



Published in final edited form as:

Aging Ment Health. 2011 March ; 15(2): 198–203. doi:10.1080/13607860903493366.

The interactive role of chronic medical conditions and sleep disturbance in predicting depressive symptoms among Korean American older adults

Yuri Jang^{a,*}, Jinah Shin^b, Soyeon Cho^c, Giyeon Kim^d, and David A. Chiriboga^a

^aDepartment of Aging and Mental Health Disparities, University of South Florida, Tampa, USA

^bElmhurst Hospital Center, New York, USA

^cDepartment of Human Services, City University of New York, NY, USA

^dCenter for Mental Health and Aging, Department of Psychology, The University of Alabama, AL, USA

Abstract

Objectives—This study examined the independent and interactive effects of chronic medical conditions and sleep disturbance on depressive symptomatology. The sample ($N = 675$) consisted of community-dwelling Korean American older adults, a group that has been found to be particularly high in depressive symptomatology.

Methods—A hierarchical regression model of depressive symptoms was estimated with an array of predictors: (a) demographic variables, including immigration history, (b) chronic medical conditions, (c) sleep disturbance, and (d) an interaction between chronic medical conditions and sleep disturbance.

Results—After controlling for the effects of demographic variables, both chronic medical conditions and sleep disturbance were identified as independent risk factors for depressive symptoms. Moreover, their interaction was significant, indicating that the coexistence of chronic medical conditions and sleep disturbance was significantly associated with higher levels of depressive symptoms ($\beta = 0.15, p < 0.01$).

Conclusion—Our findings call attention to sleep hygiene among older individuals with chronic medical conditions and recommend that sleep quality should be closely monitored and assessed by healthcare professionals.

Keywords

depressive symptoms; sleep disturbance; chronic medical conditions; Korean American; older adults

*Corresponding author. yjang@fmhi.usf.edu.

Introduction

Depression is not only the most common mental disorder in older populations (Blazer, 2003; Harpole et al., 2005), but also one with evidence of racial/ethnic disparities (US DHHS, 2001). Members of racial/ethnic minorities have higher levels of depressive symptoms compared with non-Hispanic Whites (Kuo, Chong, & Joseph, 2008; US DHHS, 2001). Among these minorities, Korean American older adults stand out as having consistently been reported as a high-risk group (Hughes, 2002; Hurh & Kim, 1990; Kuo, 1984; Noh & Avison, 1996). Studies with community-dwelling older Korean Americans report that the proportion of the sample scored higher than cut-offs on the standardized depression screening tools is from mid-20s to upper 30s (e.g., Jang, Kim, & Chiriboga, 2007; Lee, Moon, & Knight, 2005; Mui & Kang, 2006), which is higher than the 8%–16% found among older Whites and African Americans (e.g., Berkman et al., 1986; Blazer, Landerman, Hays, Simonsick, & Saunders, 1998; Cole & Dendukuri, 2003). Such findings underscore the need for evidence-based prevention and intervention strategies to improve the mental health of Korean American older adults.

Regardless of race and ethnicity, health decline is one of the most common concerns among older adults. Experiences with chronic medical conditions are linked to various stressful situations likely to affect mental health, such as decreased physical functioning, restricted social activities, and increased dependence on others (Bruce, 2001; Johnson & Wolinsky, 1999; Zeiss, Lewinsohn, Rohde, & Seeley, 1996). It is notable that at least 80% of Americans aged 60 years or older are living with chronic illness, and multiple conditions are quite common (Centers for Disease Control and Prevention, 2003). Those with multiple chronic conditions, in turn, are at heightened risk of depression (Bazargan & Hamm-Baugh, 1995). Given its persistent and progressive nature, and the likelihood of comorbidity in later years of life, the role of chronic medical conditions as a prominent risk factor for depressive symptoms deserves attention.

Along with chronic medical conditions, sleep disturbance is also common among older adults, but rarely studied in racial/ethnic minority populations such as Korean Americans. One exception is Sok's (2008) study of 52 Korean American elders, among whom over 80% indicated sleep interruptions. Although the patterns of age-related change in several dimensions of sleep vary considerably from individual to individual (Ohayon, Carskadon, Guilleminault, & Vitiello, 2004), such sleep disturbances as inability to get to sleep, shorter sleep time, and changes in the normal circadian rhythm become more likely as people age (Ancoli-Israel, 2005; Avidan, 2005; Latimer Hill, Cumming, Lewis, Carrington, & Le Couteur, 2007).

The link between sleep disturbance and depressive symptoms is complex and bidirectional in nature (Paudel et al., 2008), but several studies have conceptualized sleep disturbance as a predictor of depressive symptoms in the general population (Froese et al., 2008). While rare, longitudinal studies support this predictive model. Livingston, Blizard, and Mann (1993), for example, found that current sleep disturbance was a significant predictor of future depression among older adults in an inner London community. In a prospective cohort study, Cho et al. (2008) reported that sleep disturbance predicted a recurrent depressive episode

within two years, after controlling for confounding factors such as medical conditions. Those studies suggest that sleep disturbance may, in fact, precede symptoms of depression even though poor sleeping patterns have traditionally been viewed as a symptom of depression.

Of particular interest for this study was the coexistence of chronic medical conditions and sleep disturbance. Chronic medical conditions and sleep disturbance are likely to be associated with each other, and their co-occurrence may have a synergistic effect in lowering one's mental well-being. Although some studies have addressed sleep disturbance among patients with a specific medical condition such as heart failure (e.g., Erickson, Westlake, Dracup, Woo, & Hage, 2003), little is known about the extent to which the coexistence of chronic medical conditions and sleep disturbance contributes to depressive symptoms.

Based on the above-mentioned review, this study explored the independent and interactive effects of chronic medical conditions and sleep disturbance on depressive symptoms among Korean American older adults. We hypothesized that the coexistence of chronic medical conditions and sleep disturbance would be associated with increased depressive symptoms. Findings may help better understand the mechanisms underlying physical and mental health among Korean American older adults and suggest ways to facilitate prevention and intervention efforts for their mental well-being.

Methods

Participants

The Mental Health Literacy among Korean American Elders project provided data for the study. Data were collected from March through August 2008 in Tampa and Orlando, Florida. Selection of sites in Florida reflected our desire to study well-being among those who lacked the resources available in areas, such as California and New York, with relatively high proportions of Korean Americans. Participants were Korean adults aged 60 or older who were able to understand and complete the survey. The survey questionnaires were in Korean, and they were developed through back translation and pilot testing with 20 Korean older adults who were representative of the anticipated sample. Both because the target population is geographically dispersed and because the immigrant populations are often underrepresented in public databases (e.g., census data and telephone directories), we used a variety of sources for recruitment. The survey sites included 25 local Korean churches, two other groups with a religious affiliation, one Korean senior center, two senior apartments, and a local Korean elder association. For churches, where on-site contacts were not possible, mail surveys were conducted. For the latter, a packet including a set of questionnaire and pre-stamped return envelope was mailed to potential participants. To recruit individuals who were not affiliated in those groups or organizations, we made requests for referrals from respondents as well as other individuals associated with our primary data collection sites.

We supplemented the convenience sampling procedure with a systematic review of a telephone directory of Korean residents provided by the Florida Korean American Association. A total of 2000 Korean residents in Tampa and Orlando were listed in the directory. After excluding those who had already been recruited through our convenience

sampling efforts, we called all the remaining individuals to ask whether there were age-eligible members in their household. Up to five phone calls were made to each number. When there was an eligible person in the household, a packet of mail survey was sent. This step was designed to improve sample representation by including individuals who were not recruited by the convenience sampling efforts that are often used with hard-to-reach minority groups.

Our final sample consisted of 675 participants. About 73% of the sample was recruited through visits to local sites, and about 27% through mail surveys. We conducted a series of analyses to check whether there was any significant difference in sample characteristics by recruitment methods. Only one significant difference in major demographic variables was found: compared to those who responded by mailed survey, participants recruited through site visits were less educated ($\chi^2 = 10.3, p < 0.01$). The finding suggests that sole reliance on the mail survey approach might have excluded individuals with lower levels of education. All respondents were paid \$20 for their participation.

Measures

Sleep disturbance—The frequency of experiencing sleep problems was measured with a single item ‘how often was your sleep restless during the past week?’ The original scale range was from ‘none’ to ‘all of the time’, and the scores were dichotomized to indicate the absence (0) or presence (1) of sleep disturbance.

Chronic medical conditions—Individuals were asked to report existing medical conditions using a nine-item list of chronic diseases and conditions commonly found among older populations (e.g., arthritis, stroke, heart problems, diabetes, and cancer), using a yes/no format. The list was drawn from the Older Americans Resources and Services Questionnaire (OARS) (Fillenbaum, 1988). A summated score was used for the analysis.

Depressive symptoms—A 15-item short form of the Geriatric Depression Scale-short form (GDS-SF; Sheikh & Yesavage, 1986) was utilized to index depressive symptoms. With a yes/no response format, the scale includes five positive items (e.g., ‘Are you satisfied with your life?’ and ‘Do you feel happy?’) and 10 negative items (e.g., ‘Do you feel that your life is empty?’ and ‘Do you feel helpless?’). The total score was calculated by counting the number of depressive symptoms (scores for positive stems were reversed). The totals ranged from 0 (*no depressive symptoms*) to 15 (*severe depressive symptoms*). The GDS-SF has been translated into Korean, and its psychometric properties have been validated (e.g., Jang, Small, & Haley, 2001; Mui & Kang, 2006). Internal consistency of the GDS-SF in this sample was satisfactory ($\alpha = 0.82$).

Control variables—Demographic information included age (in years), gender (0 = male, 1 = female), marital status (0 = married, 1 = not married), and educational attainment (0 = <high school, 1 = high school). Each participant was asked how long they had lived in the United States, with results scored in years.

Results

Descriptive information of the sample and study variables

Table 1 summarizes descriptive information of the sample. The sample consisted of 675 Korean American older adults. The mean age was 70.2 (SD = 6.87) with a range from 60 to 96. More than half (58.8%) of the participants were female, and 70% had received a high school education or more. Approximately 23% of the sample was presently unmarried. The length of stay in the United States averaged 28.3 years with a range from one to 54 years.

The average number of chronic medical conditions was 1.35 (SD = 1.24). The majority of the sample (72%) was affected by at least one condition, with more than 16% having three or more. The most commonly reported conditions were high blood pressure (43.8%) and arthritis (31.8%). More than one-third of the sample (38.7%) reported sleep disturbance. The mean GDS-SF score was 3.61 (SD = 3.23) out of a possible maximum score of 15.

Bivariate correlations

In order to check collinearity among study variables, bivariate correlation coefficients were examined, and the absence of collinearity was confirmed (i.e., all r s < 0.38). As described in Table 2, individuals who had more depressive symptoms were more likely to be female, unmarried, and less educated and to have had a shorter stay in the US. As one might expect, higher levels of depressive symptoms were observed among individuals with more chronic medical conditions and sleep disturbance. Chronic medical conditions and sleep disturbance were themselves significantly and positively related.

Predictive model of depressive symptoms

Results from hierarchical regression analyses are summarized in Table 3. A hierarchical regression was modeled with the following sets of predictive variables: (a) demographic and background variables (age, gender, marital status, education, and length of stay in the US), (b) chronic medical conditions, (c) sleep disturbance, and (d) an interaction between chronic medical conditions and sleep disturbance. Centered scores were used when computing the interaction term.

In the initial model, demographic variables were entered and 7% of the total variance was explained. Marital status ($\beta = 0.17$, $p < 0.001$) and length of stay in the US ($\beta = -0.13$, $p < 0.01$) were found to be significant predictors of depressive symptoms. Individuals who were not married and had shorter stays in the US were likely to have higher depressive symptoms. In the next model, chronic medical conditions explained an additional 4% of the variance. Those who had more chronic medical conditions ($\beta = 0.19$, $p < 0.001$) were more likely to report depressive symptoms. The subsequent model with sleep disturbance accounted for an additional 11% of variance. Having sleep disturbance ($\beta = 0.35$, $p < 0.001$) was a significant predictor of depressive symptoms. As a final step, the interaction term between chronic conditions and sleep disturbance was entered; this interaction added 2% to the explained variance. The total variance explained by the estimated model was 24%.

The significant interaction suggests that the coexistence of chronic medical conditions and sleep disturbance had a synergistic power to predict depressive symptoms. In order to further interpret the interaction effect, we divided the sample into subgroups without sleep disturbance ($n = 413$) and with sleep disturbance ($n = 261$), and compared their correlations between chronic medical conditions and depressive symptoms. In the group without sleep disturbance, the association between chronic medical conditions and depressive symptoms was low and not significant ($r = 0.03$, $p > 0.05$). On the other hand, the association was moderate and significant in the subgroup with sleep disturbance ($r = 0.29$, $p < 0.001$); the group difference in the bivariate coefficients was significant ($t = 3.37$, $p < 0.001$).

Discussion

Given the high proportion of older adults with chronic medical conditions and/or sleep disturbances (e.g., Bruce, 2001; Centers for Disease Control and Prevention, 2003; Cho et al., 2008; Latimer Hill et al., 2007; Sok, 2008; Zeiss et al., 1996), the goal of the present study was to examine the independent and interactive role of chronic medical conditions and sleep disturbance in predicting depressive symptoms. The sample consisted of community-dwelling Korean American older adults, a group that has been found to be particularly high in depressive symptomatology. All subjects resided in Florida, a state that includes less than 2% of the entire population of Koreans living in the United States (US Census Bureau, 2004). Findings, therefore, are for an immigrant sample that generally had less access to culturally and linguistically appropriate health services.

Consistent with findings from previous studies (e.g., Jang et al., 2007; Lee et al., 2005), the level of depressive symptoms in this sample was quite high. A considerable proportion was also found to be affected by chronic medical conditions (72%) and sleep disturbance (38.7%). In a multivariate analysis, both chronic medical conditions and sleep disturbance were found to be independent contributors to depressive symptoms. These findings, the adverse impacts of chronic medical conditions and sleep disturbance on mental well-being and quality of life, have been reported in numerous studies with older populations (e.g., Bruce, 2001; Cho et al., 2008; Cole & Dendukuri, 2003; Zeiss et al., 1996).

The unique aspect of the present study was its examination of the coexistence of chronic medical conditions and sleep disturbance. In addition to the independent effects, we expected that having both chronic medical conditions and sleep disturbance would exert a synergistic effect, and our hypothesis was supported. The interaction term of chronic medical conditions and sleep disturbance was found to be significant ($\beta = 0.15$, $p < 0.01$), and further analysis showed that the correlation between chronic medical conditions and depressive symptoms was significantly stronger in the subgroup with sleep disturbance. Although there are some studies that have examined sleep disturbance in patients with a particular medical illness such as heart failure (e.g., Erickson et al., 2003), not much has been known about the interactive role of chronic medical conditions and sleep disturbance in community samples of older adults. Our findings call further attention to the older individuals who have chronic medical conditions and sleep disturbance and suggest that their sleep hygiene should be closely monitored and assessed by healthcare professionals.

While the findings may have relevance for older adults in general, the sample used in the present study consisted entirely of Korean American elders. This group was selected for study not only because past research has indicated unusually high levels of depressive symptomatology but also because of the potential role of cultural values and beliefs. It has been known that the unitary model of mind and body deeply permeates in Asian cultures and that somatization of emotional symptoms and distress are quite common among Asian Americans (Lin & Cheung, 1999; Pang, 1998). Given these cultural characteristics, assessment of sleep patterns may help screening and detection of depressive disorders among Korean American elders.

The results showed there is an interactive effect of two common encounters in the later years, chronic medical conditions, and sleep disturbance, on mental health. We also conducted supplemental analyses, not reported in Results section, in order to determine whether this interaction might differ when the positive and negative affect items in the depression screen were considered separately. These analyses followed from previously reported results indicating that Korean Americans respond differently to positive and negative affect items in depression screening tools (e.g., Jang et al., 2001; Jang, Kim, & Chiriboga, 2005). Using two separate depressive symptom measures, one based only on the positively-worded items and one based only on the negatively-worded items, the same results were found as with the measure based on the full instrument.

Some limitations to the present study should be noted. The foremost concern is the cross-sectional design of the study, which constrained implications due to the potential multidirectionality of the major study variables. The use of a sample of convenience also added a significant limitation. Despite our efforts to recruit participants from a variety of sources, the present sample was not recruited through random sampling procedures and may be somewhat biased toward upper middle class and healthy individuals. Given the nature of the sample and study design, the findings are only suggestive and await further investigation on the issue with a more representative sample and longitudinal assessments. Future studies also need to employ comprehensive measures of sleep that can address various aspects such as sleep duration, perceived sleep sufficiency, and presence of insomnia symptoms.

Overall the results suggest that within the complex mechanisms operating between physical and mental health, sleep may serve a bridging agent whose presence or absence may be utilized for intervention efforts. Given that sleep disturbance among older adults occurs frequently but remains largely under-detected and inadequately treated (Moller, Barbera, Kayumov, & Shapiro, 2004), more attention is required to sleep interventions in the later years.

Acknowledgments

This study was supported by the National Institute of Mental Health Research Program (grant no. 1R21MH081094; PI – Yuri Jang, PhD).

References

Ancoli-Israel S. Sleep and aging: Prevalence of disturbed sleep and treatment considerations in older adults. *Journal of Clinical Psychiatry*. 2005; 66:24–30.

Aging Ment Health. Author manuscript; available in PMC 2018 January 29.

- Avidan AY. Sleep disorders in the older patient. *Primary Care*. 2005; 32(2):563–586. [PubMed: 15935201]
- Bazargan M, Hamm-Baugh VP. The relationship between chronic illness and depression in a community of urban black elderly persons. *Journal of Gerontology: Social Sciences*. 1995; 50(2):S119–S127.
- Berkman LF, Berkman CS, Kasl S, Freeman DH Jr, Leo L, Ostfeld AM, et al. Depressive symptoms in relation to physical health and functioning in the elderly. *American Journal of Epidemiology*. 1986; 124(3):372–388. [PubMed: 3740038]
- Blazer DG. Depression in late life: Review and commentary. *Journal of Gerontology: Medical Sciences*. 2003; 58(3):249–265.
- Blazer DG, Landerman LR, Hays JC, Simonsick EM, Saunders WB. Symptoms of depression among community-dwelling elderly African-American and White older adults. *Psychological Medicine*. 1998; 28(6):1311–1320. [PubMed: 9854272]
- Bruce ML. Depression and disability in late life: Directions for future research. *American Journal of Geriatric Psychiatry*. 2001; 9(2):102–112. [PubMed: 11316615]
- Centers for Disease Control and Prevention. Public health and aging: Trends in aging – US and Worldwide. 2003. Retrieved August 8, 2008, from <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5206a2.htm>
- Cho HJ, Lavretsky H, Olmstead R, Levin MJ, Oxman MN, Irwin MR. Sleep disturbance and depression recurrence in community-dwelling older adults: A prospective study. *American Journal of Psychiatry*. 2008; 165(12):1543–1550. [PubMed: 18765482]
- Cole MG, Dendukuri N. Risk factors for depression among elderly community subjects: A systematic review and meta-analysis. *American Journal of Psychiatry*. 2003; 160(6):1147–1156. [PubMed: 12777274]
- Erickson VS, Westlake CA, Dracup KA, Woo MA, Hage A. Sleep disturbance symptoms in patients with heart failure. *AACN Clinical Issues*. 2003; 14(4):477–487. [PubMed: 14595207]
- Fillenbaum, G. Multidimensional functional assessment: The Duke older Americans resources and services procedure. Hillsdale, NJ: Erlbaum; 1988.
- Froese CL, Butt A, Mulgrew A, Cheema R, Speirs MA, Gosnell C, et al. Depression and sleep-related symptoms in an adult, indigenous, North American population. *Journal of Clinical Sleep Medicine*. 2008; 4(4):356–361. [PubMed: 18763428]
- Harpole LH, Williams JW Jr, Olsen MK, Stechuchak KM, Oddone E, Callahan CM, et al. Improving depression outcomes in older adults with comorbid medical illness. *General Hospital Psychiatry*. 2005; 27(1):4–12. [PubMed: 15694213]
- Hughes, D. Quality of health care for Asian Americans: Findings from the Commonwealth Fund 2001 Health Care Quality Survey. New York: Commonwealth Fund; 2002.
- Hurh WM, Kim KC. Correlates of Korean immigrants' mental health. *The Journal of Nervous and Mental Disease*. 1990; 178(11):703–711. [PubMed: 2230758]
- Jang Y, Kim G, Chiriboga D. Acculturation and manifestation of depressive symptoms among Korean American older adults. *Aging and Mental Health*. 2005; 9:500–507. [PubMed: 16214697]
- Jang Y, Kim G, Hansen L, Chiriboga DA. Attitudes of older Korean Americans toward mental health services. *Journal of the American Geriatrics Society*. 2007; 55(4):616–620. [PubMed: 17397442]
- Jang Y, Small BJ, Haley WE. Cross-cultural comparability of the Geriatric Depression Scale: Comparison between older Koreans and older Americans. *Aging and Mental Health*. 2001; 5(1): 31–37. [PubMed: 11513010]
- Johnson RJ, Wolinsky FD. Functional status, receipt of help, and perceived health. *Journal of Clinical Geropsychology*. 1999; 5:105–125.
- Kuo BC, Chong V, Joseph J. Depression and its psychosocial correlates among older Asian immigrants in North America: A critical review of two decades' research. *Journal of Aging and Health*. 2008; 20(6):615–652. [PubMed: 18768704]
- Kuo WH. Prevalence of depression among Asian-Americans. *The Journal of Nervous and Mental Disease*. 1984; 172(8):449–457. [PubMed: 6747614]
- Latimer Hill E, Cumming RG, Lewis R, Carrington S, Le Couteur DG. Sleep disturbances and falls in older people. *Journal of Gerontology: Medical Sciences*. 2007; 62(1):62–66.

- Lee HY, Moon A, Knight BG. Depression among elderly Korean immigrants. *Journal of Ethnic and Cultural Diversity in Social Work*. 2005; 13(4):1–26.
- Lin KM, Cheung F. Mental health issues for Asian Americans. *Psychiatric Services*. 1999; 50(6):774–780. [PubMed: 10375146]
- Livingston G, Blizard B, Mann A. Does sleep disturbance predict depression in elderly people? A study in inner London. *The British Journal of General Practice*. 1993; 43(376):445–448. [PubMed: 8292414]
- Moller HJ, Barbera J, Kayumov L, Shapiro CM. Psychiatric aspects of late-life insomnia. *Sleep Medicine Reviews*. 2004; 8(1):31–45. [PubMed: 15062209]
- Mui AC, Kang SY. Acculturation stress and depression among Asian immigrant elders. *Social Work*. 2006; 51(3):243–255. [PubMed: 17076122]
- Noh S, Avison WR. Asian immigrants and the stress process: A study of Koreans in Canada. *Journal of Health and Social Behavior*. 1996; 37(2):192–206. [PubMed: 8690879]
- Ohayon M, Carskadon M, Guilleminault C, Vitiello M. Meta-analysis of quantitative sleep parameters from childhood to old age in healthy individuals: Developing normative sleep values across the human lifespan. *Journal of Sleep and Sleep Disorders Research*. 2004; 27(7):1255–1273.
- Pang KY. Symptoms of depression in elderly Korean immigrants: Narration and the healing process. *Culture, Medicine and Psychiatry*. 1998; 22(1):93–122.
- Paudel ML, Taylor BC, Diem SJ, Stone KL, Ancoli-Israel S, Redline S, et al. Association between depressive symptoms and sleep disturbances in community-dwelling older men. *Journal of the American Geriatrics Society*. 2008; 56(7):1228–1235. [PubMed: 18482297]
- Sheikh JI, Yesavage JA. Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist*. 1986; 5:165–173.
- Sok SR. Sleep patterns and insomnia management in Korean–American older adult immigrants. *Journal of Clinical Nursing*. 2008; 17(1):135–143. [PubMed: 17419793]
- US Census Bureau. *The foreign-born population in the United States: 2003*. Washington, DC: US Department of Commerce; 2004.
- US DHHS. *Mental health: Culture, race, and ethnicity – A supplement to mental health: A report of the Surgeon General*. Rockville, MD: US D H HS, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services, National Institutes of Health, National Institute of Mental Health; 2001.
- Zeiss AM, Lewinsohn PM, Rohde P, Seeley JR. Relationship of physical disease and functional impairment to depression in older people. *Psychology and Aging*. 1996; 11(4):572–581. [PubMed: 9000290]

Table 1Descriptive information of the sample and study variables ($N = 675$).

Variable	Value
Age, mean SD (range 60–96)	70.2 ± 6.87
Female (%)	58.8
Not married (%)	23.4
High school (%)	70.5
Length of residency in the US, mean±SD (range 1–54 years)	28.3 ± 11.8
Chronic medical conditions ^I , mean±SD (range 0–9)	1.35 ± 1.24
No chronic medical conditions (%)	28.0
1–2 chronic medical conditions (%)	55.7
3 or more chronic medical conditions (%)	16.3
Sleep disturbance (%)	38.7
Depressive symptoms, mean ± SD (range 0–15)	3.61 ± 3.23

Note:

^I A variable used in the regression model.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 2

Correlations among study variables.

	1	2	3	4	5	6	7	8
1 Age	–							
2 Female	–0.14 ^{***}	–						
3 Not married	0.19 ^{***}	0.33 ^{***}	–					
4 High school	–0.22 ^{***}	–0.27 ^{***}	–0.30 ^{***}	–				
5 Length of stay in the US	–0.02	–0.05	–0.11 ^{**}	0.24 ^{***}	–			
6 Chronic medical conditions	0.14 ^{***}	0.08 [*]	0.12 ^{**}	–0.10 ^{**}	–0.03	–		
7 Sleep disturbance	–0.02	–0.00	0.01	0.01	–0.05	0.21 ^{***}	–	
8 Depressive symptoms	0.07	0.10 [*]	0.21 ^{***}	–0.16 ^{***}	–0.16 ^{***}	0.23 ^{***}	0.38 ^{***}	–

Notes:

* $p < 0.05$,

**

$p < 0.01$, and

$p < 0.001$.

Table 3

Hierarchical regression models of depressive symptoms.

Predictor	Model 1		Model 2		Model 3		Model 4	
	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>	β	<i>t</i>
Age	0.02	0.58	0.00	0.00	0.02	0.48	0.01	0.19
Female	0.02	0.49	0.01	0.16	0.01	0.38	0.01	0.36
Not married	0.17	4.04 ^{***}	0.16	3.91 ^{***}	0.16	4.05 ^{***}	0.17	4.30 ^{***}
High school	-0.07	-1.65	-0.06	-1.46	-0.08	-1.94	-0.07	-1.68
Length of stay in the US	-0.13	-3.18 ^{**}	-0.12	-3.23 ^{**}	-0.11	-3.04 ^{**}	-0.10	-2.85 ^{**}
Chronic medical conditions			0.19	5.10 ^{***}	0.11	3.13 ^{**}	0.02	0.32
Sleep disturbance					0.35	9.76 ^{***}	0.34	9.57 ^{***}
Chronic medical conditions × Sleep disturbance							0.15	3.19 ^{**}
<i>R</i> ²	0.07		0.11		0.22		0.24	
<i>F</i>	10.2 ^{***}		13.2 ^{***}		26.6 ^{***}		24.9 ^{***}	

Notes:

* $p < 0.05$,

** $p < 0.01$, and

*** $p < 0.001$.