Sleep disorders, depression, anxiety and satisfaction with life among young adults: a survey of university students in Auckland, New Zealand

Chinthaka B Samaranayake, Bruce Arroll, Antonio T Fernando, 3rd

Abstract

Aim Sleep symptoms, depression and anxiety often coexist and tertiary students are a population group that are increasingly recognised to be at risk. However the rates of these conditions in the New Zealand population are poorly understood. The aim of this study was to determine the rates of sleep disorders, depression and anxiety, and identify correlations between satisfactions with life among university students in Auckland.

Method Auckland Sleep Questionnaire (ASQ) was administered to undergraduate students from six schools of The University of Auckland. The different types of sleep disorders were calculated for the students who reported a significant sleep problem lasting more than 1 month. The rate of depression, anxiety and substance use as well as the satisfaction with life scale scores were also calculated for the whole cohort.

Results A total of 1933 students were invited to participate and 66.8% completed the questionnaire. The median age was 20 years (range 16–38) and women represented 63.9% of the total group. A total of 39.4% of the students surveyed reported having significant sleep symptoms lasting longer than 1 month. The most prevalent causes for sleep symptoms were depression and anxiety. Delayed sleep phase disorder was found in 24.9% of students and parasomnias were reported by 12.4%.

Depression and anxiety were present in 17.3% and 19.7% of the total group respectively, and 7.3% of students had thoughts of "being better off dead" or self-harm. A total of 15.5% students were found to have a CAGE score ≥2 and 9.3% reported using recreational drugs in the last 3 months. Moderate negative correlations between SWLS scores and depression and anxiety were found (r=-0.45 and r=-0.37 respectively).

Conclusion A large number of university students are suffering from significant sleep symptoms. Mood disorders, substance use, and circadian rhythm disorders can greatly contribute to sleep difficulties in this population group. The study also showed that harmful alcohol and drug use was common among this population group and is associated with clinically significant depression and anxiety. Accurate diagnosis using defined criteria will enable effective treatment for these conditions that impact greatly on the quality of life.

Sleep symptoms are distressing and greatly impact on quality of life.[1] The prevalence of sleep disorders in the general population ranges between 10% to 48%.[2,3] Young adults, particularly university students, are increasingly recognised as a population group that is greatly affected by sleep difficulties.[3] Erratic sleep schedules due to academic or employment demands and lifestyle choices, easy access to alcohol and

other substances as well as minimal supervision are some of the contributing factors for high rates of sleep symptoms in this population.[4,5]

Multiple biological and social risk factors often coexist to precipitate sleep symptoms in predisposed young adults.[6] Circadian rhythm disorders, especially delayed sleep phase disorder (DSPD), is common in young adults, which can present with difficulty falling asleep at night and difficulty waking in the morning.[7] Primary sleep disorders, such as parasomnias and restless leg syndrome often present with day time sleepiness or fatigue.[8,9]

Sleep-related breathing disorders, such obstructive sleep apnoea, is becoming more prevalent in young adults, as well as older adults, with increasing rates of obesity. Comorbid medical conditions causing hypoxemia and dyspnoea, gastroesophageal reflux, chronic pain and neurodegenerative diseases significantly increase the risk of sleep symptoms.[10]

Psychiatric disorders are common comorbidities in young adults presenting with sleep symptoms.[5,11] Up to 40% of young adults with sleep symptoms are reported to have coexisting depression and/or anxiety disorder.[12,13] Another major contributing factor to sleep symptoms is substance use. Unhealthy alcohol use can be a major cause of sleep symptoms, particularly in the young adult populations.[14]

Furthermore, a high prevalence of psychological distress including depression and anxiety has been reported in tertiary students, which can be represented in a variety of ways, including burn out, depression, anxiety, poor mental and physical wellbeing, and poor quality of life.[13, 15-17]

Depression and anxiety symptoms are also associated with lower levels of satisfaction with life.[17] There is also evidence to suggest that individuals with significant psychological distress while being a student, go on to have high level of distress during their professional careers.[16] High level of personal distress leads to adverse consequences in academic performance, competency, professionalism and physical health of young adults.

There is limited international literature on the prevalence of different types of sleep disorders, and contributing depression, anxiety and substance use among young adults. The currently available literature mainly focuses on the sleep patterns, severity of insomnia and impact on academic performance.[5] Furthermore, rate of sleep disorders and co-existing depression, anxiety and substance use among New Zealand young adults has not been studied in the past.

The aim of this study was to determine the rates of sleep disorders, depression and anxiety, and identify correlations between satisfaction with life among university students in Auckland.

Method

Students from six schools of The University of Auckland (Medical, Nursing, Health Science, Engineering, Law and Architecture) were sampled. At least one whole year group from each of the six schools were invited to participate. The study investigators administered a paper version of the Auckland Sleep Questionnaire (ASQ)[18] to the whole year groups prior to a lecture with the consent of the participants and lecturers. A short introduction into the study was given and the study investigators were present in the lecture theatres while the students completed the questionnaire. The students were given 15 minutes to complete the questions prior to the lecture and the questionnaires were collected at

the end of the lecture. The study was conducted in the middle of the academic semesters to avoid the acute stress of exams affecting the results.

The ASQ was designed to diagnose sleep disorders, and was validated with high sensitivity and specificity in the primary care setting in New Zealand.[18] The questions used in the ASQ were derived from either standard primary care inventories—namely GAD-7 (for anxiety),[19] PHQ-9 (for depression),[20] CAGE (for alcohol)[21], or the International Classification Sleep Disorders (ICSD). The 5-item Satisfaction with Life Scale (SWLS) developed by Diener et al[22] was used to measure the participants' life satisfaction. The assumptions relating to some of the diagnostic criteria in ASQ and the validation method is described elsewhere.[18] There were no exclusion criteria for participation in the study. Ethical approval for this study was granted by the Northern Regional Ethics Committee (NTX/07/05/038).

Table 1 provides the criteria used to define the specific conditions affecting sleep which are included in this study. A similar logic to that was previously described in Arroll et al[3] was used for the data analysis. The students who reported significant sleep symptoms lasting for more than 1 month were initially identified, and for these students the rates of identifiable causes of sleep symptoms as defined in Table 1 were calculated. The rate of depression (PHQ score ≥10), anxiety (GAD score ≥8), positive CAGE screen (CAGE ≥2) as well as SWLS scores were calculated for the whole cohort.

Subgroup analyses between ethnicity, gender and courses were carried out. The chi-squared test was used for subgroup comparison. Spearman correlation was used to quantify associations between groups. The 95% confidence intervals (95% CI) were calculated for rates. The reported differences were significant at p value <0.05. The analyses were carried out using Statistical Package for the Social Sciences (SPSS for Windows, IBM Corporation, Somers, NY, USA).

Table 1. Definition of significant sleep symptoms and conditions contributing to sleep symptoms used in the study

Condition	Auckland Sleep Questionnaire criteria
Reported sleep symptoms	Do you have problems getting to sleep, staying asleep or waking early such that it affects your work function the next day- this includes feeling excessively sleepy the next day, for the duration of at least one month.
Depression	PHQ score ≥10
Anxiety	GAD score ≥8
Obstructive sleep apnoea	Having ≥4 of (i) Have excessive daytime sleepiness (ii) pauses in between breaths during sleep (iii) morning headache, (iv) dry mouth (v) loud snoring. i and ii must be present.
Delayed sleep-phase disorder	All of the following: considers self to be an evening person, choosing to go to bed late or choosing to wake up late and has no medical problem, mood disorder, substance problem, breathing disorder or other sleeping disorder. Going to bed after midnight.
Parasomnias	Reported sleepwalking, started before a teenager, difficulty arousing during episode and no subjective awareness OR sleep-talking occurring ≥3/week causing disturbance to bed partner and no subjective awareness of episode OR reported teeth grinding and one of: abnormal wear of teeth, sounds associated with grinding or jaw muscle discomfort occurring ≥3/week OR unpleasant sensations (aches, pains or creeping) in legs affecting sleep, relieved by movement or rubbing occurring ≥3/week.
General health problem	Significant health problems affecting ability to sleep well occurring ≥3/week
Alcohol problem	CAGE score ≥ 2
Other substance use	Reported drug use in the last three months, and drugs use affecting sleep or quality of sleep.
Primary insomnia	Reports a sleep problem but has no other diagnosable disorder in Table 1.

PHQ = Patient Health Questionnaire; GAD = Generalised Anxiety Disorder Questionnaire; DSPD = Delayed Sleep-Phase Disorder.

Results

A total of 1933 students were invited to participate and 1292 (66.8%) students completed the questionnaire. The responded students included 575 (62.0%) medical, 208 (75.4%) health sciences, 170 (69.1%) nursing, 136 (69.4%) law, 108 (65.1%) engineering and 95 (77.9%) architecture students. The median age of the students was 20 years (range 16 to 38 years), and females represented 63.9% of the group. In terms of ethnicity makeup, 39.8% were New Zealand European, 12.6% Māori, 4.1% Pacific Island, 30.1% Asian and 13.4% other.

Sleep disorders—A total of 39.4% (n = 509/1292, 95% CI 37% to 42%) of students surveyed in this study reported a significant sleep problem for more than one month. Specific conditions causing sleep symptoms for the surveyed students are listed in Table 2. No gender difference in the students with sleep symptoms was observed. There was no statistically significant difference in the rate of reported sleep problem in the different course groups. In terms of ethnicity sub-group analysis, the rate of significant sleep symptoms reported by Māori and Pacific Island students were 54% and 49.1% respectively. These rates were higher than the rates reported by NZ European (39.1%) and Asian students (35.8%) when the ethnicity groups were compared amongst one another (p=0.01). In terms of specific causes of sleep symptoms,

Māori students had a higher rate of CAGE score ≥2 compared to other ethnicities (p=0.008). Pacific Island students had a higher rate of depression as a cause of sleep symptoms compared to other ethnicities (p=0.02). There were no other statistically significant differences in the specific causes of sleep symptoms in the ethnicity groups.

Table 2. Specific causes of sleep symptoms as a proportion of those who reported having significant sleep symptoms

Specific conditions causing sleep symptoms	n (%) (N=509)	95% Confidence Interval
Depression	153 (30.8%)	26% to 34%
Anxiety	158 (31.0%)	27% to 35%
Obstructive sleep apnoea	12 (2.4%)	1.2% to 4.1%
Delayed sleep phase disorder*	127 (24.9%)	21% to 29%
Parasomnias	63 (12.4%)	9.6% to 16%
General health problem	53 (10.4%)	7.9% to 13%
Problematic alcohol use	89 (17.5%)	14% to 21%
Other substance problem	25 (4.9%)	3.2% to 7.2%
Primary insomnia*	45 (8.8%)	6.5% to 11%

*Primary insomnia and delayed sleep phase disorder are mutually exclusive. All other conditions are not.

Depression and anxiety—In the total study population, clinically significant symptoms of depression (PHQ ≥10) and anxiety (GAD ≥8) were found in 17.3% (n=223) and 19.7% (n=254) students respectively.

Table 3 provides the details of the depression and anxiety scores. A total of 96 (7.4%) students reported having thoughts of being better off dead or of hurting themselves in some way on several days in the 2 weeks prior to the survey, and 34 (2.6%) students had these thoughts on more than half of the days of the 2 weeks prior to the survey.

In sub-group analysis, female students reported higher rates of depression (19.7% versus 12.9% in males, p=0.04) and anxiety (22.9% versus 14% in males, p=0.009). The rate of depression was lowest among medical students at 11.5% (95%CI 8.9%–14.1%). No statistically significant difference was found between students from the other courses.

Table 3. Depression and anxiety among all the surveyed students (N=1292)

Condition	Statistics
Depression	
Mean PHQ for total group	5.6 (SD 4.6)
Number of students with PHQ ≥ 10	17.3% (233/1291) 95% CI (15% to 19%)
Mean PHQ for students with PHQ ≥ 10	13.8 (SD 3.8)
Anxiety	
Mean GAD for total group	4.6 (SD 4.4)
Number of students with GAD ≥ 8	19.7% (254/ 1291) 95% CI (18% to 22%)
Mean GAD for students with GAD ≥ 8	12.0 (SD 3.5)

Substance use—A total of 15.5% (200/1292) students were found to have a CAGE score ≥2. Males were more likely to have a CAGE score ≥2 compared to females (19.8% versus 13.1%, P=0.045). Students in non-health related courses (engineering, law and architecture) were more likely to have a positive CAGE screen compared to health related course (medicine, nursing and health science); 21.8% and 13.2% respectively (p=0.006). Students with depression were more likely to have a CAGE score ≥2 compared to non-depressed students (22.0% in depressed versus 15.0% in non-depressed students, P=0.02).

A total of 119 students (9.3%) reported using drugs in the last three months, with no statistically significant difference between health and non-health students (8.3% and 12% respectively, p=0.16). The most commonly used recreational drugs were cannabis and party pills.

Satisfaction with life—The mean SWLS score the total cohort was 25.6 (SD 6.6). Table 4 shows the percentages of students with different score categories. A moderate negative correlation was found between PHQ scores and SWLS scores for the total group (r=-0.45, p=0.007). A mild to moderate negative correlation was found between GAD scores and SWLS scores for the total group (r=-0.37, p=0.005). Cronbach's alpha coefficient for the five parts of the SWLS was 0.87, indicating good reliability and internal consistency of the SWLS scores.

Table 4. Rates of satisfaction with life categories in the total study population

SWLS Categories (score)	Student percentage (%)
Extremely satisfied (35–31)	21.7%
Satisfied (26–30)	40.1%
Slightly satisfied (21–25)	20.2%
Neutral (20)	11.9%
Slightly dissatisfied (15–19)	4.3%
Dissatisfied (10–14)	1.7%
Extremely dissatisfied (5–9)	0.1%

SWLS = Satisfaction with Life Scale.

Discussion

This study sought to expand the knowledge on rates of sleep disorders and commonly associated mental health conditions of depression, anxiety and problematic substance use among a group of university students in Auckland through the use of a validated diagnostic sleep questionnaire.

The study found that over one third of the surveyed students having significant sleep symptoms. The two most common causes of sleep symptoms in the surveyed student population were depression and anxiety symptoms. Another major contributing condition to sleep symptoms in our study was delayed sleep phase disorder with almost a quarter of the students reporting symptoms which are consistent with this condition. This was anticipated and is consistent with findings in international literature.[23]

The rate of primary insomnia in this study population was 8.8%, which is higher than expected, but similar to the rates from a previous New Zealand study on a general practice population with an older cohort.[3] The rate of obstructive sleep apnoea symptoms in our group was low at 2.4%, and is similar to the previous studies in this age group,[9] which may reflect the lack of pathophysiological physical characteristics among this population group.

Epidemiological data on sleep disorders, particularly studies that explore different causes of sleep symptoms, in young adults are scarce. The prevalence of primary insomnia in a sample of Italian adolescents and young adults aged 15 to 29 years was 4.5% (95% CI 3.2–5.8)[24]. Lund et al reported over 60% of university students having poor quality sleep using the Pittsburgh sleep quality index.[5] Lack et al reported the prevalence of DSPD in a sample of 211 students to be 17%,[25] similar to the rates reported by students with a sleep problem in our study. To the best of our knowledge, there are no previous studies that explore rates of causes of sleep symptoms in young adults in New Zealand.

Anxiety and depression rates among the total student group surveyed in this study (17.3% and 19.7% respectively) were lower than the general population rates found in the New Zealand Mental Health Survey in 2003, which reported prevalences of 20.7% (95%CI 18.1–23.7) and 23.9% (95%CI 20.9–27.3) for depressive and anxiety disorders respectively for the ages 16 to 24 years group.[26] A total of 7.4% of students in our study reported having thoughts of being better off dead or of hurting

themselves in some way on several days in the two weeks prior to the survey. This rate is similar to the finding of other international studies on tertiary students.[27,28] Nevertheless, this is a significant rate especially with the increasing youth suicide rates in New Zealand.

Rates of depression among students in The University of Auckland sample is comparable to the rates reported in the literature.[13,16,28,29] The gender difference in prevalence of mood disorders found in our study is also consistent with other population data from New Zealand.[26,30] As expected depression was associated with higher use of substances.

Potential causative factors for depression and anxiety among this population group include long work hours, sleep deprivation, increasing debt burdens, challenging career decisions, uncertainty about employment prospects especially in the current financial and job market, personal life events, and less than optimal learning environments. Alcohol and drug use rates observed in our study may reflect possible maladaptive coping mechanisms for dealing with the stressors of studying and training.

Our study population consisted of a relatively larger number of medical students compared to other courses. This may have skewed the results on the rates of depression and anxiety as medical students had lower rates compared to other students. However, the impact of the larger number of medical students on the overall rates of other causes of sleep symptoms is likely to be minimal as the rates were similar when compared to other course groups.

It was interesting to see a significant difference in the rates of unhealthy alcohol use among students in non-health related courses compared other students. This is in contrary to the belief that students in health related courses (particularly the medical students) may have poorer outcomes in these measures compared to other students.[16]

The rate of reported significant sleep symptoms among Māori and Pacific Island students (when analysed as separate groups) were higher than the rates reported by other ethnicities. This is in keeping with the findings of Paine et al, who found a significantly higher rate of reported rate of sleep problems in Māori compared to others in a New Zealand general population survey.[31]

Potential contributing factors for the higher rates of sleep symptoms in Māori and Pacific Island students may include the higher rate of alcohol use among Māori and the higher rate of depression among Pacific Island students. The results from our study further add to the evidence of disparities in health in Māori and Pacific Island populations compared to other ethnicities.

There are some limitations in this study. The lack of random selection of students is a shortcoming. Limited causal information can be derived from a cross-sectional study such as this, and conclusions about rates of sleep disorders going into mature adulthood in this population can only be speculated. Due to the limited resources available, not all of the course groups were able to be surveyed.

The lack of involvement of other tertiary institutions in Auckland, which may have a different demographic population, may impact on the generalisability study findings. Furthermore, acute stressors (such as upcoming assignments, tests or exams) may

have contributed to some of the sleep, depression and anxiety symptoms reported by surveyed the students.

Re-administering the questionnaire to the same group of students at different times of the year to use the individual students as their own control would have eliminated the impact of acute stressors on the study outcomes; however the resources of the project were limited. Due to the method used in the study, the students who did not attend the lecture on the day of the study were not able to be included. However the study investigators opted to conduct the study with paper questionnaires and being physically present in the lecture rooms during the survey to increase the response rate and participation.

The study investigators were not able to conduct the survey at a standardised time of the day for the different classes (morning versus afternoon). This may have affected the results particularly for students with circadian rhythm disorders. Furthermore, compared to non-student adults of similar age, university students have later sleep and wake times, higher rates of daytime sleepiness, and physical and mental health complaints,[5] thus the generalisability of the results to the general population may be affected. Furthermore, the definitive diagnosis of obstructive sleep apnoea is made by observing and making measurements of patients' breathing and oxygen saturations in an overnight sleep study. However this is not immediately available to many practitioners and beyond the resources of the study. Due to the nature of the surveying tool used in this study, the amount of alcohol use was not quantified and tobacco use was not assessed.

In summary, this study which is a first of its kind in New Zealand, showed that a large number of university students are suffering from significant sleep symptoms. Mood disorders, substance use, and circadian rhythm disorders can greatly contribute to sleep difficulties in this population group

Screening for these conditions in students presenting to primary and other health care services is important. The study also showed that harmful alcohol and drug use was common among this population group and is associated with clinically significant depression and anxiety. This study has the potential to aid clinicians within New Zealand in better appreciating the sleep-related health problems faced by young people in this country. It will be of clinical use to student health services and primary care clinicians dealing with this demographic group and to mental health planners.

In terms of recommendations for future research, a larger study with random selection of study participants from different tertiary institutions and using the participants as their self-control at different times of the year will overcome many of the shortcomings in this study. However, despite the limitations, the authors believe that the results of this study provide the epidemiological evidence required for developing frameworks for identifying and prioritising interventions for these important health conditions in the young adult population.

As these issues become better understood, this should lead to better management and treatment options, and better outcomes. Greater recognition and understanding should allow for better service planning in the health sector.

Author information: Chinthaka B Samaranayake, Registrar, Department of General Medicine, Middlemore Hospital, Auckland; Bruce Arroll, Professor of General Practice and Primary Health Care, Department of General Practice and Primary Health Care, Faculty of Medical and Health Sciences, The University of Auckland; Antonio T Fernando, 3rd, Senior Lecturer, Psychiatrist, Department of Psychological Medicine, Faculty of Medical and Health Sciences, The University of Auckland

Correspondence: Dr Chinthaka Samaranayake, Registrar, Department of General Medicine, Middlemore Hospital, Private Bag 93311, Otahuhu, Auckland 1640, New Zealand. Email: csam020@aucklanduni.ac.nz

References:

1. Reimer MA, Flemons WW. Quality of life in sleep disorders. Sleep Med Rev. 2003;7:335–49.

2. Ohayon MM. Prevalence of DSM-IV diagnostic criteria of insomnia: distinguishing insomnia related to mental disorders from sleep disorders. J Psychiatr Res. 1997;31:333–46.

3. Arroll B, Fernando A, 3rd, Falloon K, et al. Prevalence of causes of insomnia in primary care: a cross-sectional study. Br J Gen Pract. 2012;62:e99–103.

4. Brown FC, Buboltz WC, Jr., Soper B. Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. Behav Med. 2002;28:33–8.

5. Lund HG, Reider BD, Whiting AB, Prichard JR. Sleep Patterns and Predictors of Disturbed Sleep in a Large Population of College Students. J Adolesc Health Care. 2010;46:124–32.

6. Gaultney JF. The prevalence of sleep disorders in college students: impact on academic performance. J Am Coll Health. 2011;59:91–7.

7. Hazama GI, Inoue Y, Kojima K, et al. The prevalence of probable delayed-sleep-phase syndrome in students from junior high school to university in Tottori, Japan. Tohoku J Exp Med. 2008;216:95–8.

8. Phillips B, Hening W, Britz P, Mannino D. Prevalence and correlates of restless legs syndrome: results from the 2005 National Sleep Foundation Poll. Chest. 2006;129:76–80.

9. Hui DS, Chan JK, Ho AS, et al. Prevalence of snoring and sleep-disordered breathing in a student population. Chest. 1999;116:1530–6.

10. Katz DA, McHorney CA. Clinical correlates of insomnia in patients with chronic illness. Arch Intern Med. 1998;158:1099–107.

11. Kaneita Y, Yokoyama E, Harano S, et al. Associations between sleep disturbance and mental health status: a longitudinal study of Japanese junior high school students. Sleep Med. 2009;10:780–6.

12. McCall WV. A psychiatric perspective on insomnia. J Clin Psychiatry. 2001;62(Suppl 10):27–32.

13. Moo-Estrella J, Perez-Benitez H, Solis-Rodriguez F, Arankowsky-Sandoval G. Evaluation of depressive symptoms and sleep alterations in college students. Arch Med Res. 2005;36:393–8.

14. Singleton RA, Jr., Wolfson AR, Singleton RA, Jr., Wolfson AR. Alcohol consumption, sleep, and academic performance among college students. J Stud Alcohol. 2009;70:355–63.

15. Bhave S, Nagpal J. Anxiety and depressive disorders in college youth. Pediatr Clin of North Am. 2005;52 (1):97–134.

16. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among U.S. and Canadian medical students. Acad Med. 2006;81:354-73.

17. Samaranayake CB, Fernando AT. Satisfaction with life and depression among medical students in Auckland, New Zealand. N Z Med J. 2011;124(1341):12–7. http://journal.nzma.org.nz/journal/124-1341/4838/content.pdf

18. Arroll B, Fernando A, 3rd, Falloon K, et al. Development, validation (diagnostic accuracy) and audit of the Auckland Sleep Questionnaire: a new tool for diagnosing causes of sleep disorders in primary care. J Prim Health Care. 2011;3:107–13.

19. Spitzer RL, Kroenke K, Williams JB, et al. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166:1092–7.

20. Spitzer RL, Kroenke K, Williams JB. Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. Primary Care Evaluation of Mental Disorders. Patient Health Questionnaire. JAMA. 1999;282:1737–44.

21. Mayfield D, McLeod G, Hall P. The CAGE questionnaire: validation of a new alcoholism screening instrument. Am J Psychiatry. 1974;131:1121–3.

22. Diener E, Emmons RL, Larsen RJ, Griffin S. The satisfaction with life scale. Journal of Personality Assessment. 1985;49:71–5.

23. Crowley SJ, Acebo C, Carskadon MA. Sleep, circadian rhythms, and delayed phase in adolescence. Sleep Medicine. 2007;8:602–12.

24. Ohayon MM, Smirne S. Prevalence and consequences of insomnia disorders in the general population of Italy. Sleep Medicine. 2002;3:115–20.

25. Lack LC. Delayed sleep and sleep loss in university students. J Am Coll Health. 1986;35:105–10.

26. Oakley Browne MA, Wells JE, Scot KM. Te Rau Hinengaro: The New Zealand Mental Health Survey. Wellington: Ministry of Health, 2006.

27. Eisenberg D, Gollust SE, Golberstein E, et al. Prevalence and correlates of depression, anxiety, and suicidality among university students. Am J Orthopsychiatry. 2007;77:534–42.

28. Garlow SJ, Rosenberg J, Moore JD, et al. Depression, desperation, and suicidal ideation in college students: results from the American Foundation for Suicide Prevention College Screening Project at Emory University. Depress Anxiety. 2008;25:482–8.

29. Dahlin M, Joneborg N, Runeso B. Stress and depression among medical students: a cross-sectional study. Med Educ. 2005;39:594–604.

30. The MaGPIe Research Group. The nature and prevalence of psychological problems in New Zealand primary healthcare: a report on Mental Health and General Practice Investigation (MaGPIe). N Z Med J. 2003;116(1171):U379. http://journal.nzma.org.nz/journal/116-1171/379/content.pdf

31. Paine SJ, Gander PH, Harris RB, et al. Prevalence and consequences of insomnia in New Zealand: disparities between Maori and non-Maori. Aust N Z J Public Health. 2005;29:22–8.