International Psychogeriatrics (2009), 21:3, 593–599 © 2009 International Psychogeriatric Association
doi:10.1017/S1041610209008850 Printed in the United Kingdom

Poor sleep quality and alcohol use problems among elderly Taiwanese aboriginal women

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ABSTRACT

Background: Little is known about sleep quality and alcohol use problems in the elderly minority population. This study aimed to identify a one-month prevalence of poor sleep quality and alcohol use problems among elderly Taiwanese aboriginal women and to examine the association between them.

Methods: A cross-sectional survey with stratified random sampling was conducted in eight aboriginal communities in Taiwan. The 1261 elderly aboriginal women (response rate 84%) completed all assessments. Sleep was assessed using the Pittsburgh Sleep Quality Index (PSQI), while the CAGE questionnaire was used to evaluate alcohol use problems.

Results: Of the study participants, 20.54% and 25.59% had poor sleep quality and alcohol use problems, respectively. Controlling for confounding factors, alcohol use problems were a risk factor for poor sleep quality (AOR = 1.44, p = 0.0433). Alcohol use problems were associated with three components of PSQI: sleep disturbances, subjective sleep quality, and daytime dysfunction.

Conclusions: The elderly Taiwanese aboriginal women with problematic alcohol drinking experienced poorer sleep quality. Development of a program to reduce alcohol use problems might improve sleep quality among elderly Taiwanese aboriginal women.

Key words: aboriginal women, elderly, poor sleep quality, alcohol use problems, Taiwan

Introduction

It is estimated that between 8% and 54% of elderly Taiwanese women suffer from poor sleep quality (Su *et al.*, 2004; Tsai *et al.*, 2000), constituting an important health problem (Blay *et al.*, 2008; Yao *et al.*, 2008). Alcohol use is one of the well-known risk factors for poor sleep quality (Park *et al.*, 2008). Alcohol use has been a major public health issue in Taiwanese aboriginal communities (Yen *et al.*, 2006).

The Taiwanese indigenous aborigines are an Austronesian people, with linguistic and genetic links to other Austronesian ethnic groups, such as peoples of the Philippines, Malaysia and Indonesia. They may have been living on the islands for approximately 8000 years before the major Han Chinese immigration which began in the seventeenth century. Currently, the 14 ethnic groups of the Taiwanese aboriginal people make up about 2% of the total Taiwan population. In turn, the six main ethnic groups – the Amis, Paiwan, Atayal, Bunun, Rukai and Puyuma – make up nearly 90% of the total aboriginal population. Over half of all Taiwanese aborigines live in the mountains (Council of Indigenous Peoples, 2008). As a minority group they are marginalized in the political, economic, cultural, and even health domains in Taiwan. In recent years they have faced a new cultural discontinuity and oppression (Ko *et al.*, 1994), with a high prevalence of substance abuse (Ko *et al.*, 1994), low socioeconomic status (Ko *et al.*, 1994; Ralph-Campbell *et al.*, 2006), and poor general health (Jean-Louis *et al.*, 2001). The prevalence of women with alcohol problems has increased significantly (Cameron *et al.*, 2006). Owing to differences in metabolism, women of all ages are at a higher risk than men for negative physical, medical, social, and psychological consequences associated with at-risk and higher levels of alcohol consumption (Epstein *et al.*, 2007).

Thus far, little is known regarding the prevalence of poor sleep quality and alcohol use problems

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https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press

within minority elderly communities. We conducted an epidemiological study to evaluate the prevalence of these two health problems. The purposes of this study are to identify a one-month prevalence of poor sleep quality and alcohol use problems, and to investigate the association between sleep quality (and its components) and alcohol use problems among elderly aboriginal women in Taiwan.

Methods

Design and sample

This study was part of an epidemiological study focusing specifically on 25,163 elderly aboriginal women from six major ethnic groups, including the Amis, Paiwan, Atayal, Bunun, Rukai, and Puyuma, in Taiwan (Council of Indigenous Peoples, 2008). We developed a cross-sectional survey research design with a stratified random sampling. In order to avoid any selection bias, population census data were first consulted at the respective registration offices. There were a total of 11,069 households in the eight townships of Taiwan of which 2503 (22.61%) housed at least one elderly woman aged 60 years or older. About 60% of these households were randomly selected and the elderly women in the selected households comprised the study sample. Altogether, 1500 women were selected and, of these, a total of 1261 aboriginal women (84%) completed the Pittsburgh Sleep Quality Index (PSQI). The institutional review board at the Kaohsiung Medical University reviewed and approved this study.

Measures

A questionnaire was administered to assess the aboriginal women's sleep routines, demographic data, and their physical and mental health status. Sleep status was assessed by the PSQI. The PSQI contains 19 items and generates seven components, including subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction during the past month. The score of each component ranged from 0 to 3, and the sum of the global score ranged from 0 to 21. The higher the global score, the poorer the sleep quality. A global score of less than 5 indicated a good sleeper, with good diagnostic sensitivity of 89.6% and specificity of 86.5% ($\kappa = 0.75$, $p < 0.001$) (Chung and Tang, 2006; Lai and Good, 2005). The overall reliability coefficient (α) of the PSQI in the Chinese version ranged from 0.55 to 0.86 (Chung and Tang, 2006; Yao *et al.*, 2008), and a test-retest reliability (r) of 0.74 (Lai and Good, 2005) and a split half reliability (r) of 0.79 (Mayfield *et al.*, 1974) were also found.

Alcohol use problems status was assessed by the CAGE questionnaire. The CAGE was developed specially for the purpose of screening for alcoholism and was administered by self-rating. It is composed of four items, which make up the acronym CAGE: (1) Have you ever felt that you ought to **C**ut down on your drinking? (2) Have people **A**nnoyed you by criticizing your drinking? (3) Have you ever felt bad or **G**uilty about your drinking? (4) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover (**E**ye-opener)? Cronbach's α coefficient (0.80) and test-retest reliability (0.80–0.95) of the CAGE are all quite satisfactory. Each item was rated as "no" or "yes" for a score of 0–1, and the total score was 0–4. A higher score reflects more severe alcohol use problems. The 4-item CAGE had a sensitivity of 0.70–0.87 and a specificity of 0.90–0.92 at a cutoff score of 2 for detecting alcohol abuse and dependence (Dhalla and Kopec, 2007). In this study, participants rating 2 or above were classified as those with alcohol use problems.

Depressive status was assessed using the Taiwanese Depression Questionnaire (TDQ). The 18-item TDQ was specifically developed for the purpose of screening for depression in Taiwan communities. Cronbach's α coefficient (0.90) and the area under the receiver operating characteristic (ROC) curves (0.92) of the TDQ are all quite satisfactory. Each item was self-rated as "never," "occasionally," "often," and "very often," for a score of 0–3, respectively, and the total score ranged from 0 to 54. A higher score reflects more severe depression. The 18-item TDQ had a sensitivity of 0.89 and a specificity of 0.92 at a cutoff score of 19 (Lee *et al.*, 2000). In this study, participants with scores of 19 or above were classified as depressed elders.

Physical condition status was assessed by a three-item physical condition measure. Each item was rated as "poor," "worse," "similar," "better," and "good," for a score of 1–5, respectively, and the total score was 3–15. A higher score indicates better physical condition. The three-item physical condition scale had a Cronbach's α coefficient of 0.84–0.86 in the previous study (Lin *et al.*, 2006). In this study, participants scoring 8 or below were classified as elders in worse physical condition.

Procedures and statistical analysis

After providing written informed consent, the study participants were interviewed face-to-face by trained nurses in the district health station using our study questionnaires. All statistical analyses were conducted using SPSS 12.0 for Windows. We dichotomized study participants into "poor" and "good" sleep quality groups according to the PSQI

https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press

Table 1. Distribution of demographic factors and physical and mental health factors associated with poor or good sleep quality

PARAMETER	POOR SLEEP QUALITY (N = 259)	GOOD SLEEP QUALITY (N = 1,002)	P
Demographic factors			
Age (years old), Mean (SD)	70.09 (5.63)	69.16 (5.35)	0.014
Divorce, number (%)			0.038
No	253 (97.68)	994 (99.20)	
Yes	6 (2.32)	8 (0.80)	
Physical health factors, number (%)			
Physical condition			< 0.001
Worse	207 (80.23)	529 (52.90)	
Better	51 (19.77)	471 (47.10)	
Chronic illness, number (%)			< 0.001
No	18 (8.07)	166 (18.69)	
Yes	205 (91.93)	722 (81.31)	
Mental health factors, number (%)			
Depression, number (%)			< 0.001
No	162 (63.78)	920 (93.02)	
Yes	92 (36.22)	69 (6.98)	
Alcohol use problems, number (%)			0.022
No	177 (68.87)	755 (75.88)	
Yes	80 (31.13)	240 (24.12)	

Note: Some of the variables have missing cases; the total number is therefore not 1261.

global score. Descriptive statistics were used for the sample characteristics and sleep quality variables. Associations of sleep quality with any continuous variables were analyzed using student *t*-tests, and with any categorical variables using χ^2 analyses. Multiple logistic regression was used to assess the simultaneous influence of different variables on the adjusted odds ratios (AOR) of having poor sleep quality. To examine whether there were differences in alcohol use problems in the mean scores of the PSQI and its components, analysis of covariance (ANCOVA) was performed using sleep-related factors as the covariate. The level of significance was set as 0.05.

Results

The average age of the participants was 69.35 (± 5.42), ranging from 60 to 82 years. The average PSQI score of the participants was 3.60 (± 2.66). According to the case definition of a score of PSQI > 5 indicating a poor sleeper, 20.54% of all study participants were defined as poor sleepers. Of the sample, 25.59% experienced alcohol use problems, with a score of CAGE ≥ 2. Some 12.95% and 58.51% of all study participants were identified as depressed and as elders in worse physical condition, respectively. Table 1 shows that those participants classified as "older age" ($t = 2.47$, $p = 0.0136$), "divorced" ($\chi^2 = 4.32$, $p = 0.0377$), "worse physical condition" ($\chi^2 = 63.11$, $p < 0.0001$), "chronic illness" ($\chi^2 = 14.55$, $p = 0.0001$), "depression" ($\chi^2 = 153.29$, $p < 0.0001$), or "alcohol use problems" ($\chi^2 = 5.27$, $p = 0.0217$) had a higher prevalence of poor sleep quality than their counterparts.

Table 2. Adjusted odds ratio (AOR) and p-values for poor sleep quality associated with age, depression, worse physical condition, alcohol use problems, chronic illness and divorce

POOR SLEEP QUALITY	AOR	P	95% CI OF AOR
Age	0.98	0.246	0.95–1.01
Divorce	2.04	0.266	0.58–7.20
Worse physical condition	2.50	<0.001	1.71–3.65
Chronic illness	1.59	0.096	0.92–2.75
Depression	4.96	<0.001	3.34–7.39
Alcohol use problems	1.44	0.043	1.01–2.05

Table 2 shows the predictive variables of poor sleep quality using six significantly different factors. After adjusting for these variables, only three variables were still significantly important factors of identified poor sleep quality: "depression" (AOR = 4.96, $p < 0.0001$), "worse physical condition" (AOR = 2.50, $p < 0.0001$), and "alcohol use problems" (AOR = 1.44, $p = 0.0433$).

https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press

Table 3. Adjusted alcohol use problems differences in the PSQI and its components among elderly aboriginal women

		ALCOHOL USE PROBLEMS, M (SE)		ANCOVA[a]	
PARAMETER	TOTAL, M (SD)	YES	NO	F	P
Number	1252	320	932		
PSQI	**3.59 (2.66)**	**3.79 (0.14)**	**3.41 (0.08)**	**5.48**	**0.019**
Subjective sleep quality	0.40 (0.69)	0.72 (0.01)	0.61 (0.03)	13.66	<0.001
Sleep latency	0.93 (0.86)	0.36 (0.02)	0.34 (0.03)	0.65	0.420
Sleep duration	0.59 (0.88)	0.62 (0.02)	0.61 (0.03)	0.02	0.883
Habitual sleep efficiency	0.05 (0.27)	0.97 (0.01)	0.96 (0.01)	1.55	0.214
Sleep disturbances	1.05 (0.61)	0.18 (0.01)	0.09 (0.02)	13.37	<0.001
Use of sleeping medication	0.10 (0.44)	0.93 (0.01)	0.96 (0.01)	2.53	0.112
Daytime dysfunction	0.48 (0.68)	0.63 (0.02)	0.56 (0.03)	4.41	0.036

[a]ANCOVA was performed to evaluate the score differences between the two groups in terms of alcohol use problems, using age, divorce, worse physical condition, chronic illness, and depression as covariates. Data are presented as the total mean (standard deviation) in the total sample of participants and the adjusted mean (standard error) in the two groups with or without alcohol use problems.

Table 3 shows the comparison of the PSQI and its components among the groups of subjects with or without alcohol use problems. After adjusting for "age," "depression," "worse physical condition," "alcohol use problems," "chronic illness," and "being divorced", the score of the PSQI was 3.59 (± 2.66). The PSQI score ($F = 5.48$, $p = 0.0194$) and three of the PSQI components – subjective sleep quality ($F = 13.66$, $p = 0.0002$), sleep disturbances ($F = 13.37$, $p = 0.0003$), and daytime dysfunction ($F = 4.41$, $p = 0.0359$) – were significantly different across participants with and without alcohol use problems. Moreover, participants with alcohol use problems showed a higher score (poorer sleep) in subjective sleep quality, sleep disturbances, and daytime dysfunction than those without alcohol use problems. The other PSQI components – sleep latency ($F = 0.65$, $p = 0.4202$), sleep duration ($F = 0.02$, $p = 0.8829$), habitual sleep efficiency ($F = 1.55$, $p = 0.2136$), and use of sleeping medication ($F = 2.53$, $p = 0.1121$) were not significantly different across participants with or without alcohol use problems.

Discussion

Of our participants, all of whom were elderly aboriginal Taiwanese women, 20.54% suffered from poor sleep quality, and 25.59% had alcohol use problems. Of these, 12.95% and 58.51% respectively were identified as depressed and as elders in worse physical condition. Those with alcohol use problems have 1.44 times poorer sleep quality than others. Moreover, the PSQI components that are significantly related to alcohol use problems are sleep disturbances, subjective sleep quality, and daytime dysfunction.

The prevalence of poor sleep quality (20.54%) is in the middle range compared with that of other elderly individuals, such as 8% for non-institutionalized women in urban communities in Taiwan (Su *et al.*, 2004), 25.7% for the elderly in communities in Taiwan city (Yao *et al.*, 2008), 53.8% for women in communities in Taiwan city (Tsai *et al.*, 2000), and 37.2% for female household residents in Brazil (Blay *et al.*, 2008). The poor sleep quality of elderly aboriginal women is thus no more severe than that of the general population. However, they still have a higher mean score of sleep disturbances (1.05 ± 0.61) than Taiwanese community elderly (0.81 ± 0.49) (Lin *et al.*, 2006) and Japanese community women (0.72 ± 0.53) (Sekine *et al.*, 2006); however, this is not the case for the other PSQI components. Therefore, elderly aboriginal women's sleep disturbances should be assessed in order to develop a sleep intervention program.

We found that the rate of alcohol use problems among Taiwanese elderly aboriginal women is in the high range (25.59%) compared with that of other populations, such as 4.51% for elders in a small Italian town (Di Bari *et al.*, 2002), 1.8% for the women of Li ethnic minority in villages in Hainan, China (Tang *et al.*, 2005), 12.2% for Scottish women (Cameron *et al.*, 2006), 7.4% for adults in Spain (Carballo *et al.*, 2006), or 16.5% for adults in New Mexico (Woerle *et al.*, 2007). Therefore, the high prevalence of alcohol use problems among Taiwanese elderly aboriginal women is likely to be associated with their poor sleep quality, depression, and worse physical condition.

https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press

Our results demonstrate that depression (AOR = 4.96, $p < 0.001$) and worse physical condition (AOR = 2.50, $p < 0.001$) are risk factors for poor sleep quality. Depression is importantly correlated with poor sleep quality (Ford and Kamerow, 1989; Lin *et al.*, 2006; Szklo-Coxe *et al.*, 2007; Yao *et al.*, 2008). There are significant differences in PSQI scores between elders suffering from depression (8.4 ± 3.9) and normal elders (3.5 ± 2.7) (Motivala *et al.*, 2006). Although the prevalence of depression among our elders (12.95%) is higher than among elders in Taiwanese cities (6%) (Wu, 2002), their PSQI score (3.59 ± 2.66) is similar to normal elders (3.5 ± 2.7) (Motivala *et al.*, 2006). Moreover, 58.51% of them were defined as elders in worse physical condition. Depression in the elderly is reportedly associated with worse physical condition (Niti *et al.*, 2007). Therefore, the coexistence of depression and worse physical condition in elderly aboriginal women is important in assessing their poor sleep quality.

Age-related psychosocial and physiological factors can contribute to alcohol use problems (Loukissa, 2007). After adjusting for sleep-related variables, most of the elderly aboriginal women with alcohol use problems have 1.44 times poorer sleep quality than others, which is compatible with previous reports (Ford and Kamerow, 1989; Stevenson and Masters, 2005). However, some researchers have stated that daily habitual drinking is related to improved sleep quality in the elderly. Analyzing this study in detail, the use of a single item with a yes/no response to record the daily habitual alcohol consumption did not provide satisfactory research validity and reliability (Yao *et al.*, 2008). Therefore, this result is contrasted with polysomnographic sleep parameter evidence that alcohol consumption decreases the percentage of rapid eye movement (REM) sleep, prolongs the REM latency, and increases the standard deviation of REM cycle (Rupp *et al.*, 2007b). Basically, the elderly should avoid alcohol consumption immediately prior to going to bed (Watts, 2007) or should avoid using large quantities of alcohol on a long-term basis (Unwin *et al.*, 1995) in order to avoid poor sleep quality.

Our results indicate that elderly aboriginal women with alcohol use problems have poor sleep quality. Their sleep disturbances, subjective sleep quality, and daytime dysfunction are poorer than those women without alcohol use problems. These results are supported by the polysomnographic sleep research that alcohol affects sleepiness when sleep-wake homeostatic and circadian timing influences promote high levels of sleepiness (Rupp *et al.*, 2007a). The quantity and percentage of slow wave sleep (SWS) is usually reduced and sometimes absent (Gann *et al.*, 2004). The sleep quantity and continuity are most often disturbed, and the REM sleep pressure is most often increased (Yang *et al.*, 1996). These findings demonstrate that drinking alcohol usually influences people's subjective sleep parameters. These results are supported by our study that women with alcohol use problems have poor sleep quality in sleep disturbances, subjective sleep quality, and daytime dysfunction components. However, a previous study revealed persistently abnormal polysomnographics indices after abstinence from alcohol. Short REM latency, increased REM%, and possibly increased REM density indices are factors in the prediction of subsequent alcohol relapse (Gillin *et al.*, 1994). People may be using alcohol to self-medicate for depression, anxiety or pain-related poor sleep quality (Watts, 2007). Elderly women often used alcohol to fall asleep and had less sleep latency (Stevenson and Masters, 2005) in order to avoid facing new sets of antecedents related to challenges in the older phases of life, such as widowhood, retirement, "empty nest," limited mobility, and illness (Epstein *et al.*, 2007). Therefore, we suggest that future research should provide the longitudinal epidemiological data to examine the bidirectional relationship between poor sleep quality and alcohol use problems. In addition, the polysomnographic sleep research indicated that a moderate dose of alcohol just before bedtime results in a short-lived increase in sleep intensity (van Reen *et al.*, 2006). This finding suggests that women who consume alcohol just before bedtime should have a short sleep latency; however, this was not found in our study. We suggest that future biochemical and genetic researchers examine whether race differences influence sleep latency or alcohol use problems. Furthermore, we recommend that future researchers add convergent validity to their study and improve their sleep quality measurement by using monitors. In addition, not only should alcohol amount and intake time be reported in future studies, but also subjective and objective data. If objective methods cannot be provided, health professionals who assess alcohol use problems should focus their assessments on subjective sleep quality, sleep disturbances, and daytime dysfunction.

Many countries have been developing successful interventions for cost effective reduction in the harm associated with alcohol use problems (Solberg *et al.*, 2008), such as educational interventions (Turner *et al.*, 2008), screening/behavioral counseling (Solberg *et al.*, 2008), or social norms interventions (Perkins and Craig, 2006) Therefore, we recommend a modification of successful interventions that decrease alcohol use problems in

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order to improve the sleep quality of elderly aboriginal women.

The limitations of this study are threefold. First, the stratified random sampling in the recruited samples still resulted in limited generalization of the results to the minority aboriginal groups or to the women who were absent during our home visits. For those people who are homeless or temporarily or permanently in hospitals or nursing homes, where poor sleep quality is common, alcohol use problems are likely to be higher. Therefore, the prevalence estimates are probably conservative. The second limitation of the cross-sectional design is that it prevents determination of the causative relationship between poor sleep quality and the alcohol use problem being examined. The third limitation of the present study is that the measurement of the sleep parameter is limited because the use of subjective reports provides estimates without objective verification through actigraphy or a home-based polysomnography monitor.

Conflict of interest

None.

Description of authors' roles

M. S. Yang, S. M. Chiou, and K. H. Chueh designed the study, collected the data, and supervised the data. M. S. Yang, C. S. Chen, and K. H. Chueh wrote the paper and were responsible for the statistical design of the study and for carrying out the statistical analysis.

References

Blay, S. L., Andreoli, S. B. and Gastal, F. L. (2008). Prevalence of self-reported sleep disturbance among older adults and the association of disturbed sleep with service demand and medical conditions. *International Psychogeriatrics*, 20, 582–595.

Cameron, A., Morris, J. M. and Forrest, E. H. (2006). The prevalence of alcohol misuse among acute admissions: current experience and historical comparisons. *Scottish Medical Journal*, 51, 21–23.

Carballo, J. J. *et al.* (2006). Prevalence of alcohol misuse among adolescents and young adults evaluated in a primary care setting. *International Journal of Adolescent Medicine and Health*, 18, 197–202.

Chung, K. F. and Tang, M. K. (2006). Subjective sleep disturbance and its correlates in middle-aged Hong Kong Chinese women. *Maturitas*, 53, 396–404.

Council of Indigenous Peoples, Executive Yuan (2008). *Population of Indigenous Peoples in Taiwan*. Department of Statistics. Available at: http://www.apc.gov.tw/chinese/docList/docList.jsp?cateID=A000297&linkParent=49&linkSelf=161&linkRoot=4.

Dhalla, S. and Kopec, J. A. (2007). The CAGE questionnaire for alcohol misuse: a review of reliability and validity studies. *Clinical and Investigative Medicine*, 30, 33–41.

Di Bari, M. *et al.* (2002). Features of excessive alcohol drinking in older adults distinctively captured by behavioral and biological screening instruments: an epidemiological study. *Journal of Clinical Epidemiology*, 55, 41–47.

Epstein, E. E., Fischer-Elber, K. and Al-Otaiba, Z. (2007). Women, aging, and alcohol use disorders. *Journal of Women and Aging*, 19, 31–48.

Ford, D. E. and Kamerow, D. B. (1989). Epidemiologic study of sleep disturbances and psychiatric disorders: an opportunity for prevention? *JAMA*, 262, 1479–1484.

Gann, H. *et al.* (2004). Polysomnographic comparison between patients with primary alcohol dependency during subacute withdrawal and patients with a major depression. *European Archives of Psychiatry and Clinical Neuroscience*, 254, 263–271.

Gillin, J. C., Smith, T. L., Irwin, M., Butters, N., Demodena, A. and Schuckit, M. (1994). Increased pressure for rapid eye movement sleep at time of hospital admission predicts relapse in nondepressed patients with primary alcoholism at 3-month follow-up. *Archives of General Psychiatry*, 51, 189–197.

Jean-Louis, G. *et al.* (2001). Ethnic differences in self-reported sleep problems in older adults. *Sleep*, 24, 926–933.

Ko, Y. C., Liu, B. H. and Hsieh, S. F. (1994). Issues on aboriginal health in Taiwan. *Kaohsiung Journal of Medical Sciences*, 10, 337–351.

Lai, H. L. and Good, M. (2005). Music improves sleep quality in older adults. *Journal of Advanced Nursing*, 49, 234–244.

Lee, Y., Yang, M. J., Lai, T. J., Chiu, N. M. and Chau, T. T. (2000). Development of the Taiwanese Depression Questionnaire. *Chang Gung Medical Journal*, 23, 688–694.

Lin, C. L., Pan, M. Y. and Yeh, M. C. (2006). The quality of sleep in community elderly. *Formosan Journal of Medicine*, 10, 438–446.

Loukissa, D. (2007). Under diagnosis of alcohol misuse in the older adult population. *British Journal of Nursing*, 16, 1254–1258.

Mayfield, D., McLeod, G. and Hall, P. (1974). The CAGE questionnaire: validation of a new alcoholism screening instrument. *American Journal of Psychiatry*, 131, 1121–1123.

Motivala, S. J., Levin, M. J., Oxman, M. N. and Irwin, M. R. (2006). Impairments in health functioning and sleep quality in older adults with a history of depression. *Journal of the American Geriatrics Society*, 54, 1184–1191.

Niti, M., Ng, T. P., Kua, E. H., Ho, R. C. and Tan, C. H. (2007). Depression and chronic medical illnesses in Asian older adults: the role of subjective health and functional status. *International Journal of Geriatric Psychiatry*, 22, 1087–1094.

Park, J. T., Kim, B. G. and Jhun, H. J. (2008). Alcohol consumption and the CAGE questionnaire in Korean adults: results from the Second Korea National Health and

https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press

Nutrition Examination Survey. *Journal of Korean Medical Science*, 23, 199–206.

Perkins, H. W. and Craig, D. W. (2006). A successful social norms campaign to reduce alcohol misuse among college student-athletes. *Journal of Studies on Alcohol*, 67, 880–889.

Ralph-Campbell, K., Pohar, S. L., Guirguis, L. M. and Toth, E. L. (2006). Aboriginal participation in the DOVE study. *Canadian Journal of Public Health*, 97, 305–309.

Rupp, T. L., Acebo, C. and Carskadon, M. A. (2007a). Evening alcohol suppresses salivary melatonin in young adults. *Chronobiology International*, 24, 463–470.

Rupp, T. L., Acebo, C., van Reen, E. and Carskadon, M. A. (2007b). Effects of a moderate evening alcohol dose: I. Sleepiness. *Alcoholism: Clinical and Experimental Research*, 31, 1358–1364.

Sekine, M., Chandola, T., Martikainen, P., McGeoghegan, D., Marmot, M. and Kagamimori, S. (2006). Explaining social inequalities in health by sleep: the Japanese civil servants study. *Journal of Public Health*, 28, 63–70.

Solberg, L. I., Maciosek, M. V. and Edwards, N. M. (2008). Primary care intervention to reduce alcohol misuse: ranking its health impact and cost effectiveness. *American Journal of Preventive Medicine*, 34, 143–152.

Stevenson, J. S. and Masters, J. A. (2005). Predictors of alcohol misuse and abuse in older women. *Journal of Nursing Scholarship*, 37, 329–335.

Su, T. P., Huang, S. R. and Chou, P. (2004). Prevalence and risk factors of insomnia in community-dwelling Chinese elderly: a Taiwanese urban area survey. *Australian and New Zealand Journal of Psychiatry*, 38, 706–713.

Szklo-Coxe, M., Young, T., Finn, L. and Mignot, E. (2007). Depression: relationships to sleep paralysis and other sleep disturbances in a community sample. *Journal of Sleep Research*, 16, 297–312.

Tang, X., Chen, X., Li, H., Stanton, B. and Li, X. (2005). Smoking and drinking patterns among residents of Li ethnic minority villages in Hainan, China. *Substance Use and Misuse*, 40, 687–701.

Tsai, C. H., Chen, Y. C., Wang, C., Liu, G. M., Wu, W. C. and Lin, G. D. (2000). Sleep disturbance and its related factors in the elderly – a study from a regional hospital. *Taiwan Journal of Family Medicine*, 10, 119–128.

Turner, J., Perkins, H. W. and Bauerle, J. (2008). Declining negative consequences related to alcohol misuse among students exposed to a social norms marketing intervention on a college campus. *Journal of American College Health*, 57, 85–94.

Unwin, C. E., Gracey, M. S. and Thomson, N. J. (1995). The impact of tobacco smoking and alcohol consumption on aboriginal mortality in Western Australia, 1989–1991. *Medical Journal of Australia*, 162, 475–478.

van Reen, E., Jenni, O. G. and Carskadon, M. A. (2006). Effects of alcohol on sleep and the sleep electroencephalogram in healthy young women. *Alcoholism: Clinical and Experimental Research*, 30, 974–981.

Watts, M. (2007). Incidences of excess alcohol consumption in the older person. *Nursing Older People*, 18, 27–30.

Woerle, S., Roeber, J. and Landen, M. G. (2007). Prevalence of alcohol dependence among excessive drinkers in New Mexico. *Alcoholism: Clinical and Experimental Research*, 31, 293–298.

Wu, C. Y. (2002). A correlational study among sleep quality, physical activity, and depression of community-dwelling elders. Unpublished dissertation, Department of Nursing. National Taiwan University, Taipai.

Yang, M. S., Ko, Y. C. and Wen, J. K. (1996). Prevalences and related factors of substances use in female aborigines in southern Taiwan. *Kaohsiung Journal of Medical Sciences*, 12, 634–640.

Yao, K. W., Yu, S., Cheng, S. P. and Chen, I. J. (2008). Relationships between personal, depression and social network factors and sleep quality in community-dwelling older adults. *Journal of Nursing Research*, 16, 131–139.

Yen, C. F. *et al.* (2006). Relationships among mental health status, social context, and demographic characteristics in Taiwanese aboriginal adolescents: a structural equation model. *Psychiatry and Clinical Neurosciences*, 60, 575–583.

https://doi.org/10.1017/S1041610209008850 Published online by Cambridge University Press