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Group differences in pain interference, psychiatric disorders, and general medical conditions among Hispanics and whites in the U.S. general population

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Abstract

The cross-sectional retrospective study examined whether ethnicity moderates relationships between pain interference and both psychopathology and general medical conditions among Hispanic and non-Hispanic white adults. Participants comprised 32,574 (14% Hispanic; 86% white) National Epidemiologic Survey on Alcohol and Related Conditions respondents. While Hispanic respondents were less likely than white respondents to report severe pain interference (11.4% vs. 11.9%) or moderate pain interference (5.7% vs. 7.8%), and were more likely to report no or low pain interference (82.9% vs. 80.3%), the magnitude of these ethnic group differences was relatively small. Pain interference was associated with multiple past-year Axis-I psychiatric disorders and general medical conditions in both Hispanic and white respondents. Stronger relationships were observed in Hispanic compared to white respondents between moderate pain interference and any heart condition, tachycardia, and hypertension, and between severe pain interference and any mood disorder. Stronger relationships were observed in white compared to Hispanic respondents between severe pain interference and both social phobia and any stomach

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CONFLICT OF INTEREST

All authors report that they have no conflicts of interest over the past five years to report as related to the subject of the report.

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condition. Differences between Hispanic and white respondents on the prevalence of pain interference and on the strength of the associations between pain interference and specific psychiatric disorders and general medical conditions underscore the complexity of ethnic health disparities and suggest the importance of further study of underlying mechanisms.

Keywords

pain; mental disorders; physical disorders; comorbidity; ethnicity

1. Introduction

It is estimated that over 100 million adults in the U.S. experience problems with pain (Institute of Medicine, 2011). Pain interference, the perceived disruption in functioning resulting from physical pain, is an important focus of pain assessment and treatment (Kalliomäki et al., 2008). Higher levels of pain interference are associated with increased risk of psychopathology and general medical conditions (Barry et al., 2012), and can attenuate treatment response for anxiety and depression (Kroenke et al., 2008; Means-Christensen et al., 2008; Teh et al., 2009). Although Hispanic individuals comprise about 17% of the U.S. population (U.S. Census Bureau, 2015), few studies have systematically examined their pain experiences. Research comparing Hispanic and white individuals on pain interference has focused on individuals with chronic pain (i.e., non-cancer-related pain lasting at least three months). A national survey study of adults with chronic pain found that Hispanic and white respondents had comparable levels of pain interference, but white respondents were more likely to visit a physician for pain (Portenoy et al., 2004). In a study of treatment-seeking patients with chronic pain, Hispanic and white participants exhibited similar levels of psychiatric symptoms (Edwards et al., 2005). Few studies have examined ethnic group differences in pain among non-clinical samples in the U.S. In the 2000 Health and Retirement Study, which included community-dwelling adults aged 51 years or older, Hispanic and white respondents did not differ significantly on rates of moderate or severe pain interference (Reyes-Gibby et al., 2007). One laboratory study of healthy adults examined ethnic group differences in response to pain-related cold and heat, and found that Hispanic subjects exhibited lower pain tolerance than their white counterparts (Rahim-Williams et al., 2007).

Researchers have largely ignored an examination of pain interference and associated psychiatric or medical morbidity among Hispanic and white individuals in the general U.S. population. Epidemiological databases frequently omit variables targeting pain and ethnicity or contain insufficient samples of minority members to facilitate ethnicity-based comparisons (Tait et al., 2004). One notable exception is the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), a nationally representative survey, which oversampled Hispanic respondents and assessed pain interference as well as both psychopathology and general medical conditions. The purpose of the current study was to extend prior work on pain interference by comparing levels of pain interference and associated psychopathology and general medical conditions in Hispanic and white NESARC respondents. Given that white respondents were more likely to seek help for pain while

experiencing similar levels of pain interference (Portenoy et al., 2004), we hypothesized that Hispanic respondents would have weaker relationships between pain interference and both general medical as well as psychiatric conditions.

2. Methods

2.1. Sample

The NESARC was conducted by the National Institute on Alcohol Abuse and Alcoholism and the U.S. Census Bureau, and recruited a nationally representative sample of non-institutionalized U.S. citizens and non-citizens aged 18 years and older (Grant et al., 2003a; Grant et al., 2004a). To facilitate the investigation of alcohol use in ethnic minority and young populations, the NESARC over-sampled Hispanic households and individuals 18 to 24 years of age. Multi-stage cluster sampling was used to identify respondents: Census sampling units, households, and then members of households were sequentially sampled. Individuals residing in hospitals, jails, or prisons were excluded. The sample was augmented with residents of group living environments, such as shelters, dormitories, group homes, and facilities for housing workers. Weights have been calculated to adjust standard errors for these over-samples, the cluster sampling strategy, and non-responses (Grant et al., 2003b).

The NESARC sample consisted of 43,093 respondents with an overall response rate of 81 percent. For the purposes of the present study, we restricted the sample to 32,574 respondents who self-identified as Hispanic or non-Hispanic white and provided information about their level of pain interference. Respondents provided informed consent. The current cross-sectional retrospective study of publicly accessible, population-based, de-identified data from the NESARC was presented to the Yale Human Investigations Committee, and was exempted from IRB review.

2.2. Measures

2.2.1. Sociodemographics—Respondents provided information about their gender (male, female), ethnicity/race (Hispanic or Latino, white), marital status (married, previously married, never married), education (less than high-school, high-school graduate, some college, college or higher), employment (full-time, part-time, not working), age, and household annual income.

2.2.2. Psychiatric disorders—Trained lay interviewers collected information on specific DSM-IV Axis-I psychiatric disorders using the Alcohol Use Disorder and Associated Disability Interview Schedule-DSM-IV version (AUDADIS-IV) (American Psychiatric Association, 2000; Grant et al., 2003a). The AUDADIS-IV is a structured diagnostic interview with demonstrated test-retest reliability and has been found to be useful for detecting psychiatric disorders in community samples (Grant et al., 2003a). The NESARC did not assess all DSM-IV Axis-I psychiatric disorders because of concerns about respondent burden and time constraints (Grant et al., 2005). Consistent with prior research (Grant et al., 2009), we used the following psychiatric disorders and categories (accessible at http://pubs.niaaa.nih.gov/publications/NESARCDRM/NESARCDRM.htm): mood disorders (major depression, dysthymia, mania, hypomania); anxiety disorders (panic disorder without

agoraphobia, panic disorder with agoraphobia, social phobia, specific phobia, generalized anxiety disorder); and substance-use disorders (alcohol abuse or dependence, nicotine dependence, drug abuse or dependence). Past-year Axis-I diagnoses with general-medical-condition and substance-use exclusions were used; thus, research diagnoses can be viewed as primary or orthogonal as per DSM-IV/DSM-IV-TR guidelines (American Psychiatric Association, 2000; Desai and Potenza, 2008).

2.2.3. Pain interference—Pain interference was assessed using a subscale from the 12-item short form self-report scale (SF-12) of health-related quality of life (HRQL) (Ware et al., 1996). Similar to previous studies, respondents' answers to the 5-point item: "During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)" were used to classify them into one of three groups: a) "no or low pain interference" (i.e., those reporting their pain interference as "not at all" or "a little bit"); b) "moderate pain interference" (i.e., those reporting their pain interference as "moderate"); and c) "severe pain interference" (i.e., those reporting their pain interference as "a lot" or "extreme") (Barry et al., 2012; Novak et al., 2009).

2.2.4. General medical conditions—Respondents were asked whether they had experienced in the past year any of the following 11 general medical conditions: angina, tachycardia, myocardial infarction, other heart disease, cirrhosis, other liver disease, stomach ulcer, gastritis, arthritis, arteriosclerosis, and hypertension. For each condition reported, respondents were asked whether a physician or other medical professional had diagnosed it. Only general medical conditions which respondents reported were diagnosed by a physician or other medical professional were considered positive (Goldstein et al., 2009).

2.3. Data analysis

The primary research question concerned differences among Hispanic and white respondents in the association between past-month pain interference and psychiatric disorders or general medical conditions. Data analyses proceeded in multiple steps. First, using chi-square tests (χ^2), we examined the associations between pain interference and sociodemographics (gender, marital status, education, employment, age, and household annual income), stratified by ethnicity (Hispanic and white). Second, we examined unadjusted weighted rates of psychiatric disorders and general medical conditions according to levels of pain interference (i.e., no or low pain interference [NPI], moderate pain interference [MPI], severe pain interference [SPI]), stratified by ethnicity. Third, we fitted a series of multivariable logistic regression models to examine the relationships between any Axis-I psychiatric disorder and any general medical condition and pain interference within ethnicity/race. We conducted subsequent analyses with subgroupings and individual disorders or conditions to determine the provenance of significant findings. We adjusted for potentially confounding sociodemographic variables (i.e., gender, marital status, education, employment, age, and household annual income). The NPI category was used as a reference level for two sets of adjusted odds ratios: MPI versus NPI and SPI versus NPI. Interaction odds ratios were calculated to assess whether the adjusted odds ratios for Hispanic respondents were significantly different from those for white respondents. Given the configuration of the study sample and the goal of estimating as accurately as possible the

national rates of comorbid psychiatric disorders and general medical conditions, analyses were performed using NESARC-calculated weights and SUDAAN software (Research Triangle Institute, 2001). Thus, sample proportions are based on weighted percentages. The statistical significance of the interaction term was evaluated with statistical significance set at $p < 0.05$.

3. Results

Participants' ages ranged from 18 to 90 years (M = 45.8, SE = 0.20); 48.5 % were men (n=14,467) and 51.5% were women (n=18,107). More than one-half (64.1% [n=17,996]) of the sample was married, 84.9% (n=26,836) had graduated high school, and 53.4% (n=16,785) worked fulltime. A minority of the sample (26.6% [n=7,004]) reported an annual household income of at least $70,000 (weighted percentages provided). Of the respondents, 14.03% self-identified as Hispanic (n=8,257) and 85.97% as non-Hispanic white (n=24,317). In comparison to white respondents, Hispanic respondents were more likely to be male (50.8% vs. 48.1%), have never married (24.4% vs. 17.8%), have less than a high-school level of education (38.8% vs. 11.3%), be younger (38.4 years old vs. 47.0 years old), and to have an annual household income below $20,000 (28.8% vs. 18.5%) (all p's <0.01).

Associations between pain-interference levels and sociodemographic characteristics were largely similar for Hispanic and white respondents (Table 1). The NPI, as compared to the MPI and SPI groups, more frequently acknowledged having never married, having at least some college, being employed full-time, being younger, and having an annual household income of at least $70,000.

3.1. Pain interference

The majority (n=26,005; 80.7%) of respondents reported no or low levels of pain interference. Significant ethnic/racial differences in pain interference were observed ($p<0.001$); relative to white respondents, Hispanic respondents had lower rates of moderate (5.7% vs. 7.8%) and severe pain interference (11.4% vs. 11.9%), and higher rates of no or low pain interference (82.9% vs. 80.3%).

3.2. Pain interference and psychopathology

Table 2 summarizes the patterns of associations observed between pain-interference levels and psychiatric morbidity among Hispanic and white respondents. Significant associations were observed between pain interference and any Axis-I disorder, any mood disorder, and any anxiety disorder in both Hispanic and white respondents. The association between pain interference and any substance-use disorder was significant in white but not in Hispanic respondents. Differences were suggested between Hispanic and white respondents within three of the contributing categories in the Axis-I disorder domain (mood disorder, anxiety disorder and substance-use disorder). The associations between pain interference levels and mania, hypomania, social phobia, specific phobia, and nicotine dependence were significant at $p<0.05$ for white but not for Hispanic respondents.

Adjusted odds ratios from multivariable models investigating the strengths of associations between psychiatric disorders and pain-interference-level groups are presented for Hispanic

and white respondents, using same-ethnicity NPI group as the reference group (Table 3). In both Hispanic and white respondents, the odds of any Axis-I disorder were elevated in association with moderate or severe pain interference. Additionally, in white but not Hispanic respondents, the odds of any anxiety disorder and any substance-use disorder were elevated in association with severe pain interference, and the odds of any mood disorder, major depression, any anxiety disorder, panic disorder without agoraphobia, generalized anxiety disorder, any substance-use disorder and nicotine dependence were elevated in association with moderate pain interference. Interaction analyses indicated different relationships for Hispanic and white respondents for two psychiatric disorders. A stronger relationship was observed in Hispanic compared to white respondents between severe pain interference and any mood disorder (OR = 1.36, $p < 0.05$), and a stronger relationship was observed in white as compared to Hispanic respondents between severe pain interference and social phobia (OR = 0.42, $p < 0.05$).

3.3. Pain interference and general medical conditions

As summarized in Table 2, for both Hispanic and white respondents, general medical conditions tended to occur more frequently among those with moderate or severe compared to no or low pain interference. The most frequently occurring general medical conditions among NPI, MPI, and SPI groups were arthritis and hypertension. As summarized in Table 3, for both Hispanic and white respondents, the adjusted odds of any general medical condition were elevated in association with moderate and severe pain interference compared to no or low pain interference. Interaction analyses yielded significant ethnicity-/race-related differences in the relationship between pain interference and four general medical conditions. Compared to white respondents, Hispanic respondents exhibited a stronger relationship between moderate pain interference and any heart condition (OR=1.58, $p<0.05$) tachycardia (OR=2.13, $p<0.05$), and hypertension (OR=1.34, $p<0.05$). Compared to Hispanic respondents, white respondents exhibited a stronger relationship between severe pain interference and any stomach condition (OR=0.73, $p<0.05$).

4. Discussion

To our knowledge, this cross-sectional retrospective study is among the first to both compare the prevalence of pain interference levels in a nationally representative U.S. sample of Hispanic and white adults and to examine whether ethnicity moderates relationships between pain interference and psychiatric disorders as well as general medical conditions. Rates of moderate and severe pain interference were higher in white compared to Hispanic respondents. Multiple potentially important group differences emerged in the strength of the associations between pain interference and both psychiatric disorders and general medical conditions, which only partially confirmed our hypotheses.

4.1. Pain interference

Findings from the current study indicating that white respondents had higher rates of moderate and severe pain interference contrast with those from prior studies on a) patients with chronic pain in which Hispanics and white respondents had similar levels of pain interference (Portenoy et al., 2004), b) middle-aged and older community-dwelling adults in

which Hispanic and white respondents reported comparable rates of moderate and severe pain interference (Reyes-Gibby et al., 2007), and c) healthy adults which found that Hispanic laboratory subjects exhibited lower pain tolerance than white subjects in response to pain-related cold and heat (Rahim-Williams et al., 2007). The extent to which differences in study samples (e.g., clinical vs. non-clinical), types of pain (e.g., chronic vs. acute), design (e.g., survey vs. experimental), data analytic procedures (e.g., covariates), and measures (e.g., wording of pain interference measures) account for possible inconsistencies in study findings is unclear and merits further investigation. The higher rates of severe pain interference in white compared to Hispanic respondents differ from NESARC findings indicating that African American respondents exhibited higher rates of severe pain interference than white respondents (Barry et al., 2016). In the current study, ethnic group differences in pain interference levels were statistically significant (and relatively small); given the psychiatric and medical burden accompanying moderate and severe levels of pain interference, even small statistically significant differences may have important clinical relevance.

4.2. Pain interference and psychopathology

Consistent with findings from previous epidemiological studies, respondents with moderate or severe pain interference compared to those with no or low pain interference had elevated rates of mood and anxiety disorders (McWilliams et al., 2008; McWilliams et al., 2003; McWilliams et al., 2004; Ohayon and Schatzberg, 2010; Scudds and Ostbye, 2001; Thomas et al., 2007). Our findings extend those from prior studies by demonstrating a stronger relationship in Hispanic compared to white respondents between severe pain interference and any mood disorder as well as a stronger relationship in white compared to Hispanic respondents between severe pain interference and social phobia. Research to date on the associations between pain and depression in Hispanic and white individuals has focused on clinical samples and has yielded mixed findings. Survey studies of respondents with chronic pain found no significant differences between Hispanic and white respondents on self-reported mood (Portenoy et al., 2004) or depressive symptoms (Edwards et al., 2005), while a study of patients with rheumatoid arthritis found that Hispanic participants were more likely than white ones to screen positive for depression (Escalante et al., 2000).

To assist in the interpretation of the findings of the current study, we note that prior research on the NESARC has found that white compared to Hispanic respondents exhibit higher lifetime and current rates of mood disorder (20.6% vs. 14.1% and 5.5% vs. 2.9%) and social phobia (9.4% vs. 7.9% and 3.0% vs. 1.9%) (Damush et al., 2016; Grant et al., 2004b). Since untreated pain can attenuate treatment response to depression, and depression, in turn, can worsen treatment outcomes for patients with pain (Means-Christensen et al., 2008, Teh et al., 2009), the stronger relationship between severe pain interference and any mood disorder among Hispanic compared to white respondents represents a potentially important health-related ethnic disparity. Findings from this study suggest that it may be particularly important for clinicians to assess for pain interference in Hispanic patients with depression (and to assess for mood disorders in those who present with severe pain interference). While effective treatment for co-occurring chronic pain and depression has traditionally proven

elusive, a recent study suggests the possible merits of a combined pharmacologic and behavioral treatment approach for these co-existing conditions (Damush et al., 2016).

The current study builds on previous research by documenting the rates of anxiety disorders associated with pain interference levels in Hispanic individuals (Hollingshead et al., 2016). The stronger association between social phobia and severe pain interference in white compared to Hispanic respondents is noteworthy since many interdisciplinary treatment programs for persistent pain use group modalities; patients with social anxiety may not benefit from group therapies and may require more individual modality treatments (Wurm et al., 2016). Currently, the temporal associations between psychiatric variables and pain interference among Hispanic and white respondents are unclear and merit further investigation. While the odds ratios for many of observed statistical differences were relatively modest, psychiatric disorders and general medical conditions can significantly diminish functioning; thus, even small increases in the likelihood of occurrence of psychiatric and general medical conditions among respondents with moderate or severe pain interference (compared to those with no or low) may be clinically important.

4.3. Pain interference and general medical conditions

Multivariate analyses revealed ethnicity-related differences in the relationships between pain interference and multiple general medical conditions, including any heart condition, tachycardia, any stomach condition, and hypertension. Given the cross-sectional design, the temporal associations of these study variables were unclear. For example, it is possible that Hispanic and white respondents respond differently to pain interference (e.g., diet, exercise, medications used), which may affect their subsequent risk for developing hypertension and any heart condition, generally, or tachycardia, specifically. Alternatively, respondents may vary by ethnicity in the extent to which they seek (or receive) treatment for any heart condition, tachycardia, any stomach condition, and hypertension, which in turn may result in differing susceptibility to moderate or severe pain interference. Regardless of etiology, these findings highlight the challenges faced by providers in redressing possible ethnicity-based disparities in pain management, which requires attending to both comorbid psychiatric and medical conditions in addition to levels of pain interference (Barry et al., 2016). Compared to white individuals, Hispanic individuals are less likely to visit physicians for pain (Portenoy et al., 2004) and little is known about their willingness to use nonpharmacological treatments for pain (e.g., psychosocial interventions, physical therapy) (Hollingshead et al., 2016).

4.4. Limitations

This study has limitations. The cross-sectional design precludes statements regarding causation among study variables. A single item from the SF-12 Pain interference was used to assess pain interference. Although this measure has been used in prior epidemiologic and community studies (Barry et al., 2012; Blyth et al., 2004; Goldstein et al., 2009; Novak et al., 2009; Thomas et al., 2007), further research in this area may benefit from a more comprehensive measure of pain interference (e.g., West Haven-Yale multidimensional Pain Inventory (Kerns et al., 1985); Brief Pain Inventory-Short Form (Cleeland, 1991)). Given concerns about response burden, the NESARC did not exhaustively assess psychiatric

disorders and general medical conditions. Consequently, specific diagnoses of potential clinical relevance to pain interference were not assessed, such as sleep-wake disorders and sexual dysfunctions and disorders. Future investigations of the psychiatric correlates of pain interference might benefit from the inclusion of measures that assess these conditions. Several components of respondents' pain experiences which might have informed the findings regarding associations between pain interference and psychiatric as well as medical conditions were not measured, including pain characteristics (e.g., intensity, duration), pain response (e.g., catastrophizing, treatments used), and resources (e.g., social support). Finally, findings from the NESARC may not generalize to individuals seeking or enrolled in treatment.

4.5. Conclusions

Despite these limitations, this study represents an important initial examination of differences in the pattern of psychiatric and medical comorbidity associated with varying levels of pain interference among a nationally representative sample of Hispanic and white adults in the U.S. These differences underscore the complexity of ethnic health disparities, and suggest the importance of further study of possible underlying mechanisms, including sociocultural factors (Bui et al., 2011; Zamora-Kapoor et al., 2015) and attitudes and behaviors related to pain and healthcare (Hollingshead et al., 2016; Shavers et al., 2010).

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Highlights

- Examined pain interference in Hispanic and white adults
- Hispanic adults were less likely to report moderate or severe pain interference
- Ethnicity moderated links between pain, psychopathology and medical conditions

Table 1

Sociodemographic characteristics of black and white respondents by pain interference levels.[1]

	Hispanic Respondents					White Respondents				
	No/Low Pain *n*=6,745[2]	Moderate Pain *n*=539[2]	Severe Pain *n*=973[2]	χ^2	*p*	No/Low Pain *n*=19,260[2]	Moderate Pain *n*=2,001[2]	Severe Pain *n*=3,056[2]	χ^2	*p*
Characteristics	%	%	%			%	%	%		
Gender				7.00	.002				25.02	<0.001
Female	47.8	55.4	55.9			50.6	57.3	57.5		
Male	52.2	44.6	44.1			49.4	42.7	42.5		
Marital status				8.62	<.001				38.56	<0.001
Married	62.8	64.9	61.8			65.1	62.6	60.4		
Previously married	10.9	20.4	23.1			15.7	25.5	27.5		
Never married	26.3	14.7	15.1			19.2	11.9	12.1		
Education				3.32	0.007				27.65	<0.001
Less than HS	37.0	47.9	47.0			9.0	18.1	22.1		
HS graduate	26.0	24.4	21.8			29.2	32.9	34.3		
Some college	24.5	20.5	21.5			31.8	30.7	28.0		
College or higher	12.5	7.2	9.7			30.0	18.3	15.6		
Employment				9.25	<.001				54.40	<0.001
Full time	61.8	41.1	35.1			57.9	36.3	28.6		
Part time	10.0	9.7	8.4			11.4	10.1	7.0		
Not working	28.2	49.2	56.5			30.7	53.6	64.4		
Age (mean age ± SE)[3]	36.8±0.4	47.0±1.1	45.6±0.9	85.9[4]	<.0001	45.2±0.2	54.3±0.5	54.4±0.4	293.6[4]	<0.001
Household annual income				4.42	<.001				33.30	<0.001
$0–19,999	25.9	40.4	43.8			15.5	25.6	33.7		
$20,000–34,999	26.7	25.6	20.1			18.0	22.8	22.5		
$35,000–69,999	32.4	23.9	24.3			35.2	32.1	27.6		
$70,000+	15.1	10.1	11.8			31.3	19.5	16.2		

[1] Proportions in table represent weighted percentages, stratified by race

[2] Ns represent actual number in each category

[3] Numbers represent weighted mean values, stratified by ethnicity/race

[4] For the continuous variable of age, we conducted a Wald F test

Table 2

Prevalence of psychiatric diagnoses and general medical conditions by pain interference severity among Hispanic and white respondents.

	Hispanic Respondents					White Respondents				
	No/low pain *n*=6,745[1]	**Moderate Pain *n*=539[1]**	**Severe Pain *n*=973[1]**	**χ^2**	***p***	**No/low pain *n*=19,260[1]**	**Moderate Pain *n*=2,001[1]**	**Severe Pain *n*=3,056[1]**	**χ^2**	***p***
	%	%	%			%	%	%		
Any Axis I disorder	22.7	30.6	29.3	6.90	**0.0019**	30.3	37.0	39.3	33.35	**<0.0001**
Any mood disorder	7.1	9.4	14.2	8.78	**0.0004**	8.2	13.6	15.1	42.64	**<0.0001**
Major depression	4.9	7.1	10.8	8.34	**0.0006**	6.4	10.8	12.0	37.04	**<0.0001**
Dysthymia	1.1	2.8	4.5	6.97	**0.0018**	1.4	3.1	4.5	27.88	**<0.0001**
Mania	1.4	1.9	2.3	1.55	0.2208	1.3	2.5	3.4	16.31	**<0.0001**
Hypomania	0.9	1.5	0.7	1.11	0.3373	1.2	1.5	0.7	3.93	**0.0244**
Any anxiety disorder	8.0	12.4	13.3	4.38	**0.0164**	10.5	16.7	17.6	38.66	**<0.0001**
Panic disorder without agoraphobia	1.3	3.3	3.3	5.84	**0.0047**	1.8	4.2	4.9	22.69	**<0.0001**
Panic disorder with agoraphobia	0.1	0.2	0.0	1.56	0.2185	0.04	0.1	0.1	0.77	0.4660
Social phobia	2.0	2.9	1.5	1.27	0.2882	2.7	3.8	5.2	17.32	**<0.0001**
Specific phobia	5.3	6.4	8.3	2.23	0.1159	6.9	9.8	10.3	15.27	**<0.0001**
Generalized anxiety disorder	1.3	2.5	4.2	5.15	**0.0084**	1.6	4.1	5.0	31.99	**<0.0001**
Any substance-use disorder	13.3	15.7	12.9	0.55	0.5815	20.0	22.1	23.8	7.74	**0.0010**
Alcohol abuse or dependence	8.4	7.9	5.3	4.38	**0.0164**	9.4	7.6	7.1	6.86	**0.0020**
Nicotine dependence	6.0	7.4	7.7	1.27	0.2867	13.3	17.4	19.5	24.66	**<0.0001**
Drug abuse or dependence	1.8	1.8	1.5	0.09	0.9102	1.9	1.8	2.2	0.42	0.6585
Any general medical condition	17.2	49.7	45.4	19.11	**<0.0001**	28.8	63.4	64.7	108.72	**<0.0001**
Any heart condition	2.6	13.8	14.5	17.91	**<0.0001**	5.5	17.2	23.7	89.28	**<0.0001**
Angina	1.2	7.4	10.2	13.87	**<0.0001**	2.2	9.3	13.2	72.40	**<0.0001**
Tachycardia	1.2	8.2	8.1	15.41	**<0.0001**	2.7	8.6	13.3	76.09	**<0.0001**
Myocardial infarction	0.3	2.2	2.1	7.12	**0.0016**	0.5	1.8	3.4	26.80	**<0.0001**
Other heart disease	0.7	2.9	3.5	8.70	**0.0004**	1.9	6.8	9.7	60.72	**<0.0001**

	Hispanic Respondents					White Respondents				
	No/low pain *n*=6,745[1]	**Moderate Pain *n*=539[1]**	**Severe Pain *n*=973[1]**	**χ^2**	***p***	**No/low pain *n*=19,260[1]**	**Moderate Pain *n*=2,001[1]**	**Severe Pain *n*=3,056[1]**	**χ^2**	***p***
	%	**%**	**%**			**%**	**%**	**%**		
Any liver disease	0.4	1.4	2.7	5.30	**0.0074**	0.7	0.4	1.3	7.22	**0.0015**
Cirrhosis	0.1	0.7	0.7	2.60	0.0816	0.1	0.3	1.1	7.72	**0.0010**
Other liver disease	0.3	0.9	2.2	4.20	**0.0195**	0.3	1.0	1.6	15.75	**<0.0001**
Any stomach condition	5.1	13.8	13.2	10.80	**0.0001**	4.0	10.3	14.2	73.40	**<0.0001**
Stomach ulcer	2.1	4.7	6.6	10.37	**0.0001**	1.5	4.0	6.4	42.39	**<0.0001**
Gastritis	4.1	11.4	11.2	7.93	**0.0008**	3.0	8.0	10.7	55.90	**<0.0001**
Arthritis	5.6	26.9	27.5	20.73	**<0.0001**	13.3	42.9	46.2	109.55	**<0.0001**
Arteriosclerosi s	0.4	3.9	4.5	8.50	**0.0005**	1.1	3.9	6.1	44.82	**<0.0001**
Hypertension	8.9	26.2	27.2	15.95	**<0.0001**	16.1	31.7	35.5	78.44	**<0.0001**

[1] N's represent actual number in each category. Bold values indicate statistically significant results ($p < 0.05$).

Table 3

Association between psychiatric diagnoses, medical conditions, and pain interference severity among Hispanic and white respondents.

	Hispanic Respondents		White Respondents		Interaction OR Hispanic vs. White Respondents	
	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI	MPI vs. NPI	SPI vs. NPI
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Any Axis I disorder	**1.40 (1.06– 1.86)**	**1.44 (1.14– 1.83)**	**1.30 (1.14– 1.49)**	**1.40 (1.24– 1.59)**	1.08 (0.78– 1.50)	1.03 (0.78– 1.35)
Any mood disorder[1]	0.84 (0.54– 1.32)	**1.79 (1.38– 2.32)**	**1.27 (1.03– 1.56)**	**1.31 (1.13– 1.53)**	0.66 (0.40– 1.10)	**1.36 (1.02– 1.82)**
Major depression	0.93 (0.59– 1.48)	**1.83 (1.36– 2.47)**	**1.26 (1.01– 1.57)**	**1.31 (1.11– 1.55)**	0.74 (0.43– 1.26)	1.40 (0.99– 1.97)
Dysthymia	1.58 (0.81– 3.05)	**2.68 (1.72– 4.16)**	1.38 (0.94– 2.03)	**1.75 (1.28– 2.37)**	1.14 (0.53– 2.43)	1.53 (0.92– 2.55)
Mania	0.88 (0.37– 2.10)	1.19 (0.68– 2.09)	1.23 (0.83– 1.80)	**1.40 (1.05– 1.86)**	0.72 (0.28– 1.84)	0.85 (0.46– 1.58)
Hypomania	1.51 (0.55– 4.11)	0.88 (0.40– 1.94)	1.32 (0.80– 2.19)	**0.55 (0.31– 0.99)**	1.14 (0.38– 3.43)	1.59 (0.60– 4.21)
Any anxiety disorder[2]	1.14 (0.72– 1.80)	1.31 (0.93– 1.85)	**1.32 (1.13– 1.54)**	**1.27 (1.08– 1.48)**	0.87 (0.52– 1.44)	1.04 (0.70– 1.54)
Panic disorder without agoraphobia	1.75 (0.94– 3.27)	1.55 (0.98– 2.43)	**1.65 (1.19– 2.28)**	**1.56 (1.14– 2.13)**	1.06 (0.52– 2.18)	0.99 (0.59– 1.67)
Panic disorder with agoraphobia	1.42 (0.12– 16.12)	0.00 (0.00– 0.00)	1.12 (0.13– 9.70)	1.40 (0.31– 6.33)	1.26 (0.07– 24.11)	N/A
Social phobia	0.95 (0.35– 2.57)	**0.54 (0.32– 0.92)**	1.01 (0.74– 1.36)	**1.28 (1.01– 1.61)**	0.95 (0.33– 2.69)	**0.42 (0.24– 0.76)**
Specific phobia	0.87 (0.52– 1.43)	1.28 (0.88– 1.86)	1.15 (0.95– 1.40)	1.12 (0.94– 1.32)	0.75 (0.44– 1.29)	1.15 (0.75– 1.74)
Generalized anxiety disorder	1.24 (0.59– 2.57)	**2.07 (1.12– 3.83)**	**1.68 (1.21– 2.34)**	**1.79 (1.34– 2.38)**	0.74 (0.33– 1.65)	1.16 (0.61– 2.20)
Any substance-use disorder[3]	1.34 (0.94– 1.90)	1.10 (0.84– 1.43)	**1.18 (1.01– 1.38)**	**1.35 (1.18– 1.54)**	1.13 (0.76– 1.67)	0.84 (0.61– 1.09)
Alcohol abuse or dependence	1.21 (0.64– 2.29)	0.80 (0.52– 1.23)	0.95 (0.75– 1.20)	0.97 (0.77– 1.22)	1.27 (0.66– 2.46)	0.82 (0.51– 1.34)
Nicotine dependence	1.17 (0.68– 2.02)	1.31 (0.91– 1.87)	**1.26 (1.06– 1.48)**	**1.42 (1.24– 1.64)**	0.93 (0.52– 1.66)	0.92 (0.63– 1.34)
Drug abuse or dependence	1.01 (0.15– 6.69)	1.04 (0.46– 2.38)	0.90 (0.59– 1.38)	1.07 (0.76– 1.51)	1.12 (0.16– 7.91)	0.98 (0.42– 2.26)
Any general medical condition[4]	**2.63 (2.05– 3.38)**	**2.44 (1.94– 3.06)**	**2.81 (2.48– 3.19)**	**2.92 (2.58– 3.30)**	0.94 (0.70– 1.25)	0.83 (0.66– 1.05)
Any heart condition	**3.31 (2.45– 4.48)**	**3.40 (2.52– 4.58)**	**2.09 (1.81– 2.42)**	**2.94 (2.58– 3.36)**	**1.58 (1.16– 2.15)**	1.15 (0.85– 1.57)
Angina	**3.54 (2.33– 5.37)**	**5.00 (3.42– 7.31)**	**2.65 (2.17– 3.23)**	**3.55 (2.97– 4.25)**	1.34 (0.85– 2.09)	1.41 (0.94– 2.11)
Tachycardia	**4.20 (2.81– 6.28)**	**3.89 (2.74– 5.52)**	**1.97 (1.61– 2.41)**	**2.91 (2.47– 3.42)**	**2.13 (1.39– 3.26)**	1.34 (0.92– 1.96)
Myocardial infarction	**3.17 (1.20– 8.34)**	**3.16 (1.64– 6.07)**	**1.74 (1.13– 2.67)**	**3.07 (2.17– 4.34)**	1.83 (0.63– 5.26)	1.03 (0.50– 2.12)
Other heart disease	**2.16 (1.06– 4.40)**	**2.59 (1.60– 4.19)**	**2.15 (1.70– 2.72)**	**2.97 (2.46– 3.59)**	1.01 (0.49– 2.07)	0.87 (0.52– 1.47)
Any Liver Disease	2.39 (0.90– 6.36)	**4.39 (2.30– 8.38)**	**2.33 (1.35– 4.00)**	**3.40 (2.28– 5.07)**	1.03 (0.33– 3.16)	1.29 (0.59– 2.82)
Cirrhosis	**6.07 (1.37– 26.94)**	**5.19 (1.14– 23.58)**	1.70 (0.53– 5.42)	**4.47 (2.29– 8.72)**	3.58 (0.57– 22.57)	1.16 (0.21– 6.37)

	Hispanic Respondents		White Respondents		Interaction OR Hispanic vs. White Respondents	
	MPI vs. NPI	**SPI vs. NPI**	**MPI vs. NPI**	**SPI vs. NPI**	**MPI vs. NPI**	**SPI vs. NPI**
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Other liver disease	1.82 (0.60– 5.51)	**4.58 (2.28– 9.19)**	**2.42 (1.38– 4.24)**	**3.36 (2.15– 5.23)**	0.75 (0.21– 2.66)	1.37 (0.60– 3.10)
Any stomach condition	**1.84 (1.28– 2.64)**	**1.85 (1.41– 2.43)**	**1.89 (1.57– 2.27)**	**2.53 (2.16– 2.97)**	0.97 (0.66– 1.44)	**0.73 (0.55– 0.98)**
Stomach ulcer	1.57 (0.93– 2.66)	**2.18 (1.48– 3.22)**	**1.86 (1.38– 2.51)**	**2.67 (2.12– 3.35)**	0.84 (0.47– 1.50)	0.82 (0.53– 1.25)
Gastritis	1.85 (0.17– 2.90)	**1.96 (1.42– 2.72)**	**1.94 (1.55– 2.41)**	**2.53 (2.11– 3.03)**	0.95 (0.58– 1.57)	0.78 (0.54– 1.11)
Arthritis	**3.26 (2.51– 4.23)**	**3.75 (3.01– 4.67)**	**3.27 (2.91– 3.68)**	**3.67 (3.27– 4.10)**	1.00 (0.75– 1.32)	1.02 (0.80– 1.31)
Arteriosclerosis	**4.89 (2.13– 11.26)**	**5.85 (2.83– 12.09)**	**1.99 (1.45– 2.74)**	**3.15 (2.44– 4.07)**	2.45 (0.99– 6.11)	1.86 (0.87– 3.96)
Hypertension	**1.97 (1.55– 2.52)**	**2.33 (1.75– 3.09)**	**1.48 (1.30– 1.68)**	**1.75 (1.55– 1.97)**	**1.34 (1.01– 1.77)**	1.33 (1.00– 1.77)

All models included the following covariates: sociodemographics (age, race, marital status, educational level, employment, household income), number of stressful life events, number of general medical conditions, and wave-1 Axis-II psychiatric disorders.

NPI=no/low pain interference, MPI=moderate pain interference, SPI=severe pain interference. OR=adjusted odds ratio, IOR=interaction odds ratio, CI=confidence interval. Bold values indicate statistically significant results (p <0.05).

[1]For all mood disorders, we adjusted for wave-1 past-year diagnosis of any substance-use disorder and any anxiety disorder.

[2]For all anxiety disorders, we adjusted for wave-1 past-year diagnosis of any mood disorder and any substance-use disorder.

[3]For all substance-use disorders, we adjusted for wave-1 past-year diagnosis of any mood disorder and any anxiety disorder.

[4]For all general medical conditions, we adjusted for wave-1 past-year diagnosis of mood disorder, anxiety disorder, and substance-use disorder, as well as lifetime personality disorder.