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Loneliness, cardiovascular disease, and diabetes prevalence in the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study

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Abstract

Background: The relationship between loneliness and both cardiovascular disease (CVD) and diabetes mellitus (DM) has been understudied in U.S. Hispanics, a group at high risk for DM. We examined whether loneliness was associated with CVD and DM, and whether age, sex, marital status, and years in U.S moderated these associations.

Methods: Participants were 5,313 adults (M (SD) age = 42.39 (15.01)) enrolled in the Hispanic Community Health Study/Study of Latinos Sociocultural Ancillary Study. Loneliness was assessed via the 3-item Revised UCLA Loneliness Scale.

Results: Level of reported loneliness was low. Loneliness was significantly associated with CVD: OR = 1.10 (Cl: 1.01–1.20) and DM: OR = 1.08 (Cl: 1.00 – 1.16) after adjusting for depression, demographics, body mass index, and smoking status. Age, sex, marital status, and years in U.S. did not moderate associations.

Discussion: Given that increased loneliness is associated with higher cardiometabolic disease prevalence beyond depressive symptoms, regardless of age, sex, marital status, or years in the

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Disclosures

None

U.S., Hispanic adults experiencing high levels of loneliness may be a subgroup at particularly elevated risk for CVD and DM.

Keywords

loneliness; diabetes; cardiovascular disease; Hispanics; Latinos

Background

Loneliness is a negative emotional response to a perceived deficiency between one's desired and actual level of social interaction (1). This human need to belong is arguably as important as basic needs, such as food or sleep (2). Loneliness is associated with a reduction in lifespan comparable to that caused by smoking 15 cigarettes a day and even greater than that associated with obesity (3– 6). Given these serious health consequences, the U.K. appointed a Minister for Loneliness, who is tasked with establishing a method of measuring loneliness in an effort to identify and resolve the widespread problem (7). Such a psychological construct is important to study in U.S. Hispanics/Latinos, who may be particularly vulnerable to loneliness given their immigration experience and subsequent separation from family and friends. In fact, separation from family and lack of a community is the most often-cited stressor for Hispanic/Latino immigrants (8). This sense of social isolation, or loneliness, has been linked with hopelessness, symptoms of depression and anxiety, and suicidal behaviors in Hispanics/Latinos (9, 10); yet little is known about the loneliness experiences of Hispanics/Latinos living in the U.S.

Furthermore, research suggests that patterns of loneliness may differ by cultural factors, such as familism. Familism, is considered to be one of the most important culturally specific values of Hispanics/Latinos and is described as a strong identification and attachment of individuals with their families (both nuclear and extended), and strong feelings of loyalty, reciprocity, and solidarity among members of the same family (11). These values differ from individualistic, non-Hispanic White and European cultures. Individuals that subscribe to more individualistic values may not emphasize or need a large number of social relationships, and therefore have a higher "loneliness threshold." In contrast, individuals in collectivistic cultures may require a larger number of social relationships to prevent loneliness, having a lower threshold (12).

Loneliness also has been associated with cardiometabolic abnonnalities and disease endpoints, including increased abdominal obesity, metabolic syndrome, cardiovascular disease (CVD) including coronary heart disease and stroke, diabetes mellitus (DM), and mortality (13–16). For instance, a recent meta-analysis showed that deficiencies in social relationships are related to increased risk of CVD (17). It may be particularly important to identify reasons for elevated risk of both CVD and DM among Hispanics/Latinos, because higher rates of DM exist among Hispanics/Latinos compared to other races/ethnicities (18).

Despite this importance, cross-sectional exploration of the relationships of loneliness with CVD and DM among Hispanics/Latinos has produced mixed results. For example, high levels of loneliness were associated with hypertension, heart disease, and stroke, but not DM in one study (19). Support from friends and family were better predictors of DM in the

Hispanic/Latino population than loneliness. However, given that this study's sample consisted of elderly Hispanics/Latinos (60 years and older), how these social variables impact disease in a younger sample is unclear. One potential reason for prior mixed findings may also be that the association of loneliness and cardiometabolic prevalence is not the same across sociodemographic factors such as age, sex, marital status, and length of residence in the U.S., all of which have been associated with loneliness (20–22).

Given mixed results and limitations (e.g., primarily elderly samples) of prior studies, additional examination of the relationships of loneliness, with CVD and DM is warranted. The current study evaluated cross-sectional data to determine whether loneliness was related to the prevalence of CVD and DM in U.S. Hispanic/Latino adults ages 18–74 who participated in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL) Sociocultural Ancillary Study (SCAS). The relationship between the experience of loneliness and disease presence is complicated by a number of factors, such as age, sex, marital status, and years living in the U.S. (20, 21, 23). Exploration of these variables as potential moderators may help to elucidate the relationship between loneliness and disease.

Theoretical/Conceptual Framework

The Loneliness Model, outlined by Hawkley and Cacioppo (2013) postulates that loneliness, or perceived social isolation, is equivalent to feeling unsafe. This feeling of insecurity signals a need for hypervigilance and a highly activated sympathetic nervous system. Lonely people, compared to non-lonely individuals, perceive the world as a more threatening place and have more negative social interactions. Negative social expectations may elicit behaviors from others, confirming negative cognitive biases and ultimately lead to a self-reinforcing loneliness loop. This loop, in turn, activates neurobiological and behavioral mechanisms that contribute to adverse health outcomes, such as cardiovascular disease and type 2 diabetes. It is within this framework upon which the current study is built. Whether the Loneliness Model applies to a Hispanic/Latino population has yet to explored in the literature. If such a relationship is found, it could potentially identify a subgroup of individuals at particularly elevated CVD and DM risk.

Methods

Participants

The SCAS examined sociocultural and psychosocial factors in more detail in a sample of 5,313 participants who were recruited from the HCHS/SOL parent study. Eligible participants were aged 18–74 years and were recruited from Bronx, NY, Chicago, IL, Miami, FL, and San Diego, CA. Data collection on this subsample occurred within 9 months of the participant's baseline examination. SCAS participants were willing and able to complete an additional 1–2 hour interview assessment of socioeconomic, social, psychological, and cultural factors with CVD health relevance. The SCAS cohort is a representative sub-sample of the HCHS/SOL parent study participants. For more details on the sample, design, and procedures of the SOL-Sociocultural Ancillary study, see Gallo, Penedo (24). Institutional Review Board approval was obtained from all study sites for all

HCHS/SOL Sociocultural Ancillary Study procedures and materials, and all participants provided written informed consent.

Data Collection

Participants were recruited between 2008 – 2011, and underwent a baseline examination, which included comprehensive physiological, behavioral, and sociodemographic assessments. Baseline data for the both the parent study and sociocultural ancillary study are used in the present cross-sectional analyses. For more details on the design, cohort selection, and implementation, see Sorlie, Aviles-Santa (25) and Lavange, Kalsbeek (26).

Measures

Primary predictor and outcomes

Loneliness.—Loneliness was measured with the three-item Loneliness Scale (27), which is based on the Revised UCLA Loneliness Scale (R-UCLA) (28). The three items address subjective experiences of loneliness (How often do you lack companionship? How often do you feel isolated from others? How often do you feel left-out?) and are rated on a 3-point Likert scale (hardly ever/never, some of the time, and often). The sum is used as the global measure of loneliness. Summed scores range from 3–9, with higher scores indicating greater loneliness. The three- item scale correlates highly (r = .82) with the R-UCLA and has demonstrated internal consistency (27). The UCLA Loneliness scale has demonstrated high internal consistency (coefficient alpha ranging from .89 to .94) and test-retest reliability over a 1-year period (r = .73) based on prior studies of college students, nurses, teachers, and the elderly (29). Additionally, prior research has demonstrated discriminant validity and convergent on a multi-ethnic sample including Whites, Blacks, and Hispanics (27).

CVD Prevalenc: Based on the medical history data collected in HCHS/SOL baseline, CVD prevalence was assessed as the presence of one or more of the following conditions: myocardial infarction, congestive heart failure, rheumatic heart disease, atrial fibrillation, stroke, transient ischemic attack, aortic aneurysm, or peripheral arterial disease, excluding angina (21).

Diabetes (DM) Prevalence: Presence of DM was determined according to American Diabetes Association criteria: fasting glucose of 126 mg/dL or greater, two hours post OGTT glucose of over 200 mg/dL, and/or A1C of 6.5% or greater. For the current study, a binary indicator specifying the presence or absence of DM was used as the outcome variable.

Covariates

Depression: Depression was assessed at the SC AS exam using the 10 item CES-D scale (27). Items ask respondents to indicate the frequency of symptoms experienced over the past 7 days, ranging from 0 “less than a day” to 3 “5–7 days.” Sample statements include: “I felt depressed.” “I had crying spells.” “People were unfriendly.” This 10-item version has been used widely, has good validity and reliability, and good predictive accuracy of the full-length

20-item version (κ =0.97) (30, 31). The scale has a sensitivity of 97% and specificity of 84% to screen for depressive symptoms (32).

Years in the United States: Years living in the U.S. was reported via self-report questionnaire. Based on prior research which indicates that prevalence of 3 or more cardiovascular risk factors was highest in Hispanics/Latinos living in the United States for 10 years or longer, we dichotomized length in the U.S. to be less than 10 years or 10+ years (21). A dichotomous variable was created for those living in the U.S. for less than 10 years versus those living in the U.S. for 10 years or longer.

Behavioral Factors and demographics: Age, sex, income, smoking status (never, former, or current smoker), study site, marital status, and Hispanic/Latino background were reported via self-report questionnaire. BMI was calculated as weight in kilograms over height in centimeters squared. Weight and height were objectively assessed by evaluators at baseline.

Statistical Analyses

Analyses were conducted using Mplus statistical software, version 7.1.Weights, stratification, and clustering were taken into account according to the study design, which were provided by the University of North Carolina at Chapel Hill Collaborative Studies Coordinating Center.

There were 56 participants who had missing or incomplete data on the UCLA-R and were therefore excluded from analysis, leaving a final sample size of 5,257. Full information maximum likelihood was used to estimate parameters in the presence of any other data that were assumed to be missing at random (33). All variables were screened for outliers and univariate normality.

Using logistic regression, the association between loneliness and disease presence (CVD and DM) was examined, controlling for relevant demographic factors (age, sex, income, study site, Hispanic/Latino background), disease risk factors, (BMI, smoking), and depression. The moderation effects of age, sex, marital status, and years in the U.S. were then assessed by adding the appropriate interaction terms to the model.

Results

Sample descriptive statistics

Weighted descriptive statistics for the study sample are shown in Table 1. Slightly over half of the sample was female (54.5%) and two thirds (66.1%) reported an annual income of less than $20,000. The average BMI was 29.6 kg/m^2, which is considered overweight, and about one fifth of the sample reported current tobacco use (20.7%). Prevalence of CVD in this Hispanic/Latino sample was much lower (10.9%) compared to the general U.S. prevalence (~35.3%). On the other hand, DM prevalence in this sample of Hispanics/Latinos was higher (16.8%) when compared to the general U.S. prevalence (~ 8.3%) (34). In the Ml sample of 15,079 participants, self-reported CHD and stroke levels were low: 4.2% and 2.0% in men; 2.4% and 1.2% in women, respectively. About 17% of men and women were classified as

having DM (21). Loneliness and depression scores were moderately positively correlated *(r* = 0.55, *p* < .001). Twelve percent of the sample received a score of 16 or higher on the CES-D, an established cutoff for clinical depression (35). This prevalence is lower than in the parent HCHS/SOL study, where about 27% of the sample was found to have elevated depressive symptomatology (36).

Overall, high levels of loneliness were rare in the population. In the whole sample, about 12.5% responded that they "often" feel they lack companionship; 6.2% responded that they "often" feel left out; and 8.9% responded that they "often" feel isolated from others. The loneliness mean total score was 4.50 (SD = 1.61) on a scale from 3 to 9. There was no significant difference (*p's* > .15) in loneliness scores based on age, sex, Hispanic/Latino background, marital status, or years of residence in the U.S. See Table 2 for more descriptive results on levels of loneliness in this sample.

Association with CVD and diabetes

Adjusting for age, sex, income, BMI, depression, smoking status, study site, ethnic background, marital status, and years in the U.S., loneliness was significantly associated with both CVD: OR =1.10, (95 % Cl = 1.01 – 1.20),*p* <.05) and DM: OR = 1.08, (1.00 – 1.16), *p* <05). Specifically, each unit increase in the loneliness total score was associated with 10% greater odds of having CVD and 8% greater odds of having DM. These odds ratios correspond to a small effect size (comparable to Cohen's d <.02) (37).Variables that were significantly associated with CVD were age *(p 's* < .001), income *(p* <.05), and BMI *(p* <.001). Variables significantly associated with DM were age *(p* < .001), years in the U.S. (those living in the U.S. for 10+ years had an increased risk *(p* <.01)), income *(p* < .001), and BMI *(p* <.001) (Table 3).

Of note, depression was not significantly associated with either CVD or DM in the presence of loneliness (*p*'s > .15). However, when loneliness was removed from the model, depression was significantly associated with CVD: OR =1.03 (1.01 – 1.05), p < .001) and was marginally significant for DM: OR = 1.02 (1.00 – 1.03), p = .056). Given the moderate correlation between loneliness and depression, follow-up analyses were conducted to examine the relationship between loneliness and both CVD and DM without depression in the model. Odds ratios were slightly stronger without depression as a covariate: CVD: OR =1.14, (95 % Cl = 1.06 – 1.23), *p* <.001) and DM: OR = 1.09, (1.02 – *1.17), p* <.01).

Moderation analyses

Analyses examining age, sex, marital status, or length of residence in the U.S as potential moderators of the loneliness-CVD and loneliness-DM relationship revealed no significant interaction terms (all ps > .05; see Models 2–5).

Discussion

The primary objective of this paper was to evaluate whether loneliness was associated with the prevalence of CVD and DM in Hispanics/Latinos living in the U.S. Consistent with prior literature, the current study supports the link between loneliness and CVD (19). Loneliness was associated with 10% and 8% higher odds of having CVD and DM, respectively, after

adjustment for demographic variables, disease risk factors, and depression. Age, sex, marital status, and years in the U.S. did not significantly moderate these associations, suggesting that the relationships between loneliness and both CVD and DM generalizes across these sociodemographic variables. Despite a small effect size, these findings suggest lonely Hispanic/Latino adults may have slightly increased CVD and DM risk above and beyond depressive symptoms, and regardless of age, sex, marital status, or years spent in the U.S. Although significant, loneliness in this sample was not particularly elevated. Therefore, it may be especially important to identify those Hispanic/Latino individuals struggling with loneliness, as they may be the ones who could benefit from interventions to reduce disease risk.

Loneliness is an important indicator of well-being, particularly among elderly people (38). This is often due to a loss of social contacts (loss of friends, partner) and or change in environment (e.g., moving to a nursing home); however, in Hispanics/Latinos, a culture that emphasizes the centrality of family, age did not emerge as a significant moderator of the loneliness-disease relationship. Perhaps given the importance of familismo in this culture, Hispanics/Latinos feel well cared for and surrounded by social contacts throughout older adulthood.

Previous research has also found a link between depression and elevated DM risk, complications, and mortality (39, 40). Our finding suggests that loneliness, a distinct but related concept, adds additional risk for CVD and DM, above and beyond depressive symptoms. Although previous research supports sex differences in inflammatory responses to loneliness (41), the current study did not find that sex moderated the relationship between loneliness and either CVD or DM. Moreover, while other studies have found a significant relationship between marital status and loneliness (22), our analyses did not support this finding. It is possible that measures of marital satisfaction may be more useful in detecting moderation effects rather than a crude measure of married, divorced/separated, or single. This is an important area for future research. Furthermore, the role of perceived loneliness in the acculturation process for newly immigrated Hispanics/Latinos has been largely understudied in the literature, though acculturative stress has been previously linked with psychological distress (42).

Given the cross-sectional nature of the data, we are unable to determine the directionality of key associations. Indeed, the possibility of reverse causality warrants discussion, given that the disease burden associated with CVD and DM may result in lower perceived support from others and greater sense of loneliness (43). Having CVD may make individuals less able to physically seek out companionship if functioning is impaired, therefore increasing the likelihood of loneliness and social isolation. Prospective studies are needed to understand whether loneliness predicts future diagnosis of CVD and DM among Hispanics/Latinos, and the HCHS/SOL study is currently collecting longitudinal data from participants. This second wave of data may allow a prospective investigation of loneliness at baseline predicting CVD and/or DM at follow-up. Of note, our findings may not generalize to individuals of other races/ethnicities, given that our focus was on examining the key associations among Hispanics/Latinos. Despite these limitations, strengths of the study include the large epidemiological data set, which consisted of diverse Hispanic/Latino heritage groups.

New Contribution to the Literature

To conclude, results from this large epidemiological sample raise the possibility that Hispanic/Latino adults experiencing loneliness may be at particularly elevated risk of CVD and DM, above and beyond depressive symptoms, and regardless of age, sex, marital status, or years spent in the U.S. If future prospective studies establish that loneliness precedes and predicts CVD and DM, then interventions targeting individuals with high levels of loneliness may aid in reducing their excess CVD and DM risk.

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Table 1.

Demographic characteristics of participants

Variable		Mean/ n	SD/ %
Sex	Male	N = 2297	45.5%
	Female	N = 2752	54.5%
Income	$< 20,000	N = 3477	66.1%
	$21–50,000	N = 1466	27.9%
	$>50,000	N = 314	6.0%
Marital Status	Single	N = 1788	34.1%
	Married	N = 2530	48.2%
	Separated/Divorced/Widow	N = 932	17.8%
Hispanic/Latino Background	Dominican	N = 534	10.8%
	Central American	N = 370	7.5%
	Cuban	N = 1017	20.6%
	Mexican	N = 1847	37.5%
	Puerto Rican	N = 758	15.4%
	South American	N = 238	4.8%
	More than 1 origin	N= 126	2.6%
	Other	N = 36	0.7%
Smoking Status	Current users	N = 1088	20.7%
CVD prevalence (Time 1)		N = 570	10.9%
DM prevalence (Time 1)		N = 885	16.8%
CVD prevalence (Time 2)			
DM prevalence (Time 2)			
Age		42.39	15.01
Education	Highest grade completed	11.85	3.86
BMI (kg/m^2)		29.64	6.25
Depressive symptoms		7.87	5.99

Variable	Mean/ n	SD/ %
Loneliness	4.50	1.61

Table 2.

Levels of loneliness in the sample

Variable	Mean	SD
Sex		
Male	4.45	1.59
Female	4.49	1.60
Marital Status		
Married	4.19	1.48
Single	4.72	1.66
Separated	4.88	1.68
Years in the U.S.		
10+	4.89	1.64
Less than 10	4.39	1.53
Race/Ethnicity		
Dominican	4.66	1.53
Central American	4.48	1.68
Cuban	4.31	1.49
Mexican	4.81	1.69
Puerto Rican	4.34	1.53
South American	4.70	1.65
Other	4.69	1.53

There were no significant differences in level of loneliness across groups.

Table 3.

Results of logistic regression analyses with disease presence (Time 1) as outcome

	Disease Prevalence	
	CVD	Diabetes Mellitus
Variable	**OR (95% CI)**	**OR (95% CI)**
MODEL 1		
Loneliness	**1.10 (1.01 – 1.20)***	**1.08 (1.00 – 1.16)***
Age	**1.06 (1.05 – 1.07)*****	**1.08 (1.07 – 1.09)*****
Sex	0.89 (0.68 – 1.15)	0.85 (0.67 – 1.08)
Single v Married	0.75 (0.53 – 1.07)	1.16 (0.86 – 1.56)
Separated v Married	0.94 (0.66 – 1.33)	0.78 (0.59 – 1.04)
+10 Years in the U.S.	1.36 (0.94 – 1.95)	**1.62 (1.18 – 2.23)****
Income	**0.92 (0.87 – 0.99)*****	**0.90 (0.85 – 0.95)*****
BMI	**1.04 (1.02 – 1.06)*****	**1.08 (1.07 – 1.10)*****
Depression	1.02 (1.00 – 1.04)	1.01 (0.99 – 1.03)
Smoking (Former v Never)	1.16 (0.84 – 1.62)	1.27 (0.98 – 1.64)
Smoking (Current v Never)	1.09 (0.75 – 1.59)	0.79 (0.58 – 1.08)
MODEL 2		
Loneliness	**1.16 (1.07 – 1.26)***	1.07 (0.99 – 1.53)
Age	**1.06 (1.05 – 1.07)*****	**1.08 (1.07 – 1.09)*****
Loneliness x Age	1.00 (0.99 – 1.00)	1.00 (1.00–1.01)
MODEL 3		
Loneliness	1.16 (0.90 – 1.50)	1.22 (0.98 – 1.53)
Sex	0.90 (0.70 – 1.18)	0.86 (0.67 – 1.09)
Loneliness x Sex	0.96 (0.83 – 1.11)	0.92 (0.80 – 1.06)
MODEL 4		
Loneliness	1.07 (0.94 – 1.21)	**1.14 (1.03 – 1.27)***
Marital status (Single v Married)	0.77 (0.54 – 1.11)	1.18 (0.88 – 1.59)
Marital status (Separated v Married)	0.90 (0.62 – 1.29)	0.78 (0.58 – 1.06)
Loneliness x Marital status (Single)	0.99 (0.80 – 1.22)	0.89 (0.75 – 1.06)
Loneliness x Marital status (Separated)	1.11 (0.93 – 1.31)	0.91 (0.77 – 1.07)
MODEL 5		
Loneliness	1.02 (0.87 – 1.22)	1.16 (0.99 – 1.37)
+10 Years in U.S.	1.34 (0.93 – 1.93)	**1.64 (1.19 – 2.28)*****
Loneliness x +10 Years in U.S.	1.09 (0.90 – 1.33)	0.91 (0.76 – 1.09)

All models adjusted for age, sex, income, BMI, depression, smoking status, study site, and Hispanic/Latino background.

*$p < .05$,

**$p < .01$,

***$p < .001$