

# MENTAL HEALTH IN NEW ZEALAND FROM A PUBLIC HEALTH PERSPECTIVE

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MANATU HAUORA

# CHAPTER 17:

## SLEEP DISORDERS

PHILIPPA GANDER

Although we spend about a third of our lives asleep, the systematic study of sleep and sleep disorders is a relatively new discipline (Dement 1994). Sleep can be disrupted by a range of factors. There is growing recognition that inadequate sleep is a major public health issue (Mittler et al 1988; NCSDR (National Commission on Sleep Disorders Research) 1993; Mittler et al 1994). Since the Industrial Revolution, unrestricted sleep at night, which is the physiological optimum, has become increasingly rare. Shiftwork requires more and more people to try to override the circadian biological clock, which programmes night-time sleep and daytime wakefulness (United States Congress, Office of Technology Assessment 1991). There are also many pressures in modern society to expand waketime activities at the expense of sleep. For the individual, the consequences of inadequate sleep include reduced productivity, degraded cognitive performance and mood, increased likelihood of accidents, higher morbidity and mortality risk, and decreased quality of life (NCSDR 1993). It can be argued that inadequate sleep, whatever its causes, affects mental health.

Errors made by sleep-deprived individuals can also jeopardise public health and safety. The nuclear accidents at Three Mile Island and Chernobyl became critical because of errors made by operators on the nightshift (Mittler et al 1988). Fatigue due to inadequate sleep has been identified as a causal factor in major shipping, aviation, railway, and trucking disasters (National Transportation Safety Board 1989, 1994a, 1994b, 1995). In the United States, it has been estimated that annual sleep-related accidents in transportation alone claim over 5000 lives, cause hundreds of thousands of injuries and cost billions in health care costs, death, lost productivity, and damage to property (NCSDR 1993). It is widely acknowledged that there is a gulf between current scientific and medical knowledge about sleep, and the application of this knowledge to public policy aimed at preventing personal and public catastrophes caused by inadequate sleep (Mittler et al 1988; NCSDR 1993; Mittler et al 1994).

### SLEEP DISORDERS ASSOCIATED WITH PSYCHIATRIC AND NEUROLOGICAL DISORDERS

‘Sleep disorders associated with medical or psychiatric conditions’ represents one of four categories of sleep disorders identified in the 1990 International Classification of Sleep Disorders, which includes a total of 84 different disorders (Thorpy 1994). Most psychiatric disorders can have associated sleep disturbances that may influence their development, course, and treatment (NCSDR 1993). The International Classification singles out the psychoses, mood disorders, anxiety disorders, panic disorders, and alcoholism, because these disorders are commonly seen in patients presenting with sleep complaints, and are considered important in differential diagnoses (Thorpy 1994). A number of neurological disorders have been shown to have an effect on, and to be affected by, sleep (NCSDR 1993). These include cerebral degenerative disorders, dementia, Parkinson’s disease, and some forms of epilepsy and headaches (Thorpy 1994).

## SCHIZOPHRENIA

The sleep of schizophrenic patients is frequently disturbed, particularly at the onset of the first psychotic symptoms and with each subsequent relapse (Zarcone and Benson 1994). Severe insomnia may precede the occurrence of noticeable symptoms of relapse, and there is some evidence that specific sleep abnormalities may predict future relapse or prognosis, and therapeutic responses. There is limited evidence that the rebound of both rapid eye movement (REM) and slow-wave sleep after sleep deprivation may be deficient. The incidence of intrinsic sleep disorders (narcolepsy and obstructive sleep apnoea syndrome (see later in this chapter), and periodic limb movements) appears to be high, and disorders associated with the abuse of, or dependence on, alcohol and illicit drugs are not uncommon. Antipsychotic medication can alter or normalise sleep architecture.

## MOOD DISORDERS

Changes in sleep patterns are among the diagnostic criteria for mood disorders in adults (Benca 1994). In both bipolar and major depressive disorders, sleep disturbances are more severe during acute episodes of illness, but may persist during periods of partial or complete remission.

Intrinsic sleep disorders produce sleep disruption and can produce symptoms resembling depression, such as fatigue and difficulty concentrating. In some cases, medication may also be responsible for precipitating or exacerbating sleep disorders (eg, tricyclic antidepressants and periodic leg movements; benzodiazepines and sleep apnoea).

Considerable research has focused on possible causal links between mood disorders and the sleep abnormalities that often accompany them. A variety of sleep manipulations have been shown to have antidepressant effects, including selective deprivation of REM sleep, partial and total sleep deprivation, and possibly, moving sleep to an earlier clock time. Sleep deprivation can trigger manic episodes in some patients with bipolar depression. Pharmacological treatments for mood disorders all have significant effects on sleep, whether through the tendency to normalise sleep patterns by treating the underlying illness, or through direct effects on sleep. One possibility is that common pathophysiology may lead to disturbances of both sleep and mood, but their relative prominence depends on other factors. Further research is necessary to clarify these relationships.

## THE ANXIETY DISORDERS

Patients with panic attacks report a higher rate of recurrent insomnia than healthy controls (67 percent versus 35 percent (Uhde 1994)). An estimated 30–45 percent of these patients experience repeated panic attacks during sleep. Sleep difficulties affect 56–70 percent of patients with generalised anxiety disorder, with 30 percent reporting moderate to severe symptoms. It is unclear whether the effectiveness of benzodiazepines as a treatment for generalised anxiety disorder is related to their effectiveness in reducing insomnia. Limited information suggests that patients with obsessive-compulsive disorder often experience sleep that is short, restless and fragmented. The extent to which these disturbances are the result of intrusive thoughts and associated compulsions remains to be determined. Sleep disturbances are commonly reported by patients with post-traumatic stress disorder. For some, insomnia, anxiety arousals, or flashbacks during sleep represent the primary complaint. There is an increased frequency of nightmares in comparison with the general population. Improvements in sleep or in sleep anxiety arousals usually coincide with overall benefits of drug therapy.

## EATING DISORDERS

Insomnia and decreased amounts of sleep are common among patients suffering from anorexia nervosa, particularly when weight is subnormal (Benca and Casper 1994). With bulimia nervosa, total sleep may increase following binges. Sleep-related eating in bulimia nervosa may represent a type of parasomnia (parasomnias are behaviours carried out during sleep, such as sleep-walking and sleep-talking). Sleep abnormalities among patients with eating disorders normally disappear with weight gain. In cases where they persist, it is usual to look for other psychiatric, behavioural, or medical causes.

## ALCOHOLISM

Alcohol-dependent sleep disorder is characterised by nightly self-administration of ethanol for its hypnotic effect. Sleep disturbances in alcoholism may take the form of insomnia, hypersomnia, disturbances of the circadian sleep/wake cycle, or parasomnias, and they may persist even during chronic abstinence (Gillin 1994). There is currently no well-established treatment for sleep disturbances in the chronically abstinent alcoholic. Ironically, many substance abusers cite concern about sleep as motivation for initial and continuing use (NCSDR 1993).

## DEMENTIA

Demented patients have been found to have reduced sleep efficiency and more frequent nocturnal arousals than age-matched controls, with the severity of sleep disruption paralleling the severity of dementia (Bliwise 1994). The waking EEG is typically slowed, which can make it difficult to discriminate between wakefulness and sleep, and between the different stages of non-REM sleep. The most dramatic and familiar aspect of sleep disturbance is 'sundowning' (the nocturnal exacerbation of disruptive behaviours and agitation). The syndrome is not yet clearly defined, nor are its causes understood. It may be associated with the deterioration of the circadian clock in the suprachiasmatic nucleus, which is implicated in the regulation of the sleep/wake cycle and sleep structure (Dijk and Czeisler 1995). The study of sleep in demented patients is confounded by diagnostic difficulties. The majority of patients studied have probably been suffering from Alzheimer's disease (Bliwise 1994).

## PARKINSONISM

Nocturnal symptoms and associated sleep abnormalities occur in up to 75 percent of patients with parkinsonism (Aldrich 1994). Sleep disturbance tends to increase with disease progression, particularly when depression and dementia develop in the later stages. Unfortunately, dopaminergic agents used during the day or in the evening to treat parkinsonism can themselves induce a variety of sleep disturbances. Although motor symptoms are most prominent during wakefulness, both tremor and altered muscle tone occur in varying degrees in the different stages of sleep and can contribute to sleep disruption. Sleep can cause temporary improvements in the symptoms of patients with familial early-onset Parkinson's disease, hereditary progressive dystonia, or in those suffering from a combination of idiopathic dystonia and parkinsonism.

## NARCOLEPSY

Narcolepsy is classified as an intrinsic primary sleep disorder (Thorpy 1994). It is a disabling neurological disorder of unknown cause that has four classic symptoms (NCSDR 1993): excessive daytime sleepiness; cataplexy; paralysis upon falling asleep; and hypnagogic hallucinations. Disease onset is typically between 15–35 years of age, and although the severity of symptoms may fluctuate over time, narcolepsy is usually chronic. Its pervasive effects are reflected in all aspects of the patient's life, including work, education, recreation, interpersonal relationships, and personality. Symptoms of depression are common, and marital and family problems are reported by the majority of sufferers (Carskadon 1993). Prevalence estimates range from 0.03–0.16 percent (Partinen 1994).

## PREVALENCE OF SLEEP DISORDERS

Information on the prevalence of sleep disorders is incomplete, even in countries where the practice of sleep medicine is comparatively well established (Partinen 1994). Approximately 16 percent of the US population suffer from chronic disorders of sleep and wakefulness, with an additional 8–12 percent experiencing intermittent sleep problems resulting from demanding work schedules and various other lifestyle factors. At least 95 percent of these individuals go undiagnosed (NCSDR 1993). Sleep disorders are estimated to cost the US US\$15.9 billion annually in direct costs alone, with millions more accrued through unnecessary procedures and incorrect referrals.

No prevalence data are available for New Zealand, because there are no comprehensive centres for the treatment of sleep disorders in this country, although there are several clinics treating sleep apnoea (see below). The majority of doctors now in practice have received no education in this area, and current teaching in medical schools is minimal. Thus it is reasonable to assume that the majority of patients with sleep disorders in this country also go undiagnosed. Extrapolating from the above estimates for the US population, for a New Zealand population of 3 442 500 (Statistics New Zealand 1993) it could be expected that approximately 551 000 New Zealanders suffer from chronic sleep disorders, with 275 000–350 000 more having intermittent problems sleeping. These extrapolations should be viewed with caution, particularly as the risk factors for many disorders are not yet well understood. Partinen (1994) provides an extensive review of the epidemiology of different sleep disorders.

Insomnia is the most common sleep complaint. It is a symptom that can have a diversity of causes that are not usually identified in epidemiological studies. Prevalence estimates for insomnia 'often or always' range from 2.0–23.1 percent in different populations, while estimates for insomnia 'sometimes' range from 33.0–60.0 percent (Partinen 1994). The NCSDR (1993) estimates that about a third of the adult population in the US experience frequent or chronic insomnia. People with insomnia are more than four times as likely to exhibit elevated levels of psychological distress, anxiety, depression, and medical illness than normal sleepers (Zorick 1994).

The most serious sleep disorder, in terms of mortality and morbidity, is obstructive sleep apnoea (OSA). It is characterised by intermittent collapse of the upper airway and repeated arousals (often not remembered) as the sleeper wakes up to breathe. This sleep fragmentation leads to excessive daytime sleepiness. Prevalence estimates for adult men range from 0.4–4.0 percent (Partinen 1994). For American women aged 30–60 years, the estimated prevalence is 2 percent (Young et al 1993). Potential consequences of sleep apnoea include hypertension, coronary heart disease, myocardial infarction, stroke, psychological problems, impotence, cognitive dysfunction, and memory loss. Individuals with OSA are seven times more likely to have a motor vehicle accident than the rest of the population. In children, OSA is thought to impair learning ability and to increase behavioural problems. Known and suspected risk factors include age, obesity, craniofacial abnormalities, endocrine dysfunction (thyroid deficiencies, excess growth hormone), and alcohol, tobacco, and drug use (NCSDR 1993).

Even a mild degree of sleep-disordered breathing may have adverse health effects (Young et al 1993). Snoring, which corresponds to partial airway collapse, has been associated with myocardial infarction, stroke, and hypertension (Partinen 1994). Estimates of the prevalence of snoring 'frequently or always' vary from 8.5–31.0 percent for adult men, and from 4.1–17.0 percent for adult women (Partinen 1994). Snoring is twice as common among patients with Alzheimer's disease and multi-infarct dementia than among community populations of elderly people (Erkinjuntii et al 1987).

Although not classified as a sleep disorder, voluntary chronic sleep deprivation may well be one of the major causes of inadequate sleep. It has been estimated that the average total nightly sleep of Americans has decreased by at least 20 percent in the last century or so, with the result that many are sleep-deprived and therefore sleepy during the day (NCSDR 1993). The effects of sleep loss on waketime function accumulate, so that moderate sleep loss over several successive nights can accumulate into a severe sleep debt (Roth et al 1994).

## RISK FACTORS

### SLEEP DURATION

People who average fewer than seven hours sleep per night, or more than eight hours, are at risk of increased morbidity and mortality compared with those who sleep 7–8 hours. A nationwide survey by the American Cancer Society of over a million people found that short or long sleepers were 10–150 percent more likely to have died at the time of a six-year follow-up survey. These differences persist when controlling for age, sex, exercise, diet, cigarette smoking, and use of sleeping pills (Kripke et al 1979; Kripke 1993; Carskadon 1993).

### AGE

Major changes in sleep occur in the process of maturation and aging (Bliwise 1994), and a number of sleep disorders are associated with specific times in the life-span. Major developmental changes in sleep organisation occur around the time of the peak incidence of sudden infant death syndrome (2–4 months). Parasomnias are most common among young children. Sleep-related respiratory disturbances, including obstructive sleep apnoea, can affect children. Adenotonsillar hypertrophy is the most common cause (Partinen 1994). Family stress is often concomitant with childhood sleep disorders. Parents of infants with sleep disturbances typically report more depressive symptomatology, decreased satisfaction with their marriage, and greater anxiety, than do parents of children with normal sleep habits (NCSDR 1993).

Adolescents generally do not get enough sleep. Homework, after-school jobs, and socialising often lead to later bedtimes, and getting up for school becomes increasingly difficult. There are a number of serious potential consequences, including daytime sleepiness, poor performance at school, increased incidence of car accidents, increased moodiness, and increased use of stimulants and alcohol (Carskadon 1990; Mittler et al 1994). Between the ages of 10 and 20 years, the average amount of deep slow-wave sleep declines by about 40 percent (Dahl and Carskadon 1995). Narcolepsy characteristically emerges during this period (Guilleminault 1994), as does schizophrenia. It has been hypothesised that abnormalities in sleep architecture may precede the first psychotic episode (Zarcone and Benson 1994). Delayed sleep-phase syndrome, in which sleep is displaced to an unacceptably late clock time, is also most prevalent in this age group (Roehrs and Roth 1994).

Numerous sleep disorders appear during mid-life, when workload and family responsibilities increase for most adults. Adaptability to changing work schedules declines across the decades from 20–60 years, leading to greater sleep loss among older shiftworkers (Gander et al 1993). In later adult life, nocturnal sleep characteristically becomes shorter, lighter, and more fragmented, and daytime sleepiness increases (Bliwise 1994). Reports of insomnia increase with age, as does hypnotic use (NCSDR 1993; Partinen et al 1983; Partinen 1994). One US study estimated that 5–15 percent of adults take hypnotics almost every evening before going to bed (Bixler et al 1979). There are no data on the amount of hypnotics prescribed annually for insomnia in New Zealand. In the year to December 1995, the Pharmaceutical Management Agency received for reimbursement 440543 prescriptions for sedatives and hypnotics listed in the Pharmaceutical Schedule. This represents a 4 percent increase over 1994 (Dr Andrea Nowitz, personal communication, January 1996). These data are not broken down by diagnosis, and clearly not all were related to insomnia. The number of prescriptions also gives no information on the dose, frequency, length, or number of repeats on each prescription. The prevalences of snoring, obstructive sleep apnoea, and periodic limb movements all increase with age (Bliwise 1994; Montplaisir et al 1994). Older people are also more likely to suffer from other medical and psychiatric illnesses that interfere with sleep. In the US, disturbed sleep is among the most common reasons given by caregivers for institutionalisation of the elderly (NCSDR 1993; Bliwise 1994).

## SEX

An estimated 85 percent of sleep studies have been performed with male subjects (NCSDR 1993). Normative data on the sleep changes associated with the menstrual cycle, pregnancy, and menopause are lacking. The sleep disturbances that are concomitant with post-partum psychosis and post-partum depression are poorly understood. Women report insomnia more frequently than men. The prevalence of sleep-disordered breathing, including sleep apnoea and snoring, is higher in men. Preliminary data suggest that, for 30–59-year-olds, age effects may be more important in sleep-related respiratory disturbances in men, whereas body weight effects may be more important in women (Bliwise 1994). The prevalence of narcolepsy also appears to be higher in men than in women (Guilleminault 1994).

## OBESITY

Obesity has been shown to be an important risk factor for snoring and sleep apnoea (Partinen 1994). It may compromise upper airway function by altering pharyngeal size or geometry (Sanders 1994). Indeed, neck size is a better predictor of the severity of sleep apnoea than is the body mass index (Katz et al 1990). Māori show higher rates of obesity than other New Zealanders (PHC 1995). Māori and Pacific people are represented disproportionately among sleep apnoea patients seen at the Sleep Disordered Breathing Unit at Green Lane Hospital (of the order of 50 percent of all such patients), and they often seem to be more severely affected (Dr Andrew Veale, personal communication, January 1996). Obesity may be one of the factors contributing to this difference.

## SHIFTWORK

Sixty-two percent of shiftworkers complain of sleep problems, compared to 20 percent of day workers (Coleman 1986). Shiftworkers are often acutely sleep deprived at work, and can easily become chronically sleep deprived because the circadian clock does not adapt fully to altered work/rest schedules (Akerstedt 1991; United States Congress, Office of Technology Assessment 1991; Gander et al 1996). Neither the Department of Labour nor Statistics New Zealand collects information on the prevalence of shiftwork or the demographics of shiftworkers (Murray Bathgate, personal communication, December 1995). In the US, about 20 percent of the workforce are shiftworkers (United States Congress, Office of Technology Assessment 1991).

## HUMAN LEUCOCYTE ANTIGENS IN NARCOLEPSY

A subtype of the human leucocyte antigen DR2 haplotype is found in more than 90 percent of patients with narcolepsy (Carskadon 1993). However, there are also well-documented cases of classical narcolepsy in patients who do not have this haplotype. In addition, monozygotic twins can be concordant or discordant for narcolepsy, suggesting that genetic factors may be necessary but not sufficient to manifest the disease.

## PREVENTIVE APPROACHES

Chronic sleep disorders and intermittent sleep problems may affect as many as 900 000 New Zealanders. The consequences of sleep disorders, sleep deprivation, and sleepiness are significant and include reduced productivity both in school and workplace, serious morbidity, increased mortality, and decreased quality of family and social life (NCS DR 1993). The severity of sleep disorders ranges from those that are potentially fatal, to those that are little more than an annoyance. Some are lifelong, and have complex deleterious effects on other family members, while others are brief and non-recurring. Attitudes to people who are chronically sleepy are often negative, both in the family context and the wider community. Patients suffering from sleep disorders are often misunderstood, socially isolated, and thought to be lazy. Currently, they are also likely to remain undiagnosed or misdiagnosed, despite that fact that there is a substantial amount of knowledge available on sleep disorders, their consequences, and treatment options. There has been a pervasive failure to transfer this knowledge to health care practitioners and the general public (Mittler et al 1988; NCS DR 1993; Mittler et al 1994). Consequently, there is exceptional potential for improvement in this area through preventive approaches.

## PRIMARY PREVENTION

There is an urgent need to provide effective educational programmes to increase public awareness of the importance of healthy sleep, to promote healthy sleep habits, and to create some familiarity with sleep disorders in order to help people recognise when professional intervention is appropriate. Public education programmes directed at the deleterious effects of alcohol and smoking, or the need to wear seat-belts, have contributed to changes in attitude and behaviour. A comparable effort is needed for sleep education.

Based on current knowledge, a number of at-risk groups can be identified. The high prevalence of sleep deprivation among adolescents, and its potential long-term consequences for this age group (Dahl and Carskadon 1995), are strong arguments for providing a sleep education programme in high

schools. Public health programmes to reduce obesity could be expected to have positive effects on the severity of sleep apnoea in the population, and possibly on its prevalence. Sleepiness is known to represent a significant risk to driving safety, and impairment because of alcohol is clearly potentiated by sleep deprivation (Roehrs et al 1989; Mittler et al 1994). Shiftworkers in any 24-hour operation are at added risk for sleep problems. There is a need for education about the health, safety, and productivity hazard that sleepy workers represent. Other potential approaches for reducing sleep loss in industrial settings include hours-of-work regulations and company scheduling policies (Rosekind et al 1996).

## SECONDARY PREVENTION

Secondary prevention requires an informed population, suitably trained health care professionals, and the availability of adequate treatment facilities. There is a critical need for systematic education in sleep disorders for health care workers in this country, at all levels including during initial professional training, specialist training, and continuing education for those already in practice. Programmes already in place in other countries could serve as models. The New Zealand public is not receiving the benefits of current knowledge and new findings about sleep disorders. The costs in terms of unnecessary human suffering, inappropriate diagnoses and treatment, and avoidable accident compensation claims, is likely to be very high.

Clinical services for the treatment of sleep disorders in New Zealand are in their infancy, and are unevenly distributed throughout the country, as a result of the individual priorities of the [former] regional health authorities (Dr John Kolbe, personal communication, January 1996). To date, all facilities are directed primarily or exclusively at the diagnosis and treatment of sleep apnoea. Only three facilities currently provide in-house overnight polysomnography: the Sleep Disordered Breathing Unit at Green Lane Hospital, Auckland; the private Mercy Specialist Centre, also in Auckland; and the unit at Dunedin Public Hospital. Christchurch Hospital uses ambulatory monitoring devices for both in-hospital and out-of-hospital diagnostic studies. Polysomnography can provide confirmatory diagnostic evidence in cases of sleep apnoea, narcolepsy, periodic limb movements, nocturnal epilepsy, and sleep terrors, and helps determine the severity of these conditions. Its use in the evaluation of insomnia is somewhat controversial, but may be beneficial when sleep apnoea, periodic limb movements, or sleep misperception are suspected.

A number of smaller centres (including Palmerston North, Wanganui, Hastings, Tauranga, and Northland) have in-house oximetry facilities (oximetry devices are used to continuously monitor oxygen levels in the blood) that are used to diagnose sleep apnoea (Dr Andrew Veale, personal communication, January 1996). Relying on oximetry alone as a diagnostic tool for sleep apnoea is not universally accepted in the sleep medicine community. Wellington Hospital performs nap studies with full respiratory monitoring for diagnosis, supported by oximetry monitoring at home (Dr Kevin Gain, personal communication, January 1996). Waikato Hospital has no in-house facilities dedicated to the diagnosis and treatment of sleep disorders.

Nasal continuous positive airway pressure (CPAP) is the most commonly used medical treatment for sleep apnoea. However, funding for CPAP machines is either inadequate to meet current demand, or non-existent, and they are not currently covered by major health insurance providers (Dr Andrew Veale, personal communication, January 1996).

In contrast, in the US, a National Sleep Center, housed within the National Institutes of Health, has been established in response to the findings of the National Commission on Sleep Disorders Research (Dr William Dement, Commission Chairman, personal communication, December 1995).

## TERTIARY PREVENTION

Unless there are other complicating factors, most patients with sleep disorders, including those chronically affected, can live in the community. However, there is a need in some instances for patient support services. For example, although CPAP is very effective for most patients, non-compliance rates can be high. The technology is evolving quickly. Nevertheless, it has been likened to 'sleeping with a vacuum in your ears and a scuba mask on your face' (NCSDR 1993). There is currently no cure for narcolepsy. The excessive daytime sleepiness is usually treated with stimulants, while cataplexy and other REM sleep-related symptoms are treated with antidepressants (Guilleminault 1994). People with narcolepsy can become successful and productive when receiving adequate medication and when understood by teachers, employers, and families (NCSDR 1993). The Sleep Apnoea Association of New Zealand and the Narcolepsy Association provide patient support services in this country.

## QUATERNARY PREVENTION

In addition to the usual three levels of preventive action, Cooper (1990) proposes that a fourth level is required where there is a very incomplete knowledge base. This level includes the development of health information systems and the promotion of research. To estimate the true impact of sleep disorders on New Zealand society, and to identify at-risk groups and develop targeted preventive programmes, it will be necessary to collect local prevalence data. This is only possible where comprehensive diagnostic and treatment services are available, reinforcing the need for the preceding levels of preventive action. The systematic collection of data on shiftwork and scheduling practices in different industries is necessary to assess the magnitude of shiftwork-related sleep problems in the New Zealand workforce. Information on the contribution of sleep- and fatigue-related factors to accidents of all kinds has not been systematically collected. New approaches to accident investigation are being developed (National Transportation Safety Board 1994a, 1994b, 1995) that are expected to provide important information for more effective accident prevention programmes. Research is a key element in quaternary level prevention. Increasing understanding of sleep and sleep disorders will improve diagnosis, treatment, and prevention. Research on the sleep abnormalities associated with mental and addictive disorders can be expected to advance understanding of the pathophysiology of these disorders (NCSDR 1993). In addition, researchers have an important role in monitoring new developments and findings internationally, and making this new knowledge available for application in New Zealand.

## CONCLUSIONS

A co-ordinated preventive approach to sleep disorders and sleep deprivation is needed in New Zealand. Sleep disorders medicine is in its infancy in this country, and is currently developing in a somewhat piecemeal fashion that is unlikely to lead to the efficient use of limited health care resources. It is a multidisciplinary field having intersections with psychiatry, psychology, neurology, respiratory medicine, ear-nose-and-throat, occupational and public health. In the first instance, it would be effective and cost-efficient to have an independent National Sleep Centre, similar to that of the NIMH in the US, tasked with:

- enhancing co-operation between the different regions and specialties
- organising training courses for health care workers and educational programmes for the general public
- providing an information clearing house.

Such a national facility would be a resource for other agencies, including the Ministries of Health and Education, the health funder, the Department of Labour, and the Accident Rehabilitation and Compensation Insurance Corporation.

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