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The Relationships between Psychological Symptoms and Cardiovascular Symptoms Experienced during Menopausal Transition: Racial/Ethnic Differences

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Abstract

Objective—The purpose of the study was to examine the relationships between psychological symptoms and cardiovascular symptoms in a multi-ethnic group of midlife women while controlling for other influencing factors and to determine the association of race/ethnicity to the relationships between psychological symptoms and cardiovascular symptoms.

Methods—This was a secondary analysis of the data among 1,054 midlife women from two Internet Surveys. The instruments included the questions on background characteristics, health, and menopausal status and the Midlife Women's Symptom Index. The data were analyzed using correlation analyses, chi-squared tests, ANOVA, and multivariate linear and logistic regression analyses.

Results—The total numbers and total severity scores of psychological symptoms were significantly related to those of cardiovascular symptoms as a whole and in each racial/ethnic group ($p < .01$). In total participants, both the total numbers and total severity scores of psychological symptoms were significantly associated with increased risk for cardiovascular symptoms after adjusting for race/ethnicity ($p < .01$), and there were no interactions between race/ethnicity and psychological symptoms. The existence of diagnosed CVDs was significantly associated with the total numbers of and total severity scores of psychological symptoms only in Asian women.

Conclusions—Further studies on the mechanisms through which psychological symptoms are related to cardiovascular symptoms are needed while controlling for race/ethnicity.

Keywords

Menopause; Psychological Symptoms; Cardiovascular Symptoms; Race; Ethnicity

Introduction

Many midlife women experience a number of psychological symptoms during their menopausal transition ^{1,2}. The psychological symptoms include depression, mood disturbance, loss of energy, feelings of hopelessness or worthlessness, loss of interests, lack of motivation, aggressiveness, anxiety, irritability, memory problems, and lack of concentration ³⁻⁵. Freeman et al. ⁶ reported that midlife women in their late peri-menopausal transition are 3 times more likely to experience depressive symptoms compared with pre-menopausal women. Panic disorder are also common in midlife women, and they are correlated with many physical symptoms of menopause ³. In another study among 3,369 postmenopausal women, panic attacks were prevalent and associated with negative life events, functional impairment, and medical comorbidity ⁵. These psychological symptoms in midlife could result from hormonal changes or other multiple personal, social, and cultural changes that women experience during their menopausal transition ^{1,2}.

Psychological symptoms could be associated with other health problems such as cardiovascular diseases (CVDs) as well ^{7,8}. Studies have highlighted an inherent comorbidity between psychological symptoms, especially depression, and CVDs ⁷. For example, Wright et al. ⁸ posited that both depression and CVD could be inflammatory disorders, and their co-occurrence might be associated with the mechanism through which the hypothalamic-pituitary-adrenal axis, serotonergic transmission and circulation, and the renin-angiotensin-aldosterone system via angiotensin II are influenced by the superfluous secretion of pro-inflammatory cytokines. Based on a systematic literature review, they also asserted that the systemic inflammation would be linked to a deficiency in CD4+CD25+FOXP3 regulatory T cells, and that 17- β estradiol and progesterone could intervene regulation of cytokine secretion. Thus, hormonal changes in menopausal transition could influence both women's psychological symptoms and development of CVDs.

Despite an increasing number of studies supporting the associations of psychological symptoms to CVDs in general ^{7,8}, little is still known about racial/ethnic variations in the relationships between psychological symptoms and CVD symptoms and their influencing factors. Race/ethnicity could add an important dimension to the association of psychological symptoms to CVD symptoms because psychological symptoms are often unknown and untreated in ethnic minority groups due to their cultural stigma attached to mental illness ⁹⁻¹¹. Thus, the purpose of the study is to examine the relationships between psychological symptoms and CVD symptoms in a multi-ethnic group of midlife women while controlling other influencing factors (Aim #1) and to determine the association of race/ethnicity to the relationship between psychological symptoms and CVD symptoms (Aim #2). Ultimately, we expect that this analysis would help generate hypotheses for future research and would help with understanding symptom burden of midlife women in menopausal transition. This secondary analysis used the data from two larger Internet survey studies in four major racial/ethnic groups of midlife women in the U.S. (NH Whites, NH African Americans, NH Asians, and Hispanics). More information on the original studies is available elsewhere ^{12,13}. In this paper, menopausal transition refers to the transition period that starts with changes in menstrual cycle length in a woman who has a monotropic FSH increase and ends with the last menstrual period (Soules et al. 2001). Menopausal stages

were decided based on the Study of Women's Health Across the Nation (SWAN) criteria (see the method section).

The UCSF symptom management model¹⁴ theoretically guided this secondary analysis. A number of studies on a variety of symptom experience have used this model across health care fields¹⁴⁻¹⁶. The model includes three major domains (person, health and illness, and environments), three major concepts (symptom experience, symptom management strategies, and outcomes), and several sub-concepts under the major concepts. We aimed to examine the relationships between psychological symptoms and CVD symptoms (a sub-concept of the major concept of symptom experience) in a multi-ethnic group of midlife women while controlling other influencing factors (sub-concepts of person, health and illness, and environments)(Aim #1) and to determine the association of race/ethnicity (a sub-concept of the major domain of person) to the relationship between psychological symptoms and CVD symptoms (a sub-concept of the major concept of symptom experience)(Aim #2).

Methods

As described above, this is a secondary analysis of the data from two Internet Surveys in multi-ethnic groups of midlife women. The approvals from the institutional review boards of the institutions that the researchers were affiliated were obtained.

Samples and Settings

This analysis used the data from 1,054 midlife women (316 Non-Hispanic [N-H] Whites, 255 Hispanics, 250 N-H African Americans, and 233 N-H Asians). Included were only those of the women aged 40 to 60 years who were able to read and write English and who self-identified their ethnic identity as N-H White, Hispanic, N-H African American or N-H Asian. When the response rate was calculated based on the number of visitors of the project websites, it was approximately 95%. The sample size was pre-determined, but it was enough for the analyses that were conducted in this study (including hierarchical multiple regression analyses). A sample size of 1,054 has more than 99.9% power to detect an effect size of 0.4 using multivariate regression analyses with 8-10 predictors and a 0.05 two-sided significance level.

Instruments

This secondary analysis was done only with the data from the following instruments although multiple instruments were used in the original studies.

Background characteristics, health status, and menopausal status—Questions on age, education, employment, family income, marital status, number of children, social support, and country of birth and self-reported ethnic identity, health status, and menopausal status were used to measure background characteristics of the participants. A question regarding the ability to pay for basic necessities (e.g., food, clothing, and shelter) was used to measure family income of the participants. One 4-point ordinal scale question (“none of the time,” “a little of the time,” “some of the time,” and “most of the time”) was used to measure social support. To measure health status, two questions on body weight and height

and one 5-point Likert scale question on perceived general health (1 = *very unhealthy* to 5 = *very healthy*) were used. In addition, two questions on diagnosed disease(s) and access to health care were also used. Seven questions on the last menstrual cycle, menstrual regularity, and menstrual flow were used to measure menopausal status. We determined menopausal status using the questions and criteria from the SWAN (Avis et al. 2001). When a participant reported her menstruation in the past 3 months with no change in regularity, she was regarded as pre-menopausal. When a participant reported her menstrual bleeding in the past 3 months, but had increasing changes in cycle length over the past year, she was regarded as early peri-menopausal. When a participant reported her menstruation in the past 12 months but not in the past 3 months, she was regarded as late peri-menopausal. When a participant reported no menstruation in the past year, she was regarded as post-menopausal. In this study, early peri-menopausal women and late peri-menopausal women were combined for the convenience of the analysis.

The Midlife Women's Symptom Index (MSI)—Psychological symptoms experienced during the menopausal transition were measured using the Midlife Women's Symptom Index (MSI)¹⁷. The MSI includes 73 items of symptoms that could be experienced by midlife women during their menopausal transition. The MSI includes three domains: physical, psychological, and psychosomatic symptoms. Among the three domains, the psychological symptom domain was used for this study. The psychological symptom domain includes 25 items of psychological symptoms that could be experienced during menopausal transition. The psychological symptom domain has two sub-scales: (a) a prevalence sub-scale using dichotomous items (1 = yes; 0 = no) and (b) a severity sub-scale using 6-point Likert scale items (0 = no symptom; 5 = extremely). The total numbers of psychological symptoms were calculated by adding all the responses to the prevalence subscale items (range: 0~25), and the total severity scores of psychological symptoms were calculated by adding all the responses to the severity subscale items (range: 0~125). The reliability of the MSI was supported in multi-ethnic groups (test-retest correlation, $r = 0.94 - 0.98$), and the content validity was supported by expert reviews¹⁷. In this study, the reliability of the psychological symptom domain was 0.91 for the prevalence sub-scale and 0.93 for the severity sub-scale.

The Cardiovascular Symptom Index for Midlife Women (CSIMW)—The CSIMW is a 25-item scale that was derived from the MSI¹⁷ to specifically measure cardiovascular symptoms that women have experienced during the past 6 months. The items were selected from an extensive literature review through which symptoms associated with CVDs were identified¹⁸⁻²². The CSIMW also has two sub-scales: (a) a prevalence sub-scale using dichotomous items (1 = yes; 0 = no) and (b) a severity sub-scale using 6-point Likert scale items (0 = no symptom; 5 = extremely). The total numbers of cardiovascular symptoms were calculated by adding all the responses to the prevalence subscale items (range: 0~25), and the total severity scores of cardiovascular symptoms were calculated by adding all the responses to the severity subscale items (range: 0~125). Higher scores mean more prevalent and severe cardiovascular symptoms. Cronbach's alpha was 0.86 for the prevalence subscale, and 0.91 for the severity subscale.

Data Collection Procedures

Project websites that followed the recommendations by the Health Insurance Portability and Accountability Act (HIPAA) and the SysAdmin, Audit, Network, Security (SANS)/Federal Bureau of Investigation (FBI) recommendations were established in the original studies. When a potential participant came to the project websites after reviewing the study announcements (that were made through Internet communities/groups), she was required to review *informed consent sheets*, and provide her consent to participate by clicking the “I agree to participate” button. Then, she was checked against the screening questions related to the inclusion criteria and the quota requirement. When she met the screening requirements, she was connected to the Internet survey sites through which she could answer the questions on the Internet survey sites.

Data Analysis

All analyses were performed using the SAS (version 9.4) software. Descriptive statistics were used to describe demographic characteristics and cardiovascular and psychological symptoms of the participants. To compare characteristics among four racial/ethnic groups, we used ANOVA and chi-squared tests. Correlations between cardiovascular and psychological symptoms were tested using Pearson’s correlation analyses in total participants and by race/ethnicity. To examine whether psychological symptoms were independently associated with cardiovascular symptoms, multivariate linear regression analyses were performed in multi-ethnic midlife women as a whole and in each racial/ethnic group (Am #1). After adjusting for demographic characteristics, univariate analyses were conducted to determine the factors that significantly influenced cardiovascular symptoms. In total participants, we tested the effect of race/ethnicity on the relationships between psychological and cardiovascular symptoms by adding interaction terms to the models (Aim #2). In all regression analyses, Model 1 included the total numbers of psychological symptoms as a predictor, whereas Model 2 included the total severity scores of psychological symptoms as a predictor. Multiple logistic regression analyses were also performed to determine the risk of psychological symptoms associated with diagnosed cardiovascular diseases (CVD) using the Odds Ratios (ORs). For all analyses, a p -value of less than .05 (two-sided) was considered statistically significant.

Results

Characteristics, psychological symptoms, and cardiovascular symptoms reported by the participants are summarized in Table 1. The mean age was 49 years ($SD = 5.7$) and there were no significant differences in age among the four racial/ethnic groups. BMI was significantly lower in Asian women than in Hispanic, African American, and White women ($p < .05$; Scheffe test). Significant differences were found in the level of education, family income, religion, number of children, and employment among the four racial/ethnic groups ($p < .01$). Asian women tended to be better educated and not-employed. Hispanic and African American women tended to have three or more children than Asian and White women. There were no differences in the menopausal status among the racial/ethnic groups. In total participants, the mean numbers of cardiovascular symptoms and psychological symptoms were 6.6 ($SD = 5.4$) and 6.0 ($SD = 5.2$), respectively.

There were significant racial/ethnic differences in psychological symptoms and cardiovascular symptoms ($p < .01$; see Table 1). Asians had significantly lower numbers and severity scores of psychological symptoms compared with other racial/ethnic groups. African Americans had significantly lower numbers and severity scores of psychological symptoms compared with Whites. Asians also had significantly lower numbers and lower severity scores of cardiovascular symptoms compared with other racial/ethnic groups. Asian women had the lowest prevalence rate of CVDs while African Americans had the highest prevalence rate of CVDs.

In total participants, the total numbers of psychological symptoms were significantly correlated with those of cardiovascular symptoms ($r = .655, p < .01$), and the total severity scores of psychological symptoms were significantly correlated with those of cardiovascular symptoms ($r = .698, p < .01$). In each racial/ethnic group, correlations between the total numbers of psychological symptoms and those of cardiovascular symptoms were statistically significant ($p < .01$); White women had the highest correlation coefficient ($r = .730, p < .01$), and Hispanic women had the lowest correlation coefficient ($r = .654, p < .01$). Figure 1 shows that correlations between the total severity scores of psychological symptoms and those of cardiovascular symptoms were statistically significant in each racial/ethnic group ($p < .01$); White women had the highest correlation coefficient ($r = .730, p < .01$), and Hispanic women had the lowest correlation coefficient ($r = .654, p < .01$). In each racial/ethnic group, the correlations were stronger in the total severity scores when compared with in the total numbers.

After adjusting for significant covariates, both total numbers and total severity scores of psychological symptoms were significantly associated with cardiovascular symptoms in total participants ($p < .01$; see Table 2). Race/ethnicity was not independently associated with cardiovascular symptoms, and there were no interactions between race/ethnicity and psychological symptoms in all models used for this analysis. Yet, in all individual racial/ethnic groups, psychological symptoms were significantly associated with cardiovascular symptoms ($p < .01$).

In total participants, there was no significant association between psychological symptoms and diagnosed CVD. However, only in Asian women, the total numbers and total severity scores of psychological symptoms were associated with 1.10- and 1.04-fold excess of increased risk for CVDs (see Table 3).

Discussion

The results of this study basically agree with those in the literature; there are significant associations between psychological symptoms and cardiovascular symptoms across racial/ethnic groups and in each racial/ethnic group. Furthermore, the r values are in the range to be clinically meaningful. Indeed, the literature has been clear on the significant association of psychological symptoms to CVDs. For example, overwhelming evidence has been found that psychological symptoms, especially depressive symptoms, is a major risk factor in the development of CVDs⁷. Researchers have proposed that pathophysiological alterations in depression may underlie vulnerability to CVDs partially due to alterations in heart rate

variability and platelet aggregation²³. They have also asserted that some depressive symptoms could decrease midlife women's overall physical and psychological health, and increase their risk for CVDs or make CVD symptoms worse²³. It is also reported that depressive symptoms increase people's risk of death after a heart attack²⁴. As asserted by Wright et al.⁸, a plausible reason for the strong association of psychological symptoms to cardiovascular symptoms would be that both psychological and cardiovascular symptoms are linked to systematic inflammatory process, which is influenced by hormonal changes due to menopausal transition.

The findings of this study, yet, supported that there were no racial/ethnic variances in the associations of psychological symptoms to cardiovascular symptoms in midlife women. After adjusting for covariates, psychological symptoms significantly contributed to the variances of the total numbers and total severity scores of cardiovascular symptoms, yet race/ethnicity was not significantly associated with cardiovascular symptoms and there were no interactions between race/ethnicity and psychological symptoms. This finding could be new to the literature. A possible reason for this finding could be: the association between psychological symptoms and cardiovascular symptoms itself may not be greatly influenced by cultural factors although psychological symptoms or cardiovascular symptoms could be influenced by the women's cultural attitudes and values/beliefs, respectively. In other words, socio-cultural mechanisms through which race/ethnicity could differently influence the symptoms experienced by midlife women during their menopausal transition may not adequately explain the relationships between psychological symptoms and cardiovascular symptoms that could be experienced during menopausal transition^{13,25,26}.

Compared with other racial/ethnic groups, Asian women have been reported to be less likely to experience menopausal symptoms in general^{13,25,26}, which was also supported in this study. In this study, Asian women had lower total numbers and lower total severity scores of cardiovascular and psychological symptoms during their menopausal transition. Yet, the finding that the existence of diagnosed CVDs was significantly related to the total numbers of and the total severity scores of psychological symptoms only in Asian women could be new to the literature. Despite an increasing number of the articles on significant relationships between psychological symptoms and cardiovascular symptoms among midlife women in their menopausal transition, the literature has rarely reported the significant relationships in Asian women⁷⁸. Also, virtually no article has reported that the existence of diagnosed CVDs is significantly related to psychological symptoms only in Asian women.

This finding could be interpreted in the contexts of Asian culture that prohibits the expression of psychological symptoms and stigmatizes mental illness²⁷. Although Asian women may be hesitant to express their psychological symptoms alone, the existence of CVDs may possibly provide them with an excuse to express their psychological symptoms. Subsequently, the women may feel free to express psychological symptoms while linking the symptoms to their diagnosed CVDs. Also, CVDs have been regarded as rich people's diseases in Asian culture²⁸, which may make the women easily report their psychological symptoms within the context of having diagnosed CVDs.

This study includes several limitations because this is a secondary analysis of the existing data from two Internet surveys. First of all, this study has inherent limitations as a secondary analysis (e.g., lack of control on the sample size and the data, dependency on the original studies, etc.). Also, the cross-sectional design of the original studies did not allow assessment of temporal and potential causal relations, so only associations were determined in this study. Also, the generalizability of the findings was limited because the participants of the original studies were online users who were recruited through the Internet using a convenience sampling method. Subsequently, there could exist some potential bias. Furthermore, not all the sub-ethnic groups within each of the major racial/ethnic groups were included in this study. In addition, the data might include some unauthentic cases although several measures were used to detect unauthentic cases. Finally, only self-reports were used for data collection in the original studies. Thus, the interpretation of the findings reported in this paper needs to be done carefully.

Conclusions

This study clearly supported the significant positive relationships between psychological symptoms and cardiovascular symptoms that were experienced during menopausal transition. Subsequently, the finding strongly supports a directional hypothesis generation on the positive relationship for future research. Yet, the study also supported that race/ethnicity did not significantly influence the relationships between psychological symptoms and cardiovascular symptoms that were experienced during menopausal transition. Also, the study supported that the existence of diagnosed CVDs was significantly associated with the total numbers of and the total severity scores of psychological symptoms only in Asian women. Based on the findings, this paper concludes with the following suggestions for future research. First, further studies on the mechanisms through which psychological symptoms are related to cardiovascular symptoms are needed while controlling for race/ethnicity. As discussed above, the sociocultural mechanisms through which race/ethnicity could differently influence the symptoms experienced by midlife women during their menopausal transition may not adequately explain the relationships between psychological symptoms and cardiovascular symptoms. Rather, further investigations are warranted on the possible systematic inflammation process through which both psychological symptoms and cardiovascular symptoms are influenced by hormonal changes in menopausal transition. The finding on significant associations of the existence of diagnosed CVDs to psychological symptoms only in Asian women also needs to be further explored. More in-depth cultural studies on possible reasons for the differences could clarify the finding. Finally, because the participants of the original studies did not represent sub-ethnic variations in each major racial/ethnic group, further studies are needed with diverse sub-ethnic groups of midlife women.

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Figure 1.

The associations between psychological symptoms and cardiovascular symptoms by race/ethnicity

* r =Pearson correlation coefficient

**severity of cardiovascular symptoms=total severity scores of cardiovascular symptoms (ranged 0~85)

***severity of psychological symptoms=total severity scores of psychological symptoms (ranged 0~111)

[†]N-H=Non-Hispanic

Characteristics and cardiovascular and psychological symptoms of the participants by race/ethnicity (N=1,054)

	Total (N=1,054)	By race/ethnicity			p-value
		Hispanic (n=255)	*N-H Asian (n=233)	*N-H African American (n=250)	*N-H White (n=316)
Age	49.0 ± 5.7 ⁺⁺	48.9 ± 5.4	48.6 ± 6.1	49.3 ± 5.7	49.1 ± 5.6
BMI	28.5 ± 7.4 ⁺⁺	29.6 ± 7.0	23.5 ± 4.2	31.0 ± 7.5	29.3 ± 7.7
Marital status					
Married/partnered	714 (67.7) ^{**}	172 (67.5)	196 (84.1)	134 (53.6)	212 (67.1)
Single/non-married	340 (32.3)	83 (32.5)	37 (15.9)	116 (46.4)	104 (32.9)
Education					
High school or less	141 (13.4)	43 (16.9)	30 (12.9)	17 (12.1)	51 (16.1)
Partial	262 (24.9)	76 (29.8)	26 (11.2)	65 (24.8)	95 (30.1)
College	340 (32.3)	69 (27.1)	79 (33.9)	88 (25.9)	104 (32.9)
University or more	311 (29.5)	67 (26.3)	98 (42.1)	80 (25.7)	66 (20.9)
^{**} Family income					
Very hard	185 (17.6)	41 (16.1)	20 (8.6)	32 (12.8)	92 (29.1)
Somewhat	406 (38.5)	104 (40.8)	88 (37.8)	102 (40.8)	112 (35.4)
Not hard	463 (43.9)	110 (43.1)	125 (53.7)	116 (46.4)	112 (35.4)
Religion					
Protestant	350 (33.2)	41 (16.1)	67 (28.8)	117 (46.8)	125 (39.6)
Catholic	274 (26.0)	153 (60.0)	28 (12.0)	31 (12.4)	62 (19.6)
Others	244 (23.2)	33 (12.9)	75 (32.2)	76 (30.4)	60 (19.0)
No religion	186 (17.7)	28 (11.0)	63 (27.0)	26 (10.4)	69 (21.8)
Number of children					
None	192 (18.2)	42 (16.5)	33 (14.2)	52 (20.8)	65 (20.6)
1-2	542 (51.4)	130 (51.0)	148 (63.5)	102 (40.8)	162 (51.3)
3 or more	320 (30.4)	83 (32.6)	52 (22.3)	96 (38.4)	89 (28.2)
Employment					
Yes	790 (75.0)	208 (81.6)	145 (62.2)	209 (83.6)	228 (72.2)
No	264 (25.1)	47 (18.4)	88 (37.8)	41 (16.4)	88 (27.9)
^{**} [*] Menopausal status					

	By race/ethnicity				p-value
	Total (N=1,054)	Hispanic (n=255)	*N-H Asian (n=233)	*N-H African American (n=250)	*N-H White (n=316)
Pre	149 (14.1)	37 (14.5)	41 (17.6)	36 (14.4)	35 (11.1)
Peri	158 (15.0)	36 (14.1)	40 (17.2)	31 (12.4)	51 (16.1)
Post	747 (70.9)	182 (71.4)	152 (65.2)	183 (73.2)	230 (30.8)
Cardiovascular symptoms					
Total number of symptoms	6.3 ± 5.0	6.5 ± 5.3 ^a	4.3 ± 4.1	6.4 ± 4.7 ^a	7.3 ± 5.2 ^a
Total severity of symptoms	19.4 ± 18.6	20.4 ± 19.1 ^a	12.1 ± 14.7	19.9 ± 17.2 ^a	23.6 ± 20.3 ^a
[†] CVD diagnosed (%)	187 (17.7)	17.3	12.9	26	17.7
Psychological symptoms					
Total number of symptoms	6.0 ± 5.2	6.5 ± 5.0 ^a	4.9 ± 5.0	5.5 ± 5.0 ^{a,b}	6.9 ± 5.4 ^a
Total severity of symptoms	18.6 ± 18.8	20.3 ± 18.9 ^a	14.3 ± 16.8	16.7 ± 17.6 ^{a,b}	21.9 ± 20.4 ^a

* N-H=Non-Hispanic/

** Difficulty paying for the basics such as food, housing, clothing, and health care with family income/

Pre= having menstruation in the past 3 months with no change in regularity; peri=having menstrual bleeding in the past 3 months, but having increasing changes in cycle length over the past year (early) or having menstruation in the past 12 months but not in the past 3 months (late); and post=no menstruation in the past year (by the criteria from the SWAN)/

[†] CVD: cardiovascular diseases/

^{†††} Mean±SD.

^a Significantly different from N-H Asians (p<.05; in Scheffe tests),

^b Significantly different from N-H Whites (p<.05; in Scheffe tests).

Table 2

Regression coefficients* for the total numbers and total severity scores of cardiovascular symptoms from multivariate linear regression analyses.

	Total	By race/ethnicity			
		Hispanic	** N-H Asian	N-H African American	N-H White
Model 1:	For total number of cardiovascular symptoms				
	Total number of psychological symptoms	0.6028 (p<.0001)	0.5855 (p<.0001)	0.4635 (p<.0001)	0.5464 (p<.0001)
	Race	<i>p</i> =.3725	-	-	-
	Interaction: psychological symptoms* race	<i>p</i> =.1885	-	-	-
Model 2:	For total number of cardiovascular symptoms				
	Total severity of psychological symptoms	0.1612 (p<.0001)	0.1513 (p<.0001)	0.1388 (p<.0001)	0.1518 (p<.0001)
	Race	<i>p</i> =.0966	-	-	-
	Interaction: psychological symptoms* race	<i>p</i> =.7735	-	-	-
Model 1:	For total severity of cardiovascular symptoms				
	Total number of cardiovascular symptoms	2.3169 (p<.0001)	2.2339 (p<.0001)	1.7545 (p<.0001)	2.0270 (p<.0001)
	Race	<i>p</i> =.4540	-	-	-
	Interaction: psychological symptoms* race	<i>p</i> =.0706	-	-	-
Model 2:	For total severity of cardiovascular symptoms				
	Total severity of psychological symptoms	0.6774 (p<.0001)	0.6194 (p<.0001)	0.5515 (p<.0001)	0.6047 (p<.0001)
	Race	<i>p</i> =.2516	-	-	-
	Interaction: psychological symptoms* race	<i>p</i> =.2362	-	-	-

* Adjusted for the covariates that are significantly associated with psychological symptoms in univariate analyses/

** N-H=Non-Hispanic

Table 3
The odds ratios⁺ for the diagnosed cardiovascular diseases in multivariate logistic regression analyses.

	Total	By race/ethnicity			
		Hispanic	+++N-H Asian	N-H African American	N-H White
Model 1: Total number of psychological symptoms	1.02 (0.99-1.06) ⁺⁺⁺⁺	1.00 (0.93-1.07)	1.10 ⁺⁺ (1.01-1.19)	1.05 (0.98-1.12)	0.99 (0.92-1.06)
Race	p=.5874	-	-	-	-
Interaction: psychological symptoms*race	p=.2393	-	-	-	-
Model 2: Total severity of psychological symptoms	1.01 (0.99-1.02) ⁺⁺⁺⁺	1.00 (0.98-1.02)	1.04 ⁺⁺ (1.01-1.06)	1.01 (0.99-1.03)	0.99 (0.98-1.02)
Race	p=.3440	-	-	-	-
Interaction: psychological symptoms*race	p=.0951	-	-	-	-

⁺ Adjusted for the covariates that are significantly associated with psychological symptoms in univariate analyses/

⁺⁺ p<.05/

⁺⁺⁺ N-H=Non-Hispanic/

⁺⁺⁺⁺ 95% confidence interval