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Prev Med. 2016 June ; 87: 144–150. doi:10.1016/j.ypmed.2016.02.032.**Cardiovascular Disease Risk Factors and Psychological Distress among Hispanics/Latinos: The Hispanic Community Health Study/ Study of Latinos (HCHS/SOL)****Sheila F. Castañeda, PhD,**

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Abstract

Studies show that cardiovascular disease (CVD) risk factors are correlated with psychological distress, yet research examining these relationships among Hispanic/Latinos is lacking. The population-based Hispanic Community Health Study/ Study of Latinos enrolled a cohort of Hispanic/Latino adults ($N=16,415$) ages 18–74 years at time of recruitment, from four US metropolitan areas, between March 2008 to June 2011. Psychological distress (i.e., 10-item Center for Epidemiological Studies Depression Scale, 10 item Spielberger Trait Anxiety Scale, and a combined depression/anxiety score), socio-demographics (i.e., age, education, income, insurance, sex, and Hispanic/Latino background), acculturation (i.e., country of birth and language preference), and traditional CVD risk factors (i.e., dyslipidemia, obesity, current cigarette smoking, diabetes, and hypertension) were assessed at baseline. Associations between CVD risk factors and psychological distress measures by sex were examined using multiple linear regression models, accounting for complex survey design and sampling weights, and controlling for socio-demographic and acculturation covariates. In adjusted analyses, all three psychological distress measures were significantly related to smoking. For females, greater psychological distress was significantly related to obesity and current smoking. For males, diabetes and current smoking was associated with psychological distress. For males and females, dyslipidemia and hypertension were not associated with psychological distress after adjusting for other factors. Elevated depression and anxiety symptoms were associated with CVD risk factors for Hispanic/Latino men and women. However, these results were not consistent across Hispanic/Latino groups. As promoted by the integrative care model, psychosocial concerns should be considered in research on CVD risk and chronic disease prevention.

Keywords

Psychological Distress; CVD Risk Factors; Hispanic/Latino

Introduction

The Hispanic/Latino population in the United States (U.S.) has grown in recent decades from both immigration and nativity. In 2003, Hispanic/Latinos became the fastest growing racial/ethnic population in the U.S. and from 2000 to 2010, Hispanic/Latinos accounted for more than half of the nation's growth (Pew Hispanic Center, 2011). Hispanic/Latinos in the U.S. experience numerous social and economic barriers to optimal health, including low SES (Beckles et al., 2011), poor healthcare access (Moonesinghe et al., 2011), and inadequate healthcare-system cultural competency (Cersosimo and Musi, 2011). Certain cardiovascular disease (CVD) risk factors, such as diabetes and obesity (Flegal et al., 2010),

are more prevalent among Hispanics/Latinos compared to other racial/ethnic groups, while smoking, dyslipidemia, and hypertension are less prevalent. Data from the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) showed that the prevalence among Hispanic/Latino men and women (respectively) was 17% and 17% for diabetes, 37% and 43% for obesity, 26% and 15% for cigarette smoking, 52% and 37% for hypercholesterolemia, 25% and 24% for hypertension (Daviglus et al., 2012).

National data indicate that the lifetime prevalence for major depressive disorder among the U.S. population is 16.2% (Kessler et al., 2003) and 28.8% for any anxiety disorder (Kessler et al., 2005). In comparison, the lifetime prevalence for major depression among Mexican Americans is 14.5%, 17.4% among Cubans, and 22.2% among Puerto Ricans (Gonzalez et al., 2010). Research also suggests that women have a greater burden of depression (Kessler, 2003) and anxiety (Alexander et al., 2007) than men (Alegria et al., 2007). Depression and related psychological conditions also differ by level of acculturation (Alegria et al., 2008) and SES (Pratt and Brody, 2008), such that those who have lower incomes or are more acculturated to the U.S. mainstream culture have poorer mental health.

Psychological distress measures, such as depression and anxiety, are correlated with individual CVD risk factors [i.e., high low density lipoprotein (LDL) cholesterol, low high density lipoprotein (HDL) cholesterol, obesity, cigarette smoking, diabetes, and hypertension] (Jiang et al., 2005; Okosun et al., 2001; Wilson et al., 1998) and CVD. In addition, depression has been shown to be correlated to CVD [i.e., myocardial infarction (MI) (Van der Kooy et al., 2007) and stroke (Glymour et al., 2012)] among Hispanics/Latinos in the U.S.

In terms of individual CVD risk factors, studies show that Hispanics/Latinos with diabetes experience higher levels of depressive disorders compared to those without diabetes (Ell et al., 2009). In addition, depression is associated with poorer disease self-management (Lin et al., 2004; Wang et al., 2008) and stress (Fisher et al., 2009) among individuals with diabetes. Some studies have shown a positive relationship between higher cholesterol levels and affective disorders (Papakostas et al., 2004; Shin et al., 2008), while others have found no relationship (Park et al., 2013). Meta-analyses have shown significant positive associations between depression and obesity (de Wit et al., 2010; Luppino et al., 2010). In addition, data from the National Health and Nutrition Examination I Epidemiologic Follow-up Study showed that depression and anxiety were independent predictors of hypertension among non-Hispanic Whites and African Americans (Jonas et al., 1997), however, a small local study on Hispanics/Latinos has not replicated these findings (Glassy et al., 2010). Finally, research shows a significant correlation between psychological distress and cigarette smoking and unsuccessful cessation attempts (Covey et al., 1998) (Dube et al., 2009).

Minimal research has explored the relationship between psychological distress and CVD risk among adult Hispanics/Latinos of various SES and acculturation levels and among those of diverse Hispanic/Latino heritage groups (Wassertheil-Smoller et al., 2014). In addition, new research suggests there are sex differences in the relationship between psychological distress, CVD risk and CVD, in that there is a stronger relationship among females than males (Goldstein et al., 2014; Naqvi et al., 2005; Polk and Naqvi, 2005; Shanmugasaram

et al., 2012). The current study utilized data from a large U.S. cohort study of Hispanic/Latinos from four major metropolitan areas to investigate the relationship between individual CVD risk factors and psychological distress. Recent HCHS/SOL research showed that among Hispanics/Latinos, the greater number of CVD risk factors was associated with a greater likelihood of depressive and anxiety symptoms (Wassertheil-Smoller et al., 2014), however, this was not explored by each individual CVD risk factor. In this study, we hypothesized that the presence of each individual CVD risk factor would be associated with higher psychological distress and that this relationship would be a stronger among females than males and that this relationship would differ by Hispanic/Latino background.

Methods

Participants

The multi-site prospective population-based HCHS/SOL enrolled a cohort of Hispanic/Latino adults ($N=16,415$) between the ages of 18–74 years at time of recruitment in four U.S. metropolitan areas (Chicago, San Diego, Miami, and Bronx). Households were selected using a stratified two-stage probability sampling design and door-to-door recruitment. Persons eligible for the study were community-dwelling adults who self-identified as Hispanic/Latino and who were able to travel to a local field center for completion of baseline examination. Individuals who were pregnant, on active military duty, or who had plans to move out of the study area were excluded.

Data collection

In the first stage of sampling, a stratified-random sample of census block groups was selected within purposively selected U.S. Census tracts (Lavange et al., 2010; Sorlie et al., 2010). Census tracts were chosen to provide diversity within the study population with regard to SES and national origin/ancestry. Stratification variables for selection of Census block groups included high versus low proportion of residents who were Hispanic/Latino, and high versus low proportion of residents with greater than a high school education, as defined using 2000 Census data. In the second stage of sampling, households were chosen at random within the randomly-selected census block groups, with over-selection of households that matched with commercially available U.S. Postal lists of Hispanic/Latino households. After households were sampled, in-person or telephone contacts were made to screen eligible households and to roster its members. Lastly, the study over-sampled the 45–74 age group ($n=9,714$, 59.2%) to facilitate examination of HCHS/SOL study target outcomes (e.g., stroke, diabetes, hypertension, etc.). Over-sampling at both stages of sample selection was used to increase the likelihood that a selected address yielded an eligible household.

As a result, HCHS/SOL participants were selected with unequal probabilities of selection, and these probabilities were taken into account during data analysis to appropriately represent the target population. The present study utilized data from the baseline examination (collected from 2008–2011), which included: self-report assessments, anthropometry, fasting blood draws, among other tests.

Measures

Socio-demographics and acculturation-related variables were created in HCHS/SOL based on existing major epidemiological studies, such as NHANES, and are publically available at: <https://www2.csc.c.unc.edu/hchs/manuals-pub>. The following characteristics were measured via self-report during the baseline examination: date of birth, sex, Hispanic/Latino background group (Cuban, Central American, Dominican, Mexican, Puerto Rican, South American, and other), income, education, health insurance, and site (Chicago, Bronx, Miami, and San Diego). In addition, acculturation proxy measures administered as part of the baseline exam included: US Born (defined as: US born, non US-born and in the US 10 years, or non US-born and in the US < 10 years), and primary language of preference for baseline survey administration (English and Spanish).

Risk factors were assessed as part of the HCHS/SOL baseline examination (Daviglius et al., 2012). In particular, in this analyses we included : dyslipidemia (HDL cholesterol < 40 mg/dL, LDL cholesterol 160 mg/dL, or triglycerides 200 mg/dL), body mass index (BMI), current cigarette smoking (yes, no), diabetes (i.e., fasting time > 8 hr and fasting glucose 126 mg/dL, or fasting time 8 hr AND fasting glucose 200 mg/dL, or post-Oral Glucose Tolerance Test (OGTT) glucose 200 mg/dL, or HbA_{1C} 6.5 DCCT, or on medication), and hypertension (blood pressure 140/90 mm Hg or on medications) (American Diabetes, 2010).

Distress was operationalized by depressive symptomatology, trait anxiety, and a psychological distress composite score. Depressive symptomatology was assessed by a 10-item version of the Center for Epidemiological Studies Depression (CES-D 10) Scale (Andresen et al., 1994). Scores ranged from 0 to 30, with higher scores indicating more depression symptoms. In the current sample, the CES-D 10 had a coefficient alpha reliability estimate of .82 (Spanish $\alpha = .82$ and English $\alpha = .82$). Anxiety was measured by the 10-item Spielberger Trait Anxiety Scale (STAI) (Spielberger, 1983; Spielberger et al., 1983). STAI scores ranged from 8 to 40, with higher scores indicating greater reported anxiety symptoms. The STAI had a coefficient alpha reliability estimate of .81 (Spanish $\alpha = .80$ and English $\alpha = .84$). The correlation between the STAI and CESD was .73 for the overall sample, .71 for the Spanish sample, and .76 for the English sample. To create the psychological distress composite score, the CESD and STAI total scores were converted into z-scores and then averaged. All 20 CESD and STAI items combined had a coefficient alpha reliability estimate of .89 (Spanish $\alpha = .87$ and English $\alpha = .90$). The psychological distress composite score ranged from -3 to 3 with higher scores indicating greater distress.

Statistical analyses

All analyses were conducted using procedures in SAS version 9.2 to incorporate the complex sampling design and the sampling weights. All reported values (e.g., means) were weighted to account for the disproportionate selection of the sample and to at least partially adjust for any bias effects due to differential nonresponse in the selected sample at the household and person levels. The adjusted weights were also trimmed to limit precision losses due to the variability of the adjusted weights, and calibrated to the 2010 U.S. Census characteristics by age, sex and background in each site's target population. Analyses also

accounted for cluster sampling and the use of stratification in sample selection. A series of adjusted and unadjusted analyses were conducted to examine the association between individual CVD risk measures and psychological distress measures for those with complete data on all measures analyzed (N=15,781). Associations between CVD risk factors (i.e., dyslipidemia, BMI, current cigarette smoking, diabetes, and hypertension) and psychological distress were assessed using multivariate linear regression models with depression (model 1), anxiety (model 2), and psychological distress composite (model 3) as dependent variables, controlling for socio-demographic, and acculturation covariates. In the three regression models, all CVD risk factors and socio-demographics and acculturation factors were entered simultaneously. All categorical variables were treated as dummy variables by using the “class” statement in SAS. Effect modification by sex was assessed for the five CVD risk factors on the psychological distress composite measure adjusting for socio-demographic and acculturation covariates; a $p < .05$ statistical significance criterion was used for interactions. Most of the sex*individual CVD risk factor interaction terms [i.e., sex* BMI, sex* smoking, sex * hypertension ($p < .05$)] were significant, therefore, data presented are stratified by sex. In addition to running the overall models adjusting for Hispanic/Latino background, we ran supplemental models examining the relationship between CVD risk factors and psychological distress by Hispanic/Latino background and sex.

Results

Socio-demographic, psychosocial and health characteristics in the target population are shown in Table 1 stratified by sex. Around half (49.9%) were female. Most were born outside the continental U.S. (77.4%) and most preferred completing the questionnaires in Spanish (75.4%). Over half of individuals (59.7%) were aged 18–44. Half (49.1%) reported an annual household income of more than \$20,000, around two-thirds (67.9%) graduated from high school, and half had health insurance (50.1%). Men were more likely to meet the criteria for dyslipidemia (29.4% females, 48.2% males) and to be current smokers (16.3% of females, 26.7% males). Females were more likely to meet criteria for (15.4% females, 13.9% males) Type 1 or 2 diabetes mellitus and obesity (42.4% females, 36.5% males). Around one fifth (21.5% of females, 22.2% of males) met the criteria for hypertension. Women were more likely to report depressive ($M_{\text{female}} = 7.9 \pm 0.1$, $M_{\text{male}} = 6.0 \pm 0.1$) and anxiety symptoms ($M_{\text{female}} = 17.8 \pm 0.1$, $M_{\text{male}} = 16.1 \pm 0.1$), and greater psychological distress ($M_{\text{female}} = 0.09 \pm 0.02$, $M_{\text{male}} = -0.21 \pm 0.02$) (Table 1).

Sex-specific association between psychological distress and CVD risk factors

Females—In unadjusted analyses, all individual CVD risk factors (i.e., dyslipidemia, obesity, diabetes, current smoking, and hypertension) were positively associated with depressive symptomatology. However, after adjusting for age, background, education, income, health insurance, language of preference, country of birth, and site, only obesity and smoking remained significantly associated with higher depressive symptoms ($p < .001$). Mean depressive symptomatology was .67 higher among females classified as obese (versus non-obese) and 1.83 higher among those who were current smokers (versus never/former smokers). In unadjusted analyses, all CVD risk factors except for dyslipidemia were

significantly associated with anxiety symptoms, but only obesity and smoking remained significant after adjusting for covariates. Lastly, in unadjusted analyses, all CVD risk factors except for dyslipidemia were significantly with greater psychological distress, but obesity, diabetes, and current smoking remained significant after adjusting for covariates (Table 2).

Males—For males, in unadjusted analyses, obesity, diabetes, and current smoking were positively associated with depressive symptomatology. These variables remained significant after adjusting for age, background, education, income, health insurance, language of preference, country of birth, and site ($p < .05$). Mean depressive symptomatology was .38 higher among males classified as obese (versus non-obese), .64 higher among those who met criteria for diabetes (versus no), and 1.35 higher among current smokers (versus never/former smokers). In unadjusted analyses, smoking, diabetes, and hypertension were associated with anxiety symptoms, but only smoking and diabetes remained significant after adjusting for covariates. Lastly, in unadjusted analyses, obesity, diabetes and smoking were associated with greater psychological distress, and only diabetes and smoking remained significant after adjusting for covariates (Table 3).

Sex-specific association between psychological distress and CVD risk factors by background

Females- stratified analysis by Hispanic/Latino background—In adjusted analysis examining the relationship between psychological distress and CVD risk factors, only smoking was associated with greater psychological distress across all Hispanic/Latino background groups. Obesity was associated with greater psychological distress for those of Dominican and Cuban background. Finally, hypertension was associated with greater psychological distress for those of Puerto Rican background ($p < .05$) (Table 4).

Males- stratified analysis by Hispanic/Latino background—In adjusted analysis, smoking was associated with greater psychological distress for those of Central American, Cuban, Mexican, and South American heritage. For those of Cuban heritage, having diabetes associated with greater psychological distress ($p < .05$). There were no significant relationships between CVD risk factors and psychological distress for those of Dominican and Puerto Rican heritage (Table 4).

Discussion

HCHS/SOL is one of the largest studies of the health of Hispanics/Latinos from diverse backgrounds, SES levels, and levels of acculturation in the history of the United States. This study showed that for females, obesity and current smoking was consistently, and positively, associated with all psychological distress measures, independent of age, Hispanic/Latino background, income, education, health insurance, language, and country of birth (Table 2). Results shows that among males, diabetes and current smoking were consistently, and positively, associated with all psychological distress measures, independent of other factors (Table 3). Thus, across both sexes, current smoking was consistently associated with psychological distress. It is not clear why there was a sex difference in the relationship between diabetes and psychological distress and obesity and psychological distress. Perhaps

this is due to the higher prevalence of obesity among females or greater severity of diabetes among males. Future research is needed to explore potential pathways that explain sex differences in these relationships, such as the role of acculturation

In addition to the overall relationship of CVD risk factors and psychological distress, there were varying effects by sex and Hispanic/Latino background. The most consistent effect was for smoking. Smoking was associated with greater psychological distress for both males and females for those of Central American, Cuban, Mexican, and South American heritage groups. Obesity, hypertension, and diabetes were only associated with greater psychological distress for some Hispanic/Latino heritage groups. These results imply that the effect of CVD risk factors on psychological distress is not the same for different Hispanic/Latino background groups. More in depth research is needed to determine why these differences exist.

Several of our findings parallel previous studies (Glassy et al., 2010) that examined the role of obesity (Luppino et al., 2010) (Garipey et al., 2010), diabetes (Osborn et al., 2011) (Grigsby et al., 2002; Li et al., 2008; Smith et al., 2013), and smoking (Patel et al., 2011), (Troscclair and Dube, 2010) as correlates of depression and anxiety among diverse populations. In contrast, this study differs from previous studies that have shown a strong link between cholesterol (Shin et al., 2008) and hypertension (Jonas et al., 1997; Wassertheil-Smoller et al., 2004) with psychological distress measures.

Previous research has shown that obesity, diabetes, and smoking, while independently related to psychological distress, are also interrelated CVD risk factors. For example, Behavioral Risk Factor Surveillance Survey (BRFSS) 2001 data showed that U.S. adults with a BMI in the obese range have an increased odds of diabetes ($OR = 3.44$) compared to adults with normal weight (Mokdad et al., 2003). In the current study, BMI was significantly positively correlated with total cholesterol ($r = .08$), HbA1c ($r = .19$), and systolic blood pressure ($r = .13$) and diastolic blood pressure ($r = .32$) ($p < .01$). Indeed, abdominal adiposity, and elevated levels of triglycerides, blood pressure, and fasting glucose cluster to form the metabolic syndrome, which increases one's risk of CVD and diabetes (Grundy et al., 2004), and this clustering of risk factors is associated with depression (Skilton et al., 2007).

In addition, there is an emergence of evidence-based collaborative care models, such as TEAMcare, that integrate the coordination of behavioral health and primary care services to co-manage multiple chronic medical and psychological conditions (McGregor et al., 2011). These approaches have been shown to improve depression symptoms, medication adherence (Huang et al., 2013; Watson et al., 2013), and control of CVD risk factors (e.g., LDL, HbA1c, SBP) (Atlantis et al., 2014; Katon et al., 2010); however they have been limited in their applications to Hispanic/Latino populations. Results from the current study support the potential of integrating behavioral and primary care management strategies that concurrently target mental health and medical concerns (Lorenzo-Blanco and Cortina, 2013) among Hispanic/Latinos.

The cross-sectional design of the HCHS/SOL baseline exam precludes conclusions about causation and directionality of the associations among CVD risk and the psychological distress variables examined. While not the focus of this study, previous research shows that psychological distress is correlated with CVD (Rudisch and Nemeroff, 2003) (Van der Kooy et al., 2007). There have been several biological pathways hypothesized to link distress with CVD. For example, the idea that inflammation and sympathetic nervous system activation link depression with CVD has been proposed (Musselman et al., 1998; Shimbo et al., 2005). Behavioral pathways, linking psychological distress with poorer health behaviors (e.g., diet, exercise) (Carek et al., 2011; Meznick et al., 2011; Rhodes et al., 2012; Shabbir et al., 2013) and socio-relationship pathways, linking social relationship factors such as loneliness to increased risk of psychological distress (Cacioppo et al., 2006; Hawkey et al., 2003; Hawkey and Cacioppo, 2003, 2010; Hawkey et al., 2006; Hawkey et al., 2010), may lead to greater risk for CVD. In addition, there may be hormone-dependent processes that result in gender differences in the CVD-psychological distress relationship (Goldstein et al., 2014). Finally, the degree of influence of level or severity of psychological distress on CVD risk is unknown. Research is needed to explore the developmental pathway between and mechanistic links among psychosocial distress, CVD risk, and CVD.

There are several factors in this study that may limit interpretation of results. The cross-sectional data collected on psychological distress measures were non-diagnostic and based on self-report. Second, this study is limited to four major metropolitan cities in the United States and does not include rural Hispanics/Latinos. U.S. 2010 Census Data reveal that 80.7% of the US population resides in urban (versus 19.3% rural) areas (US Census Bureau, 2013). It is estimated that 90% or more of Hispanics/Latinos in the U.S. live in metropolitan areas (Guzman, 2001; Mather and Pollard, 2014). Given that the four field centers in this study are located within the top 11 ranked metropolitan areas (PewResearch, 2014a) and the top ten counties (PewResearch, 2014b) in the U.S. for number of Hispanics/Latinos, results from this study, although not representative of all Hispanics in the U.S., are representative for each of these large concentration of Hispanic/Latino backgrounds in metropolitan areas.

Conclusion

The association of multiple CVD risk factors with several measures of psychological distress shown in this study may have implications for research on integrating primary and behavioral care. The comorbidity between chronic disease and psychological distress has led to recent attention to the integration of primary care and behavioral health in primary care settings for disease prevention and management (Bojadziewski and Gabbay, 2011; Harpole et al., 2005). The co-management of chronic diseases, such as diabetes and depression care management is hypothesized to improve self-management behaviors, reduce psychosocial barriers to self-management, and improve treatment outcomes. Results support the potential of integrated strategies that concurrently target mental health and CVD risk reduction (Lorenzo-Blanco and Cortina, 2013). Additionally, because the results were not consistent across all the different Hispanic/Latino heritage groups, it is important to consider more tailored interventions for each of these Hispanic/Latino heritage groups.

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References

- Alegria M, Canino G, Shrout PE, Woo M, Duan N, Vila D, Torres M, Chen CN, Meng XL. Prevalence of mental illness in immigrant and non-immigrant U.S. Latino groups. *The American journal of psychiatry*. 2008; 165:359–369. [PubMed: 18245178]
- Alegria M, Mulvaney-Day N, Torres M, Polo A, Cao Z, Canino G. Prevalence of psychiatric disorders across Latino subgroups in the United States. *American journal of public health*. 2007; 97:68–75. [PubMed: 17138910]
- Alexander JL, Dennerstein L, Kotz K, Richardson G. Women, anxiety and mood: a review of nomenclature, comorbidity and epidemiology. *Expert review of neurotherapeutics*. 2007; 7:S45–58. [PubMed: 18039068]
- American Diabetes, A. Diagnosis and classification of diabetes mellitus. *Diabetes care*. 2010; 33(Suppl 1):S62–69. [PubMed: 20042775]
- Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *American journal of preventive medicine*. 1994; 10:77–84. [PubMed: 8037935]
- Atlantis E, Fahey P, Foster J. Collaborative care for comorbid depression and diabetes: a systematic review and meta-analysis. *BMJ open*. 2014; 4:e004706.
- Beckles GL, Truman BI. Centers for Disease, C., Prevention. Education and income - United States, 2005 and 2009. *Morbidity and mortality weekly report. Surveillance summaries*. 2011; 60(Suppl): 13–17.
- Bojadziewski T, Gabbay RA. Patient-centered medical home and diabetes. *Diabetes care*. 2011; 34:1047–1053. [PubMed: 21447667]
- Cacioppo JT, Hughes ME, Waite LJ, Hawkley LC, Thisted RA. Loneliness as a specific risk factor for depressive symptoms: cross-sectional and longitudinal analyses. *Psychology and aging*. 2006; 21:140–151. [PubMed: 16594799]
- Carek PJ, Laibstain SE, Carek SM. Exercise for the treatment of depression and anxiety. *International journal of psychiatry in medicine*. 2011; 41:15–28. [PubMed: 21495519]
- Cersosimo E, Musi N. Improving treatment in Hispanic/Latino patients. *The American journal of medicine*. 2011; 124:S16–21. [PubMed: 21939794]
- Covey LS, Glassman AH, Stetner F. Cigarette smoking and major depression. *Journal of addictive diseases*. 1998; 17:35–46. [PubMed: 9549601]
- Daviglus ML, Talavera GA, Aviles-Santa ML, Allison M, Cai J, Criqui MH, Gellman M, Giachello AL, Gouskova N, Kaplan RC, LaVange L, Penedo F, Perreira K, Pirzada A, Schneiderman N, Wassertheil-Smoller S, Sorlie PD, Stamler J. Prevalence of major cardiovascular risk factors and cardiovascular diseases among Hispanic/Latino individuals of diverse backgrounds in the United States. *Jama*. 2012; 308:1775–1784. [PubMed: 23117778]
- de Wit L, Luppino F, van Straten A, Penninx B, Zitman F, Cuijpers P. Depression and obesity: a meta-analysis of community-based studies. *Psychiatry research*. 2010; 178:230–235. [PubMed: 20462641]
- Dube SR, Caraballo RS, Dhingra SS, Pearson WS, McClave AK, Strine TW, Berry JT, Mokdad AH. The relationship between smoking status and serious psychological distress: findings from the

- 2007 Behavioral Risk Factor Surveillance System. *International journal of public health*. 2009; 54(Suppl 1):68–74. [PubMed: 19396580]
- Ell K, Katon W, Cabassa LJ, Xie B, Lee PJ, Kapetanovic S, Guterman J. Depression and diabetes among low-income Hispanics: design elements of a socioculturally adapted collaborative care model randomized controlled trial. *International journal of psychiatry in medicine*. 2009; 39:113–132. [PubMed: 19860071]
- Fisher L, Mullan JT, Skaff MM, Glasgow RE, Areal P, Hessler D. Predicting diabetes distress in patients with Type 2 diabetes: a longitudinal study. *Diabetic medicine : a journal of the British Diabetic Association*. 2009; 26:622–627. [PubMed: 19538238]
- Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999–2008. *JAMA : the journal of the American Medical Association*. 2010; 303:235–241. [PubMed: 20071471]
- Gariepy G, Nitka D, Schmitz N. The association between obesity and anxiety disorders in the population: a systematic review and meta-analysis. *International journal of obesity*. 2010; 34:407–419. [PubMed: 19997072]
- Glassy CM, Lemus H, Cronan T, Glassy MS, Talavera GA. Relationship between depressive symptoms and cardiovascular risk factors among selected Latino patients at a community clinic. *Psychology, health & medicine*. 2010; 15:117–126.
- Glymour MM, Yen JJ, Kosheleva A, Moon JR, Capistrant BD, Patton KK. Elevated depressive symptoms and incident stroke in Hispanic, African-American, and White older Americans. *Journal of behavioral medicine*. 2012; 35:211–220. [PubMed: 21656258]
- Goldstein JM, Handa RJ, Tobet SA. Disruption of fetal hormonal programming (prenatal stress) implicates shared risk for sex differences in depression and cardiovascular disease. *Frontiers in neuroendocrinology*. 2014; 35:140–158. [PubMed: 24355523]
- Gonzalez HM, Tarraf W, Whitfield KE, Vega WA. The epidemiology of major depression and ethnicity in the United States. *Journal of psychiatric research*. 2010; 44:1043–1051. [PubMed: 20537350]
- Grigsby AB, Anderson RJ, Freedland KE, Clouse RE, Lustman PJ. Prevalence of anxiety in adults with diabetes: a systematic review. *J Psychosom Res*. 2002; 53:1053–1060. [PubMed: 12479986]
- Grundey SM, Brewer HB Jr, Cleeman JI, Smith SC Jr, Lenfant C. American Heart, A., National Heart, L., Blood, I. Definition of metabolic syndrome: Report of the National Heart, Lung, and Blood Institute/American Heart Association conference on scientific issues related to definition. *Circulation*. 2004; 109:433–438. [PubMed: 14744958]
- Guzman, B. *The Hispanic Population: Census 2000 Brief*. 2001.
- Harpole LH, Williams JW Jr, Olsen MK, Stechuchak KM, Oddone E, Callahan CM, Katon WJ, Lin EH, Grypma LM, Unutzer J. Improving depression outcomes in older adults with comorbid medical illness. *General hospital psychiatry*. 2005; 27:4–12. [PubMed: 15694213]
- Hawkey LC, Burleson MH, Berntson GG, Cacioppo JT. Loneliness in everyday life: cardiovascular activity, psychosocial context, and health behaviors. *Journal of personality and social psychology*. 2003; 85:105–120. [PubMed: 12872887]
- Hawkey LC, Cacioppo JT. Loneliness and pathways to disease. *Brain Behav Immun*. 2003; 17(Suppl 1):S98–105. [PubMed: 12615193]
- Hawkey LC, Cacioppo JT. Loneliness matters: a theoretical and empirical review of consequences and mechanisms. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*. 2010; 40:218–227. [PubMed: 20652462]
- Hawkey LC, Masi CM, Berry JD, Cacioppo JT. Loneliness is a unique predictor of age-related differences in systolic blood pressure. *Psychology and aging*. 2006; 21:152–164. [PubMed: 16594800]
- Hawkey LC, Thisted RA, Masi CM, Cacioppo JT. Loneliness predicts increased blood pressure: 5-year cross-lagged analyses in middle-aged and older adults. *Psychology and aging*. 2010; 25:132–141. [PubMed: 20230134]
- Huang Y, Wei X, Wu T, Chen R, Guo A. Collaborative care for patients with depression and diabetes mellitus: a systematic review and meta-analysis. *BMC psychiatry*. 2013; 13:260. [PubMed: 24125027]

- Jiang W, Glassman A, Krishnan R, O'Connor CM, Califf RM. Depression and ischemic heart disease: what have we learned so far and what must we do in the future? *American heart journal*. 2005; 150:54–78. [PubMed: 16084151]
- Jonas BS, Franks P, Ingram DD. Are symptoms of anxiety and depression risk factors for hypertension? Longitudinal evidence from the National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study. *Archives of family medicine*. 1997; 6:43–49. [PubMed: 9003169]
- Katon WJ, Lin EH, Von Korff M, Ciechanowski P, Ludman EJ, Young B, Peterson D, Rutter CM, McGregor M, McCulloch D. Collaborative care for patients with depression and chronic illnesses. *The New England journal of medicine*. 2010; 363:2611–2620. [PubMed: 21190455]
- Kessler RC. Epidemiology of women and depression. *Journal of affective disorders*. 2003; 74:5–13. [PubMed: 12646294]
- Kessler RC, Berglund P, Demler O, Jin R, Koretz D, Merikangas KR, Rush AJ, Walters EE, Wang PS. National Comorbidity Survey, R. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). *JAMA : the journal of the American Medical Association*. 2003; 289:3095–3105. [PubMed: 12813115]
- Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry*. 2005; 62:593–602. [PubMed: 15939837]
- Lavange LM, Kalsbeek WD, Sorlie PD, Aviles-Santa LM, Kaplan RC, Barnhart J, Liu K, Giachello A, Lee DJ, Ryan J, Criqui MH, Elder JP. Sample design and cohort selection in the Hispanic Community Health Study/Study of Latinos. *Annals of epidemiology*. 2010; 20:642–649. [PubMed: 20609344]
- Li C, Barker L, Ford ES, Zhang X, Strine TW, Mokdad AH. Diabetes and anxiety in US adults: findings from the 2006 Behavioral Risk Factor Surveillance System. *Diabetic medicine : a journal of the British Diabetic Association*. 2008; 25:878–881. [PubMed: 18644077]
- Lin EH, Katon W, Von Korff M, Rutter C, Simon GE, Oliver M, Ciechanowski P, Ludman EJ, Bush T, Young B. Relationship of depression and diabetes self-care, medication adherence, and preventive care. *Diabetes care*. 2004; 27:2154–2160. [PubMed: 15333477]
- Lorenzo-Blanco EI, Cortina LM. Latino/a Depression and Smoking: An Analysis Through the Lenses of Culture, Gender, and Ethnicity. *American journal of community psychology*. 2013; 51:332–346. [PubMed: 22956250]
- Luppino FS, de Wit LM, Bouvy PF, Stijnen T, Cuijpers P, Penninx BW, Zitman FG. Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of general psychiatry*. 2010; 67:220–229. [PubMed: 20194822]
- Mather, M.; Pollard, K. Hispanic Gains Minimize Population Losses in Rural America. 2014.
- McGregor M, Lin EH, Katon WJ. TEAMcare: an integrated multicondition collaborative care program for chronic illnesses and depression. *The Journal of ambulatory care management*. 2011; 34:152–162. [PubMed: 21415613]
- Meznick EJ, Hall M, Matthews KA. Are sleep and depression independent or overlapping risk factors for cardiometabolic disease? *Sleep Medicine Reviews*. 2011; 15:51–63. [PubMed: 20494595]
- Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. *Journal of the American Medical Association*. 2003; 289:76–79. [PubMed: 12503980]
- Moonesinghe R, Zhu J, Truman BI. Centers for Disease, C., Prevention. Health insurance coverage - United States, 2004 and 2008. *Morbidity and mortality weekly report. Surveillance summaries*. 2011; 60(Suppl):35–37.
- Musselman DL, Evans DL, Nemeroff CB. The relationship of depression to cardiovascular disease: epidemiology, biology, and treatment. *Archives of general psychiatry*. 1998; 55:580–592. [PubMed: 9672048]
- Naqvi TZ, Naqvi SS, Merz CN. Gender differences in the link between depression and cardiovascular disease. *Psychosomatic medicine*. 2005; 67(Suppl 1):S15–18. [PubMed: 15953793]

- Okosun IS, Choi S, Matamoros T, Dever GE. Obesity is associated with reduced self-rated general health status: evidence from a representative sample of white, black, and Hispanic Americans. *Preventive medicine*. 2001; 32:429–436. [PubMed: 11330993]
- Osborn CY, Patel KA, Liu J, Trott HW, Buchowski MS, Hargreaves MK, Blot WJ, Cohen SS, Schlundt DG. Diabetes and co-morbid depression among racially diverse, low-income adults. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*. 2011; 41:300–309. [PubMed: 21104461]
- Papakostas GI, Ongur D, Iosifescu DV, Mischoulon D, Fava M. Cholesterol in mood and anxiety disorders: review of the literature and new hypotheses. *European neuropsychopharmacology : the journal of the European College of Neuropsychopharmacology*. 2004; 14:135–142. [PubMed: 15013029]
- Park S, Yi KK, Na R, Lim A, Hong JP. No association between serum cholesterol and death by suicide in patients with schizophrenia, bipolar affective disorder, or major depressive disorder. *Behavioral and brain functions : BBF*. 2013; 9:45. [PubMed: 24308827]
- Patel K, Hargreaves MK, Liu J, Schlundt D, Sanderson M, Matthews CE, Dewey CM, Kenerson D, Buchowski MS, Blot WJ. Relationship between smoking and obesity among women. *American journal of health behavior*. 2011; 35:627–636. [PubMed: 22040623]
- Pew Hispanic Center. *Census 2010 50 Million Latinos*. Washington, D.C: Pew Hispanic Center; 2011.
- PewResearch. *Hispanic Trends Project: Hispanic Population in Select U.S. Metropolitan Areas, 2011. 2014a*.
- PewResearch. *Hispanic Trends Project: U.S. Hispanic Population by County, 1980–2011. 2014b*.
- Polk DM, Naqvi TZ. Cardiovascular disease in women: sex differences in presentation, risk factors, and evaluation. *Current cardiology reports*. 2005; 7:166–172. [PubMed: 15865855]
- Pratt, LA.; Brody, DJ. Depression in the United States household population, 2005–2006. 2008. NCHS data brief, 1–8
- Rhodes RE, Mark RS, Temmel CP. Adult sedentary behavior: a systematic review. *American journal of preventive medicine*. 2012; 42:e3–28. [PubMed: 22341176]
- Rudisch B, Nemeroff CB. Epidemiology of comorbid coronary artery disease and depression. *Biological psychiatry*. 2003; 54:227–240. [PubMed: 12893099]
- Shabbir F, Patel A, Mattison C, Bose S, Krishnamohan R, Sweeney E, Sandhu S, Nel W, Rais A, Sandhu R, Ngu N, Sharma S. Effect of diet on serotonergic neurotransmission in depression. *Neurochemistry international*. 2013; 62:324–329. [PubMed: 23306210]
- Shanmugasagaram S, Russell KL, Kovacs AH, Stewart DE, Grace SL. Gender and sex differences in prevalence of major depression in coronary artery disease patients: a meta-analysis. *Maturitas*. 2012; 73:305–311. [PubMed: 23026020]
- Shimbo D, Chaplin W, Crossman D, Haas D, Davidson KW. Role of depression and inflammation in incident coronary heart disease events. *The American journal of cardiology*. 2005; 96:1016–1021. [PubMed: 16188535]
- Shin JY, Suls J, Martin R. Are cholesterol and depression inversely related? A meta-analysis of the association between two cardiac risk factors. *Annals of behavioral medicine : a publication of the Society of Behavioral Medicine*. 2008; 36:33–43. [PubMed: 18787911]
- Skilton MR, Moulin P, Terra JL, Bonnet F. Associations between anxiety, depression, and the metabolic syndrome. *Biological psychiatry*. 2007; 62:1251–1257. [PubMed: 17553465]
- Smith KJ, Beland M, Clyde M, Garipey G, Page V, Badawi G, Rabasa-Lhoret R, Schmitz N. Association of diabetes with anxiety: a systematic review and meta-analysis. *J Psychosom Res*. 2013; 74:89–99. [PubMed: 23332522]
- Sorlie PD, Aviles-Santa LM, Wassertheil-Smoller S, Kaplan RC, Daviglius ML, Giachello AL, Schneiderman N, Raj L, Talavera G, Allison M, Lavange L, Chambless LE, Heiss G. Design and implementation of the Hispanic Community Health Study/Study of Latinos. *Annals of epidemiology*. 2010; 20:629–641. [PubMed: 20609343]
- Spielberger, C. *Manual for the State-Trait Anxiety Inventory STAI (Form Y)*. Consulting Psychologists Press; Palo Alto, CA: 1983.

- Spielberger, CD.; Jacobs, GH.; Russell, SF.; Crane, RS. Assessment of anger: The State-Trait Anger-Scale. In: Butcher, JN.; Spielberger, CD., editors. *Advances in personality assessment*. Vol. 2. Lawrence Erlbaum Associates, Inc; Hillsdale, NJ: 1983. p. 159-187.
- Trosclair A, Dube SR. Smoking among adults reporting lifetime depression, anxiety, anxiety with depression, and major depressive episode, United States, 2005–2006. *Addictive behaviors*. 2010; 35:438–443. [PubMed: 20079577]
- US Census Bureau. 2010 Census Urban and Rural Classification and Urban Area Criteria: Urban, Urbanized Area, Urban Cluster, and Rural Population, 2010 and 2000. United States: 2013.
- Van der Kooy K, van Hout H, Marwijk H, Marten H, Stehouwer C, Beekman A. Depression and the risk for cardiovascular diseases: systematic review and meta analysis. *International journal of geriatric psychiatry*. 2007; 22:613–626. [PubMed: 17236251]
- Wang MY, Tsai PS, Chou KR, Chen CM. A systematic review of the efficacy of non-pharmacological treatments for depression on glycaemic control in type 2 diabetics. *Journal of clinical nursing*. 2008; 17:2524–2530. [PubMed: 18808619]
- Wassertheil-Smoller S, Arredondo EM, Cai J, Castaneda SF, Choca JP, Gallo LC, Jung M, LaVange LM, Lee-Rey ET, Mosley T Jr, Penedo FJ, Santistaban DA, Zee PC. Depression, anxiety, antidepressant use, and cardiovascular disease among Hispanic men and women of different national backgrounds: results from the Hispanic Community Health Study/Study of Latinos. *Annals of epidemiology*. 2014; 24:822–830. [PubMed: 25439033]
- Wassertheil-Smoller S, Shumaker S, Ockene J, Talavera GA, Greenland P, Cochrane B, Robbins J, Aragaki A, Dunbar-Jacob J. Depression and cardiovascular sequelae in postmenopausal women. The Women’s Health Initiative (WHI). *Arch Intern Med*. 2004; 164:289–298. [PubMed: 14769624]
- Watson LC, Amick HR, Gaynes BN, Brownley KA, Thaker S, Viswanathan M, Jonas DE. Practice-based interventions addressing concomitant depression and chronic medical conditions in the primary care setting: a systematic review and meta-analysis. *Journal of primary care & community health*. 2013; 4:294–306.
- Wilson PW, D’Agostino RB, Levy D, Belanger AM, Silbershatz H, Kannel WB. Prediction of coronary heart disease using risk factor categories. *Circulation*. 1998; 97:1837–1847. [PubMed: 9603539]

Highlights

- Analyses were conducted using a large epidemiological study of diverse Hispanic/Latinos adults.
- For females, greater psychological distress was related to obesity and current smoking.
- For males, diabetes and current smoking was associated with psychological distress.
- For both sexes, dyslipidemia and hypertension were not associated with psychological distress.
- These results were not consistent across Hispanic/Latino heritage groups.

Characteristics and Psychological Distress Scores Stratified by Socio-demographic Characteristics, CVD Risk Factors, and Sex, HCHS/SOL 2008–2011, N = 15,781

	Overall	Sex % (SE)		Depressive Symptoms Mean (SE)		Anxiety Symptoms Mean (SE)		Psychological Distress Mean (SE)	
		Female	Male	Female	Male	Female	Male	Female	Male
H/L Background									
Dominican	9.52 (0.70)	11.06 (0.82)	7.84 (0.74)	8.34 (0.32)	5.29 (0.22)	18.28 (0.38)	15.63 (0.24)	0.17 (0.06)	- 0.31 (0.03)
Central American	7.47 (0.56)	7.50 (0.58)	7.44 (0.65)	7.47 (0.22)	5.58 (0.23)	17.20 (0.23)	15.82 (0.24)	0.01 (0.03)	- 0.27 (0.04)
Cuban	20.41 (1.71)	18.65 (1.64)	22.33 (1.88)	8.09 (0.19)	5.93 (0.25)	17.23 (0.19)	15.53 (0.21)	0.06 (0.03)	- 0.26 (0.04)
Mexican	38.11 (1.67)	39.65 (1.69)	37.09 (1.83)	7.00 (0.16)	5.55 (0.17)	17.61 (0.16)	16.21 (0.17)	0.04 (0.02)	- 0.23 (0.03)
Puerto Rican	15.48 (0.79)	14.68 (0.82)	16.34 (0.95)	10.24 (0.34)	7.39 (0.23)	19.60 (0.33)	17.12 (0.23)	0.44 (0.05)	- 0.001 (0.04)
South American	4.88 (0.31)	5.09 (0.38)	4.66 (0.36)	6.95 (0.33)	5.92 (0.33)	16.56 (0.35)	15.84 (0.26)	- 0.09 (0.05)	- 0.24 (0.04)
Other	4.13 (0.29)	3.98 (0.40)	4.29 (0.41)	7.94 (0.75)	6.47 (0.43)	17.36 (0.66)	16.59 (0.44)	0.06 (0.11)	- 0.13 (0.06)
Age									
18–44	59.70 (0.77)	57.76 (0.88)	61.82 (0.93)	7.35 (0.14)	5.79 (0.12)	17.75 (0.14)	16.20 (0.13)	.04 (0.02)	- 0.22 (0.02)
45–64	31.81 (0.61)	32.93 (0.73)	30.60 (0.77)	8.89 (0.18)	6.33 (0.16)	18.20 (0.16)	16.15 (0.14)	0.21 (0.03)	- 0.18 (0.02)
65–74	8.48 (0.37)	9.30 (0.48)	7.58 (0.49)	7.80 (0.33)	6.03 (0.36)	16.81 (0.27)	15.47 (0.32)	0.01 (0.05)	- 0.26 (0.05)
US Born									
Yes	22.65 (0.80)	20.78 (0.85)	24.69 (1.07)	8.37 (0.28)	6.55 (0.21)	18.69 (0.27)	16.85 (0.20)	0.21 (0.04)	- 0.10 (0.03)
No (US 10yrs)	49.26 (0.77)	50.51 (0.92)	47.89 (0.97)	7.97 (0.17)	5.99 (0.14)	17.77 (0.16)	15.95 (0.13)	0.10 (0.03)	- 0.22 (0.02)
No (US <10 yrs)	28.10 (0.96)	28.72 (1.10)	27.42 (1.09)	7.43 (0.18)	5.43 (0.16)	17.25 (0.16)	15.80 (0.14)	0.01 (0.03)	- 0.28 (0.02)
Language Preference									
Spanish	75.36 (0.91)	77.07 (1.02)	73.49 (1.17)	7.75 (0.11)	5.77 (0.12)	17.61 (0.11)	15.90 (0.11)	0.07 (0.02)	- 0.24 (0.02)
English	24.64 (0.91)	22.93 (1.02)	26.51 (1.17)	8.39 (0.26)	6.53 (0.17)	18.49 (0.22)	16.78 (0.17)	0.19 (0.04)	- 0.11 (0.03)
Annual Household Income									
<20,000	41.68 (0.90)	45.39 (0.89)	37.63 (1.18)	8.93 (0.17)	7.03 (0.17)	18.81 (0.17)	17.13 (0.16)	0.26 (0.03)	- 0.04 (0.03)
\$20001–50,000	37.13 (0.69)	34.83 (0.84)	39.65 (0.97)	7.11 (0.17)	5.25 (0.13)	17.11 (0.17)	15.59 (0.14)	- 0.03 (0.03)	- 0.31 (0.02)
>50,001	11.96 (0.80)	8.90 (0.66)	15.29 (1.09)	5.31 (0.22)	5.00 (0.19)	15.30 (0.22)	14.89 (0.19)	- 0.33 (0.03)	- 0.39 (0.03)
Not Reported	9.23 (0.41)	10.88 (0.52)	7.42 (0.51)	8.26 (0.27)	6.50 (0.34)	17.93 (0.25)	16.68 (0.32)	0.13 (0.04)	- 0.12 (0.05)
Health Insurance									

Table 1

	Overall	Sex % (SE)		Depressive Symptoms Mean (SE)		Anxiety Symptoms Mean (SE)		Psychological Distress Mean (SE)	
		Female	Male	Female	Male	Female	Male	Female	Male
No	49.91 (0.93)	47.27 (1.04)	52.79 (1.12)	7.73 (0.16)	5.82 (0.13)	17.82 (0.15)	16.12 (0.12)	0.08 (0.02)	-0.22 (0.02)
Yes	50.09 (0.93)	52.73 (1.04)	47.21 (1.12)	8.05 (0.17)	6.14 (0.14)	17.80 (0.16)	16.15 (0.13)	0.11 (0.03)	-0.19 (0.02)
Education									
< High School	32.14 (0.73)	32.56 (0.86)	31.67 (0.93)	9.07 (0.24)	6.68 (0.14)	19.06 (0.22)	16.95 (0.15)	0.30 (0.04)	-0.08 (0.02)
High School Graduate	28.29 (0.57)	26.42 (0.75)	30.33 (0.84)	7.82 (0.22)	6.00 (0.18)	18.02 (0.23)	16.23 (0.16)	0.11 (0.04)	-0.20 (0.03)
> High School	39.57 (0.85)	41.01 (1.00)	38.00 (1.05)	7.01 (0.16)	5.37 (0.14)	16.69 (0.13)	15.37 (0.14)	-0.07 (0.02)	-0.32 (0.02)
Dyslipidemia									
No	61.62 (0.59)	70.65 (0.73)	51.76 (0.87)	7.71 (0.13)	5.97 (0.12)	17.79 (0.13)	16.18 (0.12)	0.08 (0.02)	-0.20 (0.02)
Yes	38.38 (0.59)	29.35 (0.73)	48.24 (0.87)	8.36 (0.19)	5.98 (0.14)	17.87 (0.17)	16.08 (0.14)	0.14 (0.03)	-0.21 (0.02)
Current Cigarette Smoking									
No	78.77 (0.57)	83.77 (0.68)	73.32 (0.84)	7.48 (0.12)	5.52 (0.11)	17.47 (0.11)	15.77 (0.10)	0.03 (0.02)	-0.27 (0.02)
Yes	21.23 (0.57)	16.23 (0.68)	26.68 (0.84)	10.05 (0.29)	7.23 (0.18)	19.58 (0.26)	17.12 (0.18)	0.42 (0.04)	-0.02 (0.03)
Diabetes									
No	85.32 (0.43)	84.59 (0.56)	86.13 (0.59)	7.68 (0.12)	5.86 (0.11)	17.68 (0.11)	16.07 (0.10)	0.07 (0.02)	-0.22 (0.02)
Yes	14.68 (0.43)	15.41 (0.56)	13.87 (0.59)	9.09 (0.23)	6.70 (0.22)	18.52 (0.22)	16.54 (0.21)	0.25 (0.04)	-0.11 (0.03)
Hypertension									
No	78.17 (0.58)	78.49 (0.69)	77.82 (0.79)	7.61 (0.13)	5.93 (0.11)	17.69 (0.12)	16.21 (0.11)	0.06 (0.02)	-0.20 (0.02)
Yes	21.83 (0.58)	21.51 (0.69)	22.18 (0.79)	8.96 (0.19)	6.13 (0.19)	18.24 (0.17)	15.85 (0.16)	0.22 (0.03)	-0.22 (0.03)
Obesity									
No	60.44 (0.68)	57.61 (0.88)	63.53 (0.91)	7.39 (0.13)	5.82 (0.12)	17.37 (0.13)	16.04 (0.11)	0.02 (0.02)	-0.23 (0.02)
Yes	39.56 (0.68)	42.39 (0.88)	36.47 (0.91)	8.59 (0.18)	6.24 (0.16)	18.41 (0.16)	16.29 (0.16)	0.20 (0.03)	-0.17 (0.03)
Depressive symptoms (M, SE)	6.98 (0.08)	7.90 (0.11)	5.97 (0.10)						
Anxiety symptoms (M, SE)	17.01 (0.08)	17.81 (0.10)	16.13 (0.10)						
Psychological Distress (M, SE)	-0.05 (-0.01)	0.09 (0.02)	-0.21 (0.02)						

Note: CVD risk factors were defined as followed: dyslipidemia (HDL cholesterol < 40 mg/dL, LDL cholesterol 160 mg/dL, or triglycerides 200 mg/dL), obesity [body mass index (BMI) 30], current cigarette smoking, diabetes (i.e., fasting time > 8 hr AND fasting glucose 126 mg/dL, or fasting time 8 hr AND fasting glucose 200 mg/dL, or post-OGTT glucose 200 mg/dL, or A1C 6.5 DCCT or on medication), and hypertension (blood pressure 140/90 mm Hg or on medications). The CES-D total sum score ranged from 0 to 30, with higher scores indicating more depression. The STAI total sum score ranged from 8 to 40, with higher scores indicating greater anxiety. The psychological distress variable ranged from -3 to 3 with higher scores indicating greater distress.

Table 2
Adjusted and Unadjusted Linear Regression Models Assessing the Relationship between Cardiovascular Risk Factors and Psychological Distress, Females (n=9,460)

	Model 1: Depressive Symptoms		Model 2: Anxiety Symptoms		Model 3: Psychological Distress	
	Unadjusted B (SE)	Adjusted B (SE) ^a	Unadjusted B (SE)	Adjusted B (SE) ^a	Unadjusted B (SE)	Adjusted B (SE) ^a
Dyslipidemia	0.65 (0.23)**	0.18 (0.23)	0.08 (0.22)	-(0.21)	0.06 (0.04)	0.01 (0.04)
Obesity	1.20 (0.22)**	0.67 (0.20)**	1.04 (0.20)**	0.67 (0.19)**	0.19 (0.03)**	0.12 (0.03)**
Diabetes	1.41 (0.25)**	0.43(0.27)	0.84 (0.24)**	0.40 (0.26)	0.19 (0.04)**	0.09 (0.04)*
Current Smoker	2.57 (0.31)**	1.83 (0.32)**	2.11 (0.27)**	1.53 (0.27)**	0.39 (0.04)**	0.31 (0.05)**
Hypertension	1.35 (0.23)**	0.17 (0.27)	0.54 (0.19)**	0.22 (0.22)	0.16 (0.03)**	0.05 (0.04)
R ²	0.09		0.08		0.07	

* p .01,
** p .001

^a Adjusted for age, Hispanic/Latino background, education, income, health insurance, language preference, US Born (defined as US born, non US-born and in the US < 10 years), and site.
Note: Dyslipidemia, diabetes, current smoker, hypertension, and obesity were coded as 1= yes, and 0=no.

Table 3

Adjusted and Unadjusted Linear Regression Models Assessing the Relationship between Cardiovascular Risk Factor and Psychological Distress, Males (n=6,321)

	Model 1: Depressive Symptoms		Model 2: Anxiety Symptoms		Model 3: Psychological Distress	
	Unadjusted B (SE)	Adjusted B (SE) ^a	Unadjusted B (SE)	Adjusted B (SE) ^a	Unadjusted B (SE)	Adjusted B (SE) ^a
Dyslipidemia	-.003 (0.16)	-0.09 (0.16)	-0.09 (0.18)	-0.08 (0.18)	-0.01 (0.03)	-0.01 (0.03)
Obesity	0.42 (0.19) [*]	0.38 (0.18) [*]	0.25 (0.18)	0.26 (0.18)	0.06 (0.03) [*]	0.05 (0.03)
Diabetes	0.84 (0.23) ^{**}	0.64 (0.24) ^{**}	0.47 (0.22) [*]	0.61 (0.24) ^{**}	0.11 (0.04) [*]	0.11 (0.04) ^{**}
Current Smoker	1.71 (0.20) ^{**}	1.35 (0.20) ^{**}	1.35 (0.19) ^{**}	0.99 (0.19) ^{**}	0.25 (0.03) ^{**}	0.22 (0.03) ^{**}
Hypertension	0.20 (0.20)	-0.22 (0.21)	-0.36 (0.18) [*]	-0.31 (0.20)	0.02 (0.03)	0.04 (0.03)
R ²		0.08		0.07		0.06

* p .01,

** p .001

^aAdjusted for age, Hispanic/Latino background, education, income, health insurance, language preference, US Born (defined as US born, non US-born and in the US < 10 years), and site.

Note: Dyslipidemia, diabetes, current smoker, hypertension, and obesity were coded as 1= yes, and 0=no.

Table 4

Adjusted and Unadjusted Linear Regression Models Assessing the Relationship between Psychological distress and CVD Risks, by Sex and Background

	Females	Males
	Adjusted B (SE) ^a	Adjusted B (SE) ^a
Dominican		
Dyslipidemia	-.01 (0.08)	-0.09 (0.09)
Obesity	0.31 (0.09) **	0.03 (0.09)
Diabetes	0.06 (0.10)	0.22 (0.15)
Current Smoker	0.73 (0.18) **	0.15 (0.15)
Hypertension	0.10 (0.09)	0.04 (0.11)
Central American		
Dyslipidemia	0.09 (0.07)	-0.08 (0.07)
Obesity	0.10 (0.07)	0.02 (0.06)
Diabetes	0.12 (0.12)	0.01 (0.10)
Current Smoker	0.29 (0.12) *	0.32 (0.07) **
Hypertension	0.13 (0.10)	0.02 (0.09)
Cuban		
Dyslipidemia	0.06 (0.08)	0.03 (0.06)
Obesity	0.13 (0.06) *	0.01 (0.05)
Diabetes	0.12 (0.11)	0.20 (0.09) *
Current Smoker	0.33 (0.09) **	0.27 (0.06) **
Hypertension	0.10 (0.09)	0.04 (0.08)
Mexican		
Dyslipidemia	-0.05 (0.04)	0.05 (0.04)
Obesity	0.04 (0.05)	0.08 (0.05)
Diabetes	0.03 (0.05)	0.07 (0.05)
Current Smoker	0.25 (0.09) **	0.22 (0.05) **
Hypertension	0.12 (0.06) *	0.08 (0.05)
Puerto Rican		
Dyslipidemia	0.14 (0.13)	0.06 (0.07)
Obesity	0.17 (0.10)	0.10 (0.07)
Diabetes	0.15 (0.09)	0.08 (0.08)
Current Smoker	0.23 (0.11) *	0.10 (0.08)
Hypertension	0.16 (0.11)	-0.07 (0.08)
South American		
Dyslipidemia	-0.11 (0.11)	0.10 (0.08)
Obesity	0.09 (0.09)	0.07 (0.11)
Diabetes	-0.10 (0.15)	0.20 (0.16)
Current Smoker	0.32 (0.04) *	0.22 (0.11) *

	Females	Males
	Adjusted B (SE) ^a	Adjusted B (SE) ^a
Hypertension	0.15 (0.15)	0.03 (0.11)

*
p .05,

**
p .001

^aAdjusted for age, education, income, health insurance, language preference, US Born (defined as US born, non US-born and in the US > 10 years, or non US-born and in the US < 10 years), and site.

Note: Dyslipidemia, diabetes, current smoker, hypertension, and obesity were coded as 1= yes, and 0=no.

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