Title

The pain and depressive symptoms cascade: A bidirectional analysis of the Mexican Health and Aging Study 2012-2015.

Journal

International Journal of Geriatric Psychiatry, 37(10)

Authors

Wong, Rebeca
Milani, Sadaf
Gutierrez, Sirena

Publication Date

2022-10-01

DOI

10.1002/gps.5812

Peer reviewed

HHS Public Access

Author manuscript

Int J Geriatr Psychiatry. Author manuscript; available in PMC 2023 October 01.

Published in final edited form as:

Int J Geriatr Psychiatry. 2022 October ; 37(10): . doi:10.1002/gps.5812.

The pain and depressive symptoms cascade: a bidirectional analysis of the Mexican Health and Aging Study 2012–2015

Sirena Gutierrez, MPH[1], **Rebeca Wong, PhD**[2,3], **Sadaf Arefi Milani, PhD**[3,4]

[1]Department of Epidemiology and Biostatistics, University of California, San Francisco, California, USA

[2]Department of Preventive Medicine and Population Health, University of Texas Medical Branch, Galveston, Texas, USA

[3]Sealy Center on Aging, University of Texas Medical Branch, Galveston, Texas, USA

[4]Division of Geriatrics and Palliative Medicine, Department of Internal Medicine, University of Texas Medical Branch, Galveston, Texas, USA

Abstract

Objectives: The association of pain and depression has not been evaluated in low- and middle-income countries, which have a disproportionate burden of pain compared to high-income countries.

Methods: Using data from the Mexican Health and Aging Study (baseline, 2012; follow-up, 2015), we examined the bidirectional relationship between pain and depressive symptoms and identified shared predictors among community-dwelling participants ≥60 years (n=7237). Multivariable logistic regressions models evaluated the association between 1)baseline pain and incident elevated depressive symptoms and 2)baseline depressive symptoms and incident pain, adjusting for demographic, socioeconomic, and health-related factors. Models included inverse probability weights and evaluated interactions by gender.

Results: Participants (55.0% women) were on average 69.1 years old. Over half reported no pain (60.7%) and low/no depressive symptoms (67.9%) in 2012, of which, 20.2% reported elevated depressive symptoms and 25.3% self-reported pain in 2015. Baseline pain was associated with higher odds of incident elevated depressive symptoms (aOR 1.65; 95% CI, 1.41–1.93). Baseline elevated depressive symptoms were associated with higher odds of developing pain (aOR 1.57; 95% CI, 1.32–1.87). Age, gender, self-rated health, and activity of daily living limitations were shared risk factors for pain and elevated depressive symptomatology onset. Although the incidence of elevated depressive symptoms and pain was higher in women, there were no statistically significant interactions.

CORRESPONDING AUTHOR: Sirena Gutierrez, 550 16th Street, 2nd Floor, San Francisco, CA 94158, Sirena.gutierrez@ucsf.edu.

Author Contributions: Study concept and design, preparation of data, data analysis, interpretation of results, and drafting of manuscript: Gutierrez. Interpretation of results, review, and critical revision of the manuscript: Wong. Study concept and design, interpretation of results, review, and critical revision of the manuscript: Milani. All authors approved the final version of the manuscript.

CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

Conclusions: Older adults with pain or depression may be at risk for developing the other. These shared predictors could help identify patients in clinical settings, where pain and depression are often overlooked, reducing the cascading risk of this comorbidity.

Keywords

depression; multimorbidities; epidemiology; minority aging

INTRODUCTION

Pain is highly prevalent among older adults and is associated with an increased risk for comorbidities, including depression.[1] Individuals with depression are more likely to report pain, and the co-occurrence of both can lead to misdiagnosis, increased health care utilization, and improper treatment.[2,3] However, the studies that have established the reciprocal nature of the depression-pain relationship have been limited to high-income countries or younger adults.[2,4–9] This presents challenges in low- and middle-income countries (LMICs), including Mexico, due to greater exposure to risk factors for pain, including violence, unregulated manual labor, and limited access to health care.[10] Given the demographic shift towards longer life expectancy and an aging population in Mexico,[11] the burden of morbidities is expected to increase, including pain and depression, representing a greater challenge among older adults. This highlights a need to understand the relationship of pain and depression and identify contributors of both comorbidities to reduce disease burden and improve health outcomes.

Among older adults the risk of depressive symptoms increases with age as a result of functional disability and chronic illness.[16,17] Similarly, pain contributes substantially to morbidity, mortality, and disability[18] and threatens individuals' quality of life.[19] However, challenges exist in quantifying the burden of pain due to its dynamic nature[20] and the inherent subjectivity of the pain experience.[21] There has been limited longitudinal research on the burden of either pain or depression in Mexico, and estimates vary by gender.[12,13] Among adults aged 55–65 years old in Mexico, one study noted a 9.6% lifetime prevalence of major depressive disorder meeting diagnostic criteria.[14] Another study found that only 12.8% of older Mexicans (65+) with a depressive episode reported receiving treatment, suggesting that late-life depression may be untreated.[15] Analyses of the 2001 wave of the Mexican Healthy Aging Study (MHAS), found a 44.6% prevalence of self-reported pain among those 65 years and older, noting a higher burden in women (59.3% vs. 40.7%), and depression as an associated comorbidity.[13] Recent longitudinal findings from this cohort of older Mexicans suggest that almost 20% of participants have moderate-increasing activity limiting pain over time and depression was associated with this pain trajectory.[22]

Studies using cohorts of European older adults,[4,5] established that those who develop pain or depression were at risk for developing the other; however, the bidirectional relationship was not salient in men.[5] Shared risk factors included older age, lower educational attainment, comorbidities, and disability status. This is consistent with a recent Mendelian randomization study which leveraged genetic variants to establish a causal link between depression and pain at specific body sites.[23] More broadly, a literature review

cross-sectionally estimated a 65% mean prevalence of pain symptoms (i.e., self-reported complaints of pain, chronic pain, or pain scales) in adults with depression in psychiatric and clinical settings. Alternatively, the mean prevalence of concurrent major depression in patients with pain ranged from 13% to 85%, based on the study settings.[2] Increasing severity of either condition has been associated with a higher prevalence of concurrent pain and depression.[24–26]

We used data from the MHAS to investigate the bidirectional relationship between pain and depressive symptoms, with the goal of identifying common factors associated with both pain and depressive symptoms among older adults in Mexico. Drawing on shared brain pathways and the overlapping psychosocial experience of pain,[31–33] we hypothesize that incident pain and elevated depressive symptoms will be independently associated with each other. However, gender differences in these associations may be driven by sociocultural norms in this population.

METHODS

Study population

The MHAS is a nationally representative study for the study of health, economic, status, and quality of life among adults aged 50 or older from Mexico. The study was designed to be highly comparable to the U.S. Health and Retirement Study, to prospectively evaluate the impact of disease on the health, function and mortality of adults living in private dwellings. Participants were interviewed in 2001 with follow-ups completed in 2003, 2012, 2015, and 2018. The response rates for these waves were 91.8%, 93.3%, 88.1%, 88.3%, and 84.7%, respectively.[34,35] A new sample of participants born from 1952 and 1962 and from 1963 and 1968 were added in 2012 and 2018 respectively. Proxy interviews are conducted for individuals who could not respond themselves because of temporary absence or who were unable to complete the interview themselves for health reasons. Study details have been provided elsewhere.[34]

This analysis used 2012 as the baseline wave and 2015 as the follow-up. The 2012 MHAS sample included 18,465 respondents (Figure 1). Those younger than 60 years old (n=5822) were excluded. Proxy and next-of-kin respondents were excluded from the primary analytical sample since they were not asked questions on pain and depression (n=3466). Next, we excluded anyone with missing information on depressive symptoms or pain (n=1557) in both waves, and any of the baseline covariates (n=383). The final analytic sample included 7237 participants aged 60 and older in 2012 who provided information on their depressive symptoms and pain in 2015. Participants who were excluded were more likely to be older, male, and less educated (Supplementary Table 1). We address potential selection bias due to the exclusion of proxy respondents and inter-wave deaths with inverse probability of attrition weights (IPWs), described below.

Measures

Depressive symptoms were assessed at each wave using a nine-item modified CES-D.[36] The adapted scale assesses past week symptoms the respondent experienced a majority of

the time including: 1) feeling depressed, 2) feeling that everything they did was difficult, 3) feeling they had restless sleep, 4) feeling happy (reverse coded), 5) feeling alone, 6) feeling that they enjoyed life (reverse coded), 7) feeling sad, 8) feeling tired, 9) feeling very energetic (reverse coded). Items were reported as binary "yes/no" response and summary counts ranged from 0 to 9 with higher values indicating more depressive symptoms. A score ≥ 5 was categorized as elevated depressive symptomatology. This cutoff point has been previously validated to maximize the sensitivity (80.7%) and specificity (68.7%) of a clinical depression diagnosis in a sample of older Mexican adults.[37]

Self-reported pain was assessed at each wave of the questionnaire by asking participants: "Do you often suffer from pain?", possible answers included: 1) Yes, 2) No. In a sensitivity analysis, we examine activity-limiting pain. If participants reported that they often suffer from pain, they are asked "Does the pain limit your usual activities such as household chores or your job?" If yes, participants are categorized as reporting activity-limiting pain. Those who did not reported pain or reported pain that did not limit their activities were included in the reference group.

Baseline covariates included age (continuous), gender (male or female), education (none, 1–6 years, or 7 or more years), marital status (married/civil union, not married, or widowed), consumer durables (0–3, 4–6, or 7 or more household assets with a long lifespan such as a radio, television, refrigerator), health insurance (yes or no), self-rated health (excellent/very good/good or fair/poor), urban residence, activities of daily living (ADL) limitations (yes, no), arthritis, recent falls, body mass index (BMI), and social support. Urban residence was classified as yes/no if respondents lived in community with 100,000+ residents. Determination of one or more ADL limitation was scored yes/no through a modified version of the Katz Index of Activities of Daily Living assessing the following five items: bathing, eating, transferring in and out of bed, using the toilet, and dressing.[38] Diagnosis of arthritis by a doctor or medical personnel was self-reported. Falls were assessed by asking participants if they have fallen down in the last 2 years. BMI was calculated as self-reported weight in kilograms divided by the square of self-reported height in meters. We used imputed BMI, provided by the MHAS, for those who were missing information on height or weight. Finally, social support was operationalized as the participant's perceptions of emotional support from their social network members by answering "yes" or "no" to the prompt, "Do you have neighbors or friends you can count on for daily activities?".

Statistical analysis

We used descriptive statistics to describe the sociodemographic characteristics of participants. We conducted Chi-square tests of independence to test differences in pain and depressive symptoms at baseline and after 3 years. We used multivariable logistic regression models to assess the independent associations between 1) baseline pain and incident elevated depressive symptoms in 2015 and 2) baseline depressive symptoms and incident pain in 2015, adjusting for respondent's demographics, socioeconomic characteristics, and health-related factors. We corrected for selection bias due to mortality, loss to follow up, and refusal of participation by using inverse probability of attrition weights. In addition, we included robust standard errors to account for clustering of the data at the household level. We

evaluated additive and multiplicative interaction and stratified the models by gender. We also tested the sensitivity of our results to alternative measures of pain and depressive symptoms, specifically: 1) using activity-limiting pain to contextualize the associations with pain that is severe enough to limit daily activities and 2) using the continuous CES-D score (0–9). All p-values were two-sided; α=0.05 was considered the cutoff for statistical significance. We performed all statistical analyses using Stata version 17 (StataCorp LLC, College Station, TX).

RESULTS

Descriptive characteristics

At baseline, in the overall sample (n=7237), over half of the respondents had either no pain (60.7%) or low/no depressive symptoms (67.9%). Noted in Figure 1, we assessed incident outcomes at follow-up. As such we excluded 2845 (39.3%) participants with baseline pain in the first analytic sample and 2324 (31.1%) participants with baseline elevated depressive symptoms were excluded in the second analytic sample. Of those who did not report pain at baseline (n=4392; analytic sample 1), respondents were around 69 years old (standard deviation [SD]= 6.9) on average and nearly 50% were women (Table 1). Twenty seven percent of women and 14.4% of men reported elevated depressive symptoms at baseline (Supplementary Table 2). On average, women without pain at baseline were more likely to not be married, have lower education, have insurance, report fair/poor self-rated health, have an ADL limitation, arthritis, report a recent fall, and have a higher BMI, compared to men. Of those without elevated depressive symptoms at baseline (n=4913; analytic sample 2), women (34.2%) were more likely than men (24.4%) to self-report having pain at baseline (Supplementary Table 3). The distribution of baseline characteristics by gender followed similar patterns as in the first analytic sample.

In the first analytic sample, 25.3% of the respondents had incident pain in 2015, of which the majority were women (57.8%), compared to men (42.2%) (Table 1). In the second analytic sample, 20.2% of the respondents had incident elevated depressive symptoms in 2015. Similarly, women more often reported elevated symptoms than men (56.1% vs. 43.9%, respectively). Given that characteristics were comparable across the overall and analytic samples, we provided the full descriptive bivariate results for the set of covariates only in Supplementary Tables 4a and 4b.

Elevated Depressive Symptoms and Pain

Of those who did not report pain at baseline (n=4392; analytic sample 1), having elevated depressive symptoms was associated with higher odds of incident pain (adjusted odds ratio [aOR]= 1.57; 95% CI, 1.32–1.87) at follow-up (Table 2). The independent predictors for the onset of pain, were elevated depressive symptoms, older age, female gender, not being widowed, lower education, fair/poor self-rated health, lower ADL functioning, having arthritis, having a perception of no social support, and higher BMI at baseline.

Similarly, for both men and women, compared to those with low/no depressive symptoms, those with elevated depressive symptoms had higher odds of incident pain (aOR=1.52;

95% CI, 1.22–1.90 for women; aOR= 1.69; 95% CI, 1.27–2.25 for men). We did not observe significant evidence of multiplicative (*P*= .64) or additive interactions (*P*= .71) of baseline depressive symptoms and the participant's gender. However, there were some notable differences in predictors by gender. Older age was associated with an increased odds of incident pain for men, but not women. Conversely, reporting having social support was associated with lower odds of incident pain for women, but not men.

Pain and Elevated Depressive Symptoms

Of those who did not have elevated depressive symptoms at baseline (n=4913; analytic sample 2), reporting pain was associated with higher odds of incident elevated depressive symptoms (aOR= 1.65; 95% CI, 1.41–1.93) at follow-up (Table 3). The independent predictors for the onset of elevated depressive symptoms, were pain, older age, female gender, less than 7 consumer durables, fair/poor self-rated health, and lower ADL functioning at baseline.

Similarly, for both men and women, compared to those with no pain, those who reported pain had a higher odds of incident elevated depressive symptoms (aOR=1.65; 95% CI, 1.33–2.04 for women; aOR= 1.66; 95% CI, 1.31–2.10 for men). We did not observe significant evidence of multiplicative (*P*= .73) or additive interactions (*P*= .55) of baseline pain and the participant's gender. Some notable differences by gender included that for men, being single, divorced or separated (vs. married or in a civil union) was associated with a higher odds of incident elevated depressive symptoms and having 7 or more consumer durables (vs. 0–3) was associated with lower odds of incident elevated depressive symptoms, but not for women. Alternatively, for women having health insurance was associated with lower odds of onset of elevated depressive symptoms, but not for men.

Shared predictors

Both reporting pain and having elevated depressive symptoms at baseline were significant predictors of having elevated depressive symptoms or reporting pain, respectively, as at follow-up. Besides these two common risk factors, older age, female gender, fair/poor self-rated health, and having any ADLs were also shared predictors contributing to pain and elevated depressive symptoms. Although there were nuanced differences in predictors of incident elevated depressive symptoms or pain, shared risk factors between the two were consistent by gender.

Sensitivity analyses

We tested the sensitivity of our results to alternative measures of depressive symptomatology and pain. We compared associations between pain and depressive symptoms using the continuous CES-D score. Consistent with our main analyses, each unit increase in CES-D score was associated with greater odds of pain (aOR=1.12; 95% CI, 1.09–1.16) at follow-up, adjusting for all covariates. Predictors followed similar patterns of significance, however; as expected, by using a continuous measure of symptoms, the magnitude of the associations were weaker (Supplementary Table 5). On average, the mean CES-D score was 0.66 units (95% CI, .52–.81) larger for those who reported pain at baseline, compared to those who

did not. In addition, marital status, education, urbanicity, and having arthritis were also associated with depressive symptom score (Supplementary Table 6).

In addition, given the plausible subjective nature of self-reported pain, we compared associations between activity limiting pain and elevated depressive symptoms. The results were consistent with our main models. Those with elevated depressive symptoms (vs. low/no depressive symptoms) had 1.64 times the odds of activity limiting pain at follow-up (95% CI, 1.39–1.95). Of note, education and social support were no longer statistically significant predictors, however; having a fall was associated with activity limiting pain (Supplementary Table 7). Participants with activity limiting pain had 1.55 times the odds of elevated depressive symptoms, compared to those without activity limiting pain (95% CI, 1.23–1.94). Predictors followed similar patterns of significance to the main model (Supplementary Table 8).

DISCUSSION

In this large population-based cohort of older Mexican adults, we found evidence that those with pain or elevated depressive symptoms were at risk for developing the other condition. Specifically, elevated depressive symptoms at study baseline were associated with incident pain at follow-up. Conversely, reporting pain at baseline was associated with the onset of elevated depressive symptoms. Acknowledging the sociocultural scripts of gender roles and the differential burden of pain and depression in Mexican older adults, we additionally evaluated these associations by gender. We found that these pain-depression associations persisted; however, there was no evidence of statistically significant interaction, despite some nuanced gender differences in predictors such as social support being associated with a lower risk of incident pain only among women. These results provide evidence of a cascading effect of increasing pain and depressive symptoms with shared predictors such as older age, female gender, poor self-rated health, and having ADL functional limitations at baseline.

Our finding that elevated depressive symptoms was associated with pain is consistent with recent literature, but provides an important extension to a middle-income country.[4,5,39,40] We found evidence of an association between pain and incident elevated depressive symptoms, supporting a bidirectional association of both pain and depression across different study populations.[4,5,23,39–41,6,42] Although health factors were fairly consistent by gender, age and social support differentially impacted pain, suggesting demographic and psychosocial factors may be major drivers of the gender differences observed in pain burden. Conversely, marital status, consumer durables, and insurance status differentially impacted risk of elevated depressive symptoms, suggesting that only sociodemographic factors may be major drivers of the gender differences observed in depression burden. Similarly, sister studies in European cohorts of older adults (50+) also noted age, gender, BMI, and functional status limitations as predictors of incident pain and depression.[4,5] Evidence points towards a higher prevalence and risk of pain among women across several chronic conditions (e.g. fibromyalgia, migraine, and irritable bowel syndrome), as a result of various potential sociocultural, psychological, physiological mechanisms which may underlie these sex differences.[43] However, findings of gender being a significant predictor of subsequent

pain among those with depression are mixed, including observed null associations in studies with younger primary care patients.[39,40] In contrast, the participants included in our analyses were on average older; therefore, we hypothesize that there may be a differential accumulation of gender-associated risks and subsequent inequalities resulting in an increase in prevalence of health conditions associated with pain (e.g., arthritis) and functional decline across the life-course, further widening the pain gender gap in later life.

This bidirectional association between pain and elevated depressive symptoms can be explained through both molecular (i.e., common neuroplasticity changes)[32] and psychosocial mechanisms (i.e., catastrophizing, perceived locus of control, and fear-based avoidance).[33,44–46] Given the complex psychosocial aspects of the pain experience as both an emotional condition and a physical sensation, recent evidence has proposed common brain pathways for depression and pain. Depletion of modulatory neuropeptides in the central nervous system, as a result of depression, have been shown to disrupt the central pain modulation system and amplify minor signals.[31,32] Other literature argues the cyclical nature of co-morbid depression and pain lead to catastrophizing and strains to the emotion regulation system.[33] These overlapping characteristics and mechanisms have significant implications on chronic disease management. In the context of comorbid pain and depression, the clinical presentation of somatic complaints can reduce depression recognition, as the cause is more likely to only be attributed as a pain problem.[27–29] As a result, providers may be neglecting treatment for the underlying depression,[30] raising concerns of polypharmacy risk in pain management and poorer health outcomes. Future work should evaluate the role of these biological and psychosocial mechanisms and their interaction with gender, that could point to population-level interventions to ameliorate clinical outcomes and inform treatment course.

Limitations

First, we included a binary threshold (CES-D score ≥5) to define elevated depressive symptoms instead of a clinical diagnosis. Based on findings from a prior study,[37] the cutoff was validated in a geriatric clinic in Mexico. However, sensitivity analysis with the continuous CES-D score yielded similar results. Second, similar to other large national studies with community-dwelling older adults, the use of self-reported pain and depressive symptoms may be subject to underreporting of symptoms due to the cultural elements that stigmatize the perception of depression and pain, driven by traditional gender roles in Mexico. However, we used interference with daily activities to capture a more objective measure of pain, by evaluating associations with depressive symptoms using activity-limiting pain in a sensitivity analysis. Of note, no information was collected on pain location or treatment. Nevertheless, to our knowledge, this is the first study to evaluate the associations between depressive symptoms and incident pain in Mexico, a middle-income country, which, like many LMICs, is experiencing rapid aging, facing potentially increasing comorbid burden in older adults in the context of a health care infrastructure with limited mental health services. Additional strengths include the use of a nationally representative sample of older adults and the use of IPWs to account for selection due to mortality and longitudinal study attrition.

Conclusions

In our national sample of Mexicans, aged 60 and older, those with either pain or elevated depressive symptoms were at significant risk for developing the other over a three-year follow-up. We identified older age, female gender, poor self-rated health, and ADL functional limitations as shared risk factors which could serve to identify patients in clinical settings, where pain and depression are often overlooked. Both pharmacologic and nonpharmacologic interventions may result in population-level benefits which may reduce the cascading risk of developing co-morbid pain and depression.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGMENTS

FUNDING

Dr. Milani is supported by a research career development award (K12HD052023: Building Interdisciplinary Research Careers in Women's Health Program-BIRCWH; Berenson, PI) from the National Institutes of Health/ Office of the Director (OD)/National Institute of Allergy and Infectious Diseases (NIAID), and Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD). We also received support by the National Institute on Aging (P30AG059301, Markides, PI; P30AG024832, Volpi, PI). The Mexican Health and Aging Study is supported by the NIA/NIH (R01 AG018016) in the United States and the National Institute of Statistics (INEGI) in Mexico. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

REFERENCES

1. Patel KV, Guralnik JM, Dansie EJ, Turk DC. Prevalence and Impact of Pain among Older Adults in the United States: Findings from the 2011 National Health and Aging Trends Study. Pain. 2013;154(12):10.1016/j.pain.2013.07.029. doi:10.1016/j.pain.2013.07.029
2. Bair MJ, Robinson RL, Katon W, Kroenke K. Depression and Pain Comorbidity: A Literature Review. Archives of Internal Medicine. 2003;163(20):2433–2445. doi:10.1001/archinte.163.20.2433 [PubMed: 14609780]
3. Karp JF, Weiner D, Seligman K, et al. Body pain and treatment response in late-life depression. Am J Geriatr Psychiatry. 2005;13(3):188–194. doi:10.1176/appi.ajgp.13.3.188 [PubMed: 15728749]
4. Chou KL. Reciprocal relationship between pain and depression in older adults: evidence from the English Longitudinal Study of Ageing. J Affect Disord. 2007;102(1–3):115–123. doi:10.1016/j.jad.2006.12.013 [PubMed: 17240455]
5. Calvó-Perxas L, Vilalta-Franch Joan, Turró-Garriga O, López-Pousa S, Garre-Olmo J. Gender differences in depression and pain: A two year follow-up study of the Survey of Health, Ageing and Retirement in Europe. Journal of Affective Disorders. 2016;193:157–164. doi:10.1016/j.jad.2015.12.034 [PubMed: 26773909]
6. Geerlings SW, Twisk JWR, Beekman ATF, Deeg DJH, van Tilburg W. Longitudinal relationship between pain and depression in older adults: sex, age and physical disability. Soc Psychiatry Psychiatr Epidemiol. 2002;37(1):23–30. doi:10.1007/s127-002-8210-2 [PubMed: 11926200]
7. Onder G, Landi F, Gambassi G, et al. Association between pain and depression among older adults in Europe: results from the Aged in Home Care (AdHOC) project: a cross-sectional study. J Clin Psychiatry. 2005;66(8):982–988. doi:10.4088/jcp.v66n0804 [PubMed: 16086612]
8. Calabrese SK, Lyness JM, Sörensen S, Duberstein PR. Personality and the Association of Pain and Depression. The American Journal of Geriatric Psychiatry. 2006;14(6):546–549. doi:10.1097/01.JGP.0000218323.20981.10 [PubMed: 16731724]

9. Reid MC, Williams CS, Concato J, Tinetti ME, Gill TM. Depressive symptoms as a risk factor for disabling back pain in community-dwelling older persons. J Am Geriatr Soc. 2003;51(12):1710–1717. doi:10.1046/j.1532-5415.2003.51554.x [PubMed: 14687348]
10. Kohrt BA, Griffith JL, Patel V. Chronic pain and mental health: integrated solutions for global problems. Pain. 2018;159 Suppl 1:S85–S90. doi:10.1097/j.pain.0000000000001296 [PubMed: 30113952]
11. United Nations, Department of Economic and Social Affairs, Population Division. World Population Ageing: 2017 Highlights.; 2017. Accessed February 2, 2021. https://www.un.org/en/development/desa/population/publications/pdf/ageing/WPA2017_Highlights.pdf
12. Belló M, Puentes-Rosas E, Medina-Mora ME, Lozano R. [Prevalence and diagnosis of depression in Mexico]. Salud Publica Mex. 2005;47 Suppl 1:S4–11. [PubMed: 16101201]
13. Barragán-Berlanga AJ, Mejía-Arango S, Gutiérrez-Robledo LM. Dolor en adultos mayores de 50 años: prevalencia y factores asociados. Salud Pública de México. 2007;49:s488–s494. [PubMed: 17724522]
14. Medina-Mora ME, Borges G, Benjet C, Lara C, Berglund P. Psychiatric disorders in Mexico: lifetime prevalence in a nationally representative sample. Br J Psychiatry. 2007;190:521–528. doi:10.1192/bjp.bp.106.025841 [PubMed: 17541113]
15. Guerra M, Ferri CP, Sosa AL, et al. Late-life depression in Peru, Mexico and Venezuela: the 10/66 population-based study. Br J Psychiatry. 2009;195(6):510–515. doi:10.1192/bjp.bp.109.064055 [PubMed: 19949200]
16. los Santos PVD, Valdés SEC. Prevalencia de depresión en hombres y mujeres mayores en México y factores de riesgo. Población y Salud en Mesoamérica. Published online 2018. doi:10.15517/psm.v15i2.29255
17. Anderson NB, Bulatao RA, Cohen B, National Research Council (US) Panel on Race E. Cumulative Psychosocial Risks and Resilience: A Conceptual Perspective on Ethnic Health Disparities in Late Life. National Academies Press (US); 2004. Accessed October 1, 2021. https://www.ncbi.nlm.nih.gov/books/NBK25520/
18. Andrews JS, Cenzer IS, Yelin E, Covinsky KE. Pain as a risk factor for disability or death. J Am Geriatr Soc. 2013;61(4):583–589. doi:10.1111/jgs.12172 [PubMed: 23521614]
19. Turk DC, Dworkin RH, Revicki D, et al. Identifying important outcome domains for chronic pain clinical trials: an IMMPACT survey of people with pain. Pain. 2008;137(2):276–285. doi:10.1016/j.pain.2007.09.002 [PubMed: 17937976]
20. Goldberg DS, McGee SJ. Pain as a global public health priority. BMC Public Health. 2011;11:770. doi:10.1186/1471-2458-11-770 [PubMed: 21978149]
21. Coghill RC, McHaffie JG, Yen YF. Neural correlates of interindividual differences in the subjective experience of pain. PNAS. 2003;100(14):8538–8542. doi:10.1073/pnas.1430684100 [PubMed: 12824463]
22. Milani SA, Howrey B, Rodriguez MA, Samper-Ternent R, Wong R. Gender differences in activity-limiting pain trajectories over a 17-year period in the Mexican Health and Aging Study. Pain. Published online April 7, 2021. doi:10.1097/j.pain.0000000000002292
23. Tang B, Meng W, Hägg S, Burgess S, Jiang X. Reciprocal interaction between depression and pain: results from a comprehensive bidirectional Mendelian randomization study and functional annotation analysis. PAIN. Published online September 27, 2021. doi:10.1097/j.pain.0000000000002305
24. Carroll LJ, Cassidy JD, Côté P. The Saskatchewan Health and Back Pain Survey: the prevalence and factors associated with depressive symptomatology in Saskatchewan adults. Can J Public Health. 2000;91(6):459–464. [PubMed: 11200740]
25. Lamb S, Guralnik J, Buchner D, et al. Factors that modify the association between knee pain and mobility limitation in older women: the Women's Health and Aging Study. Ann Rheum Dis. 2000;59(5):331–337. doi:10.1136/ard.59.5.331 [PubMed: 10784513]
26. Von Korff M, Dworkin SF, Le Resche L, Kruger A. An epidemiologic comparison of pain complaints. Pain. 1988;32(2):173–183. doi:10.1016/0304-3959(88)90066-8 [PubMed: 3362555]

27. Kirmayer LJ, Robbins JM, Dworkind M, Yaffe MJ. Somatization and the recognition of depression and anxiety in primary care. Am J Psychiatry. 1993;150(5):734–741. doi:10.1176/ajp.150.5.734 [PubMed: 8480818]
28. Bridges KW, Goldberg DP. Somatic presentation of DSM III psychiatric disorders in primary care. J Psychosom Res. 1985;29(6):563–569. doi:10.1016/0022-3999(85)90064-9 [PubMed: 4087223]
29. Kroenke K, Jackson JL, Chamberlin J. Depressive and anxiety disorders in patients presenting with physical complaints: clinical predictors and outcome. Am J Med. 1997;103(5):339–347. doi:10.1016/s0002-9343(97)00241-6 [PubMed: 9375700]
30. Katon W. Depression: relationship to somatization and chronic medical illness. J Clin Psychiatry. 1984;45(3 Pt 2):4–12.
31. Doan L, Manders T, Wang J. Neuroplasticity Underlying the Comorbidity of Pain and Depression. Neural Plasticity. 2015;2015:e504691. doi:10.1155/2015/504691
32. Sheng J, Liu S, Wang Y, Cui R, Zhang X. The Link between Depression and Chronic Pain: Neural Mechanisms in the Brain. Neural Plast. 2017;2017:9724371. doi:10.1155/2017/9724371 [PubMed: 28706741]
33. Linton SJ, Bergbom S. Understanding the link between depression and pain. Scandinavian Journal of Pain. 2011;2(2):47–54. doi:10.1016/j.sjpain.2011.01.005 [PubMed: 29913734]
34. Wong R, Michaels-Obregon A, Palloni A. Cohort Profile: The Mexican Health and Aging Study (MHAS). Int J Epidemiol. 2017;46(2):e2. doi:10.1093/ije/dyu263 [PubMed: 25626437]
35. MHAS. The Mexican Health and Aging Study (MHAS/ENASEM): Master File Follow-up 2001, 2003, 2012, 2015 and 2018. Version 1, July 2020. Published online 2020. www.MHASweb.org
36. Radloff LS. The CES-D Scale: A Self-Report Depression Scale for Research in the General Population. Applied Psychological Measurement. 1977;1(3):385–401. doi:10.1177/014662167700100306
37. Aguilar-Navarro SG, Fuentes-Cantú A, Avila-Funes JA, García-Mayo EJ. [Validity and reliability of the screening questionnaire for geriatric depression used in the Mexican Health and Age Study]. Salud Publica Mex. 2007;49(4):256–262. doi:10.1590/s0036-36342007000400005 [PubMed: 17710274]
38. Katz S, Ford AB, Moskowitz RW, Jackson BA, Jaffe MW. Studies of Illness in the Aged: The Index of ADL: A Standardized Measure of Biological and Psychosocial Function. JAMA. 1963;185(12):914–919. doi:10.1001/jama.1963.03060120024016 [PubMed: 14044222]
39. Kroenke K, Wu J, Bair MJ, Krebs EE, Damush TM, Tu W. Reciprocal Relationship between Pain and Depression: A 12-Month Longitudinal Analysis in Primary Care. J Pain. 2011;12(9):964–973. doi:10.1016/j.jpain.2011.03.003 [PubMed: 21680251]
40. Gureje O, Simon GE, Von Korff M. A cross-national study of the course of persistent pain in primary care. Pain. 2001;92(1):195–200. doi:10.1016/S0304-3959(00)00483-8 [PubMed: 11323140]
41. Hawker GA, Gignac MAM, Badley E, et al. A longitudinal study to explain the pain-depression link in older adults with osteoarthritis. Arthritis Care & Research. 2011;63(10):1382–1390. doi:10.1002/acr.20298 [PubMed: 20662042]
42. Meyer T, Cooper J, Raspe H. Disabling low back pain and depressive symptoms in the community-dwelling elderly: a prospective study. Spine (Phila Pa 1976). 2007;32(21):2380–2386. doi:10.1097/BRS.0b013e3181557955 [PubMed: 17906583]
43. Fillingim RB, King CD, Ribeiro-Dasilva MC, Rahim-Williams B, Riley JL. Sex, Gender, and Pain: A Review of Recent Clinical and Experimental Findings. J Pain. 2009;10(5):447–485. doi:10.1016/j.jpain.2008.12.001 [PubMed: 19411059]
44. Campbell LC, Clauw DJ, Keefe FJ. Persistent pain and depression: a biopsychosocial perspective. Biol Psychiatry. 2003;54(3):399–409. doi:10.1016/s0006-3223(03)00545-6 [PubMed: 12893114]
45. Goesling J, Clauw DJ, Hassett AL. Pain and Depression: An Integrative Review of Neurobiological and Psychological Factors. Curr Psychiatry Rep. 2013;15(12):421. doi:10.1007/s11920-013-0421-0 [PubMed: 24214740]
46. Edwards RR, Bingham CO, Bathon J, Haythornthwaite JA. Catastrophizing and pain in arthritis, fibromyalgia, and other rheumatic diseases. Arthritis Rheum. 2006;55(2):325–332. doi:10.1002/art.21865 [PubMed: 16583384]

KEY POINTS:

- In Mexico, older adults (60+) with either pain or elevated depressive symptoms were at risk for developing the other health condition.
- Shared predictors included older age, female gender, fair/poor self-rated health, and activity of daily living limitations, which could serve to identify patients in clinical settings.
- There were gender nuances in the predictors of incident elevated depressive symptoms or pain, which underscore the importance of considering traditional and social gender norms when evaluating either.

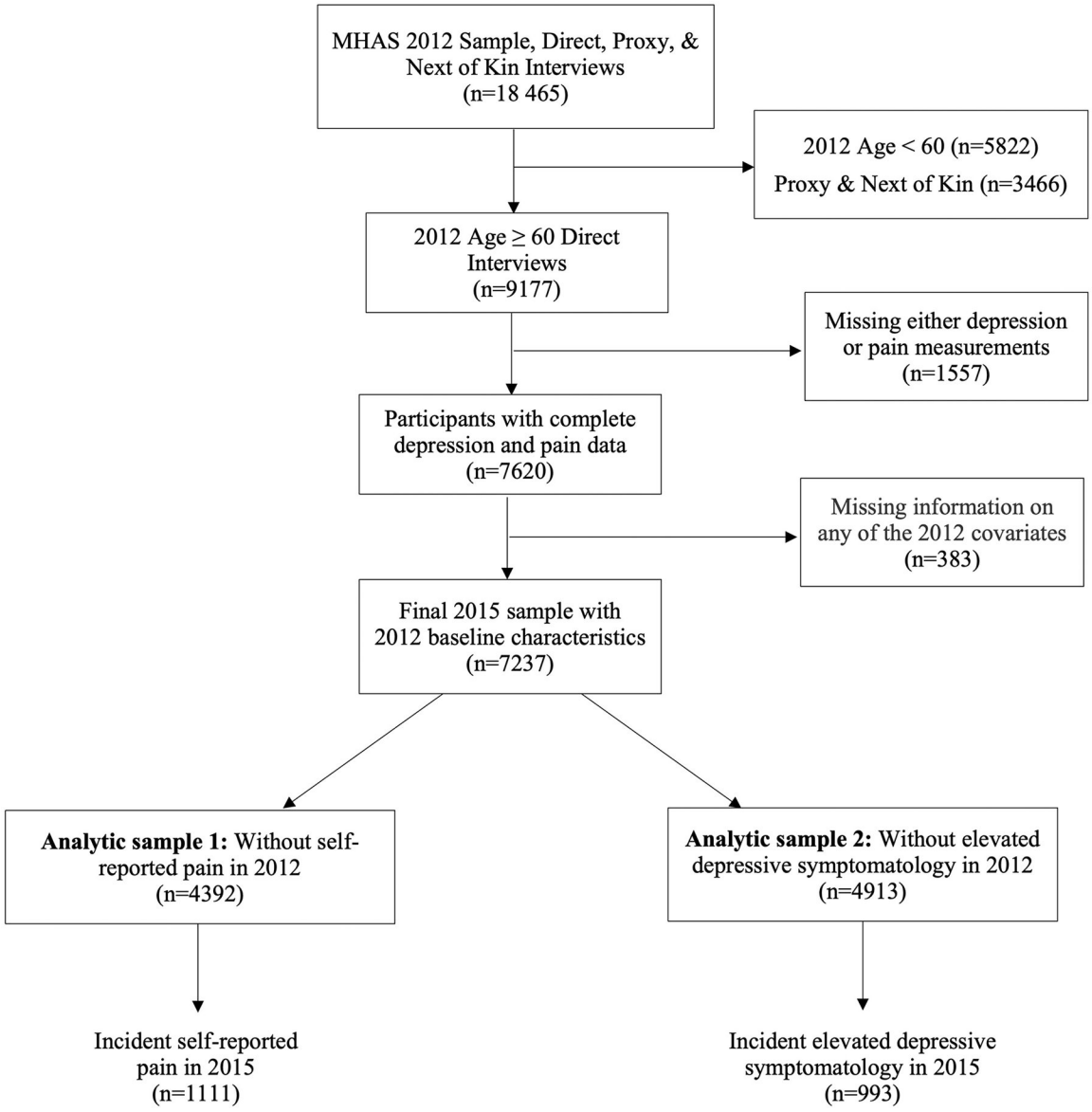

Figure 1.
Flowchart depicting analytic sample selection

Table 1.

Baseline Characteristics of Respondents for the Overall and Analytic Samples, Mexican Health and Aging Study, 2012

Characteristic	Overall (n=7237)			Analytic sample 1 (n=4392) Without pain at baseline			Analytic sample 2 (n=4913) Without depression at baseline		
	No.	%	Mean (SD)	No.	%	Mean (SD)	No.	%	Mean (SD)
Age, years			69.1 (6.9)			68.9 (6.9)			68.8 (6.8)
Gender									
Male	3258	45.0%		2224	50.6%		2517	51.2%	
Female	3979	55.0%		2168	49.4%		2396	48.8%	
Marital status									
Married or in a civil union	4852	67.0%		3004	68.4%		3504	71.3%	
Single/divorced/separated	708	9.8%		408	9.3%		450	9.2%	
Widowed	1677	23.2%		980	22.3%		959	19.5%	
Education									
0 years	1500	20.7%		809	18.4%		875	17.8%	
1 to 6 years	4008	55.4%		2368	53.9%		2618	53.3%	
6 or more years	1729	23.9%		1215	27.7%		1420	28.9%	
Locality size									
Rural	3043	42.1%		1796	40.9%		1981	40.3%	
Urban	4194	58.0%		2596	59.1%		2932	59.7%	
Consumer durables									
0–3	1454	20.1%		818	18.6%		860	17.5%	
4–6	3902	53.9%		2328	53.0%		2571	52.3%	
7+	1881	26.0%		1246	28.4%		1482	30.2%	
Has insurance	6445	89.1%		3882	88.4%		4382	89.2%	
Fair/poor self-rated health	5149	71.2%		2792	63.6%		3197	65.1%	
Has an ADL limitation	1523	21.0%		541	12.3%		682	13.9%	
Has arthritis	1190	16.4%		407	9.3%		625	12.7%	
Had a fall	3088	42.7%		1560	35.5%		1780	36.2%	
Has social support	3928	54.3%		2387	54.4%		2742	55.8%	
Body mass index			27.3 (4.5)			26.9 (4.3)			27.1 (4.4)
Self-reported pain at baseline	2845	39.3%		0	0%		1432	29.2%	
Has elevated depressive symptoms at baseline	2324	32.1%		911	20.7%		0	0%	
Incident self-reported pain in 2015	n/a			1111	25.3%		n/a		
Incident elevated depressive symptoms in 2015	n/a			n/a			993	20.2%	

Abbreviations: SD, standard deviation, ADL, activities of daily living, n/a, not applicable

Note. Consumer durables are the number of the following items available in the household of residence: radio, television, refrigerator, washer, telephone, water heater, internet, and computer

Table 2.

Multivariable logistic regression models assessing the association between elevated depressive symptoms and incident pain in 2015 among older Mexicans, overall and by gender

Characteristic	Overall (n=4392)			Women (n=2168)			Men (n=2224)		
	aOR	95% CI		aOR	95% CI		aOR	95% CI	
Elevated depressive symptoms	1.57	1.32–1.87	< .001	1.52	1.22–1.90	< .001	1.69	1.27–2.25	< .001
Age, years	1.02	1.00–1.03	.009	1.01	1.00–1.03	.13	1.02	1.00–1.04	.02
Gender									
Male	1.00	Ref		n/a	-		n/a	-	
Female	1.44	1.23–1.69	< .001	n/a	-		n/a	-	
Marital status									
Married or in a civil union	1.00	Ref		1.00	Ref		1.00	Ref	
Single/divorced/separated	0.81	0.63–1.05	.11	0.80	0.58–1.10	.17	0.85	0.55–1.31	.46
Widowed	0.71	0.58–0.86	< .001	0.76	0.61–0.96	.02	0.57	0.39–0.85	.005
Education									
0 years	1.00	Ref		1.00	Ref		1.00	Ref	
1 to 6 years	0.78	0.64–0.95	.01	0.79	0.61–1.03	.08	0.74	0.55–1.00	.05
6 or more years	0.94	0.73–1.20	.60	0.95	0.68–1.34	.79	0.89	0.62–1.30	.56
Locality size									
Rural	1.00	Ref		1.00	Ref		1.00	Ref	
Urban	0.87	0.74–1.02	.08	0.87	0.70–1.08	.20	0.86	0.68–1.09	.69
Consumer durables									
0–3	1.00	Ref		1.00	Ref		1.00	Ref	
4–6	0.99	0.81–1.21	.89	1.14	0.87–1.50	.34	0.83	0.61–1.11	.21
7+	1.05	0.81–1.35	.73	1.20	0.85–1.71	.30	0.88	0.61–1.27	.50
Has insurance	0.90	0.72–1.12	.33	0.87	0.63–1.21	.40	0.94	0.69–1.28	.69
Fair/poor self-rated health	2.56	2.15–3.05	< .001	2.76	2.16–3.53	< .001	2.36	1.83–3.03	< .001
Has an ADL limitation	1.68	1.37–2.06	< .001	1.81	1.37–2.38	< .001	1.49	1.09–2.03	.01
Has arthritis	2.59	2.07–3.24	< .001	2.48	1.87–3.28	< .001	2.77	1.89–4.06	< .001
Had a fall	1.14	0.98–1.33	.08	1.10	0.90–1.35	.33	1.20	0.95–1.52	.12
Has social support	0.83	0.72–0.96	.01	0.79	0.65–0.96	.02	0.88	0.71–1.10	.26
Body mass index	1.03	1.01–1.05	.001	1.02	1.00–1.05	.02	1.04	1.01–1.07	.01

Source: Mexican Health and Aging Study, 2012 and 2015.

Abbreviations: aOR, adjusted odds ratio, CI, confidence interval, ADL, activities of daily living

Note: Models include IPWs. Consumer durables are the number of the following items available in the household of residence: radio, television, refrigerator, washer, telephone, water heater, internet, and computer.

Table 3.

Multivariable logistic regression models assessing the association between pain and incident elevated depressive symptoms in 2015 among older Mexicans, overall and by gender

Characteristic	Overall (n=4913)			Women (n=2396)			Men (n=2517)		
	aOR	95% CI		aOR	95% CI		aOR	95% CI	
Pain	1.65	1.41–1.93	< .001	1.65	1.33–2.04	< .001	1.66	1.31–2.10	< .001
Age, years	1.03	1.01–1.04	< .001	1.02	1.00–1.04	.02	1.03	1.02–1.05	< .001
Gender									
Male	1.00	Ref		n/a	-		n/a	-	
Female	1.38	1.18–1.62	< .001	n/a	-		n/a	-	
Marital status									
Married or in a civil union	1.00	Ref		1.00	Ref		1.00	Ref	
Single/divorced/separated	1.00	0.77–1.30	1.00	0.82	0.60–1.14	.24	1.58	1.02–2.47	.04
Widowed	0.89	0.73–1.09	.27	0.87	0.69–1.11	.27	0.94	0.64–1.37	.74
Education									
0 years	1.00	Ref		1.00	Ref		1.00	Ref	
1 to 6 years	0.89	0.73–1.07	.22	0.85	0.66–1.11	.23	0.90	0.67–1.19	.45
6 or more years	0.83	0.64–1.07	.15	0.90	0.64–1.27	.56	0.72	0.48–1.06	.09
Locality size									
Rural	1.00	Ref		1.00	Ref		1.00	Ref	
Urban	0.87	0.74–1.02	.09	0.83	0.67–1.03	.09	0.94	0.74–1.19	.59
Consumer durables									
0–3	1.00	Ref		1.00	Ref		1.00	Ref	
4–6	1.06	0.87–1.31	.55	1.15	0.87–1.54	.32	0.98	0.74–1.31	.91
7+	0.71	0.55–0.93	.01	0.81	0.57–1.15	.24	0.62	0.42–0.92	.02
Has insurance	0.95	0.75–1.20	.65	0.71	0.51–0.98	.04	1.32	0.92–1.91	.14
Fair/poor self-rated health	2.84	2.35–3.44	< .001	3.00	2.30–3.92	< .001	2.71	2.06–3.55	< .001
Has an ADL limitation	1.50	1.23–1.83	< .001	1.53	1.18–1.98	.001	1.49	1.10–2.01	.01
Has arthritis	1.07	0.86–1.32	.55	1.05	0.80–1.36	.74	1.12	0.79–1.60	.52
Had a fall	1.03	0.88–1.20	.70	0.97	0.79–1.19	.75	1.16	0.92–1.47	.21
Has social support	0.91	0.78–1.05	.19	0.86	0.70–1.06	.15	0.97	0.78–1.21	.78
Body mass index	1.00	0.98–1.02	.77	1.00	0.97–1.02	.69	1.00	0.97–1.03	.99

Source: Mexican Health and Aging Study, 2012 and 2015.

Abbreviations: aOR, adjusted odds ratio, CI, confidence interval, ADL, activities of daily living.

Note: Models include IPWs. Consumer durables are the number of the following items available in the household of residence: radio, television, refrigerator, washer, telephone, water heater, internet, and computer