

Executive summary

Sleep disorders are a large and under-recognised problem in Australia. In 2004, Access Economics prepared a report on the economic cost of sleep disorders in Australia, *Wake up Australia*. This 2011 Deloitte Access Economics report was commissioned by the Sleep Health Foundation to re-estimate the cost of sleep disorders based on updated cost information and developments in the literature, which result in different methodology from the previous analysis. This report also includes a cost-utility analysis of continuous positive airway pressure (CPAP) — the most common treatment for obstructive sleep apnoea (OSA).

This report focuses on three of the most well recognised and researched sleep disorders, since these account for the majority of sleep impacts studied. These are:

- OSA;
- restless legs syndrome (RLS); and
- primary insomnia.

Prevalence

The prevalence of each sleep disorder was calculated in the Australian population aged 20 years and over (Table i). These prevalence rates do not overlap, that is they have been adjusted to avoid counting people with multiple disorders, by only counting the primary sleep condition (Section 1.1.5). In 2010 there were an estimated 1.5 million Australians (8.9% of the population) with these sleep disorders, comprising approximately:

- 775,000 people with OSA (4.7%);
- 492,000 people with primary insomnia (3%); and
- 199,000 people with RLS (1.2%).

Costs may be underestimated given the prevalence of people experiencing symptoms of insomnia, RLS or OSA is substantially higher than the proportion of people who are diagnosed with these conditions, and given the exclusion of other sleep conditions.

Table i: Prevalence of sleep disorders in Australia

Sleep Disorder	Low	Base case	High
OSA (AHI \geq 15)	4.0%	4.7%	6.0%
Primary Insomnia	1.5%	3.0%	—
Restless Legs Syndrome	—	1.2%	—

Source: Deloitte Access Economics calculations. AHI = apnoea-hypopnoea index.

Sleep disorders and other health conditions

There is evidence of a causal relationship between sleep disorders and other illnesses and injuries. Population attributable fractions (PAFs) were used to estimate the proportion of each condition attributable to each sleep disorder. These are shown in Table ii. Some of the PAFs have changed since the previous report, due to changes in the literature evidence. In particular, in this report there is:

- a lower odds ratio for the impact of OSA on the risk of workplace injuries (potentially reflecting changes in occupational health and safety practices in the intervening years);

- the PAF for motor vehicle accidents is lower in this report because it relates to OSA only, rather than to all sleep disorders (see table note below).

Table ii: PAFs for sleep disorders

Attributed injury/illness	OSA	Insomnia	RLS
Stroke	5.3%	—	—
CHF	1.1%	—	—
Coronary artery disease	3.6%	—	—
Depression	6.2%	2.9%	1%
Motor vehicle accidents (MVAs)	4.3%	—	—
Workplace injuries	0.6%	3.9%	—

Source: Deloitte Access Economics' calculations. — Not estimated this time due to a lack of data evidence. Last time PAFs were based on overall prevalence of sleep conditions with odds ratios for OSA extrapolated to other conditions. This time each relationship was, more conservatively, separately analysed, and a link discounted if there was insufficient evidence of a direct relationship, even though the causal pathway may be the same (e.g. the pathway for a link between insomnia and MVAs may be the same as for OSA – notably, fatigue).

PAFs were based on clinical evidence with the exceptions that:

- the effect of OSA on the risk of certain cardiovascular diseases (CVDs) – here comprising stroke, congestive heart failure (CHF) and coronary artery disease – for women was estimated to be the same as for men (allowing for higher CVD risk for men of the same age); and
- the link between RLS and depression was derived from the lifetime risk of experiencing a major depressive episode, since estimates of annual risk in the literature tend to be unstable and based on very small sample sizes.

Health system costs

The health system costs of sleep disorders comprise the cost of the sleep disorders themselves and the share of health costs from other conditions attributed to sleep disorders (i.e. CVDs, depression and injuries).

The total health care cost of sleep disorders in 2010 was estimated to be \$818 million.

Sleep disorders cost the hospital system \$96.2 million, of which 73.1% was due to sleep apnoeas, 6.7% to insomnia and 0.3% to RLS. The remainder was for other sleep disorders – including 13.9% due to disorders of the sleep wake schedule.

People with sleep disorders access a range of medical services and use pharmaceuticals that they would not require in the absence of the sleep disorder. Data on these out-of-hospital medical costs was only available for OSA – \$96.6 million in 2010. This estimate is likely to underestimate the actual cost because it only captures a limited range of the potential services accessed as a result of a person having OSA. In addition, the total cost of devices in 2010 was \$81.5 million (mainly CPAP devices).

The total health system cost for conditions attributed to sleep disorders in 2010 was estimated to be \$544 million. The proportion of these costs for each sleep condition were \$408.5 million to OSA, \$118.7 million to insomnia and \$16.9 million due to RLS.

Indirect costs

Indirect financial costs associated with sleep disorders and conditions attributable to them were estimated to be \$4.3 billion in 2010.

- This includes \$3.1 billion in lost productivity due to premature workforce separation and mortality, and absenteeism.
- The deadweight loss of raising revenue to fund lost productivity, public health expenditure, social security payments and a number of costs associated with motor vehicle accidents that were due to sleep disorders cost \$472 million.
- Informal care and other costs of motor vehicle and workplace accidents amounted to \$129 million and \$517 million respectively.
- OSA accounted for 62% of the total cost (\$2.6 billion) while insomnia contributed \$1.5 billion (36%) and RLS \$115 million (3%).¹

Human cost of sleep disorders

Sleep disorders impose a burden that extends beyond health care system and broader economic costs. A person living with a sleep disorder will likely experience a lower quality of life through increased morbidity, and may die prematurely e.g. from a motor vehicle accident.

Loss of healthy life is measured in disability adjusted life years (DALYs). DALYs lost from OSA, insomnia and RLS as well as attributable conditions were calculated, with an adjustment made to avoid double counting. **It was estimated 190,000 DALYs were lost due to sleep disorders in 2010. OSA contributed 109,000 DALYs, insomnia 56,000 DALYs and RLS 26,000 DALYs.**

Multiplying DALYs lost by the value of a statistical life year (VSLY) of \$165,000, **the total cost of lost wellbeing was estimated to be \$31.4 billion (\$23.5 billion – \$36.8 billion).** This is not a direct cost to the economy in the traditional sense (i.e. a loss in productivity). It is the value of a loss in the stock of health capital.

Cost effectiveness of CPAP

CPAP is the most common treatment for people with OSA. Its cost effectiveness for treating the average Australian with OSA was evaluated in comparison with no treatment. The incremental cost effectiveness ratio (ICER) from the health system perspective was \$15,523 (\$12,112 to \$19,750) per DALY averted – which is considered very cost effective based on World Health Organization (WHO) benchmarks. From the perspective of society, there was a saving of \$8,736 per DALY averted, making CPAP for OSA a ‘dominant’ intervention from a societal perspective – saving healthy life and dollars.

Comparisons and opportunities

The total cost associated with sleep disorders in Australia was estimated at \$36.4 billion (\$27.0 billion to \$42.8 billion) (Table iii).

¹ The indirect costs in this report are lower than in the previous report because the cost is primarily based on OSA and its associated conditions rather than an estimate of all sleep disorders. Also, changes made to the PAF for OSA and workplace accidents have had a large impact on the results.

This comprised \$5.1 billion (\$3.5 billion to \$6.0 billion) in financial costs and \$31.4 billion (\$23.5 billion to \$36.8 billion) in nonfinancial costs.

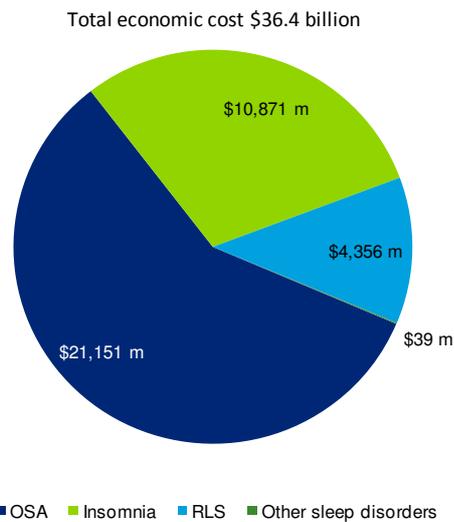
Table iii: Summary of the economic cost of sleep disorders, 2010

	Low	Base case	High
	\$m	\$m	\$m
Health care costs			
<i>Sleep disorders</i>	274	274	274
<i>Associated conditions</i>	357	544	703
Total health care cost	631	818	977
Indirect financial costs			
<i>Productivity</i>	2,120	3,132	3,673
<i>Informal care</i>	76	129	166
<i>Other cost of MVA</i>	303	465	605
<i>Other cost of workplace accidents</i>	28	53	56
<i>Deadweight loss</i>	329	472	565
Total indirect financial cost	2,855	4,250	5,065
Total financial cost	3,487	5,069	6,042
Total non-financial costs	23,468	31,350	36,751
Total cost	26,955	36,419	42,793

Source: Deloitte Access Economics estimates.

Chart i shows the total cost of sleep disorders in 2010, by type of sleep disorder. The total cost of OSA was estimated at \$21.2 billion. The total cost of insomnia was estimated at \$10.9 billion and the total cost of RLS was \$4.4 billion.²

Chart i: Economic cost of sleep disorders, 2010



Source: Deloitte Access Economics' estimates.

² These results should not be interpreted as meaning that OSA is the most costly sleep disorder as data limitations have not allowed us to include all costs associated with all sleep disorders.

The importance of sleep health is beginning to gain recognition overseas, in terms of acknowledgement of the need for and development of strategies to increase public awareness and intervention in relation to sleep disorders.

A number of groups have sought to heighten awareness of sleep disorders. World Sleep Day was established on 18 March 2008 and, in the United States (US), National Sleep Awareness week occurs on 7 – 13 March. The European Respiratory Society and the British Lung Foundation have also played an important role in raising awareness in relation to OSA.

Australia has comparative advantages in the analysis of sleep arena. Priority interventions to address the current fragmented and under-resourced sleep health landscape include the following.

- **Education and awareness raising** — for community, health professionals and public policy makers, regarding the importance of good sleep hygiene and how to achieve better sleep outcomes.
- **Research and development** — this report has identified a number of areas in which further research would be worthwhile (see Section 7).
- **Cost-effective prevention, treatment and management options** — this report has shown CPAP to be a highly cost effective treatment for OSA yet it is largely privately funded. Other treatment options may provide improved compliance, one of the shortcomings of CPAP.
- **A national coordination point** — the establishment of a catalysing agent with a forward national action plan is recommended.

Although sleep disorders remain under-recognised, the future is positive if opportunities for action are pursued since such a large proportion of sleep-related impacts are preventable or treatable.

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