTC products. What is striking is the elevated percentage of alcohol use as a sleep aid, regardless of the study. It is well documented that alcohol can have deleterious effects on sleep quality (altering sleep structure). In addition, the risks of dependency, abuse and eventual alcoholism cannot be disregarded. Once again, Canadian data are as of yet unavailable.

Indirect Costs of Insomnia

Indirect costs associated with insomnia include those related to a reduction in economic output due to illness-related morbidity and mortality. Examples are increased absenteeism, reduced work productivity and accidents. Some authors describe the *prevalence* of these occurrences, but actual cost estimates are rare and typically provide a rough idea of costs related to one dimension such as absenteeism. Despite the challenges inherent in these calculations (see caveats described below), Stoller (1994), using aggregated data from a variety of other studies, estimated the indirect costs of insomnia to society to be between $77 billion and $92 billion annually. However, she used a liberal insomnia prevalence estimate of 33%, and included studies evaluating daytime sleepiness (a symptom not necessarily representative of insomnia), both of which may have produced an inflated cost estimate.

Absenteeism and reduced work productivity. It has been estimated that individuals reporting poor sleep miss at least 5 more days of work per year than good sleepers (Schweitzer, et al., 1992). Other preliminary descriptive studies suggest that insomnia sufferers have higher absenteeism rates (Godet-Cayre, Pelletier-Fleury, Le Vaillant, Dinet, Massuel, and Leger, 2006; Jacquinet-Salord, Lang, Fouriaud, Nicoulet, & Bingham, 1993; Leger, Massuel and Metlaine, 2006; Ozminkowski, Shaohung, & Walsh, 2007), lower work productivity, satisfaction and performance levels (Godet-Cayre, Pelletier-Fleury, Le Vaillant, Dinet, Massuel, and Leger, 2006; Kupperman, Lubeck, Mazonson, et al., 1995; Schweitzer et al., 1992), and reduced promotions and access to upper pay scale ranges (Johnson & Spinweber, 1983). Stoller (1994) estimated a 4% work performance deficit in insomniacs. Using the insomnia prevalence rate of 33% mentioned above, she obtained an estimate of costs to society due to reduced productivity of $41.1 billion per year. A per person estimate was attempted by Chilcott & Shapiro (1996), who suggest a decrease in work productivity due to insomnia of 10%. This amounts to $3000 (Cdn.) per insomnia sufferer per year. What they or Stoller based their productivity loss percentage estimates on, however, is not clear, making it important to remain careful when interpreting their data. Furthermore, the use of large data banks for identifying frequencies makes it difficult

to calculate anything but the total number and total cost related to sick days. Only an individualistic approach which asks participants to recall how many days of missed work or reduced responsibility were experienced during a given time period *specifically due to insomnia*, or which traces these phenomena longitudinally, can clarify the link between insomnia and these events. In addition, given the reality that productivity losses result from a wide range of factors, efforts to more precisely estimate the relative contribution of insomnia to this loss should be made.

A recent two-year retrospective cohort study conducted in France compared the rate and cost of absenteeism in workers with insomnia to that of good sleepers (Ozminkowski, Shaohung, & Walsh, 2007). The authors also examined who bore the burden of those costs. Participants with insomnia were found to have significantly more absences annually (5.8 days) as compared to their matched good sleepers (2.4 days). The total per-worker annual cost associated with these absences was calculated at 1,472 euro ($1,959 US$), with 88% of this cost being absorbed by the employer as opposed to insurance companies or workers. Comparison to Canada, or North America, however, is difficult due to differences in compensation practices as well as work structure and culture. More importantly, the study makes the assumption that the absences are "insomnia-related" because they are incurred by individuals with sleep difficulties. This may or may not be the case, as insomnia may be associated with, or secondary to, problems such as chronic pain, depression, anxiety, menopause, etc.

Many studies directly ask individuals what the consequences of their poor sleep are. Along with the effects listed above, when compared to good sleepers, insomniacs tend to report higher levels of fatigue and sleepiness, memory deficits, impairment of judgement and thinking, and irritability (Gallup, 1994; Addison, Thorpy, Roehrs, & Roth, 1991; Schweitzer et al., 1992; Thase, 2005). Work-related interpersonal tension, accidents and pressure are also reported (Lavie, 1981). However, a caution is important here; a distinction between objective and subjective function is primordial. There is increasing evidence that attitudes and beliefs surrounding the effects of sleep are strong predictors of reported sleep satisfaction (Edinger, Fins, Glenn, Sullivan et al., 2000) and that in some

cases, psychological mediators, including perceptions in general, are more closely related to a subjective evaluation of poor sleep and its repercussions on daytime sequelae than objective sleep parameters (e.g., Fichten et al., 1995; Ohayon, Caulet, Priest & Guilleminault, 1997). For example, one study (Alapin et al., 2001) showed that while poor sleepers report more problems with daytime functioning than good sleepers, high distress and lowered psychological adjustment explain poorer daytime function better than sleep status alone. It is possible, then, that variables such as personality factors, perception of control, coping strategies, and attitudes and beliefs are responsible for both sleep quality and purported effects such as reduced job satisfaction or increased interpersonal tension. Such findings may be important to consider/measure when evaluating costs incurred due to reduced functioning. More precisely, the weight assigned to the role of insomnia in productivity or other daily function decrements may need to be estimated more carefully.

A final caveat concerning estimates of indirect costs is related to the high comorbidity levels of insomnia, psychiatric illness and physical ailments. The close link between these variables makes it problematic to place the sole responsibility for factors such as absenteeism and reduced work productivity on poor sleep alone. For example, a depressed or otherwise ill worker with concurrent insomnia may well be less productive and miss more workdays than a non-depressed co-worker, but how should the relative contribution of each disorder be determined? Once again, tracking behaviour in individuals prospectively gives the opportunity to study the complexity of these relationships more closely and to perhaps untangle the temporal relationship between variables such as physical or psychiatric illness, insomnia and costs.

Accidents. Aldrich (1989) found that automobile accidents occur two and a half times more frequently in individuals with insomnia than in those without. In a large-scale epidemiological study by Balter and Uhlenhuth (1992), the prevalence of motor vehicle or other serious accidents was four times higher in individuals reporting untreated insomnia as compared to normal controls and insomniacs treated with medication. Elsewhere, it has been demonstrated that experiencing an average of 16 nights of poor sleep per month puts people at a three times greater risk of an accident than if they do not experience sleep

difficulties (Schweitzer, Engelhardt, Hilliker et al., 1992). Specific case reports of fatigue-induced accidents include the Space Shuttle Challenger accident, and various sea and rail accidents (Lauber & Kayten, 1988). Care must be taken, however, to identify accidents in individuals with sleep difficulties related to night or irregular shifts. As daytime fatigue is often reported at higher or more disruptive levels in these individuals than in other insomnia suffers, this may represent a special case worthy of study on its own. Regardless of the etiology of the disorder, the cost of even one major transportation accident alone can climb into the millions. While Leger (1994) suggested that the cost of sleep-related accidents in the United States in 1988 was between $43.15 and $56.02 billion, he did not distinguish across different causes of sleepiness (i.e., insomnia vs. apnea vs. narcolepsy). In addition, some authors (e.g., Webb, 1995) suggest that these figures are a significant overestimate of the real cost of sleepiness-related accidents. The only concrete monetary estimate of insomnia-related accidents comes from Chilcott & Shapiro (1996) who suggest these costs to be around $2000/person/year (Cdn.). They do not provide their methodological basis for this figure.

Other costs. A number of other costs associated with insomnia can be identified but are typically more complex to quantify. Some authors refer to them as related costs in that they can be interpreted as even further removed from direct costs. These can include costs of comorbid illnesses (see Gislason & Almqvist, 1987; Hyyppa & Kronholm, 1989; Vollrath, Wicki & Angst, 1989), transportation costs, quality of life, property damage caused by insomnia-related accidents, and mortality. In reality, a series of costs can unfold relative to other costs and it can become difficult to know where to stop or how to assign relative responsibility of factors contributing to cost. For example, an individual experiencing an insomnia-related physical or psychiatric problem may consult and receive some form of treatment for the related problem. Added to the direct cost of the treatments for the *insomnia-related* problem are the associated transportation costs, lost time and diminished productivity at work, as well as quality of life decrements. Costs for babysitters, missed opportunities, or even missed opportunities of family members or friends tending to the insomnia sufferer are all valid cost measures. These various overlapping offshoot costs can quickly accumulate and make the task of accurate cost

calculation an intimidating if not impossible one. It is nonetheless important to attempt to at least identify these costs in order to understand the extent to which proposed estimates are just that - estimates - and to have as clear an idea possible as to the extent to which they likely *underestimate* the actual cost of the disorder.

Comorbidity of insomnia with other health problems increases overall costs. These health problems include depression and anxiety (Breslau, Roth, Rosenthal & Andreski, 1996; Ford & Kamerow, 1989; Gillin, 1998; Morin & Ware, 1996; Soldatos, 1994), respiratory, heart and gastrointestinal difficulties (Vollrath, Wicki & Angst, 1989), asthma, arthritis, headaches, ulcers, and high blood pressure (Lavie, 1981), and early death (Shapiro & Dement, 1993; Wingard & Berkman, 1983). Regardless of the nature of the ailment, only its association with insomnia upon or subsequent to insomnia diagnosis can be interpreted as a related cost. While more conclusive evidence based on longitudinal research is succeeding in identifying the directionality of these relationships (especially in the case of depression), it is likely that this directionality will vary in nature relative to a complex of other factors, and that the weighting of the contribution of one disorder relative to another will remain highly contentious. Chilcott & Shapiro (1996) estimate the cost of other medical problems resulting from or secondary to insomnia at $5000/person/year and admission to hospital for similar reasons at $20 000/person per 21-day period (Cdn.). Once again, their precise mode of calculation is unclear, but is reportedly based on Ontario Health Insurance Policy billing costs for 1992.

Finally, the relationship between insomnia and reduced health-related quality of life should not be ignored. Recently, evaluation of treatment outcome has evolved to encompass what is now considered to be a very important outcome factor reflecting clinical significance: quality of life (QOL; see Strupp, Horowitz, & Lambert, 1997, for an in depth discussion). While this variable is not typically associated with monetary values, it is considered by some to represent a very real but different kind of cost. QOL is generally understood to represent a multidimensional concept addressing a wide range of domains including physical and psychological state, functional capacity and social relationships. Lehman (1999) describes quality of life as encompassing three broad domains: (a)

functional status, (b) access to resources and opportunities to use one's abilities to pursue interests, and (c) a sense of well-being (see this same source for a review of instruments for measuring QOL outcomes in mental health).

In economic evaluation, good judgment should prevail when determining what costs to measure. Knapp and Beecham (1993) advocate the use of a "reduced cost list" method which should purportedly capture the most relevant costs in mental health service evaluations. The authors found that the five most costly services account for 94% of total costs and the next five for only 4%, thus suggesting that judicious and informed list construction can save time and money, while still rendering valid cost estimates.

Data from two surveys in the United States (Gallup, 1991, 1995) suggest that, when compared to good sleepers, insomnia sufferers are impaired in terms of simple task completion, stress management, decision-making and family and social functioning. Using the 36-item Short Form Health Survey of the Medical Outcomes Study (SF-36), researchers have found significant differences on QOL measures of health, physical well-being, and mental, emotional and social adjustment, including higher scores on depression and anxiety measures in treated and untreated insomniacs as compared to good sleepers (Leger, Scheuermaier, Philip, Paillard, & Guilleminault, 2001; Zammit et al., 1999). These consequences merit attention not only for purposes of clinical significance, but also because reduction of certain QOL dimensions may also translate into more concrete costs such as increased accident rates, reduced work productivity, or eventual depression (although researchers are cautioned against "double counting", understood as entering the same costs into an equation more than once). Further research should investigate QOL prospectively in order to investigate causal relationships rather than simply correlational ones. Placing a monetary value on QOL is not necessary or even necessarily advised; an approach that investigates in raw score terms the extent to which untreated insomnia is associated with significantly lower levels of QOL than treated insomnia or no insomnia, and the degree to which treatment of insomnia can significantly improve QOL is sufficient and appropriate.

Conclusion and recommendations for future research

It is becoming increasingly important to identify the costs of mental disorders and their treatment. Knowledge of costs is associated with funding and policy decisions, accessibility issues, treatment development, patient satisfaction, and many other important questions. To date, research into the costs of insomnia has been scant. Other than a handful of studies describing costs in the United States, one describing costs in France, and another reporting a pooled cost estimate for a variety of sleep disorders for Australia, we have little to base a discussion on. We do know, however, based on the research that does exist on prevalence and costs, that insomnia is very costly to individuals and to society. Existing estimates may underestimate its economic impact; the best figures available suggest that direct costs associated with insomnia are situated around $13.9 billion (US; Walsh & Engelhardt, 1999), and that when indirect costs are factored in the amount may be as high as between $77 to $92 billion.

As discussed above, the vast majority of individuals with sleep complaints do not consult for their problem (Ford & Kamerow, 1989). In addition, a significant number of individuals resort to insomnia treatments that have not been shown empirically to improve sleep, including alcohol and OTC substances. This suggests that the number of individuals experiencing relief from their sleep difficulties is very low. Of those individuals who receive a pharmacological intervention for their insomnia, the majority of these individuals continue to take medication for at least one year, a practice that may increase risks of dependence, tolerance (and thus decreased efficacy over time), negative secondary effects and rebound insomnia. It should be clear from this and the earlier discussion of costs, that the costs to society of not treating or of ineffectively treating insomnia are estimated to be very high. It is thus of utmost importance to make readily available treatments with demonstrated efficacy in reducing insomnia symptomatology. In addition, as was explained above, in an effort to offer the most cost-effective intervention possible, it is of increasing relevance and importance to conduct an evaluation of the costs associated with the treatment in question as well as an estimate of the degree and nature of cost reduction

relative to non treatment. To date, however, no attempts have been made to conduct this type of cost-offset or cost-effectiveness analysis in insomnia.

Psychologists may be reluctant to quantify the consequences of insomnia in monetary terms, as much for ethical as for methodological knowledge considerations. However, in 1997, an International Workshop on Sleep and Health that addressed research and clinical perspectives was held in Palm Springs, California. A summary of the presentations and ensuing discussions emphasized that there is a paucity of research into the cost of untreated insomnia and the degree to which treatment may reduce these costs (Roth, Costa e Silva, & Chase, 2000). The time has come to hone evaluation techniques and begin producing research that describes not just the cost of this disorder, but perhaps more importantly offers empirically based cost-effectiveness data.

The following suggestions are offered for future research. First, "burden of illness" research should be undertaken with the aim of describing indirect and direct costs incurred by individuals with varying degrees of insomnia symptomatology. This would permit a finer understanding of the relationship between the intensity or severity of insomnia and the possible extent of its economic consequences while still allowing the production of a global cost figure. Second, population-based research should be conducted that collects data on *all* forms of health-care system and product utilisation from participants. While using primary care data may be more expeditious, this approach compromises external validity and will always underestimate costs, especially in light of the very low consultation rates associated with insomnia. This methodology does not preclude the use of relevant administrative databases (e.g., private and public health care insurance sources, workplace records of absences, hospital databases, etc.) that, while limited, have considerable value as objective data sources, and can be used to cross validate certain self-report data. Third, efforts to standardize measurement tools should continue. A clear and comprehensive cost checklist should be used based on guidelines set down by Gold et al. (1996). Use of such a checklist in future insomnia cost assessments would enhance reliability as well as facilitate direct cost comparisons across burden-of-illness studies and different insomnia treatment modalities. Fourth, where possible, the simultaneous gathering of sociodemographic

information and data on variables such as depression, anxiety, stress, and general health should be undertaken. Through the application of increasingly adapted regression techniques, this could ultimately contribute to a better understanding of the relative relationship of insomnia and a multitude of other variables to costs. This is important information to obtain for outreach, education and prevention programmes. Fifth, future research should distinguish between the economic effects of primary versus secondary insomnia. Given that these are currently accepted diagnostic distinctions, it seems that for clarity's sake, cost figures should concord with existing diagnostic categories. Sixth, the use of a longitudinal study design would assist researchers in addressing certain cost-calculating obstacles such as the partitioning of costs when comorbidity is present. For example, if it is found that insomnia is a precursor to depression, then costs associated with depression could be attributable, in part, to insomnia. Finally, in order to reduce the risks of overestimating the economic impact of insomnia, every attempt should be made to isolate insomnia's relative contribution to costs. This is particularly true when estimating potentially costly domains such as productivity and accidents. Individuals with insomnia can have motor vehicle accidents or suffer from significant reduced work productivity for a multitude of reasons. For example, in the case of work function, individuals may seriously under perform due to high stress levels, lack of motivation, physical ailments such as chronic pain or migraine, all of which may co-exist with insomnia symptomatology. It is very important to try to determine insomnia's proportional contribution to decreased work function in such cases.

It is time to increase efforts to collect the kinds of data that will permit us to more completely understand the ramifications of insomnia. While cost analyses are relatively new to our thinking as mental health care researchers and practitioners, and while the methods for conducting these analyses are for the time being relatively foreign to our arsenal of analytic techniques, we must invest the energy necessary to understand and begin using these techniques if we want to respond not only to the demands of an increasingly market driven health-care system, but, most importantly, if we want to offer patients the best treatments available at the lowest cost possible.

References

Addison, R.G., Thorpy, M.J., Roehrs, T.A., & Roth, T. (1991). Sleep/wake complaints in the general population. *Sleep Research, 20,* 112.

Alapin, I., Fichten, C.S., Libman, E., Creti, L., Bailes, S. & Wright, J. (2001). How is good and poor sleep in older adults and college students related to daytime sleepiness, fatigue and ability to concentrate? *Journal of Psychosomatic Research, 49*(5), 381-390.

Aldrich, M. S. (1989). Automobile accidents in patients with sleep disorders. *Sleep, 12*, 487-494.

American Sleep Disorders Association (2000). International classification of sleep disorders: Diagnostic and coding manual, 2nd ed. Rochester, MN: The American Academy of Sleep Medicine.

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders. 4th ed., text revision. Washington DC: American Psychiatric Association.

Ancoli-Israel, S., & Roth, T. (1999). Characteristics of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. *Sleep, 22*(Suppl 2):S347-S353.

Balter, M. B., & Uhlenhuth, E. H. (1992). New epidemiologic findings about insomnia and its treatment. *Journal of Clinical Psychiatry, 53*(Suppl 34-39), discussion 40-32.

Bandura, A., Blanchard, F.B., & Ritter, B. (1969). The relative efficacy of desensitization and modeling approaches for inducing behavioral, affective and attitudinal changes. *Journal of Personality and Social Psychology, 13, 173-199.*

Brazier J., Roberts J., & Deverill M. (2002). The estimation of a preference-based measure of health from the SF-36. *Journal of Health Economics*, *21*(2): 271–292.

Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. *Biological Psychiatry, 39*, 411-418.

Briggs, A., Sculpher, M., & Buxton, M. (1994). Uncertainty in the economic evaluation of health care technologies: the role of sensitivity analysis. *Health Economics, 3*(2), 95-104.

Brown, M.C.J., van Loon, J.M.T., & Guest, J.F. (1999). Cost-effectiveness of mirtazapine relative to amitriptyline in the treatment of moderate and severe depression in France. *European Journal of Psychiatry, 13*, 197–208.

Byford, S., Barber, J.A., Fiander, M., Marshall, S., & Green, J. (2001). Factors that influence the cost of caring for patients with severe psychotic illness: report from the UK 700 trial. *British Journal of Psychiatry, 178*, 441-7.

Chan, S., Mackenzie, A., & Jacobs, P. (2000). Cost-effectiveness analysis of case management versus routine community care organization for patients with chronic schizophrenia. *Archives of Psychiatric Nursing, 14(2),* 98-104.

Chilcott, L. A., Shapiro, C. M. (1996). The socioeconomic impact of insomnia. An overview. *Pharmacoeconomics, 10*(Suppl 1), 1-14.

Dement, W.C., & Netzer, N.C. (2000). Primary care: is it the setting to address sleep disorders? *Sleep and Breathing, 4*(1):1-XX.

Docherty, J.P. (1999). Market-Based Health Reform and Cost-Effectiveness of Psychotherapy. In N.E. Miller & K. Magruder (Eds.), *Cost-Effectiveness of Psychotherapy.* Oxford University Press, 3-14.

Drummond, M.F., Schulpher, M.J., Torrance, G.W., O'Brien, B.J., & Stoddart, G.L.

(2005). *Methods for economic evaluation of health care programmes* (3rd ed.). New York: Oxford University Press.

DuPont, R. L., DuPont, C. M., & Rice, D. R. (2002). The economic costs of anxiety disorders. In D.J. Stein & E. Hollander E. (Eds.). *Textbook for Anxiety Disorders*. Washington DC: American Psychiatric Press Inc.

Edinger, J. D., & Fins, A. I. (1995). The distribution and clinical significance of sleeptime misperceptions among insomniacs. *Sleep, 18*, 232–239.

Fichten, C. S., Creti, L., Amsel, R., Brender, W., Weinstein, N., & Libman, E. (1995). Poor sleepers who do not complain of insomnia: myths and realities about psychological and lifestyle characteristics of older good and poor sleepers. *Journal of Behavioural Medicine, 18*, 189–223.

Ford, D. E. & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *Journal of the American Medical Association, 262*, 479-1484.

Gallup Organization (1991). Sleep in America. Princeton, NJ: The Gallup Organization.

Gallup Organization (1995). Sleep in America. Princeton, NJ: The Gallup Organization.

Gillin, J.C. (1998). Sleep disturbances and mood disorders. *The Journal of the California Alliance for the Mentally III, 9*(4), 33-35.

Gislason, T., & Almqvist, M. (1987). Somatic disease and sleep complaints – an epidemiological study of 3201 Swedish men. *Acta Med Scand, 221*, 475-81.

Godet-Cayre, V., Pelletier-Fleury, N., Le Vaillant, M., Dinet, J., Massuel, M. A., & Leger, D. (2006). Insomnia and absenteeism at work. Who pays the cost? *Sleep, 29(2),* 179-84.

Gold, M.L., Siegel, J.E., Russell, L.B., & Weinstein, M.C. (1996). *Cost-Effectiveness in Health and Medicine*. New York: Oxford University Press.

Greenberg, P., Stiglin, L., Finkelstein,m S., & Berndtm, E. (1993). The economic burden of depression in 1990, *Journal of Clinical Psychiatry, 54*, 405-418.

Hargreaves, W. A., Shumway, M., Hu, T.W., Cuffel, B. (1998). *Cost-outcome methods for mental health*. 1st ed. San Diego: Academic Press.

Heard, H. (2000). Cost-effectiveness of dialectical behavior therapy in the treatment of borderline personality disorder. University of Washington, Washington, USA.

Henry, J., & Rivas, C. A. (1997). Constraints on antidepressant prescribing and principles of cost-effective antidepressant use Part 1: Depression and its treatment, *Pharmacoeconomics, 11*, 419-43.

Hillman, D.R., Murphy, S.X., Antic, R., Pezzullo, L. (2006). The Economic Cost of Sleep Disorders. *Sleep, 29* (3), 299-305.

Hofmann, S. G., & Barlow, D. H. (1999). The costs of anxiety disorders: Implications for psychosocial interventions. In N.E. Miller & K.E. Magruder (Eds.). *Cost-effectiveness of psychotherapy: A guide for practitioners, researchers, and policymakers.* New York: Oxford University Press, p. 224-234.

Hyyppa, M.T., & Kronholm, E. (1989). Quality of sleep and chronic illnesses. *Journal of Clinical Epidemiology, 42(7)*, 633-638.

Jacquinet-Salord, M. C., Lang, T., Fouriaud, C., Nicoulet, I., & Bingham, A. (1993). Sleeping tablet consumption, self reported quality of sleep, and working conditions. Group of Occupational Physicians of APSAT. *Journal of Epidemiology and Community Health, 47*, 64-68.

Johnson, E. O., Roehrs, T., Roth, T., & Breslau, N. (1998). Epidemiology of alcohol and medication as aids to sleep in early adulthood. *Sleep, 21*, 178-186.

Johnson, L. C., & Spinweber, C. L. (1983). Good and poor sleepers differ in Navy performance. *Military Medicine, 148*, 727-731.

Karki, S.D., Bellnier, T.J., Patil, K., & Oretega, T. (2001). Cost-effectiveness of atypical antipsychotics in severely and persistently mentally III patients with schizophrenia and schizoaffective disorders. *Drug Benefit Trends, 13(2),* 254-167.

Kessler, R.C., McGonagle, K.A. and S. Zhao S. et al. (1994). Lifetime and 12 month prevalence of DSM-111-R psychiatric disorders in the United States. *Archives of General Psychiatry*. 51: 8-19.

Knapp, M., & Beecham, J. (1993). Reduced list costings: examination of an informed short cut in mental health research. *Health Economics*, *2*, 313-322.

Kupperman, M., Lubeck, D. P., Mazonson, P. D., et al. (1995). Sleep problems and their correlates in a working population. *Journal of General Internal Medicine, 10*, 25-32.

Lauber, J. K., & Kayten, P. J. (1988). Sleepiness, circadian dysrhythmia, and fatigue in transportation system accidents. Sleep, 11 (6), 503-12.

Lavie, P. (1981). Sleep habits and sleep disturbances in industrial workers in Israel: Main findings and some characteristics of workers complaining of excessive daytime sleepiness. *Sleep, 4*, 147-158.

Leger, D. (1994). The cost of sleep-related accidents: A report for the National Commission on Sleep Disorders Research. *Sleep, 17*, 84-93.

Leger, D., Scheuermaier, K., Philip, P., Paillard, M., & Guilleminault, C. (2001). SF-36: Evaluation of quality of life in severe and mild insomniacs compared with good sleepers. *Psychosomatic Medicine, 63*, 49-55.

Leger, D., Levy, E., & Paillard, M. (1999). The direct costs of insomnia in France. *Sleep, 22,* (Suppl 2):S394-401.

Lehman, A. F. (1999). Future research in quality of life in mental health care. In S. Priebe, J.P.J. Oliver & W. Kaiser (Eds), *Quality of Life and Mental Health Care*, 1 -18. Philadelphia: Wrightson Biomedical.

Luce, B.R., Manning, W.G., Siegel, J.E., & Lipscomb, J. (1996). Estimating costs in cost effectiveness analysis. In M.R. Gold, J.K. Siegel, L.B. Russell, & M.C. Weinstein (Eds), *Cost-Effectiveness in Health and Medicine*. NY: Oxford University Press, 176-213.

Mellinger, G. D., Balter, M. B., & Uhlenhuth, E. H. (1985). Insomnia and its treatment: Prevalence and correlates. *Archives of General Psychiatry, 42*, 225-232.

Meltzer, H.Y. (1999). The role of serotonin in antipsychotic drug action. *Neuropsychopharmacology, 21*(25), 106S-115S.

Miller, N. E., & Magruder, K. M. (1999). *Cost-effectiveness of psychotherapy: A guide for pratitioners, researchers, and policymakers.* 1st ed. New York: Oxford University Press.

Morin, C. M., LeBlanc, M., Daley, M., Grégoire, J. P., & Mérette, C. (2006). Epidemiology of insomnia: Prevalence, self-help treatments and consultations initiated, and determinants of help-seeking behaviors. *Sleep Medicine*, 2006.

Morin, C. M., & Ware, J. C. (1996). Sleep and psychopathology. *Applied and Preventive Psycholology, 5,* 211-224.

Morin C.M., & Wooten, V. Psychological and pharmacological approaches to treating insomnia : Critical issues in assessing their separate and combined effects. *Clinical Psychology Review, 16*, 521-542.

National Commission on Sleep Disorder Research (NCSDR; 1993). *Wake up America: a national sleep alert; Vol 1. Executive summary and executive report.* U.S.

Department of Health and Human Services (Bethesda, MD).
Ohayon, M.M. (2001). 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.
Ohayon, M.M., & Caulet, M. (1996). Psychotropic medication and insomnia complaints in two epidemiological studies. *Canadian Journal of Psychiatry, 41*, 457-464.
Ohayon, M. M., Caulet, M., Priest, R. G., & Guilleminault, C. (1997). DSM-IV and ICSD 90 insomnia symptoms and sleep dissatisfaction. *British Journal of Psychiatry, 171*, 382-388.
Ozminkowski, R. J., Shaohung S. W., & Walsh, J. K. (2007). The direct and indirect costs of untreated insomnia in adults in the United States. *Sleep, 30* (*3*), 263-273.
National Institutes of Health (1994). Wake up America: A national sleep alert. Vol. 2. Working groups reports. Report of the national commission on sleep disorders research. Washington DC, US Government Printing Office.
Neumann, P.J., Hermann, R.C., Kuntz, K.M., et al. (1999). Cost effectiveness of donepezil in the treatment of mild or moderate Alzheimer's disease. *Neurology, 52,* 1138-1145.
Palmer, A.J., Neeser, K., Weiss, C., Brandt, A., Comte, S., & Fox, M. (2000). The long term cost-effectiveness of improvig alcohol abstinence with adjuvant acamprosate. *Alcohol and alcoholism, 35,* 478-492.
Percudani, M., Fattore, G., Strada, L., Contini, A. (1995). Direct and Indirect costs of major depression: implementing a study methodology in a public psychiatric service, *Epidemiologia e Psichiatria Sociale*, *4* (3), 198-211.
Petersilia, J. & Turner, S. (1992). The Costs and Effects of Intensive Supervision for Drug Offenders. *Federal Probation*, *LVI* (4): 12-17.
Petitti, D. B. (2000). *Meta-Analysis, Decision Analysis, and Cost-Effectiveness Analysis: Methods for Quantitative Synthesis in Medicine.* 1st ed. NY: Oxford University Press.
Pinkerton, S.D., Johnson-Masotti, A.P., Holtgrave, D.R., & Farnham, P.G. (2002). A review of the cost-effectiveness of interventions to prevent sexual transmission of HIV in the United States. *AIDS and Behavior, 6*(1), 15-31.
Pollak, C. P., Perlick, D. (1991). Sleep problems and institutionalization of the elderly. *Journal of Geriatric Psychiatry and Neurology, 4*(4), 204-210.
Roth, T., Costa e Silva, J.A., Chase, M.H. (2000). Sleep and health: Research and clinical perspectives. *Sleep, 23,* 52-3.
Rothenberg, S.A. (1992). A pilot survey in the medical community on the use of behavioral treatments for insomnia. *Sleep Research, 21*, 355.
Sanford, J. R. (1975). Tolerance of debility in elderly dependants by supporters at home: its significance for hospital practice. *British Medical Journal, 3*(5981), 471-473.
Schweitzer, P. K., Engelhardt, C. L., Hilliker, N. A., Muehlbach, M. J., & Walsh, J. K. (1992). Consequences of reported poor sleep. *Journal of Sleep Research, 21*, 260.
Shapiro, C. M., & Dement, W. C. (1993). ABC of sleep disorders. Impact and epidemiology of sleep disorders. *British Medical Journal, 306*, 1604-1607.
Shearn, J., Beyer, S., & Felce, D. (2000). The cost-effectiveness of supported employment for people with severe intellectual disabilities and high support needs: A pilot study. *Journal of Applied Research in Intellectual Disability, 13*, 29-37.

Simon, G.E., & VonKorff, M. (1997). Prevalence, burden, and treatment of insomnia in primary care. *American Journal of Psychiatry, 154*, 1417-1423.

Soldatos, C.R. (1994). Insomnia in relations to depression and anxiety: epidemiological considerations. *Journal of Psychosomatic Research, 38* (Suppl), 3-8.

Spiegel, D. (Ed.). (1999). Efficacy and cost-effectiveness of psychotherapy. Washington, DC: American Psychiatric Press.

Stoller, M. K. (1994). Economic effects of insomnia. *Clinical Therapy, 16*, 873-897.

Stout, R.L., Rubin, A., Zwick, W., Zywiak, W., & Bellino, L. (1999). Optimizing the Costeffectiveness of alcohol treatment: A rationale for extended case monitoring. *Addictive Behaviors, 24*, 17-35.

Strupp, H.H., Horowitz, L.M., & Lambert, M.J. (1997). Measuring patient changes in mood, anxiety, and personality disorders: Toward a core battery. Washington, D.C.: American Psychological Association.

Sweat, M., O'Donnell, C., & O'Donnell, L. (2001). Cost-effectiveness of a brief video-based HIV intervention for African American and Latino sexually transmitted disease clinic clients. *AIDS, 15(6),* 781-787.

Thase, M.E. (2005). Correlates and consequences of chronic insomnia. *General Hospital Psychiatry, 27*, 100-112.

Varghese, B., & Peterman, T.A. (2001). Cost-effectiveness of HIV counselling and testing in US prisons. *Journal of Urban Health, 78*(2), 304-12.

Vitiello, M. V. (1997). Sleep disorders and aging: Understanding the causes. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 52*, M189-191.

Vollrath, M., Wicki, W., & Angst, J. (1989). The Zurich study. VIII. Insomnia: Association with depression, anxiety, somatic syndromes, and course of insomnia. *European Archives of Psychiatry and Neurological Science, 239*, 113-124.

Walsh, J.K., & Engelhardt, C.L. (1999). The direct economic costs of insomnia in the United States for 1995. *Sleep, 22*(Suppl 2):S386-393.

Walsh, J.K., Engelhardt, C.L., Hartman, P.G. (1995). The direct economic cost of insomnia. In D. Nutt and W. Mendelson (Eds.), *Hypnotics and anxiolytics*. London: Baillere Tindall, 369-381.

Ware, J.E., & Sherbourne, C.D. (1992). The MOS 36-item short-form Health Status Survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30,* 473 483.

Webb, W.B. (1995). The cost of sleep-related accidents: A reanalysis. *Sleep, 18*, 276-80.

Wingard, D. L., & Berkman, L. F. (1993). Mortality risk associated with sleeping patterns among adults. *Sleep, 6,* 102-107.

Yates, B. T. (1994). Toward the incorporation of costs, cost-effectiveness analysis, and cost benefit analysis into clinical research. *Journal of Consulting and Clinical Psychology*, *62*, (4), 729-736

Yates, B. T. (1995). Cost-effectiveness analysis, cost-benefit analysis, and beyond: Evolving models for the scientist-manager-practitioner. *Clinical Psychology: Science and Practice*, *2*, 385-398.

Yates, B. T. (1987). Cognitive vs. diet vs. exercise components in obesity bibliotherapy: Effectiveness as a function of psychological benefits versus psychological costs. *The Southern Psychologist*, *3*, 35-40.

Zammit, G.K., Weiner, J., Damato, N., Sillup, G.P., & McMillan, C.A. (1999). Quality of life in people with insomnia. *Sleep, 22*(Suppl 2), S379.

Table 1

Types of direct and indirect costs to include in cost analyses of treated and untreated insomnia.

Cost category	Types of acts to be counted and valued
Direct costs	1. Consultations (e.g., physicians, psychologists, social workers, homeopathy, acupuncture, light therapy, etc.) 2. Hospital or Sleep Clinic services 3. Institutionalization (due to insomnia; overhead, utilities, equipment, tests, etc.) 4. Transportation and child care (consultation-driven; also considered by some authors as "related costs) 5. Prescription medications (benzodiazepines, antidepressants, anxiolytics) 6. Over-the-counter products (antihistamines, melatonin, valerian, herbal products) 7. Alcohol
Indirect costs [or Productivity costs; Gold et al., 1996)]	1. Absenteeism 2. Reduced productivity (work or other activities)
Indirect, "other" or related costs [pre-1996; first three considered by the Panel on Cost-effectiveness (Gold et al., 1996) to be direct costs]	1. Motor vehicle and other accidents 2. Medical and psychiatric expenses resulting from illness or mortality associated with insomnia 3. Insomnia-related accident damage costs 4. Quality of life 5. Psychological symptoms (depression, anxiety)

Table 2

Breakdown of direct costs related to insomnia in the United States and France

	Costs (US$ millions)		
	Chilcott & Shapiro (1996)[a]	Walsh & Engelhardt (1999)[a]	Leger, Levy & Paillard (1999)[b]
Substances			
Prescription	455.3	809.92	245.9 (hypnotics) 43.7 (anxiolytics)
Non-prescription	84.0	325.80	64.7 (OTCs)
Alcohol	574.6	780.39	
Melatonin		50.00	
Sub Total	**1 113.9**	**1 966.11**	**310.6**
Services			
Nursing homes	7.0	10 900.00	
Psychiatrists	116.4		200.8
Physicians	317.0	660.00	1 149.5
Psychologists	39.1	122.40	2.7
Social workers		75.30	
Sleep specialists	8.4	18.20	
Mental health facilities	108.6	153.00	
Hospitals	77.5	30.80	
Occupational Health			402.1
Sleep specialist investigations			1.4
Sub Total	**674.0**	**11 960.70**	**1 756.7**
TOTAL	**1 787.9**	**13 926.81**	**2 067.3**

Note. [a] The annual expenditure by the U.S. population on various services for the treatment of or related to insomnia. Dollar amounts are $US million/year estimated for the year 1995 (Chilcott & Shapiro, 1996; Walsh & Engelhardt, 1999). [b] Direct costs of insomnia in France (1995) converted from francs to US$.

Insomnia and its relationship to health care utilization, accidents, and job function

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RÉSUMÉ

Le but de cette étude était d'évaluer le lien entre l'insomnie et (a) l'utilisation du système de santé (ainsi que les produits de santé et l'alcool), (b) l'absentéisme, (c) les baisses de productivité et (d) les accidents, et, dans un deuxième temps, d'effectuer une micro-analyse de ce lien. Un échantillon de 956 adultes québécois a été sélectionné aléatoirement; chaque participant a rempli un questionnaire en français portant sur leur santé, leurs habitudes de sommeil, leurs consultations chez les professionnels de la santé, la prise de médicaments prescrits ou de produits sans ordonnance, la consommation d'alcool pour dormir, leur fonctionnement au travail, et les accidents (s'il y en a eu). Trois groupes ont été formés selon la symptomatologie de l'insomnie rapportée : bons dormeurs (BD), participants avec quelques symptômes d'insomnie (SYMPT), et participants qui rencontrent les critères d'un syndrome d'insomnie (SYND).

Presque cinq fois plus de participants dans le groupe syndrome rapportaient au moins un autre problème de santé chronique. Plus de participants avec insomnie syndrome avaient (a) consulté des professionnels de santé (80% comparé à 60% des bons dormeurs); avaient pris des médicaments prescrits (56.3% vs. 31.7%) et les produits sans ordonnance (74.3% vs. 62.2%); (c) avaient utilisé l'alcool pour dormir (16.7% vs. 4.2%); (d) avait été absent de leur travail (25.3% vs. 16.3%) ou avait eu des baisses de productivité au travail (40.4% vs. 12.4%); et (e) rapportaient des accidents autre des accidents de route (11.9% vs. 6.9%). Aucune différence n'a été détectée pour les taux d'hospitalisation et d'accidents de route. L'âge, le sexe, les variables sociodémographiques et la santé étaient contrôlés dans les analyses de régression. Finalement, l'insomnie était perçue par les participants comme ayant joué un rôle important dans les accidents, les absences et les baisses de productivité.

L'insomnie est associée à une utilisation accrue du système et des produits de santé. Les résultats suggèrent également un lien entre l'insomnie et une diminution de la capacité fonctionnelle, notamment dans le domaine d'absentéisme et de la productivité au travail. Le rôle d'autres troubles comorbides, comme la dépression et l'anxiété, reste à préciser.

Abstract

Background and purpose: To document and provide a micro analysis of the relationship between insomnia and health problems, health-care use, accidents and work function.

Participants and methods: A randomly selected sample of 956 French-speaking adults from Québec, Canada completed questionnaires on sleep, health, use of health-care services and products, accidents, work absences and reduced work productivity. Data were also obtained from the provincial-government administered health insurance board. Participants were categorized as having insomnia syndrome (SYND), insomnia symptoms (SYMPT) or as good sleepers (GS).

Results: Insomnia syndrome was associated with a five-fold likelihood of having at least one chronic health problem (OR: 4.9). Eighty-one percent of the SYND group had consulted a health-care professional in the past year, as compared to 60% of the GS group (OR: 2.8); 56.3% of the SYND group had used prescription medications (GS = 31.7%; OR: 2.8); 74.3% had used over-the-counter products (GS = 62.2%; OR: 1.8); and 16.7% had used alcohol as a sleep aid (GS = 4.2%; OR: 4.6). In terms of daytime function, it was found that 25.3% of the SYND had been absent from work (GS = 16.3%; OR: 1.7), that 40.4% reported having experienced reduced productivity (GS = 12.4%; OR: 4.8) and that non motor-vehicle accidents occurred at higher rates in the SYND group (11.9% versus 6.9% for GS; OR: 2.4). No differences were found for hospitalisations or motor-vehicle accidents. Rates for the SYMPT group were situated between SYND and GS. The analysis controlled for factors such as age, gender, socioeconomic status and psychological health. Insomnia or its consequences was perceived by participants as being a significant contributing factor to accidents, absences and decreased work productivity.

Conclusions: Insomnia is associated with increased use of the health-care system and decreased work function. Given the high rate of comorbidity between insomnia and other health problems (especially depression and anxiety), this relationship requires further investigation.

Introduction

Insomnia is the most prevalent of all sleep disorders. Epidemiological research consistently reports that occasional sleep problems occur in approximately one third of the population, with between 6% and 10% meeting diagnostic criteria for insomnia syndrome (Ford & Kamerow, 1989; Gallup, 1991; Morin, LeBlanc, Daley, Grégoire & Merette, 2006; Ohayon, 2002). Chronic difficulties initiating and maintaining sleep are often associated with psychosocial and occupational impairments such as daytime fatigue, mood disturbances, performance deficits, and reduced quality of life (Zammit, Weiner, Damato, Sillup & McMillan, 1999). The direct costs of insomnia (e.g., consultations, medications) have been estimated at around $13.9 billion (1995 $US; Walsh & Engelhardt, 1999), with indirect costs associated with lost productivity, absenteeism and accidents totalling $41.1 billion (1995 $US.; Stoller, 1994).

Several studies suggest that individuals with insomnia use health care services more frequently than good sleepers, even after controlling for higher rates of depression, anxiety and medical illnesses (Ford & Kamerow, 1989; Hajak, 2001; Simon & Vonkorff, 1997). Research also suggests higher hospitalisation rates in insomniacs (Hajak, 2001; Léger, Guilleminault, Bader, Lévy & Paillard, 2002; Novak, Mucsi, Shapiro, Rethelyi & Kopp, 2005), although the specific contribution of insomnia to hospitalisation is poorly understood. Research on consultations related to sleep difficulties suggests that between 5% and 36% of individuals with insomnia have at some time consulted a physician specifically for these problems, while 27% to 55% have discussed sleep problems with a physician in the course of a consultation for another problem (Ancoli-Israel & Roth, 1999; Ohayon, Caulet, Priest, & Guilleminault, 1997; Ohayon & Hong, 2002). While the majority of these consultations are with a general practitioner, we know little about consultations with other types of health-care professionals. The wide-ranging and sometimes ill-defined definitional criteria used in much insomnia research means that further research is necessary before reliable patterns can be identified and more definitive conclusions drawn.

Higher consultation rates in people with insomnia may be due to the fact that they also suffer from a greater number of physical and/or psychological health complaints. Comorbid health problems documented at higher rates in people with insomnia as compared to those without include: respiratory, heart and gastrointestinal difficulties (Katz & McHorney, 1998; Vollrath, Wicki & Angst, 1989), asthma, arthritis, headaches, ulcers, and high blood pressure (Lavie, 1981) and hip and prostate problems (Katz & McHorney, 1998). Research on psychological complaints has identified high rates of comorbidity between insomnia, depression and anxiety (Breslau, Roth, Rosenthal, & Andreski, 1996; Ford & Kamerow, 1989; Hohagen et al., 1993; Katz & McHorney, 1998; Taylor, Lichstein, Durrence, Reidel & Bush, 2005).

People with insomnia often use prescription medications, alcohol, or over-the-counter (OTC) products such as Nytol, Sominex, Unisom, analgesics, and cough and cold remedies in an attempt to improve their sleep (Gallup, 1995; Hatoum, Kong, Kania, Wong, & Mendelson, 1998). A recent population-based survey of 2001 Quebec residents revealed that in the previous year 36% of respondents with insomnia syndrome had used natural products, 33% had used prescribed medications, 11% had used alcohol, and 8% had used OTC products. Smaller proportions had used complementary approaches such as massage therapy (10%) and acupuncture (2%; Morin et al., 2006). Other research, however, has produced different findings. For example, a 1995 Gallup survey ("Sleep in America") revealed that 22% of respondents with sleep difficulties had ever tried over-the-counter remedies, 16% had tried alcohol and 15% had tried prescription medications for their problem. Thirty-seven percent had used night time cough, cold or pain relief formulas. It is not clear whether these differences reflect cultural (e.g., attitudinal, health-care system) variations in the samples studies, or differences in research methodology, such as the criteria used to define insomnia.

Insomnia can also have a negative impact on various aspects of daytime functioning, including work performance. Several cross-sectional studies of working-age adults have found a link between poor sleep and absenteeism, reduced work capacity/productivity, and low levels of work satisfaction and performance (Godet-Cayre, Pelletier-Fleury, Le

Vaillant, Dinet, Massuel, and Leger, 2006; Kupperman, Lubeck, Mazonson, et al., 1995; Linton & Bryngelsson, 2000; Ozminkowski, Shaohung, & Walsh, 2007). Schweitzer et al., 1992). Schweitzer et al. (1992) estimated that individuals reporting poor sleep miss at least 5 more days of work per year than good sleepers, while Leigh (1991) reported monthly absence rates 1.4 times higher in poor sleepers than in workers with no sleep difficulties. The underlying causes of these absences are not clear from this research. In fact, a more recent study (Philip, Leger, Taillard, et al., 2006) suggests that depressive, behavioural and organic sleep complaints that may accompany insomnia, explain work absenteeism, and not insomnia *per se*. These are interesting results that speak to the role of insomnia relative to other comorbid problems, and that merit further investigation. Elsewhere, insomnia has been found to be a strong predictor of eventual permanent disability leave, even after controlling for socio-demographic and shift-work characteristics (OR: 3.9; Sivertsen et al., 2006). It has also been linked to objective increases in absenteeism and automobile accidents in French workers by (Leger, Massuel and Metlaine, 2006).

Fatigue, combined with other cognitive difficulties that may be associated with insomnia (e.g., concentration and coordination difficulties) can lead to serious consequences when individuals are carrying out tasks that require optimal cognitive function, such as driving. In a large-scale epidemiological study by Balter and Uhlenhuth (1992), the prevalence of motor vehicle or other serious accidents was four times more frequent in individuals reporting untreated insomnia as compared to normal controls and insomniacs treated with medication. Other evidence suggests that experiencing an average of 16 nights of poor sleep per month puts people at a three times greater risk of an accident than if they do not experience sleep difficulties (Schweitzer et al., 1992). Decision-making errors and on-the-job accidents are also more frequent in individuals with sleep problems (Léger et al., 2002; Schweitzer et al., 1992). Interpreting the results of these and similar studies is often complicated by the fact that the largest proportions of sleep-disorder-related accidents occur for people suffering from narcolepsy and sleep apnea, disorders that are often not considered separately from insomnia in the existing research. As a result, the relationship between insomnia alone and accident rates is not clear.

Little is known about insomnia correlates and impact in the Canadian context. In addition, current research tends to use definitions of insomnia that are either liberal, vague or do not reflect the diagnostic criteria used by clinicians. Furthermore, research on the consequences of insomnia is often conducted at a "macro" level, using aggregate data from large databases. Although useful as an approach, it precludes analysis of the finer nuances of variables such as consultations (e.g., with whom) and medication use (e.g., what types, for what treatment purposes), productivity losses (e.g., to what degree, for what reasons) or accident (e.g., real or perceived causes). This suggests that more micro analysis should be conducted. In addition, more population-based data research is necessary given the fact that most individuals with insomnia do not seek help from health-care practitioners, or take many years before they finally do so. Hence, using samples from primary care or data from administrative data banks probably does not adequately reflect reality. Another shortcoming of past research is that associations have been identified between insomnia and various associated variables (e.g., medication use, accidents, work performance), yet the actual contributing role of insomnia and other variables in these occurrences remains unclear.

The present study was designed to address a number of these shortcomings. More specifically, the objectives were: (a) to document rates of chronic health problems, health-care use, accidents and problems in work performance as a function of conservatively and clearly operationalized insomnia status in a population-based sample in the province of Quebec, Canada; (b) to provide a micro analysis of these data based on subtypes of health problems, consultations and medications/products used; (c) to examine the *perceived* contributing role of insomnia to health care services/products use, absences, reduced productivity and accidents; and (d) to determine, through regression analysis, the relative role of insomnia in health-care system and product use, in reduced work function and in accidents when compared to sociodemographic variables, mental health status, stressful events, and overall physical health. This study also quantified each of the associated dependent variables in terms of costs, expressed in Canadian dollars (i.e., consultations and related transportation, products used, absenteeism and reduced productivity). These data are reported elsewhere (Daley, LeBlanc, Morin, Grégoire, Gauthier, 2006, in preparation).

Method

This research was part of a larger epidemiological study conducted in the province of Quebec, Canada that also documents the natural history and costs of insomnia. It was conducted out of the School of Psychology of Laval University, and received ethical approval from the university's research ethics committee (see Annex 1).

Participant selection and screening

Participants were selected from the province of Quebec for an initial telephone-administered sleep survey. They were chosen using a stratified probabilistic approach based on the last Canadian census combined with a random digit selection method. A local professional polling agency was responsible for administering the survey. Of 5,991 calls placed, 2001 French-speaking respondents agreed to complete the initial survey (34% response rate). Of these, 1467 accepted to continue with a longitudinal extension of the study (73% participation rate). This entailed completing questionnaires sent out by mail. In order to obtain as representative a sample of the population as possible, only people having previously received a diagnosis for a sleep disorder other than insomnia (7.2%) were excluded from the next phase, thus reducing the number of questionnaires sent out to 1362. Previously diagnosed sleep disorders that disqualified individuals from participating were: restless legs syndrome, sleep apnea, narcolepsy, hypersomnia or periodic limb movement. Once households were selected and contacted, the Kish selection method was employed to identify which household member would be interviewed (Kish, 1965). The only inclusion criteria for the original telephone interview were to be over 18 years of age and to speak French (for more information regarding the methodology of the original telephone phone survey, see Morin et al., 2006).

Procedure

Individuals who accepted to participate in the longitudinal study were mailed questionnaires. Upon return of each completed questionnaire, participants received a financial compensation of $25.00 Cdn. Participants were assigned to one of three insomnia groups using an algorithm derived from a combination of criteria found in the Diagnostic

and Statistical Manual of Mental Disorders (DSM-IV-TR; American Psychiatric Association, 1994) and the International Classification of Sleep Disorders (ICSD; American Sleep Disorders Association, 1990). Three insomnia status groups were formed based on responses to the Insomnia Severity Index (ISI; Morin, 1993) and the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman & Kupfer, 1989). The algorithm combined information on frequency, severity and duration of insomnia symptoms. More information pertaining to the algorithm is available from the authors upon request.

Insomnia syndrome. Participants in this category met the following criteria: (a) were dissatisfied with their sleep or complained of poor sleep quality; (b) presented symptoms of initial, maintenance or late insomnia a minimum of three nights a week; (c) indicated psychological distress or daytime impairment related to sleep difficulties; and (d) had experienced these difficulties for at least one month. Individuals who took hypnotic medication at least three times a week, regardless of the presence of other symptoms, were also included in this group.

Insomnia symptoms. Participants in this category met some but not all of the diagnostic criteria for insomnia (e.g., initial, maintenance or late insomnia at least three times a week, but with shorter duration, or no daytime consequences, or no dissatisfaction). In addition, people who reported no symptoms but who were dissatisfied with their sleep quality were assigned to this group, as were individuals using sleep-promoting products fewer than three nights per week.

Good sleepers. Individuals in this category reported no insomnia symptoms, were satisfied with their sleep and did not use sleep-promoting products more than twice a week.

These three insomnia categories are assumed to represent degrees of insomnia severity, with good sleepers experiencing no or very, very low-level difficulties with sleep, individuals with insomnia symptoms having a moderate level of insomnia severity, and

individuals in the syndrome group exhibiting the most severe levels of insomnia symptomatology of the three groups.

Participation rates

Of the 1362 questionnaires sent out, 997 (73%) were returned. When necessary, participants received one mailed reminder and up to eight telephone calls in weeks following mailing of the questionnaires. After excluding individuals with other reported sleep disorders, a sample of 956 was obtained.

Assessment and Measures

A variety of evaluation tools were used in this study and are described below (see Annex 2 for the compiled version received by participants). The first two are insomnia questionnaires which were used to determine the level of participants' insomnia severity and thereby place them in insomnia status groups.

The Insomnia Severity Index (ISI; Morin, 1993) is a seven-item questionnaire used to provide a subjective index of sleep impairment probing (a) severity of sleep-onset, sleep maintenance and early awakening problems, (b) satisfaction with the current sleep pattern, (c) perceived interference of sleeping difficulties with daily functioning, (d) noticeability of impairment attributed to the sleep problem, and (e) degree of distress caused by the sleep problem. Items are evaluated according to a 5-point Likert scale (0 = not at all, 4 = extremely) with total scores ranging from 0 to 28. This tool has been shown to have adequate psychometric properties (Bastien, Vallières & Morin, 2001). The French version of this questionnaire (Blais, Gendron, Mimeault & Morin, 1997) has good internal consistency, test-retest reliability, and convergent validity (r = .65) when tested against the sleep diary.

Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman & Kupfer, 1989). This questionnaire is composed of 19 items designed to assess sleep quality and disturbances over a one-month interval. Four open-ended questions are followed by closed

questions that are rated on a 4-point Likert scale. Scores for seven components of sleep are derived: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score can range from 0 to 21 and is obtained by adding up the seven component scores. The PSQI has been shown to have a diagnostic sensitivity of 89.6% and a specificity of 86.5%. The French version used in this study has been shown to have adequate psychometric properties (Blais et al., 1997).

Beck Depression Inventory II (BDI-II; Beck, Steer, Brown, 1996). This questionnaire uses a series of 21 questions, rated on a 4-point Likert scale, to identify the presence of depressive symptoms experienced over the past two weeks. Total scores can range from 0 to 63, with higher scores reflecting greater degrees of depression. The psychometric properties of the French version of this instrument have been well established (Beck, Steer, Brown, 1998).

State-Trait Anxiety Index (STAI; Speilberger, Gorsuch, Lushene, 1970). This inventory measures actual anxiety levels (state) as well as more stable and enduring anxiety (trait). Items are rated on a 4-point Likert scale (1 = not at all, 4 = a lot). The psychometric properties of this instrument are well documented elsewhere (Spielberger, 1983). A validated French version of this tool was used in this study (Gauthier & Bouchard, 1993).

Life Experiences Survey (Sarason, Johnson, & Siegel, 1978). This measure was used to evaluate the frequency and the impact of negative or stressful events that have occurred during the past year. It yields four separate scores: (a) the intensity of positive events, (b) the intensity of negative events, (c) a global measure of negative and positive stresses, and (d) the frequency of stressful events during the last 12 months. A French translation of this measure was used in the present study to examine the role of stressful life events as a potential triggering factor for insomnia.

The SF-12 Health Survey (SF-12, Ware & Sherbourne, 1998). The SF-12 is a multidimensional generic measure of health-related quality of life. The subscore for

physical health was used as an independent variable. It has become widely used in clinical trials and outcome assessment because of its brevity and psychometric strengths. It is a validated shorter version of the SF-36 Health Survey (Ware & Sherbourne, 1992; see Stewart & Ware, 1992 and Ware et al., 1994 for validation research). The French version of this instrument was produced and validated by Leplège, Ecosse, Pouchot, Coste and Perneger (2000).

The *NEO-Five Factor Inventory* (Costa & McCrae, 1992). The NEO-Five Factor Inventory is a shortened version of the NEO-Personality Inventory-Revised. The tool comprises 60 items that are scored on a 5-point scale and provides measures of five broad personality factors: neuroticism, extroversion, openness, agreeableness and conscientiousness. The neuroticism score was used as an independent variable as research suggests higher levels of this construct in individuals with insomnia (e.g., Kales et al., 1984; Morgan, Healey & Healey, 1989; Voss, Kolling, Heidenreich, 2006). The inventory has been shown to have good internal and test-retest reliability (Murray, Rawlings, Allen, Trinder, 2003). The psychometric properties of the French version have been demonstrated (Rolland, 1998).

Health Care Service Use and Insomnia Impact Questionnaire. An in-house questionnaire was developed to obtain information on chronic health problems, health-care service and product utilisation, use of alcohol as a sleep aid, hospitalisations, productivity, absenteeism and accidents (motor vehicle and other types). Although this assessment instrument has yet to be formally validated, key questions are similar to those used in the NIMH Epidemiological Catchment Area Survey (Ford & Kamerow, 1989). Participants were asked to report on the past three-month frequency of consultations with all types of health-care practitioners as well as on whether insomnia was a reason for consulting (main reason, secondary reason, not a reason). Participants were also asked to provide detailed information on the number and types of all products (prescription, over-the-counter, herbal/natural, alcohol) consumed in the previous three months, the dosage (where appropriate) and the health problem for which the product was consumed. Similarly detailed information was requested regarding hospitalisations occurring in the previous six

months (frequency, reason for hospitalisation, length of stay, diagnoses, interventions). Prescription medication names provided by participants were coded according to the twenty-three major categories identified in the American Hospital Formulary Service (AHFS; see Annex 3) and, where necessary, using the self-report specification regarding the particular ailment being treated. Over-the-counter medications were coded according to categories identified by the Nonprescription Drug Manufacturers Association of Canada (NDMAC) as being the most frequently used products (with minor modifications; see Annex 4). Self-reported health problems were coded using the eighteen major diagnostic categories set forth in the ICD-9 and used by the *Régie de l'assurance maladie de Québec* (*RAMQ;* see Annex 5).

Participants were also asked to report on the number of hours absent from work in the past three months. In addition, they indicated whether they had experienced reduced productivity (remunerated work or other activities) during the same time frame and if so, for a total of how many hours. Rather than rely on a dichotomous response that could inflate productivity loss estimates, we tried to nuance our measurement by asking participants to estimate *by what proportion* they thought their productivity had diminished (e.g., 10%, 50%, 90%). For questions related to absences and productivity, participants reported on the cause that was perceived to have most strongly motivated these events (e.g., illness, appointment, insomnia, etc.), along with the perceived strength of the link with insomnia and/or insomnia's consequences (such as fatigue, reduced concentration). This was evaluated using a scale of 1 to 10, which was later transformed to a scale of 0 to 9 to allow for the lowest number, "0", to represent zero when used in analysis as a multiplier.

Motor vehicle and other accidents that occurred in the past six months were also reported, along with a subjective assessment of the link between insomnia or its consequences and the event. Other accidents included things like work-related accidents and falls. The recall period for all questions was the three months prior to questionnaire completion, except in the case of hospitalisations and accidents where a longer recall period of six months was used (see Drummond et al., 2005 for a discussion of optimal reference

periods). Finally, demographic data were obtained, including age, gender, race, income, education, and marital status.

Régie de l'assurance maladie du Québec and MedEcho. Data were obtained from two provincial government health care databases (see Annex 6 for RAMQ request approval letter and Annex 7 for RAMQ variable list). The *Régie de l'assurance maladie du Québec* (*RAMQ*) is the provincial government-administered provider of health-care services. Residents receive coverage for visits to certain health-care professionals (i.e., general practitioners and medical specialists), with some individuals receiving additional assistance if they meet certain conditions (e.g., invalidity, economic hardship, senior citizens). This database provided information as to *RAMQ*-covered consultations for the study's participants (type of professional consulted, diagnosis received). A separate database (*MedEcho*) maintained by the Ministry of Health and Social Services provided hospitalisation data (date, length of stay, principal and secondary diagnoses).

Statistical Analyses

Insomnia status was considered as an independent variable in all statistical analyses. Scores obtained from the Pittsburgh Sleep Quality Index, the BDI, the STAI, the Life Experiences Survey, the SF-12 and NEO Five Factor Inventory were entered as independent variables for multiple and logistic regression analyses performed to determine which variables were most strongly associated with elevated costs. The Health Care Service Use and Insomnia Impact Questionnaire provided data on the dependent variables of interest.

Cross-tabulations were run to test for differences in proportions of the sample reporting having experienced the dichotomous dependent variables of interest (i.e., had or had not (a) consulted, (b) used prescription medications, (c) used over-the-counter medications, (d) used alcohol as a sleep aid, (e) been hospitalised, (f) been absent from work, (g) experienced reduced productivity, (h) been in a motor-vehicle or other type of accident). Odds ratios were calculated to determine the relative likelihood that such events would occur given membership to the insomnia syndrome group relative to the "good sleepers" group. Associated 95% confidence intervals (CI) were calculated. Analysis of

variance (ANOVA) was used to compare means for all quantitative data across insomnia groups with Games-Howell nonparametric tests applied for post-hoc analyses. Finally, multiple logistic regressions were performed for analyses involving a binary outcome variable and linear regressions were performed to identify the best predictors of the various quantitative outcome variables.

In the absence of a theoretical model that predicts *a priori* specific relationships between the independent and dependent variables chosen for the regression analyses, variables were entered as a block rather than using a predetermined statistical procedure (e.g., stepwise, forward, backward). Variables entered into subsequent regression analyses as independent variables were: insomnia status group (good sleeper, symptoms or syndrome), age, gender, education, marital status, physical health (summary scale from the SF-12), depression (BDI-II score), anxiety (STAI-trait score), neuroticism (NEO), and negative life events (score from the Life Experiences Survey). Wald statistics are reported as are beta coefficients associated with each of the independent measures in the model. Confidence intervals (95%) are also reported for each significant beta value.

All data were entered twice and cross-checked for errors. Missing data were scrutinized to verify for bias patterns. Listwise deletion was the method used to deal with missing data (less than 5%). The Statistical Package for Social Sciences software (SPSS; version 11.5) was used to conduct all analyses.

Results

Sleep Status

Fifty-three percent of participants were classified as good sleepers (GS), 31% fell into the symptoms group (SYMPT) and 16% into the insomnia syndrome group (SYND).

Sociodemographic and Clinical Characteristics of Sample

Sociodemographic data are found in Table 1. The mean age of participants was 43.8 years (SD = 14.06, range = 18 - 83) with no significant group differences. Females

comprised 60.0% of the sample. No significant group differences were found for measures of marital status, education, income, work type or work schedule.

Insert Table 1 about here

Table 2 contains ANOVA results for quantitative independent variables used in the regression analyses, including scores on the SF-12 physical health summary score, the BDI, the STAI (trait), the PSQI, the ISI, the NEO (neuroticism scale) and the Negative Life Events Survey. Significant group differences were present for all variables, with participants in the syndrome group reporting poorer mental and physical health, poorer sleep and more negative life events than good sleepers and participants with insomnia symptoms.

Insert Table 2 about here

Consultations

The self-report data indicate that 67% of the entire sample had consulted *any* type of health-care professional in the prior three months for any type of health complaint (see Table 3). More participants with insomnia syndrome reported having consulted than participants in the symptoms or good sleepers groups (80.6%, 71.7%, and 60.0%, respectively, $p < .005$). Participants with insomnia syndrome were almost three times more likely to have consulted any health-care service provider than good sleepers ($OR = 2.8$; CI: 1.77 – 4.34). Group comparisons of consultation of *RAMQ*-reimbursed health professionals (general practitioners and specialists, combined) revealed a similar trend, with more participants in the SYND group (55.4%) having consulted these professionals than participants in the SYMPT group (43.5%) or the GS group (40.6%; $p < .005$).

Insert Table 3 about here

Table 4 presents detailed consultation data obtained from the provincial health board database (*RAMQ*) and the survey. The *RAMQ* data corroborate subjective reports regarding various reimbursable provider visits. More participants in the SYND group had consulted general practitioners, psychiatrists and other specialists than participants in the other two groups. Participants in the SYND group were almost twice as likely to consult general practitioners (*OR* = 1.8; CI = 1.25 - 2.63) and specialists (*OR* = 1.9; CI = 1.30 – 2.74) than good sleepers; they were about fourteen times more likely to consult psychiatrists than good sleepers (*OR* = 13.9; CI = 1.54 – 125.49).

The survey allowed for further investigation of non *RAMQ*-reimbursed visits. More participants in the SYND group had consulted the following health-care service providers than participants in the symptoms or good sleepers groups: social workers, acupuncturists, psychologists, physiotherapists, pharmacists and homeopaths ($p < .01$ to $p < .005$). No significant differences were found for consultations with chiropractors, massage therapists or nurses.

ANOVA was used to compare the *frequency* of all types of reimbursed and non-reimbursed consultations over the three-month period. The SYND group was found to have consulted more often ($M = 4.81$) than the SYMPT group ($M = 2.72$) or the GS group $M = 2.22$, F (2, 922) = 16.41, $p < .001$. Post-hoc comparisons showed significant differences between the SYND group and each of the two other groups ($p < .05$). Of the thirteen consultation categories compared, group differences were found for the frequency of visits to general practitioners and psychiatrists. The average number of general practitioner visits for the three subgroups was 2.79, 1.91, and 1.68 according to decreasing insomnia severity, F (2, 407) = 3.97, $p < .05$. The average number of visits to psychiatrists was .12 for the SYND group, .02 for the SYMPT group, and .00 for the GS group, F (2, 407) = 5.78, $p < .003$.

Insert Table 4 about here

A regression model based on the *RAMQ* consultation data was generated using multiple logistic regression analysis (see Table 5). Being female, having poor physical health, experiencing negative life events, being older, and suffering from insomnia syndrome were associated with whether or not individuals had consulted a *RAMQ*-reimbursed health-care professional ($p < .05$), with the model predicting 68.4% of the results correctly.

Insert Table 5 about here

Comorbid Medical and Psychiatric Diagnoses

RAMQ data pertaining to principle diagnoses received were then analysed. Significant group differences were detected for three diagnostic categories: mental disorders, disorders of the bone, muscle or conjunctive tissue, and cancer. About 17% of the SYND group had received a diagnosis for a mental disorder (predominantly anxiety and mood disorders), compared to 4.8% of SYMPT and 9.8% of GS, χ^2 (2, N = 410) = 8.39, $p < .01$. Of all the participants having received a diagnosis of Anxiety Disorder, 55.2% were in the SYND group, 24.3% in the SYMPT group, and 20.5% in the GS group respectively, χ^2 (2, N = 410) = 10.43, $p < .005$. Of all the participants having received a diagnosis of Dysthymic Disorder, 56.3% were in the SYND group, 26.8% in the SYMPT group and 16.9% in the GS group respectively, χ^2 (2, 410) = 11.67, $p < .005$. Finally, of all the participants having received a diagnosis of Depressive Disorder, 59% were in the SYND group, 26.6% in the SYMPT group, and 14.4% in the GS group respectively [χ^2 (2, N = 410) = 13.9, $p < .005$].

As for disorders of the bone, muscle or conjunctive tissue, 19.5% of the SYND group had received a diagnosis, as compared to 12.9% of SYMPT and 9.3% of GS, χ^2 (2, N = 410) = 5.6, $p < .05$. Finally, a greater proportion of participants in the SYND group had

received a diagnosis of cancer (11.0%) as compared to 3.2% and 4.9% for the SYMPT and GS groups, respectively, χ^2 (2, N = 410) = 5.98, $p < .05$.

Self-Reported Chronic Health Problems

The survey data revealed insomnia sufferers to be over represented in a significant number of chronic health problem categories (see Table 6). SYND participants were almost five times more likely to suffer from at least one chronic health problem than good sleepers (OR = 4.93, CI = 2.88 – 8.46). Health problem categories associated more frequently with insomnia syndrome were: chronic pain, arthritis, headache/migraine, bronchial condition/emphysema, hypertension, diabetes, sinusitis, and "other". The total number of health problems was tallied per participant and means compared across groups; an omnibus test revealed a significant difference, with mean number of health problems for SYND, SYMPT and GS groups as follows: 1.67, 1.07, and .83, respectively, F (2, 922) = 37.82, $p < .001$. All pairwise comparisons were found to be significant ($p < .001$).

Insert Table 6 about here

Consultation Motives

Participants were asked in the survey to indicate whether insomnia was the primary motive for their health consultations, was not the primary motive but was addressed during the visit, or was not addressed whatsoever. Independent of insomnia category, 3.5% of all consultations were motivated by insomnia alone, another 15.6% were primarily motivated by another health problem, but insomnia was discussed during the visit, and the remaining 80.9% were unrelated to insomnia.

Analysis of consultation motives was undertaken in two ways: (a) by looking at the proportion of individuals in groups who had or had not consulted for different purposes, and (b) by calculating the percentage of total consultations motivated by different purposes. The figures turn out to be very similar, regardless of approach: of participants in the SYND group, 12.2% had consulted specifically for their insomnia in the past three months (9.2%

of all of their consultations), and 38.5% had discussed it with a health-care professional, but as a secondary motivation (34.9% of all consultations). Of participants in the SYMPT group, 1.8% had consulted expressly for insomnia (2.8% of all of their consultations), with 13.7% discussing it during a consultation, but as a secondary or other motive (12.7% of all consultations). Finally, of the good sleepers, 1% had consulted expressly for insomnia (1.2% of all consultations), with 6.8% mentioning insomnia symptoms during their visit (8.2% of all consultations).

Hospitalisations

About four percent (4.1%) of the overall sample had been hospitalized in the past six months (*RAMQ* data). No significant group difference was found in the percentage of participants having been hospitalised (SYND = 5.6, SYMPT = 4.3, and GS = 3.6) nor in the total number of days spent hospitalised. There were also no differences identified in the types or total number of diagnoses received during hospitalisation. The omnibus model generated by the logistic regression identified negative events and negative health status as being associated with whether or not participants had been hospitalised, χ^2 (19, N = 956) = 33.28, $p < .05$.

Prescription Medication Use

Thirty-nine percent (38.6%) of the overall sample reported having taken at least one prescription medication in the past three months (for any health problem), with significantly more syndrome participants (56.3%) having done so as compared to participants with symptoms (41.9%) and good sleepers (31.7%, $p < .001$). Insomnia syndrome was associated with a 2.77 increased odds of taking any prescription product (CI: 1.90 – 4.05). The number of prescription medications per person per three month period was also significantly different across groups: SYND = 1.23, SYMPT = .87, GS = .59; F = (2, 922) = 14.56, $p < .001$.

Self-report data on prescription medication use revealed that more participants in the SYND group had used medications for mood, anxiety and insomnia problems in the past three months than individuals in the SYMPT and GS groups ($p < .001$; see Table 7). Differences were also identified for medications prescribed for infectious/parasitic diseases,

disorders of the bone/muscle/conjunctive tissue, and the ICD-9 category "signs and symptoms" ($p < .05$).

Insert Table 7 about here

Multiple regression analysis revealed age, poor health, negative life events, and insomnia syndrome status as being associated with prescription medication use, χ^2 (19, N = 956) = 168.50, $p < .001$ (see Table 5).

Over-the-Counter Product Use (includes natural and herbal remedies)

Sixty-five percent (64.8%) of all participants reported having used at least one over-the-counter product in the past three months. A significant difference was found between proportions in the insomnia syndrome group (74.3%) as compared to participants with insomnia symptoms (64.5%) and good sleepers [62.2%; χ^2 (2, N = 925) = 7.25, $p < .01$]. Participants in the SYND group were 1.76 times more likely to utilise these types of products than good sleepers (CI: 1.16 – 2.67). The SYND group took, on average, a greater number of different OTC products over the three-month period than the other groups (SYND = 1.27, SYMPT = 1.15, and GS = .83, F (2, 922) = 4.13, $p < .05$.

Two types of OTC products were used more frequently by the SYND group than by the other groups: products to treat backache and insomnia. Percentages of participants taking products for insomnia are as follows: SYND = 10.1%, SYMPT = 3.9%, GS = 1.4% ($p < .001$). While no significant association was found between insomnia group and use of OTC products for stress, nerves and anxiety ($p < .08$), two cells contained fewer than 5 obervations. No significant between-group differences were found when comparing use of OTC products for the following health complaints: headache, cold/flu, muscle and other pain, sore throat, sinus, indigestion, arthritis/rheumatism, menstrual discomfort, allergies/asthma, regularity, heartburn, haemorrhoids, vaginal infection, nausea, immune system, skin, or other.

Multiple logistic regression analysis revealed female gender, lower education, insomnia syndrome, depression, negative events, and anxiety to be associated with OTC product use, χ^2 (19, N = 925) = 109.37, $p < .001$.

Alcohol Used As a Sleep Aid

Of the entire sample, 8% had consumed alcohol to try to promote sleep in the previous three months. Of the SYND group, 16.7% had used alcohol as a sleep aid, compared to 10.4% of the SYMPT group and 4.2% of the GS group (see Table 3). This translates into an over four-fold probability (*OR* = 4.57; CI: 2.46 – 8.48) that people with insomnia syndrome will use alcohol as a sleep aid when compared to good sleepers. Regression analysis generated a model identifying male gender, negative events, insomnia syndrome and anxiety as being associated with this type of alcohol use.

Absenteeism

Of the total sample, 20.3% reported having been absent from paid work at least once in the past three months (see Table 3). SYND participants were 1.74 times more likely to have been absent from work than good sleepers (CI: 1.03 – 2.94), and had a significantly higher number of total hours missed from paid work: participants in the SYND group missed an average of 17.40 hours (SD = 80.99) of paid work in the previous three months, compared to 11.40 (SD = 48.80) for the SYMPT group and 5.05 (SD = 35.33) for the GS group, F (2, 932) = 4.65, $p < .005$ (see Table 8).

Insert Table 8 about here

Subjective explanations for the absences that were investigated were: health of the participant, health of a significant other, a leave of absence, appointments, fatigue, and "other reasons" (single category). Each of these possible reasons was equally represented across groups, with the exception of fatigue. The overall rate of reporting fatigue as the primary reason for absences was 21.4%, with more participants in the SYND (33.9%) group reporting fatigue as a reason for their absences than in the SYMPT group (15.5%) or

the GS group (14.8%), $F = (2, 142) = 3.1, p < .05$. The strongest self-reported link between insomnia (or its consequences) and absences was found for the SYND group (43.8%) as compared to the SYND group (22.0%) and the GS group (11.4%), $F\,(2, 141) = 10.0, p < .001$.

These percentages were then used to derive the proportion of the total time absent from work that can be attributable to insomnia. Analysis after this adjustment indicated that participants in the SYND were absent 7.6 hours per three-month period because of their insomnia. This was significantly higher than both SYMPT and GS participants (2.5 hours and .58 hours, respectively, $F\,(2,141) = 34.73, p < .001$. Estimates for annual days lost due to insomnia are found in Table 8. Based on extrapolation, it is estimated that on an annual basis, for individuals engaged in remunerated employment, an average of 3.8 days are lost to absences associated with insomnia in individuals with insomnia syndrome. Individuals with insomnia symptoms are estimated to be absent 1.26 days a year because of insomnia while good sleepers are estimated to be absent .29 days per year due to insomnia, $F\,(2, 141) = 23.54, p < .001$.

Variables found to be associated with absences were poor health and negative life events, χ^2 (19, N = 668) = 57.94, $p < .001$. Neuroticism (NEO) and insomnia syndrome came just short of reaching statistical significance ($p < .07$; see Table 5 for Wald statistics and coefficients).

Reduced Productivity

Nineteen percent (19.1%) of the sample reported having experienced a reduction in their productivity levels in the prior three months, with the largest proportions being in the SYND group (40.4%), compared to 20.0% of the SYMPT group and 12.4% of the GS group (see Table 3). This represents close to a five-fold increased probability that the poorest sleepers will report productivity problems than good sleepers (*OR*: 4.79; CI: 3.12 – 7.37).

Seven possible explanatory factors for productivity decreases were investigated (health, fatigue, stress, preoccupations, decreased motivation/interest, other, or a mixture of reasons). Table 9 presents these data. The most frequently cited reasons for reduced productivity, regardless of insomnia status, were: fatigue (46%), a mixture of reasons that included fatigue (17.7%), stress (11.9%), and the participant's health (11.8%). Insomnia sufferers were significantly more likely to report fatigue as the main reason for their reduced productivity (54.61%) than participants with insomnia symptoms (46.62%) or good sleepers (36.90%), F (2, 174) = 3.83, $p < .05$. No differences were found for the remaining six categories.

Insert Table 9 about here

The number of hours of reported lost productivity is displayed in Table 8 along with the absenteeism data. Participants in the SYND group reported significantly more hours of lost productivity in the past three months (91.34 hours) than participants in the SYMPT group (32.32 hours) or GS group (21.29 hours), F (2, 923) = 16.16, $p < .001$. These numbers were obtained after having adjusted for the estimated percentage drop in productivity for each reported episode (see Method section). Of those participants who responded "yes" to the question regarding whether insomnia or its consequences had played a role in their productivity difficulties, SYND participants rated the extent of that contribution at 54.1%, SYMPT participants at 36.7%, and good sleepers at 29.9%, F (2, 171) = 11.34, $p < .001$.

These figures were used to determine the relative contribution of insomnia to overall lost productivity. Participants in the SYND group had 49.39 hours of lost productivity due to insomnia, while participants in the SYMPT and GS groups had 11.86 and 6.37 hours, respectively, F (2, 171) = 21.87, $p < .001$. Estimates (based on extrapolation) for annual insomnia-related lost productivity costs are also found in Table 8. It is estimated that individuals with insomnia syndrome lose the equivalent of 25 days in lost productivity annually as a result of insomnia or its consequences. This is compared to

3.18 days for good sleepers and 5.9 days for individuals with insomnia symptoms, F (2, 171) = 37.47, $p < .001$. Four variables were significantly associated with reduced productivity: negative life events, depression, insomnia syndrome and being female, χ^2 (19, N = 889) = 162.41, $p < .001$.

Automobile Accidents

Thirty-four people in the sample (3.6%) reported having had an automobile accident in the previous six months (see Table 3). No significant between-group differences were observed in the rates of automobile accidents having occurred during this reference period. However, 23.5%, or eight participants, having had an automobile accident reported that insomnia or its consequences had played a role in the event, with no group differences being present. Variables associated with motor vehicle accidents in the past six months were depression, anxiety, negative events and age, $\chi^2 = (19, N - 842) = 40.19, p < .003$.

Other Accidents

Significant differences were detected for other types of accidents as a function of insomnia status (see Table 3). Seventy-five participants (8.5%) had experienced some other type of accident during the reference period. The proportions were significantly different across groups: 11.9% of participants with insomnia syndrome, 10% of participants with symptoms, and 6.7% of good sleepers ($p < .05$). Individuals in the SYND group were almost twice as likely to have experienced other types of accident as compared to good sleepers (*OR*: 2.43). About 39% of participants, regardless of insomnia status, stated that insomnia or it consequences played a role in the event. There was no effect, however, of insomnia status on the belief that there existed a link between the sleep difficulty and the accident. Finally, while no group differences were revealed regarding the *strength* of the perceived link (scale of 0 to 9) between insomnia and the accident, the link was rated to be quite high for all groups: SYND = 5.5, SYMPT = 7.2, GS = 6.00. Negative life events was the only variable identified using multiple logistic regression as being associated with other types of accidents (see Table 5, $p < .001$).

Discussion

The purpose of this study was to investigate the relationship between insomnia, health, and health care service and product use. In addition, we looked at work performance and accident occurrences as a function of insomnia status. The results indicate that there is a relationship between insomnia symptomatology, use of the health-care system, work function and non motor-vehicle accidents. For the majority of these findings, a linear relationship was identified, demonstrating that participants in the syndrome group had scores more elevated than those in the symptoms groups, who had, in turn, scores more elevated than participants in the good sleepers group. Along with insomnia syndrome, the variable "negative events," as measured by the Life Experiences Survey, was regularly identified as predicting the dependent variable studies here. The relationship between these two variables needs further investigation.

Individuals with insomnia syndrome were found to consult health-care practitioners more frequently than individuals who presented with sub-clinical symptomatology or who had no insomnia symptoms. These data corroborate other research findings that highlight the overrepresentation of individuals with insomnia in the health-care system (e.g., Hajak, 2001; Simon & Vonkorff, 1997). Group differences were present when all professional categories were considered together, and persisted for comparisons across eight of the twelve individual subspecialties. Differences were particularly pronounced for consultations with psychiatrists, social workers, acupuncturists and psychologists. These data provide further evidence that insomnia is associated with high levels of psychological distress.

Insomnia syndrome was also found to be associated with a greater prevalence of certain mental and physical disorders, a fact which may in part explain the greater number of consultations observed for this group. Self-reported chronic health conditions reported more frequently in the syndrome group were pain, arthritis, headaches, bronchial conditions, hypertension, diabetes, and sinusitis. These results are consistent with other findings (Katz & McHorney, 1998; Lavie, 1981; Vollrath, Wicki & Angst, 1989). Psychological disorders, most notably depression and anxiety, were also identified to a

greater extent in individuals with insomnia. The present cross-sectional data preclude drawing conclusions about a temporal relationship. It is likely that the relationship between sleep disturbance and physical or mental health problems is a bi-directional one; while evidence is accumulating that insomnia is a precursor of certain physical and psychological disorders (e.g., Breslau et al., 1996; Chang et al., 1997), further research is necessary to clarify this etiological process.

Unlike previous research (e.g., Hajak, 2001; Léger et al., 2002; Novak et al., 2004), we did not find significantly higher hospitalisation rates in individuals with insomnia symptoms or syndrome as compared to good sleepers. Although the reasons for this are not clear, most of the chronic health problems reported by participants do not necessitate hospitalisation. One of the main causes of hospitalisation in Canada (Statistics Canada, Health Reports, 2005) is circulatory disease for which no significant differences were found between groups. As only 4% of the entire sample had been hospitalized during the reference period, it may be that the sample size did not provide sufficient power to detect actual differences.

Individuals with insomnia syndrome were found to be almost three times more likely to take prescription medications than good sleepers and to take a greater variety of medications. These findings are similar to those of Leger et al. (2002) and Simon and Vonkorff (1997). This is likely explained, at least in part, by the higher rates of chronic illnesses found in insomnia disorder. The group differences were most pronounced for anxiety, depression and insomnia prescriptions.

A strength of this study was its attempt to identify the principle target problem associated with mood, anxiety and insomnia prescriptions. These medications are often used interchangeably, or to treat several problems at once. When large databases are used to match study participants with prescriptions, as is often the case in this type of research, the target health problem is not always clear. In the present study, participants were asked to furnish the names of their medications, along with the problem it had been prescribed to

treat. This allowed us to determine that a given medication, such as venlafaxine, had been prescribed to treat anxiety, and not depression or insomnia, for example.

The present study corroborates earlier work that suggests an association between insomnia and increased over-the-counter product use (e.g., Hatoum et al., 1998; Hohagen et al., 1993) revealing, more particularly, an increased use of products for insomnia and backache. There was a non-significant trend for insomnia severity to be associated with the use of non-prescription products for stress, nerves and anxiety. There may have been insufficient statistical power, however, to detect actual differences. As is the case with prescription medications, individuals with insomnia syndrome also take a greater *number* of different products than good sleepers. The effectiveness of some OTC products remains uncertain, as do short- and long-term side effects and other drug/product interactions. The fact that individuals are not monitored by professionals and may mix or misuse products is also problematic.

With the exception of the Gallup poll (1995) and a recent study (Morin et al, 2006), we know little about the use of alcohol as a sleep aid. The observed rate of alcohol use across all groups raises concern. First, its actual usefulness as a sleep aid is questionable. While it may help induce sleep more rapidly, it affects sleep architecture and results in decreased slow wave sleep and increased lighter stages of sleep (Vitiello, 1997). This means, among other things, that sleep is often experienced as non-restorative. Perhaps the biggest concern regarding the use of alcohol is the risk associated with dependence and abuse. Longitudinal studies should be designed to study the long-term risks of developing substance abuse or dependency problems.

Only a few studies have examined the link between insomnia and work performance (Leger, Massuel, & Metlaine, 2006; Kupperman et al., 1995; Leigh, 1991; Linton & Bryngelsson, 2000; Schweitzer et al., 1992). This study identified an almost two-fold risk of being absent from work (three-month period) when comparing individuals with insomnia syndrome to good sleepers. While Leigh (1991) found monthly absence rates 1.4 times higher in people with insomnia compared to good sleepers, we found insomnia

syndrome to be associated with three-month absence rates 3.4 times higher than for good sleepers. To our knowledge, this is the first study to probe participants' perceptions regarding these absences. The most frequently reported reason by all participants was fatigue, with more than twice as many participants with insomnia syndrome reporting fatigue as the main cause of their absences as participants in the other groups.

This study is also the first, to our knowledge, to attempt to determine the *relative* responsibility of insomnia in decreased work function. On average, across all groups, the subjective strength of the link between insomnia and absences, expressed as a percentage, was about 25.7%. This perceived link was four times higher in the syndrome group than in the good sleepers group. This information is useful as it allowed the estimation of the number of hours of work absences perceived to result from insomnia; extrapolation permitted the estimation that individuals with insomnia syndrome are absent an average of 3.8 days a year *because of their sleep difficulties*, compared to 1.26 days and .26 days for people with symptoms and for good sleepers, respectively. An important caveat must be stated at this point. It is well documented that individuals with insomnia tend to overestimate the time it takes them to fall asleep and to underestimate their total sleep time. They have also been shown sometimes to amplify the consequences of their sleep difficulties and to attribute problems in daytime functioning to their insomnia. Such errors in attribution may occur when individuals with insomnia are asked to estimate their reduced productivity that results from their sleep difficulties. While this may contribute to a possible inflation of estimates, it should be pointed out that no exiting research factors out any contribution of insomnia. In this regard, the present study is still significantly more conservative than the rest of the literature. More objective measures of productivity would be required to remedy this problem. Unfortunately, most job types do not lend themselves to these types of measures.

The productivity results of this study reveal that participants with insomnia syndrome are almost five times more likely than good sleepers to report having experienced reduced productivity over a period of three months. As was the case with absences from work, fatigue was the most frequently cited perceived cause of productivity problems,

regardless of insomnia status, with reports of fatigue most marked in the syndrome group. Despite insomnia status, insomnia is perceived as playing a contributing role in reduced productivity, with the strength of the relationship increasing with insomnia severity.

These data provide evidence that insomnia and its consequences are perceived to have an important impact on work function. Some authors (e.g., Drummond et al., 2005) have argued that these types of productivity losses are minimally felt by the economy, as other workers may "pick up the slack" or the affected workers may readjust their workload priorities to compensate at another moment by being more efficient/productive. Most authors argue (e.g., Tompa, 2002), that all types of work disruption come with their own direct and indirect costs and that the use of the wage rates to estimate lost productivity may actually underestimate its impact. In fact, significant numbers of individuals who did not meet the criteria for insomnia syndrome nonetheless reported important insomnia-related work deficits. It is not clear the extent to which the association between fatigue and work performance identified in this study is insomnia-induced and to what extent the fatigue is associated with other factors such as comorbid illness and stress. This should be investigated in further research. This relationship between insomnia, absences and reduced productivity presents clear implications for the economy. Economic losses, which have been estimated for the United States (Walsh & Englehardt, 1999) and France (Leger et al., 1999), can be presumed to be significant in Canada as well.

Finally, while no significant differences were identified across groups for motor vehicle accidents, almost a quarter of individuals who had been involved in such an accident, regardless of insomnia status, reported that insomnia or its consequences had been the main cause of their accident. It may be that the effects of acute insomnia episodes explain this relationship better than diagnoses that take into account frequency and chronicity. This is an interesting and important distinction from earlier research on accidents where insomnia intensity has been identified as having an association with the event. It may be more accurate to say that sleep disorders in general are associated with motor vehicle accidents; in the present study, individuals with narcolepsy and sleep apnea were excluded. While these sleep disorders have been shown to be associated with

increased risks of motor vehicle accidents (Balter & Uhlenhuth, 1992), the contributing role of insomnia alone has perhaps been masked. We were able to isolate insomnia as a possible contributing factor as well as quantify its proportional contribution to accidents. The fact that accident rates *per se* do not appear to be higher in the syndrome group likely reflects two facts. First, base rates for automobile accidents are low to begin with; a larger sample may have detected group differences. Second, we know that many people suffer from acute insomnia (discrete periods of disturbed sleep that do not necessarily persist and become chronic). It is not clear that acute insomnia would be any less associated with accidents or, in other words, that its impact on a discrete event such as an accident would be any different than for someone with insomnia syndrome. Further research using a larger sample, and perhaps a longitudinal design able to capture frequency of accidents, would help clarify this question. These results also suggest that the fatigue and sleepiness often believed to be responsible for many accidents may function independently of insomnia status.

Other types of accidents were more prevalent in the insomnia syndrome group. The reason for this is not clear and requires further investigation. It may be that when individuals are driving a car, a high-risk activity, they are better able to mobilize their resources to concentrate and stay vigilant than when they are engaged in more mundane activities (reflected in this second type of accident). The cognitive capacities involved in these two categories of activities may be qualitatively different and may therefore explain the results. This question begs further research.

This research makes a contribution to the literature in several ways. It is a population-based study that allows considerable generalizability. The only individuals excluded were those who could not respond to the questionnaires in French, and those individuals having received a diagnosis for another sleep disorder. In addition, a conservative and clear definition of insomnia syndrome based on DSM-IV and ICSD criteria was used. Three groups were compared rather than the typical two (insomnia vs. no insomnia). This allowed for the detection of a linear relationship that was present for the vast majority of analyses, with syndrome participants' measures being higher than those for

participants in the symptoms groups, who in turn had measures higher than good sleepers. Subtypes of consultations were studied, as were consultation motives. Medication sub-types and prescription purposes (i.e., what medications were prescribed for) were also identified. We also attempted to go beyond a correlational examination of the decreased work function and accident data by asking participants their perception of the principle causes behind these phenomena, as well as of the proportional contribution of insomnia. The use of data from the *RAMQ* and *MedEcho* provided objective, reliable measures of consultations and hospitalisations. The concordance of these objective data with subjective reports lends further strength to the analyses. Finally, we provide new findings specific to the Canadian population.

Despite these contributions, several limitations should be identified. First, in any survey research, participants' reasons for choosing to collaborate may bias results. Almost six thousand households (5,991) were called in order to obtain the desired sample size of 2000 for the initial telephone survey. After refusals to continue with the next phase are combined with exclusions due to the presence of other sleep disorders, a significantly smaller number of participants remained for the present study. While the acceptance rate for the initial telephone survey is acceptable, we know nothing about the differences between respondents and non-respondents. In addition, the sample for this research represented only French-speaking inhabitants of Quebec. Whether these individuals are similar to English-speaking Quebecers or the rest of the Canadian population is uncertain. While there is no empirically based reason to assume otherwise, no comparative data exist to address this question. This being said, other than gender, the distribution of participants according to age and socioeconomic status resembled the distribution across the general population.

In addition, potential problems associated with self-report methodology are present. While we attempted to use clear question wording and a manageable reference period, recall for frequent or difficult to define and quantify events such as medication consumption and reduced productivity means caution should be exercised when drawing conclusions based on these findings. Self-report issues specific to insomnia research also

exist; research suggests that, on average, individuals with insomnia make predictable errors when estimating the nature of their sleep difficulties. More precisely, as stated earlier, they tend to overestimate the time it takes them to fall asleep and underestimate the total time they spend asleep (Bonnet, 1990; Edinger and Fins, 1995). It is unclear whether such misperception tendencies generalize to other relevant measures such as the use of sleep aids, the frequency of consultations related to sleep difficulties, or the impact of insomnia on productivity. If they do, then estimates presented in this study may be biased towards inflation in the SYND group. Furthermore, given that productivity is harder to measure than medication use or consultations, and that the economic impact of reduced productivity can be significant, conclusions about the precise link between insomnia and productivity should be approached with caution. Similarly, as insomnia sufferers tend to overestimate the actual impact of their sleep difficulties on daytime function, the subjective evaluation of the *role* of insomnia in absences, productivity and accidents may also be inflated.

Standardized tools were not available to measure the dimensions of work function of interest, leaving the present estimates open to validity criticisms; it is not clear that individuals are able to quantify their productivity losses, especially when asked to do so retrospectively. However, simply using objective absence data as a proxy for lost productivity has been found to underestimate economic losses. In addition, for certain low base-rate outcome variables such as motor vehicle accidents, hospitalisations and physical and mental health categories (e.g., schizophrenia), there may have been insufficient power to detect actual group differences.

Furthermore, regression analyses regularly identified "negative events" as a strong predictor of the various dependent variables. As a total score was entered into the regression, a finer analysis of the types of negative events involved was not performed. This would be an informative avenue to follow up. In addition, while regression analysis identified insomnia status as being associated with most of the dependent variables investigated, even after controlling for other potential confounds, longitudinal research would contribute to a better comprehension of the temporal evolution of these relationships and of the contributing causal role of insomnia.

Perhaps the most important limitation of this study relates to the issue of comorbidity. To illustrate, as insomnia is a diagnostic criterion for depressive disorder, and depressive disorder is associated with motivational and concentration deficits, it is unclear to what extent depression could be predominantly responsible for productivity problems or increased use of health-care resources, with insomnia playing a secondary and relatively minor role. This should be a focus of future research. Tracing the development of different disorders using longitudinal research methodology might help, as could measuring and comparing comorbid disorder severity or directly questioning participants as to their perceptions of the contributing role of their symptoms. Matching participants along health and other parameters would also help isolate insomnia's unique contributing role.

The following recommendations are proposed for future research. First, investigators should adopt a consistent nosology, ideally based on the DSM-IV and/or ICSD for the classification of insomnia subgroups. This would result in conservative estimates and facilitate comprehension and comparison of research findings from different sources. Second, more longitudinal research using large population-based samples is required to better uncover the causal relationships between insomnia and dependent variables of interest. Third, this research should be expanded to span the country. Cross-provincial and territory comparisons as well as linguistic/cultural comparisons would then be possible. Fourth, untangling the role of fatigue related to insomnia and fatigue unrelated to insomnia in work performance difficulties and accidents is another research area that requires development. Finally, isolating primary from secondary insomnia, a challenging endeavour, would shed further light on the perhaps unique relationships between the disorder and the dependent variables investigated in this research.

To conclude, insomnia syndrome is associated with increased prevalence of chronic health problems, increased use of the majority of available health care services, and increased use of prescription and non prescription products. Alcohol is also used frequently, especially by individuals with insomnia syndrome, to help induce sleep. This

research also found further evidence of the link between insomnia, depression and anxiety, as evidenced by the higher frequency of diagnoses received as well as by the prescription and OTC products used to treat these disorders by individuals in the syndrome group. Work function, measured in terms of absences and reduced productivity, was also found to be associated with insomnia syndrome status. Participants with reduced function perceived insomnia and fatigue to be causally linked to their work difficulties. Finally, while no significant association was identified linking insomnia status to automobile accidents, insomnia and fatigue in general were perceived by participants to have played a causal role in significant numbers of accident cases.

References

American Sleep Disorders Association (2000). International classification of sleep disorders: Diagnostic and coding manual, 2nd ed. Rochester, MN: The American Academy of Sleep Medicine.

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders. 4th ed., text revision. Washington DC: American Psychiatric Association.

Ancoli-Israel, S., & Roth, T. (1999). Characteristics of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. *Sleep, 22*(Suppl 2):S347-S353.

Balter, M. B., & Uhlenhuth, E. H. (1992). New epidemiologic findings about insomnia and its treatment. *Journal of Clinical Psychiatry, 53*(Suppl 34-39), discussion 40-32.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine, 2*, 297 307.

Beck, A.T., Steer, R.A., & Brown, G.K. (1998). *Manuel de l'inventaire de dépression de Beck*, second edition. Toronto: The Psychological Corporation.

Blais, F. C., Gendron, L., Mimeault, V., & Morin, C. M. (1997). Évaluation de l'insomnie: validation de trois questionnaires. *L'Encéphale, 23*, 447-453.

Bonnet, M. H. (1990). The perception of sleep onset in insomniacs and normal sleepers. In R. R. Bootzin, J. F. Kihlstrom, & D. L. Schacter (Eds.), *Sleep and cognition* (pp. 148 158). Washington DC: American Psychological Association.

Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. *Biological Psychiatry, 39*, 411-418.

and severe depression in France. *European Journal of Psychiatry, 13*, 197–208.

Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R., & Kupfer, D.J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213.

Chang, P. P., Ford, D. E., Mead, L. A., Cooper-Patrick, L., & Klag, M. J. (1997). Insomnia in young men and subsequent depression. The Johns Hopkins Precursors Study. *American Journal of Epidemiology, 146,* 105-114.

Costa, P, & McCrae, R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI): professional manual.* Odessa, FL: Psychological Assessment Resources.

Daley, M., Morin, C., LeBlanc, M, Grégoire, J.P., Savard, J., & Baillargeon, L. (2007). Insomnia and its relationship to health care utilization, accidents, and job function. In preparation.

Drummond, M.F., Schulpher, M.J., Torrance, G.W., O'Brien, B.J., & Stoddart, G.L. (2005). *Methods for economic evaluation of health care programmes* (3rd ed.). New York: Oxford University Press.

Edinger, J. D., & Fins, A. I. (1995). The distribution and clinical significance of sleeptime misperceptions among insomniacs. *Sleep, 18*, 232–239.

Ford, D. E. & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *Journal of the American Medical Association, 262*, 479-1484.

Gallup Organization (1991). Sleep in America. Princeton, NJ: The Gallup Organization.

Gallup Organization (1995). Sleep in America. Princeton, NJ: The Gallup Organization.

Gauthier, J., & Bouchard, S. (1993). Adaptation canadienne-française de la forme révisée du State-Trait Anxiety Inventory de Spielberger. *Canadian Journal of Behavioural Sciences, 25,* 559- 578.

Godet-Cayre, V., Pelletier-Fleury, N., Le Vaillant, M., Dinet, J., Massuel, M. A., & Leger, D. (2006). Insomnia and absenteeism at work. Who pays the cost? *Sleep, 29(2),* 179 84.

Hajak, G. (2001). Epidemiology of severe insomnia and its consequences in Germany. *European Archives of Psychiatry and Clinical Neuroscience, 251*, 49-56.

Hatoum, H. T., Kong, S. X., Kania, C. M., Wong, J. M., & Mendelson, W. B. (1998). Insomnia, health-related quality of life and healthcare resource consumption. A study of managed-care organisation enrollees. *Pharmacoeconomics, 14*, 629-637.

Hohagen, F., Rink, K., Kappler, C., et al. (1993). Prevalence and treatment of insomnia in general practice: A longitudinal study. *European Archives of Psychiatry and Clinical Neuroscience, 242,* 329-336.

Kales, J. D., Kales, A., Bixler, E. O., Soldatos, C. R., Cadieux, R. J., Kashurba G. J., & Vela- Bueno, A. (1984). Biopsychobehavioral correlates of insomnia, V : Clinical characteristics and clinical correlates. *American Journal of Psychiatry, 141*, 1371-1376.

Katz, D. A., & McHorney, C. A. (1998). Clinical correlates of insomnia in patients with chronic illness. *Archives of Internal Medicine, 158*, 1099-1107.

Kish, L. (1965). *Survey Sampling.* New York: Wiley.

Kupperman, M., Lubeck, D. P., Mazonson, P. D., et al. (1995). Sleep problems and their correlates in a working population. *Journal of General Internal Medicine, 10*, 25-32.

Lavie, P. (1981). Sleep habits and sleep disturbances in industrial workers in Israel: Main findings and some characteristics of workers complaining of excessive daytime sleepiness. *Sleep, 4*, 147-158.

Leger, D., Levy, E., Paillard, M. (1999). The direct costs of insomia in France. *Sleep, 1(2),* Suppl 2:S394-410.

Leger, D., Guilleminault, C., Bader, G., Levy, E., & Paillard, M. (2002). Medical and socio-professional impact of insomnia. *Sleep, 25*, 625-629.

Leger, D., Massuel, M.-A., & Metlaine, A. (2006). Professional correlates of insomnia. *Sleep, 29 (2),* 171-178.

Leigh, J. P. (1991). Employee and job attributes as predictors of absenteeism in a national sample of workers: the importance of health and dangerous working conditions. *Social Science and Medicine, 33*, 127-137.

Leplège, A., Ecosse, E., Pouchot, J., Coste, J., Perneger, T. (2000). Manuel de l'utilisateur et guide d'interprétation des scores du MOS SF-36. Éditions Estem.

Linton, S.J., & Bryngelsson, I. (2000). Insomnia and its relationship to work and health in a working-age population. *Journal of Occupational Rehabilitation, 10*(2), 169-183.

Morin, C.M. (1993). *Insomnia: Psychological Assessment and Management*. New York: Guilford Press.

Morin, C. M., LeBlanc, M., Daley, M., Grégoire, J. P., & Mérette, C. (2006). Epidemiology of insomnia: Prevalence, self-help treatments and consultations initiated, and determinants of help-seeking behaviors. *Sleep Medicine*, 2006.

Ohayon, M. M. (2002). Epidemiology of insomnia: What we know and what we still need to learn. *Sleep Medicine Review, 6*, 97-111.

Ohayon, M. M., Caulet, M., Priest, R. G., & Guilleminault, C. (1997). DSM-IV and ICSD 90 insomnia symptoms and sleep dissatisfaction. *British Journal of Psychiatry, 171*, 382-388.

Ohayon, M. M., & Hong, S. C. (2002). Prevalence of insomnia and associated factors in South Korea. *Journal of Psychosomatic Research, 53,* 93-600.

Ozminkowski, R. J., Shaohung S. W., & Walsh, J. K. (2007). The direct and indirect costs of untreated insomnia in adults in the United States. *Sleep, 30 (3)*, 263-273.

Novak, M., Mucsi, I., Shapiro, C.M., Rethelyi, J., & Kopp, M.S. (2005). Increased utilization of health services by insomniacs - an epidemiological perspective. *Journal of Psychosomatic Research, 56* (5), 527 – 36.

Philip, P., Leger, D., Taillard, J., Quera-Salva, M.A., et al. (2006). Insomniac complaints interfere with quality of life but not with absenteeism : Respective role of depressive and organic comorbidity. *Sleep Medicine, 7(7)*, 585-591.

Sarason, I. G., Johnson, J. H., & Siegel, J. M. (1978). Assessing the impact of life changes: Development of the Life Experiences Survey. *Journal of Consulting and Clinical Psychology, 46,* 932-946.

Schweitzer, P. K., Engelhardt, C. L., Hilliker, N. A., Muehlbach, M. J., & Walsh, J. K. (1992). Consequences of reported poor sleep. *Journal of Sleep Research, 21*, 260.

Simon, G.E., & VonKorff, M. (1997). Prevalence, burden, and treatment of insomnia in primary care. *American Journal of Psychiatry, 154*, 1417-1423.

Sivertsen, B., Overland, S., Neckelmann, D., Glozier, N., Krokstad, S., et al. (2006). The long-term effect of insomnia on work disability: the HUNT-2 historical cohort study. *American Journal of Epidemiology, 163(11),* 1018-1024.

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists Press.

Speilberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *State-trait anxiety inventory. Test manual for form X.* Palo Alto, CA: Consulting Psychologists Press.

Stewart, A., and J. E. Ware Jr., eds. (1992). *Measuring Functioning and Well-Being.* Durham, NC: Duke University Press.

Stoller, M. K. (1994). Economic effects of insomnia. *Clinical Therapy, 16*, 873-897.

Taylor, D.J., Lichstein, K.L., Durrence, H.H., Reidel, B.W., & Bush, A.J. (2005). Epidemiology of Insomnia, depression, and anxiety. *Sleep, 28* (11), 1457-1464.

Tompa, E. (2002). The Impact of Health on Productivity: Empirical Evidence and Policy Implications. In A. Sharpe, K. Banting & F. St-Hilaire (Eds.) *The Review of Economic Performance and Social Progress: Towards A Social Understanding of Productivity* (Ottawa: Centre for the Study of Living Standards and Montreal: Institute for Research on Public Policy and distributed by McGill-Queen's University Press).

Vitiello, M. V. (1997). Sleep disorders and aging: Understanding the causes. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 52*, M189-191.

Vollrath, M., Wicki, W., & Angst, J. (1989). The Zurich study. VIII. Insomnia: Association with depression, anxiety, somatic syndromes, and course of insomnia. *European Archives of Psychiatry and Neurological Science, 239*, 113-124.

Walsh, J.K., & Engelhardt, C.L. (1999). The direct economic costs of insomnia in the United States for 1995. *Sleep, 22*(Suppl 2):S386-393.

Walsh, J.K., Engelhardt, C.L., Hartman, P.G. (1995). The direct economic cost of insomnia. In D. Nutt and W. Mendelson (Eds.), *Hypnotics and anxiolytics*. London:

Baillere Tindall, 369-381.

Ware, J.E., & Sherbourne, C.D. (1992). The MOS 36-item short-form Health Status Survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30,* 473 483.

Ware, J. E., Snow, K. K., Kosinski, M., & Gandek, B. (1993). SF-36 Health Survey manual and interpretation guide. Boston, MA: The Health Institute, New England Medical Center.

Zammit, G.K., Weiner, J., Damato, N., Sillup, G.P., & McMillan, C.A. (1999). Quality of life in people with insomnia. *Sleep, 22*(Suppl 2), S379.

Table 1. Sociodemographic characteristics expressed as proportions of participants in each category (N = 956)

Variable	Good Sleepers (GS) (n = 508) % (n)	Symptoms (SYMPT) (n = 295) % (n)	Syndrome (SYND) (n = 153) % (n)	Total (n = 956) % (n)	X^2	Sig.
Age (mean in years)	43.13 (sd = 14.01)	43.83 (sd = 14.17)	45.87 (sd = 13.89)		2.82 (F-value)	.11
Gender						
Male	40.2 (204)	44.1 (130)	30.1 (46)	39.7 (380)	10.13 (*df* = 4)	.04
Female	59.4 (302)	55.9 (165)	69.9 (107)	60 (574)		
Marital Status						
Single	24.0 (121)	25.9 (76)	24.2 (37)	24.6 (234)	4.32 (*df* = 6)	.63
Married	59.5 (300)	58.0 (170)	53.6 (82)	58.1 (552)		
Divorced/Separated	12.5 (63)	12.6 (37)	18.3 (28)	13.5 (128)		
Widowed/Widower	4.0 (20)	3.4 (10)	3.9 (6)	3.8 (36)		
Education						
Primary or less	4.5 (23)	4.4 (13)	5.9 (9)	4.7 (45)	12.36 (*df* = 14)	.77
Secondary	29.8 (151)	32.9 (97)	36.6 (56)	31.9 (304)		
Professional diploma	13.6 (69)	10.2 (30)	13.7 (21)	12.6 (120)		
General college	8.5 (43)	10.5 (31)	8.5 (13)	9.1 (87)		
Professional college	13.4 (68)	12.9 (38)	13.7 (21)	13.3 (127)		
BA	21.1 (107)	20.0 (59)	17.6 (27)	20.2 (193)		
Graduate studies	7.3 (37)	8.5 (25)	3.9 (6)	7.1 (68)		
Other	1.6 (8)	.7 (2)	0.0 (0)	1.0 (10)		
Work type						
Full time	56.3 (284)	57.8 (167)	50.7 (77)	55.9 (528)	13.06 (*df* = 14)	.52
Part time	11.1 (56)	8.7 (25)	9.9 (15)	10.2 (96)		
Not working	3.0 (15)	4.2 (12)	4.6 (7)	3.6 (34)		
Homemaker	5.2 (26)	6.6 (19)	7.2 (11)	5.9 (56)		
Full time student	6.2 (31)	3.5 (10)	3.9 (6)	5.0 (47)		
Study + work	3.4 (17)	3.1 (9)	2.0 (3)	3.1 (29)		
Retired	12.5 (63)	12.5 (36)	16.4 (25)	13.1 (124)		
Other	2.4 (12)	3.8 (11)	5.3 (8)	3.3 (31)		
Work schedule [for n = 687 (28.1% = N/A]						
Day	78.4 (294)	77.5 (165)	66.7 (66)	76.4 (525)	10.74 (*df* = 8)	.22
Evening	2.4 (9)	3.3 (7)	6.1 (6)	3.2 (22)		
Night	2.4 (9)	2.3 (5)	2.0 (2)	2.3 (16)		
Rotating	7.2 (27)	5.2 (11)	7.1 (7)	6.6 (45)		
Other	9.6 (36)	11.7 (25)	18.2 (18)	11.5 (79)		
Income (thousands)						
< $15	10.2 (51)	9.7 (28)	16.6 (25)	11.0 (104)	17.13 (*df* = 10)	.07
$15 – $30	20.6 (103)	18.6 (54)	24.5 (37)	20.6 (194)		
$31 – $45	17.4 (87)	22.4 (65)	20.5 (31)	19.4 (183)		
$46 – $60	18.0 (90)	17.9 (52)	15.9 (24)	17.6 (166)		
> $60	29.5 (148)	25.5 (74)	17.2 (26)	26.3 (248)		
No response	4.4 (22)	5.9 (17)	5.3 (8)	5.0 (47)		

Note. Some percentages may not add to 100% or total n's to 956 due to missing data. No categories had missing data that exceeded 1.5%.

Table 2

Group comparisons of means across quantitative clinical variables (ANOVA; n = 956)

Variable	Good Sleepers (n = 508) M (sd)	Symptoms (n = 295) M (sd)	Syndrome (n = 153) M (sd)	*F*	Sig.
SF-12					
Physical Health	75.33 $_a$ (17.84)	70.54$_b$ (18.81)	62.76$_c$ (23.28)	26.46	.001
Mental Health	72.96 $_a$ (14.60)	67.75 $_b$ (16.40)	55.72$_c$ (19.61)	68.40	.001
BDI-II	5.76 $_a$ (5.73)	8.88 $_b$ (7.48)	13.75$_c$ (19.12)	81.49	.001
STAI-trait	37.31$_a$ (8.63)	39.76 $_b$ (8.98)	46.41$_c$ (9.67)	61.15	.001
PSQI	3.54 $_a$ (1.79)	6.15 $_b$ (2.71)	10.21$_c$ (3.04)	501.13	.001
ISI	3.85 $_a$ (3.40)	8.61 $_b$ (4.36)	14.69 $_c$ (4.72)	477.03	.001
NEO (neuroticism scale)	45.04 $_a$ (10.03)	47.23 $_b$ (10.17)	53.35$_c$ (10.41)	37.17	.001
Negative Life Events	5.99 $_a$ (6.66)	7.80 $_b$ (6.78)	10.33$_c$ (8.41)	23.49	.001

Note: Means with different subscripts differ significantly from each other using Games-Howell post-hoc tests ($p < .005$). SF-12 = Short Form Health Status Survey; BDI-II = Beck Depression Inventory-II; STAI-trait – State-Trait Anxiety Inventory, trait anxiety summary score; PSQI = Pittsburgh Sleep Quality Index; ISI – Insomnia Severity Index; NEO = NEO Five Factor Inventory, neuroticism summary score.

Table 3

Crosstabulations for proportions of "yes" responses on dichotomous dependent variables (reference period = 3 months; $N = 956$)

Dependent variables	Good Sleepers (n = 508) % (n)	Symptoms (n = 295) % (n)	Syndrome (n = 153) % (n)	Total (N = 956) % (n)	X^2	*OR*	CI
Consultations (all - survey)	60.0 (301)	71.7 (200)	80.6 (116)	66.7 (617)	25.84***	2.77	1.77 – 4.34
RAMQ consultations	40.6 (204)	43.5 (124)	55.4 (82)	43.9 (410)	10.14***	1.82	1.25 – 2.63
Hospitalisations (RAMQ)[a]	3.6 (18)	4.3 (12)	5.6 (8)	4.1 (38)	1.14		
Prescription medications	31.7 (159)	41.9 (117)	56.3 (81)	38.6 (357)	30.40***	2.77	1.90 – 4.05
OTC products	62.2 (312)	64.5 (180)	74.3 (107)	64.8 (599)	7.25*	1.76	1.16 – 2.67
Alcohol	4.2 (21)	10.4 (29)	16.7 (24)	8.0 (74)	26.75***	4.57	2.46 – 8.48
Absences	16.3 (65)	25.4 (54)	25.3 (25)	20.3 (144)	8.84**	1.74	1.03 – 2.94
Productivity	12.4 (61)	20.0 (55)	40.4 (57)	19.1 (173)	56.05***	4.79	3.12 – 7.37
Accidents (motor vehicle)[a]	3.4 (17)	3.6 (10)	4.2 (6)	3.6 (33)	.18		
Accidents (other)[a]	6.7 (32)	10 (27)	11.9 (16)	8.5 (75)	4.82*	2.43	1.51 – 3.89

[a] Reference period = past six months. *p < .05, **p < .01, ***p < .005. Significance tests are one-tailed. Missing data was less than 5% of the sample. *OR* comparisons for good sleepers vs. syndrome groups.

Table 4

Crosstabulations for proportions of respondents having consulted various health care providers (reference period = past three months; $N = 956$)

Service types	Good Sleepers % (n)	Symptoms % (n)	Syndrome % (n)	Total % (n)	X^2 ($df = 2$)	Sig.	OR^a	CI
			RAMQ-reimbursed practitioners					
All combined	40.6 (204)	43.5 (124)	55.4 (82)	43.9% (410) [b]	10.14	.006	1.82	1.25 – 2.63
General practitioners	32.3 (162)	34.7 (99)	47.3 (70)	35.4% (331)	11.37	.001	1.88	1.30 – 2.74
Psychiatrists	0.2 (1)	.4 (1)	2.7 (4)	0.6% (6)	11.78	.001	13.92	1.54 – 125.49
Other specialists	19.1 (96)	22.1 (163)	30.4 (45)	21.8% (204)	8.55	.007	1.85	1.22 – 2.80
			Non-reimbursed practitioners (survey)					
Social Worker	.6% (3)	1.8 (5)	6.3 (9)	1.8% (17)	19.82	.001	11.09	2.96 – 41.53
Acupuncturist	.4 (2)	0.7 (2)	3.5 (5)	1.0% (9)	11.24	.002	9.00	1.73 – 46.85
Psychologist	2.8 (14)	3.3 (9)	13.2 (19)	4.5% (42)	29.55	.001	5.30	2.59 – 10.86
Physiotherapist	3.6 (18)	2.9 (8)	6.9 (10)	3.9% (36)	4.50	.05	2.01	1.01 – 4.45
Pharmacist	19.9 (100)	31.5 (88)	36.1 (52)	25.9% (240)	21.78	.001	2.27	1.52 – 3.41
Homeopath	.8 (4)	1.4 (4)	4.2 (6)	1.5% (14)	8.54	.007	5.41	1.51 – 19.45
Chiropractor	4.8 (24)	6.1 (17)	6.3% (9)	5.4% (50)	.84	n.s.		
Nurse	4.4% (22)	6.5% (18)	6.3 (9)	5.3% (49)	1.84	n.s.		
Massage Therapist	9.6% (48)	6.5 (18)	10.4 (15)	8.8% (81)	2.76	n.s.		
Other	6.6 (33)	8.2 (23)	3.5 (5)	6.6% (61)	3.51	n.s.		

Note. [a] Odds ratios compare good sleepers to participants with insomnia syndrome. [b] This number represents the total percentage of the sample having consulted a member of that health profession.

Table 5

Multiple logistic regression results for binary discrete self-report (unless otherwise specified) dependent variables (N = 956)

Variable	X^2 (% correct)	Wald	*df*	Sig	β	CI
Consultations (RAMQ)						
Omnibus	92.31 (68.4)	-----	19	.000	-----	----------
Female		18.30	1	.000	1.99	1.45 – 2.73
Health (SF-12)		10.47	1	.001	1.02	1.01 – 1.03
Negative events		10.64	1	.001	.956	.930 - .982
Age		7.17	1	.007	.982	.968 - .995
Insomnia Syndrome		6.52	1	.01	1.98	1.17 – 3.33
Hospitalisations (RAMQ)						
Omnibus	33.28 (96.3)	-----	19	.022	-----	----------
Negative events		6.61	1	.01	.945	.905 - .987
Health (SF-12)		4.11	1	.04	1.02	1.00 – 1.04
Prescriptions Medications (Survey)						
Omnibus	168.50 (70.7)	-----	19	.000	-----	----------
Age		62.41	1	.000	.944	.930 - .960
Health (SF-12)		18.51	1	.000	1.02	1.01 – 1.03
Negative events		12.39	1	.000	.957	.933 - .981
Insomnia Syndrome		7.45	1	.006	.525	.330 - .834
Education (secondary)		6.07	1	.01	7.86	1.52 – 40.55
Female		6.60	1	.01	1.54	1.11 – 2.13
Widowed		6.07	1	.007	.276	.120 – .708
Divorced		4.01	1	.045	.361	.133 - .978

Table 5 (cont'd)

Multiple logistic regression results for binary discrete self-report (unless otherwise specified) dependent variables (N = 956)

Variable	X^2 (% correct)	Wald	*df*	Sig	*β*	CI
OTC products (Survey)						
Omnibus	109.37 (70.7)	-----	19	.000	-----	----------
Female		39.42	1	.000	2.73	1.20 – 3.74
Insomnia syndrome		7.56	1	.006	.954	.922 - .986
Depression (BDI-II)		6.84	1	.008	1.05	1.01 – 1.08
Education		20.51	7	.005	.979	.953 - .999
Negative events		5.58	1	.01	.969	.944 - .995
Anxiety (trait)		5.48	1	.01	.962	.932 - .994
Alcohol used as a sleep aid (Survey)						
Omnibus	101.51 (92.5)	-----	19	.000	-----	----------
Male		24.95	1	.000	.219	.121 - .398
Negative events		10.69	1	.001	.943	.911 - .977
Insomnia syndrome		6.31	1	.01	.432	.224 - .831
Anxiety (trait)		4.34	1	.03	.940	.886 - .996
Absences (Survey)						
Omnibus	57.94 (78.7)	-----	19	.000	-----	----------
Health (SF-12)		5.00	1	.025	1.01	1.00 – 1.03
Negative events		4.91	1	.027	.967	.939 - .996
NEO-neuroticism		3.25	1	.07*	.970	.939 – 1.00
Insomnia syndrome		2.78	1	.07*	.971	.930 – 1.01
Reduced Productivity (Survey)						
Omnibus	162.41 (82.8)	-----	19	.000	-----	----------
Depression (BDI-II)		11.67	1	.001	.935	.899 - .972
Female		3.79	1	.05	1.52	.997 – 2.33
Negative events		11.98	1	.001	.953	.927 - .979
Insomnia syndrome		9.17	1	.002	.441	.259 - .749

Table 5 (cont'd)

Multiple logistic regression results for binary discrete self-report (unless otherwise specified) dependent variables (N = 956)

Variable	X^2 (% correct)	Wald	*df*	Sig	β	CI
Motor-vehicle accidents (Survey)						
Omnibus	40.19 (96.7)	------	19	.003	-----	----------
Depression (BDI-II)		7.56	1	.006	.905	.843 - .972
Age		5.51	1	.01	1.05	1.01 – 1.10
Negative events		4.73	1	.03	.953	.912 - .995
Anxiety (trait)		2.70	1	.05	1.07	.987 – 1.17
Other accidents (Survey)						
Omnibus	31.25 (91.3)	-----	19	.03	-----	----------
Negative events		6.28	1	.01	.959	.928 - 991

Note. Significance tests are two-tailed and are therefore conservative. *Reported because approached statistical significance.

Table 6

Self-report percentages of participants with various chronic health problems ($N = 956$)

Health problems	Good Sleepers (n = 502) % (n)	Symptoms (n = 285) % (n)	Syndrome (n = 148) % (n)	Total (n = 956) % (n)	X^2	Sig.	*OR*	CI
Any problem at all	54.1 (262)	59.8 (138)	81.1 (86)	59.2 (486)	26.29	.001	4.93	2.88 – 8.46
Chronic pain	11.2 (51)	16.7 (40)	29.2 (31)	15.2 (122)	22.31	.001	3.28	1.97 – 5.47
Arthritis	7.0 (32)	15.0 (36)	22.6 (24)	11.5 (92)	24.87	.001	3.88	2.17 – 6.92
Headaches/migraine	7.5 (34)	12.1 (29)	21.7 (23)	10.7 (86)	18.89	.001	3.44	1.93 – 6.14
Other	10.5 (48)	13.8 (33)	24.5 (26)	13.3 (107)	14.63	.001	2.76	1.62 – 4.71
Bronchitis/emphys.	.4 (2)	1.7 (4)	4.7 (5)	1.4 (11)	11.89	.003	11.26	2.15 - 58. 87
Hypertension	7.7 (35)	13.3 (32)	17.0 (18)	10.6 (85)	10.56	.005	2.46	1.33 – 4.54
Diabetes	1.8 (8)	4.2 (10)	7.5 (8)	3.2 (27)	10.13	.006	4.57	1.68 – 12.48
Sinusitis	3.5 (16)	1.3 (3)	7.5 (8)	3.4 (27)	9.03	.011		
Allergies	14.5 (66)	17.1[a] (41)	13.2 (14)	15.1 (121)	1.17	.56		
Asthma	6.8 (31)	8.8 (21)	8.5 (9)	7.6 (61)	.988	.61		
Ulcers	2.6 (12)	2.1 (5)	5.7 (6)	2.9 (23)	3.59	.166		
Epilepsy	.2 (1)	.0 (0)	.0 (0)	.1 (1)	.76	.684		
Heart disease	2.4 (11)	2.9 (7)	5.7 (6)	3.0 (24)	9.22	.209		
Cancer	.9 (4)	.8 (2)	2.8 (3)	1.1 (9)	3.21	.200		
Stroke	.0 (0)	.4 (1)	.9 (1)	.2 (2)	3.46	.177		

Note. [a] When the X^2 statistic is not significant or the higher percentage across groups is found in a group other than the syndrome group, the *OR* is not calculated. Percentages may not add to 100% due to rounding. Significance tests are two-tailed.

Table 7
Crosstabulations for proportions of participants reporting having used different types of prescription medications in the past three months.

Category	Total (n = 956) (%, n)	Good Sleepers (n = 502) (%, n)	Symptoms (285) (n = 285) (%, n)	Syndrome (148) (n = 148) (%, n)	X^2	Sig	*OR*	CI
Overall	**38.6**	**31.7**	**41.9**	**56.3**	**30.40**	**.000**	**2.77**	**1.90 – 4.05**
Mood	2.7 (25)	1.6 (8)	2.1 (6)	7.4 (11)	15.48	.000	4.96	1.96 – 12.59
Anxiety	4.9 (46)	2.6 (13)	3.5 (10)	15.5 (23)	42.73	.000	6.92	3.41 – 14.05
Insomnia	3.6 (34)	1.2 (6)	2.5 (7)	14.2 (21)	56.71	.000	13.67	5.40 – 34.58
Bone/Musc/Conj. Tissue	6.5 (61)	5.8 (29)	5.3 (15)	11.5 (17)	7.18	.028	2.12	1.13 – 3.97
Infectious/parasitic	1.3 (12)	.4 (2)	2.1 (6)	2.7 (4)	6.98	.030	6.94	1.26 – 38.30
Signs and symptoms	3.1 (29)	2.0 (10)	3.5 (10)	6.1 (9)	6.59	.037		
Digestive	2.9 (27)	2.0 (10)	4.6 (13)	2.7 (4)	4.30	.116		
Supplementary	.7 (7)	.6 (3)	1.4 (4)	0.0 (0)	2.92	.233		
Neoplasms	.2 (2)	0.0 (0)	.4 (1)	.7 (1)	2.81	.246		
Genitourinary	5.9 (55)	5.2 (26)	5.6 (16)	8.8 (13)	2.74	.255		
Respiratory	4.5 (42)	4.2 (21)	6.0 (17)	2.7 (4)	2.66	.265		
Endocrine/metabolism	6.2 (58)	5.4 (27)	8.1 (23)	5.4 (8)	2.46	.293		
Skin and Tissue	1.3 (12)	1.0 (5)	2.1 (6)	.7 (1)	2.28	.320		
Circulatory	10.9 (102)	10.4 (52)	13.0 (37)	8.8 (13)	2.11	.349		
Nervous system/sense organs	2.5 (23)	2.0 (10)	2.5 (7)	4.1 (6)	2.03	.363		
Injuries/side effects	.7 (7)	.4 (2)	1.1 (3)	1.4 (2)	1.91	.385		
Blood	.5 (5)	.6 (3)	.4 (1)	.7 (1)	.274	.872		
Other	.7 (7)	.8 (4)	.4 (1)	1.4 (2)	1.35	.510		
Pregnancy	N/A							
Congenital	N/A							
Perinatal	N/A							

Note. Significance tests are two-tailed. Percentages may not add up to 100 due to rounding. Odds ratios are not provided for non-significant test statistics.

Table 8. Mean hours lost to absences and reduced productivity: three-month data and extrapolated annual estimates (N = 956).

	3-month				1-year estimate		
Insomnia group	# of hrs M (sd)	CI	% loss due to insomnia	hrs lost due to insomnia M	# of hrs (days) M (sd)	hrs. lost due to insomnia M	days lost due to insomnia M
Absenteeism							
Good sleepers (n = 508)	5.05_a (35.33)	1.96 – 8.15	$11.40\%_a$	.58	20.0 (2.5)	2.28	.285
Symptoms (n = 295)	11.40_b (48.80)	3.76 – 19.61	$22.02\%_b$	2.51	45.6 (5.7)	10.04	1.26
Syndrome (n = 153)	17.40_c (80.99)	7.96 – 26.84	$43.78\%_c$	7.61	69.6 (8.7)	30.44	3.81
Reduced Productivity							
Good sleepers (n = 508)	21.29_a (100.86)	12.41 – 30.16	$29.93\%_a$	6.37	85.16 (10.65)	25.46	3.18
Symptoms (n = 295)	32.32_b (102.61)	20.31 – 44.33	$36.73\%_b$	11.87	129.28 (16.16)	47.45	5.9
Syndrome (n = 153)	91.34_c (232.77)	52.99 – 129.68	$54.07\%_c$	49.39	365.36 (45.67)	197.55	24.69

Note. Means with different subscripts differ significantly from each other using Games Howell post hoc tests ($p < .005$).

Table 9

Percentages of participants reporting on their *principle* reason for productivity decreases (N = 956)

Reason (total %)	Good Sleepers (n = 508) % (n)	Symptoms (n = 295) % (n)	Syndrome (n = 153) % (n)	X^2
Physical Health (11.77)	13.14 (67)	11.41 (34)	14.47 (22)	.485
Fatigue (46.0)	36.9 (187)	46.62 (138)	54.61 (84)	3.83*
Stress (11.89)	13.39 (68)	17.71 (52)	7.46 (11)	1.80
Preoccupations (0.73)	2.01 (10)	0 .59 (2)	.00 (0)	.642
Decreased Motivation/ Interest (4.29)	4.03 (20)	7.14 (21)	1.19 (2)	1.20
Multiple + fatigue (17.67)	24.51 (125)	11.16 (33)	18.33 (28)	1.44
Other + multiple w/o fatigue (6.45)	6.01 (31)	5.36 (16)	3.93 (6)	.215

Note. * $p < .05$.

Running head: THE DIRECT AND INDIRECT COSTS ASSOCIATED WITH INSOMNIA

The cost of insomnia: direct and indirect costs in a population-based sample in Quebec

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RÉSUMÉ

Le but principal de cette étude était d'estimer, du point de vue de la société, les coûts associés à l'insomnie. Deux catégories de coûts ont été évalués: (a) les coûts directs (ou les coûts associés à l'utilisation des ressources), y compris les coûts des consultations, des hospitalisations, des médicaments, des produits sans ordonnance, de l'alcool pris pour dormir, et de transport associé aux consultations; et (b) les coûts indirects (ou les coûts associés à une perte de ressources pour l'économie), y compris les coûts provenant de l'absentéisme, des baisses de productivité, et des accidents.

Un échantillon de 956 adultes québécois a été sélectionné aléatoirement. Trois sous-groupes de participants ont été constitués : les bons dormeurs, les participants avec des symptômes d'insomnie, et les participants avec un syndrome d'insomnie. Les participants ont rempli un questionnaire concernant la fréquence des comportements ou phénomènes décrits ci-dessus. Le coût de chaque variable indépendante (ex., consultation chez un psychologue, pilule, heure de travail manquée) a été chiffré. Ceux-ci ont été multipliés par les fréquences rapportées pour arriver à une estimation des coûts directs et indirects.

Les coûts annuels de l'insomnie pour la province du Québec sont estimés à 6.3$ milliards. La ventilation de ces coûts est comme suit : consultations à 205$ millions, transport associé à l'insomnie à 139$ millions, médicaments prescrits à 17.3$ millions, produits sans ordonnance à 2.1$ millions, alcool à 356$ millions, absentéisme attribuable à l'insomnie à 725$ millions, et les baisses de productivité attribuable à l'insomnie à 4.7$ milliards. Le coût moyen annuel par personne selon leur catégorie d'insomnie est: 4,394$ pour les personnes avec un syndrome d'insomnie, 1,302$ pour les personnes avec des symptômes, et 603$ pour les bons dormeurs.

Abstract

Background and purpose: Insomnia is a highly prevalent problem that is associated with increased use of health care services and products, as well as deficits in work function and increased accident risk. Associated costs can be significant. This study undertook to estimate from a societal perspective the direct and indirect costs of insomnia.

Participants and methods: A randomly selected sample of 956 French-speaking adults from Québec, Canada completed questionnaires on sleep, health, use of health-care services and products, accidents, work absences and reduced productivity. Data were also obtained from the provincial government administered health insurance board. Participants were categorized as having insomnia syndrome, insomnia symptoms or as being good sleepers using a standardized algorithm. Frequencies of target cost variables were obtained and multiplied by unit costs to generate estimates of costs for the province's population from a societal perspective.

Results: The total annual cost of insomnia in the province of Quebec was estimated at $6.3 billion (Cdn$). This includes direct costs associated with insomnia-motivated health-care consultations ($205.4 million), transportation costs associated with insomnia-motivated consultations ($119 thousand), prescription medications ($17.3 million), over the-counter products ($2.1 million) and alcohol used as a sleep aid ($356 thousand). Annual indirect costs associated with insomnia-related absenteeism are estimated at $724 million, with insomnia-related productivity losses estimated at $4.7 billion. The average annual per-person costs (direct and indirect combined) are: $4,394 for individuals with insomnia syndrome, $1,302 for individuals presenting with symptoms, and $603 for good sleepers.

Conclusions: While this study suggests that insomnia is very costly to society, more burden-of illness research is necessary to corroborate these findings. Energy should also be focused on education, prevention and the provision of effective treatments in order to reduce the negative impact and significant costs of this prevalent disorder. Cost-effectiveness and cost-offset research should be conducted to provide quantitative evidence of the relative effectiveness of treatments in reducing symptoms and health-care system use relative to the cost required to implement them.

Introduction

Epidemiological studies show insomnia to be a prevalent problem, with between 6% and 10% of the population meeting diagnostic criteria for insomnia syndrome (Ford & Kamerow, 1989; Gallup, 1991; Morin, LeBlanc, Daley, Grégoire & Mérette, 2006; Ohayon, 2002). At any given moment, about a third of the population experiences insomnia symptoms (Gallup, 1995; Morin et al., 2006). Despite its high prevalence, we know very little about what this disorder costs individuals and society as a whole. Information on the costs of illnesses, which is an indicator of their burden to society, is increasingly fuelling policy decisions about the funding and development of health care and research programs and priorities. Insurance companies are also concerned with the costs of illnesses and the impact that interventions may have in reducing symptoms and health care system utilisation. Furthermore, understanding the cost of treated and untreated illnesses is a necessary first step if researchers wish to eventually conduct cost-effectiveness research, another growth area motivated by the evidence-based movement presently afoot.

To conduct economic evaluations of the cost of illnesses or the cost effectiveness of treatments, two broad categories of costs are considered. These include direct costs associated with the consumption of resources (i.e., costs resulting from consultations, product use, testing, transportation to and from appointments), and indirect costs associated with the loss of resources (i.e., costs due to absenteeism, reduced productivity, accidents, morbidity and early death resulting from the disorder; see Drummond & McGuire, 2001 for an in-depth discussion). While several studies have shown a positive correlation between insomnia severity and the use of prescription products, over-the-counter (OTC) sleep medications, and alcohol, as well as more frequent visits to health-care providers (Chilcott & Shapiro, 1996; Kapur, Redline, Nieto, & Young, 2002; Ohayon & Caulet, 1996; Simon & VonKorff, 1997; Walsh, Engelhardt, & Hartman, 1995), actual quantification of the costs associated with this consumption is scarce. Similarly, several researchers have identified a relationship between insomnia, increased absenteeism and decreased productivity (Léger, Massuel & Metlaine, 2006; Linton & Bryngelsson, 2000; Kupperman, Lubeck, Mazonson, et al., 1995; Schweitzer, Engelhardt, Hilliker, Muehlbach & Walsh, 1992). For example, Schweitzer et al. (1992) estimated that individuals reporting poor sleep miss at least 5 more

days of work per year than good sleepers, while Leigh (1991) reported monthly absence rates 1.4 times higher in poor sleepers than in workers with no sleep difficulties. Indirect cost constructs such as these are difficult to measure and quantify economically, with fewer attempts having been made to do so than in the case of direct costs.

When research identifies a direct or indirect impact of an illness or disorder, it is logical to ask how that impact translates into costs. While the costs associated with physical illnesses such as stroke (e.g., Taylor et al., 1996), asthma (e.g., Krahn, Berka, Langlois & Detsky, 1996), and diabetes (e.g., Gerard, Donaldson & Maynard, 1989) have been studied fairly extensively, a smaller number of studies have investigated the economic impact of psychological disorders on society. Using survey and interview data, Rice and Miller (1996) estimated the total burden of all mental illness in the United States to be around $147.8 billion in 1990. Anxiety disorders were found to be the most costly, accounting for 31.5% of this total ($46.6 billion). Schizophrenia and mood disorders were similar in their cost to society ($32.5 billion and $30.4 billion, respectively), with the balance of estimated costs attributable to other mental disorders ($38.4 billion). More recently, Dupont, Dupont & Rice (2002) reported the overall cost of all mental disorders in the U.S. to be about $204.4 billion per year, with anxiety disorders once again being identified as among the most costly at $65 billion.

With the exception of one study conducted in France (Leger, Levy & Paillard, 1999), and another conducted in Australia on costs associated with sleep disorders in general (insomnia, obstructive sleep apnea, periodic limb movement disorder; Hillman, Murphy, Antic & Pezzullo, 2006), the few publications that exist regarding the cost of insomnia have been predominantly limited to the costs associated with insomnia in the United States (Chilcott & Shapiro, 1996; Stoller, 1994; Walsh & Engelhardt, 1999; Walsh, Engelhardt, & Hartman, 1995), and have essentially comprised variations on evaluating and interpreting the same databases and results. These studies are examples of cost-of-illness or burden-of-illness research (i.e., direct and indirect costs are estimated, usually from a societal perspective, which is considered the gold standard; see Drummond & McGuire, 2001 for further explanation) and should be distinguished from other types of cost analyses

such as cost-effectiveness, cost-benefit or cost-utility analysis (see Gold, Seigel, Russell & Weinstein, 1996 for more details).

A recent study (Ozminkowski, Shaohung & Walsh, 2007) used insurance data from matched participants to compare direct (inpatient, outpatient, pharmacy, emergency room visits) and indirect (work absences, short-term disability) costs of individuals with and without insomnia. The average annual difference of these combined costs was $1,253 for participants between 18 and 64 years of age, and $1,143 for participants 65 years of age and over. The comparison of two matched groups and the use of propensity analysis to try to factor out non insomnia-related costs represents an improvement over earlier research. Other insomnia-related costs that would not be reflected in insurance claims (e.g., over-the-counter products, transportation, alcohol used as a sleep aid, reduced productivity) were not, however, measured.

Another study by Godet-Cayre, Pelletier-Fleury, Le Vaillant, Dinet, Massuel, and Leger (2006) looked at insomnia and work function in France. The study concludes that insomnia is associated with increased absenteeism and reduced productivity. The author's methods of costing do not allow, however, for an analysis of the proportional contribution of insomnia. There is also a methodological problem associated with double-counting costs which means that the authors' cost estimates may be inflated.

Walsh and Engelhardt (1999) used several databases including the National Ambulatory Medical Care Survey (NAMCS), the Retail/Provider Perspective Audit, the National Disease and Therapeutic Index, as well as data from a firm called Information Resources and data from other studies to estimate the cost of insomnia. Based on information obtained from these sources, they estimated the direct costs of insomnia in 1995 in the United States to be about $13.9 billion. Substances used for insomnia accounted for $1.96 billion (prescription medications = $809 million; non-prescription medications = $325 million; alcohol = $780 million; and melatonin = $50 million). Health care services used for insomnia made up the remainder of the total at $11.96 billion. The greatest expenditures were for outpatient physician visits ($660 million), psychologist visits

($122 million), mental health organizations ($153 million) and nursing home admissions due to sleep difficulties ($10.9 *billion*, or 91% of all health care service costs). This last figure is contested by some as being too liberal; however, the literature suggests that between 20.4% (Walsh & Engelhardt, 1999) and 52% (Sanford, 1975) of admissions of the elderly to long-term care facilities are a direct consequence of sleep disturbances and that if it weren't for these difficulties caregivers would keep the elderly person at home. While transportation costs for visits to and from insomnia-related appointments are a type of direct cost, to our knowledge, no estimates exist for such costs.

Indirect costs (i.e., absenteeism, reduced productivity, accidents) have been given only passing mention in the literature, their conspicuous absence likely being due to several factors: first, these costs are more difficult to estimate and quantify; second, there is no single, definitive database from which to draw; and finally, measurement of these variables is subject to interpretation bias as well as well-documented recall bias (see Tourangeau, Rips, & Rasinski, 2000 for a complete discussion of memory and surveys). In order to measure work-related deficits, Stoller (1994) analysed data obtained in a study of workplace performance in Navy servicemen (Johnson & Spinweber, 1983) using an insomnia prevalence estimate of 33% (proposed by Bixler, Kales, Soldatos et al., 1979) and a performance decrement estimate of 4% (based on wage data from the Navy Times pay chart for insomniacs and non insomniacs). Her calculations placed the monetary value of absenteeism and lost productivity at $41.1 billion annually (1995 U.S.$). A per person estimate was provided by Chilcott & Shapiro (1996), who suggested a decrease in work productivity due to insomnia of 10% (the justification for choosing this particular percentage estimate was not provided). This amounts to $3000 per person with insomnia per year.

Stoller (1994) also looked at a number of other indirect costs; she placed the cost of insomnia-related accidents (motor vehicle, work-related and home/public) between $26.42 billion and $38.43 billion annually (based on 1988 accident rate figures, a .33 insomnia prevalence rate and the estimate that accidents occur 2 to 3 times more frequently in insomniacs). Finally, she also estimated insomnia-related alcohol abuse costs at between

$8.5 and $11.6 billion and insomnia-related depression costs at $1 billion. This brings Stoller's overall estimate of indirect costs to between $77.05 and $92.13 billion, a figure that Walsh and Engelhardt (1999) suggest is inflated. Indeed, this figure is difficult to fathom if one accepts Dupont et al.'s estimate of $204 billion for the overall cost of mental disorders in the U.S. (direct and indirect costs combined). In fact Walsh (1996) suggests a downward-revised overall estimate of between $30 and $35 billion (i.e., direct and indirect costs combined). While Stoller's work has been viewed as a liberal estimate because of the high prevalence rate used, her data are still frequently used to describe the indirect economic consequences of insomnia.

A number of limitations are present in the existing insomnia cost-of-illness research. To begin, while the use of large data bases to obtain consultation and prescription data is practical, efficient and provides objective data, this approach precludes analysis of important factors such as consultation motivation, actual consumption of prescribed medications and, in the case of certain medications, the target ailment for which the medication was intended. When workplace records are used to obtain absenteeism data, reasons for absences are rarely available. Only an individualistic approach whereby individuals are explicitly asked to evaluate the relationship between insomnia and days/hours lost can begin to uncover the role of insomnia in workplace function deficits. The same holds true when examining the relationship between insomnia and accidents; the use of official accident records does not isolate individuals with clearly defined insomnia symptoms from individuals suffering from other sleep disorders such as narcolepsy or sleep apnea, disorders that explain the largest proportion of sleep disorder-related accidents, precludes the clear identification of the contributing role of insomnia to these events. Second, the indirect cost estimates advanced by Stoller (1994) are based on a very particular sample: Navy servicemen. The military population and workplace conditions may differ significantly in a number of ways from the civilian population, making it inappropriate to generalize to the population at large. Third, the existing data are rather preliminary and necessitate further validation; study methodologies and results are heterogeneous, further suggesting that cost-of illness questions require continued investigation. Finally, no extensive research has been conducted on the Canadian

population. While US-Canada comparisons often invoke a factor of 10 (i.e., the American population is approximately 10 times greater than the Canadian), in this instance, simply dividing cost estimates obtained on an American population by 10 is inappropriate (a) because of possible cultural differences associated with treatment and prescribing practices or the availability of products (e.g., melatonin); (b) because of third-party payer differences that may influence treatments sought and treatments received; and (c) because the existing American cost estimates are too preliminary.

The primary purpose of this study was to estimate, from the societal perspective, global direct and indirect costs of insomnia in the province of Quebec, Canada. Costs were also compared across three groups of participants classified as being good sleepers, having insomnia symptoms or having insomnia syndrome. This was done in order to examine the extent to which costs are a function of increasing insomnia symptomatology. A second objective was to estimate the *proportional* contribution of insomnia to the three indirect dependent cost variables: absenteeism, productivity and accidents. The final objective was to determine insomnia's contribution to costs relative to other variables.

Method

This research was part of a larger epidemiological study conducted in the province of Quebec, Canada that documents the natural history and costs of insomnia (Morin et al., 2006). It was conducted out of the School of Psychology of Laval University, and received ethical approval from the university's research ethics committee (see Annex 1). Only the elements relevant to the cost aspect of the study will be reported here.

Participant selection and screening

Participants were selected from the province of Quebec for an initial telephone-administered sleep survey. They were chosen using a stratified probabilistic approach based on the last Canadian census combined with a random digit selection method. A local professional polling agency was responsible for administering the survey. Of 5,991 calls placed, 2001 French-speaking respondents agreed to complete the initial survey (34% response rate). Of these, 1467 accepted to continue with a longitudinal extension of the

study (73% participation rate). This entailed completing questionnaires sent out by mail. In order to obtain as representative a sample of the population as possible, only people having previously received a diagnosis for a sleep disorder other than insomnia (7.2%) were excluded from the next phase, thus reducing the number of questionnaires sent out to 1362. Previously diagnosed sleep disorders that disqualified individuals from participating were: restless legs syndrome, sleep apnea, narcolepsy, hypersomnia or periodic limb movement. Once households were selected and contacted, the Kish selection method was employed to identify which household member would be interviewed (Kish, 1965). The only inclusion criteria for the original telephone interview were to be over 18 years of age and to speak French (for more information regarding the methodology of the original telephone phone survey, see Morin et al., 2006).

Procedure

Individuals who accepted to participate in the longitudinal study were mailed questionnaires. Upon return of each completed questionnaire, participants received a financial compensation of $25.00 Cdn. Three insomnia status groups were formed based on an algorithm derived from a combination of criteria found in the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) and the International Classification of Sleep Disorders (ICSD; American Sleep Disorders Association, 1990). Responses to the Insomnia Severity Index (ISI; Morin, 1993) and the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman & Kupfer, 1989) were used to determine group membership. The algorithm combined information on frequency, severity and duration of insomnia symptoms. Information pertaining to the algorithm is available from the authors upon request.

This study was part of a larger epidemiological study for which the formation of these three insomnia status groups was essential. While burden-of-illness research is typically concerned with overall costs associated with a health problem, regardless of diagnosis or severity of illness, we chose to take advantage of the fact that participants were coded as to severity: good sleepers (no/very low severity), insomnia symptoms (moderate severity), and insomnia syndrome (most severe). This subdivision in no way precludes the

advancement of an overall burden-of-illness estimate (collapsed across groups), but it also provides a unique opportunity to study and compare costs according to group association. Results pertaining to the relationship between these insomnia status groups and health-care system use (service and products), work function and accidents are reported elsewhere (Daley, Morin, LeBlanc, Grégoire, Savard, & Baillargeon, in preparation).

Insomnia syndrome group. Participants in this category met the following criteria: (a) were dissatisfied with their sleep or complained of poor sleep quality; (b) presented symptoms of initial, maintenance or late insomnia a minimum of three nights a week; (c) indicated psychological distress or daytime impairment related to sleep difficulties; and (d) had experienced these difficulties for at least one month. Individuals who took hypnotic medication at least three times a week, regardless of the presence of other symptoms, were also included in this group.

Insomnia symptoms group. Participants in this category met some but not all of the diagnostic criteria for insomnia (e.g., initial, maintenance or late insomnia at least three times a week, but with shorter duration, or no daytime consequences, or no dissatisfaction). In addition, people who reported no symptoms but who were dissatisfied with their sleep quality were assigned to this group, as were individuals using sleep-promoting products fewer than three nights per week.

Good sleepers group. Individuals in this category reported no insomnia symptoms, were satisfied with their sleep and did not use sleep-promoting products more than twice a week.

These three insomnia categories are assumed to represent degrees of insomnia severity, with good sleepers experiencing no or very, very low-level difficulties with sleep, individuals with insomnia symptoms having a moderate level of insomnia severity, and individuals in the syndrome group exhibiting the most severe levels of insomnia symptomatology of the three groups.

Assessment and Measures

A variety of evaluation tools were used in this study and are described below (see Annex 2 for the compiled versions received by participants). The first two are insomnia questionnaires which were used to determine the level of participants' insomnia symptomatology and thereby place them in insomnia status groups.

The Insomnia Severity Index (ISI; Morin, 1993) is a seven-item questionnaire used to provide a subjective index of sleep impairment probing (a) severity of sleep-onset, sleep maintenance and early awakening problems, (b) satisfaction with the current sleep pattern, (c) perceived interference of sleeping difficulties with daily functioning, (d) noticeability of impairment attributed to the sleep problem, and (e) degree of distress caused by the sleep problem. Items are evaluated according to a 5-point Likert scale (0 = not at all, 4 = extremely) with total scores ranging from 0 to 28. This tool has been shown to have adequate psychometric properties (Bastien, Vallières & Morin, 2001). The French version of this questionnaire (Blais, Gendron, Mimeault & Morin, 1997) has good internal consistency, test-retest reliability, and convergent validity (r = .65) when tested against the sleep diary.

Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman & Kupfer, 1989). This questionnaire is composed of 19 items designed to assess sleep quality and disturbances over a one-month interval. Four open-ended questions are followed by closed questions that are rated on a 4-point Likert scale. Scores for seven components of sleep are derived: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The total score can range from 0 to 21 and is obtained by adding up the seven component scores. The PSQI has been shown to have a diagnostic sensitivity of 89.6% and a specificity of 86.5%. The French version used in this study has been shown to have adequate psychometric properties (Blais et al., 1997).

Beck Depression Inventory II (BDI-II; Beck, Steer, Brown, 1996). This questionnaire uses a series of 21 questions, rated on a 4-point Likert scale, to identify the presence of depressive symptoms experienced over the past two weeks. Total scores can range from 0 to 63, with higher scores reflecting greater degrees of depression. The psychometric properties of the French version of this instrument have been well established (Beck, Steer, Brown, 1998).

State-Trait Anxiety Scale (STAI; Speilberger, Gorsuch, Lushene, 1970). This inventory measures actual anxiety levels (state) as well as more stable and enduring anxiety (trait). Items are rated on a 4-point Likert scale (1 = not at all, 4 = a lot). The psychometric properties of this instrument are well documented elsewhere (Spielberger, 1983). A validated French version of this tool was used in this study (Gauthier & Bouchard, 1993).

Life Experiences Survey (Sarason, Johnson, & Siegel, 1978). This measure was used to evaluate the frequency and the impact of negative or stressful events that have occurred during the past year. It yields four separate scores: (a) the intensity of positive events, (b) the intensity of negative events, (c) a global measure of negative and positive stresses, and (d) the frequency of stressful events during the last 12 months. A French translation of this measure was used in the present study to examine the role of stressful life events as a potential triggering factor for insomnia.

The SF-12 Health Survey (SF-12, Ware & Sherbourne, 1998). The SF-12 is a multidimensional generic measure of health-related quality of life. It has become widely used in clinical trials and routine outcome assessment because of its brevity and psychometric performance. The subscore for physical health was used as an independent variable. It is a validated shorter version of the familiar SF-36 Health Survey (Ware & Sherbourne, 1992; see Stewart & Ware, 1992 and Ware et al., 1994 for validation research). The French version of this instrument was produced and validated by Leplège, Ecosse, Pouchot, Coste and Perneger (2000).

The *NEO-Five Factor Inventory* (Costa & McCrae, 1992). The NEO-Five Factor Inventory is a shortened version of the NEO- Personality Inventory- Revised. The tool comprises 60 items that are scored on a 5-point scale and provides measures of five broad personality factors: neuroticism, extroversion, openness, agreeableness and conscientiousness. The neuroticism score was used as an independent variable as research suggests higher levels of this construct in individuals with insomnia (e.g., Kales et al., 1984; Morgan, Healey & Healey, 1989; Voss, Kolling, Heidenreich, 2006). The inventory has been shown to have good internal and test-retest reliability (Murray, Rawlings, Allen, Trinder, 2003). The psychometric properties of the French version have been demonstrated (Rolland, 1998).

Health care service use and insomnia impact questionnaire. An in-house questionnaire was developed to obtain information on chronic health problems, health-care service and product utilisation, use of alcohol as a sleep aid, hospitalisations, productivity, absenteeism and accidents (motor vehicle and other types). Although this assessment instrument has yet to be formally validated, key questions are similar to those used in the NIMH Epidemiological Catchment Area Survey (Ford & Kamerow, 1989). Participants were asked to report on the frequency of consultations with all types of health-care practitioners as well as on whether insomnia was a reason for consulting (main reason, secondary reason, not a reason). Only a fraction of costs associated with visits where insomnia was not the main consultation motive was considered in the cost-of-illness calculations. No other studies were identified that have used this apportioning approach that could have served as a guide as to the proportion to choose. In the aim of being conservative, yet recognizing a small proportion of a consultation as attributable to the secondary consultation motive, a fraction of .20 was chosen as an estimate of the proportion of the time (and hence cost) involved in discussing insomnia problems in the context of a consultation for another health problem. The total cost of these consultations was therefore multiplied by .2 to estimate their cost.

Participants were also asked to provide detailed information on the number and types of *all* products consumed (prescription, over-the-counter, herbal/natural, alcohol), the

dosage (where appropriate), the frequency in the last three months, and the health problem for which the product was consumed. Similarly detailed information was requested regarding hospitalisations (frequency, reason for hospitalisation, length of stay, diagnoses, interventions). Prescription medication names provided by participants were coded according to the twenty-three major categories identified in the American Hospital Formulary Service (AHFS; see Annex 3) and, where necessary, using the self-report specification regarding the particular ailment being treated. Over-the-counter medications were coded according to categories identified by the Nonprescription Drug Manufacturers Association of Canada (NDMAC) as being the most frequently used products (with minor modifications; see Annex 4). Self-reported health problems were coded using the eighteen major diagnostic categories set forth in the ICD-9 and used by the *Régie de l'assurance maladie de Québec* (*RAMQ;* see Annex 5).

Participants were also asked to report on the number of hours absent from work. In addition, they indicated whether they had experienced reduced productivity (remunerated work or other activities) in the past three months and if so, for a total of how many hours. Rather than rely on a dichotomous response that could inflate productivity loss estimates, we tried to nuance our measurement by asking participants to estimate *by what proportion* they thought their productivity had diminished (e.g., 10%, 50%, 90%). For questions related to absences and productivity, participants reported on the cause that was perceived to have most strongly motivated these events (e.g., illness, fatigue, stress, etc.), along with the perceived strength of the link with insomnia and/or insomnia's consequences. This was evaluated using a scale of 0 to 10 which was later used as a multiplier for calculating insomnia-related costs.

Motor vehicle and other accidents that occurred in the past six months were also reported, along with a subjective assessment of the link between insomnia or its consequences (such as fatigue, reduced concentration) and the event. Other accidents included things like work-related accidents and falls. The recall period for all questions was the three months prior to questionnaire completion, except in the case of hospitalisations and accidents where a longer recall period of six months was used (see Drummond et al.,

2005 for a discussion of optimal reference periods). Finally, demographic data were obtained, including age, gender, race, income, education, and marital status.

Régie de l'assurance maladie du Québec and MedEcho. Data were obtained from two provincial government health care databases (see Annex 6 for RAMQ request approval letter and Annex 7 for RAMQ variable list). The *Régie de l'assurance maladie du Québec* (*RAMQ*) is the provincial government-administered provider of health-care services. All citizens receive coverage for visits to certain health-care professionals (i.e., general practitioners and medical specialists), and others receive additional provisions if they meet certain conditions (e.g., invalidity, economic hardship, senior citizens). This database provided information as to *RAMQ*-covered consultations for each of the participants such as type of professional consulted, diagnosis received and cost of the consultation (regardless of diagnosis received). *MedEcho*, a separate database maintained by the Ministry of Health and Social Services, provided hospitalisation data (date, reason, length of stay, principal and secondary diagnoses).

Cost measures and calculations (see Annex 8 for a summary of unit costs and costing sources). The procedures for the costing process were based on guidelines set down by the Canadian Coordinating Office for Health Technology Assessment (CCOHTA) in a document entitled "A Guidance Document for the Costing Process." This document provides information on the identification of resources, the measurement of resource use and preferred cost valuation procedures. Consultation unit costs for survey data were calculated by taking the average cost in 2002 of a consultation with each type of health-care professional and multiplying it by the frequency of visits to that same professional. Unit costs were obtained either from professional associations (modal charge) or by calling a sample of five service providers (e.g., acupuncture) and calculating the mean. Costs associated with *RAMQ* visits to general practitioners and specialists were provided directly by the source.

Transportation costs were calculated according to distance estimates provided by participants for each consultation. Automobile transportation costs were obtained from the Canadian office of Runzheimer International, a firm specializing in providing companies

and researchers with costs associated with operating vehicles (and espoused by the Canadian Automobile Association). The standard 2002 unit cost for running a mid-sized vehicle includes owning and operating costs (internal fixed and variable costs) and is expressed as a per-kilometre cost of $0.53. (For further information about this company and its publications, the reader may visit the following website: www.runzheimer.com). Public transportation costs for the bus or subway were based on the individual ticket or token price of $1.95. Taxi rates in function at the time of the study consisted of a base rate of $2.50 to which was added the standard per-kilometre fee of $1.20. Public transportation and taxi rates were identical across the province at the time of the study.

Medication costs were obtained from a publication of IMS Health (CompuScript database, 2002; see Annex 9 for sample pages) that identifies the unit costs of the one thousand most frequently used prescription and OTC products and their variants in Canada. Products can vary according to strength, format or target symptoms. For example, Tylenol is considered one of the one thousand products, but it has twenty variants including Tylenol Cold, Tylenol Sinus, Extra Strength Tylenol, Children's Tylenol, etc. Data for each province are available along with a national average. These costs include mark-up and pharmacists' fees. In all, costs for 2,634 products and their variants were available. While this represents a fairly complete source, in fact about 300 products reported by participants were not identified on the list. These remaining products were costed in one of three ways, in this order of choice: first, we used a price catalogue (2002) published annually by the *RAMQ* that is used for their determination of reimbursements and to which was added to unit costs the minimum pharmacist's fee of $7.80 per prescription; second, a wholesaler's pharmaceutical catalogue for the year 2002 was used to find list costs. To this was added the pharmacist's minimal fee of $7.80 and an average mark-up for the province of Quebec provided in the RAMQ cost catalogue. This number was then divided by the number of units in the product (e.g., capsules, doses). Alternatively, we obtained shelf prices directly from a sample of pharmacies, averaging across them to obtain a mean. In every case of doubt (e.g., the dosage or variant of a prescription medication was not indicated by the participant), the lowest identifiable price was chosen in order to produce the most conservative estimate possible.

Unit costs for alcohol were provided by the *Société des alcools du Québec* (SAQ) and were based on means of sales of various types of alcohol in the province in 2002. A distinction was made between beer, wine, hard liquor and "cooler" type beverages with unit prices as follows: $2.27, $3.10, $1.50 and $2.79, respectively.

The human capital approach, an accepted labour costing technique, was used to calculate the cost of absenteeism and lost productivity (see Drummond & McGuire, 2001, for further discussion). More precisely, time was valued using Statistics Canada Labour Force Survey data for 2002 on mean salaries according to age group and gender. Final calculations were weighted to take into consideration work force participation rates reported by the Labour Force Survey (also stratified by age and gender). As the time period for this study did not exceed one year, no adjustments for inflation or other factors were necessary.

In order to determine the cost of absences, total hours reported absent in the three-month reference period were multiplied by the age- and gender-appropriate hourly wage. In order to estimate costs associated with lost productivity, the reported hours of reduced productivity were multiplied by the reported estimate of the percentage drop in productivity indicated by the participants (e.g., 8 hours at 50% reduced productivity = 8 x .5 = 4 hours). The resulting numbers were totalled across the various reduced productivity periods for each person, and then multiplied by the age- and gender-appropriate hourly wage. A further distinction was made between total costs and costs attributable to insomnia. For *each* reported absence or period of lost productivity, participants indicated on a scale of 0 to 10 the extent to which they felt insomnia and/or its consequences had been responsible for their absence or productivity reduction. The proportional contribution of insomnia in monetary terms to absenteeism and productivity loss was estimated by multiplying total costs by the percentage indicated by participants on the scale. Participants had the option to report on productivity issues both at work and in other situations (e.g., household chores). A daily task approach is more inclusive and allows reports by homemakers, unemployed and retired participants to be included (Drummond & McGuire, 2001).

Annual insomnia-related consultation costs for the province of Quebec were estimated via extrapolation by multiplying per person costs determined for each sleep status category by the number of adults estimated to be in each of these categories in the province. Prevalence rates used were those obtained in the initial epidemiological mother study based on survey data (see method; Morin et al., 2006): 9.5% for insomnia syndrome (criteria described in the method section of this paper), 29.9% for insomnia symptoms, and 60.6% for good sleepers. The estimated number of adults 18 years or older living in Quebec at the time of the study was 5,679,702 (Statistics Canada, Population Statistics, 2002). It is therefore estimated that 3,441,899 (60.6%) of those individuals are good sleepers, that 1,698,230 (29.9%) have some insomnia symptoms, and that 539,571 (9.5%) meet the criteria used in this study for insomnia syndrome.

Statistical Analyses

Insomnia status was considered as an independent variable in all statistical analyses. Scores obtained from the Pittsburgh Sleep Quality Index, the BDI, the STAI, the Life Experiences Survey, the SF-12 and NEO Five Factor Inventory were entered as independent variables for multiple and logistic regression analyses performed to determine which variables were most strongly associated with elevated costs. The Health Care Service Use and Insomnia Impact Questionnaire provided data on the dependent variables of interest.

Analysis of variance (ANOVA) was used to compare costs means with Games-Howell nonparametric tests applied for post-hoc analyses. Multiple linear regressions were performed to identify the best predictors of costs, with variables being entered in block form. Independent variables entered into the equation were: insomnia severity (ISI score), age, gender, income, marital status, physical health (summary score from the SF-12), depression (BDI-II score), anxiety (STAI-trait score), neuroticism (NEO), and negative life events (scores from the Life Experiences Survey). Wald statistics are reported as are beta coefficients associated with each of the independent measures in the model. Confidence intervals (95%) are also reported for each significant beta value.

All data were entered twice and cross-checked for errors. The Statistical Package for Social Sciences software (SPSS; version 11.5) was used to conduct all analyses with listwise deletion being the method used to deal with missing data (less than 3% of cases).

Log-transformation and bootstrap methods are sometimes advocated in the analysis of cost data which often follow a non-normal distribution (skewed to the right). Recently, some authors have argued that if group sizes are large enough (i.e., $n > 50$), t-tests, standard analysis of variance and associated 95% confidence intervals will provide an accurate assessment of group differences (see Thompson & Barber, 2000, for an in depth discussion of this topic) and will not differ significantly from results obtained from bootstrap or log-transformation methods. A preliminary comparison of analysis techniques was conducted for a subset of variables, with results not differing significantly. With a sample of 956 participants and group sizes sufficiently greater than 50, we felt justified in using analysis of variance techniques using non-log-transformed data.

Results

Sociodemographic data

Sociodemographic data are found in Table 1. The mean age of participants was 43.8 years (*SD* = 14.06, range = 18 - 83) with no significant group differences. Females comprised 60.0% of the sample. No significant differences were found for measures of marital status, education, income, work type or work schedule.

Insert Table 1 about here

Sleep status

Fifty-three percent of participants were classified as good sleepers (GS), 31% fell into the symptoms group (SYMPT) and 16% into the insomnia syndrome group (SYND).

Consultations

Consultation cost group contrasts. Mean costs for consultations with different types of health-care professionals are presented in Table 2. Data are based on a three-month time period and are presented for the three subgroups: GS, SYMPT and SYND. The cost of health-care visits was calculated separately for *RAMQ*-reimbursed and non *RAMQ*-reimbursed consultations given the fact that the data came from different sources. Analysis of the *RAMQ* database was undertaken by looking at general practitioners and psychiatrists separately, and by collapsing all other specialists into one group. These data indicate that participants in the SYND group had higher costs associated with visits to general practitioners, $F(2, 934) = 21.71$, $p < .001$, to psychiatrists, $F(2, 934) = 5.63$, $p < .005$ and to other specialists combined, $F(2, 934) = 9.42$, $p < .001$ than good sleepers.

Costs of all self-reported non *RAMQ* consultations combined were found to be significantly higher in the SYND group ($p < .001$) with post-hoc comparisons identifying differences between the SYND and SYMPT groups ($p < .002$) and the SYND and GS groups ($p < .001$). Comparisons were also made for each of the health professional classes based on self-report data. It was found that participants in the SYND groups had higher expenditures than participants in the other groups for visits to psychologists, $F(2, 932) = 12.06$, $p < .001$, physiotherapists, $F(2, 932) = 2.70$, $p < .05$, homeopathic specialists, $F(2, 932) = 3.59$, $p < .05$, acupuncturists, $F(2, 932) = 3.34$, $p < .05$, and pharmacists $F(2, 932) = 9.16$, $p < .001$ (see Table 2).

Insert Table 2 about here

Insomnia consultation costs. Costs according to the three consultation motive categories are also found in Table 2 (i.e., insomnia as the primary motivating factor for consulting, as a secondary factor, or not a factor). Mean per-person three-month expenditures associated with visits for which insomnia was the primary motive were significantly higher in the SYND group ($M = \$14.51$) than in the SYMPT ($M = \$3.85$) and

GS groups (M = \$1.79), $F(2, 932) = 7.08$, $p < .001$. Costs associated with visits where insomnia was discussed as a secondary problem were also different across groups (SYND, M = \$106.62; SYMPT, M = \$21.23; GS, M = \$18.03; $F(2, 932) = 15.65$, $p < .001$). Finally, costs associated with consultations that had nothing to do with insomnia where also significantly different (SYND, M = \$113.29; SYMPT, M = \$91.46; GS, M = \$72.87; $F(2, 932) = 3.01$, $p < .05$).

Annual insomnia-related consultation costs for the province of Quebec were estimated by extrapolation by multiplying per person costs determined for each sleep status category by the number of adults estimated to be in each of these categories in the province (see Method). The annual cost of insomnia-driven consultations was thereby estimated at \$82.1 million dollars (see Table 3), or 3% of all costs measured (see Figure 1). Using the apportioning method described earlier, the estimated cost of visits to health-care professionals for which insomnia was treated as a secondary complaint was determined to be \$123.3 million

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Insert Figure 1 about here

Insert Table 3 about here

Multiple linear regression analysis was performed to determine the factors most strongly associated with overall consultation costs. The regression model was significant, with negative events (t = 2.78, $p < .001$) and poor physical health (t = -3.74, $p < .001$) being significantly associated with consultation expenditures, $F(12, 871) = 6.21$, $p < .001$.

Transportation

Transportation costs related to travel to and from all health care appointments during a three-month period were calculated, with significant differences found between participants in the SYND group (\$52.33) and the SYMPT and GS groups (\$24.66 and

$21.16, respectively), $F(2, 947) = 6.50$, $p < .05$. Extrapolation for the three sleep status groups over a one-year interval revealed an estimated transportation cost for health-care consultations of $544.9 million. The cost of consultations motivated solely by insomnia was estimated at $19.6 million (3.6% of all transportation costs) and the cost attributed to transportation to consultations where insomnia was not the primary consultation motive but was discussed was estimated at $119 million (22% of all transportation costs). Both of these multiplier percentages are based on the proportions of these motive-defined consultations subcategories identified in the present study.

Rather than fraction transportation costs in the case of secondary motive consultations, they were viewed in this context as a dichotomous variable (i.e., the concept of a partial trip to a consultation is illogical). We therefore did not attribute a proportion of transportation costs to insomnia, but rather considered the entire transportation sum. The total transportation costs associated with insomnia were thus estimated at $139.4 million, or 2% of all costs measured.

Prescription Medications

Prescription medication group contrasts. Participants in the SYND group spent an average of $90.59 (out of pocket, before possible reimbursements) on all prescription medications combined in the three-month reference period, while participants in the SYMPT group spent $96.33, and those in the GS group spent $65.37 (Table 4).

Insert Table 4 about here

Cost of prescription medications for insomnia. Table 4 contains comparisons of mean costs of prescription and OTC products as well as of alcohol used as a sleep aid. While the highest per-person expenditures for prescription insomnia medication were observed in the SYND group (M = $4.40), participants in the other two groups had also purchased medications for insomnia complaints (GS, M = $0 .48 and SYMPT, M = $0.19), $F(2, 928) = 8.86$, $p < .001$. Expenditures on medications prescribed for depression and anxiety are also presented in Table 4, with participants in the SYND group spending

significantly more on these products than participants in the other two groups ($p < .005$). Annual estimates of provincial costs are presented in Table 3. Based on self-report data, it is estimated that a total of $17.4 million is spent annually on prescription medications for insomnia in the province of Quebec. Individuals with insomnia syndrome are estimated to consume $9.4 million worth of prescription medications, individuals with insomnia symptoms $1.2 million and good sleepers $6.6 million. This total represents less than 1% of all insomnia costs.

Of the variables tested in the multiple linear regression, low scores reflecting poor overall health, as measured by the SF-12, were found to be associated with higher costs for prescription medications ($t = -3.716$, $p < .001$), as did increased age ($t = 4.151$, $p < .001$), $F(12, 871) = 3.89$, $p < .001$.

Over-the-Counter (OTC) Products

Over-the-counter product group contrasts. Participants in the SYND group spent more on products for insomnia ($M = \$0.42$) than participants in the SYMPT group ($M = \$0.06$) or the GS group [$M = \$0.03$; $F(2, 931) = 12.03$, $p < .03$]. A similar pattern was identified for money spent on OTC products for anxiety, stress or nerves: SYND, $M = \$0.40$; SYMPT, $M = \$0.05$; GS, $M = \$0.01$; $F(2, 930) = 4.39$, $p < .01$.

Costs of over-the-counter products for insomnia. The annual provincial estimate of expenditures for over-the-counter products consumed to reduce insomnia symptoms is $2.1 million, with $906 thousand spent by individuals with insomnia syndrome, $832 thousand spent by those with symptoms and $413 thousand by good sleepers. This constitutes less than 1% of combined direct and indirect insomnia costs.

Factors related to overall OTC expenditures were increased age ($t = 2.152$, $p < .001$), *low* scores on the BDI (i.e., low levels of depressive symptomatology; $t = 2.070$, $p < .001$), elevated scores on the neuroticism subscale of the NEO ($t = 2.47$, $p < .005$), higher income ($t = 2.082$, $p < .001$) and negative life events ($t = 4.52$, $p < .001$), $F(12, 871) = 4.18$, $p < .001$.

Alcohol

Mean three-month *group* expenditures on alcohol used as a sleep aid are as follows: GS, M = \$6.42; SYMPT, M = \$32.05; and SYND, M = \$23.54, $F(2, 921) = 5.29$, $p < .006$. The total estimated annual cost of alcohol used for promoting sleep is \$356.3 million, with \$50.8 million (14%) of that being spent by individuals with insomnia syndrome, \$217.6 million (61%) of that being spent by individuals with insomnia symptoms and \$87.9 million (25%) being spent by good sleepers. The total amount represents 6% of all insomnia costs (see Figure 1). No single variable had predictive value when regressed onto costs.

Hospitalisations

Med-Echo data indicated no significant difference in the percentage of participants having been hospitalised as a function of insomnia symptomatology (GS, M = 3.6; SYMPT, M = 4.3; SYND, M = 5.6), $\chi^2(2, 925) = 1.14$, $p = .57$. Furthermore, no hospitalisations were coded in the Med-Echo database as being due to insomnia (as indicated by the admission and hospital-stay diagnoses). Data were not obtained on possible treatments offered to participants for insomnia during hospitalisations for other ailments or interventions. Cost calculations were therefore not performed.

Absenteeism

Group contrasts for absenteeism. Because of divergent opinions regarding the optimal methodology for the quantification of the cost of absenteeism, data will be presented in two ways: (a) in terms of time missed from work and (b) in terms of dollars associated with that time. Results from both methods of calculation are presented in Table 5. Participants in the SYND group reported missing 17.4 hours of work over the previous three months, compared to 11.4 hours in the SYMPT group and 5.05 hours in the GS group, $F(2, 932) = 4.65$, $p < .01$. Participants with insomnia syndrome attributed a higher proportion of this time as being due to their sleep difficulties (43.77%) than participants in the SYMPT group (22.02%) or the GS group (11.40%), $F(2, 141) = 10.00$, $p < .001$.

Cost of insomnia-related absenteeism. Total annual missed days of work are estimated at 2.5 for good sleepers, 5.7 for people with insomnia symptoms and 8.7 for people with insomnia syndrome. Multiplying the total time absent by the percentages representing the proportional contribution of insomnia to these absences results in an estimate of the time absent that is due to insomnia. On an annual per person basis for the province, good sleepers are estimated to be absent .29 days because of their insomnia, individuals with symptoms 1.25 days, and individuals with insomnia syndrome 3.8 days (Table 13). Expressed otherwise, individuals with insomnia syndrome miss about 13 times as much work, annually, as good sleepers because of their sleep problems.

These hours can also be assigned a dollar value. Three-month mean costs associated with absences were higher for individuals in the SYND and SYMPT groups as compared to the GS group (GS = $84.58, SYMPT = $206.56, SYND = $299.45; $F(2, 141) = 7.04$, $p < .001$; see Table 5). After adjusting for the perceived proportional contribution of insomnia to these absences, average per-person three-month costs were estimated to be the following: GS = $9.64, SYMPT = $45.48 and SYND = $131.06. Extrapolating to the year for the Quebec population, it was estimated that about $724.5 million is lost annually due to insomnia-related absences (GS = $132.7 million, SYMPT = $308.9 million, and SYND = $282.8 million; see Table 3). This represents 12% of the economic burden of insomnia to society.

Insert Table 5 about here

The variables most strongly associated with overall absenteeism costs were negative life events ($t = 2.696$, $p < .005$) and poor general physical health ($t = 2.262$, $p < .005$), $F(12, 831) = 1.967$, $p < .033$.

Productivity

Group contrasts for productivity losses. Participants with insomnia syndrome reported significantly more hours (91.33) of lost productivity in the past three months than participants in the SYMPT group (32.32) or the GS group (21.28), $F(2, 923) = 16.16$, $p < .001$; Table 5.

Cost of insomnia-related lost productivity. After adjusting for the estimated contribution of insomnia to productivity deficits (GS = 29.9%, SYMPT = 36.7%, and SYND = 54.1%), it was found that participants in the insomnia syndrome group experienced 49.39 hours of insomnia-related reduced productivity in a three-month period. This compares to 11.86 hours for the SYMPT group and 6.36 hours in the GS group (see Table 5). Extrapolating from these figures, the annual estimate of insomnia-related lost productivity was found to be 24.7 days per year for individuals with insomnia syndrome, 5.9 days per year for those with symptoms and 3.2 days annually for good sleepers. This translates into 21.5 more such days annually for insomnia syndrome participants than good sleepers, or a ratio of about 8 days of reduced productivity to 1.

As with absenteeism, these hours can be expressed in terms of monetary losses. Good sleepers lost an average of $356 per three months due to lost productivity, participants with insomnia symptoms lost an estimated $585, and the most severely impaired sleepers lost an average of $1,572. The perceived proportional contribution of insomnia to these productivity deficits was 29.9%, 36.7% and 54.1%, for the three groups in order of increasing insomnia severity. These figures were used to adjust overall reported productivity losses downward. Resulting estimates of three-month per-person productivity costs resulting from insomnia were $74 for the GS group, $215 for the SYMPT group and $850 for the SYND group. Over the year this adds up to $426 per good sleeper, $860 per person with insomnia symptoms and $3,403 for individuals with insomnia syndrome. The provincial annual estimate of the indirect cost of insomnia in terms of productivity losses is thus $4.7 billion (see Table 3), or 77% of all insomnia costs.

Multiple linear regression revealed six variables to be associated with lost productivity costs: female gender (t = -1.96, p < .002), negative life events (t = 4.101, p < .001), poor physical health (t = -2.373, p < .009), poor sleep (t = 1.798, p < .003), elevated scores on the BDI (t = 2.415, p < .005), and younger age (t = -1.608, p < .005), $F(12,861)$ = 9.922, p < .001.

Accidents

Motor vehicle accidents. Thirty-four participants reported having experienced a motor vehicle accident in the previous six months. No significant group differences were detected. Of the thirty-three accidents, seventeen insurance claims were filed and sixteen received financial compensation ranging between $600 and $8,000. When asked whether they believed insomnia or its consequences had played a contributing role in the occurrence of the accident, 8 (23.5%) reported seeing a link: none of the participants from the SYND group saw a link, compared to 2 (20%) participants from the SYMPT group and 6 (33.3%) participants from the GS group. Differences were not significant. When asked to rate the strength of the link between insomnia and their accident on a scale of 0 to 10, all participants circled the number 5 or higher (one participant circled 5, 2 participants circled 6, 3 participants circled 8 and 2 participants circled 10). Given the small number of accident cases and the heterogeneity of compensation amounts involved, it was deemed unwise to try to generate further estimates for the province.

Other accidents. Individuals in the SYND group were almost twice as likely to have experienced other types of accidents as compared to good sleepers (*OR*: 2.43). Of the seventy-five accidents, fourteen insurance claims were laid and nine of those were awarded financial compensation. Compensation settlements ranged between $100 and $4,240. When asked whether they believed insomnia or its consequences had played a contributing role in the occurrence of the accident, 38.7% reported seeing a link: four participants (25%) in the SYND group responded affirmatively, as compared to 10 participants (37%) in the SYMPT group and 15 (46.9%) participants in the GS group. Differences were not significant. When asked to rate the strength of the link between insomnia and their accident on a scale of 0 to 10, seventy-nine percent of participants circled a 5 or higher.

Four (14%) of those circled the number 8 and 5 (17%) circled the number 10. Once again, given the small number of accident cases and the heterogeneity of compensation amounts involved, no cost estimates were produced.

Discussion

The purpose of this study was to estimate the direct and indirect costs of insomnia to society. Direct costs considered were those resulting from consultations (and related transportation) associated with insomnia, hospitalisations, prescription medications, OTC products, and alcohol consumed to improve sleep. Indirect costs estimated were those related to absenteeism, reduced productivity and accidents. In order to estimate these costs, target outcome variables were measured using a questionnaire administered to 956 French-speaking adults in the province of Quebec, Canada.

It was found that the total provincial annual costs associated with this sleep disorder are in the order of $6.3 billion, which is the equivalent of just more than 1% (0.013) of Quebec's $228.5 billion in gross domestic product (GDP) for 2002. This figure combines costs estimated for consultations ($205.4 million) with transportation costs associated with insomnia consultations ($139 million), prescription ($17.3 million) and over-the-counter products ($2.1 million), alcohol used as a sleep aid ($356 million), insomnia-related absenteeism ($725 million) and insomnia-related reduced productivity ($4.7 billion). Hospitalisation and accidents costs could not be estimated due to very low incidence rates observed in the sample. The cost table can also be interpreted in such a way as to produce annual per person insomnia-related costs to society, according to insomnia category. Individuals with insomnia syndrome cost an average of $4,394 per year ($466 in direct costs and $3,927 in indirect costs); individuals with insomnia symptoms cost, on average, $1,302 annually ($260 in direct costs and $1,042 in indirect costs); and good sleepers, despite having few or no insomnia symptoms, still cost an average of $603 per person annually ($138 in direct costs and $465 in indirect costs).

It is difficult to compare the present findings with the results of other research because few data exist, the data are predominantly American, and the data collection

methodologies are different. Previous studies (e.g., Chilcott & Shapiro, 1996; Stoller, 1994; Walsh & Engelhardt, 1999) have estimated costs using large databases, prevalence rate data and a combination of information from a variety of sources. The present study used a questionnaire to identify target behaviour frequencies for individual participants, then multiplied these frequencies by predetermined unit costs to obtain annual cost estimates. There are advantages and disadvantages to each approach. The individualistic approach used in the present study allows for a more sensitive analysis of actual behaviours, such as reasons for consulting, actual consumption of prescribed medications, specific health problems targeted by specific prescriptions, and the perceived proportional contribution of insomnia to absences, reduced productivity and accidents. In addition, survey methodology allows for closer investigation of insomnia symptoms which in turn permits the formation of insomnia status groups that differ along a continuum of insomnia severity. This allows for the examination of a possible linear relationship between costs and insomnia severity as well as the linking of individuals and their other characteristics to outcomes. The major disadvantage of the survey methodology, which is avoided when using large databases, is the risk inherent in self-report measures that may result in bias and recall error. The negative impact this may have on validity and reliability may be substantial and warrants further comparative investigation (Clarke, Ricketts & McHugo, 1996; Evans & Crawford, 1999; Rhodes & Fung, 2004; Rhodes, Lin & Mustard, 2002; Simon & VonKorff, 1995).

In an attempt to avoid overestimating insomnia-related consultation and transportation costs, self-report data distinguished between consultations that were completely, partially or not motivated by insomnia. The case of partial association must be considered when calculating costs due to insomnia, as time allotted during the consultation to discuss insomnia symptoms and consequences and to properly diagnose the disorder, while seemingly negligible, has an economic value. Three and a half percent of all consultations were found to be motivated by insomnia, with 22% of respondents reporting having discussed insomnia during an appointment with a health care professional, but not as a primary complaint. These figures resemble those reported by Dement (1992), who found that 5% of patients with insomnia visit their doctor specifically for that problem,

while about 26% mention it in the course of a consultation for another problem. The difference of 10% across the two studies likely reflects variations in insomnia definition. The annual cost associated with insomnia-driven consultations was estimated at $82.1 million, with $123.3 million associated with the diagnosis and treatment of insomnia in the context of a health care visit for another health problem. If we compare proportions of combined direct and indirect costs between this study and the Walsh and Engelhardt study, including only variables that were measured in both studies (i.e., consultations, prescription medications, OTC products, alcohol, absences and reduced productivity), consultations are found to constitute 3% of all direct costs in this study, as compared to 18% in the Walsh and Engelhardt study (1999). The difference is likely due to the higher proportions of costs attributed to decreased work function and alcohol use in the present study (see below). In addition, in Quebec, direct costs represent predominantly administrative costs. Salaries and capital costs in the Quebec health care system are relatively low, given the centralization of the system.

Transportation costs represent significant expenditures that are often overlooked in the existing literature. This may be due to the tendency to use databases and known prevalence rates to estimate costs. A survey approach is required to obtain the necessary information on distances travelled and transportation mode that is essential to estimating associated costs with any accuracy. Disregard of this dimension of direct costs will likely lead to significant underestimation of the costs of any disorder. In the present study, insomnia-related transportation costs comprised 17% of all direct costs measured and 2% of all direct and indirect costs combined. While this may appear minor in the grander scheme of things, it still amounts to just over $119 million annually.

Prescription medication use for insomnia was reported by 3.6% of all participants, regardless of insomnia status. This figure is almost identical to that identified by Ohayon and Caulet (1996) in their study comparing insomnia medication trends in a French and a Quebec sample; while 9.9% of the French cohort reported using prescription medication for sleep, 3.8% of the Quebec sample did. In the present study, 16.5% of people with insomnia syndrome and insomnia symptoms had used prescription sleep medications in the prior

three months. These results are very similar to results from a Gallup (1991) survey of Americans that revealed that of those with insomnia, 20% had taken a prescription medication to help them sleep. This represents a significant proportion of the insomnia population and warrants further investigation because of the potential long term risks and costs associated with prolonged hypnotic medication use. The cost of sleep medications was estimated at $17.3 million annually, an amount which comprises a very small proportion of overall direct costs (< 1%). We also identified significantly higher rates of antidepressant and anxiolytic use in individuals with insomnia syndrome, but did not attempt to factor out a proportion of those costs which may be due to insomnia – an important area for future research. This therefore likely contributes to an underestimation of overall medication costs.

Little is known about OTC product use for insomnia other than the fact that their efficacy has yet to be empirically demonstrated and that their use is often associated with undesirable daytime effects such as sedation (Balter & Uhlenhuth, 1991). Prevalence rates identified for OTC use were similar to rates for prescription insomnia medication use. Expenditures on OTC products, however, are considerably lower than expenditures on prescription medications; they comprise less than 1% of all costs associated with insomnia and represent the smallest expenditure total of all outcome measures. Many participants report using products such as Tylenol, antihistamines and herbal teas to aid sleep. Compared to prescription medications and alcohol, the unit cost of these products is significantly lower, explaining the relatively low overall cost.

In the present study, 8% of the entire sample had consumed alcohol in an effort to facilitate sleep, regardless of sleep status, during the three-month reference period. About 28% of participants with either insomnia syndrome or insomnia symptoms used alcohol for its sedating effects. This figure is identical to the 28% reported in the *Wake Up America* study conducted by the NIH (1994). While more people in the insomnia syndrome group reported having consumed alcohol as a sleep aid than in the other groups, this did not translate into higher costs for this group. Alcohol unit costs are very high. An individual who takes .5 mg of Ativan three times a week will spend about $0.66 per week (one tablet

is $0.22). An individual who consumes three beers with the goal of improving sleep onset or quality will spend $6.81 ($3 x $2.27), or 10.32 times more money for this choice of sleep aid. In a sample the size of the one in this study, it would only take a few participants with excessive or abusive alcohol consumption to significantly raise the total cost for one of the groups.

The present findings are similar to those of another study that revealed that individuals with occasional insomnia consume alcohol as a sleep aid an average of 3.6 times a week while those with chronic insomnia complaints do so 6.8 times per week (Ancoli-Israel & Roth, 1999). The reason for the higher rate of consumption in the SYMPT group is unclear. Perhaps individuals with insomnia syndrome are more likely to use prescription medications due to the greater severity of their symptoms. With the prevalence of DSM-IV defined alcohol abuse being around 7.4% (Grant et al., 1992), we can expect, in a sample of 965, to have about 70 individuals who engage in excessive or abusive drinking. The current survey methodology could not control for the possibility that the distribution of these individuals across insomnia status groups may be unequal. Furthermore, the fact that the comorbidity rate of alcohol abuse and mental disorders is elevated may also help explain these high alcohol use rates (Kessler, Nelson, & McGonagle, 1996).

Costs associated with alcohol consumption as a sleep aid represent a considerably higher proportion of overall costs than has been estimated in other studies (6% here, versus 1% identified by Walsh and Engelhardt). This is probably due to our use of self-report data that may provide more precise estimates. To compare, Chilcott and Shapiro (1996) used prevalence data relating to alcohol used as a sleep aid from the *Wake up America: A national sleep alert* study (NIH; 1994). They estimated that $574.6 million is spent annually on alcohol by multiplying a 6% rate of alcohol use by an estimate of $1.00 per week. This is likely a considerable underestimation. The methods used in this study rendered an estimate for a single province of Canada that is approximately one half of the *national* estimate for the U.S. Alcohol use is a very costly method of inducing sleep. An individual consuming three glasses of wine a week will spend about $9.30, while an

individual taking a sleep medication three times a week may spend between, for example, $1.77 and $2.94 for Imovane (5 mg and 7.5 mg, respectively), $1.17 and $1.35 for Restoril (15 mg and 30 mg, respectively), and under $1.00 for most dosages of Ativan. Not only does alcohol consumption alter nightly sleep architecture, but there are also obvious risks of dependence and abuse associated with its use.

Monetary costs associated with insomnia-related absenteeism and reduced productivity ($5.5 billion) represent the largest portion of the total of direct and indirect costs combined: about 89%. Stoller's (1994) estimate of these indirect costs is similar, but lower: 77%. This may be due to Stoller's use of a non representative Navy sample, or to other costing differences. Both of these figures highlight the far-reaching and costly impact of insomnia on the economy and on the individual, above and beyond health cost measures typically considered in cost discussions (i.e., medication and consultation expenses). A significant proportion of work-function difficulties appear to be due to fatigue. The link between this self-reported fatigue, insomnia and impaired work function will require further investigation.

Each person with insomnia syndrome is estimated to cost society $524 a year in work-related absences and $3,403 in reduced productivity as a result of their sleep problems. This last figure is very close to Chilcott and Shapiro's per person annual lost productivity estimate of $3,000 (1996). People generally classified as good sleepers may nonetheless have episodes of poor sleep which have economic repercussions: even good sleepers are estimated to cost $38.56 in insomnia-related absences and $426.44 in insomnia-related lost productivity annually. These figures are *fractions* of overall absenteeism and productivity costs as they have been adjusted downward to reflect the proportional role insomnia plays; they are therefore believed to better reflect the real cost of insomnia in these overall costs than figures proposed elsewhere (e.g., Stoller, 1994; Walsh & Engelhardt, 1999). Despite this conservative approach, absenteeism is still estimated to comprise 12% of overall direct and indirect insomnia costs. Direct comparison with other studies is difficult, but we can nonetheless attempt to do so. Stoller (1994) estimated direct insomnia costs to be between $77 and $92 billion. If we subtract

from $92 billion the $8.5 to 11.6 billion for insomnia-related alcohol use, the $1 billion for insomnia-related depression and the $26 to $39 billion for insomnia-related accidents, we are not far from $55 billion, which is about ten times greater than our provincial estimate of $5.5 billion. As far as typical U.S.-Canada comparisons go, this is an entirely plausible figure.

Chronic insomnia has been reported to be responsible for motor vehicle accident rates that are two to three times higher than in the general population (Schweitzer et al., 1992; Shapiro and Dement, 1993). A similar relationship has been identified for work-related accidents (Balter & Uhlenhuth, 1992; Leger, 1994; Stoller, 1994; Webb, 1995) and larger-scale catastrophes. Motor vehicle and other types of accidents, however, are relatively infrequent occurrences and the methodology of the present study did not permit the estimation of associated costs. The current study did, however, identify a significant perceived link between accidents and insomnia or its consequences. Future research should be particularly careful to distinguish between accidents associated with fatigue (which could be due to other sleep disorders such as apnea, narcolepsy or other parasomnias, or indeed to other reasons) and with insomnia syndrome and symptoms. This distinction will remain an important one in identifying the relative role of different pathologies in accident rates and costs.

This study offers a number of contributions to the literature. First, it attempted to employ a standardized and conservative algorithm to make a distinction between good sleepers, individuals with insomnia symptoms and individuals meeting stricter diagnostic criteria for insomnia syndrome. The existing cost research typically uses multipliers based on prevalence rates based on more liberal criteria. This differentiation also allows for determining if impact and costs are present as a function of increasing insomnia symptomatology and allows the identification of consumption patterns that may be sensitive to variations in sleep status in something other than a dichotomous fashion. Second, we attempted to be careful when identifying burden-of-illness indicators, including only the consultation, transportation, medication/OTC product, alcohol and work function costs identified as being *due to* insomnia. Third, we attempted to apportion insomnia's

contribution to absenteeism and productivity losses. Stoller (1994), when describing her use of work performance decrement data to generate estimates, admits to working under the assumption that all of the lost income is a consequence of insomnia and not some other variable. This is an unlikely assumption, given our understanding of the high comorbidity levels that exist between insomnia, depression, anxiety, and physical illnesses such as chronic pain and cancer. Finally, the sampling methods and selection criteria used in this study were systematic and inclusive, increasing the external validity.

The most important limit of this study may be its self-report methodology. Studies have shown that while accuracy of recall increases with shorter reference periods (e.g., one week), the benefits observed in terms of short-term accuracy are at the expense of accuracy when trying to extrapolate to longer periods of time (e.g., one year). Based on recommendations found in the literature, a three-month reference period was adopted for most recall items to maximize the trade-off on these two points (Conrad, Brown, & Cashman, 1998; Friedman, 1993). For certain measures, participants may be asked questions to which they have difficulty responding; for example, in order to calculate transportation costs, participants were asked to provide estimates of the distance travelled for their appointments. It is not clear whether or not this can be done in a reliable and accurate way (no research on estimating distances was found). Self-report issues specific to insomnia research also exist; research suggests that, on average, individuals with insomnia make predictable errors when estimating the nature of their sleep difficulties. More precisely, they tend to overestimate the time it takes them to fall asleep and underestimate the total time they spend asleep (Bonnet, 1990; Edinger and Fins, 1995). It is unclear whether such misperception tendencies generalize to other relevant measures such as the use of sleep aids or the frequency of consultations related to sleep difficulties.

A second limitation involves the fact that the techniques used to estimate productivity have not been validated. However, unless dealing with assembly-line style occupations where work productivity measures can be obtained by counting output units, it is challenging to measure productivity decreases. A contribution of the present study was its attempt to apportion productivity losses rather than assume that any and all reduced

productivity can be attributed to insomnia. A third limitation concerns sample size: while the sample size was sufficient to study costs of relatively frequently occurring events such as consultations, medication use or work-related events, it was too small to allow valid conclusions to be drawn regarding less frequent events such as accidents and hospitalisations.

More insomnia burden-of-illness research is necessary. We are just beginning to understand where and how the economic impact of this disorder is felt. In the future, it will be important to attempt to distinguish between primary and secondary insomnia; methods of apportioning the contribution of insomnia in cases where it is secondary to other disorders will need to be developed, perhaps using already-existing odds ratio data. This is especially important, and difficult, when trying to assess what now appear to be the areas of most consequential economic impact: work function. Not adjusting for the contribution of coexisting physical and psychological disorders will lead to exaggeration of these costs. The adoption of more standardized methods of defining insomnia, counting frequencies of target variables and identifying unit costs will also be important if cross-study comparisons are to be undertaken. The use of large samples, preferably population-based, will increase generalizability and allow investigation of infrequent occurrences such as accidents and hospitalisations. Finally, it is time to conduct true cost-effectiveness research where units of improvement in insomnia symptomatology are assigned a dollar value. This way, dialogue will be possible regarding the best treatments to offer and their comparative costs. Continued development of effective, affordable interventions will reduce individuals' reliance on the health care system, reduce the negative consequences of insomnia in terms of occupational function and thereby reduce the economic burden on society.

References

American Sleep Disorders Association (2000). International classification of sleep disorders: Diagnostic and coding manual, 2nd ed. Rochester, MN: The American Academy of Sleep Medicine.

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders. 4th ed., text revision. Washington DC: American Psychiatric Association.

Ancoli-Israel, S., & Roth, T. (1999). Characteristics of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. *Sleep, 22*(Suppl 2):S347-S353.

Balter, M. B., & Uhlenhuth, E. H. (1992). New epidemiologic findings about insomnia and its treatment. *Journal of Clinical Psychiatry, 53*(Suppl 34-39), discussion 40-32.

Bastien, C. H., Vallières, A., & Morin, C. M. (2001). Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Medicine*, *2*, 297 307.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory,* 2nd ed. San Antonio, TX: The Psychological Corporation.

Beck, A.T., Steer, R.A., & Brown, G.K. (1998). *Manuel de l'inventaire de dépression de Beck*, second edition. Toronto: The Psychological Corporation.

Bixler, E. O., Kales, A., Soldatos, C. R., Kales, J. D., & Healey, S. (1979). Prevalence of sleep disorders in the Los Angeles metropolitan area. *American Journal of Psychiatry, 136,* 1257–1262.

Blais, F. C., Gendron, L., Mimeault, V., & Morin, C. M. (1997). Évaluation de l'insomnie: validation de trois questionnaires. *L'Encéphale, 23*, 447-453.

Bonnet, M. H. (1990). The perception of sleep onset in insomniacs and normal sleepers. In R. R. Bootzin, J. F. Kihlstrom, & D. L. Schacter (Eds.), *Sleep and cognition* (pp. 148 158). Washington DC: American Psychological Association.

Buysse, D.J., Reynolds, C.F., Monk, T.H., Berman, S.R., & Kupfer, D.J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Research, 28*, 193-213.

Chilcott, L. A., Shapiro, C. M. (1996). The socioeconomic impact of insomnia. An overview. *Pharmacoeconomics, 10*(Suppl 1), 1-14.

Clarke, R.E., Ricketts, S.K., & McHugo, G.J. (1996). Measuring hospital use without claims: a comparison of patient and provider reports. *Health Services Research*, 31(2): 153-169 (Abstracted in *The American Journal of Managed Care*, 2(10): 1310, 1996.).

Conrad, F.G., Brown, N. R. & Cashman, E. R. (1998). Strategies for estimating behavioural frequency in survey interviews. *Memory, 6*, 339-366.

Costa, P, & McCrae, R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI): professional manual.* Odessa, FL: Psychological Assessment Resources.

Daley, M., Morin, C., LeBlanc, M, Grégoire, J.P., Savard, J., & Baillargeon (2007). Insomnia and its relationship to health care utilization, accidents and job function. In preparation.

Drummond, M. F., & McGuire, A. (2001). *Economic Evaluation in Health Care,* Oxford: Oxford University Press.

DuPont, R. L., DuPont, C. M., & Rice, D. R. (2002). The economic costs of anxiety disorders. In D.J. Stein & E. Hollander E. (Eds.). *Textbook for Anxiety Disorders.*

Washington DC: American Psychiatric Press Inc.
Edinger, J. D., & Fins, A. I. (1995). The distribution and clinical significance of sleeptime misperceptions among insomniacs. *Sleep, 18*, 232–239.
Evans, C., & Crawford, B. (1999). Patient self-reports in pharmacoeconomic studies. Their use and impact on study validity. *Pharmacoeconomics, 15,* 241-56.
Ford, D. E. & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *Journal of the American Medical Association, 262*, 479-1484.
Friedman, W.J. (1993). Memory for the time of past events. *Psychological Bulletin, 35*, 44-66.
Gallup Organization. Sleep in America. Princeton, NJ: The Gallup Organization; 1991.
Gallup Organization (1995). Sleep in America. Princeton, NJ: The Gallup Organization.
Gauthier, J., & Bouchard, S. (1993). Adaptation canadienne-française de la forme révisée du State-Trait Anxiety Inventory de Spielberger. *Canadian Journal of Behavioural Sciences, 25,* 559- 578.
Gerard, K., Donaldson, C., & Maynard, A.K. (1989). The cost of diabetes. *Diabetic Medicine, 6,* 164-170.
Godet-Cayre, V., Pelletier-Fleury, N., Le Vaillant, M., Dinet, J., Massuel, M. A., & Leger, D. (2006). Insomnia and absenteeism at work. Who pays the cost? *Sleep, 29(2),* 179 84.
Gold, M.L., Siegel, J.E., Russell, L.B., & Weinstein, M.C. (1996). *Cost-Effectiveness in Health and Medicine*. New York: Oxford University Press.
Grant, B.F., Harford, T.C., Dawson, D.A., Chou, S.P., Dufour, M., & Pickering, R.P. (1992). Prevalence of DSM-IV alcohol abuse and
Hillman, D.R., Murphy, S.X., Antic, R., Pezzullo, L. (2006). The Economic Cost of
Johnson, L. C., & Spinweber, C. L. (1983). Good and poor sleepers differ in Navy performance. *Military Medicine, 148*, 727-731.
Kales, J. D., Kales, A., Bixler, E. O., Soldatos, C. R., Cadieux, R. J., Kashurba G. J., & Vela- Bueno, A. (1984). Biopsychobehavioral correlates of insomnia, V : Clinical characteristics and clinical correlates. *American Journal of Psychiatry, 141*, 1371-1376.
Kapur, V.K., Redline, S., Nieto, F.J., Young, T.B., Newman, A.B., & Henderson, J.A. (2002). The relationship between chronically disrupted sleep and healthcare use. *Sleep, 25*(3), 289-96.
Kessler, R.C., McGonagle, K.A. and S. Zhao S. et al. (1994). Lifetime and 12 month prevalence of DSM-111-R psychiatric disorders in the United States. *Archives of General Psychiatry*. 51: 8-19.
Kish, L. (1965). *Survey Sampling.* New York: Wiley.
Krahn, M., Berka, C., Langlois, P., & Detsky, A.S. (1996). Direct and indirect costs of asthma in Canada. *Canadian Medical Association Journal, 154*, 821S31.
Kupperman, M., Lubeck, D. P., Mazonson, P. D., et al. (1995). Sleep problems and their correlates in a working population. *Journal of General Internal Medicine, 10*, 25-32.
Leigh, J. P. (1991). Employee and job attributes as predictors of absenteeism in a national sample of workers: the importance of health and dangerous working conditions. *Social Science and Medicine, 33*, 127-137.
Leger, D. (1994). The cost of sleep-related accidents: A report for the National Commission on Sleep Disorders Research. *Sleep, 17*, 84-93.

Leger, D., Levy, E., & Paillard, M. (1999). The direct costs of insomnia in France. *Sleep, 22,* (Suppl 2):S394-401.

Leger, D., Massuel, M.-A., & Metlaine, A. (2006). Professional correlates of insomnia. *Sleep, 29 (2),* 171-178.

Leplège, A., Ecosse, E., Pouchot, J., Coste, J., Perneger, T. (2000). Manuel de l'utilisateur et guide d'interprétation des scores du MOS SF-36. Éditions Estem.

Linton, S.J., & Bryngelsson, I. (2000). Insomnia and its relationship to work and health in a working-age population. *Journal of Occupational Rehabilitation, 10*(2), 169-183.

Morin, C.M. (1993). *Insomnia: Psychological Assessment and Management*. New York: Guilford Press.

Morin, C. M., LeBlanc, M., Daley, M., Grégoire, J. P., & Mérette, C. (2006). Epidemiology of insomnia: Prevalence, self-help treatments and consultations initiated, and determinants of help-seeking behaviors. *Sleep Medicine*, 2006.

Ohayon, M. M. (2002). Epidemiology of insomnia: What we know and what we still need to learn. *Sleep Medicine Review, 6*, 97-111.

Ohayon, M.M., & Caulet, M. (1996). Psychotropic medication and insomnia complaints in two epidemiological studies. *Canadian Journal of Psychiatry, 41*, 457-464.

Ozminkowski, R. J., Shaohung S. W., & Walsh, J. K. (2007). The direct and indirect costs of untreated insomnia in adults in the United States. *Sleep, 30* (*3*), 263-273.

National Institutes of Health (1994). Wake up America: A national sleep alert. Vol. 2. Working groups reports. Report of the national commission on sleep disorders research. Washington DC, US Government Printing Office.

Rhodes, A.E., Fung, K. (2004). Self-Reported Use of Mental Health Services vs. Administrative Records: Care to Recall? *The International Journal of Methods in Psychiatric Research, 13*(3),165-175, 2004.

Rhodes, A.E., Lin, E., & Mustard C.A. (2002). Self-Reported Use of Mental Health Services vs. Administrative Records: Should We Care? *The International Journal of Methods in Psychiatric Research. 11*(3), 125-133, 2002.

Rice, D.P., & Miller, L.S. (1995). The economic burden of affective disorders. *British Journal of Psychiatry Supplement, 27*, 34–42.

Sanford, J. R. (1975). Tolerance of debility in elderly dependants by supporters at home: its significance for hospital practice. *British Medical Journal, 3*(5981), 471-473.

Sarason, I. G., Johnson, J. H., & Siegel, J. M. (1978). Assessing the impact of life changes: Development of the Life Experiences Survey. *Journal of Consulting and Clinical Psychology, 46,* 932-946.

Schweitzer, P. K., Engelhardt, C. L., Hilliker, N. A., Muehlbach, M. J., & Walsh, J. K. (1992). Consequences of reported poor sleep. *Journal of Sleep Research, 21*, 260.

Simon, G.E., & VonKorff, M. (1997). Prevalence, burden, and treatment of insomnia in primary care. *American Journal of Psychiatry, 154*, 1417-1423.

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory.* Palo Alto, CA: Consulting Psychologists Press.

Speilberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *State-trait anxiety inventory. Test manual for form X.* Palo Alto, CA: Consulting Psychologists Press.

Stoller, M. K. (1994). Economic effects of insomnia. *Clinical Therapy, 16*, 873-897.

Taylor, T. N., Davis, P. H., James M. D., Torner, C., Holmes, J., Meyer, J. W., & Jacobson, M. F. (1996). Liftime cost of stroke in the United States. *Stroke, 27*, 1459-1466.

Thompson, S.G., & Barber, J.A. (2000). How should cost data in randomised controlled

trials be analysed? *British Medical Journal* , 320, 1197-1200, 2000.
Tourangeau, R., Rips, L.J., & Rasinski, K. (2000). *The Psychology of Survey Response*. Cambridge, UK: Cambridge University Press.
Walsh, J.K., & Engelhardt, C.L. (1999). The direct economic costs of insomnia in the United States for 1995. *Sleep, 22*(Suppl 2):S386-393.
Walsh, J.K., Engelhardt, C.L., Hartman, P.G. (1995). The direct economic cost of insomnia. In D. Nutt and W. Mendelson (Eds.), *Hypnotics and anxiolytics*. London: Baillere Tindall, 369-381.
Ware, J.E., Gandek, B., Keller, S.D. (1996). The IQOLA Project Group. Evaluating instruments used cross-nationally: methods from the IQOLA Project. In: Spilker B Ed. *Quality of Life and Pharmacoeconomics in Clinical Trials. Second Edition edition.* New York: Raven Press.
Ware, J.E., & Sherbourne, C.D. (1992). The MOS 36-item short-form Health Status Survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30,* 473 483.
Ware, J. E., Snow, K. K., Kosinski, M., & Gandek, B. (1993). SF-36 Health Survey manual and interpretation guide. Boston, MA: The Health Institute, New England Medical Center.
Webb, W.B. (1995). The cost of sleep-related accidents: A reanalysis. *Sleep, 18*, 276-80.

Table 1. Sociodemographic characteristics expressed as proportions of participants in each category (N = 956)

Variable	Good Sleepers (GS) (n = 508) % (n)	Symptoms (SYMPT) (n = 295) % (n)	Syndrome (SYND) (n = 153) % (n)	Total (n = 956) % (n)	X^2	Sig.
Age (mean in years)	43.13 (sd = 14.01)	43.83 (sd = 14.17)	45.87 (sd = 13.89)		2.82 (F-value)	.11
Gender						
Male	40.2 (204)	44.1 (130)	30.1 (46)	39.7 (380)	10.13 (*df* = 4)	.04
Female	59.4 (302)	55.9 (165)	69.9 (107)	60 (574)		
Marital Status						
Single	24.0 (121)	25.9 (76)	24.2 (37)	24.6 (234)	4.32 (*df* = 6)	.63
Married	59.5 (300)	58.0 (170)	53.6 (82)	58.1 (552)		
Divorced/Separated	12.5 (63)	12.6 (37)	18.3 (28)	13.5 (128)		
Widowed/Widower	4.0 (20)	3.4 (10)	3.9 (6)	3.8 (36)		
Education						
Primary or less	4.5 (23)	4.4 (13)	5.9 (9)	4.7 (45)	12.36 (*df* = 14)	.77
Secondary	29.8 (151)	32.9 (97)	36.6 (56)	31.9 (304)		
Professional diploma	13.6 (69)	10.2 (30)	13.7 (21)	12.6 (120)		
General college	8.5 (43)	10.5 (31)	8.5 (13)	9.1 (87)		
Professional college	13.4 (68)	12.9 (38)	13.7 (21)	13.3 (127)		
BA	21.1 (107)	20.0 (59)	17.6 (27)	20.2 (193)		
Graduate studies	7.3 (37)	8.5 (25)	3.9 (6)	7.1 (68)		
Other	1.6 (8)	.7 (2)	0.0 (0)	1.0 (10)		
Work type						
Full time	56.3 (284)	57.8 (167)	50.7 (77)	55.9 (528)	13.06 (*df* = 14)	.52
Part time	11.1 (56)	8.7 (25)	9.9 (15)	10.2 (96)		
Not working	3.0 (15)	4.2 (12)	4.6 (7)	3.6 (34)		
Homemaker	5.2 (26)	6.6 (19)	7.2 (11)	5.9 (56)		
Full time student	6.2 (31)	3.5 (10)	3.9 (6)	5.0 (47)		
Study + work	3.4 (17)	3.1 (9)	2.0 (3)	3.1 (29)		
Retired	12.5 (63)	12.5 (36)	16.4 (25)	13.1 (124)		
Other	2.4 (12)	3.8 (11)	5.3 (8)	3.3 (31)		
Work schedule [for n = 687 (28.1% = N/A]						
Day	78.4 (294)	77.5 (165)	66.7 (66)	76.4 (525)	10.74 (*df* = 8)	.22
Evening	2.4 (9)	3.3 (7)	6.1 (6)	3.2 (22)		
Night	2.4 (9)	2.3 (5)	2.0 (2)	2.3 (16)		
Rotating	7.2 (27)	5.2 (11)	7.1 (7)	6.6 (45)		
Other	9.6 (36)	11.7 (25)	18.2 (18)	11.5 (79)		
Income (thousands)						
< $15	10.2 (51)	9.7 (28)	16.6 (25)	11.0 (104)	17.13 (*df* = 10)	.07
$15 – $30	20.6 (103)	18.6 (54)	24.5 (37)	20.6 (194)		
$31 – $45	17.4 (87)	22.4 (65)	20.5 (31)	19.4 (183)		
$46 – $60	18.0 (90)	17.9 (52)	15.9 (24)	17.6 (166)		
> $60	29.5 (148)	25.5 (74)	17.2 (26)	26.3 (248)		
No response	4.4 (22)	5.9 (17)	5.3 (8)	5.0 (47)		

Note. Some percentages may not add to 100% or total n's to 956 due to missing data. No categories had missing data that exceeded 1.5%.

Mean global three-month health-care costs (Cdn$) according to professional and diagnostic categories (n = 956, df = 2)

Category	GS (n = 508) M	SYMPT (n = 295) M	SYND (n = 153) M	F	p value
Professionals consulted: RAMQ-reimbursed					
General practitioners	22.45_a	27.97_b	48.02_c	21.71	.000
Psychiatrists	0.12_a	0.18_a	1.75_b	5.63	.004
Other specialists	12.29_a	23.25_b	35.56_c	9.42	.000
Professionals consulted: Non-RAMQ reimbursed (survey)					
Overall	96.59_a	121.43_b	240.30_c	17.82	.000
Psychologists	11.47_a	12.35_a	55.68_b	12.06	.000
Physiotherapists	18.29_a	8.84_b	49.05_c	2.70	.052
Acupuncturists	0.77_a	6.95_b	7.80_b	3.34	.036
Pharmacists	5.76_a	10.51_b	11.87_b	9.16	.000
Nurses	1.81	2.51	4.39	0.49	.613
Social Workers	1.81	2.51	4.39	0.60	.550
Chiropractor	5.82	9.12	8.65	0.81	.446
Massage Therapists	8.22	10.81	11.15	0.45	.639
Homeopaths	0.65	1.60	3.51	3.59	.028
Other	7.57	5.61	0.81	0.91	.404
Consultation motives					
Motive: insomnia	1.79_a	3.85_b	14.51_c	7.08	.001
Motive: insomnia secondary	18.03_a	21.23_a	106.62_b	15.65	.000
Motive: not insomnia	72.87_a	91.46_b	113.29_c	3.02	.049
Diagnoses received					
Mental disorders	4.30_a	7.86_b	14.11_c	6.515	.002
Bone/muscle	5.12_a	9.87_b	19.25_c	5.352	.005
Signs and symptoms	5.80_a	7.53_b	10.43_c	3.133	.044

Note. Means with different subscripts differ significantly from each other using Games Howell post hoc test ($p < .05$). GS = good sleepers, SYMPT = insomnia symptoms, SYND = insomnia syndrome.

Table 3

Three-month and one-year estimates of insomnia costs per person and for Quebec per insomnia category (Cdn$; $N = 956$)

Category	3-month per person M	1-year per person M	Quebec (1 year)	Total
Consultations (insomnia primary motive)				
Good Sleepers ($n = 508$)	$1.79	$7.16	$24,653,996	
Symptoms ($n = 295$)	$3.85	$15.40	$26,152,742	**$82,113,440**
Syndrome ($n = 153$)	$14.51	$58.04	$31,316,700	
Consultations (insomnia secondary motive * 20%)				
Good Sleepers ($n = 508$)	$18.03*20% = $3.60	$14.40	$48,530,775	
Symptoms ($n = 295$)	$21.23*20% = $4.24	$16.96	$28,801,980	**$123,352,767**
Syndrome ($n = 153$)	$106.62*20% =$21.32	$85.29	$46,020,004	
Transportation (for *all* consultations; 5% trimmed mean used)				
Good Sleepers ($n = 508$)	$21.16	$86.84	$264,475,519	
Symptoms ($n = 295$)	$24.66	$98.64	$167,513,407	($544,931,927)
Syndrome ($n = 153$)	$52.33	$209.32	$112,943,001	* .035 for insomnia = **$19,072,617**
				*15.6 for related = **$85,009,380**

Table 3. (cont'd). Three-month and one-year estimates of insomnia costs per person and for Quebec per insomnia category (Cdn$; $N = 956$)

Prescription medications for insomnia				
Good Sleepers ($n = 508$)	$0.48	$1.92	$6,608,446	
Symptoms ($n = 295$)	$0.19	$0.76	$1,290,654	**$17,395,550**
Syndrome ($n = 153$)	$4.40	$17.6	$9,496,449	
Over-the-counter products for insomnia				
Good Sleepers ($n = 508$)	$0.03	$.12	$413,027	
Symptoms ($n = 295$)	$0.07	$0.49	$832,132	**$2,151,640**
Syndrome ($n = 153$)	$0.42	$1.68	$906,479	
Alcohol as a Sleep Aid				
Good Sleepers ($n = 508$)	$6.42	$25.56	$87,974,938	
Symptoms ($n = 295$)	$32.03	$128.12	$217,577,227	**$356,358,170**
Syndrome ($n = 153$)	$23.54	$94.16	$50806005	
Absences (hours due to insomnia)				
Good Sleepers ($n = 508$)	.58 hours	2.32 (.29 days)	998,151 days	
Symptoms ($n = 295$)	2.50 hours	10.0 (1.25 days)	2,122,788 days	41,374,935 (hours)
Syndrome ($n = 153$)	7.60 hours	30.4 (3.8 days)	2,050,370 days	5,171,309 days

Table 3. (cont'd). Three-month and one-year estimates of insomnia costs per person and for Quebec per insomnia category (Cdn$; $N = 956$)

Absences (costs due to insomnia)				
Good Sleepers ($n = 508$)	$9.64	$38.56	$132,719,625	
Symptoms ($n = 295$)	$45.48	$ 181.92	$308,942,001	**$724,526,328**
Syndrome ($n = 153$)	$131.06	$ 524.24	$282,864,901	
Productivity (hours due to insomnia)				
Good Sleepers ($n = 508$)	6.36 hours	25.44 (3.18 days)	10,945,238 days	
Symptoms ($n = 295$)	11.86 hours	47.44 (5.93 days)	10,070,503 days	34,337,748 days
Syndrome ($n = 153$)	49.39 hours	197.56 (24.69 days)	13,322,007 days	
Productivity (costs due to insomnia)				
Good Sleepers ($n = 508$)	$106.61	$426.44	$1,467,763,410	
Symptoms ($n = 295$)	$215.04	$860.16	$1,460,749,517	**$4,764,780,954**
Syndrome ($n = 153$)	$850.80	$3,403.20	$1,836,268,027	
Total				**$6,279,751,933**

Note. Annual unit costs found in column 2 were multiplied by the estimated Quebec prevalence (adult) per category: Good Sleepers = 3,441,899; Symptoms = 1,698,230; Syndrome = 539,571. Only summary numbers in boldface (dollar figures in far right column) are included in total cost calculation.

Table 4

ANOVA analysis of mean costs per person of prescription medications, over-the-counter products and alcohol used as a sleep aid (Cdn$; $N = 956$, $df = 2$)

Category	GS (n = 508) M	SYMPT (n = 295) M	SYND (n = 153) M	F	p value
		Prescription Medications ($)			
Overall	65.37	96.33	90.59	1.32	.267
Insomnia	0.48	0.19	4.40	8.86	.000
Mood	2.11	3.67	10.46	5.62	.004
Anxiety	2.38	2.31	10.53	6.42	.002
		OTC products ($)			
Overall	6.97	13.25	8.65	1.20	.303
Insomnia	.03	.06	0.42	12.03	.000
Anxiety	0.01	0.05	0.40	4.39	.01
		Alcohol used as a sleep aid ($)			
Overall	6.42	32.03	23.54	5.286	.006

Note. GS = good sleepers, SYMPT = insomnia symptoms, SYND = insomnia syndrome.

Table 5

Mean hour and revenue losses (absences and lost productivity) per person per three months due to insomnia (Cdn$, 2002; $N = 956$)

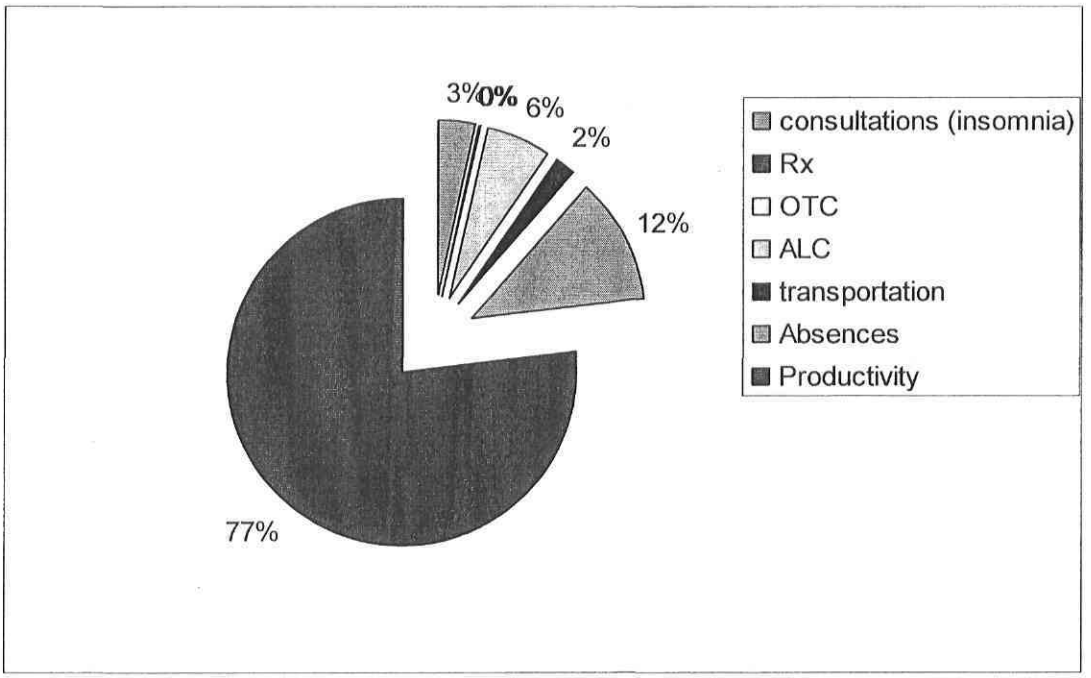
	Total loss		Loss due to insomnia		
Insomnia group	# of hours M	$$$ M	% loss due to insomnia M	# of hours M	$$$ M
Absenteeism					
Good sleepers ($n = 508$)	5.05	$84.58	11.40%	0.58	$9.64
Symptoms ($n = 298$)	11.40	$206.56	22.02%	2.50	$45.48
Syndrome ($n = 153$)	17.40	$299.45	43.77%	7.60	$131.06
Reduced Productivity					
Good sleepers	21.28	$356.58	20.9%	6.36	$74.52
Symptoms	32.32	$585.95	36.70%	11.86	$215.04
Syndrome	91.33	$1572.65	54.01%	9.39	$850.80

Note. All data under the "loss due to insomnia" are extrapolations from the "total loss" columns. Significance levels are reported for the original data, but not for extrapolations.

FIGURES

Figure 1

Estimated proportional contribution of targeted direct and indirect costs to the overall economic burden of insomnia to society



Thesis Conclusion

Insomnia is a prevalent problem that is under diagnosed and under treated. It has serious repercussions on individuals, affecting their quality of life, daytime functioning, and health. The costs to individuals and to society as a whole are therefore substantial. As discussed earlier, the vast majority of individuals with sleep complaints do not consult for their problem. In addition, a significant number of individuals resort to insomnia treatments that have not been validated, including alcohol and OTC substances, some of which are known to have potential deleterious effects if misused. Despite the high prevalence of this disorder and the far reaching implications of its consequence, little is known about its impact, especially in terms of occupational function and the economic burden it poses to society. It is therefore time to increase efforts to collect the data that will provide more accurate and reliable estimates of the economic ramifications of insomnia (NIH, 2005). In 1997, an International Workshop on Sleep and Health that addressed research and clinical perspectives emphasized that there is a paucity of research into the cost of untreated insomnia and the degree to which treatment may reduce these costs (Roth, Costa e Silva & Chase, 2000). This remains true despite the possibility that mental health practitioners and researchers may be reluctant to quantify the impact of insomnia in monetary terms, as much for ethical as for methodological concerns.

The research reported here was undertaken in an attempt to address some of the gaps in the existing research and is submitted in partial fulfilment of the Ph.D in Research and Clinical Psychology at Laval University, Québec. It was presented in the form of three articles which will be summarized here. The goals of the first article were (a) to introduce basic insomnia terminology, including an overview of diagnostic criteria and current treatment options; (b) to introduce the reader to basic health economics terminology, including the different cost analysis models and methods used; (c) to report on cost research that has been conducted in the mental health field; and (d) to discuss the existing research on the direct and indirect costs of insomnia, as well as possible directions for future research. It was concluded that there is much work to be done to understand the economic burden of insomnia to society. Most of the existing studies recycle data from the same national databases and rely on the same set of articles to provide prevalence and other

statistics that are then used in combination with the database figures to generate estimates. New approaches and fresh data are necessary to test the validity of earlier findings and to advance our understanding.

Articles 2 and 3 report the findings of empirical research conducted using a population-based sample of French-speaking adults living in the province of Québec (N = 956). The goals of the second article were (a) to document rates of health problems, health-care use, accidents and problems in work performance as a function of conservatively and clearly operationalized sleep status; (b) to provide a micro analysis of these data based on subtypes of health problems, consultations and medications/products used; (c) to examine the perceived relationship between insomnia and health care services/products used, absences, reduced productivity and accidents by directly measuring participants' perceptions of the link between insomnia and these variables; and (d) to determine the relative contribution of insomnia to all of the dependent variables when compared to sociodemographic variables, mental health status, stressful events, and overall physical health. Results corroborated other studies in the following ways: individuals with insomnia syndrome were found to consult health-care practitioners more frequently and report significantly more chronic health problems than individuals who present with subclinical symptomatology or who have no insomnia symptoms; more individuals with insomnia syndrome reported have used prescription and over-the-counter medications, including a greater *variety* of these products; an important proportion of society uses alcohol as a sleep aid (8%), with use increasing as a function of insomnia severity; an increased likelihood of being absent from work or experiencing reduced work productivity was identified in individuals with insomnia; finally, while motor vehicle accidents were not found to occur more frequently in participants with insomnia, possibly due to insufficient statistical power, other accidents were reported more frequently.

More specifically, this study identified an almost two-fold risk of being absent from work when comparing individuals with insomnia syndrome to good sleepers, and an almost five-fold risk of experiencing periods of productivity reduction. An innovation of this study was its attempt to factor out the relative contribution of insomnia to work function

deficits. It was estimated that individuals with insomnia syndrome are absent an average of 3.8 days a year *because of their sleep difficulties* and that insomnia syndrome is directly responsible for about 25 days in lost productivity annually. The more severe the insomnia, the stronger a link people reported seeing between any work function deficits and sleep problems. This was also true for accidents other than motor-vehicle accidents. Regardless of insomnia status, participants identified fatigue as the second most important explanation for their absences from work and the most important reason for episodes of reduced productivity. In the case of motor vehicle accidents and other types of accidents, participants saw a strong association between fatigue and the occurrence of these accidents. This is an important finding and should be used to nuance our interpretation of other research as well as the design of future studies; while fatigue is frequently experienced by individuals with insomnia syndrome, it can follow acute bouts of insomnia (in the absence of insomnia syndrome) or be associated with a myriad of other life and health realities such as stress and negative life events, depression, chronic pain, alcohol and drug abuse, head injury, prescription medication use, and a number of other sleep disorders, notably obstructive sleep apnea and narcolepsy. After holding other factors constant, such as gender, physical and mental health, and age, we found insomnia syndrome to be associated with greater health-care service utilisation and greater use of prescription and over-the-counter products. It was also associated with use of alcohol as a sleep aid, reduced productivity and, to a lesser extent, absences.

The third article constitutes an attempt to quantify the impact of insomnia in economic terms. It takes the form of a burden-of-illness study with the following objectives: (a) to estimate the direct costs of insomnia in Quebec, including the cost of consultations and hospitalizations for insomnia (and associated transportation), and prescriptions, over-the-counter products and alcohol used as a sleep aid; (b) to estimate the indirect costs of insomnia for the same province, including costs associated with absenteeism, reduced productivity and accidents; and (c) to determine the association between insomnia and expenditures, relative to other factors such as gender, age, marital status, income, overall health, depression, anxiety, negative life events and personality (neuroticism). Data were obtained directly from individuals via questionnaires rather than

from databases. Attempts were made to carefully isolate costs uniquely due to insomnia in order not to overestimate its economic impact, especially as pertains to consultations, absenteeism and reduced productivity.

It was found that the total provincial annual costs associated with this sleep disorder are in the order of $6.3 billion, which is the equivalent of just more than .5% (0.006) of Canada's $951.9 billion in GDP for 2002. This figure combines costs estimated for consultations ($205.4 million) with transportation costs associated with insomnia consultations ($139 million), prescription ($17.3 million) and over-the-counter products ($2.1 million), alcohol used as a sleep aid ($356 million), insomnia-related absenteeism ($725 thousand) and insomnia-related reduced productivity ($4.7 billion). Hospitalisation and accidents costs could not be estimated due to very low incidence rates observed in the sample and the small sample size.

It is difficult to discuss these figures relative to other research, as very little data exist, it is mostly based on the American situation, and the methodologies are dramatically different (utilisation of large databases in the case of the America studies, versus survey research in the present case). That being said, a few comparisons can be made. Current estimates of the cost of insomnia-related absenteeism and reduced productivity, including those advanced by the present study, are quite similar. There appears to be agreement that these indirect costs comprise by far the largest proportion of overall costs: between about 77% (other research) and 89% (present study) of the total cost of insomnia. Similarly, agreement across studies was found regarding over-the-counter products and prescriptions for insomnia, the cost of which was estimated to comprise about 2% of overall costs (for each category). The relative proportion of costs associated with the consumption of alcohol used to promote sleep was found to be higher in the present study (6%) than in other research (1%). This is likely due to differing methodologies. Other researchers have used prevalence estimates regarding this type of alcohol use, combined with estimates of cost and frequency. The present study used precise unit cost data in combination with self-report data on frequency of use and type of alcohol consumed. More research is necessary to shed light on this discrepancy. Finally, a significant difference was identified as to costs

associated with consultations. The current study identifies these costs as representing about 3% of overall insomnia costs, whereas other research situates them at 18%. This can be explained in part by the higher estimates of work function and alcohol costs reported in the present study, but may also reflect one of the problems inherent in self-report research: general recall bias and error may be responsible and may have led, in the case of our study, to an underestimate of consultation-related costs. Once again, additional research will contribute to a clearer understanding of the true cost of consultations to society.

The following suggestions are offered for future research. While the use of large databases is an efficient and objective approach to obtaining resource-use and loss data, it should be nuanced with information obtained from self-report in order to guard against the risk of overestimating the impact and cost of insomnia. This is especially important when considering prescription medications that can be prescribed in a multifunctional fashion with the aim of treating several maladies at once. It is also very important when estimating the impact and costs associated with work function and accidents. A host of factors may act conjointly in individuals with insomnia to lead them to experience accidents and problems and work. While admittedly challenging, the nagging question of the causal role of insomnia must not be abandoned. Self-report measures and longitudinal studies allow researchers to identify individuals' characteristics that may not otherwise be obtainable, such as comorbid illnesses, negative life events, age, socioeconomic status and gender, and which may play an important contributing or mediating role in the socioeconomic impact and cost of insomnia. This is also important information to obtain for outreach, education and prevention purposes.

"Burden of illness" research should be undertaken with the aim of describing the impact and costs for individuals with varying degrees of insomnia symptomatology, with researchers striving to use more uniform definitions of insomnia in order to facilitate comparisons. To further aid in this comparison process, a clear and comprehensive cost checklist a costing methodology should be used based on guidelines set down by Gold et al. (1996). Use of such a checklist in future insomnia cost assessments would permit direct comparisons in the case of both burden-of-illness research as well as in cost-effectiveness

studies. Cost-effectiveness research would use this same checklist, but would apply it when comparing costs across intervention modalities at pre- and post-treatment. In this same vein, future research needs to shift its focus to the negative impact of insomnia and to how effective treatment can reduce morbidity (NIH, 2005). To conclude, the time has come to hone evaluation techniques and begin producing research that describes not just the impact and cost of this disorder but offers empirically based cost-effectiveness data. This is essential if we want to respond not only to the demands of an increasingly market driven health-care system, but, most importantly, if we want to offer patients the best treatments available at the lowest cost possible.

References (Introduction and Conclusion)

Aldrich, M. S. (1989). Automobile accidents in patients with sleep disorders. *Sleep, 12*, 487-494.

American Sleep Disorders Association (2005). International classification of sleep disorders: Diagnostic and coding manual, 2nd ed. Rochester, MN: The American Academy of Sleep Medicine.

American Psychiatric Association (2000). Diagnostic and statistical manual of mental disorders. 4th ed., text revision. Washington DC: American Psychiatric Association.

Ancoli-Israel, S., & Roth, T. (1999). Characteristics of insomnia in the United States: Results of the 1991 National Sleep Foundation Survey. *Sleep, 22*(Suppl 2):S347-S353.

Balter, M. B., & Uhlenhuth, E. H. (1992). New epidemiologic findings about insomnia and its treatment. *Journal of Clinical Psychiatry, 53*(Suppl 34-39), discussion 40-32.

Bastien, C. H., & Morin, C. M. (2000). Familial incidence of insomnia. *Journal of Sleep Research, 9*, 49-54.

Benca, R. M., Obermeyer, W. H., Thisted, R. A., & Gillin, J. C. (1992). Sleep and psychiatric disorders: A meta-analysis. *Archives of General Psychiatry, 49*, 651-668.

Bliwise, D. L., King, A. C., Harris, R. B., & Haskell, W. L. (1992). Prevalence of self reported poor sleep in a healthy population aged 50-65. *Social Science and Medicine, 34,* 49-55.

Breslau, N., Roth, T., Rosenthal, L., & Andreski, P. (1996). Sleep disturbance and psychiatric disorders: A longitudinal epidemiological study of young adults. *Biological Psychiatry, 39*, 411-418.

Chang, P. P., Ford, D. E., Mead, L. A., Cooper-Patrick, L., & Klag, M. J. (1997). Insomnia in young men and subsequent depression. The Johns Hopkins Precursors Study. *American Journal of Epidemiology, 146,* 105-114.

Chilcott, L. A., Shapiro, C. M. (1996). The socioeconomic impact of insomnia. An overview. *Pharmacoeconomics, 10*(Suppl 1), 1-14.

Dauvilliers, Y., Morin, C., Cervena, K., et al. (2005). Family studies in insomnia. *Journal of Psychosomatic Research, 58,* 271-278.

Davidson, J.R., Maclean, A.W., Brundage, M.D., & Schulze, K. (2002). Sleep disturbance in cancer patients. *Social Science and Medicine*, *54*(9), 1309-21.

Drummond, M.F., Schulpher, M.J., Torrance, G.W., O'Brien, B.J., & Stoddart, G.L. (2005). *Methods for economic evaluation of health care programmes* (3rd ed.). New York: Oxford University Press.

DuPont, R. L., DuPont, C. M., & Rice, D. R. (2002). The economic costs of anxiety disorders. In D.J. Stein & E. Hollander E. (Eds.). *Textbook for Anxiety Disorders*. Washington DC: American Psychiatric Press Inc.

Dündar, Y., Dodd, S., Strobl, J., Boland, A., Dickson, R., & Walley, T. (2004). Comparative efficacy of newer hypnotic drugs for the short-term management of insomnia: A systematic review and meta-analysis. *Human Psychopharmacology: Clinical and Experimental, 19*, 305-22.

Edinger, J. D. (2004). Classifying insomnia in a clinically useful way. *Journal of Clinical Psychiatry, 65*(Suppl 8):36-43.

Edinger, J. D., Bonnet, M. H., Bootzin, R. R., et al. (2004). Derivation of research diagnostic criteria for insomnia: Report of an American Academy of Sleep

Medicine work group. *Sleep, 27*, 1567-1588.
Fawcett, J., Scheftner, W.A., Fogg, L., Clark, D.C., Young, M.A., Hedeker, D., & Gibbons, R. (1990). Time-related predictors of suicide in major affective disorder. *American Journal of Psychiatry, 147*, 1189-1194.
Foley, D. J., Monjan, A. A., Izmirlian, G., Hays, J. C., & Blazer, D. G. (1999). Incidence and remission of insomnia among elderly adults in a biracial cohort. *Sleep, 22*(Suppl 2):S373-378.
Ford, D. E. & Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders. An opportunity for prevention? *Journal of the American Medical Association, 262*, 479-1484.
Gallup Organization (1991). Sleep in America. Princeton, NJ: The Gallup Organization.
Godet-Cayre, V., Pelletier-Fleury, N., Le Vaillant, M., Dinet, J., Massuel, M. A., & Leger, D. (2006). Insomnia and absenteeism at work. Who pays the cost? *Sleep, 29(2),* 179 84.
Gold, M.L., Siegel, J.E., Russell, L.B., & Weinstein, M.C. (1996). *Cost-Effectiveness in Health and Medicine*. New York: Oxford University Press.
Goldstein, M. J. (1999). Psychosocial treatments for individuals with schizophrenia and related disorders. In N.E. Miller & K.E. Magruder (Eds.). *Cost-effectiveness of psychotherapy: A guide for practitioners, researchers, and policymakers.* New York: Oxford University Press, p. 325-247.
Hall, R. C., & Platt, D. E., & Hall, R. (1999). Suicide risk assessment: A review of risk factors for suicide in 100 patients who made severe suicide attempts. Evaluation of suicide risk in a time of managed care. *Psychosomatics, 40*, 18-27
Hargreaves, W. A., Shumway, M., Hu, T.W., Cuffel, B. (1998). *Cost-outcome methods for mental health.* 1st ed. San Diego: Academic Press.
Hatoum, H. T., Kong, S. X., Kania, C. M., Wong, J. M., & Mendelson, W. B. (1998). Insomnia, health-related quality of life and healthcare resource consumption. A study of managed-care organisation enrollees. *Pharmacoeconomics, 14*, 629-637.
Hillman, D.R., Murphy, S.X., Antic, R., Pezzullo, L. (2006). The Economic Cost of Sleep Disorders. *Sleep, 29* (3), 299-305.
Hofmann, S. G., & Barlow, D. H. (1999). The costs of anxiety disorders: Implications for psychosocial interventions. In N.E. Miller & K.E. Magruder (Eds.). *Cost-effectiveness of psychotherapy: A guide for practitioners, researchers, and policymakers.* New York: Oxford University Press, p. 224-234.
Jacquinet-Salord, M. C., Lang, T., Fouriaud, C., Nicoulet, I., & Bingham, A. (1993). Sleeping tablet consumption, self reported quality of sleep, and working conditions. Group of Occupational Physicians of APSAT. *Journal of Epidemiology and Community Health, 47*, 64-68.
Johnson, E. O., Roehrs, T., Roth, T., & Breslau, N. (1998). Epidemiology of alcohol and medication as aids to sleep in early adulthood. *Sleep, 21*, 178-186.
Johnson, L. C., & Spinweber, C. L. (1983). Good and poor sleepers differ in Navy performance. *Military Medicine, 148*, 727-731.
Katz, D. A., & McHorney, C. A. (1998). Clinical correlates of insomnia in patients with chronic illness. *Archives of Internal Medicine, 158*, 1099-1107.
Klink, M. E., Quan, S.F., Kaltenborn, W.T., & Lebowitz, M.D. (1992), Risk factors associated with complaints of insomnia in a general adult population. Influence of previous complaints of insomnia. *Archives of Internal Medicine, 152,* 1634-1637.

Kupperman, M., Lubeck, D. P., Mazonson, P. D., et al. (1995). Sleep problems and their correlates in a working population. *Journal of General Internal Medicine, 10*, 25-32.

Lavie, P. (1981). Sleep habits and sleep disturbances in industrial workers in Israel: Main findings and some characteristics of workers complaining of excessive daytime sleepiness. *Sleep, 4*, 147-158.

Leger, D., Guilleminault, C., Bader, G., Levy, E., & Paillard, M. (2002). Medical and socio-professional impact of insomnia. *Sleep, 25*, 625-629.

Leger, D., Scheuermaier, K., Philip, P., Paillard, M., & Guilleminault, C. (2001). SF-36: Evaluation of quality of life in severe and mild insomniacs compared with good sleepers. *Psychosomatic Medicine, 63*, 49-55.

Leigh, J. P. (1991). Employee and job attributes as predictors of absenteeism in a national sample of workers: the importance of health and dangerous working conditions. *Social Science and Medicine, 33*, 127-137.

Leger, D., Levy, E., & Paillard, M. (1999). The direct costs of insomnia in France. *Sleep, 22,* (Suppl 2):S394-401.

Mellinger, G. D., Balter, M. B., & Uhlenhuth, E. H. (1985). Insomnia and its treatment: Prevalence and correlates. *Archives of General Psychiatry, 42*, 225-232.

Miller, N. E., & Magruder, K. M. (1999). *Cost-effectiveness of psychotherapy: A guide for pratitioners, researchers, and policymakers.* 1st ed. New York: Oxford University Press.

Morgan, K., & Clarke, D. (1997). Risk factors for late-life insomnia in a representative general practice sample. *British Journal of General Practice, 47*, 166-9.

Morin, C. M., & Espie, C. A. (2003). *Insomnia: A clinical guide to assessment and treatment.* 1st ed. New York: Kluwer Academic/Plenum.

Morin, C. M., LeBlanc, M., Daley, M., Grégoire, J. P., & Mérette, C. (2006). Epidemiology of insomnia: Prevalence, self-help treatments and consultations initiated, and determinants of help-seeking behaviors. *Sleep Medicine*, 2006.

Morin, C. M., & Ware, J. C. (1996). Sleep and psychopathology. *Applied and Preventive Psycholology, 5,* 211-224.

National Institutes of Health (1994). Wake up America: A national sleep alert. Vol. 2. Working groups reports. Report of the national commission on sleep disorders research. Washington DC, US Government Printing Office.

Ohayon, M. M. (2002). Epidemiology of insomnia: What we know and what we still need to learn. *Sleep Medicine Review, 6*, 97-111.

Ohayon, M.M., & Caulet, M. (1996). Psychotropic medication and insomnia complaints in two epidemiological studies. *Canadian Journal of Psychiatry, 41*, 457-464.

Ohayon, M. M., Caulet, M., Priest, R. G., & Guilleminault, C. (1997). DSM-IV and ICSD 90 insomnia symptoms and sleep dissatisfaction. *British Journal of Psychiatry, 171*, 382-388.

Ohayon, M. M., & Hong, S. C. (2002). Prevalence of insomnia and associated factors in South Korea. *Journal of Psychosomatic Research, 53,* 93-600.

Paffenbarger, R. S., Lee, I. M., & Leung, R. (1994). Physical activity and personal characteristics associated with depression and suicide in American college men. *ACTA Psychiatrica Scandinavica, 89,* 16-22.

Petitti, D. B. (2000). *Meta-Analysis, Decision Analysis, and Cost-Effectiveness Analysis: Methods for Quantitative Synthesis in Medicine.* 1st ed. New York: Oxford University Press.

Pollak, C. P., Perlick, D. (1991). Sleep problems and institutionalization of the elderly. *Journal of Geriatric Psychiatry and Neurology, 4*(4), 204-210.

Riemann, D., & Voderholzer, U. (2003). Primary insomnia: A risk factor to develop depression? *Journal of Affective Disorders, 76*, 255-259.

Robbins, D. R., & Alessi, N. E. (1985). Depressive symptoms and suicidal behavior in adolescents. *American Journal of Psychiatry, 142*, 588-592.

Roberts, R. E., Shema, S. J., Kaplan, G. A., & Strawbridge, W. J. (2000). Sleep complaints and depression in an aging cohort: A prospective perspective. *American Journal of Psychiatry, 157*, 81-88.

Roth, T., Costa e Silva, J.A., Chase, M.H. (2000). Sleep and health: Research and clinical perspectives. *Sleep, 23,* 52-3.

Rush, A. J. (1999). Psychotherapy for major mood disorders: From efficacy to effectiveness. In N.E. Miller & K.E. Magruder (Eds.). *Cost-effectiveness of psychotherapy: A guide for practitioners, researchers, and policymakers*. New York: Oxford University Press, p. 211-223.

Sanford, J. R. (1975). Tolerance of debility in elderly dependants by supporters at home: its significance for hospital practice. *British Medical Journal, 3*(5981), 471-473.

Savard, J., Morin, C.M. (2001). Insomnia in the context of cancer: A review of a neglected problem. *Journal of Clinical Oncology, 19*(3), 895-908.

Schubert, C. R., Cruickshanks, K. J., Dalton, D. S., Klein, B. E., Klein, R., & Nondahl, D. M. (2002). Prevalence of sleep problems and quality of life in an older population. *Sleep, 25*, 889-893.

Schweitzer, P. K., Engelhardt, C. L., Hilliker, N. A., Muehlbach, M. J., & Walsh, J. K. (1992). Consequences of reported poor sleep. *Journal of Sleep Research, 21*, 260.

Shapiro, C. M., & Dement, W. C. (1993). ABC of sleep disorders. Impact and epidemiology of sleep disorders. *British Medical Journal, 306*, 1604-1607. pilot study. *Journal of Applied Research in Intellectual Disability, 13*, 29-37.

Simon, G.E., & VonKorff, M. (1997). Prevalence, burden, and treatment of insomnia in primary care. *American Journal of Psychiatry, 154*, 1417-1423.

Sproule, B., Busto, U., Buckle, C., Herrmann, N., & Bowles, S. (1999). The use of non-prescription sleep products in the elderly. *International Journal of Geriatric Psychiatry, 14* (10), 851-57.

Stoller, M. K. (1994). Economic effects of insomnia. *Clinical Therapy, 16*, 873-897.

Vitiello, M. V. (1997). Sleep disorders and aging: Understanding the causes. *Journals of Gerontology Series A: Biological Sciences and Medical Sciences, 52*, M189-191.

Vollrath, M., Wicki, W., & Angst, J. (1989). The Zurich study. VIII. Insomnia: Association with depression, anxiety, somatic syndromes, and course of insomnia. *European Archives of Psychiatry and Neurological Science, 239*, 113-124.

Walsh, J.K., & Engelhardt, C.L. (1999). The direct economic costs of insomnia in the United States for 1995. *Sleep, 22*(Suppl 2):S386-393.

Ware, J. E., Snow, K. K., Kosinski, M., & Gandek, B. (1993). SF-36 Health Survey manual and interpretation guide. Boston, MA: The Health Institute, New England Medical Center.

World Health Organization (1992). The ICD-9 classification of mental and behavioural disorder: Diagnostic criteria for research. 10th revision ed. Geneva: The World Health Organization.

Weissman, M. M., Greenwald, S., Nino-Murcia, G., & Dement, W. C. (1997). The

morbidity of insomnia uncomplicated by psychiatric disorders. *General Hospital Psychiatry, 19*, 245-250.

Wingard, D. L., & Berkman, L. F. (1993). Mortality risk associated with sleeping patterns among adults. *Sleep, 6,* 102-107.

Zammit, G.K., Weiner, J., Damato, N., Sillup, G.P., & McMillan, C.A. (1999). Quality of life in people with insomnia. *Sleep, 22*(Suppl 2), S379.

ANNEXES

ANNEX 1: Ethical Approval Letter

UNIVERSITÉ LAVAL

VICE-RECTORAT À LA RECHERCHE
Comité d'éthique de la recherche

Cité universitaire
Québec, Canada G1K 7P4

Sainte-Foy, le 12 septembre 2001

Monsieur Charles M. Morin
École de psychologie
Faculté des sciences sociales
Université Laval
Sainte-Foy (Québec) G1K 7P4

Objet : Projet de recherche intitulé: Histoire naturelle et traitement de l'insomnie/Natural History and Treatment of Insomnia **(2001-098)**

Monsieur,

Le Comité d'éthique de la recherche de l'Université Laval a pris connaissance de la lettre du 26 août 2001 que vous lui avez adressée, concernant le projet de recherche cité en objet. Le Comité se montre satisfait des modifications apportées au formulaire de consentement et approuve ledit projet pour une période d'un an, soit jusqu'au 1er septembre 2002.

Le comité d'éthique devra être informé et devra réévaluer ce projet advenant toute modification ou l'obtention de toute nouvelle information qui surviendrait à une date ultérieure à celle de la présente approbation et qui comporterait des changements dans le choix des sujets, dans la manière d'obtenir leur consentement ou dans les risques encourus. De plus, toute complication imprévue et sérieuse concernant un participant inscrit à la présente étude devra être immédiatement rapportée par écrit au comité d'éthique peu importe si cet événement est survenu dans notre milieu ou ailleurs dans un autre centre. Le chercheur devra y joindre son évaluation personnelle de la situation en précisant si, selon lui, cet événement est relié à l'étude, s'il s'agit d'un risque jusque-là inconnu, si les participants déjà inscrits doivent être informés et si une modification du formulaire de consentement est nécessaire pour les nouveaux sujets.

Le projet devra être réévalué un an à partir de la date d'approbation, le chercheur indiquant brièvement l'évolution et le déroulement de sa recherche, les résultats à date, le nombre de participants recrutés et si les perspectives de cette recherche se déroulent tel que prévu.

Veuillez agréer, l'expression de nos sentiments les meilleurs.

Édith Deleury
Présidente
Comité d'éthique de l'Université Laval

ANNEX 2: Questionnaire
(pages 163 – 199)

ANNEX 2 : QUESTIONNAIRE

ENQUÊTE SUR LE SOMMEIL

PHASE 2

Enquête sur le sommeil
École de psychologie
Université Laval
Québec, Qc
G1K 7P4
☎:1-866-656-3075
✉ : enquete.sommeil@psy.ulaval.ca

École de Psychologie

UNIVERSITÉ LAVAL

VOTRE SOMMEIL

Cette première série de questions concerne vos habitudes de sommeil ainsi que la qualité de ce dernier. Veuillez lire attentivement les consignes propres à chaque question avant de les compléter.

Les questions suivantes font référence à vos habitudes de sommeil DU DERNIER MOIS. Vos réponses devraient correspondre aux meilleures estimations possibles pour la majorité des jours et des nuits du dernier mois. S.V.P., répondez à toutes les questions même si vous ne considérez pas avoir de difficultés de sommeil.

1. Durant le dernier mois, à quelle heure vous êtes-vous habituellement couché(e) les soirs de semaine? _____ heure (00:00 à 23:59)

2. Durant le dernier mois, combien de temps (en minutes) avez-vous habituellement pris pour vous endormir le soir? _____ minutes

2.b Durant le dernier mois, combien de temps (en minutes) avez-vous été éveillé durant la nuit après vous être endormi(e) pour la première fois? _____ minutes
(S.V.P. additionnez le temps pour chaque éveil au cours d'une nuit.)

3. Durant le dernier mois, à quelle heure vous êtes-vous habituellement levé(e) le matin? _____ heure (00:00 à 23:59)

4. Durant le dernier mois, combien d'heures de sommeil avez-vous eues par nuit? *(Ceci peut être différent du nombre d'heures passées au lit)* _____ heures

5. Pour le dernier mois, quel est votre degré de satisfaction concernant votre sommeil? Diriez-vous que vous êtes :

   ☐ Très satisfait
   ☐ Assez satisfait
   ☐ Peu satisfait
   ☐ Pas du tout satisfait

5. **Durant le dernier mois, combien de fois avez-vous eu de la difficulté à dormir parce que vous...**

a) Ne pouviez pas vous endormir à l'intérieur de 30 minutes.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

b) Vous réveilliez au milieu de la nuit ou tôt le matin.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

c) Deviez vous lever pour aller à la salle de bain.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

d) Aviez des difficultés à respirer.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

e) Toussiez ou ronfliez bruyamment.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

f) Aviez trop froid.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

g) Aviez trop chaud.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

h) Aviez fait de mauvais rêves.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

Durant le dernier mois, combien de fois avez-vous eu de la difficulté à dormir parce que vous...

i) Ressentiez de la douleur.

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

j) Autre raison; s.v.p. décrivez:_____

À quelle fréquence durant le dernier mois avez-vous eu de la difficulté à dormir pour cette raison?

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

7. Durant le dernier mois, combien de fois avez-vous pris une médication (avec ou sans ordonnance) pour vous aider à dormir?

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

8. Durant le dernier mois, combien de fois avez-vous eu de la difficulté à rester éveillé(e) pendant que vous conduisiez, mangiez ou étiez engagé(e) dans une activité sociale?

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ 3 fois ou plus par semaine

9. Durant le dernier mois, jusqu'à quel point avez-vous eu de la difficulté à maintenir suffisamment d'enthousiasme pour compléter vos activités?

- ☐ Aucunement
- ☐ Légèrement
- ☐ Moyennement
- ☐ Beaucoup

9.b Durant le dernier mois, combien de fois avez-vous fait une sieste dans la journée?

- ☐ Aucune fois
- ☐ Moins d'une fois par semaine
- ☐ Une ou deux fois par semaine
- ☐ Trois à six fois par semaine
- ☐ À tous les jours

10. Considérez-vous avoir actuellement des difficultés de sommeil?

☐ Oui ☐ Non

Si vous avez répondu NON à la question 10, allez directement à la question 13.
Si vous avez répondu OUI, poursuivez avec la question 11.

11. Pour le dernier mois, combien de nuits par semaine, en moyenne, avez-vous eu des difficultés de sommeil?

_____ nuits par semaine

12. Depuis combien de temps avez-vous des difficultés de sommeil?

_____ années _____ mois

13. Avez-vous déjà reçu un diagnostic, par un professionnel de la santé, pour l'une des difficultés de sommeil suivantes?

☐ Insomnie
☐ Apnée du sommeil
☐ Hypersomnie
☐ Impatiences musculaires
☐ Mouvements périodiques des jambes
☐ Autre (précisez) _____

13.b **SI OUI**, quand? _____

13.c Comparativement à notre dernière enquête (novembre 2002), considérez-vous que la **qualité** de votre sommeil est:

☐ Bien meilleure maintenant
☐ Un peu meilleure maintenant
☐ À peu près la même
☐ Un peu moins bonne maintenant
☐ Bien moins bonne maintenant

Toujours en vous référant AU DERNIER MOIS, veuillez encercler le chiffre qui correspond le plus fidèlement à votre sommeil. S.V.P., répondez à toutes les questions même si vous ne considérez pas avoir de difficultés de sommeil.

14. Veuillez estimer la **SÉVÉRITÉ** de vos difficultés à vous endormir:

Aucune	Légère	Moyenne	Très	Extrêmement
0	**1**	**2**	**3**	**4**

15. Veuillez estimer la **SÉVÉRITÉ** de vos éveils nocturnes fréquents et/ou prolongés:

Aucune	Légère	Moyenne	Très	Extrêmement
0	**1**	**2**	**3**	**4**

16. Veuillez estimer la **SÉVÉRITÉ** de vos problèmes d'éveils trop tôt le matin:

Aucune	Légère	Moyenne	Très	Extrêmement
0	**1**	**2**	**3**	**4**

17. À quel point êtes-vous **SATISFAIT(E)/INSATISFAIT(E)** de votre sommeil actuel?

Très satisfait	Satisfait	Plutôt neutre	Insatisfait	Très insatisfait
0	**1**	**2**	**3**	**4**

18. À quel point considérez-vous que vos difficultés de sommeil **PERTURBENT** votre fonctionnement quotidien (ex: fatigue, concentration, mémoire, humeur)?

Aucunement	Légèrement	Moyennement	Beaucoup	Extrêmement
0	**1**	**2**	**3**	**4**

19. À quel point considérez-vous que vos difficultés de sommeil sont **APPARENTES** pour les autres en termes de détérioration de la qualité de votre vie?

Aucunement	Légèrement	Moyennement	Beaucoup	Extrêmement
0	**1**	**2**	**3**	**4**

20. À quel point êtes-vous **INQUIET(ÈTE)**/préoccupé(e) à propos de vos difficultés de sommeil?

Aucunement	Légèrement	Moyennement	Beaucoup	Extrêmement
0	**1**	**2**	**3**	**4**

20-1. De façon générale, comment évaluez-vous la **QUALITÉ** de votre sommeil?

Excellente	Bonne	Acceptable	Pauvre	Médiocre
0	**1**	**2**	**3**	**4**

20-2. Dans quelle mesure vos difficultés de sommeil diminuent votre **QUALITÉ DE VIE** ?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

20-3. Jusqu'à quel point considérez-vous que vos difficultés de sommeil causent de la **FATIGUE** le jour?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

20-4. Jusqu'à quel point considérez-vous que vos difficultés de sommeil affectent vos capacités mentales comme votre **CONCENTRATION** ou votre **MÉMOIRE**?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

20-5. Jusqu'à quel point considérez-vous que vos difficultés de sommeil affectent vos **RELATIONS** interpersonnelles (famille, travail, ami-e-s)?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

20-6. Jusqu'à quel point considérez-vous que vos difficultés de sommeil affectent votre **HUMEUR**?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

20-7. Jusqu'à quel point considérez-vous que vos difficultés de sommeil affectent vos **ACTIVITÉS SOCIALES** ou de **LOISIRS** ?

Aucunement	Légèrement	Moyennement	Très	Extrêmement
0	1	2	3	4

29. Au cours des **SIX DERNIERS MOIS**, avez-vous consulté un professionnel de la santé pour des difficultés de sommeil?

☐ Oui ☐ Non

30. **SI OUI,** est-ce au cours du **DERNIER MOIS**?

☐ Oui ☐ Non

31. **SI OUI,** quel(s) type(s) de professionnel(s) avez-vous consulté?
(vous pouvez choisir plus d'une réponse)

☐ Médecin de famille
☐ Médecin spécialiste (ex: pneumologue, neurologue, psychiatre)
☐ Infirmière
☐ Psychologue
☐ Homéopathe
☐ Acupuncteur
☐ Pharmacien
☐ Massothérapeute
☐ Autre (précisez) _____

32. **SI OUI,** qu'est-ce qui vous a principalement incité à consulter un professionnel de la santé pour vos difficultés de sommeil ? *(ne choisir qu'une seule réponse)*

☐ La suggestion d'un proche *(conjoint, parent, ami(e))*
☐ La fatigue
☐ Des malaises physiques
☐ Une détresse psychologique *(déprime, anxiété)*
☐ Baisse du rendement au travail
☐ Suggestion d'un professionnel de la santé
☐ Autre (précisez) _____

36. Au cours des **6 DERNIERS MOIS**, avez-vous utilisé des médicaments **prescrits** par un médecin pour dormir?

☐ Oui ☐ Non

37. **SI OUI,** au cours du **DERNIER MOIS,** combien de nuits par semaine, en moyenne, avez-vous utilisé des médicaments **prescrits** pour dormir?

_____ nuits / semaine

38. Au cours des **6 DERNIERS MOIS**, avez-vous utilisé des **produits naturels** comme de la tisane ou de la valériane ou des produits **homéopathiques** pour dormir?

☐ Oui ☐ Non

39. **SI OUI,** au cours du **DERNIER MOIS,** combien de nuits par semaine, en moyenne, avez-vous utilisé des **produits naturels** ou **homéopathiques** pour dormir?

_____ nuits / semaine

40. Au cours des **6 DERNIERS MOIS**, avez-vous utilisé des médicaments **sans ordonnance** pour dormir comme Nytol ou Sominex?

☐ Oui ☐ Non

41. **SI OUI,** au cours du **DERNIER MOIS,** combien de nuits par semaine, en moyenne, avez-vous utilisé des médicaments **sans ordonnance** pour dormir?

_____ nuits / semaine

42. Au cours des **6 DERNIERS MOIS**, avez-vous utilisé de l'**alcool** pour dormir?

☐ Oui ☐ Non

43. **SI OUI,** au cours du **DERNIER MOIS,** combien de nuits par semaine, en moyenne, avez-vous utilisé de l'**alcool** pour dormir?

_____ nuits / semaine

44. A) Au cours des **6 DERNIERS MOIS**, avez-vous essayé une autre aide pour dormir?

☐ Oui ☐ Non

B) Au cours des **6 DERNIERS MOIS,** quelle autre aide avez-vous essayé pour dormir?
(vous pouvez choisir plus d'une réponse)

☐ Acupuncture
☐ Relaxation
☐ Musique
☐ Lecture
☐ Massothérapie
☐ Hypnose
☐ Autre (précisez) _____

48. Quelques énoncés reflétant les croyances et les attitudes des gens concernant le sommeil sont énumérés ci-dessous. Veuillez indiquer à quel point vous êtes personnellement en accord ou en désaccord avec chaque énoncé. Il n'y a pas de bonne ou de mauvaise réponse. Pour chaque phrase, encerclez le chiffre correspondant à votre ESTIMATION PERSONNELLE. Utilisez l'échelle entière plutôt qu'uniquement ses extrémités. S.V.P., répondez à toutes les questions même si vous n'avez pas de difficultés de sommeil.

a) J'ai besoin de huit heures de sommeil pour me sentir reposé(e) et bien fonctionner pendant la journée.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

b) Lorsque je ne dors pas suffisamment durant la nuit, j'ai besoin de récupérer le jour suivant en faisant une sieste, ou la nuit suivante, en dormant plus longtemps.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

c) Je crains que l'insomnie chronique puisse avoir des conséquences sérieuses sur ma santé physique.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

d) Je suis inquiet(ète) de perdre le contrôle sur mes habiletés à dormir.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

e) Parce que je vieillis, je dois aller au lit plus tôt dans la soirée.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

f) Après une mauvaise nuit de sommeil, je sais que cela va nuire à mes activités quotidiennes le lendemain.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

g) Afin d'être éveillé et de bien fonctionner le jour, je crois qu'il serait mieux de prendre une pilule pour dormir plutôt que d'avoir une mauvaise nuit de sommeil.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

h) Lorsque je me sens irritable, déprimé(e) ou anxieux(se) pendant la journée, c'est surtout parce que j'ai mal dormi la nuit précédente.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

i) Quand je dors mal une nuit, je sais que cela dérangera mon horaire de sommeil pour toute la semaine.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

j) Sans une nuit de sommeil adéquate, je peux à peine fonctionner le lendemain.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

k) J'ai peu d'habiletés pour faire face aux conséquences négatives d'un sommeil perturbé.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

l) Quand je me sens fatigué(e), sans énergie ou simplement incapable de bien fonctionner, c'est généralement parce que j'ai mal dormi la nuit précédente.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

m) Lorsque je suis envahi(e) par mes pensées la nuit, je sens que je n'ai pas le contrôle sur ces pensées.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

n) Je crois que l'insomnie est principalement le résultat d'un problème physiologique.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

0) Je crois que l'insomnie est en train de ruiner ma capacité à jouir de la vie.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

p) La médication est probablement la seule solution à l'insomnie.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

q) Habituellement, lorsque je n'ai pas bien dormi, ça affecte mon apparence physique.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

r) J'évite ou j'annule mes engagements (travail, famille, loisirs) après une mauvaise nuit de sommeil.

Fortement en désaccord — Fortement en accord

0 1 2 3 4 5 6 7 8 9 10

VOTRE SANTÉ

Cette seconde section du questionnaire porte sur votre état de santé ainsi que sur vos habitudes de consultation des professionnels de la santé.

---

1. Quelle est votre grandeur ? _____ mètres
2. Quel est votre poids? _____ kg
3. Fumez-vous la cigarette ?

   ☐ Oui, à tous les jours
   ☐ Oui, à l'occasion
   ☐ Non, jamais

4. Combien de consommations d'alcool prenez-vous, en moyenne, dans une journée et/ou dans une semaine?

   _____ consommations par jour _____ consommations par semaine

5. Combien de produits contenant de la caféine prenez-vous, en moyenne, dans une journée?

   _____ consommations par jour.

6. Combien de fois pratiquez-vous des activités physiques de plus de 20 minutes dans vos temps libres?

   ☐ Au moins 4 fois par semaine
   ☐ Environ 3 fois par semaine
   ☐ Environ 2 fois par semaine
   ☐ Environ une fois par semaine
   ☐ Environ 2 à 3 fois par mois
   ☐ Environ une fois par mois
   ☐ Aucune fois/ Jamais

7. En général, diriez-vous que votre santé est:

   ☐ Excellente
   ☐ Très bonne
   ☐ Bonne
   ☐ Passable
   ☐ Mauvaise

ACTUELLEMENT, votre état de santé vous limite-t-il dans la pratique des activités suivantes?

8. Dans les activités modérées comme déplacer une table, passer l'aspirateur, jouer aux quilles ou au golf…

   ☐ Mon état de santé me limite beaucoup
   ☐ Mon état de santé me limite peu
   ☐ Mon état de santé ne me limite pas du tout

9. Pour monter plusieurs étages à pied …

- ☐ Mon état de santé me limite beaucoup
- ☐ Mon état de santé me limite peu
- ☐ Mon état de santé ne me limite pas du tout

Au cours des QUATRE DERNIÈRES SEMAINES, avez-vous eu les difficultés suivantes au travail ou dans vos autres activités quotidiennes à cause de votre état de SANTÉ PHYSIQUE?

10. Avez-vous accompli moins de choses que vous l'auriez voulu?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

11. Avez-vous été limité(e) dans la nature de vos tâches ou de vos autres activités?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

Au cours des QUATRE DERNIÈRES SEMAINES, avez-vous eu les difficultés suivantes au travail ou dans vos autres activités quotidiennes à cause de l'état de votre MORAL (ex: se sentir déprimé(e) ou anxieux(se))?

12. Avez-vous accompli moins de choses que vous l'auriez voulu?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

13. Avez-vous fait votre travail ou vos autres activités avec moins de soin qu'à l'habitude?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

14. Au cours des **QUATRE DERNIÈRES SEMAINES**, dans quelle mesure **LA DOULEUR** a-t-elle nui à vos activités habituelles au travail ou à la maison?

- ☐ Pas du tout
- ☐ Un peu
- ☐ Moyennement
- ☐ Beaucoup
- ☐ Énormément

Pour les questions suivantes, donnez la réponse qui se rapproche le plus de la façon dont vous vous êtes senti(e) au cours des QUATRE DERNIÈRES SEMAINES.

15. Vous êtes-vous senti(e) calme et serein(e)?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

16. Avez-vous eu beaucoup d'énergie?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

17. Vous êtes-vous senti(e) triste et abattu(e)?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

18. Au cours des **QUATRE DERNIÈRES SEMAINES**, combien de fois votre **ÉTAT PHYSIQUE OU MORAL** a-t-il nui à vos activités sociales (comme visiter des amis, des parents, etc.)?

- ☐ Tout le temps
- ☐ La plupart du temps
- ☐ Quelques fois
- ☐ Rarement
- ☐ Jamais

19. **Par comparaison au mois de NOVEMBRE 2002**, comment évaluez-vous maintenant votre santé générale?

- ☐ Bien meilleure maintenant
- ☐ Un peu meilleure maintenant
- ☐ À peu près la même
- ☐ Un peu moins bonne maintenant
- ☐ Bien moins bonne maintenant

19.b **Par comparaison au mois de NOVEMBRE 2002**, diriez-vous que:

- ☐ Votre état de santé est resté stable
- ☐ Vous avez développé de nouveaux problèmes de santé
- ☐ Vos problèmes de santé (déjà présents) ont empirés
- ☐ Vos problèmes de santé se sont améliorés
- ☐ Autre, précisez : _____

20.b **Par comparaison au mois de NOVEMBRE 2002,** diriez-vous que votre **SANTÉ MENTALE** est:

- ☐ Bien meilleure maintenant
- ☐ Un peu meilleure maintenant
- ☐ À peu près la même
- ☐ Un peu moins bonne maintenant
- ☐ Bien moins bonne maintenant

Les prochaines questions portent sur votre utilisation des produits et services de santé.

A. Présentement, souffrez-vous de l'un ou de plusieurs des problèmes de santé suivants:
S.V.P., cochez (4) **TOUTES** les réponses appropriées.

- ☐ Allergies (ex : alimentaires, cutanées, autres)
- ☐ Asthme
- ☐ Arthrite ou rhumatisme
- ☐ Douleur chronique (ex : maux de dos)
- ☐ Hypertension (tension artérielle élevée)
- ☐ Maux de tête chroniques et migraines
- ☐ Ulcères d'estomac ou à l'intestin
- ☐ Bronchite chronique ou emphysème
- ☐ Sinusite
- ☐ Diabète
- ☐ Épilepsie
- ☐ Maladie cardiaque
- ☐ Cancer
- ☐ Trouble dû à un accident cardio-vasculaire
- ☐ Tout autre problème de santé chronique (précisez) _____

1. Au cours des 3 DERNIERS MOIS, quels services de santé avez-vous utilisé pour vos BESOINS PERSONNELS. Cochez TOUS les services que vous avez utilisés.

Si vous n'avez utilisé aucun service de santé dans les 3 derniers mois, cochez (4) et passez à la question 3 ☐

- ☐ Médecin de famille
- ☐ Infirmière
- ☐ Psychologue
- ☐ Médecin spécialiste (ex : pneumologue, neurologue)
- ☐ Physiothérapeute
- ☐ Pharmacien
- ☐ Autre (précisez) _____
- ☐ Psychiatre
- ☐ Travailleur social
- ☐ Chiropraticien
- ☐ Homéopathe
- ☐ Acupuncteur
- ☐ Massothérapeute

2. Dans le tableau ci-dessous, réinscrivez chaque service coché à la question précédente et indiquez le nombre de fois où vous avez consulté ce professionnel dans les 3 DERNIERS MOIS. De plus, indiquez si vous avez discuté d'un problème d'insomnie lors de ces consultations ainsi que le nombre de kilomètres (km) parcourus pour vous rendre aux consultations.

Professionnel consulté	Nombre de consultations (3 derniers mois)	Motif(s) de consultation *Choix de réponse:* 1: l'insomnie était le motif de consultation. 2: l'insomnie n'était pas le motif de consultation **mais** nous en avons discuté. 3: l'insomnie n'était pas le motif de consultation et nous n'en avons pas discuté.	Distance parcourue pour se rendre aux consultations en km *(aller seulement)*
Ex 1: médecin de famille	**1**	**1**	**2 km**
Ex 2 : psychologue	**3**	**2**	**3 km**
a)			
b)			
c)			
d)			
e)			

3. a) Avez-vous des assurances qui vous remboursent une partie des frais de consultations ?

☐ Oui ☐ Non

b) Si oui, quel pourcentage des frais est en général couvert par vos assurances?

_____ %

4. Habituellement, quel moyen de transport utilisez-vous pour vous rendre à vos consultations?

☐ Automobile
☐ Taxi
☐ Autobus
☐ La marche
☐ Autre (précisez) _____

5. Indiquez si vous avez utilisé des médicaments PRESCRITS par un médecin pour des problèmes de santé physique ou psychologique. Indiquez la fréquence de votre utilisation soit par jour, par semaine, par mois, ou le total pour LES TROIS DERNIERS MOIS.

Si vous n'avez utilisé aucun médicament prescrit dans les trois derniers mois, cochez (4) et passez à la question 6 ☐

Médicament	Problème de santé (physique/psychologique)	Dose	Fréquence d'utilisation (depuis 3 mois)
Ex. 1: Ativan	Anxiété	0.5 mg	2 par jour
Ex. 2: Imovane	Insomnie	3.75 mg	5 dans les 3 derniers mois
a)			
b)			
c)			
d)			
e)			

6. Indiquez les produits SANS ORDONNANCE que vous avez utilisés dans les TROIS DERNIERS MOIS. Ces produits peuvent être des analgésiques (ex: Aspirine, Tylenol), des produits pour la grippe ou les allergies (ex: Sinutab, Claritin), des produits pour le sommeil (ex: Nytol, Sominex), des produits homéopathiques et naturels (ex: gouttes, tisanes), etc. Indiquez la fréquence de votre utilisation soit par jour, par semaine, par mois, ou le total pour les trois derniers mois.

Si vous n'avez pas utilisé de médicament sans ordonnance dans les trois derniers mois, cochez (4) et passez à la question 7. ☐

Produit	Problème de santé (physique/psychologique)	Fréquence d'utilisation (depuis 3 mois)
Ex. 1: Claritin	Allergies	3 fois/semaine
Ex. 2: Tisane (Camomille)	Digestion	6 fois/mois
a)		
b)		
c)		
d)		

7. S'il y a lieu, dans les SIX DERNIERS MOIS, pour quel(s) problème(s) de santé physique ou psychologique avez-vous été hospitalisé(e) (ex: pontage, dépression)?

** Si vous n'avez pas été hospitalisé (e) dans les trois derniers mois, cochez (4) et passez à la question 8* ☐

Problème de santé physique/psychologique	Nombre d'hospitalisations pour ce problème	Durée de(s) l'hospitalisation(s)
Ex. : Infarctus	1 fois	2 semaines
a)		
b)		
c)		
d)		

8. Dans les 3 DERNIERS MOIS, vous est-il arrivé de prendre des boissons alcoolisées pour vous aider à dormir?

☐ Oui ☐ Non

Si vous avez répondu OUI à la question 8, poursuivez avec la question 9.
Si vous avez répondu NON, passez à la question 10.

9. Complétez le tableau suivant en indiquant la quantité et la fréquence de votre consommation d'alcool POUR DORMIR soit par jour, par semaine, par mois, ou encore le total pour les trois derniers mois.

Type d'alcool	Quantité	Fréquence de la consommation
Ex. 1 : vin	**6 oz. (1 verre)**	**6 verres par semaine**
Ex. 2 : bière	**1 bouteille**	**2 fois dans les 3 derniers mois**
(a)		
(b)		
(c)		

10. Dans les trois derniers mois, avez-vous été absent(e) de votre travail rémunéré pour des raisons de santé?

☐ Oui ☐ Non ☐ Ne s'applique pas

Si vous avez répondu OUI à la question 10, poursuivez avec la question 11.
Si vous avez répondu NON, passez à la question 12.

11. Pour chaque période d'absence du travail, indiquez la durée ainsi que la cause de l'absence. Aussi, indiquez si, à votre avis, l'insomnie et/ou ses séquelles sont responsables de ces absences en utilisant l'échelle de 1 (aucunement) à 10 (entièrement).

Temps manqué	Cause de l'absence	Degré de relation entre l'insomnie et le temps manqué
Ex. 1: 2 jours	grippe	1 2 (3) 4 5 6 7 8 9 10 (aucunement … entièrement)
Ex. 2: 3 heures	fatigue	1 2 3 4 5 (6) 7 8 9 10 (aucunement … entièrement)
(a)		1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(b)		1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(c)		1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(d)		1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)

12. Toujours dans les TROIS DERNIERS MOIS, avez-vous constaté une baisse de productivité au travail ou dans vos autres tâches et responsabilités?

☐ Oui ☐ Non

SI OUI, estimez le nombre d'heures ou de jours où vous avez ressenti une BAISSE DE PRODUCTIVITÉ, la raison de cette baisse ainsi que votre perception du pourcentage de diminution de productivité. Autrement dit, est-ce que votre productivité a diminué de 10%, 25%, 50%, etc.? Pour chaque période de baisse de productivité, indiquez aussi, en utilisant l'échelle de 1 (aucunement) à 10 (entièrement), à quel point l'insomnie a joué un rôle dans ces baisses.

Activité affectée	Nombre d'heures ou de jours affectés	% de baisse de productivité	Raison	Degré de relation entre l'insomnie et la baisse de productivité
Ex. 1 : travail	**2 jours**	**35%**	**stress**	1 2 3 (4) 5 6 7 8 9 10 (aucunement … entièrement)
Ex . 2 : tâches quotidiennes	**10 jours**	**10%**	**fatigue**	1 2 3 4 5 (6) 7 8 9 10 (aucunement … entièrement)
(a)				1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(b)				1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(c)				1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)
(d)				1 2 3 4 5 6 7 8 9 10 (aucunement … entièrement)

13. Dans les SIX DERNIERS MOIS, avez-vous eu un accident de la route lorsque vous étiez au volant?

☐ Oui ☐ Non

Si vous avez répondu OUI à la question 13, poursuivez avec la question 13 (a).
Si vous avez répondu NON, passez à la question 14.

(a) À votre avis, est-ce que l'insomnie et/ou ses séquelles (ex: fatigue, manque de concentration) ont joué un rôle dans cet accident?

☐ Oui ☐ Non

(b) SI OUI, encerclez sur l'échelle de 1 (aucunement) à 10 (entièrement) à quel point l'insomnie et/ou ses séquelles (ex: fatigue, manque de concentration) ont été responsables de l'accident.

1	2	3	4	5	6	7	8	9	10
aucunement				modérément					entièrement

(c) Avez-vous fait une réclamation auprès de votre compagnie d'assurance pour cet accident?

☐ Oui ☐ Non

(d) Si oui, avez-vous reçu une compensation pour des dommages matériels ou personnels?

☐ Oui ☐ Non

(e) Si oui, quel montant avez-vous reçu pour les…

Dommages matériels: _____ Dommages personnels: _____

14. Dans les SIX DERNIERS MOIS, avez-vous été impliqué(e) dans un autre accident (ex: chute, accident de travail)?

☐ Oui ☐ Non

Si vous avez répondu OUI à la question 14, poursuivez avec la question 14(a).
Si vous avez répondu NON, passez à la section suivante.

(a) À votre avis, est-ce que l'insomnie et/ou ses séquelles (ex: fatigue, manque de concentration) ont joué un rôle dans cet accident?

☐ Oui ☐ Non

(b) SI OUI, encerclez sur l'échelle de 1 (aucunement) à 10 (entièrement), à quel point l'insomnie ou ses séquelles (ex: fatigue, manque de concentration) ont été responsables de l'accident.

1	2	3	4	5	6	7	8	9	10
aucunement				modérément					entièrement

(c) Avez-vous fait une réclamation auprès de votre compagnie d'assurance?

☐ Oui ☐ Non

(d) Si oui, avez-vous reçu une compensation pour des dommages matériels ou personnels?

☐ Oui ☐ Non

(e) Si oui, quel montant avez-vous reçu pour les…

Dommages matériels: _____ Dommages personnels: _____

STRESS ET ÉVÉNEMENTS DE VIE

Dans cette section, les questions réfèrent à des événements qui peuvent provoquer des changements dans la vie des gens et qui nécessitent souvent une période d'adaptation. S.V.P., veuillez lire attentivement les consignes avant de répondre à chaque question.

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1. Au cours des 6 derniers mois, avez-vous vécu un événement de vie important (ex: maladie, décès d'un proche) ou un changement important (ex: retraite, déménagement) ?

☐ Oui ☐ Non

Si oui, décrivez : _____

_____

En vous référant au tableau ci-dessous, veuillez cocher (4) à l'endroit approprié, les événements que vous avez vécus au cours des 6 DERNIERS MOIS (depuis NOVEMBRE 2002) et indiquez le mois au cours duquel l'événement est survenu.

Pour chaque événement vécu, indiquez à quel point vous l'avez perçu comme ayant un impact positif ou négatif sur votre vie au moment où il est survenu. Indiquez l'ampleur de l'impact que l'événement a provoqué en vous servant de l'échelle située à côté de chaque énoncé. Un score de -3 correspond à un impact extrêmement négatif (-), un score de 0 signifie aucun impact et un score de 3 correspond à un impact extrêmement positif (+).

LISTE DES ÉVÉNEMENTS	4	MOIS	Extrêmement -	Modérément -	Légèrement -	Aucun impact	Légèrement +	Modérément +	Extrêmement +
Mariage			-3	–2	–1	0	+1	+2	+3
Détention en prison ou dans une institution semblable			-3	–2	–1	0	+1	+2	+3
Mort du conjoint			-3	–2	–1	0	+1	+2	+3
Changement majeur dans les habitudes de sommeil (beaucoup plus ou beaucoup moins)			-3	–2	–1	0	+1	+2	+3

LISTE DES ÉVÉNEMENTS	4	MOIS	Extrêmement -	Modérément -	Légèrement -	Aucun impact	Légèrement +	Modérément +	Extrêmement +
Mort d'un membre proche de la famille									
nère - père			-3	–2	–1	0	+1	+2	+3
rère - sœur			-3	–2	–1	0	+1	+2	+3
grand-mère - grand-père			-3	–2	–1	0	+1	+2	+3
utre (spécifiez) _____			-3	–2	–1	0	+1	+2	+3
Changement majeur dans les habitudes alimentaires (manger beaucoup plus ou beaucoup moins)			-3	–2	–1	0	+1	+2	+3
Saisie sur une hypothèque ou un prêt			-3	–2	–1	0	+1	+2	+3
Mort d'un ami proche			-3	–2	–1	0	+1	+2	+3
Réussite personnelle exceptionnelle			-3	–2	–1	0	+1	+2	+3
Violation mineure de la loi (contravention, tapage)			-3	–2	–1	0	+1	+2	+3
Homme: grossesse de la conjointe			-3	–2	–1	0	+1	+2	+3
Femme: grossesse			-3	–2	–1	0	+1	+2	+3
Changement important au travail responsabilités différentes, changements majeurs dans les onditions ou les heures de travail, etc.)			-3	–2	–1	0	+1	+2	+3
Nouvel emploi			-3	–2	–1	0	+1	+2	+3
Maladie ou blessure grave pour un membre de la famille:									
nère - père			-3	–2	–1	0	+1	+2	+3
rère - sœur			-3	–2	–1	0	+1	+2	+3
grand-mère - grand-père			-3	–2	–1	0	+1	+2	+3
onjoint			-3	–2	–1	0	+1	+2	+3
utres (spécifiez) _____			-3	–2	–1	0	+1	+2	+3
Difficultés sexuelles			-3	–2	–1	0	+1	+2	+3
Problèmes avec l'employeur danger de perdre l'emploi, d'être suspendu, d'être rétrogradé)			-3	–2	–1	0	+1	+2	+3
Problème avec la belle-famille			-3	–2	–1	0	+1	+2	+3
Changement majeur du statut financier beaucoup plus ou beaucoup moins d'argent)			-3	–2	–1	0	+1	+2	+3

LISTE DES ÉVÉNEMENTS	4	MOIS	Extrêmement -	Modérément -	Légèrement -	Aucun impact	Légèrement +	Modérément +	Extrêmement +
• Changement majeur de la relation avec les membres de la famille (intimité/proximité augmentée ou diminuée)			-3	–2	–1	0	+1	+2	+3
• Accueil d'un nouveau membre dans la famille (naissance, adoption, emménagement, etc.)			-3	–2	–1	0	+1	+2	+3
• Déménagement			-3	–2	–1	0	+1	+2	+3
• Séparation maritale (conflit avec le conjoint)			-3	–2	–1	0	+1	+2	+3
• Changement majeur dans la pratique de la religion (augmentation ou diminution de la participation)			-3	–2	–1	0	+1	+2	+3
• Réconciliation avec le conjoint			-3	–2	–1	0	+1	+2	+3
• Changement majeur dans le nombre de disputes avec le conjoint (beaucoup plus ou beaucoup moins)			-3	–2	–1	0	+1	+2	+3
• Changement de travail du (de la) conjoint (e)			-3	–2	–1	0	+1	+2	+3
• Être congédié(e) de son emploi			-3	–2	–1	0	+1	+2	+3
• Changement majeur dans le type ou la quantité de divertissements			-3	–2	–1	0	+1	+2	+3
• Emprunt de plus de 10 000$ (achat d'une maison, d'une entreprise, etc.)			-3	–2	–1	0	+1	+2	+3
• Emprunt de moins de 10 000$ (achat d'une voiture, d'une télévision, prêt étudiant etc.)			-3	–2	–1	0	+1	+2	+3
• Homme: la conjointe a subi un avortement			-3	–2	–1	0	+1	+2	+3
• Femme: subir un avortement			-3	–2	–1	0	+1	+2	+3
• Avoir une maladie ou une blessure majeure			-3	–2	–1	0	+1	+2	+3
• Changement majeur dans les activités sociales comme les réceptions, films, sorties, visites (augmentation ou diminution de la participation)			-3	–2	–1	0	+1	+2	+3
• Changement majeur dans les conditions de vie familiales (construction d'une nouvelle maison, rénovations, détérioration de la maison, nouveaux voisins)			-3	–2	–1	0	+1	+2	+3

LISTE DES ÉVÉNEMENTS	4	MOIS	Extrêmement -	Modérément -	Légèrement -	Aucun impact	Légèrement +	Modérément +	Extrêmement +
Divorce			-3	–2	–1	0	+1	+2	+3
Maladie ou blessure grave d'un ami proche			-3	–2	–1	0	+1	+2	+3
Prendre sa retraite			-3	–2	–1	0	+1	+2	+3
Départ d'un enfant de la maison (mariage, études)			-3	–2	–1	0	+1	+2	+3
Fin des études			-3	–2	–1	0	+1	+2	+3
Séparation du conjoint (pour le travail ou un voyage)			-3	–2	–1	0	+1	+2	+3
Fiançailles			-3	-2	-1	0	+1	+2	+3
Fin d'une relation amoureuse			-3	-2	-1	0	+1	+2	+3
Quitter la maison pour la première fois			-3	–2	–1	0	+1	+2	+3
Réconciliation avec son ami(e) de cœur			-3	–2	–1	0	+1	+2	+3

Autres événements récents ayant eu un impact sur votre vie. Énumérez et cotez.

			-3	-2	-1	0	+1	+2	+3
			-3	–2	–1	0	+1	+2	+3
			-3	–2	–1	0	+1	+2	+3

Si vous n'avez vécu aucun événement au cours des 6 derniers mois, veuillez cocher: ☐

Les énoncés suivants représentent des sentiments que vous avez peut-être ressentis au cours du DERNIER MOIS. Pour chaque énoncé, indiquez à quelle fréquence vous vous êtes senti(e) de cette façon. Il est préférable de répondre aux questions spontanément et rapidement. Ne perdez pas de temps à trouver le nombre exact de fois où vous avez ressenti ce que décrit l'énoncé, mais essayez plutôt de faire un estimé. Même si quelques énoncés paraissent similaires, S.V.P., répondez à chacun d'eux. Pour répondre à chaque question, utilisez les choix suivants:

0= Jamais 1= Presque jamais 2= Parfois 3= Assez souvent 4= Très souvent

DANS LE DERNIER MOIS ...		**Réponse (0 à 4)**
1.	À quelle fréquence avez-vous été contrarié(e) par quelque chose qui est survenu de façon inattendue?	
2.	À quelle fréquence avez-vous senti que vous étiez incapable de contrôler les choses importantes de votre vie?	
3.	À quelle fréquence vous êtes-vous senti(e) nerveux(se) et stressé(e)?	
4.	À quelle fréquence avez-vous composé efficacement avec les événements mineurs stressants et irritants de la vie?	
5.	À quelle fréquence avez-vous senti que vous composiez de façon adéquate avec des changements importants survenant dans votre vie?	
6.	À quelle fréquence vous êtes-vous senti(e) confiant(e) concernant vos habiletés à prendre en mains vos problèmes personnels?	
7.	À quelle fréquence avez-vous senti que les choses allaient comme vous le vouliez?	
8.	À quelle fréquence avez-vous trouvé que vous ne pouviez pas composer adéquatement avec toutes les choses que vous aviez à faire?	
9.	À quelle fréquence avez-vous été capable de contrôler les irritants de votre vie?	
10.	À quelle fréquence avez-vous senti que vous étiez au-dessus de vos affaires?	
11.	À quelle fréquence avez-vous été en colère en raison de choses qui arrivaient et qui étaient hors de votre contrôle?	
12.	À quelle fréquence avez-vous pensé aux choses que vous aviez à faire?	
13.	À quelle fréquence avez-vous été capable de contrôler la façon dont vous employiez votre temps?	
14.	À quelle fréquence avez-vous senti que les difficultés s'accumulaient tellement que vous ne pourriez les surmonter?	

Les dernières questions de cette section portent sur votre entourage et votre réseau social ainsi que du soutien que vous pouvez recevoir de ce dernier.

1. a) Demeurez-vous seul(e)? ☐ Oui ☐ Non

b) Si vous avez répondu **non**, avec qui demeurez-vous? *(vous pouvez sélectionner plus d'une réponse)*

☐ mon/ma conjoint(e)
☐ mon/mes enfant(s)
☐ un/mes parent(s)
☐ un(e)/des ami-e(s)
☐ en colocation
☐ mon/mes frère(s) et sœur(s)
☐ un autre membre de la famille (grand-parent, oncle, cousin)
☐ en hébergement
☐ en communauté religieuse
☐ autre (précisez) _____

2. a) Y a-t-il dans votre entourage (vos amis ou votre famille) quelqu'un à qui vous pouvez vous confier, parler librement de vos problèmes? ☐ Oui ☐ Non

b) Si vous avez répondu oui; combien de personnes?

☐ Une
☐ Deux
☐ Trois
☐ Quatre
☐ Cinq et plus

3. a) Y a-t-il dans votre entourage (amis ou famille) quelqu'un qui peut vous aider si vous êtes mal pris(e)?

☐ Oui ☐ Non

b) Si vous avez répondu oui; combien de personnes?

☐ Une
☐ Deux
☐ Trois
☐ Quatre
☐ Cinq et plus

4. a) Y a-t-il dans votre entourage (vos amis ou votre famille) quelqu'un de qui vous vous sentez proche et qui vous démontre de l'affection?

☐ Oui ☐ Non

b) Si vous avez répondu oui; combien de personnes?

☐ Une
☐ Deux
☐ Trois
☐ Quatre
☐ Cinq et plus

5. Avez-vous noté un changement dans votre réseau social au cours des 6 derniers mois (depuis Novembre 2002).

☐ Oui ☐ Non

b) Si vous avez répondu oui; décrivez : _____

_____

VOTRE HUMEUR ET PERSONNALITÉ

Cette nouvelle série de questions concerne, entre autres, votre humeur, votre moral, vos inquiétudes ainsi que certaines facettes de votre personnalité. Rappelez-vous qu'il n'y a ni bonne ni mauvaise réponse. L'important, c'est de répondre en fonction de VOTRE VÉCU.

---

1. Quels sont les sujets à propos desquels vous vous inquiétez le plus souvent?

a) _____ b) _____ c) _____

d) _____ e) _____ f) _____

2. Est-ce que vos inquiétudes vous semblent excessives ou exagérées ?

0 1 2 3 4 5 6 7 8
Aucunement — Modérément — Complètement

3. Durant les derniers 6 mois, combien de jours avez-vous été troublé(e) par des inquiétudes excessives?

0 1 2 3 4 5 6 7 8
Jamais — 1 jour sur 2 — À tous les jours

4. Est-ce que vous avez de la difficulté à contrôler vos inquiétudes? Par exemple, lorsque vous commencez à vous inquiéter à propos de quelque chose, avez-vous de la difficulté à arrêter?

0 1 2 3 4 5 6 7 8
Aucune difficulté — Difficulté modérée — Difficulté extrême

5. Durant les derniers 6 mois, avez-vous été troublé(e) par l'une ou l'autre des sensations suivantes lorsque vous étiez inquiet(ète) ou anxieux(se)? Donnez une réponse à chaque sensation.

0 1 2 3 4 5 6 7 8
Aucunement — Modérément — Très sévèrement

a) Agité-e, surexcité-e ou avoir les nerfs à vif : ____

b) Facilement fatigué-e : ____

c) Difficulté de se concentrer ou blanc de mémoire ____

d) Irritabilité____

e) Tensions musculaires____

f) Problèmes de sommeil ____

6. À quel point est-ce que l'anxiété ou l'inquiétude interfère avec votre vie, c'est-à-dire votre travail, activités sociales, famille, etc.?

0 1 2 3 4 5 6 7 8
Aucunement — Modérément — Très sévèrement

Voici quelques énoncés que les gens ont l'habitude d'utiliser pour se décrire. Lisez chaque énoncé et inscrivez le chiffre approprié (à droite) pour indiquer comment vous vous sentez EN GÉNÉRAL. S.V.P., répondez à chaque énoncé en utilisant les choix suivants:

1= pas du tout 2= Un peu 3= Modérément 4= Beaucoup

		(1 à 4)
1.	Je me sens bien.	
2.	Je me sens nerveux(se) et agité(e)	
3.	Je me sens content(e) de moi-même	
4.	Je voudrais être aussi heureux(se) que les autres semblent l'être.	
5.	J'ai l'impression d'être un(e) raté(e).	
6.	Je me sens reposé(e).	
7.	Je suis préoccupé(e) actuellement par des malheurs possibles.	
8.	Je suis d'un grand clame	
9.	Je m'en fais trop pour des choses qui en valent pas vraiment la peine.	
10.	Je suis heureux(se).	
11.	J'ai des pensées troublantes.	
12.	Je manque de confiance en moi.	
13.	Je me sens en sécurité.	
14.	Prendre des décisions est facile pour moi.	
15.	Je sens que je ne suis pas à la hauteur de la situation	
16.	Je suis satisfait(e).	
17.	Des idées sans importance me passent par la tête et me tracassent.	
18.	Je prends les désappointements tellement à cœur que je n'arrive pas à les chasser de mon esprit.	
19.	Je suis une personne qui a les nerfs solides.	
20.	Je deviens tendu(e) ou bouleversé(e) quand je songe à mes préoccupations et mes intérêts récents.	

Maintenant, lisez les énoncés suivants et inscrivez comment vous vous sentez <u>À CE MOMENT PRÉCIS</u>. S.V.P., répondez à droite de chaque énoncé en utilisant les choix suivants:

1= Pas du tout 2= Un peu 3= Modérément 4= Beaucoup

		(1 à 4)
1.	Je me sens calme.	
2.	Je me sens en sécurité.	
3.	Je suis tendu(e).	
4.	Je me sens surmené(e).	
5.	Je me sens tranquille.	
6.	Je me sens boulversé(e).	
7.	Je suis préoccupé(e) actuellement par des malheurs possibles.	
8.	Je me sens comblé(e).	
9.	Je me sens effrayé(e).	
10.	Je me sens à l'aise.	
11.	Je me sens sûr(e) de moi.	
12.	Je me sens nerveux(se).	
13.	Je suis affolé(e).	
14.	Je me sens indécis(e).	
15.	Je suis détendu(e).	
16.	Je me sens satisfait(e).	
17.	Je suis préoccupé(e).	
18.	Je me sens tout mêlé(e).	
19.	Je sens que j'ai les nerfs solides.	
20.	Je me sens bien.	

Vous trouverez ci-dessous 21 groupes d'énoncés. Veuillez lire avec soin chaque groupe puis, dans chacun d'eux, choisissez l'énoncé qui décrit le mieux comment vous vous êtes senti(e) au cours DES DEUX DERNIÈRES SEMAINES, incluant aujourd'hui. Encerclez le chiffre placé devant l'énoncé que vous avez choisi. Si, dans un groupe d'énoncés, vous en trouvez plusieurs qui décrivent bien ce que vous ressentez, choisissez celui qui a le chiffre le plus élevé. Assurez-vous de ne choisir qu'un seul énoncé dans chaque groupe, y compris le groupe n° 16 (modification dans les habitudes de sommeil) et le groupe n° 18 (modification de l'appétit).

1. Tristesse

0 Je ne me sens pas triste.
1 Je me sens très souvent triste.
2 Je suis tout le temps triste.
3 Je suis si triste ou si malheureux(se), que ce n'est pas supportable.

2. Pessimisme

0 Je ne suis pas découragé(e) face à mon avenir.
1 Je me sens plus découragé(e) qu'avant face à mon avenir.
2 Je ne m'attend pas à ce que les choses s'arrangent pour moi.
3 J'ai le sentiment que mon avenir est sans espoir et qu'il ne peut qu'empirer.

3. Échecs dans le passé

0 Je n'ai pas le sentiment d'avoir échoué dans la vie, d'être un(e) raté(e).
1 J'ai échoué plus souvent que je n'aurais dû.
2 Quand je pense à mon passé, je constate un grand nombre d'échecs.
3 J'ai le sentiment d'avoir complètement raté ma vie.

4. Perte de plaisir

0 J'éprouve toujours autant de plaisir qu'avant aux choses qui me plaisent.
1 Je n'éprouve pas autant de plaisir aux choses qu'avant.
2 J'éprouve très peu de plaisir aux choses qui me plaisent habituellement.
3 Je n'éprouve aucun plaisir aux choses qui me plaisant habituellement.

5. Sentiments de culpabilité

0 Je ne me sens pas particulièrement coupable.
1 Je me sens coupable pour bien des choses que j'ai faites ou que j'aurais dû faire.
2 Je me sens coupable la plupart du temps.
3 Je me sens tout le temps coupable.

6. Sentiment d'être puni(e)

0 Je n'ai pas le sentiment d'être puni(e).
1 Je sens que je pourrais être puni(e).
2 Je m'attends à être puni(e).
3 J'ai le sentiment d'être puni(e).

7. Sentiments négatifs envers soi-même

0 Mes sentiments envers moi-même n'ont pas changé.
1 J'ai perdu confiance en moi.
2 Je suis déçu(e) par moi-même.
3 Je ne m'aime pas du tout.

8. Attitude critique envers soi

0 Je ne me blâme pas ou ne me critique pas plus que d'habitude.
1 Je suis plus critique envers moi-même que je ne l'étais.
2 Je me reproche tous mes défauts.
3 Je me reproche tous les malheurs qui arrivent.

9. Pensées ou désirs du suicide

0 Je ne pense pas du tout à me suicider.
1 Il m'arrive de penser à me suicider, mais je ne le ferais pas.
2 J'aimerais me suicider.
3 Je me suiciderais si l'occasion se présentait.

10. Pleurs

0 Je ne pleure pas plus qu'avant
1 Je pleure plus qu'avant.
2 Je pleure pour la moindre petite chose.
3 Je voudrais pleurer mais je n'en suis pas capable.

11. Agitation

0 Je ne suis pas plus agité(e) ou plus tendu(e) que d'habitude.
1 Je me sens plus agité(e) ou plus tendu(e) que d'habitude.
2 Je suis si agité(e) ou tendu(e) que j'ai du mal à rester tranquille.
3 Je suis si agité(e) ou tendu(e) que je dois continuellement bouger ou faire quelque chose.

12. Perte d'intérêt

0 Je n'ai pas perdu d'intérêt pour les gens ou pour les activités.
1 Je m'intéresse moins qu'avant aux gens et aux choses.
2 Je ne m'intéresse presque plus aux gens et aux choses.
3 J'ai du mal à m'intéresser à quoi que ce soit.

13. Indécision

0 Je prends des décisions toujours aussi bien qu'avant.
1 Il m'est plus difficile que d'habitude de prendre des décisions.
2 J'ai beaucoup plus de mal qu'avant à prendre des décisions.
3 J'ai du mal à prendre n'importe quelle décision.

14. Dévalorisation

0 Je pense être quelqu'un de valable.
1 Je ne crois pas avoir autant de valeur ni être aussi utile qu'avant.
2 Je me sens moins valable que les autres.
3 Je sens que je ne vaux absolument rien.

15. Perte d'énergie

0 J'ai toujours autant d'énergie qu'avant.
1 J'ai moins d'énergie qu'avant.
2 Je n'ai pas assez d'énergie pour pouvoir faire grand-chose.
3 J'ai trop peu d'énergie pour faire quoi que ce soit.

16. Modification dans les habitudes de sommeil

0 Mes habitudes de sommeil n'ont pas changé.
1a Je dors un peu plus que d'habitude.
1b Je dors un peu moins que d'habitude.
2a Je dors beaucoup plus que d'habitude.
2b Je dors beaucoup moins que d'habitude.
3a Je dors presque toute la journée.
3b Je me réveille une ou deux heures plus tôt et je suis incapable de me rendormir

17. Irritabilité

0 Je ne suis pas plus irritable que d'habitude.
1 Je suis plus irritable que d'habitude.
2 Je suis beaucoup plus irritable que d'habitude.
3 Je suis constamment irritable.

18. Modification de l'appétit

0 Mon appétit n'a pas changé.
1a J'ai un peu moins d'appétit que d'habitude.
1b J'ai un peu plus d'appétit que d'habitude.
2a J'ai beaucoup moins d'appétit que d'habitude.
2b J'ai beaucoup plus d'appétit que d'habitude.
3a Je n'ai pas d'appétit du tout.
3b J'ai constamment envie de manger.

19. Difficulté à se concentrer

0 Je parviens à me concentrer toujours aussi bien qu'avant.
1 Je ne parviens pas à me concentrer aussi bien que d'habitude.
2 J'ai du mal à me concentrer longtemps sur quoi que ce soit.
3 Je me trouve incapable de me concentrer sur quoi que ce soit.

20. Fatigue

0 Je ne suis pas plus fatigué(e) que d'habitude.
1 Je me fatigue plus facilement que d'habitude.
2 Je suis trop fatigué(e) pour faire un grand nombre de choses que de faisais avant.
3 Je suis trop fatigué(e) pour faire la plupart des choses que je faisais avant.

21. Perte d'intérêt pour le sexe

0 Je n'ai pas noté de changement récent dans mon intérêt pour le sexe.
1 Le sexe m'intéresse moins qu'avant.
2 Le sexe m'intéresse beaucoup moins maintenant.
3 J'ai perdu tout intérêt pour le sexe.

Les énoncés suivants représentent des comportements ou des réactions émotionnelles qui sont communs. Pour chaque énoncé, choisissez la réponse qui vous décrit le mieux.

1. Je suis une personne calme.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

2. Je deviens perturbé(e) si j'ai plusieurs choses à faire en même temps.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

3. Un changement soudain de n'importe quelle nature provoque immédiatement des émotions en moi.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

4. Les émotions fortes persistent une à deux heures après que j'aie quitté la situation qui les a causées.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

5. Je suis agité(e) et nerveux(se)

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

6. Mon humeur est rapidement influencée par de nouveaux endroits.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

7. Je m'excite facilement.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

8. J'ai l'impression que mon cœur continue de battre rapidement après avoir été perturbé(e).

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

9. Je peux facilement être ému(e) par des choses que les autres considèrent simples.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

10. Je suis facilement étonné(e).

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

11. Je suis facilement frustré(e).

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

12. Je reste excité(e) ou ému(e) longtemps après avoir vu un bon film.

☐ Jamais ☐ Rarement ☐ Occasionnellement ☐ Fréquemment ☐ Toujours

DONNÉES SOCIODÉMOGRAPHIQUES

Ces dernières questions portent sur des données sociodémographiques. Ces renseignements nous permettent de faire un portrait général des personnes qui participent à notre enquête.

1. Quel est votre sexe?

   ☐ Féminin ☐ Màsculin

2. Quelle est votre date de naissance?

   __ __ / __ __ / __ __
   jour mois année

3. Quel est votre état civil?

   ☐ Célibataire
   ☐ Marié(e) / union libre
   ☐ Séparé(e) / divorcé(e)
   ☐ Veuf(ve)
   ☐ Autre (précisez) _____

4. Combien de personnes demeurent actuellement avec vous?

   _____ personnes

5. Quelle est votre nationalité?

   ☐ Canadienne ☐ Autre (précisez) _____

6. Quelle est votre ethnie?

   ☐ Blanc
   ☐ Noir
   ☐ Hispanique
   ☐ Asiatique
   ☐ Amérindien
   ☐ Autre (précisez) _____

7. Quel est votre dernier niveau de scolarité complété?

   ☐ Primaire ou moins
   ☐ Secondaire
   ☐ Diplôme étude professionnelle (DEP)
   ☐ Collégial général
   ☐ Collégial professionnel
   ☐ Universitaire 1er cycle
   ☐ Universitaire 2e et/ou 3e cycle
   ☐ Autre (précisez) _____

8. Quelle est votre principale occupation?

- ☐ Travail à temps complet
- ☐ Travail à temps partiel
- ☐ Sans travail/recherche d'emploi
- ☐ Travail familial non rémunéré
- ☐ Étude à temps plein
- ☐ Étude et travail
- ☐ Retraité(e)
- ☐ Autre (précisez) _____

9. Quel est votre horaire de travail?

- ☐ De jour
- ☐ De soir
- ☐ De nuit
- ☐ Rotatif
- ☐ Autre (précisez) _____

10. A) Quel est votre revenu familial annuel?

- ☐ Moins de 15 000$
- ☐ Entre 15 000$ et 30 000 $
- ☐ Entre 31 000$ et 45 000 $
- ☐ Entre 46 000 $ et 60 000 $
- ☐ Plus de 61 000 $
- ☐ Ne sais pas/ refuse de répondre

B) Combien de personnes contribuent à ce revenu? _____

11. Avez-vous une adresse électronique que nous pourrions utiliser pour communiquer avec vous?

_____

CONCLUSION

Nous vous remercions beaucoup pour le temps que vous nous avez accordé. Votre implication dans cette étude est très importante et permettra, entre autres, de contribuer à l'avancement des connaissances et au développement de programmes de traitement pour les difficultés de sommeil.

Après avoir vérifié si vous avez bien répondu à toutes les questions, veuillez nous retourner le questionnaire dans l'enveloppe pré-affranchie qui vous a été remise. Vous recevrez les 25 $ de dédommagement pour avoir complété le questionnaire d'ici environ un mois. Aussi, nous vous enverrons le troisième questionnaire dans environ six mois.

Nous vous rappelons que si vous avez des questions concernant l'étude ou sur la açon de répondre aux questions, vous pouvez contacter la responsable de l'étude, Mélanie eBlanc, au numéro de téléphone suivant: 1-866-656-3075 (pour l'extérieur de Québec) u au 656-3075 (pour la région de Québec). Vous pouvez aussi nous rejoindre à l'adresse lectronique suivante: enquete.sommeil@psy.ulaval.ca. ou à cette adresse postale: Centre 'étude des troubles du sommeil, École de psychologie, Université Laval, G1K 7P4.

Merci beaucoup !

CHANGEMENT D'ADRESSE

SI VOUS PRÉVOYEZ DÉMÉNAGER AU COURS DES PROCHAINS MOIS, NOUS VOUS SERIONS RECONNAISSANTS DE BIEN VOULOIR NOUS FAIRE PART DE VOS NOUVELLES COORDONNÉES.

Nom: _____ **Prénom:** _____

ANCIENNE ADRESSE:

_____

no civique **rue**

_____

Ville **province**

_____

code postal

NOUVELLE ADRESSE:

_____

no civique **rue**

_____

Ville **province**

_____

code postal

DATE D'ENTRÉE EN VIGUEUR DE LA NOUVELLE ADRESSE : _____

MERCI !

ANNEX 3: List of AHFS Pharmacologic-Therapeutic Classification(c)

Drug terms in the IPA database are classified according to the categories established in the American Hospital Formulary Service published by the American Society of Hospital Pharmacists. Classifications are listed by numeric code below:

04.00 Antihistamines

08.00 Antiprotozoals
08.00 Antileprotic agents
08.00 Anti-infective agents
- 08.04 Amebicides
- 08.08 Anthelmintics
- 08.12 Antibacterial agents
- 08.12 Antibiotics
  - 08.12.02 Aminoglycosides
  - 08.12.04 Antifungals
  - 08.12.04 Fungicides
  - 08.12.06 Cephalosporins
  - 08.12.08 Chloramphenicols
  - 08.12.12 Macrolides
  - 08.12.12 Erythromycins
  - 08.12.16 Penicillins
  - 08.12.24 Tetracyclines
- 08.16 Antituberculars
- 08.18 Antivirals
- 08.18 Virucides
- 08.20 Antimalarial agents
- 08.20 Plasmodicides
- 08.22 Quinolones
- 08.24 Sulfonamides
- 08.26 Sulfones
- 08.28 Antitreponemal agents
- 08.32 Trichomonacides
- 08.36 Urinary anti-infectives
- 08.36 Urinary germicides

10.00 Antineoplastic agents

12.00 Autonomic drugs
- 12.04 Parasympathomimetic agents
- 12.08 Parasympatholytic agents
  - 12.08.04 Antiparkinson agents
  - 12.08.08 Spasmolytics
- 12.12 Sympathomimetic agents
- 12.16 Sympatholytic agents
- 12.20 Skeletal muscle relaxants

16.00 Blood derivatives

20.00 Blood formation and coagulation
- 20.04 Anti-anemia drugs
  - 20.04.04 Iron preparations
  - 20.04.08 Liver and stomach preparations

ANNEX 3 (cont'd)

20.12.04 Anticoagulants
20.12.04 Platelet aggregation inhibitors

20.12.08 Antiheparin agents
20.12.12 Coagulants
20.12.16 Hemostatics
20.24 Hemorrheologic agents
20.40 Thrombolytic agents

24.00 Cardiovascular drugs
24.04 Cardiac drugs
24.04 Angiotensin converting enzyme inhibitors
24.04 Calcium antagonists
24.04 Cardiac glycosides
24.06 Antilipemic agents
24.08 Hypotensive agents
24.12 Vasodilating agents
24.16 Sclerosing agents

28.00 Benzodiazepine antagonists
28.00 Central nervous system drugs
28.04 Anesthetics
28.08 Analgesics and antipyretics
28.08.04 Anti-inflammatory agents
28.08.08 Opiates
28.10 Opiate antagonists
28.12 Anticonvulsants
28.12.12 Hydantoins
28.12.16 Oxazolidinediones
28.12.20 Succinimides
28.16 Psychotherapeutic agents
28.16.04 Antidepressants
28.16.08 Tranquilizers
28.20 Central nervous system stimulants
28.20 Anorexics
28.20 Appetite stimulants
28.24 Central nervous system depressants
28.24 Sedatives and hypnotics
28.24 Anxiolytics, sedatives and hypnotics
28.24.04 Barbiturates
28.24.08 Benzodiazepines
28.28 Antimanic agents

32.00 Contraceptives
32.00 Contraceptives, intracervical devices
32.00 Contraceptives, intrauterine devices
32.00 Contraceptives, intravaginal
32.00 Spermicides

34.00 Dental preparations
34.00 Dentifrices
34.00 Dental products

ANNEX 3 (cont'd)

36.00 Diagnostic agents

38.00 Disinfectants

40.00 Electrolytic, caloric and water balance
- 40.04 Acidifying agents
- 40.08 Alkalinizing agents
- 40.10 Ammonia detoxicants

- 40.12 Replacement solutions
- 40.12 Oral rehydration compound
- 40.12 Minerals
- 40.12 Elements
- 40.12 Electrolytes
- 40.16 Sodium removing resins
- 40.17 Calcium removing resins
- 40.18 Potassium removing resins
- 40.20 Caloric agents
- 40.24 Sugar substitutes
- 40.24 Salt substitutes
- 40.28 Diuretics
- 40.36 Irrigating solutions
- 40.40 Uricosuric agents

44.00 Enzymes

48.00 Expectorants and cough preparations
- 48.08 Antitussives
- 48.16 Expectorants
- 48.24 Mucolytic agents

52.00 Ointments, ophthalmic
52.00 Solutions, ophthalmic
52.00 Suspensions, ophthalmic
52.00 Otic preparations
52.00 Nasal preparations
52.00 Ophthalmic preparations
- 52.10 Carbonic anhydrase inhibitors
- 52.12 Contact lens solutions
- 52.20 Miotics
- 52.24 Mydriatics
- 52.28 Mouthwashes
- 52.28 Mouthwashes and gargles
- 52.32 Vasoconstricting agents

56.00 Gastrointestinal drugs
- 56.04 Antacids
- 56.04 Adsorbents
- 56.08 Antidiarrhea agents
- 56.10 Antiflatulents
- 56.12 Cathartics
- 56.12 Cathartics and laxatives

ANNEX 3 (cont'd)

56.14 Cholelitholytic agents
56.16 Digestants
56.20 Emetics
56.22 Anti-emetics
56.24 Lipotropic agents

60.00 Gold compounds

64.00 Heavy metal antagonists
64.00 Chelating agents

68.00 Hormones
68.04 Steroids, cortico-
68.08 Androgens
68.08 Anabolic agents

68.12 Contraceptives, oral
68.12 Contraceptives, injectable
68.12 Contraceptives, implants
68.12 Contraceptives, postcoital
68.16 Estrogens
68.16 Estrogens conjugated
68.18 Gonadotropins
68.20 Antidiabetic agents
68.20.08 Insulins
68.20.08 Insulin
68.20.08 Insulin human
68.20.08 Insulin human isophane
68.20.08 Insulin human protamine zinc
68.20.08 Insulin human zinc
68.20.08 Insulin human zinc extended
68.20.08 Insulin isophane
68.20.08 Insulin neutral
68.20.08 Insulin protamine zinc
68.20.08 Insulin zinc
68.20.08 Insulin zinc extended
68.20.08 Insulin zinc prompt
68.20.20 Sulfonylureas
68.24 Parathyroid hormones
68.28 Pituitary hormones
68.32 Progestins
68.36.04 Thyroid drugs
68.36.08 Antithyroid drugs

72.00 Anesthetics, local

76.00 Abortifacients
76.00 Oxytocics

78.00 Roentgenographic agents
78.00 Radiopharmaceuticals
78.00 Radioisotopes

ANNEX 3 (cont'd)

80.00 Serums, toxoids, vaccines
- 80.04 Serums
- 80.04 Antivenins
- 80.08 Toxoids
- 80.12 Vaccines

84.00 Antiperspirants
84.00 Topical preparations
84.00 Skin and mucous membrane preparations
- 84.04.12 Scabicides
- 84.04.12 Pediculicides
- 84.08 Antipruritics
- 84.12 Astringents
- 84.16 Cell stimulants and proliferants
- 84.20 Detergents
- 84.24 Emollients
- 84.24 Demulcents
- 84.24 Protectants
- 84.24 Lotions
- 84.24 Ointments
- 84.24 Creams

- 84.28 Keratolytic agents
- 84.28 Antiseborrheic agents
- 84.32 Keratoplastic agents
  - 84.50.04 Depigmenting agents
  - 84.50.06 Pigmenting agents
- 84.80 Sunscreen agents

86.00 Smooth muscle relaxants
- 86.12 Genitourinary smooth muscle relaxants
- 86.16 Respiratory smooth muscle relaxants

88.00 Dietary supplements
88.00 Vitamins
- 88.04 Vitamin A
- 88.08 Vitamin B complex
- 88.12 Vitamin C
- 88.16 Vitamin D
- 88.20 Vitamin E
- 88.24 Vitamin K

92.00 Alcohol deterrants
92.00 Bronchodilators
92.00 Immunosuppressive agents
92.00 Mast cell stabilizers
92.00 Pulmonary surfactants
92.00 Xanthine oxidase inhibitors

94.00 Devices

ANNEX 4: Categories of Over-the-Counter Remedies

CODE	MEDICATION CATEGORY (ailment being treated)
1	Headache
2	Cold/Flue
3	Sore throat
4	Muscular or other pain (other than headache or backache)
5	Sinus ailments
6	Back ache
7	Indigestion
8	Arthritis/rheumatism
9	Insomnia
10	Menstrual cramps
11	Allergies/asthma
12	Regularity (constipation, diarrhoea)
13	Heartburn
14	Haemorrhoids
15	Vaginal/yeast infections
16	Nausea
17	Immune system
18	Skin-related
19	Stress/anxiety/nerves
20	Other

ANNEX 5: ICD-9 Major Categories

1. Infectious And Parasitic Diseases (001-139)
2. Neoplasms (140-239)
3. Endocrine, Nutritional And Metabolic Diseases, And Immunity Disorders (240-279)
4. Diseases Of The Blood And Blood-Forming Organs (280-289)
5. Mental Disorders (290-319), with the following categories coded separately for analysis:
   - 5.1 mood disorders
   - 5.2 anxiety disorders
   - 5.3 insomnia
   - 5.4 psychosis
   - 5.5 other
6. Diseases Of The Nervous System And Sense Organs (320-389)
7. Diseases Of The Circulatory System (390-459)
8. Diseases Of The Respiratory System (460-519)
9. Diseases Of The Digestive System (520-579)
10. Diseases Of The Genitourinary System (580-629)
11. Complications Of Pregnancy, Childbirth, And The Puerperium (630-676)
12. Diseases Of The Skin And Subcutaneous Tissue (680-709)
13. Diseases Of The Musculoskeletal System And Connective Tissue (710-739)
14. Congenital Anomalies (740-759)
15. Certain Conditions Originating In The Perinatal Period (760-779)
16. Symptoms, Signs, And Ill-Defined Conditions (780-799)
17. Injury And Poisoning (800-999)
18. Plementary Classification Of Factors Influencing Health Status And Contact With Health Services (V01-V82)

ANNEX 6: Letter of approval from *RAMQ*

Commission d'accès à l'information du Québec

Siège social
575, rue St-Amable, bureau 1.10
Québec (Québec) G1R 2G4
Téléphone: (418) 528-7741
Télécopieur: (418) 529-3102

Bureau de Montréal
480, boul. St-Laurent, bureau 501
Montréal (Québec) H2Y 3Y7
Téléphone: (514) 873-4196
Télécopieur: (514) 844-6170

Québec, le 16 mai 2005

Madame Meagan Daley
Centre d'étude des troubles de sommeil
École de psychologie
Université Laval
Cité universitaire
Québec (Québec) G1K 7P4

Objet : Étude - Coûts de l'insomnie - N/Réf. : 03 08 32 et 03 16 54

Madame,

En vertu des dispositions de la *Loi sur l'accès aux documents des organismes publics et sur la protection des renseignements personnels*, la Commission d'accès à l'information vous autorisait, les 28 mai et 1er octobre 2003, à recevoir de la Régie de l'assurance maladie du Québec et du ministère de la Santé et des Services sociaux certains renseignements nominatifs spécifiques.

Ces autorisations sont valables jusqu'au 31 mai 2005. En vertu des conditions inhérentes aux autorisations qui vous ont été consenties, nous vous rappelons qu'à cette date, les renseignements nominatifs reçus doivent donc être détruits. **Ainsi, dès que les renseignements seront détruits, nous vous demandons de nous en aviser, par écrit, au plus tard le 10 juin 2005.**

S'il devait s'avérer nécessaire de vous accorder un nouveau délai de détention, vous devrez alors en exprimer la demande et en démontrer la justification auprès de la Commission.

Enfin, nous voulons porter à votre attention que conformément aux pouvoirs qui lui sont conférés par la loi, la Commission peut vérifier sur place le respect des conditions spécifiées dans les autorisations qui vous ont été émises.

Veuillez agréer, Madame, l'expression de mes sentiments les meilleurs.

Le directeur de l'analyse
et de l'évaluation par intérim,

DB/cg

Daniel Bourassa, avocat

ANNEX 7: *RAMQ* Variables

List of variables obtained from the Régie de l'assurance maladie du Québec (RAMQ) and corresponding database information

Number	Identification
1	ID (provided to RAMQ by researchers on disquette)
2	Professional category
3	Professional specialization
4	Code of act performed
5	Service date
6	ICD-9 diagnostic code
7	Number of acts administered
8	Amount paid per act
9	Remuneration code

ANNEX 8: Unit Costs and Costing Sources

Unit costs and costing sources for dependent variables

Variable	Cost (range, where applicable)	Cost source
Consultations		
Family doctor		RAMQ[a]
Psychiatrist		RAMQ
Other medical specialist		RAMQ
Nurse		RAMQ
Pharmacist		RAMQ
Psychologist	$75 ($60 - $100)	*Ordre des psychologues du Québec*[b]
Physiotherapist	$50 ($40 - $75)	*Ordre professionnel des physiothérapeutes du Québec*
Social work	$65 ($60 - $70)	*Ordre professionnel des travailleurs sociaux du Québec*
Chiropractor	$40 ($35 - $45)	*Ordre des chiropraticiens du Québec*
Homeopath/Naturopath	$60 ($55 - $80)	Quebec Association of Naturopathic Medicine
Acupuncturist	$60 ($45 - $75)	*Ordre des acupuncteurs du Québec*
Massage therapist	$50 ($40 - $70)	*Fédération québécoise des massothérapeutes*
Dietician	$80	*Ordre professionnel des diététistes du Québec*
Other	$60[c]	
Transportation		
Automobile	$0.53/km	Runzheimer International, Canadian Office
Motorcycle	$1.35/km	Runzheimer International, Canadian Office
Taxi	base : $2.50 + $1.20/km	*Commission des transports du Québec*
Bus/Metro	$1.95/ticket, token	*Commission des transports du Québec*
Walking, bicycle	$0.00	

ANNEX 8 (cont'd)

Variable	Cost (range, where applicable)	Cost source
Prescription Medications (in order of use)		a. IMS Health Canada CompuScript database[d] (resource person: Brian Carter) b. *RAMQ liste de medicaments assurés* (annual publication containing unit prices for medications grouped by American Hospital Formulary System classification code c. directly from a random sample of pharmacies (average calculated thereafter), when above two sources not fruitful
Over-the-counter products (in order of use)		a. IMS Health Canada CompuScript database[d] (resource person: Brian Carter) b. Wholesaler catalogue c. directly from a random sample of pharmacies (average calculated thereafter), when above two sources not fruitful
Alcohol		*Société des alcools du* Québec (SAQ); research department
Beer	\$2.27 (341 ml bottle; $\bar{x}$ = \$5.00/750 ml)	
Wine	\$3.10 (6 oz. glass; $\bar{x}$ = \$12.50/750 ml)	
"cooler"-type drinks	\$2.79 (341 ml bottle; $\bar{x}$ = \$6.15/750 ml)	
Liquor	\$1.50 (average consumption = 1.5 oz.; $\bar{x}$ = \$23.00/750 ml bottle)	

ANNEX 8 (cont'd)

Unit costs and costing sources for dependent variables (cont'd)

Variable	Cost (range, where applicable)	Cost source
Productivity and Absenteeism		Statistics Canada, Labour Force Survey (2002)
Annual average hourly wage rate for Québec; all employees, all occupations		
18 – 24 years		
Male	$10.47	
Female	$9.62	
25 – 54 years		
Male	$18.37	
Female	$16.76	
55 years and over		
Male	$20.79	
Female	$15.69	

Note: All unit costs are expressed in 2002 Canadian dollars. Unit counts were reported in the self-report questionnaires. Counts were then multiplied by per unit costs identified in this table. [a] Taken from the *Régie de l'assurance maladie du Québec* published list of remuneration scales for 2002. [b] Modal fees and ranges suggested by professional orders and associations. [c] Estimate obtained by taking the average of all non-RAMQ professional consultation costs. [d] See Annex 2 for sample pages from database.

ANNEX 9: IMS Health CompuScript database sample

id	PRODUCT	THERAPEUTIC CLASS	AHFS CLASS CODE	AHFS SUB-CLASS	AHFS SUB-SUB-CLASS	STRENGTH	UNIT DESCRIPTION	CANADA UNIT PRICE $	QCUnit
1	222	02251 ASA & CODEINE NON/RX	28:00:00	28:08:00	28:08:92	8MG	TAB	0,18	0,19
2	282 MEP	02252 ASA & CODEINE RX	28:00:00	28:08:00	28:08:92	15MG	TAB	0,36	0,42
3	3TC	81110 ANTI-RETROVIRALS	08:00:00	08:18:00	08:18:08	10MG/M	ML	0,33	0,33
4	3TC	81110 ANTI-RETROVIRALS	08:00:00	08:18:00	08:18:08	150MG	TAB	4,94	4,88
5	ACCOLATE	28314 LEUKOTRIENE AGENTS	92:00:00			20MG	TAB	0,89	0,87
6	ACCUPRIL	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	10MG	TAB	1,04	1,10
7	ACCUPRIL	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	20MG	TAB	1,04	1,09
8	ACCUPRIL	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	40MG	TAB	1,08	1,12
9	ACCUPRIL	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	5MG	TAB	1,04	1,10
10	ACCUTANE	37100 ACNE THERAPY	84:00:00	84:36:00		10MG	TAB	1,78	1,81
11	ACCUTANE	37100 ACNE THERAPY	84:00:00	84:36:00		40MG	TAB	3,51	3,54
12	ACETAMINOPHEN W/CO	02241 ACETAMINOPHEN & CODEINE NRX	28:00:00	28:08:00	28:08:08	300MG	TAB	0,05	0,07
13	ACETAMINOPHEN W/CO	02241 ACETAMINOPHEN & CODEINE NRX	28:00:00	28:08:00	28:08:08	325MG	TAB	0,13	0,11
14	ACILAC	56110 FECAL SOFTENERS W/STIMULANTS	56:00:00	56:12:00		667MG	ML	0,03	0,03
15	ACTIFED	34112 COLD W/O ANALGESICS, LIQUIDS	04:00:00	04:00:00		60MG	ML	0,12	0,11
16	ACTIFED	34111 COLD W/O ANALGESICS, CAPS	04:00:00	04:00:00		60MG	TAB	0,35	0,30
17	ACULAR	61700 OTHER OPHTHALMIC PREPS	52:00:00	52:08:00	52:08:04	0.5%	ML	4,53	5,15
18	ADALAT PA20	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		20MG	TAB	1,00	0,99
19	ADALAT XL	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		20MG	TAB	0,98	1,02
20	ADALAT XL	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		30MG	TAB	1,15	1,20
21	ADALAT XL	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		60MG	TAB	1,74	1,78
22	ADVIL	03100 ANALGESIC PROPRIETARY INTERNAL	28:00:00	28:08:00	28:08:04	200MG	TAB	0,16	0,14
23	ADVIL CHILDRENS	03100 ANALGESIC PROPRIETARY INTERNAL	28:00:00	28:08:00	28:08:04	100MG/	ML	0,09	0,07
24	AGRYLIN	11200 ANTI-PLATELETS	92:00:00			0.5MG	TAB	5,55	5,49
25	ALESSE	33232 ORAL CONTRACEPTIVES, SUB 50MCG ESTI	68:00:00	68:12:00		21 DAY	TAB	0,83	0,81
26	ALESSE	33232 ORAL CONTRACEPTIVES, SUB 50MCG ESTI	68:00:00	68:12:00		28 DAY	TAB	0,63	0,61
27	ALLEGRA	14100 ANTIHISTAMINES, CAPS&TABS	04:00:00			60MG	TAB	0,59	0,57
28	ALLEGRA D	14100 ANTIHISTAMINES, CAPS&TABS	04:00:00			60/120	TAB	0,72	0,66
29	ALPHA KERI	37300 ANTIPRURITICS	84:00:00	84:08:00		3%	GM	0,04	0,04
30	ALPHA KERI	37300 ANTIPRURITICS	84:00:00	84:08:00		3%	ML	0,03	0,03
31	ALPHAGAN	61400 MIOTICS & GLAUCOMA	52:00:00	52:36:00		0.2%	ML	4,57	4,59
32	ALTACE	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	1.25MG	TAB	0,85	0,91
33	ALTACE	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	10MG	TAB	1,17	1,24
34	ALTACE	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	2.5MG	TAB	0,96	1,03
35	ALTACE	31810 ACE INHIBITORS	24:00:00	24:32:00	24:32:04	5MG	TAB	0,96	1,02
36	ALTI-ACYCLOVIR	81210 ANTI-VIRALS,SYSTEM	8:00:00	8:18:00		200MG	TAB	1,08	1,12
37	ALTI-ACYCLOVIR	81210 ANTI-VIRALS,SYSTEM	8:00:00	8:18:00		400MG	TAB	2,00	2,01
38	ALTI-ACYCLOVIR	81210 ANTI-VIRALS,SYSTEM	8:00:00	8:18:00		800MG	TAB	3,40	3,48
39	ALTI-AMIODARONE	31300 ANTI-ARRHYTHMIA	24:00:00	24:04:00	24:04:04	200MG	TAB	1,62	1,70
40	ALTI-BENZYDAMINE	03200 ANALGESIC PROPRIETARY EXTERNAL	52:28:00			0.15%	ML	0,09	0,09
41	ALTI-DILTIAZEM CD	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		120MG	TAB	1,05	1,10
42	ALTI-DILTIAZEM CD	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		180MG	TAB	1,34	1,39
43	ALTI-DILTIAZEM CD	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		240MG	TAB	1,76	1,78
44	ALTI-DILTIAZEM CD	31700 CALCIUM BLOCKING AGENTS	24:00:00	24:28:00		300MG	TAB	2,28	2,27
45	ALTI-FLUVOXAMINE	64340 SEROTONIN REUPTAKE INHIBITORS	28:00:00	28:16:00	28:16:04	100MG	TAB	1,23	1,27
46	ALTI-FLUVOXAMINE	64340 SEROTONIN REUPTAKE INHIBITORS	28:00:00	28:16:00	28:16:04	50MG	TAB	0,75	0,78
47	ALTI-IPRATROPIUM	28120 BRONCHODILATORS, GENERAL	12:00:00	12:08:00	12:08:08	125MCG	ML	0,65	0,68
48	ALTI-IPRATROPIUM	28120 BRONCHODILATORS, GENERAL	12:00:00	12:08:00	12:08:08	250MCG	ML	1,00	1,13
49	ALTI-MOCLOBEMIDE	64390 ANTI-DEPRESSANTS, OTHER	28:00:00	28:16:00	28:16:04	150MG	TAB	0,53	0,57
50	ALTI-RANITIDINE	23600 H-2 RECEPTOR ANTAGONISTS	56:00:00	56:40:00		150MG	TAB	0,55	0,58
51	ALTI-RANITIDINE	23600 H-2 RECEPTOR ANTAGONISTS	56:00:00	56:40:00		300MG	TAB	1,04	1,06
52	ALTI-SULFASALAZINE	15310 SULFONAMIDES PLAIN	08:00:00	08:24:00		500MG	TAB	0,15	0,18
53	ALTI-TERAZOSIN	31140 OTHER ANTIHYPERTENSIVES	24:00:00	24:08:00		10MG	TAB	1,13	1,21
54	ALTI-TERAZOSIN	31140 OTHER ANTIHYPERTENSIVES	24:00:00	24:08:00		1MG	TAB	0,51	0,58
55	ALTI-TERAZOSIN	31140 OTHER ANTIHYPERTENSIVES	24:00:00	24:08:00		2MG	TAB	0,61	0,69
56	ALTI-TERAZOSIN	31140 OTHER ANTIHYPERTENSIVES	24:00:00	24:08:00		5MG	TAB	0,80	0,88
57	ALTI-VALPROIC	20220 SEIZURE DISORDERS, ORAL LIQUIDS	28:00:00	28:12:00	28:12:92	50MG/M	ML	0,08	0,08
58	ALTI-VALPROIC	20210 SEIZURE DISORDERS, CAPS&TABS	28:00:00	28:12:00	28:12:92	250MG	TAB	0,36	0,37
59	ALTI-VALPROIC	20210 SEIZURE DISORDERS, CAPS&TABS	28:00:00	28:12:00	28:12:92	500MG	TAB	0,69	0,66
60	AMATINE	31690 CARDIO OTHERS	12:00:00	12:12:00		2.5MG	TAB	0,56	0,58
61	AMATINE	31690 CARDIO OTHERS	12:00:00	12:12:00		5MG	TAB	0,89	0,86
62	AMERGE	02400 ANTI-MIGRAINE	28:00:00	28:92:00		1MG	TAB	15,32	15,17
63	AMERGE	02400 ANTI-MIGRAINE	28:00:00	28:92:00		2.5MG	TAB	15,89	15,69
64	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	125MG	ML	0,10	0,09
65	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	250MG	ML	0,12	0,12
66	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	125MG	TAB	0,61	0,47
67	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	250MG	TAB	0,84	0,73
68	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	250MG	TAB	0,44	0,45
69	AMOXIL	15152 AMOXICILLIN	08:00:00	08:12:00	08:12:16	500MG	TAB	0,67	0,66
70	ANACIN	03100 ANALGESIC PROPRIETARY INTERNAL	28:00:00	28:08:00	28:08:04	325MG	TAB	0,10	0,11
71	ANAKIT	78600 OTHER MISCELLANEOUS, ETHICAL				N/A au Canada	KIT	29,85	27,73
72	ANANDRON	30200 CYTOSTATIC DRUGS,OTHERS	10:00:00			100MG	TAB	2,33	2,28
73	ANANDRON	30200 CYTOSTATIC DRUGS,OTHERS	10:00:00			50MG	TAB	1,94	1,93
74	ANAPROX	02132 SYNTHETIC NON-NARCOTICS, NON/INJECT	28:00:00	28:08:00	28:08:04	275MG	TAB	0,91	0,89
75	ANAPROX DS	02132 SYNTHETIC NON-NARCOTICS, NON/INJECT	28:00:00	28:08:00	28:08:04	550MG	TAB	1,57	1,57
76	ANDRIOL	52152 ANDROGENS, ORAL	68:00:00	68:08:00		40MG	TAB	1,15	1,16
77	ANDROCUR	30200 CYTOSTATIC DRUGS,OTHERS	92:00:00			100MG/	ML	27,74	28,71
78	ANDROCUR	30200 CYTOSTATIC DRUGS,OTHERS	92:00:00			50MG	TAB	1,75	1,70
79	ANTIPHLOGISTINE RU	03200 ANALGESIC PROPRIETARY EXTERNAL	28:00:00	28:08:00	28:08:04	12,5%	GM	0,07	0,06
80	ANTIPHLOGISTINE RU	03200 ANALGESIC PROPRIETARY EXTERNAL	28:00:00	28:08:00	28:08:04	13,3%	GM	0,08	0,10
81	ANTIPHLOGISTINE RU	03200 ANALGESIC PROPRIETARY EXTERNAL	28:00:00	28:08:00	28:08:04	18%	GM	0,07	0,07
82	ANTIPHLOGISTINE RU	03200 ANALGESIC PROPRIETARY EXTERNAL	28:00:00	28:08:00	28:08:04	4%	GM	0,06	0,06
83	ANUGESIC H.C.	49200 HEMORRHOIDAL PREPS WITH CORTICOID	84:00:00	84:06:00		0.5%	GM	1,35	1,39