



# **Report to the Sleep Health Foundation 2016 Sleep Health Survey of Australian Adults**

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## 2016 Sleep Health Survey of Australian Adults Executive Summary

### ***Sleep problems are common***

- It is apparent that inadequate sleep, of either duration or quality, and its daytime consequences are very common in Australian adults, affecting 33-45% of adults.
- These problems occur across all age groups.
- Medical sleep conditions are also very common, with diagnosed sleep apnea affecting 8%, significant insomnia 20% and restless legs 18% of adults.
- Average reported sleep time is 7 hours, although 12% sleep less than 5 ½ hours and 8% over 9 hours. Three-quarters (76%) who sleep less than 5 ½ hours report frequent daytime impairment or sleep-related symptoms.
- Frequent, loud snoring is reported by 24% of men and 17% of women. Frequent, loud snoring and breathing pauses in sleep are more often seen in middle age. Among those with frequent, loud snoring, 70% report daytime impairment or other sleep-related symptoms.
- Among the 19% of people with frequent loud snoring and/or witnessed breathing pauses but no prior diagnosis of OSA on a sleep study, 63% report awakening unrefreshed, and 65% report one or more daytime sleep-related symptoms, suggesting undiagnosed sleep apnea is relatively common in the community.

### ***The effect of the '24/7 society' is profound.***

- A quarter of all adults (26%), both use the internet most or every night of the week just before bed and have frequent sleep difficulties or daytime impairments. Similarly, 16% of all working adults do work just before bed and also have frequent sleep difficulties or daytime sleep-related symptoms.
- Nearly a quarter (23%) report their typical weekday routine of work or home duties does not allow them to get enough sleep.
- Younger adults (18-34y) sleep around 1 hour longer before non-work days than working days, compared to 18 minutes in older age groups.

### ***Sleep problems have a major effect on work performance.***

- In the past month 17% have missed work because they were sleepy and 17% have also fallen asleep on the job. In the past 3 months 29% of adults report making errors at work due to sleepiness or sleep problems.
- People with sleep problems are significantly more likely to report decreased work productivity (as assessed on the Stanford Presenteeism Scale).

### ***Sleepiness and sleep problems are a major source of risk on our roads.***

- Driving while drowsy at least every month is reported by 29% of people, 20% have nodded off while driving and 5% have had an accident in the past year because they dozed off.

### ***Sleep problems may be increasing in the community***

- The prevalence of sleep difficulties and daytime consequences appears to have increased since 2010, with various sleep problems reported by more adults than in 2010.

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Cover photo: *Lautrec in bed*, 1893. Henri de Toulouse-Lautrec. Wikipedia Commons.

## Introduction

Sleep is a fundamental biological requirement for human health. Over the past 20 years there has been increasing interest in the bidirectional association between sleep and adverse health effects. Sleep disorders can affect the quality of sleep and insufficient time allowed or available for sleep can also lead to inadequate sleep or sleep quality.

Specific sleep disorders, such as obstructive sleep apnea (OSA), have been strongly linked to a variety of health problems and chronic diseases, such as coronary heart disease, stroke, atrial fibrillation, diabetes, hypertension, depression, erectile dysfunction, nocturia, cognitive impairment and mortality risk.<sup>1-6</sup> Symptoms of sleep problems, such as snoring and breathing pauses during sleep have also been associated with increased risk of heart disease.<sup>7</sup> Insomnia, defined as difficulty getting off to sleep or maintaining sleep with daytime symptoms such as fatigue, is also associated with increased risk of mortality.<sup>8-10</sup>

Shortened sleep time also carries health risks and may adversely affect metabolic health through changes in the activity of neuroendocrine systems.<sup>11</sup> Studies show sleeping less than six or seven hours on average per night may increase the risk for obesity,<sup>12, 13</sup> type 2 diabetes,<sup>14, 15</sup> and heart disease.<sup>16</sup> Sleep deprivation affects the body's metabolism, including glucose metabolism. Laboratory studies have consistently found short-term sleep loss decreases glucose tolerance and insulin sensitivity.<sup>17</sup> Research has also found that when sleep-deprived, people increase intake of comfort foods high in fat and sugar.<sup>18</sup> These changes to body metabolism and eating behavior with sleep-deprivation will tend to increase the risk of obesity and diabetes. Population level studies have also shown that people who sleep less than 8 hours on average have a higher body mass index and show changes in the hormones that control appetite, such as ghrelin, contributing to the risk of obesity.<sup>19</sup>

Short sleep also reduces natural immune function,<sup>20</sup> increasing the risk of infections and possibly cancer. Reduced sleep is also linked to hypertension and heart disease, possibly by triggering over-activity in the body's stress responses such as sympathetic hyperactivity or inflammation.<sup>21, 22</sup> Sleep disorders, other sleep problems and insufficient sleep are linked to cognitive function and mental well-being. Disturbance in mood, thinking, concentration, memory, learning, vigilance and reaction times have been reported.<sup>23, 24</sup>

Problems with sleep have a substantial economic and social cost. Increase risk of motor vehicle and workplace accidents, as well as decreased workplace performance and productivity have been associated with sleep problems. Deloitte Access Economics estimated that in 2010 the healthcare costs of the three most common sleep disorders, OSA, primary insomnia and restless legs, was \$818 million. Indirect financial and non-financial costs of these sleep disorders were estimated at a further \$4.3 billion.

The scope of sleep problems in Australia has been examined in only a few studies. In 2010 the Sleep Health Foundation commissioned a telephone survey of 1512 Australians aged 14 to <70 years old. The study found sleep difficulties, such as initiating and maintaining sleep, and daytime symptoms fatigue, sleepiness and irritability are reported to occur most days by 20%–35% of the population. The prevalence of sleep disorders such as sleep apnea is reported to have increased substantially over recent years in line with that of obesity, its principal risk factor. In addition, lifestyle behaviours that can influence sleep, such as use of internet devices and consumption of energy drinks, are reported to have increased. For these reasons, the current prevalence and impact of sleep disorders and problems in the Australian community needs revisiting.



## Methodology

The survey was conducted in March 2016 on behalf of the Sleep Health Foundation among 1,011 adults aged over 18 years across Australia, with representativeness for age, sex, location and an indicator of socio-economic status. Researchers from The University of Adelaide were responsible for the survey design and analysis.

The study objective was to assess the scale of the health and social consequences of insufficient sleep and sleep disorders in Australia. The survey aimed to measure the prevalence and economic impacts of sleep problems in Australia, including sleep loss, insufficient sleep, and sleep disorders, including sleep apnea, insomnia and restless legs syndrome. The economic impact includes absenteeism, reduced productivity and performance.

The survey questions are taken largely from the 2002 US National Sleep Foundation Sleep in Adults survey with some additional questions from the Australian 2005 Sleep in Adults survey plus further items that examined the impact of sleep on work, including absenteeism and work performance. The Stanford Presenteeism Scale (SPS)<sup>25</sup> was also used to examine work performance. The SPS measures workers' perceptions of their ability to overcome the distraction of physical and/or psychological problems in order to handle job stress, complete tasks, achieve goals and maintain sufficient focus and energy levels. The scale measures two factors that the authors labeled as completing work and avoiding distraction.

The questionnaire is included as Appendix B.

The survey was conducted online by the Survey Sampling International (SSI) research organization. SSI have developed a panel of over 220,000 Australians who are invited to complete surveys for a small remuneration. Participants are selected from SSI's online sample blend, a consistently-managed, diverse and large frame. To minimize the risk of bias, SSI uses a three-stage randomization process in matching a participant with a survey they are likely to be able to complete

To minimize the risk of bias, SSI uses a three-stage randomization process in matching a participant with a survey they are likely to be able to complete. First, participants are randomly selected from SSI's panels to be invited to take a survey, and these participants are combined with others entering SSI's Dynamix<sup>TM</sup> sampling platform after responding to online messaging. A set of profiling questions is randomly selected for them to answer (these are methodologically correct questions, never affirmation questions) and upon completion, participants are matched with a survey they are likely to be able to take (ie the sleep survey), using a further element of randomization. Invitations to participate include e-mail invitations, telephone alerts, banners and messaging on SSI panel community sites. The messages themselves are also varied, including invitations to give your opinion, or let your voice be heard. A diversity of motivation contributes to high-quality sample. To avoid self-selection bias, specific project details are not generally included in the invitation. Rather, participants are invited to "take a survey." The details are disclosed later, when a survey has been selected within the system.

The survey methodology was approved by The University of Adelaide Office of Research Ethics, Compliance and Integrity's Human Research Ethics Secretariat (H-2016-029).

### *Statistical analysis and power*

Data were analyzed using IBM SPSS version 20.0 (IBM Corporation, Armonk, NY, USA). T-tests and ANOVA determined mean levels of continuous variables (e.g. sleep duration, Stanford Presenteeism Scale) in relation to sex, age, and sleep factors. Differences in the distribution of other

sleep variables were determined with the Pearson Chi-square or Linear-by-linear association statistic (Mantel-Haenszel) for testing the presence of a linear trend. A sample size of 1000 provides estimates of proportions to within  $\pm 2.5\%$ , and of means of  $\pm 1\%$ . For estimating differences between groups this sample size will provide 99% power of detecting a small effect size (Cohen's  $d < 0.2$ ). The analysis of work issues was conducted in 554 participants who were working at the time of the survey.

## Results

The sample was generally representative of the Australian population with regards to age, gender, income and geographic location across states and metropolitan and rural locations (see Appendix A, Table 1). The sample had a higher proportion with post-school qualifications, particularly Bachelor degrees or higher, than population estimates. The survey completion time was 15-20 minutes.

### **Sleep difficulties and clinical sleep conditions (Table 1)**

The percentage of adults who report difficulties sleeping at least a few times a week or more, is high. Females (40%) are more likely than males (26%) to experience difficulty in falling asleep with little difference across age groups. Nearly half (47%) of women wake often overnight, which is a problem that also increases significantly with age. Problems with waking early and not being able to easily get back to sleep also increase with age. However, older age groups are significantly more likely to report getting adequate sleep and less likely to report awakening unrefreshed than younger adults. Frequent, loud snoring is reported by 24% of men and 17% of women, and is less common among younger adults. Frequent, loud snoring and breathing pauses in sleep are more often seen in middle age, but symptoms of restless legs are constant across age groups.

Diagnosed sleep disorders are common. A doctor-diagnosis of sleep apnea was over 3 times more common in men than women, although the gender difference in the cardinal symptoms of sleep apnea, i.e. snoring, breathing pauses and daytime symptoms, was much less pronounced. For example, 9% of women and 14% of men report breathing pauses, a defining feature of sleep apnea. Very high percentages (70-80%) of people with symptoms of clinical sleep disorders (i.e. frequent snoring, observed breathing pauses, restless legs) also reported having two or more of problems with daytime symptoms such as sleepiness, or sleep difficulties, such as problems getting off to sleep, compared with around 40% of people without symptoms of clinical sleep disorders (see Table 2).

#### *Daytime symptomatology*

Daytime symptoms related to insufficient or unrefreshing sleep, such as sleepiness, fatigue or feeling irritable are common, being seen in 30-39% of adults. These symptoms are significantly more common among younger age groups than older adults, with these problems occurring in around half of 18-24y, twice the level of those >65y. Pathological daytime sleepiness where people describe a strong tendency to doze off, as assessed by the Epworth Sleepiness Scale (ESS), is also significantly more common in younger adults. Over one-quarter of people aged 18-35 years (27%) have an abnormal ESS score, double the prevalence of older adults (65+ years – 13%).

#### *Sleep Duration*

Duration of reported sleep was around 7 hours on average on week-days (or before working days) but 35 minutes longer on week-ends (or non-working days), which varied little by gender. Although there was little difference across age groups in sleep time during the working week, younger adults slept an hour or more longer before non-working days, significantly more than older adults. The distribution of sleep time is large, with a standard deviation in 18-24y of over 2 hours, indicating many people, especially younger adults, sleep for much less than the average time. Overall, 12% of adults sleep less than 5 ½ hours, with 8% sleeping over 9 hours on average. Although difficulties with sleep onset and maintenance and daytime sleep-related symptoms are more common in women than men, the amount of time spent sleeping and the use of prescribed sleep medications does not differ between the sexes.

## *Insomnia*

The criteria for clinically significant insomnia by The International Classification for Sleep Disorders-3 classification<sup>26</sup> includes a report of sleep initiation or maintenance problems and daytime consequences (daytime sleepiness /fatigue or exhaustion/ irritable or moody) at least three times per week with adequate opportunity and circumstances to sleep. This constellation of symptoms of insomnia was present in 20% of adults. Although significantly more common in women (23%), insomnia was also estimated to be present in 17% of men. Insomnia was also seen more often among young and late middle-aged adults than the elderly. Prescribed sleep medication is used at least a few times a week by 9%, more often by the middle-aged (35-54y) than other age groups.

### **Chronic illness and sleep (Table 2)**

The effect of chronic illness on sleep is also significant. Multimorbidity, or a higher number of comorbid chronic diseases in an individual, was associated with higher frequency of 2 or more sleep difficulties or daytime symptoms. Among those 4 or more chronic conditions, 68% reported having 2 or more sleep difficulties, compared to 36% of those with no chronic conditions. Some specific, individual conditions (heartburn/reflux; depression; anxiety; lung disease) are associated with higher frequency of sleep difficulties than people without those individual conditions.

### **Burden of sleep problems in relation to sleep disorders (Table 3)**

To examine the relative effect of clinical sleep conditions on the population burden of sleep problems, the prevalence of sleep symptoms and daytime sleep-related symptoms reported  $\geq 3$  times/week were compared among people: 1) without diagnosed OSA or OSA symptoms or restless legs symptoms; 2) with diagnosed OSA (with or without restless legs symptoms) ; 3) with likely undiagnosed OSA, defined as loud snoring and/or witnessed breathing pauses at least 3 times/week but no prior diagnosis of OSA on a sleep study (with or without restless legs symptoms), and 4) with restless legs symptoms only. Although the percentage of frequent sleep problems or daytime symptoms was lower in the group without OSA or restless legs, the absolute total number in this group was similar to those with specific clinical conditions

### **Activities done in the hour before bed (Table 4)**

It is common for people to do activities in the hour before bed that may affect their sleep. Overall, 44% of adults (47% women, 40% men) are on the internet just before bed almost every night. This is more frequent in younger people (18-24y – 75%; 25-34y – 55%) but even in over 65y 22% use devices before sleeping. Work intrudes late into the evening for many. At least a few nights per week, 17% do job-related work before sleeping. This is common in younger adults, with 36% of 18-24y and 28% of 25-34y working before bed. Over half of adults watch TV (52%) before bed although the age distribution is reversed from internet use, with 35% of 18-24 year olds, TV watching compared to 66% of those 65 years and over. Age differences are seen for other behaviours as well. Young adults also more likely to have a hot bath or shower before bed a few nights per week, with 48% of 18-24 year olds reporting this behaviour compared with 32% of over 65 year olds. The young are also more likely to have sex before sleeping a few nights per week, reported by 30% of 24-35y compared with 8% of 55-64yo. However, they are less likely to drink alcohol (18-24y – 14%; 45-64y – 26%).



### **Sleep habits and environmental influences (Table 5)**

Nearly a quarter of adults report their typical routine does not allow them to get enough sleep, with this figure rising to around 30% in the prime working ages of 18-44y. Many people take naps, with 40% napping at least twice weekly. This was common across age groups, with 35% of 35-44y napping twice weekly or more. Napping was more common among men, with 44% of men taking 2 or more naps per week, compared with 36% of women. Among women who nap, 26% sleep for over 1 hour, compared to 16% of men.

Nearly a quarter (24%) of adults think that they have a sleep problem, and although more common in older adults, reported by 31% of 55-64 year olds, 21 % of 18-24yo consider they have a sleep problem. There was little difference by gender. What individuals would do if they thought they had a sleep problem also varied by age. Younger adults were more likely to assume a sleep problem would go away and were less likely to talk to a doctor than older adults.

Only a minority of adults report using sleep aids, such as medications. Over-the counter preparations are used by 7% of people a few nights per month and by 5% most nights. Prescribed sleep medications from a doctor are used by 5% on a few nights per month and by 8% most nights. There was little difference by gender in the reported use of sleep aids, and no significant difference across age groups.

Many adults consume caffeinated drinks, with over one-third (34%) of adults taking in 4 or more caffeinated drinks per day. Caffeine intake is more common among older age groups, with 40% or more of over 45y taking in 4 or more drinks per day, compared with 9% of 18-24yo.

### **Causes of sleep disturbance (Table 6)**

Half of women (50%) and 38% of men find it somewhat or very difficult to get back to sleep if they are awoken during the night. Nominated causes of awakening from sleep include environmental stimuli such as noise, reported by 50%, and light, by 27%. Cognitive or emotional issues such as stress (28%), thinking about work (24%), or nightmares (24%) and physical or health reasons, including pain (25%) and going to the bathroom (60%) are other common reasons for disturbance from sleep. All of these reasons are more common in women than men. Cognitive or emotional reasons such as stress are more common among younger adults whilst physical reasons for sleep disturbance such as pain occur more frequently with age. For 1 in 7 adults (14.3%) a partner's sleep problem has a moderate or significant effect on the couple's relationship.

### **Effect of sleep problems on work and social activities (Table 7)**

Seventeen percent of people report missing at least one day of work in the past four weeks because they were too sleepy or had a sleep problem. This was especially common in younger adults, with 27% of 18-24y and 30% of 24-35y reporting days off from sleepiness. Errors at work from sleepiness or sleep problems are also common, with 20% reporting errors on 1-2 days in the past 3 months, and 9% on 3 or more days. Again this was more common in younger adults, with around half of 18-34y reporting errors at work from sleep problems at least 1-2 days in the past 3 months.

Sleep problems are a common reason people are late for work, with 14% of men and 21% of women reporting being late because they were too sleepy when they woke up or have a sleep problem. Further, 21% of men and 13% of women have fallen asleep at work in the past month, which is a common finding up to the age of 55y. Sleep related decreases in productivity, where workers are present at work but have a reduced ability to finish tasks, focus on work and cope with distractions (also known as presenteeism), were also common. Specifically, people who report sleep

problems, have observed breathing pauses during sleep, or restless legs, report significantly more work impairments, as assessed by the Stanford Presenteeism Scale (SPS, **Table 8**). The difference in SPS scores between those with two or more sleep problems and those with zero or one, was around half of a standard deviation, indicating at least a moderate effect size on work performance from sleep problems. Sleep-related work impairment was more likely among younger adults aged 18-34y compared to older adults aged over 55y.

Being too sleepy or having a sleep problem is also a common reason for missing social activities, with 22% of men and 27% of women reporting missing social events on at least 1 day in past 3 months. Again this was more common in younger age groups, affecting 45% of 18-24y and 37% of 24-34y.

Drowsiness while driving is also common. Being drowsy when driving occurring at least every week is reported by 17% of men and 15% of women, and 29% report doing so at least monthly. This figure varies by age, with 30% of 25-34yo, compared with less than 1% of over 65yo. A further 13% of adults report driving while feeling drowsy once or twice a month. One-fifth of adults (22% men, 17% women) have nodded off while driving, with 5% have had a motor vehicle accident in the past year because they dozed off or were too tired. Reported accidents from sleepiness were more common among younger adults, reported by 10% of 25-34y.

### **Effect of sleep habits and routine on sleep quality and daytime functioning (Table 9)**

Nearly half of adults (48%) report having 2 or more sleep-related problems or difficulties (i.e. difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody or pathological daytime sleepiness [ESS>10]).

Of the 22% of people who report doing work related to their job in the hour before bed a few nights of the week or more, 69% have 2 or more sleep problems, significantly more than adults who do not work before bed. Similarly, of the 44% of people who use the internet most or every night of the week, that figure is 59%, i.e. 26% of adults both use the internet most or every night of the week and also have 2 or more sleep difficulties or daytime symptoms. Among the 12% of adults who sleep less than 5 ½ hours before workdays, three quarters (76%), report 2 or more sleeping difficulties or daytime symptoms, compared to 43% of those who sleep more than 5 ½ hours. Higher caffeine use is associated with higher likelihood of sleep problems. Among those who do not consume caffeinated drinks, 40% report  $\geq 2$  sleep problems, compared with 61% who consume  $\geq 6$  caffeinated drinks per day.

## Comparison with 2010 survey

In 2010, a national landline telephone survey of adolescents and adults between 14 to > 70 years of age) was conducted across successive weekend evenings by Roy Morgan Research on behalf of the Sleep Health Foundation. There were 1512 respondents from all states and territories, both urban and rural, with sampling proportionate to the populations of those areas, sex and age. Results of this survey were published by Hillman and Lack in 2013.<sup>27</sup> Although differences in survey methodology exist between this survey and the current one, including use of landline telephones and sample size (1415 adults aged over 18y), it is instructive to compare results from the two surveys as 14 identical items were asked in the two surveys.

Overall, comparison of the results from the previous survey shows reported increases in the prevalence of sleep problems in Australia since 2010 (see Appendix A, Figure 1). The number of adults who report sleep difficulties more than a few times per week, such as difficulty falling asleep, awakening unrefreshed and who report they did not get adequate sleep has increased. These changes were seen across all age groups, including older adults aged >65 years. The use of prescribed sleep medication has increased to match, particularly in younger adults aged 18-34 years.

The percentage of adults who have daytime symptoms related to insufficient or unrefreshing sleep, such as daytime sleepiness, fatigue or irritability, has also shown an increase. These changes were more pronounced in younger adults, especially 18-24 year olds, where over half now report sleepiness or fatigue most days. The length of self-reported time asleep has remained fairly constant at around 7 hours on workdays, with a consistent finding of increased sleep on non-working days.

Diagnosed, clinical sleep disorders have also increased, although not universally. Doctor-diagnosed sleep apnea prevalence has doubled in men to 12.9%, although the prevalence of frequent, loud snoring has not altered much. However diagnosed sleep apnea prevalence has remained unchanged in women.

Despite increasing awareness in the general media and medical literature of the potential adverse consequences of poor sleep, the prevalence of sleep problems appears to have not improved since 2010.

## Discussion

The results from this national survey of Australian adults shows that sleep problems, related to clinical sleep disorders and/or lifestyle and behavioural choices, produce a considerable burden on public health, social life and workplace functioning. Nearly half of adults report having two or more sleep-related problems, such as difficulty initiating or maintaining sleep, or daytime sleepiness or fatigue. Much of this is due to competing demands on people's time, with a quarter of all adults reporting their usual routine does not allow them to get enough sleep. Lifestyle choices affecting sleep habits, such as working or using the internet just before bed, are also having adverse effects on sleep and daytime performance. The data shows insufficient or inadequate sleep adversely affects social events and workplace performance, with absenteeism and falling asleep at work common. Alarming numbers report driving when drowsy, and the frequency that young, relatively inexperienced drivers report accidents after dozing off is also a major concern. Although comparisons with the previous 2010 survey should be made with caution due to differences in methodology, it certainly appears sleep problems and their consequences are increasing in scope and frequency. Whilst specific issues vary with age, sleep-related problems occur frequently across all age groups. Overall, the picture emerges of a nation whose health, social life and productivity is suffering from lack of quality sleep.

Specific diagnosed sleep conditions, such as sleep apnea, are common. However, many continue to report significant sleep-related symptoms following a clinical diagnosis. For instance, a quarter of people with diagnosed sleep apnea report pathological daytime sleepiness on the Epworth Sleepiness Scale (ESS)<sup>28</sup> and over half report one or more daytime sleep-related symptom such as fatigue or irritability. It is also likely that under-diagnosis of sleep apnea is also common. Around 10% of the population report frequent loud snoring with observed breathing pauses during sleep, cardinal symptoms of sleep apnea. Less than half of these people feel they get adequate sleep and 22% also have abnormal ESS scores. Snoring and breathing pauses during sleep have also been associated with increased risk of heart disease.<sup>7</sup> It seems that there is potential to substantially improve both the diagnosis and treatment of sleep apnea to reduce the population health burden of this condition. Recognition by clinicians and in the community that snoring may not be a benign symptom and that daytime impairment may have a pathological cause is an important first step.

Although it is often assumed sleep problems are a feature of ageing our results in general did not bear this out. In this our results were consistent with recent reports from the HypnoLaus population study in Switzerland, in that older people complained less about sleepiness, and pathological sleepiness was significantly lower than in younger subjects.<sup>29</sup> Self-reported sleep quality and daytime functioning also improved with aging. Whilst sleep apnea and awakening overnight increased with age, our findings were consistent with those of the HypnoLaus study authors<sup>29</sup> who concluded that "sleep complaints should not be viewed as part of normal aging but should prompt the identification of underlying causes".

Our data shows many people, particularly younger adults, require "catch-up" sleep on days off from work after limited weekday or workday sleep. Social jet lag refers to the phenomenon where individuals have different sleep schedules for workdays than days off. Commonly this occurs when people with delayed sleep times on workdays force themselves onto daytime society's schedule with extra sleep on days off.<sup>30</sup> This misalignment of sleep timing is associated with metabolic risk factors that predispose to diabetes and atherosclerotic cardiovascular disease, including raised cholesterol, triglycerides and insulin resistance.<sup>31</sup> Delayed sleep problems are reportedly common in adolescents but we found the need for catch-up sleep is common up to at least age 35y. This is associated with pre-sleep habits that will work against quality sleep, such as spending time on the Internet and working up until bedtime. We also found these lifestyle behaviours, whether forced by circumstance or by choice, that limit sleep are strongly associated with daytime symptoms and

reduced workplace performance. There is some evidence that catch-up sleep may ameliorate some of the adverse effects of reduced sleep. In one study, three nights of 'catch-up' sleep improved insulin sensitivity and testosterone in men with chronic, repetitive sleep restriction.<sup>32</sup> However, the weekend sleep-in can contribute to circadian rhythm disruption and difficulties in establishing a sleep routine. The frequency of impaired daytime functioning suggests that currently the adequacy of a catch-up sleep strategy is insufficient for many people in the community.

Chronic sleep restriction has been linked to cardio-metabolic disorders.<sup>11, 24, 33</sup> Lifestyle behaviours and choices influence sleep. A quarter of adults report use of the internet most or every night of the week just before bed and also have 2 or more sleep difficulties or daytime symptoms. The intrusion of work into non-work lives is also associated with adverse effects on sleep and daytime functioning, including workplace productivity. The data indicates that the population burden of sleep problems in the community likely related to lifestyle choices of sleep habits and duration rivals that of clinical disorders. There is potential to improve sleep and consequences of inadequate sleep with relatively simple lifestyle changes.

Sleepiness or sleep problems were a common reason for work absenteeism, errors at work, reduced punctuality and dozing off at work. Presenteeism, where workers are physical present but less than fully functional, was significantly more common among those with sleep problems. A number of authors have found that performance-based work loss or presenteeism represented a far greater proportion of lost productivity compared with absenteeism.<sup>34-37</sup> US estimates are that presenteeism accounted for approximately three-quarters of the loss in national productivity.<sup>38, 39</sup> The implication from this is that interventions that focus on absenteeism and ignore presenteeism not only underestimate the true magnitude of the impact of health on productivity, but also may not accurately characterize the financial return on health interventions.<sup>40</sup> The difference in work impairment among those with observed breathing pauses in sleep compared to those with a diagnosis of sleep apnea, suggests there remains a significant burden of under-diagnosed sleep apnea in the community on workplace productivity. The SPS measures an individual's perception of their ability to avoid distraction and complete tasks and it can be asked whether self-perception regarding work performance may not always be accurate. However, much research has found that self-reporting measures are reliable and accurate.<sup>41, 42</sup>

The limitations of a self-report survey may have affected our results. Many people with insomnia misperceive their sleep, with the tendency to overestimate sleep latency and underestimate total time asleep.<sup>43</sup> However, self-reported sleep restriction and perceived poor sleep quality is associated with increased all-cause mortality risk among younger and older people in some studies,<sup>44</sup> as well as hypertension,<sup>45</sup> heart disease,<sup>16</sup> and diabetes.<sup>14</sup> The survey sample was closely matched to the general population for age, gender, income and geographic distribution, but respondents were on average better educated than the general population, which may have influenced the study results.

In conclusion, sleep problems, inadequate sleep and poor sleep quality are common and have adverse health, social and economic costs. There is significant potential to improve this situation but this will require concerted action from a number of key players. These include health care providers and peak bodies increasing their advocacy for healthy sleep to become a higher priority to the community. Despite to relationship to general health and to key national priorities such as obesity, cardiovascular disease and diabetes, healthy sleep is not a national health priority or given a high priority in healthcare policy. The data in this report indicates this situation deserves to be rectified.

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**Table 1. Prevalence (%) of sleep difficulties, sleep disorder symptoms and daytime impairments a few times a week or more.**

	Overall	Sex		Age category						p across age
		Male	Female	18-24	25-34	35-44	45-54	55-64	≥65	
<b>n</b>	<b>1011</b>	503	508	121	184	195	182	154	175	
<b>%</b>		49.8	50.2	12.0	18.2	19.3	18.0	15.2	17.3	
<b>Sleeping difficulty</b>										
Difficulty falling asleep	<b>33.2</b>	26.4	40.0 <sup>†</sup>	41.3	31.5	29.7	34.6	33.1	32.0	0.40
Waking a lot during night	<b>41.9</b>	36.8	47.0 <sup>†</sup>	25.6	31.0	42.6	47.3	49.4	52.0	<0.01
Waking up too early and can't get back to sleep	<b>33.8</b>	31.4	36.2	28.1	30.4	32.8	36.3	33.8	40.0	0.28
Waking feeling unrefreshed	<b>45.3</b>	40.0	50.6 <sup>†</sup>	65.3	49.5	45.1	43.4	39.6	34.3	<0.01
Got adequate sleep	<b>49.4</b>	51.5	47.2	39.7	41.3	47.2	51.1	54.5	60.6	<0.01
<b>Snoring, obstructed breathing</b>										
Frequent or loud snoring	<b>20.2</b>	23.7	16.7 <sup>†</sup>	13.2	17.4	23.1	23.6	21.1	19.4	0.15
Breathing pauses in sleep	<b>11.9</b>	14.3	9.4	9.9	9.2	16.9	13.7	10.4	9.7	0.86
<b>Restless legs</b>	<b>17.6</b>	18.1	17.1	19.8	15.8	14.9	22.0	16.9	17.1	0.95
<b>Prescribed sleep medication use</b>	<b>9.3</b>	9.5	9.1	5.0	9.8	12.3	11.0	6.5	9.1	0.83
<b>Daytime symptoms</b>										
Daytime sleepiness	<b>29.6</b>	24.7	34.4 <sup>†</sup>	52.9	36.4	26.7	28.0	24.7	15.4	<0.01
Fatigue or exhaustion	<b>39.2</b>	32.6	45.7 <sup>†</sup>	59.5	46.2	39.5	33.5	38.3	24.0	<0.01
Irritable or moody	<b>31.6</b>	26.4	36.6 <sup>†</sup>	49.6	38.6	32.8	32.4	27.3	13.1	<0.01
<b>Epworth Sleepiness Scale ≥11</b>	<b>19.1</b>	18.5	19.7	27.3	26.6	15.4	15.9	18.9	13.1	<0.01
<b>Sleep duration, min [Mean (SD)]</b>										
Night before working days	<b>421 (91)</b>	417 (87)	424 (95)	434 (128)	424 (83)	426 (76)	409 (89)	416 (89)	419 (92)	0.34
Night before non-working days	<b>456 (99)</b>	451 (94)	462 (104)	505 (122)	478 (90)	460 (89)	447 (99)	439 (91)	423 (90)	<0.01
<b>Sleep disorders</b>										
Doctor diagnosed sleep apnea	<b>8.3</b>	12.9	3.7 <sup>†</sup>	5.0	4.9	3.6	11.5	13.0	12.0	<0.01
Insomnia <sup>‡</sup>	<b>20.0</b>	16.7	23.2 <sup>†</sup>	26.4	17.9	16.4	20.9	23.4	17.7	0.22

\*p<0.05 <sup>†</sup>p<0.01 within gender

<sup>‡</sup> International Classification for Sleep Disorders -3 criteria: report of sleep initiation or maintenance problems and daytime consequences (daytime sleepiness /fatigue or exhaustion/ irritable or moody) at least three times per week with adequate opportunity and circumstances to sleep.

**Table 2. Prevalence (%) of sleep problems\* in relation to sleep apnoea, symptoms and comorbidities.**

<b>Sleep symptoms and comorbidities</b>	<b>% of population</b>	<b>≥1 sleep problem</b>	<b>≥2 sleep problem</b>
		65.9%	48.4%
<b>Frequent loud snoring ≥3 nights/week</b>		P<0.01	P<0.01
No	79.8	61.0	42.8
Yes	20.2	85.3	70.6
<b>Observed breathing pauses during sleep ≥3 nights/week</b>		P<0.01	P<0.01
No	88.1	62.3	44.1
Yes	11.9	92.5	80.0
<b>Diagnosed with sleep apnoea with an overnight sleep study</b>		P<0.01	P=0.06
No	87.6	64.9	47.6
Yes	8.3	82.1	58.3
Don't know	4.1	53.7	43.9
<b>Leg symptoms ≥3 nights/week</b>		P<0.01	P<0.01
No	82.4	59.7	40.5
Yes	17.6	94.9	85.4
<b>Use prescribed sleep medication ≥3 nights/week</b>		P<0.01	P<0.01
No	90.7	62.6	44.4
Yes	9.3	97.9	87.2
<b>Number of comorbidities</b>		P<0.01	P<0.01
0	41.1	51.9	36.3
1	20.2	64.7	44.6
2-3	29.5	80.2	61.7
4 or more	9.2	84.9	67.7
<b>Specific doctor-diagnosed conditions</b>			
<b>Heart disease</b>		P=0.045	P=0.36
No	93.6	65.4	48.1
Yes	6.4	77.8	54.0
<b>Arthritis</b>		P<0.01	P=0.23
No	77.0	63.6	46.6
Yes	23.0	75.2	54.5

\*Sleep problems: difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody or pathological daytime sleepiness [ESS>10]).

**Table 2 (cont'd). Prevalence (%) of sleep problems\* in relation to sleep apnoea, symptoms and comorbidities.**

<b>Sleep symptoms and comorbidities</b>	<b>% of population</b>	<b>≥1 sleep problem</b>	<b>≥2 sleep problem</b>
Diabetes		P=0.64	P=0.29
No	89.8	66.7	49.2
Yes	10.2	64.4	43.6
Heartburn/GORD		p<0.01	p<0.01
No	84.9	62.9	45.7
Yes	15.1	83.1	62.2
Depression		p<0.01	p<0.01
No	71.8	58.9	38.7
Yes	28.2	84.8	72.9
Anxiety disorder (panic, post-traumatic stress)		p<0.01	p<0.01
No	78.3	59.9	40.5
Yes	21.7	88.8	76.6
Lung disease		p=0.01	p=0.07
No	96.0	65.5	47.9
Yes	4.0	85.0	62.5
Hypertension		P=0.02	P=0.68
No	74.0	64.0	47.9
Yes	26.0	72.2	49.4

\*Sleep problems: difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody or pathological daytime sleepiness (ESS>10).

**Table 3. Sleep problems and daytime problems experienced  $\geq 3$  times/week among ~people 1) without OSA or OSA symptoms or restless legs symptoms, 2) likely undiagnosed OSA 3) diagnosed OSA, and 4) only restless legs symptoms.**

<b>Sleep symptoms and comorbidities</b>	<b>No OSA or restless legs</b>	<b>Likely undiagnosed OSA*</b>	<b>OSA diagnosed on a sleep study<sup>†</sup></b>	<b>Only restless legs</b>	<b>p</b>
	n=505	n=193	n=84	n=229	
Difficulty falling asleep	21.2	48.2	31.0	48.0	<0.001
Waking a lot during night	28.9	60.6	50.0	52.0	<0.001
Waking up too early and can't get back to sleep	23.4	51.3	39.3	40.2	<0.001
Waking feeling unrefreshed	31.9	63.7	52.4	56.8	<0.001
Felt got adequate sleep	56.0	46.6	48.8	37.1	<0.001
Prescribed sleep medication use	2.6	20.7	16.7	11.8	<0.001
<b>Daytime symptoms</b>					
Daytime sleepiness	17.6	46.1	39.3	38.4	<0.001
Fatigue or exhaustion	24.4	56.5	52.4	52.4	<0.001
Irritable or moody	19.0	50.8	39.3	40.2	<0.001
$\geq 1$ daytime symptom	29.3	65.3	60.7	58.1	<0.001
<b>Epworth Sleepiness Scale <math>\geq 11</math></b>	11.1	29.5	33.3	22.7	<0.001

\* Loud snoring and/or witnessed breathing pauses at least 3 times/week but no prior diagnosis of OSA on a sleep study (with or without restless legs symptoms)

<sup>†</sup> Self-report of OSA diagnosed on a sleep study (with or without restless legs symptoms)



**Table 4. Prevalence of activities conducted in the hour before going to bed in the last month in relation to sex and age.**

	Overall	Male	Female	18-24y	25-34y	35-44y	45-54y	55-64y	≥65y	p across age
<b>n</b>	<b>1011</b>	503	508	121	184	195	182	154	175	
<b>%</b>		49.8	50.2	12.0	18.2	19.3	18.0	15.2	17.3	
<b>Activity</b>										
<b>Work related to job</b>										<0.01
Never/rarely	63.2	60.9	65.6	56.2	51.5	66.0	66.7	75.0	73.3	
Few nights/month	14.7	14.1	15.3	12.5	14.2	18.1	15.1	9.4	13.3	
Few nights/week	14.5	16.2	12.6	18.8	23.1	9.0	12.7	10.9	10.0	
Every/almost every night/week	7.7	8.8	6.5	12.5	11.2	6.9	5.6	4.7	3.3	
<b>Watched TV</b>										<0.01
Never/rarely	<b>13.6</b>	15.1	12.3	26.1	14.4	14.2	10.6	9.1	10.9	
Few nights/month	<b>9.7</b>	9.6	9.9	10.9	14.9	12.1	7.3	4.5	8.0	
Few nights/week	<b>24.6</b>	26.5	22.7	27.7	30.4	25.3	27.9	20.8	15.5	
Every/almost every night/week	<b>52.1</b>	48.9	55.1	35.3	40.3	48.4	54.2	65.6	65.5	
<b>Listened to radio/music</b>										<0.01
Never/rarely	<b>66.0</b>	65.4	66.6	35.3	65.2	69.1	65.2	77.9	74.7	
Few nights/month	<b>13.1</b>	13.4	12.8	16.8	14.4	13.1	18.5	7.1	9.2	
Few nights/week	<b>11.8</b>	11.8	11.9	26.9	11.6	11.0	10.7	7.8	7.5	
Every/almost every night/week	<b>9.0</b>	9.4	8.7	21.0	8.8	6.8	5.6	7.1	8.6	
<b>Used the internet<sup>†</sup></b>										<0.01
Never/rarely	<b>14.7</b>	12.2	17.2	5.0	7.7	9.5	18.0	17.5	28.7	
Few nights/month	<b>13.7</b>	15.3	12.2	3.4	9.3	14.7	12.4	20.1	20.1	
Few nights/week	<b>27.5</b>	31.6	23.5	16.8	31.9	31.1	26.4	26.0	28.7	
Every/almost every night/week	<b>44.0</b>	40.8	47.1	74.8	51.1	44.7	43.3	36.4	22.4	
<b>Reading<sup>†</sup></b>										0.02
Never/rarely	<b>45.6</b>	49.6	41.7	46.6	44.5	50.3	42.4	50.6	39.7	
Few nights/month	<b>17.9</b>	18.8	17.0	19.5	20.9	17.3	15.8	13.6	20.1	
Few nights/week	<b>19.9</b>	19.4	20.4	24.6	24.7	15.2	24.3	17.5	14.4	
Every/almost every night/week	<b>16.7</b>	12.2	20.9	9.3	9.9	17.3	17.5	18.2	25.9	
<b>Sex</b>										<0.01
Never/rarely	<b>62.3</b>	63.5	61.1	56.1	43.1	51.4	61.8	77.6	85.9	
Few nights/month	<b>19.8</b>	19.3	20.4	19.6	26.9	23.8	21.8	14.2	11.0	
Few nights/week	<b>16.2</b>	16.0	16.5	19.6	26.3	23.8	15.2	8.2	3.1	
Every/almost every night/week	<b>1.6</b>	1.3	2.0	4.7	3.6	1.1	1.2	0.0	0.0	

**Table 4 (cont'd). Prevalence of activities conducted in the hour before going to bed in the last month in relation to sex and age.**

	<b>Overall</b>	<b>male</b>	<b>female</b>	<b>18-24</b>	<b>25-34</b>	<b>35-44</b>	<b>45-54</b>	<b>55-64</b>	<b>≥65</b>	<b>p across age</b>
<b>Exercised</b>										<0.01
Never/rarely	<b>77.7</b>	75.2	80.2	67.5	66.3	74.1	78.4	88.0	90.8	
Few nights/month	<b>9.2</b>	10.1	8.4	12.3	13.8	11.1	9.7	5.3	3.4	
Few nights/week	<b>9.5</b>	10.8	8.2	14.9	14.4	12.7	9.1	2.7	3.4	
Every/almost every night/week	<b>3.6</b>	3.9	3.2	5.3	5.5	2.1	2.8	4.0	2.3	
<b>Spent time with family/friends</b>										<0.01
Never/rarely	<b>41.0</b>	42.8	39.3	23.5	33.0	41.4	39.3	50.6	54.0	
Few nights/month	<b>28.1</b>	26.8	29.2	26.1	36.3	29.3	26.4	22.7	25.9	
Few nights/week	<b>17.0</b>	16.6	17.4	24.3	20.3	16.8	20.2	13.6	8.6	
Every/almost every night/week	<b>13.9</b>	13.7	14.0	26.1	10.4	12.6	14.0	13.0	11.5	
<b>Drank alcohol</b>										0.26
Never/rarely	<b>59.7</b>	58.3	61.0	63.2	58.0	55.5	57.3	63.0	63.0	
Few nights/month	<b>17.9</b>	18.0	17.8	23.1	22.1	17.8	18.0	11.0	16.2	
Few nights/week	<b>14.9</b>	15.5	14.3	10.3	16.6	17.3	18.5	14.9	9.8	
Every/almost every night/week	<b>7.5</b>	8.2	6.9	3.4	3.3	9.4	6.2	11.0	11.0	
<b>Hot bath/shower</b>										<0.01
Never/rarely	<b>45.0</b>	48.6	41.6	24.8	29.8	46.6	46.6	60.8	57.2	
Few nights/month	<b>16.1</b>	14.8	17.4	27.4	24.3	15.7	13.5	7.8	10.4	
Few nights/week	<b>18.0</b>	17.5	18.5	23.1	25.4	15.2	21.3	13.1	11.0	
Every/almost every night/week	<b>20.8</b>	19.1	22.2	24.8	20.4	22.5	18.5	18.3	21.4	

\*p<0.05 †p<0.01 within gender

**Table 5. Approach to sleep problems and sleep aid use in relation to sex and age.**

	<b>Overall</b>	<b>male</b>	<b>female</b>	<b>18-24</b>	<b>25-34</b>	<b>35-44</b>	<b>45-54</b>	<b>55-64</b>	<b>≥65</b>	<b>p across age</b>
<b>n</b>	<b>1011</b>	503	508	121	184	195	182	154	175	
<b>%</b>		49.8	50.2	12.0	18.2	19.3	18.0	15.2	17.3	
<b>Typical weekday routine (work/home duties) allows you to get enough sleep</b>										<0.01
Yes	<b>69.9</b>	70.0	69.9	63.6	62.0	61.5	69.8	77.9	85.1	
No	<b>23.3</b>	22.9	23.8	29.8	28.8	31.3	22.8	14.9	12.6	
Don't know	<b>6.3</b>	6.8	5.9	5.8	8.7	7.2	7.1	7.1	1.7	
<b>Average number of naps per week</b>										0.094
None	<b>41.5</b>	38.6	44.4	31.9	43.8	47.6	42.9	41.4	37.8	
1	<b>18.6</b>	17.6	19.6	23.3	22.7	17.6	16.4	20.4	12.8	
2-3	<b>27.8</b>	30.2	25.4	30.2	25.0	25.1	27.7	23.7	35.5	
≥ 4	<b>12.1</b>	13.6	10.7	14.7	8.5	9.6	13.0	14.5	14.0	
<b>Average nap times<sup>†</sup></b>										0.02
0-30 min	<b>37.3</b>	40.8	33.5	21.8	36.8	33.0	35.4	43.2	50.0	
30-60 min	<b>42.3</b>	43.5	40.9	42.3	49.5	41.2	44.4	38.6	37.7	
>60 min	<b>20.4</b>	15.6	25.7	35.9	13.7	25.8	20.2	18.2	12.3	
<b>Do you think you have a sleep problem?</b>										0.02
Yes	<b>23.6</b>	23.1	24.2	20.7	17.4	19.0	29.1	31.2	25.1	
No	<b>51.2</b>	53.3	49.2	52.1	55.4	55.9	48.9	46.1	48.0	
Maybe	<b>21.5</b>	19.3	23.6	23.1	21.7	20.5	19.2	20.8	24.0	
Don't know/not sure	<b>3.6</b>	4.2	3.0	4.1	5.4	4.6	2.7	1.3	2.9	
<b>Approach to sleep problems if thought had a problem</b>										
Assume it will go away in time	<b>27.1</b>	28.0	26.2	48.8	36.4	25.1	24.2	21.4	12.6	<0.01
Use an OTC sleep aid	<b>10.2</b>	8.3	12.0	2.5	12.0	13.3	10.4	8.4	11.4	0.28
Talk to a doctor	<b>47.3</b>	48.5	46.1	35.5	44.6	44.6	49.5	51.9	54.9	<0.01
Self-treat it (with something other than OTC sleep aid)	<b>11.2</b>	8.3	14.0 <sup>†</sup>	9.1	14.7	13.3	10.4	11.7	6.9	0.15
Get recommendations from family friends	<b>7.8</b>	6.4	9.3	9.9	14.1	9.2	6.6	4.5	2.3	<0.01
Something else	<b>3.0</b>	2.0	3.9	2.5	2.2	3.6	3.8	3.2	2.3	0.90
Nothing	<b>10.5</b>	11.3	9.6	6.6	7.6	11.8	8.8	12.3	14.9	0.01
<b>Frequency of sleep aid use</b>										
<b>OTC sleep aids</b>										0.70
Never/rarely	<b>88.1</b>	89.6	88.1	89.1	85.6	87.2	86.0	92.2	89.7	
Few nights/month	<b>6.9</b>	5.7	6.9	6.7	10.0	8.5	8.4	3.2	4.0	
Few nights/every night/week	<b>4.9</b>	4.7	4.9	4.2	4.4	4.3	5.6	4.5	6.3	

**Table 5 (cont'd). Approach to sleep problems and sleep aid use in relation to sex and age.**

	Overall	male	female	18-24	25-34	35-44	45-54	55-64	≥65	p across age
<b>Frequency of sleep aid use</b>										
<b>OTC sleep aids</b>										0.70
Never/rarely	<b>88.1</b>	89.6	88.1	89.1	85.6	87.2	86.0	92.2	89.7	
Few nights/month	<b>6.9</b>	5.7	6.9	6.7	10.0	8.5	8.4	3.2	4.0	
Few nights/every or almost every night/week	<b>4.9</b>	4.7	4.9	4.2	4.4	4.3	5.6	4.5	6.3	
<b>Doctor prescribed sleep medications</b>										0.67
Never/rarely	<b>87.1</b>	87.0	87.3	88.2	85.1	87.8	84.9	91.6	86.3	
Few nights/month	<b>4.7</b>	4.3	5.2	6.7	7.7	3.7	5.0	1.9	3.4	
Few nights/every night/week	<b>8.1</b>	8.7	7.6	5.0	7.2	8.5	10.1	6.5	10.3	
<b>Alcohol/beer/wine<sup>†</sup></b>										<0.01
Never/rarely	<b>81.9</b>	78.9	84.9	85.7	77.3	81.5	80.4	83.8	84.5	
Few nights/month	<b>7.9</b>	9.5	6.4	12.6	12.7	8.5	5.6	3.9	5.2	
Few nights/every night/week	<b>10.1</b>	11.6	8.7	1.7	9.9	10.1	14.0	12.3	10.3	
<b>Eye mask or ear plugs</b>										<0.01
Never/rarely	<b>88.2</b>	88.4	88.0	87.4	80.4	85.6	87.7	94.8	94.3	
Few nights/month	<b>4.2</b>	4.7	3.8	4.2	9.5	5.9	1.7	2.6	1.1	
Few nights/every night/week	<b>7.5</b>	6.9	8.2	8.4	10.1	8.5	10.6	2.6	4.6	
<b>Melatonin</b>										<0.01
Never/rarely	<b>93.2</b>	93.4	93.0	93.1	86.0	92.5	94.3	97.4	96.5	
Few nights/month	<b>3.1</b>	2.7	3.4	2.6	6.7	3.8	2.3	1.3	1.2	
Few nights/every night/week	<b>3.8</b>	3.9	3.6	4.3	7.3	3.8	3.4	1.3	2.3	
<b>Caffeinated drinks/day</b>										<0.01
None	<b>12.3</b>	12.4	12.2	31.0	16.6	11.6	7.8	6.0	6.4	
≤ 1	<b>18.9</b>	19.0	19.8	31.9	29.7	18.0	13.9	9.4	13.4	
2-3	<b>38.3</b>	37.3	39.3	27.6	36.0	41.3	38.3	43.6	40.1	
4-5	<b>20.9</b>	20.4	21.4	6.0	12.6	21.2	23.9	30.2	27.9	
≥ 6	<b>9.6</b>	11.8	7.3	3.4	5.1	7.9	16.1	10.7	12.2	
<b>Alcoholic drinks/week<sup>†</sup></b>										<0.01
None or < 1	<b>44.7</b>	38.3	51.1	64.3	46.6	43.1	47.2	38.3	34.5	
1-7	<b>39.9</b>	42.0	37.9	31.3	44.4	42.0	32.6	37.6	48.5	
8-14	<b>8.5</b>	9.0	7.9	0.9	6.7	10.1	12.4	9.4	8.8	
≥15	<b>6.8</b>	10.7	3.1	3.5	2.2	4.8	7.9	14.8	8.2	

\*p<0.05 <sup>†</sup>p<0.01 within gender

**Table 6. Reported causes of sleep disturbance and effect on relationships.**

	Overall	male	female	18-24	25-34	35-44	45-54	55-64	≥65	p across age
<b>n</b>	<b>1011</b>	503	508	121	184	195	182	154	175	
<b>%</b>		49.8	50.2	12.0	18.2	19.3	18.0	15.2	17.3	
<b>Difficulty getting back to sleep if awoken during night<sup>†</sup></b>										0.31
Very difficult	<b>10.8</b>	9.8	11.9	8.3	7.7	12.4	11.0	11.7	13.1	
Somewhat difficult	<b>33.8</b>	28.9	38.5	33.1	36.8	37.1	33.7	20.9	30.9	
Not very/not at all difficult	<b>52.7</b>	57.7	47.8	56.2	51.6	46.4	52.5	56.5	55.4	
Don't know	<b>2.7</b>	3.6	1.8	2.5	3.8	4.1	2.8	1.9	0.6	
<b>What if anything awakens you during the night</b>										
Noise <sup>†</sup>	<b>49.8</b>	44.9	54.5	52.1	48.9	51.3	52.7	51.9	42.3	0.23
Light	<b>27.2</b>	26.6	27.8	32.2	31.5	24.6	31.3	22.1	22.3	0.019
Stress <sup>†</sup>	<b>27.9</b>	21.3	34.4	33.1	32.1	31.3	31.3	24.0	16.0	<0.01
Thinking (about work, other) <sup>*</sup>	<b>24.1</b>	21.3	27.0	24.0	20.1	28.7	31.9	27.3	12.6	<0.01
Someone else <sup>†</sup>	<b>16.1</b>	11.7	20.5	22.3	19.0	18.5	20.3	13.0	4.6	<0.01
Pain/discomfort <sup>†</sup>	<b>25.6</b>	20.9	30.3	17.4	20.7	21.5	30.8	35.1	27.4	<0.01
Nightmares <sup>†</sup>	<b>24.2</b>	18.5	29.9	40.5	32.6	24.6	21.4	19.5	10.9	<0.01
World events	<b>1.9</b>	2.0	1.8	0.8	2.7	1.5	1.6	3.2	1.1	0.90
Need to go to the bathroom <sup>†</sup>	<b>59.9</b>	54.5	65.4	40.5	46.2	56.4	62.6	72.7	77.7	<0.01
Wake for no reason <sup>†</sup>	<b>33.2</b>	28.4	38.0	39.7	28.3	31.8	32.4	35.1	34.9	0.80
Something else <sup>*</sup>	<b>5.9</b>	4.4	7.5	1.7	4.3	10.3	4.4	4.5	8.6	0.01
Nothing <sup>*</sup>	<b>4.2</b>	5.8	2.6	5.8	4.3	4.6	6.6	1.9	1.7	0.06
<b>Sleep lost due to partner's sleep problem<sup>†</sup></b>										<0.01
None	<b>69.7</b>	74.3	65.1	87.6	64.7	64.1	64.4	69.5	74.3	
≤30 min	<b>16.7</b>	15.3	18.1	5.0	23.4	20.0	20.0	13.0	14.3	
>30 min	<b>6.3</b>	4.8	7.9	5.0	7.6	9.7	7.2	4.5	2.9	
Don't know	<b>7.2</b>	5.6	8.9	2.5	4.3	6.2	8.3	13.0	8.6	
<b>How much does your or your partner's sleep problem have on relationship</b>										0.26
Moderate-significant problem	<b>14.3</b>	14.2	14.3	10.3	16.2	15.7	18.0	12.8	9.8	
Little/no problem	<b>85.7</b>	85.8	85.7	89.7	83.8	84.3	82.0	87.2	90.2	

\*p<0.05<sup>†</sup>p<0.01 within gender

**Table 7. Sleep problems and effect on driving, work and social life.**

	Overall	male	female	18-24	25-34	35-44	45-54	55-64	≥65	p across age
<b>n</b>	<b>1011</b>	503	508	121	184	195	182	154	175	
<b>%</b>		49.8	50.2	12.0	18.2	19.3	18.0	15.2	17.3	
<b>Driving while feeling drowsy in past year</b>										<0.01
1 or 2/ ≥3 times per week	<b>16.0</b>	16.7	15.2	19.8	30.1	20.6	17.2	9.4	0.6	
1 or two times/month	<b>13.0</b>	11.6	14.5	20.9	15.0	14.5	13.4	5.8	10.9	
Never/ Less than monthly	<b>71.0</b>	71.7	70.3	59.3	54.9	64.8	69.4	84.8	88.5	
<b>Had motor vehicle accident in past year because dozed off/too tired</b>										<0.01
	<b>5.5</b>	5.3	5.8	8.3	10.1	4.9	5.7	4.3	1.2	
<b>Ever nodded off or fallen asleep while driving</b>										0.03
	<b>19.9</b>	22.3	17.2	15.2	15.4	16.0	25.5	27.0	19.3	
<b>Work Schedule past 3 months</b>										<0.01
Not working	<b>45.7</b>	43.1	48.4	60.3	27.1	26.1	29.8	56.9	82.9	
Day shift	<b>41.3</b>	43.1	39.6	19.0	55.2	55.9	59.7	35.9	12.6	
Night/evening/rotating shifts	<b>12.9</b>	13.8	12.0	20.7	17.7	18.1	10.5	7.2	4.6	
<b>Work days missed in past 28 days due to physical or mental health problems</b>										<0.01
None	<b>73.0</b>	74.7	71.1	66.7	64.9	75.0	72.7	82.1	90.0	
1-2 days	<b>16.3</b>	15.6	17.1	20.8	20.1	15.3	15.6	13.4	6.7	
3-28 days	<b>10.7</b>	9.7	11.8	12.5	14.9	9.7	11.7	4.5	3.3	
<b>Work days missed in past 28 days because too sleepy or had sleep problem</b>										<0.01
none	<b>79.4</b>	81.2	77.4	72.9	64.4	83.6	82.0	92.5	96.7	
≥ 1 day	<b>17.0</b>	16.3	17.7	27.1	30.4	9.6	17.2	6.0	0.0	
Don't know	<b>3.6</b>	2.4	4.9	0.0	5.2	6.8	0.8	1.5	3.3	
<b>Days made work errors because too sleepy or had sleep problem in past 3 months</b>										<0.01
None	<b>63.4</b>	64.9	61.7	47.9	49.6	64.4	66.4	83.6	86.7	
1-2 days	<b>20.0</b>	21.2	18.8	35.4	24.4	15.8	24.2	7.5	6.7	
≥ 3 days	<b>9.0</b>	9.0	9.0	10.4	14.8	8.9	7.0	3.0	3.3	
Don't know	<b>7.6</b>	4.9	10.5	6.2	11.1	11.0	2.3	6.0	3.3	
<b>Fallen asleep or nearly on the job past month<sup>†</sup></b>										0.03
	<b>17.1</b>	21.2	12.8	27.1	22.2	9.6	21.1	13.4	6.7	
<b>Ever told supervisor not alert enough to perform job safely</b>										0.07
	<b>6.1</b>	7.6	4.5	8.3	8.1	5.5	7.0	3.0	0.0	



**Table 7 (cont'd). Sleep problems and effect on driving, work and social life.**

	Overall	male	female	18-24	25-34	35-44	45-54	55-64	≥65	p across age
<b>Reasons why late to work</b>										
Went to bed too late	<b>10.1</b>	10.1	10.2	10.4	16.3	8.9	7.8	9.0	0.0	0.02
Slept too late	<b>13.0</b>	11.8	14.3	27.1	21.5	11.0	8.6	4.5	0.0	<0.01
Too sleepy when woke up*	<b>12.8</b>	9.4	16.5	25.0	17.0	11.6	10.2	9.0	0.0	<0.01
Have a sleep problem	<b>4.3</b>	4.2	4.5	0.0	7.4	4.1	6.2	0.0	0.0	0.25
Traffic/transport problems*	<b>29.4</b>	25.7	33.5	31.2	34.1	28.1	27.3	29.9	20.0	0.19
Needed to take care of others	<b>8.8</b>	9.0	8.6	6.2	11.1	11.0	9.4	1.5	6.7	0.24
Never late	<b>34.5</b>	37.5	31.2	25.0	23.7	31.5	43.0	44.8	53.3	pearson <0.01
None of above	<b>13.9</b>	17.7	9.8	10.4	10.4	16.4	12.5	16.4	23.3	0.09
<b>Stanford Presenteeism Scale<sup>‡</sup></b>	20.0 (5.4)	20.4 (4.5)	19.5 <sup>†</sup> (4.0)	19.0 (4.3)	18.5 (3.4)	20.2 (4.1)	20.1 (4.1)	22.7 (4.6)	22.1 (5.4)	<0.01
Mean (SD)										
<b>Days missed social activities because too sleepy or had sleep problem in past 3 months</b>										<0.01
None	<b>70.4</b>	73.2	67.7	45.5	54.9	73.8	66.5	88.3	88.6	
1-2 days	<b>14.4</b>	13.3	15.6	28.1	20.1	11.3	20.3	5.2	4.6	
≥ 3 days	<b>9.9</b>	8.7	11.0	17.4	16.8	9.2	7.7	5.2	4.6	
Don't know	<b>5.2</b>	4.8	5.7	9.1	8.2	5.6	5.5	1.3	2.3	

\*p<0.05, †p<0.01 by gender

<sup>‡</sup>Stanford Presenteeism Scale' range 6-30 with higher scores indicating higher presenteeism.

**Table 8. Mean (SD) Stanford Presenteeism Scale scores in relation to sleep factors\***

<b>Sleep symptoms and comorbidities</b>	<b>Mean (SD)</b>	<b>p</b>
<b>≥1 sleep problem</b>		<0.01
No (n=158)	20.8 (4.5)	
Yes (n=313)	19.5 (4.1)	
<b>≥2 sleep problem</b>		<0.01
No (n=237)	21.0 (4.4)	
Yes (n=234)	19.0 (3.9)	
<b>Hours slept before work days</b>		0.68
<5.5 (n=51)	19.5 (4.2)	
5.5-9.0 (n=377)	20.0 (4.3)	
≥ 9.0 (n=22)	20.3 (3.9)	
<b>Hours slept before non-work days</b>		0.77
<5.5 (n=33)	19.7 (3.9)	
5.5-9.0 (n=293)	20.0 (4.5)	
≥ 9.0 (n=129)	19.8 (4.0)	
<b>Frequent loud snoring ≥3 nights/week</b>		0.77
No (n=372)	20.0 (4.3)	
Yes (n=99)	19.9 (4.1)	
<b>Observed breathing pauses during sleep ≥3 nights/week</b>		0.035
No (n=407)	20.1 (4.4)	
Yes (n=64)	19.1 (3.4)	
<b>Diagnosed with sleep apnoea with an overnight sleep study</b>		0.027
No (n=411)	20.1 (4.3)	
Yes (n=39)	20.3 (4.4)	
Don't know (n=21)	17.7 (3.3)	
<b>Restless legs symptoms ≥3 nights/week</b>		<0.01
No (n=387)	20.3 (4.3)	
Yes (n=84)	18.2 (3.5)	
<b>Use prescribed sleep medication ≥3 nights/week</b>		<0.01
No (n=429)	20.1 (4.4)	
Yes (n=42)	18.5 (2.2)	
<b>Number of comorbidities</b>		0.36
0 (n=237)	20.1 (4.1)	
1 (n=100)	20.0 (4.9)	
2-3 (n=111)	20.0 (4.2)	
4 or more (n=23)	18.5 (3.0)	

\*Scale range 6-30 with higher scores indicating better work performance.

**Table 9. Prevalence (%) of sleep problems in relation to activities conducted in the hour before bed and sleep hours.\***

Activity	% of population	≥1 sleep problem	≥2 sleep problem
		65.9%	48.4%
<b>Sex</b>		p<0.01	p<0.01
Male	49.8	60.4	40.8
Female	50.2	71.3	55.9
<b>Age</b>		p<0.01	p<0.01
18-24	12.0	80.2	68.6
25-34	18.2	66.8	53.3
35-44	19.3	59.5	44.6
45-54	18.0	64.3	45.1
55-64	15.2	68.8	45.5
65+	17.3	61.1	39.4
<b>Work related to job</b>		p<0.01	p<0.01
Never/rarely	63.2	55.7	36.5
Few nights/month	14.7	60.0	41.2
Few nights/week	14.5	79.7	68.4
Every/almost every night/week	7.7	81.0	71.4
<b>Used the internet</b>		p<0.01	p<0.01
Never/rarely	14.7	61.2	38.8
Few nights/month	13.7	63.5	40.9
Few nights/week	27.5	58.4	41.2
Every/almost every night/week	44.0	73.3	58.5
<b>Watched TV</b>		p=0.061	p=0.11
Never/rarely	13.6	65.4	42.6
Few nights/month	9.7	55.7	41.2
Few nights/week	24.6	64.1	53.1
Every/almost every night/week	52.1	69.2	49.1
<b>Listened to radio/music</b>		p=0.10	p<0.01
Never/rarely	66.0	64.6	45.1
Few nights/month	13.1	66.4	50.4
Few nights/week	11.8	67.8	59.3
Every/almost every night/week	9.0	73.3	54.4

\*Sleep problems: difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody or pathological daytime sleepiness (ESS>10).

**Table 9 (cont'd). Prevalence (%) of sleep problems in relation to activities conducted in the hour before bed and sleep hours.\***

Activity	% of population	≥1 sleep problem	≥2 sleep problem
<b>Exercised</b>		p=0.61	p=0.09
Never/rarely	77.7	67.2	48.1
Few nights/month	9.2	51.6	36.3
Few nights/week	9.5	71.0	61.3
Every/almost every night/week	3.6	77.1	57.1
<b>Number caffeinated drinks/day</b>		p<0.01	p<0.01
0	12.0	58.7	40.5
≤ 1	18.4	60.0	44.3
2-3	37.3	68.1	48.9
4-5	20.3	66.8	47.8
≥ 6/don't know	12.0	73.4	60.6
<b>Drank alcohol</b>		p=0.04	p=0.33
Never/rarely	59.7	65.1	48.4
Few nights/month	17.9	57.9	42.7
Few nights/week	14.9	75.7	53.4
Every/almost every night/week	7.5	73.3	55.3
<b>Hours slept before work days</b>		p<0.01	p<0.01
<5.5	11.9	88.3	75.7
5.5-9.0	80.1	62.3	43.6
≥ 9.0	8.0	61.3	42.7
<b>Hours slept before non-work days</b>		p<0.01	p<0.01
<5.5	9.5	90.9	84.1
5.5-9.0	66.5	63.0	43.1
≥ 9.0	24.1	61.6	45.5

\*Sleep problems: difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody or pathological daytime sleepiness (ESS>10).

## APPENDIX A

**Appendix Table 1. Sociodemographic characteristics of survey participants [% , (n)]**

		Survey sample	ABS population estimates
<b>Sex</b>	Male	49.8 (503)	49.8
	Female	50.2 (508)	50.2
<b>Age</b>	18-24	12.0 (121)	12.2
	25-34	18.2 (184)	18.0
	35-44	19.3 (195)	18.5
	45-54	18.0 (182)	17.9
	55-64	15.2 (154)	15.2
	65 and over	17.3 (175)	18.3
<b>State of residence</b>	ACT/NT	2.8 (28)	2.7
	NSW	33.3 (337)	32.1
	QLD	19.9 (201)	20.1
	SA	7.4 (75)	7.4
	TAS	2.1 (24)	2.3
	VIC	24.9 (252)	24.9
	WA	9.6 (97)	10.4
<b>Area of residence</b>	Metropolitan	65.7 (664)	64
	Rural	31.6 (319)	33.3
	ACT/NT	2.8 (28)	2.7
<b>Country of birth</b>	Australia	74.7 (755)	72
	UK/Ireland	7.0 (71)	6
	Rest of world	16.9 (171)	22
	Refused	1.4 (14)	-
<b>Highest education level</b>	Still studying	4.4 (44)	6
	High school	21.5 (217)	40
	Trade/apprenticeship/ Certificate/Diploma	38.2 (387)	30
	Bachelor degree or higher	34.5 (349)	24
	Refused	1.4 (14)	-
<b>Household income</b>	<\$20,000	7.1 (72)	11.8
	\$20,001-50,000	23.7 (240)	25.4
	\$50,001-80,000	18.9 (191)	16.0
	\$80,001-150,000	26.8 (271)	26.9
	>\$150,000	8.3 (84)	10.0
	Refused/don't know	15.1 (153)	10.9

**Figure 1. Results from the 2010 Sleep Health Foundation Survey, n=1512** (From Hillman DR, Lack LC. Med J Aust 2013;199:S7-S10).

1 Proportions of survey respondents experiencing sleep difficulties, sleep disorder symptoms and daytime impairments a few times a week or more (often), overall and by sex and age group									
Difficulty experienced often	Overall	Sex		Age group					
		Male	Female	14–17 years	18–24 years	25–34 years	35–49 years	50–64 years	≥ 65 years
Weighted proportion of total	100%	49.4%	50.6%	6.4%	11.7%	17.4%	26.0%	21.9%	16.5%
Sleeping difficulty									
Difficulty falling asleep	19.6%	16.9%	22.4%*	33.6%†	32.2%†	17.6%	20.0%	14.6%	13.5%
Waking a lot during night	34.9%	30.4%	39.3%†	21.2%	28.1%	32.6%	42.6%†	31.8%	39.5%†
Waking up too early	25.3%	22.9%	27.7%*	19.5%	23.4%	20.3%	29.1%*	25.5%	27.9%*
Waking feeling unrefreshed	34.7%	31.8%	37.6%*	38.1%†	44.0%†	42.0%†	39.8%†	28.5%	19.3%
Did not get adequate sleep	23.7%	17.9%	29.4%†	24.9%†	29.3%†	25.3%†	24.5%†	21.4%	19.3%
Snoring, obstructed breathing									
Frequent or loud snoring‡	21.2%	26.4%†	12.1%	8.4%	8.6%	21.7%†	23.5%†	20.0%†	20.0%†
Pauses in breathing in sleep‡	6.6%	6.2%	5.1%	2.9%	4.4%	3.8%	4.6%	7.8%*	8.4%*
Restless legs	9.4%	8.6%	10.3%	4.0%	5.3%	11.2%†	7.2%	10.7%†	14.5%†
Prescribed sleep medication use	3.6%	4.0%	3.1%	3.5%	2.5%	1.8%	2.4%	5.8%†	5.4%†
Daytime symptoms									
Daytime sleepiness	19.0%	15.7%	22.3%*	24.6%†	26.2%†	21.1%†	22.4%†	13.6%	11.4%
Fatigue or exhaustion	23.5%	20.0%	27.0%†	22.8%	27.7%†	27.7%†	29.1%†	18.8%	14.2%
Irritable or moody	18.8%	18.2%	19.3%	18.8%	19.2%	27.9%†	22.9%†	12.9%	9.8%
Sleep duration									
Weeknights (Sunday–Thursday), h	7.16	7.15	7.17	8.24†	7.49*	7.18	6.86	7.01	7.14*
Weekend nights (Friday, Saturday), h	7.37	7.37	7.37	8.45†	7.37	7.54	7.19	7.29	7.14
Overall, h	7.22	7.21	7.23	8.30†	7.46*	7.28	6.95	7.09	7.14*
Sleep disorder estimates									
Severe clinical insomnia§	6.9%	5.0%	8.7%*	2.0%	11.3%*	4.2%	10.1%*	6.9%	3.8%
Sleep apnoea‡,¶	4.9%	6.3%*	3.6%	0	2.2%	2.1%	4.7%	7.7%*	7.0%*

\*  $P < 0.05$ . †  $P < 0.001$ . ‡ Adjusted for the 10%–11% who “can’t say”. § Estimated Insomnia Severity Index  $> 14$ , derived from data for sleeping difficulty and daytime symptoms. ¶ Estimates derived from data for frequent breathing pauses and loud snoring.



**APPENDIX B.**

**Sleep Survey Questionnaire**

# **Sleep Survey Questionnaire 2016**

## **WELCOME PAGE**

**Thank you for agreeing to take part in this important survey regarding sleep and health for The University of Adelaide.**

**I can assure you that all information given will remain confidential. The answers from all people interviewed will be gathered together and presented in a report. No individual answers will be passed on.**

**Whilst your input to the survey is very important to us, participation is voluntary and you can choose not to answer any particular question or any section. You are free to withdraw from the survey at any time.**

**The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2015-xxx). If you have questions or problems associated with the practical aspects of your participation in the project, or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator, Professor Robert Adams on 08 82227413 or by email ([Robert.adams@adelaide.edu.au](mailto:Robert.adams@adelaide.edu.au)). Contact the Human Research Ethics Committee's Secretariat on phone 08 8313 6028 or by email to [hrec@adelaide.edu.au](mailto:hrec@adelaide.edu.au) if you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant. Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.**

**The questionnaire will take approximately 15-20 minutes to complete, but may take longer depending on the number of questions that are relevant to you. Please click 'start survey' to begin.**

## A. DEMOGRAPHICS

As some of the next questions relate to certain groups of people only, could you please tell me...

### A.1 How old you are?

(Single Response)

1. Enter age
2. Not stated
3. Don't know

Sequence Guide: If A.1 <2 Go to A.3

### A.2 Which age group are you in? Would it be...

(Single response)

1. 18 to 24 years
2. 25 to 34 years
3. 35 to 44 years
4. 45 to 54 years
5. 55 to 64 years
6. 65 to 74 years
7. 75 years or over
8. Refused (End interview)

### A.3 Sex

1. Male
2. Female

### A.4 What is the Postcode of the house you live in?

(Single Response. *If postcode is not known enter 9999*)

1. Enter number
2. Not stated

## B. SLEEP HABITS

First, I would like to ask you some general questions regarding sleep. Please think about your sleep schedule in the past two weeks.

### B.1 At what time do you usually get up on days you work or on weekdays?

(Single response)

1. 12:00 AM (Midnight)
2. 12:01 AM – 4:59 AM
3. 5:00 AM – 5:14 AM
4. 5:15 AM – 5:29 AM
5. 5:30 AM – 5:44 AM
6. 5:45 AM – 5:59 AM
7. 6:00 AM – 6:14 AM
8. 6:15 AM – 6:29 AM

9. 6:30 AM – 6:44 AM
10. 6:45 AM – 6:59 AM
11. 7:00 AM – 7:14 AM
12. 7:15 AM – 7:29 AM
13. 7:30 AM – 7:44 AM
14. 7:45 AM – 7:59 AM
15. 8:00 AM – 8:14 AM
16. 8:15 AM – 8:29 AM
17. 8:30 AM – 8:44 AM
18. 8:45 AM – 8:59 AM
19. 9:00 AM – 9:14 AM
20. 9:15 AM – 9:29 AM
21. 9:30 AM – 9:44 AM
22. 9:45 AM – 9:59 AM
23. 10:00 AM – 10:59 AM
24. 11:00 AM – 11:59 AM
25. 12:00 PM (Noon) – 5:59 PM
26. 6:00 PM – 11:59 PM
27. Refused
28. Don't know

**B.2 At what time do you usually go to bed on nights before workdays or weekdays?**

(Single response)

1. 12:00 AM (Midnight)
2. 12:01 AM – 12:59 AM
3. 1:00 AM – 1:59 AM
4. 2:00 AM – 5:00 AM
5. 5:01 AM – 8:59 AM
6. 9:00 AM – 11:59 AM
7. 12:00 PM (Noon) – 6:59 PM
8. 7:00 PM – 7:59 PM
9. 8:00 PM – 8:59 PM
10. 9:00 PM – 9:14 PM
11. 9:15 PM – 9:29 PM
12. 9:30 PM – 9:44 PM
13. 9:45 PM – 9:59 PM
14. 10:00 PM – 10:14 PM
15. 10:15 PM – 10:29 PM
16. 10:30 PM – 10:44 PM
17. 10:45 PM – 10:59 PM
18. 11:00 PM – 11:14 PM
19. 11:15 PM – 11:29 PM
20. 11:30 PM – 11:44 PM
21. 11:45 PM – 11:59 PM
22. Refused
23. Don't know

**B.3 On workdays or weekdays, how many hours, not including naps, do you usually sleep during one night?**

(Do not accept ranges)

1. Enter Hours and/or
2. Enter Minutes
3. Refused
4. Don't know

**B.4 Thinking about your usual non-workday or weekend, please answer the following questions. At what time do you usually get up on days you do not work or weekends?**

(Single response)

1. 12:00 AM (Midnight)
2. 12:01 AM – 4:59 AM
3. 5:00 AM – 5:14 AM
4. 5:15 AM – 5:29 AM
5. 5:30 AM – 5:44 AM
6. 5:45 AM – 5:59 AM
7. 6:00 AM – 6:14 AM
8. 6:15 AM – 6:29 AM
9. 6:30 AM – 6:44 AM
10. 6:45 AM – 6:59 AM
11. 7:00 AM – 7:14 AM
12. 7:15 AM – 7:29 AM
13. 7:30 AM – 7:44 AM
14. 7:45 AM – 7:59 AM
15. 8:00 AM – 8:14 AM
16. 8:15 AM – 8:29 AM
17. 8:30 AM – 8:44 AM
18. 8:45 AM – 8:59 AM
19. 9:00 AM – 9:14 AM
20. 9:15 AM – 9:29 AM
21. 9:30 AM – 9:44 AM
22. 9:45 AM – 9:59 AM
23. 10:00 AM – 10:59 AM
24. 11:00 AM – 11:59 AM
25. 12:00 PM (Noon) – 5:59 PM
26. 6:00 PM – 11:59 PM
27. Refused
28. Don't know

**B.5 At what time do you usually go to bed on nights you do not work the next day or weekends?**

(Single response)

1. 12:00 AM (Midnight)
2. 12:01 AM – 12:59 AM
3. 1:00 AM – 1:59 AM
4. 2:00 AM – 5:00 AM
5. 5:01 AM – 8:59 AM
6. 9:00 AM – 11:59 AM
7. 12:00 PM (Noon) – 6:59 PM
8. 7:00 PM – 7:59 PM

9. 8:00 PM – 8:59 PM
10. 9:00 PM – 9:14 PM
11. 9:15 PM – 9:29 PM
12. 9:30 PM – 9:44 PM
13. 9:45 PM – 9:59 PM
14. 10:00 PM – 10:14 PM
15. 10:15 PM – 10:29 PM
16. 10:30 PM – 10:44 PM
17. 10:45 PM – 10:59 PM
18. 11:00 PM – 11:14 PM
19. 11:15 PM – 11:29 PM
20. 11:30 PM – 11:44 PM
21. 11:45 PM – 11:59 PM
22. Refused    23. Don't know

**B.6 On days you do not work or on weekends, how many hours, not including naps, do you usually sleep during one night?**

(Do not accept ranges)

1. Enter Hours and/or
2. Enter Minutes
3. Refused
4. Don't know

**B.7 How often do you stay up later than you planned or wanted to on weeknights? Would you say...**

(Single response)

1. Every night or almost every night
2. A few nights a week
3. A few nights a month
4. Rarely
5. Never
6. Refused
7. Don't know

**B.8 Thinking about your sleep and sleep habits within the past month, how often have you done the following in the hour before you went to bed? Would you say that in the past month you... within an hour of going to bed**

	Every night or almost every night	A few nights a week	A few nights a month	Rarely	Never	Refused	Don't know
a. Did work relating to your job	05	04	03	02	01	98	99
b. Watched TV	05	04	03	02	01	98	99
c. Listened to the radio or music	05	04	03	02	01	98	99
d. Were on the Internet	05	04	03	02	01	98	99
e. Read	05	04	03	02	01	98	99

f. Had sex	05	04	03	02	01	98	99
g. Exercised	05	04	03	02	01	98	99
h. Spent time with family/friends	05	04	03	02	01	98	99
i. Drank an alcoholic beverage	05	04	03	02	01	98	99
j. Took a hot bath/shower	05	04	03	02	01	98	99

**B.9 Do you have any of the following in your bedroom?**

	Yes	No	Refused	Don't know
a. Television	01	02	98	99
b. Computer	01	02	98	99
c. Telephone	01	02	98	99
d. Radio/Stereo/DVD	01	02	98	99

**B.10 How long, on most nights, does it take you to fall asleep? Would you say ...**

(Single response)

1. Less than 5 minutes
2. 5 up to 10 minutes
3. 10 up to 15 minutes
4. 15 up to 30 minutes
5. 30 up to 45 minutes
6. 45 minutes up to 1 hour
7. 1 hour or more
8. Depends/Varies
9. Refused
10. Don't know/Not sure

**B.11 Most nights, do you sleep...**

(Multiple response)

1. Alone
2. With your significant other
3. With your children
4. With a pet
5. Something else? (Specify)
6. Refused
7. Don't know

**B.12 Most nights, do you prefer to sleep...**

(Multiple response)

1. Alone
2. With your significant other
3. With your children
4. With a pet
5. Something else? (Specify)
6. Refused
7. Don't know

**B.13 If you thought you had a sleep problem, what would you be likely to do? Would you...**  
(Multiple response)

1. Assume it will go away in time,
2. Use an over-the-counter (OTC) sleep aid,
3. Talk to your doctor,
4. Self-treat it (using something other than OTC sleep aids),
5. Get recommendations from family/friends, or
6. Something else (SPECIFY)
7. Nothing
8. Refused
9. Don't know

**B.14 Do you think you have a sleep problem?**  
(Single response)

1. Yes
2. No
3. Maybe
4. Refused
5. Don't know/Not sure

**B.15 Does your current work schedule or typical weekday routine, including your duties at home, allow you to get enough sleep?**

(Single Response)

1. Yes
2. No
3. Don't know
4. Refused

**B.16 On average, how many times during the week do you take a nap? Would you say...**  
(Single response)

1. None
2. 1 time
3. 2 or 3 times
4. 4 or 5 times, or
5. More than 5 times
6. Refused
7. Don't know

Sequence guide: If B.16= 1, 6 or 7 go to C.1

**B.17 On average, how long would you say you usually nap? Would you say...**  
(Single response)

1. Less than 15 minutes
2. 15 to less than 30 minutes
3. 30 to less than 45 minutes
4. 45 minutes to less than 1 hour
5. 1 hour or more
6. Refused
7. Don't know



## C. SLEEP QUALITY

**C.1 We are interested in asking you some specific questions about what your sleep has been like over this past month. In the past month how often have you experienced these things?**

	Rarely or never	A few nights a month	A few nights a week	Every or almost every night
a. Difficulty falling asleep	01	02	03	04
b. Waking a lot during the night	01	02	03	04
c. Waking up too early and not able to get back to sleep	01	02	03	04
d. Waking up feeling un-refreshed	01	02	03	04
e. Observed frequent or loud snoring	01	02	03	04
f. Observed pauses in breathing during sleep or stopped breathing	01	02	03	04
g. Unpleasant, tingling, restless feelings in the legs	01	02	03	04
h. Used a prescribed sleep medication	01	02	03	04
i. Feel you got adequate or satisfactory sleep	01	02	03	04

**C.2 We are also interested to hear about your typical daytime feelings over this past month. In the past month how often have you experienced these daytime feelings?**

	Rarely or never	A few nights a month	A few nights a week	Every or almost every night
a. Experienced sleepiness that interfered with your daily activities	01	02	03	04
b. Felt fatigue or exhaustion	01	02	03	04
c. Felt irritable or moody	01	02	03	04

## D. SLEEP PROBLEMS / DISORDERS

### D.1 Have you been diagnosed with sleep apnoea with an overnight sleep study?

(Single response)

1. Yes
2. No
3. Don't know

Sequence guide: If D.1  $\geq 2$  go to D.4

### D.2 Were you told if your sleep apnea was mild/moderate or severe?

(Single response)

1. Mild/ moderate
2. Severe
3. Don't know

### D.3 Do you use treatment for your sleep apnea?

(Single response)

1. No
2. Yes, Constant Positive Airway Pressure or CPAP for less than 4 hours/night
3. Yes, Constant Positive Airway Pressure or CPAP for more than 4 hours/night
4. Yes other (surgery, use oral device / mandibular advancement splint)
5. Don't know

As the next questions are related to certain groups of people can you please tell me...

### D.4 Which of the following best describes your current marital status?

(Single Response)

1. Married
2. Living with a partner
3. Separated
4. Divorced
5. Widowed
6. Never Married
7. Refused

Sequence guide: If D.4  $\geq 3$  (Not married or living with partner) go to E.1

### D.5 As a result of a sleep problem, do you or does your partner do any of the following to ensure that you both get a good night sleep...

(Randomise)

	Yes	No	Refused	Don't know
a. Sleep in a separate bed, bedroom or on the couch	01	02	98	99
b. Alter your sleep schedules	01	02	98	99
c. Sleep with earplugs or an eye mask	01	02	98	99

**D.6 How much of a problem do your or your partner's sleep disorders have on your relationship? Would you say it causes...**

(Single response)

1. Significant problems
2. Moderate problems
3. Little problems
4. No problems
5. Refused
6. Don't know

**E. HEALTH CARE**

**E.1 Has a doctor ever asked you about your sleep?**

(Single response)

1. Yes
2. No
3. Refused
4. Don't know

**E.2 What, if anything, awakens you during the night?**

(Multiple response)

1. Noise
2. Light
3. Stress
4. Thinking about work, something else
5. Someone else
6. Pain/Discomfort
7. Nightmares
8. World events
9. The need to go to the bathroom
10. Wake up for no apparent reason
11. Something else (Specify)
12. Nothing awakens me at night
13. Refused
14. Don't know

**E.3 If you awaken during the night, how difficult is it for you to fall back asleep? Would you say ...**

(Single response)

1. Very difficult
2. Somewhat difficult
3. Not very difficult
4. Not at all difficult

5. Refused
6. Don't know

**E.4 How frequently do you use the following sleep aids specifically to help you sleep?  
Would you say you use.....  
(Randomise)**

	Every night or almost every night	A few night a week	A few nights a month	Rarely	Never	Refused	Don't know
a. Over-the-counter or store-bought sleep aids	05	04	03	02	01	98	99
b. Sleep medication prescribed by a doctor	05	04	03	02	01	98	99
c. Alcohol, beer or wine	05	04	03	02	01	98	99
d. An eye mask or earplugs	05	04	03	02	01	98	99
e. Melatonin	05	04	03	02	01	98	99

## F. EMPLOYMENT

**F.1 What was your employment status over the past 3 months? Were you primarily...**  
(Multiple responses accepted except with 5, 6, and 8.)

1. Working more than one job
2. Working full-time
3. Working part-time
4. A student
5. A homemaker
6. Unemployed
7. Retired
8. Disabled
9. Volunteer
10. Other (Specify)
11. Refused
12. Don't know

Sequence guide: if F.1 ≥ 4 go to G1.

**F.2 Thinking about the past 3 months, which of the following best describes your work  
schedule? Would you say that you worked...**  
(Single response)

1. Regular day shifts
2. Regular evening shifts
3. Regular night shifts
4. Rotating shifts
5. Other (Specify)

6. Refused
7. Don't know

**F.3 On average, how many total hours per week do you work at a job for which you are paid?**

(Do not accept ranges. Record 998 for refused, 999 for don't know and 000 for none.)

1. Enter number of hours

**F.4 In the past 4 weeks (28 days), how many days did you, miss an entire work day because of problems with your physical or mental health? (Please include only days missed for your own health not someone else's health)**

(Single Response. *It is about the main job, that is the one in which you work most hours*)

1. Enter number of days (0-28)
2. None
3. Refused

**F.5 Over the past 12 months how often have you gone to work despite feeling that you really should have taken sick leave because of your state of health?**

(Single Response)

1. Never
2. Once
3. 2 times
4. 3 times
5. 4 times
6. 5 times
7. Over 5 times

**F.6 Besides planned naps, have you fallen asleep or nearly fallen asleep on the job in the past month?**

(Single Response)

1. Yes
2. No

**F.7 Have you ever told your supervisor that you were not alert enough to perform your job safely?**

(Single Response)

1. Yes
2. No

**F.8 If you were late to work, was it because...**

(Multiple Response)

1. You went to bed too late,
2. You slept too late,
3. You were too sleepy when you woke up,
4. You have a sleep problem,
5. Traffic or transportation problems,

6. You needed to take care of others, or
7. You are never late or tardy?
8. None of the above
9. Refused
10. Don't know

**F.9 How many days within the past three months have you missed work because you were too sleepy or you had a sleep problem? Would you say...**

(Single response)

1. None
2. 1 to 2 days
3. 3 to 5 days
4. 6 to 10 days
5. More than 10 days
6. Refused
7. Don't know

**F.10 Thinking about the past three months, how many days did you make errors at work because you were too sleepy or you had a sleep problem? Would you say...**

(Single response)

1. None
2. 1 to 2 days
3. 3 to 5 days
4. 6 to 10 days
5. More than 10 days
6. Refused
7. Don't know

**F.11 Please tell me if you completely agree, mostly agree, mostly disagree or completely disagree with the following statement. Not getting enough sleep impacts or affects my job performance?**

(Single Response)

1. Completely agree
2. Mostly agree
3. Mostly disagree
4. Completely disagree
5. Don't know

## G. STANFORD PRESENTEEISM SCALE (SPS-6)

**G.1** These experiences may be affected by many environmental as well as personal factors, and may change from time to time. For each of the following statements, please check one of the following responses to show your agreement or disagreement with this statement in describing your work experiences in the past month.

	Strongly disagree	Somewhat disagree	Uncertain	Somewhat agree	Strongly agree	Not Applicable
a. Because of lack of sleep, the stresses of my job were much harder to handle.	01	02	03	04	05	
b. Despite having lack of sleep, I was able to finish hard tasks in my work.	01	02	03	04	05	
c. My lack of sleep distracted me from taking pleasure in my work	01	02	03	04	05	
d. I felt hopeless about finishing certain work tasks, due to lack of sleep.	01	02	03	04	05	
e. At work, I was able to focus on achieving my goals despite lack of sleep.	01	02	03	04	05	
f. Despite lack of sleep, I felt energetic enough to complete all my work.	01	02	03	04	05	

## **H. DAYTIME SLEEPINESS**

### **H.1 What wakes you up in the morning?**

(Multiple response)

1. Alarm clock
2. Bed partner
3. Children
4. Light
5. Pet
6. Radio/Television
7. Wake up on own
8. Other (Specify)
9. Refused
10. Don't know

### **H.2 What is the minimum number of hours you need to sleep to function at your best during the day? (do not accept ranges. Record 98 for Refused and 99 for don't know.)**

1. Hours and/ or
2. Minutes

### **H.3 How many days within the past three months have you missed family events, leisure activities, work functions or other activities because you were too sleepy or you had a sleep problem? Would you say...**

(Single response)

1. None
2. 1 to 2 days
3. 3 to 5 days
4. 6 to 10 days
5. More than 10 days
6. Refused
7. Don't know



## I. SLEEP EXPERIENCES

- I.1 Can you please tell me if you completely agree, mostly agree, mostly disagree or completely disagree with each of the following statements.**  
(Randomise)

	Completel y Agree	Mostly Agree	Mostly Disagree	Completel y Disagree	Refused	Don't know
j. You can learn to function well over time with one or two fewer hours of sleep than you need.	04	03	02	01	98	99
k. Doctors should discuss sleep issues with their patients.	04	03	02	01	98	99
l. Sleep problems are associated with being overweight or obese.	04	03	02	01	98	99
m. Insufficient or poor sleep is associated with health problems.	04	03	02	01	98	99

- I.2 Would you consider yourself a morning person or an evening person? That is are you more alert, productive and energetic in the morning or evening?**

(Single response)

1. Morning person
2. Evening person
3. Refused
4. Don't know

- I.3 Thinking about caffeinated beverages such as soda, soft drinks, coffee and tea, how many cups or cans of caffeinated beverages do you typically drink each day?**  
(Do not accept ranges. Record 99 for "don't know", 98 for "refused", 00 for "none" and 97 for "less than one".)

1. Enter caffeinated beverages

- I.4 Now, thinking about alcoholic beverages such as beer, wine, liquor or mixed drinks, how many alcoholic beverages do you typically drink each week?**  
(Do not accept ranges. Record 99 for "don't know", 98 for "refused", 00 for "none" and 97 for "less than one".)

1. Alcoholic beverages

## **J. DROWSY DRIVING**

**J.1 In the past year, how often have you had an accident or a near accident because you dozed off or were too tired while driving? Would you say...**

(Single response)

1. 3 or more times a week
2. 1 to 2 times a week
3. 1 to 2 times a month
4. Less than once a month
5. Never
6. Don't drive/Don't have a license
7. Refused
8. Don't know

**J.2 Have you ever nodded off or fallen asleep, even just for a brief moment while driving a vehicle?**

(Single response)

1. Yes
2. No
3. Don't drive/Don't have a license
4. Refused
5. Don't know

Sequence guide: If J.2  $\geq 2$  go to K.1

**J.3 How often do you nod off or fall asleep while driving a vehicle? Would you say...**

(Single response)

1. Every day or almost every day
2. 3 to 4 days a week
3. 1 to 2 days a week
4. 1 to 2 days a month
5. Less often or Never
6. Refused
7. Don't know

## K. HEALTH

### K.1 What is your height without shoes?

1. Enter in centimetres or
2. Enter feet and inches
3. Don't know
4. Refused

### K.2 What is your weight without shoes?

1. Enter in centimetres or
2. Enter feet and inches
3. Don't know
4. Refused

### K.3 Do you now smoke every day, some days, or not at all?

(Single response)

1. Every day
2. Some days
3. Not at all
4. Refused
5. Don't know

### K.4 Have you ever been told by a doctor that you have any of the following medical conditions?

(Randomise)

	Yes	No	Refused	Don't know
a. Heart disease	01	02	98	99
b. Arthritis	01	02	98	99
c. Diabetes	01	02	98	99
d. Heartburn or GERD	01	02	98	99
e. Depression	01	02	98	99
f. Anxiety disorder such as panic disorder or post dramatic stress disorder	01	02	98	99
g. Lung disease	01	02	98	99
h. High blood pressure	01	02	98	99

## L. EPWORTH SLEEPINESS SCALE (ESS)

**L.1** How likely are you to doze off or fall asleep in the following situations, in contrast to just feeling tired? Even if you haven't done some of the activities recently, think about how they would have affected you. Use this scale to choose the most appropriate number for each situation:

	Would never doze	Slight chance of dozing	Moderate chance of dozing	High chance of dozing
a. Sitting and reading	00	01	02	03
b. Watching TV	00	01	02	03
c. Sitting inactive in a public place (e.g. cinema or in a meeting)	00	01	02	03
d. Being in a car for an hour as a passenger (without a break)	00	01	02	03
e. Lying down to rest in the afternoon (when possible)	00	01	02	03
f. Sitting and chatting to someone	00	01	02	03
g. Sitting quietly after lunch (not having had alcohol)	00	01	02	03
h. In a car when you stop in traffic for a few minutes	00	01	02	03

## DEMOGRAPHICS

Now to finish with some general questions.

### L.2 In which country were you born?

(Single Response)

1. Australia
2. Austria
3. Bosnia-Herzegovina
4. Canada
5. China
6. Croatia
7. France
8. Germany
9. Greece
10. Holland / Netherlands
11. Hong Kong
12. Iran
13. Italy
14. Japan
15. Malaysia
16. New Zealand
17. Philippines
18. Poland
19. Slovenia
20. Spain
21. U.K. and Ireland
22. USA
23. Vietnam
24. Former Yugoslav Republic of Macedonia
25. Former Yugoslav Republics of Serbia & Montenegro
26. Other country (*specify*)
27. Refused

**L.3 What is the main language you speak at home?**

(Single Response)

1. English
2. Cambodian
3. Cantonese
4. Chinese
5. Croatian
6. Dutch
7. Filipino
8. German
9. Greek
10. Italian
11. Polish
12. Serbian
13. Spanish
14. Vietnamese
15. Other (specify)
16. Refused

**L.4 Which best describes the highest educational qualification you have obtained?**

(Single response)

1. Still at school
2. Left school at 16 years or less
3. Left school after age 16
4. Left school after age 16 but still studying
5. Trade / Apprenticeship
6. Certificate / Diploma
7. Bachelor degree or higher
8. Refused

**L.5 The next question is about housing. Is the dwelling you live in ....**

(Single Response)

1. Owned by you
2. Being purchased by you
3. Rented from the Government
4. Rented privately
5. Retirement village
6. Other (specify)
7. Refused

**L.6 I would now like to ask you about your household's income. We are interested in how income relates to lifestyle and access to health services. Before tax is taken out, which of the following ranges best describes your household's income, from all sources, over the last 12 months?**

(Single Response)

1. Up to \$12,000
2. \$12,001 - \$20,000
3. \$20,001 - \$30,000
4. \$30,001 - \$40,000
5. \$40,001 - \$50,000
6. \$50,001 - \$60,000
7. \$60,001 - \$80,000
8. \$80,001 - \$100,000
9. \$100,001 - \$150,000
10. \$150,001 - \$200,000
11. More than \$200,000
12. Not stated/refused
13. Don't know

**L.7 Which best describe your family's money situation?**

(Single Response)

1. I am/We are spending more money than I/we get
2. I/We have just enough money to get me/us through to the next pay day
3. There's some money left over each week but I/we just spend it
4. I/We can save a bit every now and then
5. I/We can save a lot
6. Don't know

**That concludes the survey. On behalf of the University of Adelaide, thank you very much for taking part in this survey.**