SLEEP: A CORE PILLAR OF HEALTH AND WELLBEING

Improving population sleep health to reduce preventable illness and injury

Policy Evidence Brief
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Stella McNamara, Tyler Nichols, Sarah Dash, Maximilian de Courten, Rosemary Calder

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ABOUT US

The Mitchell Institute for Education and Health Policy at Victoria University is an independent education and health policy think tank. Our focus is on improving health and education systems so more Australians can engage with and benefit from these services, supporting a healthier, fairer and more productive society.

The Australian Health Policy Collaboration is led by the Mitchell Institute at Victoria University and brings together leading health organisations and chronic disease experts to translate rigorous research into good policy. The national collaboration has developed health targets and indicators for preventable chronic diseases to contribute to reducing the health impacts of chronic conditions on the Australian population.

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- **Dr Moira Junge,** CEO, Sleep Health Foundation; Adjunct Clinical Associate Professor, Monash University
- **Prof Shantha Rajaratnam**, Chair, Sleep Health Foundation; Professor of Sleep and Circadian Medicine, Monash University; Head, Monash School of Psychological Sciences; Deputy Director, Turner Institute for Brain and Mental Health
- **Prof Robert Adams,** Professor of Respiratory and Sleep Medicine and Medical Director, Adelaide Institute for Sleep Health, Flinders University; Consultant Physician, Respiratory and Sleep Service, Southern Adelaide Local Health Network
- **Prof Sean P.A. Drummond,** Professor of Clinical Neuroscience and Director, Research Programs and Infrastructure, School of Psychological Sciences and Turner Institute for Brain and Mental Health, Monash University
- **Dr Melissa Ree,** Senior Lecturer and Clinical Psychologist, School of Psychological Science, The University of Western Australia
- **Prof Peter Cistulli,** Professor of Sleep Medicine, Charles Perkins Centre and Northern Clinical School, University of Sydney; and Department of Respiratory and Sleep Medicine, Royal North Shore Hospital, Sydney
- **Prof Nick Zwar,** General Practitioner, Fellow, Royal Australian College of General Practitioners, Executive Dean, Health Sciences & Medicine, Bond University
- **Assoc Prof Yaqoot Fatima,** Principal Research Fellow, Poche Centre for Indigenous Health, University of Queensland
- **Dr Nicholas Saner,** Post-doctoral Research Fellow, Institute for Health and Sport, Victoria University
- **Dr Alexandra Metse**, Lecturer and Clinical Psychologist, School of Health, University of the Sunshine Coast, Honorary Clinical Senior Lecturer, School of Psychological Sciences, University of Newcastle
- **Dr Alexander Sweetman,** Senior Program Manager, Australasian Sleep Association; Academic Status, Adelaide Institute for Sleep Health, Flinders University
- **Dr Yu Sun Bin,** Senior Lecturer and Research Fellow, Charles Perkins Centre, University of Sydney
- **Dr Sam Manger,** General Practitioner; Vice President, Australasian Society of Lifestyle Medicine; Academic Lead/Senior Lecturer, Lifestyle Medicine, James Cook University College of Medicine and Dentistry; Advisor, RACGP Shaping a Healthy Australia Project

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SLEEP HEALTH: A NATIONAL CONCERN

Sleep is a fundamental human need and, along with nutrition and physical exercise, it is one of the three pillars of good health (1).

The evidence summarised in this report and discussed in detail in the accompanying policy evidence review (2) shows that significant proportions of people in Australia have poor sleep (3) or have been diagnosed with common sleep disorders. The prevalence of poor sleep is likely to be much higher as many with sleep disorders are considered unlikely to have been diagnosed (4,5). Poor sleep affects mood, mental health, cognitive functioning, learning and development and productivity.

Poor sleep health is a risk factor for accidents and injuries, including motor vehicle accidents (MVAs), and is associated with a range of chronic health conditions such as Type 2 diabetes, hypertension, obesity, cardiovascular disease, dementia, major depression and all-cause mortality (6). Injuries, accidents and sequelae of chronic diseases directly attributable to poor or inadequate sleep were estimated to result in 3017 deaths in Australia in 2016-2017 (7).

Preventive health action has become a national health policy and funding priority. People in Australia now live an average of almost eleven years in poor health because of increasingly high rates of chronic disease, and more than one-third of the burden of those diseases is considered preventable.

The major modifiable risk factors that contribute to preventable chronic diseases include unhealthy diets, physical inactivity, tobacco use and the consumption of alcohol. These well-established chronic disease risk factors are also risk factors for, and potential consequences of, poor sleep health. Improving the physical activity levels, dietary intakes and sleep health of as many in the population as possible could achieve a healthier Australia in the coming years (8).

Economic and social developments in the last century, including the growth in night-time social and work activity and the recent, pervasive 24/7 nature of digital communication and social media in daily life have had a considerable impact on sleep health (9). These influences have placed pressure on the ability of individuals to 'stay tuned' to their internal body clock and to understand the importance of healthy sleep – sleep that is of good quality and is sufficient and consistent for good health and wellbeing.

These impacts are likely to have contributed to increasing demand for health care and treatment for poor sleep and sleep disorders. Evidence of the health, societal and economic benefits of healthy sleep is accumulating and there is growing attention in health information and health policy to the importance of sleep, both in Australia and internationally.

This policy evidence brief summarises an extensive policy evidence review that has drawn together the available evidence on sleep health relevant to the Australian policy context and that has identified recommendations that would enable a nationally consistent approach, in health and other public policies, to improving sleep health in Australia. The review report, Sleep: a core pillar of health and wellbeing. Policy evidence review. Mitchell Institute, September 2023 (2), is a companion report to this policy evidence brief.

The focus of this paper and the companion evidence review is on policy responses that are relevant to addressing population sleep health and improving the capacity for prevention and early intervention of poor sleep at the primary care level. The clinical treatment and management of sleep disorders within specialist sleep health services are beyond its scope. The potential role of policymakers and Australia's primary health care system in improving the prevention and early detection of sleep disorders is explored throughout.

The recommended policy options for improving sleep health in Australia were informed by the findings of the policy evidence review and further refined and endorsed by a working group of leading Australian sleep health experts. In particular, the recommendations focus on optimal support of the prevention and treatment of poor sleep in the Australian population. The role of population health policy in improving public awareness, understanding and engagement in improved sleep health is considered together with the potential for primary care services, particularly general practice, to identify, prevent and treat poor sleep and sleep disorders.

The recommended policy actions are to:

- Establish a 10-year National Sleep Health Strategy;
- Establish National Sleep Guidelines;
- Implement a national sleep health awareness campaign;
- Monitor population sleep health;
- Support primary care capacity for early intervention and risk reduction; and
- Promote recognition of sleep health in other public policy.

These recommendations are described in further detail from page 17. The establishment of a National Sleep Health Strategy is an overarching recommendation that would encompass the other five recommendations and provide a comprehensive policy framework to improve sleep health in Australia. Each of the recommended policy actions implemented individually will have positive impact on sleep health in Australia and should be considered as individual recommendations as well as component parts of a broader, sustained, national strategy.

SLEEP: WHAT IT IS AND WHY IT MATTERS

Healthy sleep is a significant contributor to health and wellbeing for individuals of all ages (1,9).

In children and young people, good sleep health is important for healthy brain and body development and is associated with improved learning outcomes (10). In adults, healthy sleep is critical to support physical and mental health and wellbeing, social and economic participation and workplace and occupational health and safety (11). In older people, good sleep health has also been shown to be an important contributing factor to healthy ageing (12,13).

Sleep has been described as "a state that is characterized by changes in brain wave activity, breathing, heart rate, body temperature, and other physiological functions" (14). Sleep is a complex process affecting nearly every body tissue and many physiological functions that are essential for physical and mental health and wellbeing (15,16). Sleep is the restorative power of the body, as it provides an opportunity for recovery and repair related to cardiovascular health, immune function, metabolism and cognitive function and development.

As we sleep, our bodies alternate between two sleep states – rapid eye movement (often called 'REM sleep') and non-rapid eye movement (NREM). With the help of an electroencephalogram (EEG) electrical brain activity during sleep can be measured and the states and stages of sleep identified in more detail (17,18). In adults, NREM sleep is broken down into 3 stages – N1, N2 and N3. The two states, NREM and REM, cycle approximately every 90 minutes throughout the sleep episode (17,18).

In adults, a sleep episode usually begins with the individual attempting to go to sleep. The time between this and sleep onset, that is, commencing N1 sleep, is called sleep latency. Once asleep, an individual progresses through NREM N1 (light sleep), through N2 sleep and into N3 (deep sleep/slow-wave sleep), before progressing back up through the stages to light sleep and REM sleep, hence completing the first sleep cycle. Over the course of 4-6 sleep cycles throughout the night, an individual typically experiences progressively less deep sleep and more light sleep, awakenings, and REM sleep. Brief awakenings/arousals from sleep are completely normal. The cumulative time an adult spends awake between first falling asleep and subsequently getting out of bed the next morning is referred to as 'wake after sleep onset' (WASO). The amount of time an individual is actually sleeping is the sleep duration. Time asleep divided by the time spent in bed during the sleep episode is referred to as sleep efficiency (17,18).

Sleep is well known as an important biological function essential for life. Successfully cycling through all the sleep stages multiple times each night allows sleep to perform the critical function of restoration and recovery for the body and mind (15).

Sleep supports learning, memory and mood and is particularly important for healthy growth and development in babies and children. Sleep also affects various other physiological processes and functions and how they interact with the body's biological clock (11).

Circadian rhythms and sleep

Sleep is regulated by the interaction of two processes – sleep homeostasis and the sleep circadian rhythm. Sleep homeostasis is a regulated balance between sleep and waking. The sleep homeostatic process can be described as a rise of sleep pressure during wakefulness – or propensity to sleep – and its dissipation during sleep (19). The longer we are without sleep, the stronger our propensity to fall asleep (20).

Circadian rhythms are physiological processes that follow an approximate 24-hour cycle, controlled by an internal biological clock (21). This master circadian clock sends signals to different parts of the body to regulate a wide range of physiological functions and processes in repeating 24-hour cycles (22). While it is common to refer to one, singular "circadian rhythm", there are actually several interconnected circadian rhythms occurring in the human body, with the most prominent being the sleep-wake cycle (22).

Other physiological processes and functions that are influenced or regulated by circadian rhythms include hormone secretion, metabolism and energy production, appetite and feeding, body temperature regulation and immune function (23).

Circadian rhythms are internal physiological processes that run independently of external stimuli. However, they are still influenced by and can be synchronised to environmental cues, particularly exposure to light and the day-night cycle (24). Circadian rhythm disruptions refer to disruptions of internal biological timing mechanisms (which can increase the risk of several adverse health outcomes), or a mismatch between internal and behavioural or environmental (e.g. night-day) cycles (24,25). Night shift work and jetlag are common examples of circadian disruptions.

Despite being closely aligned with the day-night cycle, the precise timing of circadian rhythms and sleep-wake cycles varies from person to person (24). An individual's natural or preferred sleep and wake times are known as their chronotype, with early risers (larks) at one end of the spectrum and late-night types (night owls) at the other (24).

Contemporary impacts on sleep

The three pillars of good health – physical activity, nutrition and sleep, are also aspects of daily life that, in much of the world, have significantly and rapidly changed due to economic and social developments over the past century. Historical diets made up of locally produced and minimally processed foods have been transformed by the rapid growth of the international food industry and the subsequent increase in the availability of manufactured/ processed food products (26). Physical activity has shifted from an integral part of domestic and work activity to a personal choice or option as an adjunct to a largely sedentary social and work environment (27). Sleep health has been similarly impacted by changes to social patterns, globalised commercial activities and work and employment trends that impinge upon factors that support sleep (9).

Sleep health for the individual can be adversely affected by a wide range of factors, such as personal, social, study and work circumstances and/or by other aspects of a person's health and wellbeing (28). These factors can indicate risks for poor sleep and subsequently point to the most appropriate interventions that can be applied – either by individuals, through medical or non-clinical measures, or through health and other public policies and approaches that address environmental factors relevant to sleep health.

SLEEP HEALTH IN THE AUSTRALIAN POPULATION

Nearly two-thirds of adults in a 2016 nationally representative survey (65.9%) reported one or more sleep problems, such as difficulty falling asleep, waking up a lot overnight, daytime sleepiness, daytime fatigue or exhaustion, feeling irritable or moody, or pathological daytime sleepiness. Almost half (48%) reported at least two sleep-related problems (see *Figure 1*). Between 33-45% of respondents reported both inadequate sleep, in duration or quality, and associated daytime consequences (3).

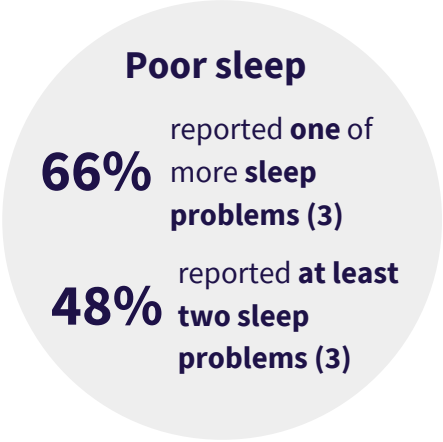


Figure 1: Self-reported poor sleep

Poor or inadequate sleep increases the risk of suffering a workplace injury or being involved in a motor vehicle accident (MVA). A 2017 Deloitte Access Economics report found that four in every ten Australians regularly experienced inadequate sleep and estimated that inadequate sleep was the primary contributing factor in nearly a quarter of all MVAs and workplace injuries (7).

According to the 2013 Household, Income and Labor Dynamics in Australia (HILDA) study of nearly 15,000 Australians aged 15 or older, self-reported poor sleep quality was linked with lower scores on scales measuring physical, emotional and social functioning (29). Insufficient sleep duration and/or poor sleep quality have also been identified as a potentially significant risk factor for suicidal ideation and behaviours (30–32).

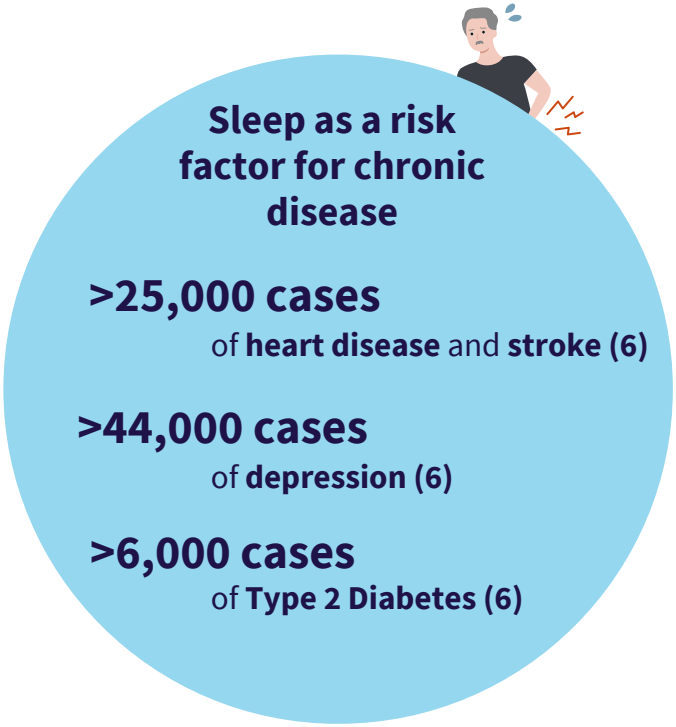


Figure 2: Sleep as a risk factor for chronic disease

Poor sleep health increases the risk of developing various chronic health conditions (e.g., diabetes, heart disease, stroke, depression) (33) which place an enormous burden on society and the health system. A 2021 Deloitte Access Economics analysis of the social, health and economic costs of sleep disorders in Australia estimated the specific number and proportion of cases of other chronic conditions considered directly attributable to sleep disorders (6). Approximately 3.5% of heart disease, 4% of stroke, 5.5% of depression and 1.3% of type 2 diabetes cases were estimated to be directly attributable to sleep disorders in 2019-20, which equates to over 25,000 cases of heart disease and stroke, over 44,000 cases of depression and almost 15,000 cases of type 2 diabetes (6) (see *Figure 2*). Given that this analysis only focussed on sleep disorders rather than poor sleep more broadly, the total burden of disease related to poor sleep is likely considerably higher (6).

Injuries, accidents and sequelae of chronic diseases directly attributable to poor or inadequate sleep were estimated to result in 3017 deaths in Australia in 2016-2017 (7).

In addition to the substantial health and wellbeing impacts, poor sleep health also incurs a significant economic burden in Australia each year (34,35). Based on a 2016-17 economic analysis of inadequate sleep in Australia, the financial costs (e.g. health system costs, productivity losses) of poor sleep health were estimated to be in excess of $26 billion AUD per year. A further $40 billion AUD of non-financial costs (e.g. years of life lost due to premature death and years of healthy life lost to disability) were estimated for the same one-year period (34) (see *Figure 3*). The non-financial impact of sleep disorders alone was estimated to account for 3.2% of the burden of disease among Australians for the 2019-2020 year (35).

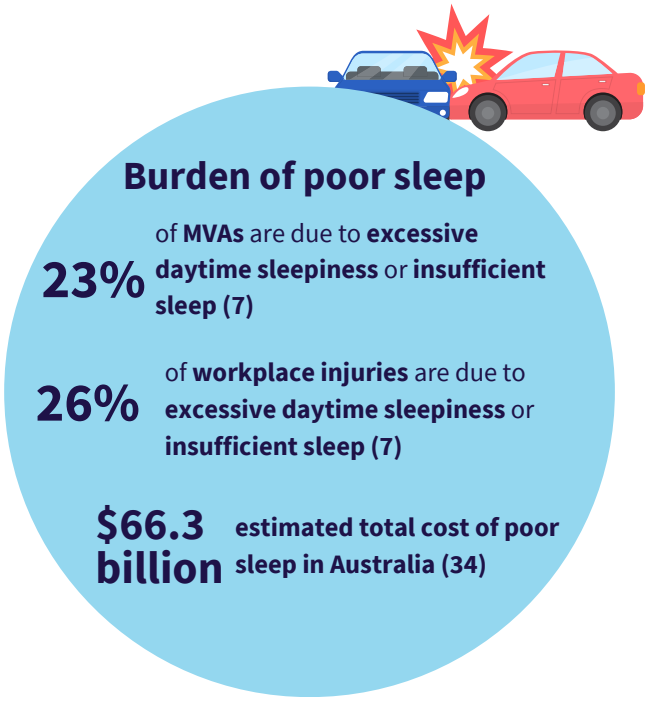


Figure 3: Burden of poor sleep

Prevalence of common sleep disorders

Figure 4 shows the prevalence of the three most common sleep disorders in Australia.

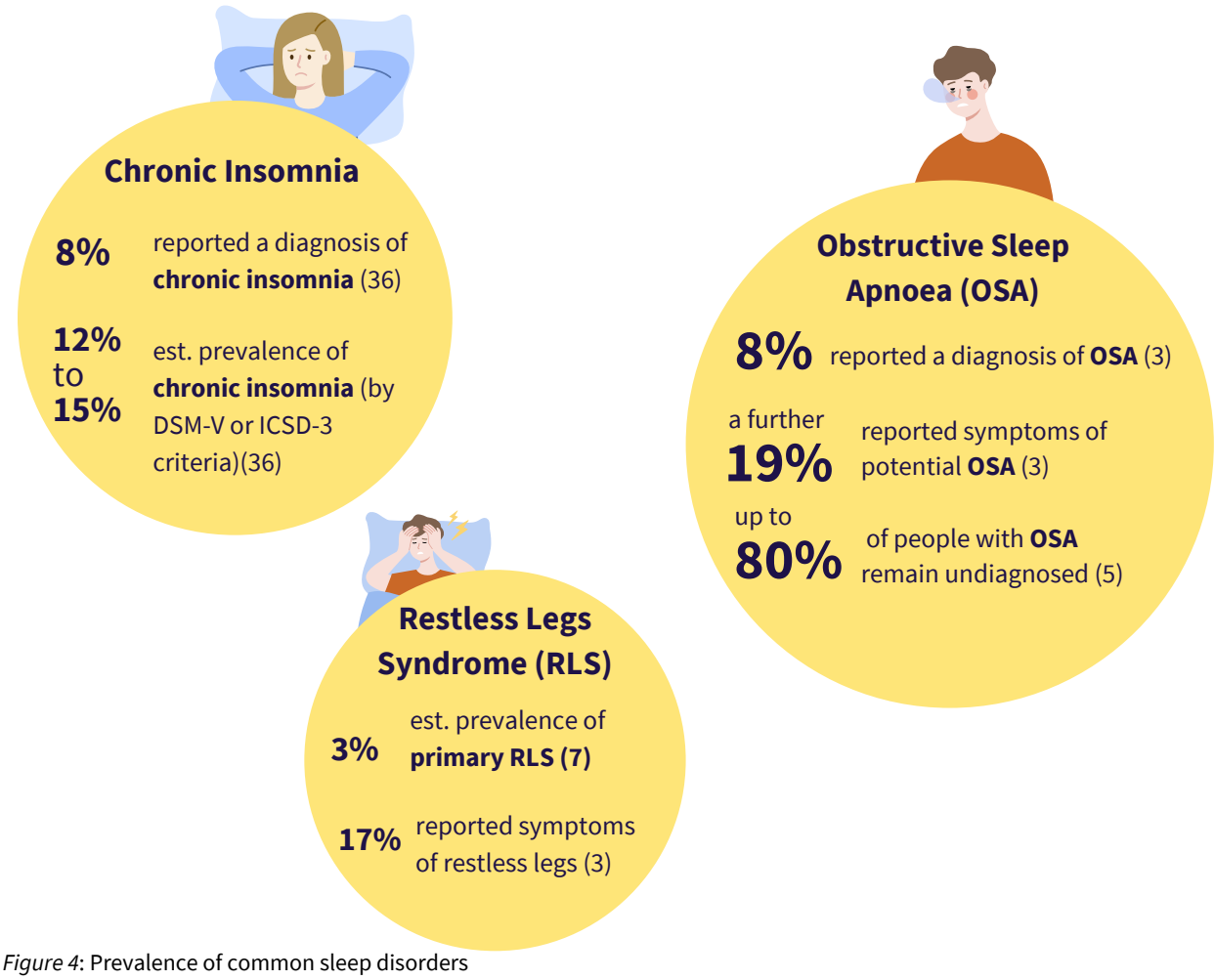


Figure 4: Prevalence of common sleep disorders

UNDERSTANDING SLEEP HEALTH: A CONCEPTUAL FRAMEWORK

Sleep health is a multidimensional concept that encompasses the various aspects, or domains, of sleep that have been shown to contribute to health and wellbeing outcomes (37). The concept of sleep health emphasises that good sleep is essential for good health and that 'healthy sleep' is more than just the absence of a clinical sleep disorder. By highlighting the positive role of sleep in overall health, sleep health contrasts with the historically dominant focus on negative outcomes associated with sleep problems or disorders (37). Understanding the various aspects of sleep that contribute to overall health and wellbeing can also assist with identifying potential areas of focus to improve sleep health in the population through health promotion and prevention activities (37).

This paper identifies three principal domains of sleep health:

- **Quantity** – total sleep duration (in hours) over a 24-hour period;
- **Quality** – the ease of falling asleep (sleep initiation), staying asleep through the night (sleep maintenance) and feeling subjectively satisfied/refreshed after a sleep episode; and
- **Consistency** – a consistent sleep schedule that aligns with the natural circadian cycle (i.e. most sleep occurs during the hours of darkness overnight) and minimises night-to-night variability in bed and wake times.

When one or more of these domains are insufficient or compromised, an individual's sleep health will be poor or suboptimal, and the individual is more likely to experience the negative health and wellbeing consequences associated with poor sleep.

It is important to note that sleep health refers to the long-term pattern of an individual's sleep. A person whose sleep is usually healthy may have occasional episodes of poor sleep and it is the pattern over time that indicates their overall sleep health.

To enable the multidimensional and complex nature of sleep health to be readily understood, a conceptual framework for sleep health (see *Figure 5* on the next page) was developed for this paper.

The framework was developed in collaboration with the working group of Australian sleep health experts, who informed and guided this work. The conceptual framework is based on three principal domains of sleep health (quantity, quality and consistency) and a subset of sleep health dimensions, indicators and outcomes related to each domain.

The development of the conceptual framework was informed by various existing resources and tools, including scales and suites of indicators that were designed to assess sleep health.

One of these is the RuSATED Scale – a self-report scale measuring sleep health using six dimensions: regularity, subjective satisfaction, timing, duration, sleep efficiency and alertness during the day (37). The conceptual framework incorporates the RuSATED dimensions of sleep health under each high-level domain. Whilst these dimensions can be used as direct indicators of sleep health, the conceptual framework also identifies, where relevant, additional specific indicators related to each domain (see *Figure 6)* and highlights additional outcomes (see *Figure 7*) related to sleep health not included in the RuSATED tool.

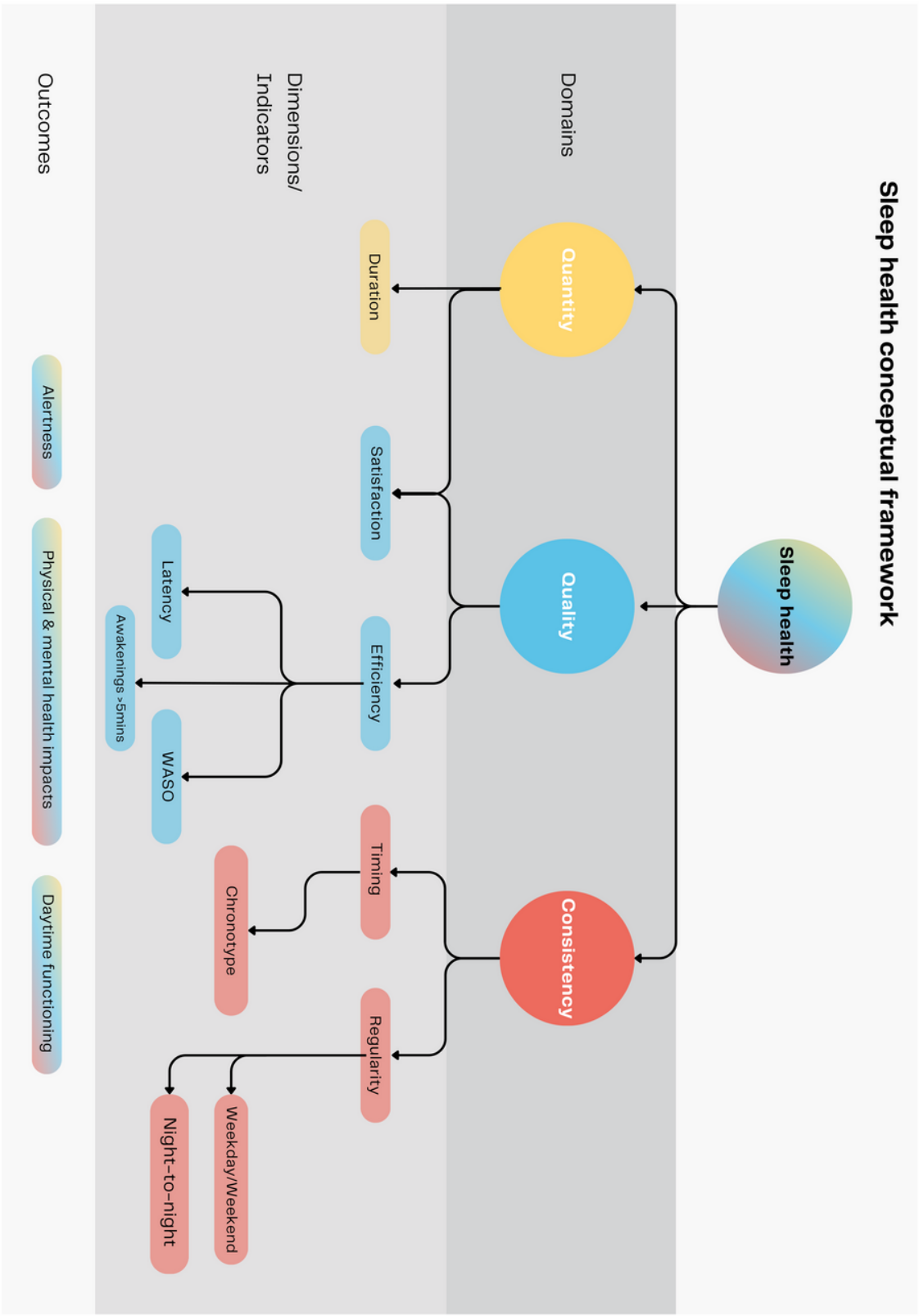


Figure 5: Sleep health conceptual framework

Domains of sleep health

Quantity

Sleep quantity is predominantly defined by one sleep health dimension/indicator – sleep duration – but can also be partially indicated by subjective sleep satisfaction.

- **Sleep duration:** the amount of time, in hours, that a person sleeps in a 24-hour period.
- **Sleep satisfaction:** a self-reported subjective assessment of an individual's sleep.

The recommended sleep duration changes across the lifespan (38).

Quality

The conceptual framework identifies several dimensions and indicators of sleep quality, which provide a suite of sleep quality measures (39):

- **Sleep satisfaction:** a subjective assessment of an individual's sleep.
- **Sleep efficiency:** percentage of time in bed spent asleep.
- **Awakenings > 5mins:** # of awakenings > 5 mins per overnight sleep episode.
- **Sleep latency:** time (mins) to first transition from wake to sleep.
- **Wake after sleep onset:** cumulative time awake after sleep initiation (39).

Consistency

Sleep consistency comprises two major dimensions:

- **Sleep timing:** time within the 24-hour cycle that sleep occurs (i.e. an individual's usual bedtime and wake-up time).
- **Sleep regularity:** night-to-night and weeknight-to-weekend consistency of sleep timing and sleep duration.

Healthy sleep timing is underpinned by circadian consistency (i.e. being asleep at the time that aligns with the body's circadian cycle) (24,40).

Figure 6: Domains of sleep health

Outcomes of sleep

Sleep outcomes are identified by how an individual feels and performs during their wake time as a result of their sleep. The indicators for these outcomes (see *Figure 7*) are measures that are influenced by any or all of the three sleep domains.

Alertness during the day

The presence of or lack of daytime sleepiness (i.e. ability to stay awake during the day). There is a natural dip in the circadian system in the afternoon that can reduce alertness, but excessive daytime sleepiness is often a sign of an underlying sleep disorder (41).

Daytime functioning

The ability to perform daily tasks productively and effectively. Various consequences of poor sleep health can inhibit or impair daytime functioning, including sleepiness, fatigue, irritability, lack of motivation and/or concentration difficulties (42).

Physical & mental health impacts

Sleep health is associated with a range of physical and mental health outcomes and conditions including Type 2 diabetes, stroke, obesity, heart disease, anxiety, depression, suicidality and all-cause mortality (7,43,44). Sleep health is also a significant contributor to mood and physical performance (42).

Figure 7: Outcomes of sleep

The Sleep Health Spectrum

This policy brief and the accompanying Policy Evidence Review (2) propose that sleep health should be considered as a spectrum, from healthy sleep through to poor sleep and clinical sleep disorders. The Sleep Health Spectrum (see *Figure 8* on the next page) suggests that individual's sleep experience can vary over time without being predictive of subsequent sleep experience. That is, someone with healthy sleep can develop sleep disorders and vice versa. An individual may also experience transient sleep disturbances, which resolve with no intervention, or which may develop into a pattern of episodic or persistent sleep disturbances.

Traditionally, sleep medicine and health policy related to sleep has focused almost exclusively on the treatment and management of clinical sleep disorders, with little attention given to the rest of the spectrum (37). This has contributed to a significant cohort of the population, who experience poor sleep but may not meet the diagnostic threshold for a sleep disorder, not having their sleep problems adequately addressed (3). The spectrum illustrates the need for population-wide preventive health activities to improve sleep health education and awareness and highlights opportunities to identify and address sleep disturbances before they potentially progress into sleep disorders.

Sleep Health Spectrum

Healthy sleep	Transient sleep disturbances	Persistent and/or episodic sleep disturbances	Sleep disorders
Age and life stage appropriate healthy sleep most of the time	Short term sleep deficit or excessive sleep Acute/transient insomnia Temporary circadian disruption (social jetlag, transmeridian jetlag, temporary irregular work hours)	Prolonged sleep deficiency Persistent/episodic hypersomnia symptoms Persistent/episodic insomnia Circadian misalignment (severe social jetlag, shift work)	Obstructive Sleep Apnoea (OSA) Chronic Insomnia Disorder Restless Legs Syndrome (RLS) Circadian rhythm disorders e.g. Shift Work Disorder, Delayed Sleep-Wake Phase Disorder Rare sleep disorders: e.g. Narcolepsy, Idopathic hypersomnia
public policy strategies			
Sleep health education **Policies that promote sleep health**	**Sleep health education** **Preventive activities for sleep health** **Policies that promote sleep health** **Organisational policies**	**Sleep health education** **Preventive activities for sleep health** **Primary care and treatment pathways** **Organisational policies**	**Sleep health education** **Primary care pathways** **Specialist pathways** **Treatment pathways** **Organisational policies**

Figure 8: Sleep Health Spectrum

Healthy sleep

Sleep that is considered healthy should align with the three high-level domains identified in the sleep health conceptual framework i.e. it should be high-quality sleep that is sufficient in duration (quantity) and follows a consistent schedule that aligns with an individual's natural circadian cycle (consistency). Healthy sleep should also facilitate attentive wakefulness and daytime functioning and meet an individual's subjective assessment of 'good sleep' (37).

Transient sleep disturbances

Almost everyone experiences episodes of suboptimal sleep throughout their life, generally characterised by trouble falling or staying asleep and/or temporary insufficient sleep duration. In most cases, transient sleep disturbances do not persist over time or lead to ongoing sleep problems or clinical sleep disorders (45). They are usually attributable to an external trigger (e.g. acute pain, psychological stress, transmeridian travel, substance use, bereavement or temporary changes to the sleep environment) and sleep normally returns to normal after the trigger has subsided. Transient sleep disturbances can include acute/short-term insomnia (ranging from a few nights to a few weeks), temporary circadian rhythm disruptions (e.g. jetlag caused by transmeridian travel) or voluntary sleep restriction (e.g. curtailing sleep because of work, childcare or social commitments).

Although transient sleep disturbances are temporary, generally attributable to an external trigger and rarely require treatment in their own right, they can still negatively affect health and well-being. Even a short-term sleep deficit can result in reduced alertness and impaired daytime functioning, increasing the risk of accidents and negatively affecting an individual's work or education (46).

Persistent and/or episodic sleep disturbances

People can experience patterns of poor sleep or recurring episodes of sleep disturbances that persist into the medium to long term but may not necessarily meet the clinical threshold for diagnosis of a recognised sleep disorder. Persistent or relapsing-remitting sleep disturbances and ongoing patterns of poor sleep are less likely to resolve themselves over time than transient sleep disturbances and in some cases can progress into clinical sleep disorders. Persistent sleep disturbances (which may not meet the diagnostic criteria for a clinical disorder) can include episodic insomnia, recurring circadian rhythm disruptions and/or the ongoing presence of one or more sleep disorder symptoms.

Circadian rhythm disruptions can be either transient (e.g. jetlag) or persistent (e.g. shift work) and have many underlying causes (47). Jetlag tends to be transient as circadian rhythms adapt to the new time zone over the course of a few days. In contrast, shift work, particularly rotating shift work, may perpetuate ongoing circadian disruption. Those with evening chronotype who delay bedtime or those experiencing 'social jetlag', a phenomenon caused by significantly differing bed/wake times between work days and non-work days, can also experience regular circadian disruptions (47).

Sleep disorders

Sleep disorders require clinical diagnosis and can have significant implications for a person's health and wellbeing. A broad range of online resources have emerged to provide information regarding common disorders, such as the Sleep Health Foundation factsheets (48).

The two most common sleep disorders in Australia are insomnia and obstructive sleep apnoea (OSA) (1). However, they are only two of over 100 diagnosable clinical sleep disorders, which can be grouped into the following six categories:

- Insomnias (e.g. chronic insomnia disorder);
- Sleep-related breathing disorders (e.g. OSA);
- Sleep-related movement disorders (e.g. RLS);
- Circadian rhythm disorders (e.g. shift work sleep disorder);
- Central disorders of hypersomnolence (e.g. narcolepsy, idiopathic hypersomnia); and
- Parasomnias (e.g. night terrors, REM sleep behaviour disorder) (49,50).

RISK FACTORS AND CONSEQUENCES OF POOR SLEEP

Numerous risk factors can contribute to poor sleep health and poor sleep health is itself a risk factor for various adverse health outcomes (3,51–54). Many of these risk factors are behavioural factors that are modifiable and are also well-known, significant risk factors for chronic disease.

Figure 9 is a schematic representation of the wide array of risk factors for poor sleep and the outcomes that can arise as a consequence of poor sleep.

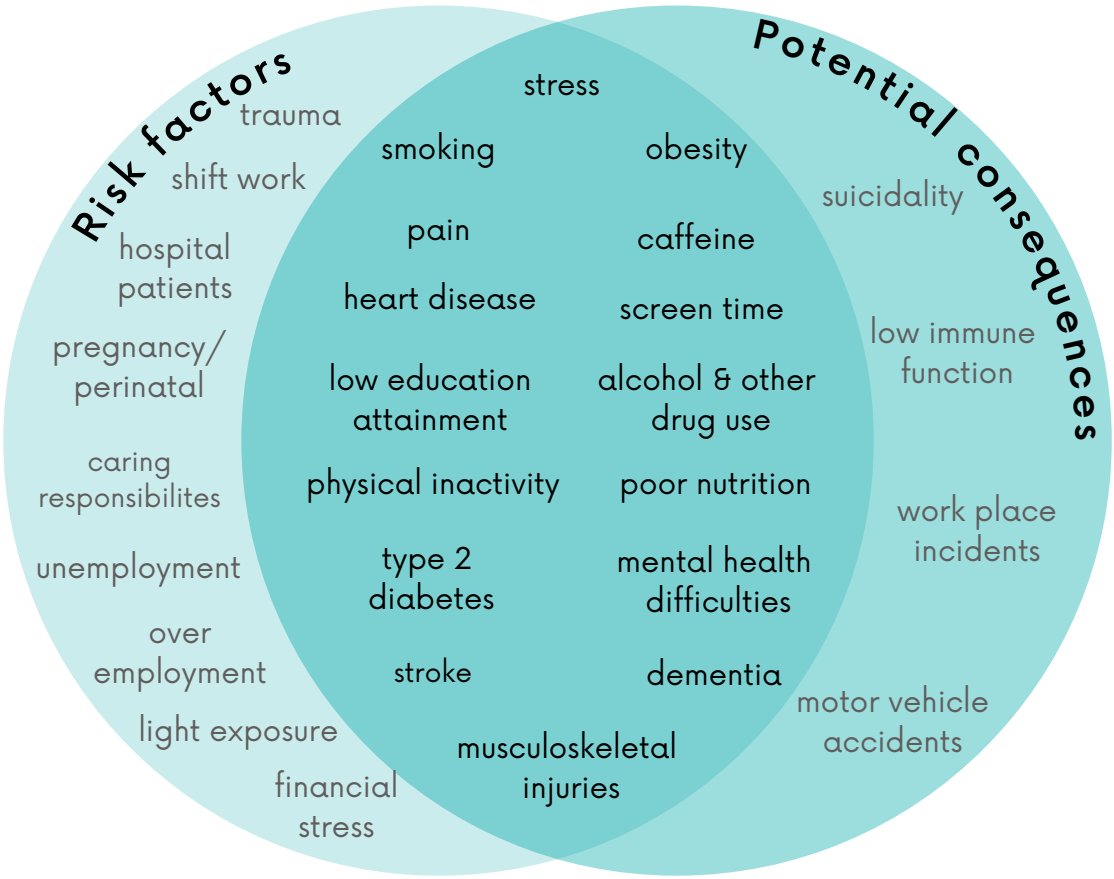


Figure 9: Risk factors for and potential consequences of poor sleep

Health behaviours and sleep hygiene

Sleep hygiene is the term used to describe behaviours and environmental or lifestyle factors that influence sleep health in individuals (56).

Screen time: viewing bright screens in the evening significantly impacts the time taken to feel sleepy and fall asleep. Exposure to shorter wavelengths of light can increase alert-ness, delay circadian rhythms and suppress release of melatonin, which is important for maintaining and regulating the individual sleep-wake cycle (61,40).

Alcohol consumption in the hours before bed is associated with sleep disturbances, more frequent awakenings and decreased restorative sleep (63). Alcohol is associated with OSA, circadian rhythm disruptions and short sleep duration (64,65). There is a long established link between insomnia and increased risk of relapse in alcohol dependence (66,67).

Smoking has a bi-directional relationship with sleep quality. Smoking impacts sleep quality and poor sleep influences nicotine dependence (72,73).

Physical inactivity and sedentary behaviour are both associated with poor sleep and the relationship is bi-directional (75). Physical inactivity is also associated with moderate-to-severe OSA (76). A recent study showed that all cause mortality risks associated with short and long sleep could be decreased by high volumes of physical activity or moderate to vigorous physical activity (78).

Caffeine consumption is associated with prolonged sleep latency, reduced sleep time, reduced sleep efficiency and lower reported sleep quality (69). Caffeine close to bedtime can impact circadian rhythm and melatonin secretion. There is significant individual variability in response to caffeine (71).

Light exposure: Exposure to light affects sleep. Having plenty of natural light exposure during the day and dim light conditions at night support good sleep health (40,47).

Diet and sleep also display a bi-directional relationship. Poor sleep affects appetite-regulating hormones and the ratio of carbohydrate and fats oxidation. Sleep is influenced by carbohydrates, fatty acids, amino acids and vitamins in various ways. Highly processed foods and foods high in free-sugars are associated with poorer sleep and patterns of irregular eating have also been linked with indicators of poor sleep (80,81,82,83,84).

Circadian rhythms and the 'body clock': health and wellbeing are dependent on circadian rhythms and these are in turn influenced by light and dark signals. Sleepiness is at it's highest at night and wakefulness is highest during the day. Sleep timing that is out of alignment with the circadian rhythms puts sleep health at risk. This is a particular risk for shift workers and others who work irregular hours (85).

Health behaviours or 'lifestyle factors' tend to cluster together for a range of environmental and psychosocial reasons (86,87). Behavioural clustering means that one 'risky' behaviour is likely to occur with other 'risky' behaviours. People identified as poor sleepers have also been shown to have a poor health profile, indicating a cluster of health risks occurring at once (88). Importantly, both health behaviours and sleep health are underpinned by complex social factors, known as social determinants.

Much of the current evidence tends to examine individual health behavioural risk factors in isolation (e.g. nutrition, physical activity) on sleep, when the impact of multiple risk factors such as socioeconomic status, may be synergistic or some offset each other's impact. Current evidence may not capture the extent of the complex interactions between sleep hygiene, other health behaviours, sleep health status and various health outcomes.

Common health conditions and outcomes associated with poor sleep

Chronic disease and chronic pain: Poor sleep is associated with physiological changes, such as altered hypothalamic-pituitary-adrenal (HPA) functioning, metabolism and stress reactivity, which are risk factors for chronic disease (91). While association between sleep duration and chronic disease differs with age and sex, population studies in adults have shown that short sleep duration (<6 hours) is associated with increased risk of diabetes, cardiovascular disease, coronary heart disease, obesity and hypertension. Long sleep duration (>9 hours) is associated with diabetes, cardiovascular disease, coronary heart disease, obesity and stroke (92,93).

Chronic physical pain and sleep disturbances have a bi-directional relationship. Persistent or chronic pain increases symptoms of insomnia and reduces daytime functioning and short sleep can exacerbate pain intensity (90,94,95).

Mental health conditions and poor sleep are known to have a bi-directional relationship. Mental health conditions can disrupt sleep and lack of sleep can affect mental health (53,102,103). Both depression and anxiety are associated with short sleep and poor sleep has been shown to precede the onset of depression and anxiety. Furthermore, up to 90% of people experiencing depression also report comorbid sleep disturbances, including 75% who report trouble with falling or staying asleep and 10-40% who report hypersomnia symptoms (106,108,109,110).

Historically, sleep disturbance has been viewed as a 'secondary symptom' when occurring in the presence of mental health disorders, however this view is not supported by scientific evidence. In fact, insomnia symptoms are among the most consistent risk factors for the development of depression (111).

Evidence indicates that addressing sleep can improve mental health and sleep intervention strategies can have a mutual benefit for sleep and mental health outcomes (114,115,116,117).

Overweight and obesity: The relationship between sleep and obesity is bi-directional, with poor sleep leading to increased appetite and increased risk of adiposity and obesity. Weight gain may also be an independent risk factor for poor sleep and obesity is one of the biggest risk factors for development of OSA (96,97,98,101).

Suicidal ideation and behaviour risk: Short or disrupted sleep has been identified as a risk factor and warning sign for suicide behaviours (30,31,32). A range of sleep disturbances and sleep disorders have been shown to be related to suicide behaviours, including insomnia, hypersomnia, parasomnias, nightmares and non-specific disturbances. Sleep disturbance is linked with more active suicidal ideation the following day as well as increased risk of suicide over a medium to long term follow up period (118,119).

'Mind After Midnight' is proposed by Tubbs et al. (121) to summarise the complex changes in biological signalling and thus, behaviour, that result from sleep disturbance. This suggests that psychological and biological factors, including chronotype, intersect with nocturnal wakefulness to create conditions of poor mood and impaired judgement, which may be linked to increased immediate risk of suicide (121,122). It is evident that sleep is a critical prevention and intervention target in suicide prevention.

Injury and accident risk: Insufficient sleep duration, sleep disorders and driving at night when the circadian and homeostatic propensity for sleep is high, are all associated with both workplace injuries and motor vehicle accidents (MVAs) (123). People living with OSA were estimated to be 1.5x more likely to experience a workplace injury or accident and 2.4x more likely to be in a MVA. People living with insomnia are estimated to be 2.5x more likely to experience a workplace injury or accident (7).

Social and environmental factors that affect sleep health

Educational attainment and employment status are associated with sleep health status. Compared to tertiary education attainment, a lower education level i.e. secondary school completion is associated with poor sleep. Unemployment, working longer hours (>30hrs per week) and shift work are all associated with poor sleep and type of employment influences sleep quality (99,124). The effects of unemployment and education appear to be primarily driven by psychological distress (90,125).

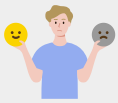
Health literacy, defined as "how people access, understand and use health information in ways that benefit their health", is influenced by many factors including education, disability, age, gender, digital literacy, culture, language and wider determinants of health (8,126). People who have OSA often have lower health literacy (127). Poor sleep in children is associated with lower parental health literacy (128).

Environmental factors can significantly impact sleep health in individuals. Sleep quality, quantity and consistency can all be affected by artificial lighting, elevated bedroom temperature, poor ventilation, overcrowding, lack of access to a safe sleeping environment/homelessness, and industrial and urban noise (129,130,131).

Modern living is shaped by an 'insomnogenic environment' that affects many of us. Sleep is modified by the social, physical and built environments in which we live. For example, aspects of modern life and a '24/7 society' including long work hours, the extension of business hours, technology use and patterns of evening socialisation are all environmental factors enabling behaviours that can contribute to individual adverse sleep outcomes (9,132,133,134).

Additionally, social and physical features of society such as socioeconomic circumstances, family and social cohesion, safety, noise, light and walkability can also influence sleep health (135). These environmental factors contribute to cumulative chronic stress which has a negative impact on sleep (136).

Psychological factors: Bedtime procrastination has been recognised as a psychological response to a range of causes. This includes daytime stresses and habitual behaviours such as late-night screen viewing and online activities, despite their subsequent impact of inadequate or poor sleep and fatigue the following day (137,138). Poor sleep patterns for individuals are also associated with delayed bedtime, with stress associated with difficulties going to sleep leading to deferring attempting to do so (139,140). The term "Revenge Bedtime Procrastination" has developed in the past decade to describe an individual's choice to stay up late in order to have some control over daily life (141). This behaviour can be associated with work stresses, long hours of work or other daily stresses that lead to an individual choosing to sleep less in order to have time for themselves.



Social and health equity issues are evident in 'sleep disparity' across social strata – at-risk individuals and those experiencing social disadvantage have less quality sleep and experience sleep patterns that are linked with poorer health outcomes (9,142). Disparities in sleep health among minority groups are a reflection of a range of social and environmental factors, such as proximity to green space, neighbourhood noise and level of socioeconomic disadvantage (135). Higher levels of stress due to daily challenges experienced by disadvantaged groups (e.g. financial insecurity, racism, poor mental health) also contribute to poorer sleep (142,143). As sleep is a risk factor for chronic diseases, sleep disparities across the social gradient can also widen health inequities (144,145,146,147).

Caring responsibilities, typically undertaken by women, also affect sleep. Interrupted sleep from attending to night-time needs, light sleep from anticipating night-time needs, sleeping difficulties due to stress and/or anxiety at night and ongoing, disruptive night-time behaviours can all contribute to poor sleep of caregivers (148,150).

Population groups and individuals at risk of poor sleep

Workforce

Fatigue is a well established industrial and workplace safety concern, particularly in industries with long hours or atypical work hours.

Fatigue can result from:

- exertion;
- sleep loss;
- altered sleep patterns; and
- extended time awake (150).

Shift work

The modern 24-hour global economy has meant that more people are working atypical work hours (151).

Shift work can lead to serious health issues such as:

- obesity;
- diabetes;
- cardiovascular disease;
- cancer;
- stomach/digestive disorders;
- fertility issues; and
- depression.

And to a higher risk of:

- family and social problems;
- workplace; and
- motor vehicle accidents.

Children and young people

Good sleep is important for children's health, development and well-being including (10,152,153):

- memory – both declarative and non-declarative;
- cognition and school performance; and
- mental and physical health.

12% of children 6-11yo and 25% of 12-13yo do not meet minimum sleep guidelines on school nights. Many students under-sleep on school nights and over-sleep on non-school nights (social jetlag) (152).

Such catch up sleep when needed is better than chronic sleep deprivation, however consistent sleep and wake times are optimal where achievable.

Adolescent 'phase delay' (late sleep onset and wake times) paired with academic and social pressure and early school start times means many students are not getting adequate time for sleep (154).

First Nations Australians

First Nations Australians are more likely to report worse sleep than non-indigenous Australians including:

- higher reports of 'unhealthy sleep'; and
- higher proportions of 'severe' OSA (146).

First Nations Australians are also more likely to experience access and availability barriers to services than non-indigenous Australians (146).

Sleep problems in First Nations Australians have causal associations with (146) daytime performance, sleepiness levels academic performance, attention, learning, emotional regulation, behaviour and mood

Poor sleep increases the likelihood of obesity, diabetes, high blood pressure, somatic health issues, cardiovascular disease and general psychological health issues.

Pregnancy

Pregnancy can be associated with inadequate sleep, disrupted sleep including frequent night-time awakenings, daytime sleepiness and symptoms of sleep disorders (158).

Short sleep and later sleep midpoint are associated with a risk of gestational diabetes and subjective declining sleep quality during pregnancy is a risk factor for perinatal depression (159,160).

Menopause

Menopause is associated with poorer sleep than would be expected with ageing alone (155).

40-60% of women report sleep disturbances during the menopausal transition (155).

Menopause is associated with significant hormonal changes, which can have direct and indirect impacts on sleep (156).

Menopause has also been linked to an increase in sleep disorders including insomnia, RLS and OSA (157).

Older people

Sleep requirements change with age where older people require less sleep than younger people. However disrupted sleep is common in older adults (>65years).

They typically experience:

- less slow wave sleep;
- less rapid eye movement (REM) sleep;
- reduced sleep efficiency; and
- elongated sleep latency.

Sleep disturbances in older people is associated with increased risk of falls and several chronic diseases (161).

POLICY RECOMMENDATIONS FOR IMPROVING SLEEP HEALTH

The recommended policy options presented in this brief are based on analysis of the evidence in academic and other literature and developed in collaboration with a working group of Australia's leading sleep health experts.

Sleep health interventions have been and still are largely focussed on behaviours and risk factors related to individuals. It is clear from available evidence and increasing health care demand that policy attention must now be given to population health and primary care approaches that can effectively address the increasing prevalence of poor sleep, sleep disorders and associated negative health outcomes.

A population health approach to improving sleep health would be consistent with contemporary emphasis on the prevention of chronic health conditions and be in alignment with current policy efforts and investments promoting engagement in physical activity and improved nutrition.

Accordingly, a population health approach to the prevention of poor sleep is proposed, with specific approaches for at-risk population groups and the promotion of sleep health as a preventive health measure through tailored public health information and awareness-raising strategies.

Primary health care, particularly general practice, is an important provider of preventive health care and early intervention in preventable chronic disease (163). Supporting general practice to provide sleep health support and early intervention and treatment for poor sleep and common sleep disorders is recommended.

Table 1: Policy Recommendations

A comprehensive national sleep health policy framework	Establishment of a 10-year National Sleep Health Strategy in Australia is recommended to improve population sleep health, better address the increasing prevalence of poor sleep and associated negative health outcomes, and provide leadership and policy commitment necessary to improve population sleep health progressively over the coming decade.
Public health guidelines for sleep	Australian National Sleep Guidelines for children and young people, adults (18 to 64) and older adults should be commissioned and implemented.
Public awareness of sleep health	Investment in a national public awareness campaign to improve health knowledge of the importance of sleep to health and wellbeing is recommended as a well-recognised, effective means to increase public awareness of a significant population health issue.
Population sleep health data and monitoring	Monitoring the sleep health of the population, and the patterns and extent of poor sleep and sleep disorders to support health services to meet health needs and to aid the design of health policy initiatives and practice improvements.
Primary care and sleep health	Policy and funding recognition of the importance and complexity of identifying and managing sleep health risks and needs in primary care to adequately meet the evident population burden and prevalence of poor sleep and sleep disorders.
Sleep health in other public policy	Health policy actions to improve sleep health should emphasise the relevance and impact on population sleep health of other public policies, particularly of industry and workforce-specific policies; road safety policies; education policies and town and community planning policies.

A comprehensive national sleep health policy framework

As with other significant health issues affecting the health and wellbeing and social and economic participation of individuals, poor sleep health imposes a substantial demand and burden on health services and health expenditure. The evidence and expert consensus drawn together for this policy brief and accompanying Policy Evidence Review identified a range of recommendations (detailed below) that, if implemented individually, would improve population sleep health through increased awareness and education or improved access to treatment and management of poor sleep and sleep disorders. However, given sleep health is a significant and growing national population health concern, a comprehensive and sustained national sleep strategy is warranted.

A 10-year national strategy would provide a coherent implementation framework for service enhancements and investments to improve population sleep health and contribute directly to national health and wellbeing objectives (8,164). It would align with the Australian Government's commitment to enhancing the capacity of primary care to support people to be healthy and well and improving access to ensure people receive the health care they need when they need it.

A national strategy would set overarching objectives for improved population sleep health and better access to sleep health care. It would consider the wider public policy environment influencing population sleep health and inform targeted and coordinated action at the national and jurisdictional levels to address the increasing incidence and health, social and economic consequences of poor sleep in specific high-risk groups and the wider population. The strategy should also inform and support other public policy areas relevant to sleep health, including road safety, workplace and employment policies, education and town planning.

The strategy would address service capacity, health professional and workforce development and the importance of improving population sleep health to deliver on broader national health and wellbeing objectives (2). It would also improve public and health professional awareness of and engagement in sleep health and support the provision of targeted sleep health services.

A national strategy would also encourage and enable key policy and service sector stakeholders to contribute to improved population sleep health in Australia. This would include federal and state/territory government agencies and other service providers across the health, education and industrial relations sectors, as well as local government and other community level stakeholders.

The establishment of a national sleep health strategy would address a neglected and increasingly significant health issue, align with other national health priorities and complement other national strategies developed for comparable health issues, including the:

- National Suicide Prevention Strategy 2020
- Closing the Gap National Agreement
- National Injury Prevention Strategy 2020-2030
- National Women's Health Strategy 2020-2030
- National Men's Health Strategy 2020-2030
- National Preventive Health Strategy 2021-2030
- National Obesity Strategy 2022-2032

Recommendation: Establish a 10-year National Sleep Health Strategy

Establishment of a 10-year National Sleep Health Strategy in Australia is recommended to better address the increasing prevalence of poor sleep and associated negative health outcomes, and provide leadership and policy commitment necessary to improve population sleep health progressively over the coming decade.

Proposed aims and objectives for the 10-year National Sleep Health Strategy are to:

i. Provide a national policy framework for specific attention to sleep health in health policy, health services and funding and other relevant public policies.

ii. Promote and support effective population health strategies and sleep health treatment and care nationally, in states and territories and local communities.

iii. Develop widespread recognition and understanding of sleep health across the life cycle and specifically the importance of appropriate sleep quantity, quality and consistency to health and wellbeing. This should be recognised in health and other public policies and include both awareness raising initiatives for the general population and targeted initiatives aimed at health services, health professionals and population groups at high-risk of experiencing poor sleep health.

iv. Enhance primary care capacity to identify poor sleep, provide evidence-based information, support and early intervention for sleep health and to refer people with sleep disorders to accessible and appropriate specialist treatment.

v. Provide at-risk population groups (e.g. children and young people, shift workers, women during pregnancy and menopause, First Nations Australians and older adults) and disadvantaged communities with co-designed, tailored sleep health information and resources, and appropriate early intervention, referral and treatment services.

vi. Inform and support the development of policies, which directly or indirectly affect sleep health, at all levels of government and within specific industries. Policies should be guided by the best available evidence and aim to promote sleep health in their populations and areas of responsibility.

vii. Establish routine and comprehensive population sleep health data collections and monitoring mechanisms to inform and evaluate the Strategy, develop target population health initiatives for high-risk population groups and support policy development and service design related to sleep health.

viii. Support research into the interrelationships between sleep health, physical activity, nutrition and overall health and wellbeing to inform the provision of health care and preventive health policy activities.

Public health guidelines for sleep

Sleep health guidelines are recommendations that aim to help people improve their sleep quality, duration and consistency. Several guidelines have been produced by several health organisations and authorities. The guidance and advice generally provide similar recommendations, particularly for behavioural changes to improve sleep habits, for action to reduce modifiable risk factors adversely impacting sleep and advice to create good pro-sleep habits during the daytime. The target population for these recommendations are individuals.

The National Health and Medical Research Council (NHMRC) supports the development of guidelines for clinical practice and public health among others. Public health guidelines are evidence-based and developed with the engagement of relevant stakeholders and are "intended to promote health, prevent harm and encourage best practice" (165).

At present, sleep is recognised in the 24-Hour Movement Guidelines for children and young people aged 0-17 years. This includes recommendations on time in hours spent asleep as well as time spent in physical activity and sedentary behaviour, recognising the co-dependent and time-based nature of physical activity, sedentary behaviour and sleep.

The guidelines separately note that children should have:

- a consistent bedtime and wake-up time;
- avoid screen time for 1 hour before sleep; and
- not have screens in bedrooms to establish and maintain healthy sleep patterns (166,167).

The 2022-23 federal government budget (168) included provision for the development of 24-hour movement guidelines for adults and older Australians, integrating physical activity, sedentary behaviour and sleep. These are currently in development.

Whilst movement guidelines for adults as well as children would go some way to address the lack of attention to sleep in public health policy, the evidence summarised in this evidence brief and the accompanying Policy Evidence Review (2) makes it clear that sleep should be recognised as the third pillar of good health, alongside physical activity and diet. Sleep health, diet and physical activity are closely interrelated and influence each other in various complex ways. Further research is required to better understand these interrelationships sleep, diet and exercise are central to overall health and wellbeing (44).

Recommendation: Establish National Sleep Guidelines

National Sleep Guidelines are proposed to provide guidance to the general public, health care providers, health professionals and policymakers on the recommended quantity, quality and consistency of sleep for optimal health. Standalone guidelines would also highlight the importance of sleep health as a third pillar of good health, alongside diet and physical activity, and ensure it is given equal attention in health care provision and policy development.

i. Australian National Sleep Guidelines for children and young people, for adults (18 to 64) and older adults should be commissioned and implemented in alignment with national health and wellbeing policy aims and objectives.

ii. National Guidelines on Sleep, Physical Activity and Nutrition should be separate and complementary and make explicit the interrelationship of each of these lifestyle factors in health and wellbeing.

Public awareness of sleep health

Investment in a national public awareness campaign to improve health knowledge of the importance of sleep to health and wellbeing is an obvious strategy and a well-recognised, effective means to increase public awareness of a significant population health issue. A national and sustained public awareness campaign about sleep health would contribute to national health and wellbeing policy objectives (8).

Australia has a strong and long record of public health awareness campaigns that have successfully informed and influenced the awareness and consequent behaviours of a majority of Australians in response to evidence of significant health risks (such as campaigns to reduce sun exposure and related cancers and to reduce tobacco consumption). Public awareness strategies have demonstrated their effectiveness in reducing preventable disease and death. Tailored and co-designed campaigns to raise awareness and engagement in priority population groups, particularly First Nations Australians, the LGBTQI+ community, rural and regional communities and socioeconomically disadvantaged communities have been shown to be effective (169).

A national campaign to improve public awareness of the importance of healthy sleep to health and wellbeing was recommended by the 2019 Parliamentary Inquiry into Sleep Health Awareness in Australia (1). The Inquiry proposed that a campaign be undertaken to promote sleep health as foundational to positive health and wellbeing and to provide information and education about sleep hygiene and healthy sleep practices, the risks and potential consequences of poor sleep and common sleep disorders and treatments.

The Australasian Sleep Association (ASA) and the Sleep Health Foundation (SHF) provided a detailed pre-Budget submission to the 2020-21 Australian Government Budget process proposing a national sleep health awareness and behaviour change campaign (170). This proposed a five-year staged national campaign included several public awareness priorities including the need to:

- Promote awareness of normal sleep requirements, including the variable needs between individuals across age groups and the consequences of inadequate sleep on wellbeing, mood, relationships, productivity and safety;
- enhance knowledge of the causes of inadequate sleep, including issues related to inadequate duration of sleep, inappropriate timing of sleep and quality of sleep;
- improve understanding of the nature of circadian misalignment and common sleep disorders such as obstructive sleep apnoea and insomnia, with emphasis on their mental health, cognitive and cardio-metabolic consequences;
- develop healthy sleep habits amongst Australian children and adolescents to optimise their emotional wellbeing, with a particular focus on mental health impacts and risk of suicide;
- support healthy sleep in older Australians, including the identification of sleep disorders, to improve physical and mental health and reduce rates of cognitive decline; and
- refine strategies to meet the challenges of shift work and associated mental, metabolic, physical and performance consequences (170).

Recommendation: Implement a national sleep health awareness campaign

A comprehensive and multi-focal national sleep health public awareness campaign should be undertaken in alignment with and within the life of the National Preventive Health Strategy.

A national public awareness campaign would improve understanding of the importance of sleep to health and wellbeing across the population. It is recommended as a well-recognised, effective means to increase public awareness of a significant population health issue.

Population sleep health data and monitoring

There is a lack of robust, comprehensive population-level data about the sleep health of Australians. Sleep data that is available is from a patchwork of self-reported longitudinal surveys, academic research and cross-sectional cohort studies and outdated Australian Health Survey data. There are several notable limitations associated with sleep data in Australia (171), including:

- Reliance on self-reported data. The majority of Australian sleep health data are based on self-report survey responses. Reliance on solely self-report data can be problematic as people often misjudge the adequacy of their sleep and find it difficult to accurately estimate sleep quantity, quality and consistency. Population level self-report data should be augmented by regular collections of biometric data using actigraphy (i.e. the use of wrist worn devices to measure aspects of sleep health) or other objective assessment methods (3,171,172).
- Different sleep health measures used in different studies. A wide variety of tools, indicators and metrics are available to measure sleep health. These differences potentially contribute to discrepancies in prevalence estimates between data sources, as illustrated by self-reported insomnia prevalence data estimates which range from 5.4% (90), to 33% (173).
- Prevalence estimates are largely extrapolated from research studies with non-nationally representative samples and focus on sleep disorders, with little attention paid to sub-clinical sleep disturbances (171, 175).
- Lack of Australian data on the relationship between sleep health issues and chronic conditions. The data that does exist are dated and limited in scope (171,174).

Improved monitoring and surveillance of sleep health in Australia would provide reliable information for public health decision-making and planning and should include data and statistics on:

- sleep health issues and associated health outcomes across the sleep health spectrum;
- modifiable sleep behaviours;
- reliable sleep disorder prevalence data;
- risk factors and social and economic determinants for poor sleep;
- access to health care and support for individuals with poor sleep; and
- estimated economic and social costs associated with poor sleep health (174).

A combination of regularly collected population-level self-reported data and representative sample biometric data related to sleep would provide reliable information on sleep health and the impacts of poor sleep in Australia.

Recommendation: Monitor population sleep health

Routine sleep health data collection and comprehensive monitoring mechanisms are essential to better understand population sleep health, over time, in Australia. Better sleep health data would also support healthcare providers in meeting service demand and inform the design of health policy and practice initiatives aimed at improving sleep health.

i. National Health Surveys and other large surveys related to physical and mental health should include questions on sleep health that are capable of:
   - monitoring population sleep health;
   - indicating the impact of sleep on other aspects of physical and mental health; and
   - informing health policy, service provision and interventions.

ii. National Health Measures Surveys should include the regular collection of biometric sleep data using actigraphy or other objective assessment methods to assess sleep health.

iii. National Primary Health Care Data Collections should be expanded to include collection of primary care sleep health incidence and treatment data.

iv. A coordinated data strategy and National Sleep Health Monitoring Centre should be established to monitor and report on the prevalence and impact of poor sleep and sleep disorders. This should include utilsing and anlysing existing data sets relevant to sleep health.

Primary care and sleep health

Primary health care, as the entry-level to health care, encompasses a broad range of health services, from health promotion and prevention to treatment and management of acute and chronic conditions (176). Primary care includes general practice, community health centres, maternal and child health services, community pharmacy, community mental health services, oral health and allied health services, Aboriginal community-controlled health services and drug and alcohol treatment services (177).

Prevention is an important activity in primary health care, especially general practice because the partnership between general practitioners (GPs) and their patients can help people improve their health and reduce preventable chronic health conditions. Preventive primary health care is also crucial in addressing the health disparities experienced by vulnerable population groups. Preventive health care includes "the prevention of illness, the early detection of specific disease, and the promotion and maintenance of health" (163).

Preventive health care

Regular health checks of modifiable chronic disease risk factors in adults are recommended to prevent disease and achieve better health (e.g. diet, weight, physical activity, alcohol use, smoking) (178). These checks are to identify current or emerging medical problems, assess the risk of future medical issues and prompt individuals to maintain a healthy lifestyle. Current advice regarding health checks does not include sleep as a risk factor for poor health and preventable disease (178). A Medicare rebate is provided for a GP health assessment for people aged 45-49 years who are at risk of developing chronic disease including through lifestyle risk factors such as smoking, physical inactivity, poor nutrition or alcohol use (179). Given the evidence of the contribution of sleep health to preventable chronic disease, poor sleep should be included as a risk factor in these health assessments.

The Royal Australian College of General Practitioners (RACGP) promotes and supports evidence-based preventive health care in general practice. It is recognised as effective in preventing disease not only amongst individuals but within whole local communities, reducing healthcare costs and improving the health and productivity of the population (180).

Evidence-based prevention through risk factor management is supported by the RACGP Smoking, Nutrition, Alcohol, Physical Activity (SNAP) guide, a resource to 'assist GPs and practice staff (the GP practice team) to work with patients on (these) lifestyle risk factors' (181). The SNAP guide provides a 5-step model of health care, the 5As, for GPs to: ask, assess, advise, assist and arrange; for detecting, assessing and managing risk factors (181). The SNAP guide does not currently include sleep.

The Healthy Habits website and mobile application is an initiative by the RACGP in partnership with the Australian Government Department of Health and Aged Care. It is an evidence-based behaviour change intervention that uses the same 5As model as the SNAP guide above. This contains 'information, programs, guidelines and training opportunities on physical activity, nutrition and other factors that impact these behaviours such as sleep, mental wellbeing, alcohol consumption, and chronic conditions' (182). The program has received additional funding and is presently being expanded to include information on sleep and its relationship to physical activity and nutrition.

Identification and treatment of poor sleep and sleep disorders

Available evidence indicates that the prescription of sedative-hypnotics for people complaining of sleep disturbances is high, with 90% of those reporting sleep disturbances in recent years being given a prescription for a 'sleeping pill' (183). This may indicate that there are barriers to the provision of or access to other forms of evidence-based prevention and early intervention measures.

The capacity of general practice and general practitioners to identify and intervene in poor sleep health would be enhanced through the provision of sleep health resources together with

education and awareness-raising strategies. These would provide GPs and general practices with contemporary evidence on sleep health, risk factors for poor sleep and poor sleep risk for other health conditions and high-risk behaviours together with information on management options and referral pathways.

The current outreach GP education activities associated with projects delivered by the National Centre for Research Excellence (CRE) at the National Centre for Sleep Health Services Research provide evidence of the benefit of GP education in sleep health and a formal GP outreach program with investment should be considered (184).

Individual variability in sleep needs and behaviours can mean that individuals with poor sleep may not present with typical risk factors. Reliance on specific indicators to trigger assessment may fail to capture sleep concerns at an early stage. Routine assessment in primary care of at-risk groups and people with known risk factors for sleep health may be most appropriate (185). Issues not directly sleep-related such as impaired attention, mood disturbances, headaches and worsening of a comorbid illness (186) may also indicate a potential need for assessment for a sleep disorder. Importantly, there is significant overlap between risks for sleep health/symptoms of poor sleep and other clinical conditions, particularly depression where up to 90% of people with depression report sleeping difficulties (108).

Routine assessment in general practice would be based on the use of a validated tool assessing sleep duration, sleep quality, sleep consistency and daytime alertness, such as RuSATED, and the absence of a sleep disorder in individuals (187). The use of an assessment tool and initial conversations around sleep quantity, quality and consistency could identify sleep problems that may be transient or persistent sleep disturbances and sleep concerns that require further follow-up investigations for sleep disorders such as OSA or chronic insomnia.

Other primary healthcare services for poor sleep

Some interventions showing potential to improve sleep health could be provided through other primary care settings (56). Community pharmacy is a potential referral option for the management of sleep issues. A systematic review examining the role of pharmacists in supporting sleep health and managing sleep disorders found that pharmacists can have a role in 'deprescribing' or managing and tapering medications, collaborating with other health professionals in team care arrangements and educating patients (188). The review found that this could result in quicker access to treatment for patients, decreased health expenditure and increased patient awareness of sleep disorders (188).

One Australian study that looked at GP attitudes to embedding non-dispensing pharmacists in general practice found overall willingness by GPs to utilise pharmacists in insomnia management, although barriers to this include infrastructure, funding and perceived patient attitudes (189).

Treatment and management of sleep disorders in primary care

When a GP has determined that an individual requires further investigation of sleep health and for the presence of a sleep disorder, various assessment tools are available. The Sleep Health Primary Care Resources website was launched by the Australasian Sleep Association (ASA) in December 2022. The website was developed as part of the funding from the National Health and Medical Research Council (NHMRC) for the National Centre for Sleep Health Services Research (NCSHSR): Centre for Research Excellence's (CRE). The website hosts "evidence-based information to assist primary care practitioners involved in the assessment and management of adult patients with obstructive sleep apnoea and chronic insomnia/insomnia disorder" (190).

GPs and general practice will be the mainstay of prevention, diagnosis, early intervention and management of poor sleep and sleep disorders in

the population. Although there are more than 100 diagnosable clinical sleep disorders, this Policy Evidence Brief focuses on the two which are most common – chronic insomnia and obstructive sleep apnoea. When assessment indicates that an individual has a sleep disorder, there are several clinical pathways for further diagnosis, treatment and management options. These will vary depending on the individual, the potential disorder and any underlying or co-morbid conditions. These are discussed in detail in the Policy Evidence Review companion report to this brief (2).

Chronic Insomnia

Chronic Insomnia is a clinical sleep disorder defined by frequent self-reported difficulty initiating and/or maintaining sleep, despite adequate opportunity, with associated distress and daytime impairment. Chronic Insomnia frequently co-occurs with other mental and physical health conditions, including other sleep disorders (36).

Chronic Insomnia can be managed in general practice or an individual with insomnia can be referred for psychological therapy. Chronic insomnia is listed in the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5), the guide for diagnostic criteria of mental disorders. Diagnosis of insomnia therefore meets eligibility criteria for Medicare subsidised referral to a psychologist under the Better Access Initiative (191,192).

Treatment and management options for chronic insomnia include specific psychological therapies, Cognitive Behavioural Therapy for insomnia (CBTi), which is provided by a psychologist with specialist training, and Brief Behavioural Therapy for Insomnia (BBTi), a short form (4-5 session) of CBTi that may be provided by a general practitioner or primary care nurse with appropriate training (193,194). Digital CBTi (dCBTi) programs are self-guided interactive online programs that allow people to self-administer CBTi through mobile/computer devices (195) and may be an appropriate way to scale access to CBTi as additional clinicians are being trained.

Upskilling of practice nurses and other allied health professionals to deliver insomnia treatments such as BBTi and CBTi and appropriate pathways and remuneration options for patients to access these would make this treatment more accessible within general practice. The Better Access Initiative, a Commonwealth program that gives eligible people Medicare-subsidised access to mental health care, provides for GPs to refer patients to psychologists and other allied health professionals for the management of insomnia under a Mental Health Treatment Plan (196). This referral option is limited for some patients by the common requirement for a further gap payment, in addition to the subsidy, to the provider. Similarly, a Chronic Disease GP Management Plan and Team Care Arrangement can provide an individual with up to five allied health services. Like the Better Access Initiative, services often require a further gap payment. First Nations Australians are eligible for a Health Assessment from their GP which may provide a further five subsidised allied health services (197). Five sessions (or ten with a Health Assessment) with an allied health provider may not be adequate to deliver a CBTi or similar intervention for insomnia or other sleep issue.

These referral options are also limited by the number and distribution of psychologists who are trained in the provision of CBTi. In 2021-22, the ASA audited the number of psychologists trained in sleep therapy in Australia and found fewer than 70 psychologists who specialise in the delivery of CBTi. There is presently no formal recognition of psychologists who specialise in sleep therapy. Since 2015, the Australian Psychological Society (APS) has provided a 32-hour text-based online education program for psychologists on sleep health and sleep disorders. The ASA and the APS are working collaboratively to develop CBTi education resources and programs for psychologists (198), including the development of an online CBTi education training program, with the aim of having 200 psychologists complete the training each year (199). In addition to CBTi training for psychologists, the program aims to develop a pathway for Australians to access an evidence-based digital CBTi (dCBTi) program, Bedtime Window, and to provide training for GPs in identifying, assessing insomnia and

managing/referring patients for CBTi. Bedtime Window is currently being tested in three Randomised Controlled Trials throughout Australia with promising early results.

Policy and funding recognition of CBTi and related interventions, as a routine treatment for a common health problem that has significant physical and mental health implications, would facilitate greater uptake of this treatment option. These options would include:

- funding provision for access to self-guided digital CBTi programs for sleep health;
- explicit inclusion of CBTi for sleep health in referral options under the Better Access Initiative. This would improve access to services for individuals and would support growth in the clinical workforce that is trained and qualified to deliver CBTi therapy for sleep health; and
- MBS support for the delivery of BBTi for sleep health in the general practice setting through a health care plan.

Obstructive Sleep Apnoea (OSA)

Obstructive sleep apnoea (OSA) is a breathing disorder in which an individual experiences repeated episodes of partial or complete airway obstruction during sleep, causing them to stop breathing for multiple 10-90 second episodes throughout the night (200,201). OSA is associated with poor sleep quality, insufficient sleep duration, comorbid insomnia, and daytime sleepiness (202). OSA is primarily managed by a sleep specialist. However, access to sleep specialists for OSA assessment and management can be difficult with long waiting lists, some out-of-pocket costs and a lack of local services, particularly in rural and remote areas (203).

The 9th edition of the RACGP Guidelines for preventative activities in general practice — 'Red Book'(163) — removed recommendations for screening for OSA in asymptomatic people due to its unproven benefit in the general population (204). However, a 2021 qualitative analysis explored the attitudes and experiences of Australian GPs on primary care management of OSA and found that GPs are integral to recognising OSA symptoms and facilitating diagnosis and management by specialists (203).

Improving the capacity of general practice

Policy and funding recognition of the importance and complexity of identifying and managing sleep health risks and needs in primary care is essential if primary care services are to adequately meet the evident population burden and prevalence of poor sleep and sleep disorders.

The provision of brief interventions in poor sleep and at the primary care level is supported by contemporary evidence. The capacity of general practice and general practitioners to identify, treat and manage poor sleep health and sleep disorders would be enhanced through the provision of resources together with education and awareness-raising strategies. These would provide GPs and general practices with up-to-date evidence on sleep health, risk factors for poor sleep, poor sleep risk for other health conditions and high-risk behaviours together with information on management options and referral pathways for poor sleep and sleep disorders. The current outreach GP education activities associated with projects delivered by the National Centre for Research Excellence (CRE) at the National Centre for Sleep Health Services Research provide evidence of the benefit of GP education in sleep health and a formal GP outreach program with investment should be considered.

Enabling the available primary care workforce to work to their full scope of practice is a current national health policy priority. To improve access and reduce fee barriers for eligible patients, qualified practice nurses could deliver BBTi within general practice in line with existing provisions for alcohol and other drugs practice nurse services.

Recommendation: Support primary care capacity for early intervention and risk reduction

The RACGP SNAP guidelines for lifestyle risk factors in primary care should be further developed to include sleep health in addition to smoking, nutrition, alcohol and physical activity (SNAP). This would resource and support general practitioners in engaging with, recognising and addressing poor sleep and sleep disorders in their patient population. Guidelines need to emphasise the significant relationship between disrupted sleep to suicide risk particularly for at-risk adolescents and adults.

A GP sleep health engagement, awareness and support strategy, consistent with the RACGP Alcohol and Other Drugs (AOD) strategy, should be funded to strengthen GP capacity to address poor sleep and sleep disorders in the community setting including through inclusion of sleep in routine health checks.

Policy should recognise and support the capacity of primary care to respond to the significance and complexity of detecting and managing poor sleep health. This should include policy and funding support for:

i. The multidisciplinary team required to enable evidence-based, primary care provided identification and early intervention of sleep problems.

ii. Interventions for insomnia and other common sleep health problems, such as Brief Behavioural Therapy for Insomnia (BBTi), digital Cognitive Behavioural Therapy (dCBTi) and Cognitive Behavioural Therapy (CBTi).

iii. Education and training programs to increase the number of psychologists with specialist expertise in CBTi for sleep health. Incentive funding to promote sleep disorder/insomnia education in University postgraduate psychology courses, such as Masters of Clinical Psychology, should be considered.

These recommendations are in alignment with and reliant on the recommendations of the Strengthening Medicare Taskforce that include:

- Introducing voluntary patient registration;
- funding for longer consultations;
- increased investment to support multidisciplinary teams;
- blended funding models to go beyond fee-for-service;
- investment in research; and
- better use of data and digital technology.

Sleep health in other public policy

Sleep as a risk factor for health and/or safety is relevant in other public policies. Poor sleep is a significant risk factor for motor vehicle accidents (MVAs) and workplace injuries and is associated with impaired concentration and cognition in young people, meaning sleep has a place within employment/labour (occupational health and safety) policy, road safety policy and education policy.

Even though the economic cost of sleep disorders is significant (7), there has been limited policy attention to the importance of sleep for everyday life other than in some health policies (205). Whilst fatigue has been recognised as a risk factor in industry, its corollary, sleep health, has not been widely recognised as important to the health and safety of workers.

A range of factors including work and education arrangements, community environments and social and economic influences can negatively affect sleep health, either directly or indirectly. As such, it is critical that sleep health is recognised as a significant component of education and employment, town and community planning and other relevant public policy sectors.

Recognition of the influence of public policy on health and wellbeing and specifically on population sleep health is desirable. One approach to improve the recognition of sleep health in public policy could be to focus on the cumulative effect of policies on how people use their time. There is a growing understanding that how we use our time affects our well-being. Whilst this has not attracted policymakers' attention outside health, the 'side effects' of other public policies on sleep health and health and wellbeing should be identified and addressed to improve population sleep health.

Additionally, assessment of the impacts and benefits of public policy on population sleep health, with particular attention to the risk factors for and incidence of poor sleep health outcomes, should be considered. Governments have a legitimate interest in protecting public health and improving occupational health and safety. Policy attention to the measurable daytime consequences of poor sleep (e.g. fatigue, excessive daytime sleepiness, reduced cognitive performance), particularly in populations and occupational groups identified as high-risk (206), would enable more effective efforts to manage those risks.

Another approach is to review and improve the impact of specific industries, work, education, road transport and other public policies relevant to known risks for poor sleep health outcomes in particular population groups. This should include industry-specific policies for industries at increased risk of poor sleep and policies related to road safety, education and town and community planning.

Employment/work hours

- In Australia, each state and territory legislates and regulates occupational health and safety separately and the Australian Government Fair Work Ombudsman has National Employment Standards that relate to the maximum hours of weekly work hours (207).
- Full-time employees are permitted to work up to 38 hours per week, unless additional hours are considered reasonable in terms of minimal risk to the employee, adequate notice and compensation (208).

High -risk industries

- There are national, state and territory arrangements that separately regulate occupational health and safety (incl. provisions relating to fatigue management).
- There is increasing recognition that prescriptive regulations for maximum hours worked and minimum rest periods are not adequate for fatigue management.
- Fatigue risk management systems (FRMS) sets out standards for standard work hours, guides scheduling and mandatory rest periods, includes fatigue training for staff and calculates risks or safety breaches based on fatigue-based activities and periods of work (209).

Road safety

- Some overlap between occupational health and safety and road safety where industries use roads, particularly the heavy vehicle industry.
- National Road Safety Strategy 2021-2030 (NRSS), which aims to reduce the burden from road crashes and develop a safer, sustainable transport system, refers to fatigue in:
  - *heavy vehicle stops*; and
  - *community understanding of risky road use* (210).

Education

- Academic and social pressure coupled with school start times and associated commute times, means many students are not getting adequate sleep (154).
- Poor sleep in children and young people is associated with impairments of mood, memory, emotional regulation, mental health problems and physical health issues. Some countries have introduced later school start times to account for this (10,152,154).
- There is some evidence to support the impact of sleep education on improving sleep behaviours and outcomes among school-aged kids (215,216).
- Embedding sleep education into existing health curricula in schools to support sleep and related learning and education outcomes could be beneficial but it is important to also not overload curricula (217).

Daylight savings

- In the US, several sleep-related organisations have called for the elimination of Daylight Savings Time (DST) to protect health, sleep and circadian biology (211,212,213).
- There is mixed evidence of DST impact but DST has been shown to cause acute sleep loss across the week of the change.
- Some research has shown modestly elevated risk clusters following daylight savings shift for incidence of cardiovascular disease, injuries, mental and behavioural disorders and immune-related disorders (214).
- It is however important to note that the benefits and harms of DST are not restricted to sleep/circadian rhythm and therefore a public conversation to address all the factors is needed.

Urban planning/light pollution

- Light and noise pollution are neglected pollutants that are causing significant health impacts (218).
- Artificial light at night effects sleep by impacting sleep and circadian rhythms, this can affect population-wide health and quality of life (220,221).
- A series of Australian Standards and Technical Specifications guide local governments and other authorities (e.g. road, traffic) on how to design safe and effective lighting but sleep is not mentioned or targeted by existing lighting guidelines (219).

Recommendation: Promote recognition of sleep health in other public policy

Sleep health is highly relevant to, and influenced by, public policy beyond the health sector. Application of the evidence curated in this review regarding other policy sectors and particular industries could contribute to improved sleep health in some at-risk population groups.

i. Health policy actions should emphasise the relevance and impact of sleep health in other public policy areas, with a particular focus on industry/workforce-specific, road safety, education and community planning policies.

ii. Health policy should consider and address the cumulative effect of other public policies on sleep health and associated physical and mental health outcomes.

GLOSSARY OF TERMS

Chronic insomnia: a clinical sleep disorder defined by frequent self-reported difficulty initiating and/or maintaining sleep, despite adequate opportunity, with associated distress and daytime impairment, over a time period of greater than 3 months (222).

Chronotype: a person's natural inclination regarding the time/s during the 24-hour daily cycle when they prefer to sleep or when they are most alert or energetic. An early morning chronotype is commonly referred to as being a 'lark' and a later night chronotype as being a 'night owl' (223,224).

Circadian rhythms: physiological processes and functions that follow an approximate 24-hour cycle, controlled by an internal biological clock, including the sleep-wake cycle (225).

Fatigue: feeling of constant tiredness or weakness which can be physical, mental or both (226).

Healthy sleep: refers to sleep that is considered adequate across key metrics (e.g. quantity, quality and consistency) and is associated with avoiding the consequences of poor sleep (227).

Inadequate sleep: insufficient sleep duration and/or poor sleep quality (228).

Obstructive Sleep Apnoea (OSA): a sleep disorder characterised by intermittent airway blockage during sleep resulting in brief episodes of no breathing (229).

Poor sleep: refers to sleep that is not adequate across the key measures of quantity, quality and/or consistency, resulting in tiredness or lack of wakefulness and contributing to a range of long-term negative health outcomes (230).

Preventive health: "approaches and activities aimed at reducing the likelihood that a disease or disorder will affect an individual, interrupting or slowing the progress of the disorder or reducing disability" (231).

Restless Legs Syndrome (RLS): a neurological disorder that causes uncomfortable sensations in your legs and an irresistible urge to move them. Symptoms are worse at night and disrupt or prevent sleep (232).

Sleep disorders: a group of conditions that disrupt and affect sleep on a regular basis. Examples include Obstructive Sleep Apnoea, Chronic Insomnia, Restless Legs Syndrome and circadian rhythm disorders (1,233).

Sleep efficiency: refers to the percentage of time in bed that is spent asleep (234).

Sleep health: a multidimensional concept encompassing the various aspects of sleep that have been shown to contribute to health and wellbeing outcomes (37). Sleep health in individuals exists across a spectrum, from optimal sleep health to clinical sleep disorders.

Sleep Health Spectrum: is used in this paper to describe the overall range of sleep experience, that is - healthy sleep, transient or persistent sleep problems (poor sleep) and sleep disorders.

Sleep hygiene: describes behaviours, environmental factors and sleep-specific factors (e.g. sleep timing) that can improve sleep quality and quantity (235).

Sleep latency: the length of time, in minutes, it takes to transition from wake to sleep (236).

Sleep quality: is described as an individual's "satisfaction with the sleep experience, integrating aspects of sleep initiation, sleep maintenance, sleep quantity, and refreshment upon awakening" (237) or in short, sleep quality refers to how well an individual slept.

Social jetlag: a form of circadian misalignment when the sleep schedule on school/work days is different from free days, mainly due to obligations such as school, work or social commitments (238).

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Mitchell Institute for Education and Health Policy
300 Queen Street, Melbourne, Victoria 3000
+61 9919 1820
info@mitchellinstitute.org.au
mitchellinstittute.org.au