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Association between Anxious Symptoms and Sleeping Medication Use Among US Older Adults

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Abstract

Objective—To investigate the relationship between anxiety symptoms and sleeping medication use among a nationally representative sample of U.S. older adults.

Design—Cross-sectional design using data from the 2011 National Health and Aging Trends Study (NHATS) to examine the relationship between anxiety symptoms as rated by the Generalized Anxiety Disorder-2 (GAD2) and self-reported sleeping medication use. Survey weights were applied to account for complex survey design. Logistic regression was used to measure the association between anxiety symptoms and sleeping medication use after adjusting for sociodemographic factors, physical health, and other sleep related issues.

Results—In 2011, 13.1% of respondents experienced high anxiety symptoms and 29.0% reported taking a sleeping medication at least once a week during the last thirty days. Results estimate that approximately 4 million U.S. older adults have clinically significant anxiety symptoms and approximately 10 million U.S. older adults used a sleeping medication in the last 30 days. Adjusted results revealed that high anxiety symptoms are significantly associated with sleeping medication use compared to low anxiety symptoms (AOR = 1.57 (95%CI: 1.29, 1.91)). Depression symptoms were also associated with sleeping medication (AOR = 1.29 (95%CI: 1.08, 1.55)).

Conclusions—Results demonstrated that anxiety symptoms are significantly associated with sleeping medication use among U.S. older adults. We also found that depressive symptoms, chronic conditions, and worse self-rated health are associated with sleeping medication use. As sleeping medications are associated with adverse health events, these results have clinical implications for treating anxiety symptoms among older patients.

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Introduction

Anxiety disorders are among the most common psychiatric disorders in older adults (Porensky *et al.*, 2009; Kessler *et al.*, 2001; Bower *et al.*, 2015). Though there are several types of anxiety disorders (e.g., panic disorder, posttraumatic stress disorder (PTSD), agoraphobia, and obsessive compulsive disorder) anxiety symptoms are broadly a persistent fear, worry, nervousness, or panic, which can be accompanied with non-specific psychophysiological symptoms (e.g., muscle tension, insomnia, and fatigue) (American Psychiatric Association, 2013; Martin, 2003; Bower *et al.*, 2015). Among older adults, the 12-month prevalence of any of the aforementioned disorders is 10%, with a lifetime prevalence of 15.3% (Gum *et al.*, 2009; Kessler *et al.*, 2005). Generalized anxiety disorder (GAD) is the most common anxiety disorder among older adults (Kessler, 2000). Research has shown that anxiety symptoms may peak in older adulthood due to the emergence of chronic health conditions (Mackenzie *et al.*, 2011).

A breadth of literature has identified several comorbidities, largely depression and psychosocial risk factors, associated with anxiety symptoms (Chou *et al.*, 2011; Moreno-Peral *et al.*, 2014). Risk factors for developing late-age anxiety are being female, chronic health problems, lower socioeconomic position, and adverse events during childhood (e.g. physical, sexual, and psychological abuse) (Moreno-Peral *et al.*, 2014). As the United States (U.S.) population ages, it is necessary to understand the clinical presentation and treatment of anxiety symptoms and anxiety-related disorders in older adults.

Prescribed and over-the-counter sleeping medications are used to treat insomnia and anxiety symptoms in older patients. However, their sedative effects increase the risk of falls and cognitive impairment in this population (Moore *et al.*, 2015). Moreover, as anxiety disorders in later-life are more chronic in nature, the use of benzodiazepines is discouraged (Baldwin and Polkinghorn, 2005; American Geriatrics Society, 2015). Despite this, several studies have shown alarmingly high rates of benzodiazepine use in older patients with GAD (Olfson *et al.*, 2015). Even antihistamines (e.g., diphenhydramine), an over-the-counter alternative to benzodiazepines, have been associated with negative health outcomes in older adults (i.e., greater risk of falls) (Chang *et al.*, 2011). By establishing an association between anxiety symptoms and general sleeping medication use, clinicians may first consider non-pharmacological interventions for anxiety-related insomnia (e.g., cognitive behavioral therapy) as opposed to sedating medications; which may reduce adverse drug events related to sedating medication.

Insomnia is intimately linked to anxiety and mood disorders (Morin and Gramling, 1989; Cox and Olatunji, 2016). However, several studies report differences in the types of insomnia observed in anxiety compared to depression and their relationships to sleeping medication use (Leblanc *et al.*, 2015; Potvin *et al.*, 2014). For example, one study assessing sleep quality (Leblanc *et al.*, 2015) found that depression was associated with waking during the night and early morning, sleepiness during the day, and the use of a sleeping medication, while anxiety was associated with longer sleep latency and waking during the evening and early morning. The authors posit that the observed differences in sleep quality, namely longer sleep latency, may be due to, in part, the central nervous system activation and

rumination that occurs in anxiety disorders. Similarly, another study also found that depressive symptoms, not anxiety, were associated with sleeping medication use after controlling for confounding (Potvin *et al.*, 2014). Unlike Leblanc *et al.* (2015) and Potvin *et al.* (2014), one study reported that depression *and* anxiety symptoms were associated with sleeping medication use (Omvik *et al.*, 2010). Similarly, in a representative sample of U.S. adults ages 18–75 years old, it was found that sleeping medication was associated with both anxiety and depressive disorders (Vaidya *et al.*, 2014). However, compared to 18–24 year olds, older adults, age 65+ years with anxiety did not exhibit greater odds of taking a sleeping medication.

To our knowledge, only one study has measured associations between anxiety disorders (GAD, PTSD, and panic disorder), mood disorders (major depressive disorder (MDD) and depressive symptoms), insomnia, and sleeping medications in older adults in the U.S. (Conti *et al.*, 2017). Though sedative-hypnotic sleeping medications were associated with every clinical group, similar to previous studies, only depressive symptoms remained a significant predictor after controlling for confounding. Against expectations, participants with GAD exhibited *less* sedative-hypnotic use than participants with MDD. However, as the authors noted, their study was limited due to a small sample size (total N = 483; N taking sedative-hypnotic = 125). In summary, unlike depression, the association between anxiety symptoms and sleeping medication use among older adults is unclear. Therefore, the present study aims to clarify the association between anxiety symptoms and sleeping medication use by utilizing a nationally representative sample of older adults. In addition to addressing a gap in the present literature, our study is also motivated by the clinical implications of older adults' use of sedating medications.

To address the inconsistency present in the literature and build upon previous research with small samples, we investigate the association between anxiety symptoms and sleeping medication use with a nationally representative sample of Medicare-eligible older adults in the US. A major strength of the present study's data source, The National Health and Aging Trends Study (NHATS), is the over-sampling of non-Hispanic Black Americans and oldest-old to obtain a more demographically diverse and representative image of the association between anxiety symptoms and sleeping medication use (Montaquila *et al.*, 2012). We hypothesize that there will be a significant association between anxiety symptoms and sleeping medication use. Our secondary objective is to explore sociodemographic, physical, and mental health variables that may also be associated with sleeping medication use in this sample.

Methods

Data were obtained from the 2011 National Health and Aging Trends Study (NHATS; www.nhats.org). National Institute on Aging sponsors the NHATS (grant number NIA U01AG032947) through a cooperative agreement with the Johns Hopkins Bloomberg School of Public Health. The NHATS longitudinally investigates factors related to later life functioning. Respondents were drawn from the Medicare enrollment file (N = 11,627) to amass a representative sample of Medicare beneficiaries aged 65 years and older in the contiguous U.S. (Montaquila *et al.*, 2012). The NHATS uses a stratified multistage survey

design, consisting of personal interviews conducted by trained research staff (Montaquila *et al.*, 2012). A total of 8,245 adults age 65 years and older were enrolled in the study for a response rate of 71% (Kasper and Freedman, 2012). Respondents residing in a nursing home (N = 468 (5.58%)) or residential care facility (N = 580 (7.04%)) were excluded from analysis. The final sample population consisted of community-dwelling older adults (N = 7,197 (87.29%)), representative of approximately 36.4 million older adults living in the U.S. The final analytic sample consisted of 7,148 (89.69%) respondents after excluding those with missing, "don't know", or refused to answer for the anxiety and/or sleeping medication measures (N = 50 (0.70%)).

Outcome Variable

Sleeping medication, hypnotic or otherwise, use is operationalized by the NHATS survey question, "how often did you use sleeping medication in the past month?" Responses were recorded using a five-point likert scale ("every night" (7 nights a week; n = 863)), "most nights" (5–6 nights a week; n = 201), "some nights" (2–4 nights a week; n = 460), "rarely" (once a week of less; n = 547), and "never" (n = 5,077)). To create a binary variable, we combined responses indicating sleeping medication use ("every night", "most nights", "some nights", "rarely"; n = 2,071) and responses indicating no sleeping medication use ("never"; n = 5,077).

Mental Health Variables

The NHATS assesses anxiety symptoms with the Generalized Anxiety Disorder-2 (GAD-2) module. The GAD-2 is a two-question standardized and validated measure of anxiety symptoms for both clinical and elderly populations (Kroenke *et al.*, 2007). The NHATS GAD-2 questions are: "Over the last month, how often have you: a) felt nervous, anxious, or on edge; b) been unable to stop or control worrying?" Using a four-point likert scale scored from zero to three, respondent's response categories were: "not at all", "several days", "more than half the days", and "everyday". Scores from the GAD-2 questions were summed to create a composite measure, ranging from zero to six. It has been previously identified that scores greater than or equal to three have a sensitivity of 86% and specificity of 83% for a GAD diagnosis (Kroenke *et al.*, 2007). Therefore, we specified anxiety as a binary variable with a GAD-2 score less than or equal to two identified as low anxiety and GAD-2 scores greater than or equal to three identified as high anxiety.

Depression was measured via the Patient Health Questionnaire-2 (PHQ-2) NHATS module. The PHQ-2 is a two question standardized and validated measure of depression in both clinical and elderly populations (Arroll *et al.*, 2010; Li *et al.*, 2007). PHQ-2 questions are: "Over the last month, how often have you: a) had little interest or pleasure in doing things; b) felt down, depressed, or hopeless". Valid response categories were: "not at all", "several days", "more than half the days", and "everyday". Individual questions were scored from zero ("not at all") to three ("everyday"). We summed scores on both of the PHQ-2 questions to create a composite score from zero to six. Similar to the GAD-2 module, it has been found that PHQ-2 scores greater than or equal to three have a sensitivity of 82.9% and specificity of 90.0% for depression.(Kroenke *et al.*, 2003) Therefore, depression was

categorized into a binary variable using PHQ-2 scores greater or equal to three as a cut-off for high depressive symptoms.

Additional Measures

We adjusted for self-reported insomnia symptoms (i.e., trouble falling back asleep after an early waking and taking over 30 minutes to fall asleep). Additional self-reported variables were identified to both describe the respondent sample and adjust for potential confounding (i.e., age, biological sex, race/ethnicity, dementia diagnosis, self-reported health, and chronic conditions).

Respondents were asked 1) “In the last month, how often did it take you more than 30 minutes to fall asleep?” and 2) “In the last month, on nights when you woke up before you wanted to get up, how often did you have trouble falling back asleep?” Valid responses included, “every night (7 nights per week)”, “most nights (5–6 nights per week)”, “some nights (2–4 nights per week)”, “rarely (once or less a week)”, and “never”. Similar to several other studies, chronic conditions and self-related health were included as relevant potential confounders (Potvin *et al.*, 2014; Omvik *et al.*, 2010; Vaidya *et al.*, 2014). The following chronic conditions were first recoded as binary variables of either having or not having the diagnosis: high blood pressure, heart disease, arthritis, osteoporosis, diabetes, and cancer. Each diagnosis was then summed to create a score of chronic conditions ranging from 0–6. Due to a low percentage of respondents with five (3.0%) and six (< 1%) chronic conditions, three groups were created: 1) no chronic conditions (10.06%), 2) 1–3 chronic conditions (75.78%), and 3) 4–6 chronic conditions (14.16%). Lastly, a self-reported dementia diagnosis was also included as a potential confounder (Seignourel *et al.*, 2008). Respondents with invalid data (“don’t know/refused to answer/missing”) were excluded from analysis.

Data Analysis

For these analyses, we conducted a logistic regression to measure the association between sleeping medication use and anxiety symptoms after adjusting for potential confounders. We also included sociodemographic, physical, and mental health variables that have been shown to be related to sleeping medication use (Conti *et al.*, 2017; Potvin *et al.*, 2014; Omvik *et al.*, 2010; Chang *et al.*, 2014) in our logistic regression model. Given the potential inaccuracies in self-reported data among individuals with cognitive impairment, we conducted a sensitivity analysis excluding participants with a dementia diagnosis (n=457). Specifically, we modeled the association between sleeping medication use and anxiety symptoms among community dwelling respondents, adjusting for the same covariates as in the main model among the sample without a dementia diagnosis (n=6,756). Sample estimates and comparisons are weighted to reflect the U.S. population of older adults. All statistical analyses were performed in STATA version 14.0 (StataCorp, 2015).

Results

Among 7,148 community dwelling NHATS respondents, 933 (13.1%) were classified as having high anxiety and 2,071 (29.0%) reported taking a sleeping medication. After applying population weights, it is estimated that 4 million community-dwelling older adults

may have clinically significant generalized anxiety symptoms and 10 million take a sleeping medication. Table 1 stratifies sleeping medication use and other predictor variables by low and high anxiety. Expectedly, a large portion of respondents classified as high anxiety, were also classified as having significant depressive symptoms (51.9%). Additionally, we observe significant gender differences across the low and high anxiety groups, with a greater proportion of females experiencing high anxiety (64.2%) compared to low anxiety (54.5%). The stratification also reveals noteworthy differences in demographic characteristics (e.g., age, education, and race) the number of chronic illnesses, self-rated health, and insomnia across individuals with low and high anxiety.

Logistic regression results revealed several significant associations (Table 2). In support of our hypothesis, respondents with high anxiety symptoms had 2.60 (95% CI: 2.24, 3.02) times the odds of taking a sleeping medication compared to individuals with low anxiety symptoms. After adjusting for confounding, the effect of anxiety attenuates slightly, but remains a significant predictor of sleeping medication use (AOR=1.57; 95% CI: 1.29, 1.91). Depression emerged as a significant predictor of sleeping medication use in both the unadjusted (OR= .98; 95% CI: 1.74, 2.24)) and adjusted (AOR=1.29; 95% CI: 1.08, 1.54) results.

Compared to females, males had 28% (95% CI: 0.63, 0.82) lower odds of taking a sleeping medication in the adjusted model. Compared to White respondents, Black and “other” racial and ethnic groups have significantly lower odds of taking a sleeping medication before and after adjusting for confounding. Moreover, the number of chronic conditions was also predictive of sleeping medication use. Compared to respondents without any chronic conditions, those with 1–3 had 34% (95% CI: 1.07, 1.70) increased odds of taking a sleeping medication after adjusting for confounding. Respondents with 4–6 chronic conditions were 68% more likely to take a sleeping medication (AOR=1.68; 95% CI: 1.27, 2.32), as were individuals with a college or greater education (AOR=1.51; 95% CI: 1.22, 1.86)). Respondents with fair and poor self-rated health had greater odds of taking a sleeping medication (AOR=1.48; 95% CI: 1.15, 1.92; AOR=2.30; 95% CI: 1.65, 3.21, respectively), compared to respondents with excellent self-rated health. The more often respondents reported falling asleep in more than thirty-minutes or trouble falling back asleep after waking, the greater their odds of sleeping medication use. Last, results from the sensitivity analysis suggest that the association between anxiety symptoms and sleeping medication use (AOR=1.64; 95% CI: 1.33, 2.01) persisted even after excluding individuals with a self-reported dementia diagnosis (results can be found in the online appendix).

Discussion

Our study has several key findings. First, among a national sample of older adults, respondents with high anxiety symptoms had significantly greater odds of sleeping medication use compared to older adults with low anxiety symptoms, even after adjusting for potential confounding. Second, we replicated previous findings that have associated depressive symptoms with sleeping medication use (Potvin *et al.*, 2014; Omvik *et al.*, 2010; Leblanc *et al.*, 2015; Vaidya *et al.*, 2014). Third, a greater number of chronic health conditions, worse self-rated health, being female and White were also associated with

increased odds of using sleeping medications. Interestingly, age did not emerge as a significant factor of sleeping medication use among our sample of older adults. Last, results from the sensitivity analysis excluding respondents with dementia revealed the association between high anxiety symptoms and sleeping medication use persisted.

Studies of older adults living outside of U.S. have inconsistently identified anxiety symptoms as a predictor of sleeping medication use (Potvin *et al.*, 2014; Leblanc *et al.*, 2015; Omvik *et al.*, 2010). One study among the U.S. general population did associate anxiety and sleeping medications, though did not identify age as a significant factor (Vaidya *et al.*, 2014). To our knowledge, this is among the first studies to identify a significant association between anxiety and sleeping medication use among a nationally representative sample of older adults living in the U.S.

In addition to our primary aim, our results identified associations between depressive symptoms, the presence of chronic health conditions, and worse self-rated health as factors related to sleeping medication use. Therefore, surveying the presence or absence of the various predictors of sleeping medication use in older patients during a clinical interview may allow clinicians to identify older adults who may be at risk for sleeping medication use. Furthermore, the results from our work finding an association between sleep latency and difficulty falling asleep and sleeping medication use may enable clinicians to tailor clinical interventions. Specifically, for older patients presenting with clinically significant anxiety symptoms, inquiries into their sleep health and sleep hygiene may open opportunities for the use of non-pharmacologic tools for the management of anxiety-induced insomnia. Additionally, clinicians may also measure anxiety symptoms and ask about the use of over the counter sleep aids to assess if anxiety is a factor related to their insomnia. If over the counter sleep aids are identified, this can create an opportunity to teach about sleep hygiene, risks associated with hypnotic medication, and treatment options for anxiety.

Despite previous evidence suggesting greater sleeping medication use with age, we do not find this relationship in our study among older adults (Chong *et al.*, 2013). Similar to previous research, non-White respondents, were significantly *less* likely to report taking a sleeping medication (Chong *et al.*, 2013). These findings are echoed in a 2010 poll by the National Sleep Foundation: 13% of White-Americans reported sleeping medication use at least a few nights a week, compared to 9% for Blacks/African-Americans, 8% for Hispanics, and 5% for Asians (Hall *et al.*, 2010). These ethnic differences may be attributed to, in part, differential reporting of sleeping problems with healthcare providers; however, future research is required to further understand this association (Hall *et al.*, 2010).

As older adults tend to be more sensitive to the side effects of medications and are susceptible to adverse drug events related to polypharmacy, the use of non-pharmacologic interventions may be clinically beneficial (Maher *et al.*, 2014). Several studies have highlighted the effectiveness of cognitive behavioral therapy (CBT) for treating insomnia (Bush *et al.*, 2012) and anxiety (Kishita and Laidlaw, 2017). CBT aims to identify and challenge dysfunctional thoughts related to sleep and its impact on function (Morin, 1993; Zdanys and Steffens, 2015). Based on our findings, we suggest that future research examine

whether or not patients with anxiety symptoms taking sleep medications may benefit from alternative and tailored non-pharmacological interventions, such as CBT.

It is worthy to note this study's limitations. First, we relied on self-reported measures, making them more susceptible to recall, social desirability, and other biases. Moreover, our measure for sleeping medication could neither differentiate between prescription and non-prescription medications nor the type of sedative medication (e.g., benzodiazepines antidepressants, hypnotics/anxiolytics, antipsychotics). Future research may explore if there are associations between anxiety symptoms and different types of sleeping medication prescribing, filling, and purchasing patterns. In addition, this analysis was cross-sectional in nature and therefore does not lend itself to identify the causal pathway between anxiety and sleeping medication use. Therefore, the field would benefit from additional analyses that incorporate a longitudinal design to understand the risk of taking a sleeping medication after the onset of anxiety symptoms. Lastly, due to the nature of the sampling frame and representative survey, we are unable to extend the findings to populations outside of the U.S. or other age groups within the U.S.

The strength of the present study is largely the use of nationally representative data to extend findings to older adults throughout the U.S. NHATS is a strong survey tool with a high response rate (87%) and deliberate over-sampling of underrepresented ethnic populations and ages. Also, the large sample size with minimal missing and invalid data enables for more robust statistical analyses.

In summary, the present research adds to current literature by identifying anxiety symptoms as being significantly associated with sleeping medication use. We replicate previous findings asserting depressive symptoms (Potvin *et al.*, 2014; Omvik *et al.*, 2010; Vaidya *et al.*, 2014) other sociodemographic factors (e.g., gender, education, ethnicity) (Chong *et al.*, 2013; Omvik *et al.*, 2010) chronic conditions, and self-reported health as factors related to sleeping medication use (Vaidya *et al.*, 2014). Beyond the individual finding associating anxiety symptoms and sleeping medication use, we stress that all variables significantly associated with sleeping medication use must be considered when treating older patients because anxiety is rarely independent of other clinical, demographic, and socioeconomic factors. A thorough and comprehensive clinical interview identifying alternative treatment strategies for anxiety symptoms and anxiety-induced insomnia is likely to optimize and improve care for older patients.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Key Points

1. Approximately 4 million older adults above the age of 65 in the United States have clinically significant anxiety symptoms.
2. Approximately 10 million older adults in the United States have taken a sleeping medication in the last 30 days.
3. Results identified a significant association between high anxiety symptoms and sleeping medication use in a nationally representative sample of US older adults.
4. Depression, chronic conditions, and poor self-rated health were also significantly associated with sleeping medication use.

Table 1

Sample characteristics of NHATS community dwelling adults (age 65≤ years) by anxiety group[1] (N= 7,148)

Variable	Low Anxiety N (Weighted %)	High Anxiety N (Weighted %)	χ^2, p
Primary Outcome			168.83, p < 0.001
Sleep Medication	1626 (27.49)	445 (49.65)	
No Sleep Medication	4589 (72.51)	488 (50.35)	
Depression[2]			710.79, p < 0.001
Low	5550 (91.12)	441 (48.09)	
High	629(8.88)	482 (51.91)	
Age Group			8.84, p < 0.001
65–74	2586 (55.80)	335 (48.93)	
75–84	2475 (33.40)	395 (36.97)	
85 ≤	1154 (10.82)	203 (14.10)	
Gender			26.11, p < 0.001
Female	3499 (54.46)	624 (64.15)	
Male	2716 (45.36)	309 (35.85)	
Education			59.20, p < 0.001
Less than High School	1539 (19.74)	388 (36.80)	
High School/Some College	2925 (48.71)	406 (47.96)	
College and Greater	1684 (31.54)	125 (15.23)	
Race/Ethnicity			13.10, p < 0.001
Black	1357 (8.17)	234 (9.95)	
Hispanic	344 (6.33)	96 (12.08)	
Other	187 (3.59)	37 (3.60)	
White	4262 (81.90)	565 (74.36)	
Time to fall asleep < 30 minutes			93.41, p < 0.001
Every night	575 (8.42)	234 (26.99)	
Most nights	616 (10.02)	159 (16.29)	
Some nights	1467 (22.23)	243 (24.24)	
Rarely	1639 (28.62)	129 (14.90)	
Never	1903 (30.65)	168 (17.57)	
Frequency of Experiencing Difficulty Falling Back Asleep			68.64, p < 0.001
Every night	295 (4.45)	136 (16.46)	
Most nights	548 (8.28)	173 (18.85)	
Some nights	1632 (26.10)	285 (28.77)	
Rarely	1846 (31.54)	175 (18.87)	
Never	1876 (29.62)	162 (17.13)	
Dementia Diagnosis			133.64, p < 0.000
No	5937 (97.11)	819 (90.56)	
Yes	276 (2.89)	112 (9.44)	
Number of Chronic Conditions			62.75, p < 0.000

Variable	Low Anxiety N (Weighted %)	High Anxiety N (Weighted %)	χ^2, p
0	676 (12.27)	41 (5.33)	
1–3	4743 (76.38)	646 (70.09)	
4–6	754 (11.35)	238 (24.59)	
Self-Reported Health			142.73, $p < 0.000$
Excellent	865 (16.60)	36 (4.32)	
Very Good	1812 (32.13)	103 (12.79)	
Good	2035 (31.03)	237 (25.78)	
Fair	1165 (15.81)	325 (33.92)	
Poor	335 (4.43)	231 (23.19)	

Notes. Chronic conditions represent a composite score, ranging from 0–6, of having a diagnosis of high blood pressure, heart disease, arthritis, osteoporosis, Diabetes, and Cancer, or not. Data were weighted to account for complex survey design and represent a sample of older adults living in the United States.

[1]Anxiety was measured using the Generalized Anxiety Disorder-2 module. Scores less than or equal to 2 were considered low anxiety and scores greater than or equal to 3 were considered high anxiety.

[2]Depression was measured using the Patient Health Questionnaire-2 module. Scores less than or equal to 2 were considered low depression and scores greater than or equal to 3 were considered high depression.

Table 2

Unadjusted and adjusted odds ratios of sleep medication use among NHATS community-dwelling older adults in the United States (n=7,148)

Variable	Unadjusted OR OR (95% CI)	Adjusted OR (All predictors) OR (95% CI)
Anxiety[1]		
Low	1.00	1.00
High	2.60 (2.24, 3.02)***	1.57 (1.29, 1.91)***
Depression[2]		
Low	1.00	1.00
High	1.98 (1.74, 2.24)***	1.29 (1.08, 1.54)**
Age		
65–74	1.00	1.00
75–84	1.04 (0.936, 1.15)	0.91 (0.80, 1.03)
85+	1.07 (0.91, 1.25)	0.86 (0.72, 1.04)
Gender		
Female	1.00	1.00
Male	0.64 (0.56, 0.73)***	0.72 (0.63, 0.82)***
Education		
Less than High School	1.00	1.00
High School	1.03 (0.89, 1.2)	1.15 (0.97, 1.35)
College and above	0.972 (0.81, 1.17)	1.51 (1.22, 1.86)***
Race/Ethnicity		
White	1.00	1.00
Black	0.58 (0.50, 0.68)***	0.49 (0.41, 0.58)***
Hispanic	0.98 (0.79, 1.20)	0.79 (0.64, 0.98)*
Other	0.48 (0.36, 0.66)***	0.40 (0.29, 0.56)***
Sleep Latency		
Every night	6.13 (5.05, 7.45)***	4.15 (3.27, 5.28)***
Most nights	5.05 (3.95, 6.46)***	3.47 (2.62, 4.61)***
Some nights	3.57 (3.04, 4.21)***	2.76 (2.29, 3.34)***
Rarely	2.10 (1.76, 2.52)***	1.73 (1.44, 2.01)***
Never	1.00	1.00
Difficulty Falling Back Asleep		
Every night	3.95 (3.12, 5.00)***	1.38 (1.02, 1.87)*
Most nights	4.05 (3.31, 4.94)***	1.77 (1.37, 2.28)***
Some nights	2.73 (2.39, 3.12)***	1.61 (1.36, 1.91)***
Rarely	1.86 (1.56, 2.21)***	1.46 (1.25, 1.71)***
Never	1.00	1.00
Dementia		

Variable	Unadjusted OR OR (95% CI)	Adjusted OR (All predictors) OR (95% CI)
No	1.00	1.00
Yes	1.54 (1.17, 2.02) ***	1.31 (0.94, 1.80)
Chronic Conditions		
0	1.00	1.00
1–3	1.71 (1.36, 2.15) ***	1.34 (1.07, 1.70) **
4–6	2.88 (2.24, 3.71) ***	1.68 (1.27, 2.23) ***
Self-Rated Health		
Excellent	1.00	1.00
Very Good	1.48 (1.17, 1.87) ***	1.26 (1.00, 1.59)
Good	1.56 (1.24, 1.97) ***	1.28 (0.99, 1.64)
Fair	2.10 (1.69, 2.62) ***	1.49 (1.15, 1.92) **
Poor	3.77 (2.91, 4.89) ***	2.30 (1.65, 3.21) ***

Notes. Chronic conditions represents a composite score, ranging from 0–6, of having a diagnosis of high blood pressure, heart disease, arthritis, osteoporosis, Diabetes, and Cancer, or not. Data were weighted to account for complex survey design and represent a sample of older adults living in the United States.

[1] Anxiety was measured using the Generalized Anxiety Disorder-2 module. Scores less than or equal to 2 were considered low anxiety and scores greater than or equal to 3 were considered high anxiety.

[2] Depression was measured using the Patient Health Questionnaire-2 module. Scores less than or equal to 2 were considered low depression and scores greater than or equal to 3 were considered high depression.

* $p < 0.05$;

** $p < 0.01$;

*** $p < 0.001$

Adjusted logistic regression $F_{25, 32} = 37.13$