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Sleep Problems and Suicidality in the National Comorbidity Survey Replication

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Abstract

Objective—Links between sleep problems and suicidality have been frequently described in clinical samples; however this issue has not been well-studied in the general population. Using data from a nationally representative survey, we examined the association between self-reported sleep difficulties and suicidality in the United States.

Methods—The *WHO Composite International Diagnostic Interview* was used to assess sleep problems and suicidality in the *National Comorbidity Survey Replication* (NCS-R). Relationships between three measures of sleep (difficulty initiating sleep, maintaining sleep, early morning awakening), and suicidal thoughts, plans, and attempts were assessed in logistic regression analyses, while controlling for demographic characteristics, 12-month diagnoses of mood, anxiety and substance use disorders, and chronic health conditions.

Results—In multivariate models, the presence of any of these sleep problems was significantly related to each measure of suicidality, including suicidal ideation (OR = 2.1), planning (OR = 2.6), and suicide attempt (OR = 2.5). Early morning awakening was associated with suicidal ideation (OR = 2.0), suicide planning (OR = 2.1), and suicide attempt (OR = 2.7). Difficulty initiating sleep was a significant predictor of suicidal ideation and planning (ORs: 1.9 for ideation; 2.2 for planning), while difficulty maintaining sleep during the night was a significant predictor of suicidal ideation and suicide attempts (ORs: 2.0 for ideation; 3.00 for attempt).

Conclusions—Among community residents, chronic sleep problems are consistently associated with greater risk for suicidality. Efforts to develop comprehensive models of suicidality should consider sleep problems as potentially independent indicators of risk.

Keywords

sleep; insomnia; suicide; suicidal ideation; NCS-R

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1. Introduction

Suicide is a common cause of premature mortality and improved strategies are needed to identify those at greatest risk for suicidal behaviors (Institute of Medicine, 2002). In the United States, approximately 30,000 people die by suicide every year, and over 395,000 emergency department visits occur per year for the treatment of non-fatal self-injury (Centers for Disease Control and Prevention, 2007). Population surveys indicate that at some point during their lifetime, 5% of the US population reports a suicide attempt and 14% report serious suicidal ideation (Kessler et al., 1999).

Recently, research has identified sleep problems as potentially important risk factors for suicidal thoughts and behaviors (Goldstein et al., 2008; Liu and Buysse, 2006; Singareddy and Balon, 2001). Sleep problems are prevalent in the United States. In surveys of the general population, about one third of adults report one or more sleep complaints in the past year (Hartz et al., 2007; Centers for Disease Control and Prevention, 2008; Roth et al., 2006). Using data from the National Comorbidity Survey Replication study (NCS-R), Roth and colleagues (2006) found that 16 to 25% of the adult population reported sleep problems lasting for 2 weeks or longer in the last 12 months, with 16.4% reporting difficulty initiating sleep, 16.7% reporting early morning awakening, 19.9% reporting difficulty maintaining sleep, and 25% reporting non-restorative sleep. These sleep difficulties were persistent, continuing for a mean of 22.4 weeks during the 12 month period (Roth et al., 2006).

Sleep problems are strongly associated with co-occurring psychiatric disorders (Breslau et al., 1996; Ford and Kamerow, 1989; Rocha et al., 2005; Roth et al., 2006; Wallander et al., 2007), which in turn are associated with increased risk for suicidality. Individuals with sleep difficulties have a higher probability of having symptoms or a diagnosis of depression, anxiety disorder, or a substance use disorder than those without sleep complaints (Brower et al., 2001; Buysse et al., 2008; Neckelmann et al., 2007; Teplin et al., 2006). Ford and Kamerow (1989) found that individuals with persistent insomnia across a 1-year interval had a remarkably higher risk for developing new-onset major depression (OR = 39.8; 95% CI 19.8–80.0) than subjects with no sleep problems. Another longitudinal study revealed that insomnia in young adults at baseline was associated with an increased risk of anxiety disorders (OR 1.97; 95% CI 1.08–3.60), drug abuse or dependence (OR 7.18; 95% CI 2.13–24.17), and nicotine dependence (OR 2.41; 95% CI 1.46–3.97) (Breslau et al., 1996).

The association between sleep and suicidality has been examined most frequently in adolescents. Among adolescents, insomnia or other sleep disturbances have been consistently found to be associated with an increased risk of suicidal ideation and behavior (Goldstein et al., 2008; Liu, 2004; Nruham et al., 2008). Of the existing research on sleep and suicidality in adults, most studies have utilized clinical samples (Agargun et al., 1997; Bernert et al., 2005; Fawcett et al., 1990; Hall et al., 1999; Rocha et al., 2005) or suicide victims (McGirr et al., 2007). Fawcett (1990) found that global insomnia was one of the most significant factors predicting short-term risk for suicide in major affective disorder. Also, Agargun and colleagues (1997) demonstrated a significant association between poor sleep quality and suicidal behavior among depressed outpatients. Hall et al. (1999) found that insomnia was among the most prevalent symptoms preceding a serious suicide attempt among psychiatric inpatients that required either emergency treatment or admission to the general hospital prior to psychiatric admission. Sleep problems were also strongly associated with suicidal ideation in psychiatric outpatients, after controlling for severity of depressive symptoms (Bernert et al., 2005) or the duration (Chellappa and Araujo, 2007) of the depressive disorder.

Because many patients with sleep problems never present for formal psychiatric evaluation or treatment, it is important to examine the link between suicidality and sleep in the general

population in addition to clinical populations. Several general population surveys indicate that less than 4% of individuals with uncomplicated insomnia report having received any psychiatric treatment in the prior 6 months (Weissman et al., 1997). However, only two studies have investigated the relationship between sleep and suicide risks in adults in non-psychiatric samples. In a 20-year follow-up study of general population samples examined for risk factors for cardiovascular disease in Finland, Tanskanen et al. (2001) found that nightmares predicted risk for completed suicide. Additionally, poor sleep quality was a risk factor for late-life suicide mortality at a 10-year follow-up in a community sample of older individuals in a prospective study of aging (Turvey et al., 2002). However, both studies had important limitations. The study by Tanskanen et al. (2001) focused only on nightmares, and omitted other, more frequent sleep problems, while the study by Turvey et al. (2002) had a small number of suicide deaths in their study sample. Neither study controlled for psychiatric disorders assessed through diagnostic interviews in their analyses examining the relationship between sleep and suicidality.

In addition to psychiatric problems, research on suicide and sleep needs to account for the potential influence of co-occurring chronic medical conditions. Many chronic physical conditions are associated with insomnia (Ohayon, 2005). Taylor and colleagues (2007) reported that patients with high blood pressure, breathing problems, urinary problems, chronic pain, and gastrointestinal problems have statistically higher levels of insomnia than those without these medical disorders. The presence of a chronic medical condition is also established risk factor for suicidal behavior in the general population (Druss and Pincus, 2000; Tang and Crane, 2006). The assessment of the impact of sleep, comorbid conditions and suicidality is also complicated by the high degree of overlap between psychiatric and medical problems. Kessler et al. (2003) reported that significant comorbidity exists between chronic physical conditions and mental disorders. In this nationally representative sample of US adults, mental disorders were between 2 to 8 times more prevalent among individuals with physical disorders, with the degree of risk varying by the particular condition.

Further research is needed to establish the relationship between sleep problems and suicidality in recent and representative samples of the general adult U.S. population, while controlling for medical and psychiatric comorbidities. Using data from the NCS-R, we examined the association between three measures of sleep symptoms characteristic of insomnia (difficulty initiating sleep, difficulty maintaining sleep, and early morning awakening), and three measures of suicidality (suicidal thoughts, plans, and attempts) in a nationally representative sample of U.S. adults during a 12-month period. We hypothesized that respondents with any of three specific types of sleep symptoms would have a higher likelihood of suicidality than those who did not report any of these symptoms. Additionally, we hypothesized that respondents with multiple symptoms of insomnia (i.e., 2 or 3) would have greater suicidality than respondents reporting only one symptom. Finally, we hypothesized that sleep problems would be associated with greater risks for suicidal thoughts, plans, and attempts during the preceding 12 months, even after controlling for other established risk factors for suicidality such as psychiatric comorbidities, chronic health conditions, and demographic characteristics.

2. Methods

All analyses utilized publicly available data from the National Comorbidity Survey Replication. The NCS-R is multistage clustered area probability sample of the English-speaking US household population ages 18 and over that was conducted from 2001 through 2003 (Kessler and Merikangas, 2004). Data were weighted to adjust for differential probabilities of selection, over-sampling of certain respondents, and unit non-response, while also post-stratifying the sample to the 2000 Census on sociodemographic and geographic variables (Kessler et al., 2004).

The *World Health Organization Composite International Diagnostic Interview* (CIDI) version 3.0 (Kessler and Ustun, 2004) was used to obtain DSM-IV diagnoses. We specifically examined diagnoses of mood, anxiety, and substance use disorders in the past 12 months. Lifetime chronic health conditions were measured by counting the number of medical conditions reported: seasonal allergies, stroke, heart attack, heart disease, high blood pressure, asthma, lung disease, diabetes, ulcer, seizure disorders, and cancer. For statistical purposes, the count variable for lifetime chronic health conditions was used as a continuous variable (0–4 or more). Multivariate models also controlled for gender (male vs. female), age (18–44 vs. > 44), race (white vs. other), education (high school or less vs. other), marital status (never married vs. previously married or married), and income status (poverty vs. other).

Three items addressed suicidal thoughts, plans and attempts within the past 12-months: “Have you ever seriously thought about committing suicide?”; “Have you ever made a plan for committing suicide?” and, “Have you ever attempted suicide?” Respondents who endorsed the ideation item were then asked to respond to the plan and attempt items.

Sleep problems were measured by asking a series of three yes-no questions: “Did you have a period lasting two weeks or longer in the past 12 months when you had: problems getting to sleep, when nearly every night it took you two hours or longer before you could fall asleep?”, “Problems staying asleep, when you woke up nearly every night and took an hour or more to get back to sleep?”, and “Problems waking too early, when you woke up nearly every morning at least two hours earlier than you wanted to?” Using these items, an *insomnia score* (0–3) was created indicating the number of different sleep symptoms endorsed. Additional information about the measures of sleep symptoms can be found in Roth et al. (Roth et al., 2006).

Bivariate relationships between the sleep problems and suicidality items were assessed using chi-square tests and logistic regression models. Multivariate logistic regression models were used to assess the relationship between sleep and suicidality while controlling for demographic characteristics and other risk factors including 12-month diagnoses of mood, anxiety and substance use disorders, and lifetime chronic health conditions. Results are presented as unadjusted and adjusted Odds Ratios (OR) with 95% confidence intervals (CI). The Taylor expansion method (Wolter, 1985) was used to estimate sampling errors of estimators based on complex sample designs with the SURVEYLOGISTIC and SURVEYFREQ procedures in SAS 9.1. This study was approved by The Institutional Review Board at the University of Michigan.

3. Results

Using a representative sample of 5,692 adults in the U.S., sleep problems (difficulty initiating sleep, maintaining sleep, early morning awakening, and insomnia score) were consistently associated with suicidality (Table 1). Problems with initiating sleep had the strongest bivariate associations with suicidal ideation, planning, and attempts in the past 12 months. Individuals suffering from problems with initiating sleep were 5.1 times (CI: 4.0–6.5) more likely to think about suicide, 9.1 times (CI: 5.5–15.0) more likely to plan suicide, and 7.5 times (CI: 4.3–13.4) more likely to have attempted suicide in the past 12-months than those without that particular sleep problem (see Table 1).

In multivariate models that accounted for psychiatric disorders, chronic health conditions, and other demographic factors, the association between particular sleep problems and different aspects of suicidality remained significant in most cases (Table 2 and 3). Both early morning awakening and the insomnia score were related to all suicidal items: ideation (ORs: 2.0, CI: 1.4–2.9 for early awakening and 1.4, CI: 1.3–1.6 for insomnia score), suicide planning (ORs: 2.1, CI: 1.1–3.7 for early awakening and 1.4, CI: 1.1–1.8 for insomnia score), and suicide

attempt (ORs: 2.7, CI: 1.4–5.3 for early awakening and 1.6, CI: 1.2–2.1 for insomnia score). Difficulty initiating sleep was a significant predictor of a suicidal ideation and suicide planning (ORs: 1.9, CI: 1.4–2.4 for ideation; 2.2, CI: 1.3–4.0 for planning), while problems with maintaining sleep during the night was a significant predictor of a suicidal ideation and suicide attempt (ORs: 2.0, CI: 1.5–2.7 for ideation; 3.0, CI: 1.4–6.4 for attempt). In multivariate models examining the impact of any symptom of insomnia (no/yes; results not presented in the Tables), reporting any sleep problem was predictive of each aspect of suicidality, including suicidal ideation (OR = 2.1, CI: 1.6–2.8), planning (OR = 2.6, CI: 1.4–4.9), and suicide attempt (OR = 2.5, CI: 1.2–5.2).

4. Discussion

In a representative sample of the adult US population, reports of sleep problems were significantly associated with an increased risk of suicidality (i.e., suicidal thoughts, plans, or attempts). In unadjusted analyses, the observed increases in risk was quite large (unadjusted odds ratios of 4.20 to 9.09) but significant risks were also observed in multivariate analyses that adjusted for established suicide-related risk factors, such as psychiatric or general medical disorders. Multiple sleep complaints particularly increased the risk of 12-month suicidality. Individuals with two or more types of sleep symptoms were about 2.6 times more likely to report a suicide attempt than those without any insomnia complaints.

Our findings are consistent with other research linking sleep problems with an increased risk for suicidality in clinical samples of patients presenting with sleep problems or with depression and other psychiatric disorders (Agargun et al., 1997; Bernert et al., 2005; Chellappa and Araujo, 2007; Fawcett et al., 1990; Goldstein et al., 2008; Hall et al., 1999; McGirr et al., 2007; Rocha et al., 2005). However, this study which examines the link between sleep and suicidality in the general population, has implications for public education efforts and for the treatment of those without psychiatric disorders. Fawcett et al. (1990) considered insomnia to be one of the ‘modifiable risks’ for suicide in major affective disorder. Insomnia may also be a “modifiable” risk factor for suicide in non-psychiatric populations.

In most prior research, the extent to which sleep problems were unique risks for suicidal thoughts and behaviors beyond other known risk factors could not be determined. The present findings demonstrate that sleep factors were predictive of suicidality in most cases even after controlling for diagnoses of depression, anxiety disorders, and substance use disorders. This finding supplements several other studies that found that sleep problems predicted suicidality after controlling for severity (Bernert et al., 2005), duration (Chellappa and Araujo, 2007), or subtype of depressive disorder (Nruham et al., 2008).

However, the association between sleep disturbance and suicidality is still poorly understood in terms of an underlying pathophysiological mechanism. It has been previously proposed that insufficient sleep may negatively impact cognitive function resulting in poor judgment, deficits in impulse control, increased tiredness and hopelessness, which might all contribute to suicidal thinking and behavior (Goldstein et al., 2008; Liu, 2004). Singareddy and Balon (2001) suggested that the relationship between subjective sleep difficulties or polysomnography-recorded sleep abnormalities, and suicidality, might be explained through a common pathway in psychiatric disorders - a hypothesis that is not entirely supported by our study results. However, the mechanism underlying the relationship between sleep and suicidality may be related to other factors, such as serotonin system dysfunction, which has been shown to play an important role in sleep, psychiatric disorders and suicide.

A unique contribution of the present study was its comparison between different types of sleep symptoms and aspects of suicidality. Results indicated that, after controlling for other risk

factors, the most consistent associations between sleep and suicidality pertained to early morning awakening. This is in agreement with previous research reporting strong relationships between early morning awakening and suicidality in adult depressed patients (Agargun et al., 2007) and adolescents (Liu, 2004). This study found that an association between early morning awakening and suicidality remained, even when analyses were adjusted for comorbid depression.

In multivariate analyses, respondents who reported difficulty maintaining sleep during the night did not have an increased risk of making plans for suicide, but they did have the highest risk for making suicide attempts. It is possible that respondents with middle insomnia were most susceptible to making unplanned or impulsive suicide attempts and future research that includes assessments of impulsivity among patients with middle insomnia may be warranted. Middle insomnia was previously recognized as a risk factor for suicide attempts in outpatients with depression (Agargun et al., 2007) and secondary school students (Nrugham et al., 2008).

In other research, difficulty initiating sleep was found to be the most significant factor associated with suicidal behavior (Sjostrom et al., 2007). In our unadjusted analyses, difficulty initiating sleep was correlated with all types of suicide behavior over past 12 months. However, in multivariate analyses, this relationship was present for suicidal ideation and planning, but not for suicide attempts. These analyses indicate the association between difficulty initiating sleep and suicide attempts may be due to concurrent psychiatric disorders such as major depressive disorder, post traumatic stress disorder, generalized anxiety disorder, and drug dependence, all of which have been strongly tied to sleep problems (Roth et al., 2006) and suicide attempts (Vickers and McNally, 2004). Thus, efforts to prevent suicide attempts in those with early nighttime sleep issues could potentially focus on the treatment of the co-occurring conditions. Finally, the present study indicates that people with multiple sleep complaints have a particularly high risk for suicidality and likely deserve closer attention.

This study has a number of clinical implications. A fully comprehensive evaluation of suicide risk should include a sleep assessment irrespective of whether or not an individual reports other co-occurring psychiatric or medical conditions. Additionally, the presence of sleep problems should alert treatment providers about the potential for a heightened risk for suicide. These findings also raise the interesting possibility that addressing sleep problems in patients with and without comorbid conditions could reduce the risk of future suicidal behaviors. Future research is needed to examine this potentially important implication.

Several limitations of the present study should be noted. Study analyses were cross-sectional and although sleep symptoms and suicidality both occurred during the same 12-month period, sleep disturbances may have occurred before, during, or after periods of suicidality. Although we controlled for the presence of comorbid psychiatric and physical disorders, we did not control for their level of severity. Future research is needed that uses more comprehensive, dimensional measures of co-occurring conditions. Measures of suicidality and sleep were also based on single items in a survey and were not specifically designed to test the associations between sleep and suicidality. Subjective reports of sleep problems and suicidal ideation or planning may be subject to recall biases, and there were no other confirming sources for this information, e.g., from a family member (for suicidal behavior) or from polysomnographic examination (for sleep disturbance; see Singareddy & Balon (2001). However, others have found that the perception of poor sleep is associated with significant distress and consequences even in the absence of objective polysomnography findings (Conroy et al., 2006). Additionally, the NCS-R survey items have a high degree of face validity and the 2-week requirement for insomnia symptoms suggests that transient or trivial symptoms were excluded. Items on the NCS-R survey have also previously been used to measure rates of suicidality in the US population (Kessler et al., 2005; Nock and Kessler, 2006).

We note that we did not analyze potential relationships between suicidality and other sleep symptoms such as non-restorative sleep or daytime sleepiness. We excluded daytime sleepiness, because it represents a distinct construct from insomnia. We excluded non-restorative sleep because of its preliminary nature as measured in the NCS-R (Roth et al., 2006). Future research is needed to determine if the present results generalize to non-restorative sleep. Similarly, the NCS-R did not measure other common sleep disorders, such as sleep apnea or upper airway resistance syndrome, and the association between these disorders and suicidality warrants further study.

Despite these limitations, this is the first study of which we are aware to examine the association during the preceding 12 months between several different symptoms of insomnia and suicidal ideation, planning and attempts in a nationally representative sample of US adults. For the most part, symptoms of insomnia were consistently related to higher levels of suicidality. Our results highlight the need for psychiatric researchers, sleep researchers, and mental health and primary care clinicians to include an assessment of suicidality among patients presenting with sleep issues both when accompanied and when unaccompanied by concurrent psychiatric conditions.

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Table 1

Percent endorsing and unadjusted odds ratios for 12-month suicide ideation, plan, and attempt by sleep problem in the NCS-R (n = 5,692).

	IDEATION				PLAN		ATTEMPT	
	N	%	N	%	N	%	N	%
Difficulty Initiating Sleep								
No	N= 4,494	1.6	26	0.3	19	0.2		
Yes	N= 1,191	7.6	39	2.8	26	1.8		
χ^2_1	p-value	0.000	116.4	0.000	65.8	0.000		
OR	95% CI	4.0–6.5	9.1	5.5–15.0	7.5	4.3–13.4		
Difficulty Maintaining Sleep								
No	N= 4,252	1.6	26	0.4	15	0.2		
Yes	N= 1,436	6.5	29	2.0	30	1.7		
χ^2_1	p-value	0.000	35.1	0.000	50.8	0.000		
OR	95% CI	3.3–5.5	5.3	2.9–9.8	7.5	4.1–14.0		
Early Morning Awakening								
No	N= 4,484	1.7	32	0.4	20	0.3		
Yes	N= 1,203	6.9	33	2.4	25	1.7		
χ^2_1	p-value	0.000	63.1	0.000	43.8	0.000		
OR	95% CI	3.2–5.5	6.2	3.7–10.2	6.6	3.5–12.4		
Insomnia Score (0–3)								
0	N= 3,654	1.2	14	0.2	10	0.2		
1	N= 811	3.4	13	1.1	9	0.9		
2	N= 636	6.1	16	2.1	6	0.8		
3	N= 579	9.6	22	3.3	20	3.0		
χ^2_3	p-value	0.000	110.3	0.000	86.8	0.000		
OR*	95% CI	1.9–2.3	2.5	2.1–2.9	2.6	2.0–3.2		

* Odds ratio associated with insomnia score treated as a continuous variable

Table 2
Multivariate logistic regression models of sleep problems and suicidality in the NCS-R (N=5,692).

<u>Predictor</u>	<u>Model 1</u> Difficulty Initiating Sleep				<u>Model 2</u> Difficulty Maintaining Sleep			
	<u>Ideation</u>		<u>Attempt</u>		<u>Ideation</u>		<u>Attempt</u>	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender (female)	1.1	0.7–1.5	0.8	0.4–1.4	1.0	0.7–1.5	0.7	0.4–1.3
Age	1.4	1.0–1.9	3.3	1.5–7.5**	1.4	1.0–1.9	3.3	1.5–7.4**
Race–ethnicity	1.0	0.7–1.5	1.3	0.8–2.2	1.0	0.7–1.5	1.3	0.8–2.2
Marital status (never married)	2.4	1.6–3.5***	2.2	0.9–5.0	2.6	1.7–3.9***	2.3	1.0–5.6*
Education	1.1	0.7–1.8	1.0	0.4–2.7	1.0	0.7–1.6	0.9	0.3–2.4
Poverty status	1.3	0.8–2.1	1.2	0.5–2.5	1.4	0.9–2.2	1.2	0.6–2.6
Chronic health conditions	1.1	1.0–1.3	1.3	1.1–1.6***	1.1	1.0–1.3	1.4	1.1–1.6***
Substance use disorder	2.5	1.4–4.3***	1.7	0.7–4.3	2.5	1.5–4.4**	1.8	0.7–4.6
Anxiety disorder	3.6	2.6–5.1***	6.1	2.6–13.9***	3.6	2.6–5.0***	6.4	2.8–14.6***
Mood disorder	6.0	4.4–8.1***	10.0	4.9–20.1***	5.9	4.4–8.0***	10.4	4.9–22.1***
Sleep problem (type)	Difficulty Initiating Sleep				Difficulty Maintaining Sleep			
Sleep problem	1.9	1.4–2.4***	2.2	1.3–4.0**	2.0	1.5–2.7***	1.5	0.8–3.1

* p<0.05
** p<0.01
*** p<0.001

Table 3
Multivariate logistic regression models of sleep problems and suicidality in the NCS-R (n=5,692).

Model 3 Early Morning Awakening											
Model 4 Insomnia Score (0–3)											
IDEATION			PLAN			ATTEMPT			IDEATION		
IDEATION			PLAN			ATTEMPT			IDEATION		
Predictor	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	Odds Ratio	95% CI	Odds Ratio	Odds Ratio	95% CI	95% CI
Gender (female)	1.0	0.7–1.5	0.7	0.4–1.3	0.7	1.0	0.7–1.5	0.7	1.0	0.7–1.5	0.4–1.3
Age	1.4	1.0–2.0	3.5	1.6–7.9**	6.8	1.4	1.0–2.0*	3.5	1.4	1.0–2.0*	1.5–7.8**
Race–ethnicity	1.0	0.7–1.4	1.2	0.7–2.1	1.9	1.0	0.8–4.2	1.3	1.0	0.7–1.4	0.7–2.1
Marital status (never married)	2.5	1.7–3.6***	2.3	1.0–5.3	2.3	2.5	1.2–4.5*	2.4	2.5	1.7–3.7***	1.0–5.6
Education	1.1	0.7–1.8	1.0	0.4–2.6	1.7	1.1	0.8–3.9	1.0	1.1	0.7–1.8	0.4–2.7
Poverty status	1.3	0.8–2.1	1.2	0.5–2.5	1.7	1.3	0.9–3.4	1.2	1.3	0.8–2.1	0.5–2.5
Chronic health conditions	1.1	1.0–1.3	1.4	1.1–1.7***	1.5	1.1	1.1–2.0*	1.3	1.1	1.0–1.3	1.1–1.6**
Substance use disorder	2.6	1.5–4.5***	1.9	0.7–4.7	3.2	2.4	1.2–8.6*	1.7	2.4	1.4–4.2**	0.7–4.4
Anxiety disorder	3.6	2.6–5.0***	6.1	2.7–13.8***	4.5	3.4	2.0–10.2***	5.8	3.4	2.4–4.7***	2.6–12.9***
Mood disorder	6.1	4.5–8.3***	10.2	5.2–20.0***	6.8	5.6	3.2–14.4***	9.6	5.6	4.2–7.6***	4.7–19.5***
Sleep problem (type)					Early Morning Awakening						Insomnia Score (0–3)
Sleep problem	2.0	1.4–2.9***	2.1	1.1–3.7*	2.7	1.4	1.4–5.3**	1.4	1.4	1.3–1.6***	1.1–1.8**

* p<0.05
** p<0.01
*** p<0.001