Insomnia treatment in New Zealand

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Abstract

Aim To describe insomnia treatment in New Zealand and estimate the annual societal costs of insomnia among New Zealanders aged 20–59 years.

Method Twenty-one interviews were conducted with insomnia treatment providers in New Zealand using a snowballing recruitment method. Information from the interviews and the international literature was used to estimate treatment profiles, availability, uptake and costs, as the basis for a decision analytic model with micro costing of each potential outcome. Sensitivity analyses were conducted with 10,000 Monte Carlo simulations randomly varying between each model parameter between minimum and maximum estimates.

Results The treatment provider interviews highlighted the unstructured nature of insomnia treatment in New Zealand. The net cost of treating a person with insomnia was estimated to be –$482. The net annual benefit (saving) for treating insomniacs aged between 20–59 yrs was estimated at $21.8 million.

Conclusion The estimated total societal costs per QALY gained by treating insomnia is substantially lower than the average QALY cost-effectiveness threshold ($6,865) of PHARMAC funding decisions for new pharmaceuticals. Thus, these analyses strongly support the cost-effectiveness of insomnia treatment.

Insomnia is defined as having difficulty initiating or maintaining sleep, or non-restorative sleep, together with impaired waking function that has been present for at least one month. These complaints occur despite having adequate time and opportunity for sleep.[1,2] Insomnia may occur secondary to other conditions including medical and psychological conditions, substance abuse and other sleep disorders, or it may occur as primary insomnia.

Based on a national survey of insomnia symptoms,[3,4] we have estimated that 13.0% of New Zealanders aged 20–59 yrs are affected by at least one symptom of insomnia often/always, together with excessive daytime sleepiness. Māori are affected disproportionately (prevalence in the study population: Māori 19.1%, non-Māori 8.9%). The risk of reporting a chronic sleep problem (lasting longer than six months) increased with increasing socioeconomic deprivation and increasing age, but ethnicity and sex were not significant independent risk factors. These figures are similar to international population prevalence estimates, in which approximately 30% of individuals report symptoms of insomnia, 15–20% report insomnia symptoms with daytime impairment and 5–10% meet a diagnosis of insomnia according to standardised criteria.[1,2,5]

A number of health factors such as poor physical health, poor mental health, and symptoms of anxiety or depression are associated with insomnia.[6] Individuals with insomnia are more likely to develop symptoms of depression at a later assessment,

and persistent insomnia symptoms may increase the likelihood of developing a mental health disorder at a later date.[7] It has been shown that insomnia symptoms precede the onset of depression and that depressed older individuals with persistent insomnia are more likely to remain depressed (OR 1.8) than those who do not suffer from insomnia.[8,9]

Few studies have investigated whether there is a causal relationship between insomnia and poor physical wellbeing, however it is known that short sleep duration is a risk factor for increased body mass, metabolic dysfunction, type 2 diabetes and hypertension.[10] Individuals with insomnia are more likely to take more medications, use more healthcare resources, be absent from work due to illness more often, and have more work-related and motor vehicle accidents.[11,12] Recent studies controlling for anxiety, depression and various medical comorbidities have shown that poor sleep can independently impair health-related quality of life.[13]

Despite significant advancement in pharmacological and non-pharmacological insomnia treatment internationally, including practice parameters for the behavioural and psychological treatment of insomnia,[14,15] there is currently no standardised approach to the diagnosis and treatment of insomnia in New Zealand. There is also no formal training of health care professionals working in this area and no current requirement for treatment providers to be legally registered.

This study aimed to:

- Investigate insomnia treatment in New Zealand based on interviews with a snowball sample of different providers; and

- Estimate the societal costs of insomnia among New Zealanders aged 20–59 yrs.

The economic modelling and analysis followed the approach we used in estimating the societal costs of obstructive sleep apnoea syndrome in New Zealand.[16]

Method

Interview—Structured interviews of insomnia treatment providers were conducted in person and by telephone between October 2007 and March 2008. The interviews were used to collect information on the profile of patients seen, the diagnostic and treatment practices being used, length of treatment regimes, patient outcomes in terms of treatment success, and the costs of treatment. In addition to open interview questions relating to their diagnosis and treatment practices, interviewees were shown or read a list of treatment options sourced from the literature, but not limited to those validated in the literature.[14,15] Interviewees were also given the opportunity to comment on any issue pertaining to insomnia treatment that they felt had not been adequately discussed within the structured interview.

Initial interviews were conducted with sleep physicians known to the researchers and currently working in established clinics, as well as other health practitioners known to specialise in insomnia treatment. A snowballing method was used during the interview process to build a small database of practitioners to interview that would canvas the range of treatment options currently available.

In order to obtain a reasonable representation of the different insomnia treatment practices available in New Zealand, providers were categorised as: *specialist physicians* (appropriately qualified physician working in specialty medical practice other than general practice); *general practitioners* (GP); *psychologists*; *pharmacists; health practitioners* (a medically-trained GP or other qualified health practitioner who has taken an interest, or undergone some training, in sleep); and *alternative health practitioners* (a practitioner with any level of training in alternative medicine, practising insomnia treatment). An equal number of treatment providers were sought from each category for interview.

A scoring system for comparing providers was developed based on: category of practitioner; being registered to practise with an appropriate New Zealand Registration Board or Council under the Health Practitioners Competence Assurance Act (2003); apparent knowledge of sleep terminology and medicine (and in particular, insomnia); diagnostic and treatment approaches used; practising within their scope of practice and competency guidelines; and provision of patient follow-up. Knowledge of sleep terminology and sleep medicine was rated against a four-point scale ranging from poor (lacked any knowledge or understanding of sleep terminology or medicine) to excellent (full understanding of sleep terminology and medicine).

Economic analysis—This study is a retrospective, prevalence-based, cost utility analysis (CUA) where net treatment costs were compared with quality of life years (QALYs) gained. The impact of treated and untreated insomnia on health resource utilisation and quality of life were evaluated to estimate the total costs of all cases in a one year period. As a one year time frame was used, discounting of costs was not necessary.

The interviews and a review of the literature were used to develop a treatment cost decision tree which was used as a basis for the health economic costing model. The decision tree took into account potential pathways for patients with insomnia, the population prevalence of insomnia, and the direct medical and non-medical costs associated with diagnosis of insomnia. To maintain a manageable level of complexity, the final version of the model represented a simplified version of all potential pathways. Pathways with low probability were excluded and the model was limited to one level of on-referral. On-referral pathways were also limited to those identified by the interviewees.

Patient pathways—The final decision tree is shown in Figure 1. In the first instance, a patient with insomnia could choose to seek treatment or not seek treatment. The treatment provider interviews were used to estimate the total number of patients who would seek treatment, and the proportions who would seek treatment from each category of provider. Since patients cannot self-refer to a specialist physician, this option only occurs in subsequent branches of the model. In each case, the probability of a confirmed diagnosis of insomnia, successful treatment of insomnia, and on-referral to other treatment providers were estimated.

For example, we assumed that approximately 40% of patients first approached their GP for treatment of insomnia. Of these, 65% received a diagnosis of insomnia and treatment was initiated. It was estimated that for 87.5% of these patients treatment was successful, with the remaining 12.5% were on-referred to either a psychologist, specialist physician or health practitioner. Similar pathways were constructed for other treatment providers. To account for uncertainty in estimates of the proportion of patients following each pathway, high and low probabilities were calculated as ±25% of the base case.

Prevalence and QALYs—The prevalence of insomnia was estimated as 13.0%, with a high probability of 16.2% and a low probability of 9.7%. Quality of life years (QALYs) gained with successful treatment were estimated from international literature for the base case values, and 0 was used as the low value.[18–20] Two treatment providers retrospectively completed a EuroQoL 5D (EQ–5D) questionnaire relating to successful treatment of insomnia in their patients, which were compared against the international literature. The EQ–5D score of one treatment provider was used for the high case value for QALYs gained in the decision tree. The score from the remaining practitioner was determined to be a high outlier and was disregarded.

Resource utilisations—At each node in the decision tree, events take place and resources are consumed. For example, a person with insomnia may consult a pharmacist and be recommended an over-the-counter medication. A purchase is made and transport costs are incurred. The resource utilisation estimates are summarised in Table 1.

Table 1. Resource utilisations by event

Events	Units of resource utilised by each event									
	General Practitioner Consult	Specialist Physician Initial Consult	Specialist Physician Follow Up Consult	Psychologist Consult	Health Practitioner Consult	Alternative Health Practitioner Consult	Prescription Medicine	Non Prescription Medicine	Transport For Treatment (Round Trip)	Increase In Total Health Cost Per Capita
Do not seek treatment										1.0
Seek treatment										
1 Pharmacist								1.0	1.0	
1.1 Refer General Practitioner	1.0						1.0		1.0	
1.2 Success										
2 General Practitioner	1.0								1.0	
2.1 No further action										
2.2 Treat							1.0			
2.2.1 Success										
2.2.2 Refer										
2.2.2.1 Psychologist				4.0					4.0	
2.2.2.2 Specialist Physician		1.0	1.0				1.0		2.0	
2.2.2.3 Health Practitioner					2.0				2.0	
3 Health Practitioner					1.0				1.0	
3.1 No further action										
3.2 Treat							0.5			
3.2.1 Success										
3.2.2 Refer										
3.2.2.1 Psychologist				4.0					4.0	
3.2.2.2 Specialist Physician		1.0	1.0				1.0		2.0	
3.2.2.3 General Practitioner	1.0						1.0		1.0	
3.2.2.4 Other Health Practitioner					3.0		0.5		3.0	
4 Psychologist				1.0					1.0	
4.1 No further action										
4.2 Treat										
4.2.1 Success										
4.2.2 Refer/ no further action										
4.2.2.1 Other Psychologist				4.0					4.0	
4.2.2.2 Specialist Physician		1.0	1.0				1.0		2.0	
4.2.2.3 General Practitioner	1.0						1.0		1.0	
4.2.2.4 No further action										
5 Alternative Health Practitioner						1.0			1.0	
5.1 No further action										
5.2 Treat						2.0			2.0	
5.2.2 Success										
5.2.3 Refer/ no further action										
5.2.3.1 Other Alternative Health Practitioner						2.0			2.0	
5.2.3.2 General Practitioner									1.0	
5.2.3.3 No Further Action										

Cost estimates—Costs were categorised as direct medical and direct non-medical. This study assumed the cost of any conservative, behavioural and/or psychological therapy was included in the cost of the consultation. Only incremental costs were included. That is, if a cost would have been incurred regardless of whether an event occurred or not, it was not included in the analysis. High and low values for each cost were calculated as ±25% of the base case value, and all costs were exclusive of GST.

Table 2. Unit resource cost estimates for insomnia treatment in 2009 New Zealand dollars

Resource	Base Case	Source
Direct Medical		
General practitioner	$48.89	Average adult consultation fee[21]
Specialist physician initial	$222.22	Initial adult consultation fee for medical practitioner band III[21]
Specialist physician follow up	$99.56	Follow-up adult consultation fee for medical practitioner band III[21]
Psychologist	$88.89	Initial adult consultation fee[21]
Health practitioner	$120.00	Average adult consultation fee for medical practitioner band II;[21] high case, interviews
Alternative health practitioner	$75.56	Base case and range, interviews
Prescription medicine	$6.42	Zopiclone,[22,23] interviews; base case, 7.5mg @30 days plus prescription dispensing fees[24]
Non prescription medicine	$16.00	Blackmores Valerian Forte,[25] interviews
Increase in cost per capita for individuals with and without insomnia	$627.52	Difference in total health costs of individuals with and without insomnia, derived from population prevalence estimates[3,4,26–28]
Direct Non-Medical		
Transport for treatment (round trip)	$16.71	Average reimbursement of $0.63/km for round trip to hospital (average 29.83km)[29]

Sensitivity analysis—To account for uncertainty in prevalence and cost estimates, 10,000 Monte Carlo simulations were conducted using randomly generated variables between the low and high estimates for each model parameter.[30] Multiple linear regression was then used to evaluate the effects of each model parameter on the total direct and indirect costs, and the total costs calculated by the model.

Results

Insomnia treatment providers—Of 31 providers approached, 18 agreed to complete an interview. Three specialist physicians, two GPs, one pharmacist, five psychologists, three health practitioners and four alternative health practitioners completed a full interview. Three pharmacists were not able to commit the time required to complete a full interview and agreed to complete a shortened version so that costing information and patient treatment pathways could be determined. Data from all 21 interviews were used in the analyses.

Insomnia patients were referred to treatment providers via a number of pathways. Self-referral and GP were the most common modes of referral, with occasional referrals from psychologists, psychiatrists, nurses, occupational health physicians and sleep physicians. Those interviewed reported that insomnia patients have often consulted several other insomnia treatment providers before seeking their services.

Among interviewees, 81% stated that their patients had consulted a GP at some stage and 81% stated that their patients had consulted alternative health practitioners in the

past. Psychologists, psychiatrists, occupational health physicians and sleep physicians were also occasionally consulted. Four of the 21 interviewees did not hold any registration to practise under the Health Practitioners Competence Assurance Act (2003), three because their field of work is not covered by the Act and one whose registration had lapsed.

Providers indicated treating individuals aged 3 months to 90 years for insomnia, of which the majority were middle-aged and Caucasian. The number of patients seen by each practitioner varied greatly, ranging from 15–110 patients per year for specialist physicians to 1000–5200 per year for pharmacists.

The majority of interviewees (62%) had poor/fair knowledge of the different types of insomnia. This included all the pharmacists, alternative health practitioners, and GPs interviewed. These providers were also the most likely to confirm a diagnosis of insomnia, were the least likely to use structured interviews, validated questionnaires, or supplementary tools for diagnosis, had the poorest understanding of standard sleep terminology, and offered the most limited range of treatment options. All psychologists and specialist physicians, and the majority of health practitioners, considered supplementary diagnostic tools in their every day practice. Sleep diaries were the most commonly employed adjunct diagnostic tool.

Table 3 shows the treatment options offered to insomnia patients by different providers. Sleep hygiene education was the most popular option being offered by 61.9%. Approximately half the providers (52.4%) also considered pharmacological management of insomnia. Specialist physicians, GPs, health practitioners and psychologists always used validated treatment options as per the American Academy of Sleep Medicine guidelines.

A quarter of alternative health practitioners used validated treatment options, while the remainder of the interviewees (38%) used forms of treatment lacking any evidence base for successful insomnia treatment. None of the pharmacists interviewed used validated treatment options. Specialist physicians, GPs, and psychologists always implemented treatment according to best practice guidelines, as did three of four alternative health practitioners. However, while health practitioners reported using validated treatment options, two of the three deviated from best practice guidelines for these treatments.

Table 3. Treatment options offered to insomnia patients by provider type

Treatment options	Specialist Physician	Pharmacist	GP	Psychologist	Health Practitioner	Alternative Health Practitioner
N	3	4	2	5	3	4
Pharmacological management	100%	100%	100%	20%	33%	0%
Herbal remedies	0%	100%	0%	0%	0%	50%
Stimulus control	66.7%	0%	0%	40%	66.7%	0%
Temporal control therapy	33.3%	0%	0%	0%	33.3%	0%
Relaxation training	33.3%	0%	50%	40%	66.7%	75%
Imagery training	0%	0%	0%	20%	33.3%	0%
Sleep restriction therapy	100%	0%	0%	20%	66.7%	0%
Paradoxical intention	0%	0%	0%	0%	33.3%	0%
Cognitive therapy	100%	0%	0%	20%	33.3%	0%
Cognitive behavioural therapy	66.7%	0%	0%	100%	66.7%	0%
Multi-component therapy	33.3%	0%	0%	0%	33.3%	0%
Biofeedback	100%	0%	0%	0%	33.3%	0%
Sleep hygiene education	100%	50%	50%	60%	66.7%	50%
Exercise	0%	0%	0%	0%	66.7%	25%
Light therapy	33.3%	0%	0%	0%	66.7%	0%
Other treatment options	33.3%	0%	50%	60%	66.7%	100%

Note: The numbers of treatment providers interviewed in each group are shown in row labelled N.

Only 57.1% of those interviewed officially assessed treatment effectiveness as part of their insomnia treatment plan. Table 4 outlines the number of consultations and the estimated treatment success rate by treatment provider type. Unsuccessfully treated patients may continue to see a treatment provider for up to 180 days (up to 12 consultations) before being offered a referral to an alternative provider or discontinuing consultation.

Table 4. Estimated number of consultations, success rate and length of treatment regime for insomnia by provider type

	Specialist Physician	Pharmacist	GP	Psychologist	Health Practitioner	Alternative Health Practitioner
N	*3*	*4*	*2*	*5*	*3*	*4*
Number of consultations	1–2	1–2	2–3	2–6	3–4	3–5
Treatment success rate (%)	*	95	85–90	65–100	75–80	90–100
Average time for successful treatment(days)	90–365	3–7	14–30	14–56	21–90	14–126

* It was common for specialist physician to confirm diagnosis and treatment plan before referring back to another treatment provider/GP for implementation and ongoing management.

Most providers (94%) were of the opinion that there was an unmet need for insomnia treatment in New Zealand. Many felt that patients did not have sufficient validated treatment options available to them, and that patients were not currently provided with accurate information when seeking treatment for insomnia. A proportion of treatment providers commented that they felt overwhelmed by the number of patients approaching them for insomnia treatment, and either could not meet that demand themselves, or were not confident in their ability to provide effective insomnia treatment.

Costs—Figure 1 depicts the final decision tree used to model treatment pathways and costs.

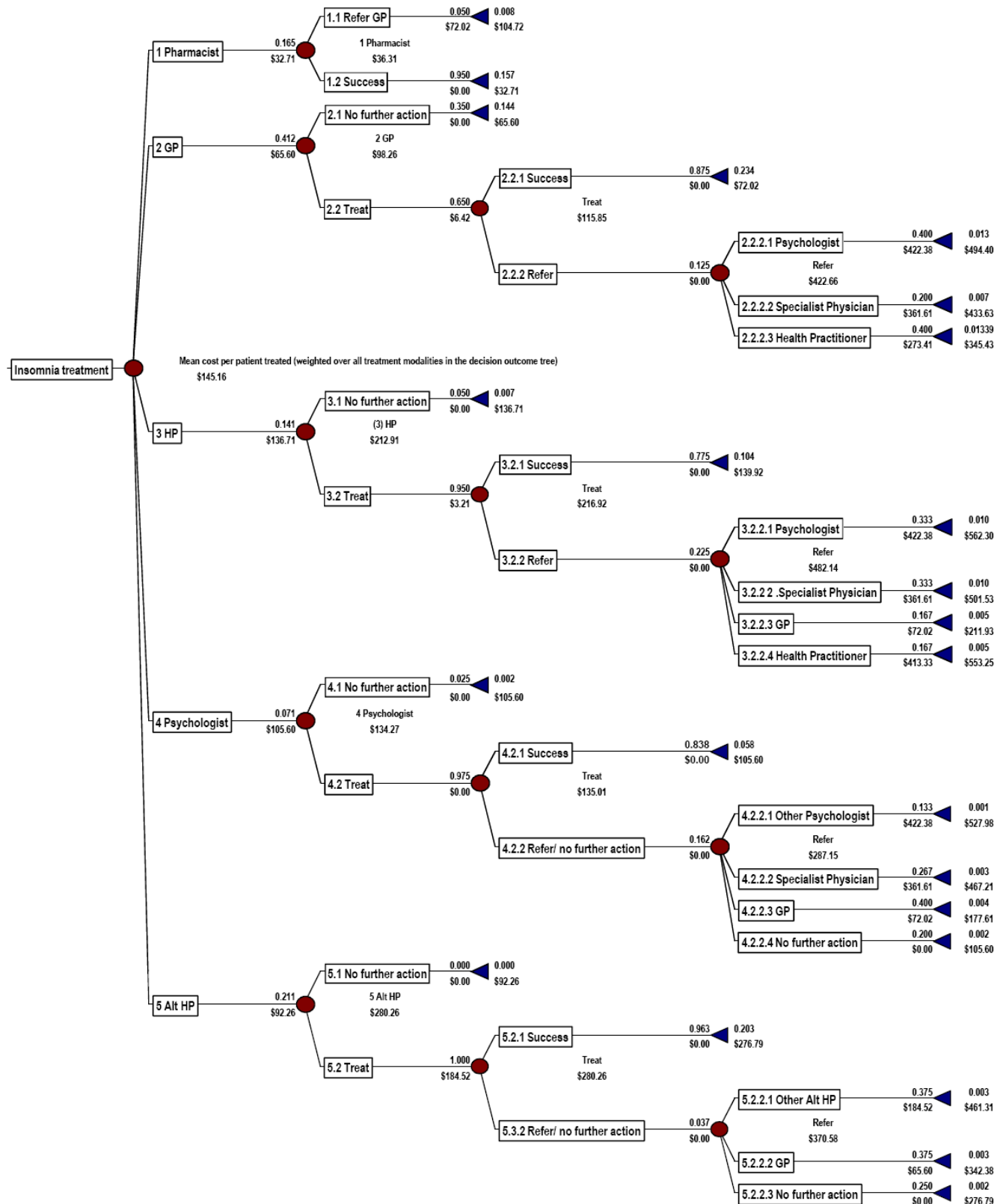**Figure 1. Treatment cost decision tree (base case values)**

Table 5 summarises the estimated total societal costs of insomnia in New Zealand. The mean treatment cost across all treatment provider types was $145 per patient. The net cost of treating a person with insomnia was estimated to be –$482 ($145 less health costs avoided of $628), and 90% of the Monte Carlo simulations fell between –$679 and –$41 (a negative cost is a benefit).

Table 5. Total societal costs of insomnia treatment in New Zealand

Variables	Per Person Treated	NZ Total Million
At risk population (20–59 years, at June 2008)[31]		2.317
Prevalence of insomnia 13.0%[24]		0.300
Proportion seeking treatment 15%		0.045
Costs incurred	$145.00	$6.52
Costs avoided	–$628.00	–$28.4
Net cost	–$482.00	–$21.8
QALYs gained (#)	0.157	0.007
Net cost per QALY gained	–$3,072	–$21.8

The net annual benefit (saving) for treating insomniacs aged between 20–59 yrs was estimated at $21.8 million. The cost per QALY gained was estimated to be –$3072, and 90% of the Monte Carlo simulations fell between –$8102 and –$240.

The sensitivity analyses indicated that the three key determinants of the cost utility ratio were (in order of importance); costs avoided (difference in increase in health costs per capita for those untreated patients compared with successfully treated patients); the number of QALYs gained from successfully treating a patient; and costs incurred (treatment costs).

Discussion

The interviews undertaken for this study have highlighted the diversity of treatment services being offered, and the relatively small proportion of providers who have any awareness of international best practice standards for insomnia diagnosis and treatment. Insomnia treatment providers are not required to be registered or accredited, so there is no way of assessing how representative the 21 interviewees are of services being offered nationwide. Nevertheless, the snapshot provided does not indicate effective, efficient, or equitable provision of treatment services.

The cost utility analysis, comparing net treatment costs to QALYs gained, is based on a different approach to that used in previously published estimates of the societal costs of insomnia. Despite this different approach, the results of this study remain aligned with previous research[31,32] and indicate that effective treatment of insomnia saves money.

In 2009, the net annual societal cost of treating a person with insomnia was estimated to be –$482 per person (a saving). The estimated annual savings associated with

effective treatment of all people with insomnia aged 20–59 yrs was $21.8 million. The cost per QALY gained was estimated to be –$3072, and 90% of the Monte Carlo simulations fell between –$8102 and –$240. By way of comparison, the cost-effectiveness threshold of PHARMAC funding decisions for new medicines between 1999 and 2005 was $6,865 per QALY gained.[24]

The economic analysis has a number of limitations. The sensitivity analysis indicated that the number of QALYs gained from successfully treating a patient was a significant determinant of the cost utility ratio. In the absence of New Zealand data, QALY estimates were taken from the international literature. The published studies have used the SF-36 (a general health profile not specifically designed for economic evaluation). Two of the interviewees completed an EQ–5D (an economics tool designed for estimating QALYs), but this was retrospective and provided a general indication only of the quality of life improvements assumed by New Zealand practitioners.

An accurate assessment of QALYs gained would require prospective completion of the EQ–5D by individuals undergoing insomnia treatment. It was also not possible to include the costs of accidents and decreased productivity for people with untreated insomnia, or the extended impact on their family and friends.

The cost estimates in this study are based on the international literature and the treatment provider interviews. They have the limitation that we do not know how representative the treatment providers are. In addition, self-rated on-referral and treatment rates were used to determine event probabilities in the treatment cost decision tree. These values were not able to be independently verified and treatment providers did not provide an exact definition of 'success'. However, a conservative approach was taken in all calculations.

With the exception of 'other' alternative health techniques, most self-rated treatment success rates aligned reasonably well with the international literature and tended towards conservative estimates.[15,33] Although treatment success may not be a true reflection of patient outcomes, treatment success influenced how a treatment provider interacted with a patient (that is, on-referral, continuing treatment or discharge).

Population prevalence is a key factor in determining the total societal costs of insomnia. The international literature estimates insomnia prevalence in the range of 9–30%[5] and previously published New Zealand data indicated that 25% of people aged 20–59 yrs had a current sleeping problem.[3,4] The present study used a conservative population prevalence estimate calculated from the national survey dataset, requiring at least one insomnia symptom along with daytime impairment (ESS >10), with a population prevalence of 13%.[27]

The international literature suggests that insomnia is associated with a range of other medical conditions. However, the causal relationship between these conditions and insomnia is not well established. It is also not known whether insomnia treatment alone would improve associated medical conditions, such as anxiety or depression. Therefore, the study took the conservative approach of estimating costs only from total health care utilisation. In general, research addressing the health and safety consequences of untreated insomnia is less developed than for sleep-related breathing

disorders, where knowledge has been greatly enhanced by a number of large longitudinal cohort studies.

The providers interviewed have sought to address patient needs in the absence of a structured approach to insomnia treatment in the healthcare system. A 2010 survey of sleep services provided by District Health Boards found that none had dedicated funding for the treatment of insomnia (Kanchana Pathirana, personal communication).

The dilemma of a high burden of disease and lack of appropriate diagnosis and treatment services for insomnia is not unique to New Zealand.[6,17] In part, this probably reflects the diverse aetiology of insomnia and the range of treatment options, which should be linked to differential diagnosis. Nevertheless, the conservative economic analysis presented here indicates that a more systematic approach to treatment would be highly cost-effective for the New Zealand healthcare system.

This study highlights a number of significant issues. New Zealand would greatly benefit from a standardised approach to insomnia diagnosis and treatment. In particular, the multiple aetiologies of insomnia require differential diagnosis and a systematic approach to treatment that is implemented by trained individuals across a range of disciplines.

New Zealand is fortunate to have a well characterised population in terms of sleep disorder prevalence. However, a more accurate assessment of the economic burden of insomnia would also require prospective measurement of quality of life, resource utilisation, treatment pathways, and incidence of adverse health and safety outcomes in those undergoing treatment for insomnia.

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