Association between immigration status and anxiety, depression and use of anxiolytic and antidepressant medications in the Hispanic Community Health Study/Study of Latinos

Jonathan Ross[1,*], **Simin Hua**[1], **Krista M. Perreira**[2], **David B. Hanna**[1], **Sheila F. Castañeda**[3], **Linda C. Gallo**[4], **Frank J. Penedo**[5], **Wassim Tarraf**[6], **Rosalba Hernandez**[7], **Natan Vega Potler**[1], **Gregory A. Talavera**[3], **Martha L. Daviglus**[5], **Franklin Gonzalez II**[2], **Robert C. Kaplan**[1], **Sylvia Smoller-Wassertheil**[1]

[1]Albert Einstein College of Medicine/Montefiore Medical Center, Bronx, NY

[2]Gillings School of Public Health, University of North Carolina, Chapel Hill, NC

[3]South Bay Latino Research Center, School of Public Health, San Diego State University, San Diego, CA

[4]Department of Psychology, San Diego State University, San Diego, CA

[5]Feinberg School of Medicine, University of Chicago, Chicago, IL

[6]Wayne State University, Detroit, MI

[7]School of Social Work, University of Illinois at Urbana-Champaign, Urbana, IL

Abstract

Purpose: To investigate the association between undocumented immigration status and anxiety, depression and use of anxiolytic or antidepressant medications in the Hispanic Community Health Study/Study of Latinos.

Methods: Cross-sectional analysis of data collected between 2014–2017. Participants were categorized as US-born citizens, naturalized citizens, documented non-citizens, or undocumented non-citizens. We calculated prevalence and prevalence ratios (PRs) for anxiety, depression and use of anxiolytic or antidepressant medication, by immigration status.

Results: Of 9,257 participants, 1403 (15%) were undocumented non-citizens, 2872 (31%) were documented non-citizens, 3766 (41%) were naturalized citizens, and 1216 (13%) were US-born citizens. Prevalence of anxiety was lower among undocumented compared to documented noncitizens (9 vs 15%, p<0.0001) but not significantly different in adjusted analyses. Prevalence of depression was similar among undocumented and documented non-citizens (20 vs 24%, p=0.07) and not significantly different in adjusted analyses. Among participants with depression,

*Corresponding author: Division of General Internal Medicine, 3300 Kossuth Ave, Bronx, NY 10463, (718) 920 7064, joross@montefiore.org.

7% of undocumented and 27% of documented non-citizens reported use of antidepressants (adjusted PR 0.49, 95% CI 0.27–0.87).

Conclusions: Undocumented non-citizens had similar likelihood of anxiety and depression, but lower likelihood of antidepressant use, compared to documented non-citizens. These results may reflect the resilience of an undocumented population facing multiple stressors but suggest that this group may be undertreated for depression.

Keywords

emigration and immigration; undocumented immigrants; anxiety; depression; Hispanic Americans; Latinos

INTRODUCTION

There are an estimated 11 million undocumented immigrants in the United States (US), of whom over three-quarters are Hispanic/Latino.[1] More restrictive immigration policies recently implemented by the federal government have highlighted potential health-related vulnerabilities of undocumented immigrants in the US. Undocumented Hispanic/Latino immigrants may be subject to psychological stress related to violence in their countries of origin,[2] and may face trauma during migration.[3] Once in the US, this population is often exposed to unique stressors including fear of deportation, marginalization, stigma, occupational hazards, and limited access to social and medical services.[4–6] These factors may place undocumented Hispanics/Latinos at risk for anxiety and depression as well as undertreatment of these disorders.

Limited data have been published about either the burden of anxiety and depression among undocumented Hispanics/Latinos in the US, or the association between these disorders and immigration status. Garcini et al. (2018), reported a point prevalence of generalized anxiety disorder of 7% and major depressive disorder of 14% among 248 undocumented Mexicans near the California-Mexico border,[6] both higher than general US population estimates (twelve-month prevalences of 2% and 10%, respectively).[7,8] Data from North Carolina showed a higher risk of anxiety and depression among undocumented persons compared to persons with legal immigration status,[2] while studies in California and Massachusetts found no association between undocumented immigration status and anxiety or depression.[9,10] Because these studies were limited in sample size or geographical scope, their findings may not be generalizable to the broader population of undocumented Hispanics/Latinos in the US. To our knowledge, no studies have examined use of anxiolytic or antidepressant medications in this population, but limited access to healthcare for undocumented immigrants suggests these medications may be underutilized despite medical indication.

To better understand the relationship of undocumented immigration status with anxiety and depression, we conducted a study using data from the Hispanic Community Health Study/ Study of Latinos (HCHS/SOL), a cohort study of 16,415 Hispanics/Latinos from diverse cultural backgrounds in four communities across the US. Using this large, probabilistic sample, we examined the association of immigration status with symptoms of anxiety and depression and use of anxiolytic and antidepressant medications.

METHODS

Study design and sample

HCHS/SOL is a prospective cohort study that enrolled 16,415 self-identified Hispanics/ Latinos ages 18–74 from 2008–2011. Participants of diverse backgrounds, including Cuban, Central American, Dominican, Puerto Rican, and South American, were recruited from four US communities: Bronx, New York; Chicago, Illinois; Miami, Florida; and San Diego, California. Details of the design, recruitment and implementation of HCHS/SOL have been previously described.[11,12] HCHS/SOL was approved by Institutional Review Boards at all participating academic institutions.

During baseline interviews (Visit 1), participants completed questionnaires on demographic, behavioral, psychosocial and physiological factors, acculturation, medical co-morbidities, medication use and assessment of anxiety and depression. Participants returned for Visit 2 approximately six years after enrollment (2014–2017) and completed questionnaires in similar domains to the baseline visit with additional questions on citizenship and visa status.

For this analysis we included all participants who underwent a Visit 2 interview and who had available data on the exposure and outcomes of interest. Unlike participants of other Hispanic/Latino backgrounds, because all persons of Puerto Rican heritage are US citizens by birth, and thus never at risk of being undocumented, we excluded this group from the analysis. Of the 16,415 persons enrolled in Visit 1, 1,033 were not eligible to continue in the study because they moved out of the study area and an additional 3,759 did not return for Visit 2; of the 11,623 who returned for Visit 2, 1801 were Puerto Rican, 356 were missing data on immigration status, and an additional 209 were missing outcomes of interest, resulting in an analytic sample of 9,257 (Supplementary Figure 1). When compared to the Visit 1 sample (excluding Puerto Ricans), the analytic sample for this study was similar with respect to sex, Hispanic/Latino background, US nativity, and educational status.

Outcomes

Four primary outcomes measured in Visit 2 were considered in this analysis: *anxiety, depression, use of anxiolytic medication*, and *use of antidepressant medications*. We assessed anxiety symptoms using the Generalized Anxiety Disorder 7-item scale (GAD-7), [13] a scale with reliability and validity in English- and Spanish-speaking Hispanics/Latinos in the US.[14] We defined anxiety as a GAD-7 score ≥ 10[13] and/or self-reported use of medication to treat anxiety (participants were asked, "*Were any of the medications you took during the last four weeks for anxiety?*"); we refer to this definition as anxiety while noting this is not equivalent to clinically diagnosed anxiety disorder. Depressive symptoms were assessed with the 10-item Center for Epidemiological Studies Depression Scale (CESD-10), a subset of the 20-item CESD scale.[15] The CESD-10 has high sensitivity and specificity when measured against the full CESD,[16] and high internal reliability in HCHS/SOL (α=.83) in English and Spanish.[17] We defined participants as having depression if their CESD-10 score was ≥ 10 (out of a possible score of 30) and/or self-reported use of medications to treat depression (*"Were any of the medications you took during the last four weeks for depression!"*), again noting that this is not equivalent to clinically-diagnosed major

depressive disorder. Because undocumented immigrants access health care less frequently than persons with documented status[18] and may therefore be less likely to be prescribed medications, we conducted sensitivity analyses using definitions for anxiety and depression that did not include medication use and were based solely on the GAD-7 and CESD-10 scales, respectively.

Immigration status

The primary independent variable was immigration status. HCHS/SOL did not explicitly inquire about undocumented status but did collect data on US citizenship and visa status at Visit 2. Participants reporting that they were not US citizens were asked whether they were legal permanent residents, had applied for legal permanent residency, held another type of visa, or whether none of these situations applied. Based on established methods,[19] we used these data to classify participants' immigration status as US-born citizens, naturalized citizens, documented non-citizens (if they reported holding or applying for legal permanent residency or another visa), or undocumented non-citizens (if they did not hold or had not applied for a visa). Citizenship and visa status were checked against variables for place of birth and immigrant generation for quality control.

Covariates

Additional variables included field center (Bronx, Chicago, Miami, San Diego), sex (male, female), age in years at time of Visit 2 (44, 45–64, 65, determined based on the study's over-sampling of individuals >45 years and 65 as common cut-off for elderly), Hispanic/Latino background (Dominican, Central American, Cuban, Mexican, South American, mixed/other), primary language of interview (Spanish, English), duration living in the US (<10 years, 10 years), education (< 9th grade, some high school, high school, >high school), household income (<$30,000, $30,000), employment status (full time, part time, unemployed, retired), mean Charlson comorbidity index score,[20] and current use of alcohol and tobacco (yes, no).

Analyses

We present actual cohort sample sizes with weighted proportions to describe demographic characteristics in Table 1. We calculated weighted estimates of prevalence, means, confidence intervals, and prevalence ratios (PRs) with associated 95% confidence intervals (CIs). All weighted estimates account for the probability sampling design that included stratification, cluster sampling, and over-sampling of individuals aged 45–74 years, to allow appropriate generalizations to the target population.

Baseline characteristics of participants grouped by immigration status were compared using survey chi-square tests for categorical and survey linear regression for continuous variables. To test the association between undocumented immigration status and the outcomes of interest, we compared undocumented non-citizens (as well as US-born and naturalized citizens) to documented non-citizens using bivariate modified survey Poisson regression models, generating crude PRs with 95% CIs. We used multivariable models to generate adjusted PRs (aPRs), adjusting for key variables associated with the exposure and outcomes of interest: Hispanic/Latino background, age, sex, study field center, education, employment

status, and medical comorbidity. Because health insurance is largely a function of age, employment status, geographical location and immigration status, we did not include this variable in the main models; however, we conducted sensitivity analyses that included health insurance as a covariate to examine the potential effect of insurance on the outcomes of interest. Models examining use of anxiolytic and antidepressant medications were limited to participants who met the criteria for anxiety and depression, respectively.

We examined potential interactions between immigration status and age, Hispanic/Latino background, and field center and reported stratified analyses for interactions with p<0.05. Data were analyzed using SAS 9.4 (Cary, NC) and, to adjust for weighting and survey design, SUDAAN 11.0 (Research Triangle Park, NC). Statistical significance was two-sided at p<0.05.

RESULTS

Of 9,257 participants included in this analysis, self-reported Hispanic/Latino background (weighted proportions) was 4,603 (46%) Mexican, 1,507 (23%) Cuban, 1,142 (9%) Central American, 934 (11%) Dominican, and 747 (6%) South American. Among participants, 5,877 (52%) were female and 81% preferred Spanish as their interview language. Compared to participants of other immigration status, undocumented non-citizens were more likely to be of Central American or Mexican heritage and prefer Spanish, and were less likely to have completed high school, or report current alcohol or tobacco use (Table 1).

Anxiety and anxiolytic medication use

The weighted prevalence of anxiety in the analytic sample was 15%, with lowest prevalence among undocumented non-citizens (9%), compared to documented non-citizens (15%), naturalized citizens (16%) and US-born citizens (18%) (p<0.000l) (Table 2). In models assessing anxiety, we detected an interaction between immigration status and age and thus report separate models for age <45 and age 45 years (Table 3); no interactions were observed between immigration status and other variables. For participants <45 years old, prevalence of anxiety among undocumented non-citizens was similar to that of documented non-citizens in both the unadjusted (PR 0.75, 95% CI 0.48, 1.15; p=0.19) and adjusted (adjusted PR 0.73, 95% CI 0.46,1.13, p=0.16). For participants 45 years old, prevalence of anxiety among undocumented noncitizens was lower than that of documented non-citizens in the unadjusted model (PR 0.62, 95% CI 0.45, 0.84; p=0.002); in the final adjusted model differences were not statistically significant (aPR 0.78, 95% CI 0.57, 1.08; p=0.13). We observed similar prevalence of anxiety among naturalized citizens, and higher prevalence of anxiety among US-born citizens, when compared to documented non-citizens.

Among patients with anxiety, 17% of undocumented non-citizens reported use of medication for anxiety compared to 41% of documented non-citizens, 54% of naturalized citizens, and 37% of US-born citizens (p<0.0001). Compared to documented non-citizens, undocumented non-citizens had an unadjusted prevalence of medication use that was 58% lower (PR 0.42, 95% CI 0.25,0.70; p=0.001); medication use for anxiety remained lower in the fully adjusted models, though was not statistically significant (aPR 0.69, 95% CI 0.41, 1.16; p=0.16). In

adjusted models, prevalence of anxiolytic use among naturalized citizens and documented non-citizens was similar to that of US-born citizens.

Depression and antidepressant medication use

The overall prevalence of depression among participants was 24%, with slightly lower prevalence among undocumented non-citizens (20%) compared to documented non-citizens (24%), naturalized citizens (25%), or US-born citizens (25%) (p=0.07). Prevalence of depression among undocumented non-citizens was slightly lower than documented non-citizens in the unadjusted model (PR 0.84, 95% CI 0.70, 1.01; p=0.06) and very similar in the adjusted model 0.94 (95% CI 0.77, 1.13; p=0.5) (Table 4). We observed similar results for depression among naturalized citizens, but higher prevalence of depression among US-born citizens, compared to documented non-citizens.

Among patients meeting the definition for depression, 7% of undocumented non-citizens reported use of antidepressant medication compared to 23% of US-born citizens, 36% of naturalized citizens, and 27% of documented non-citizens (p<0.0001). Compared to documented non-citizens, the unadjusted odds of medication use were 72% lower among undocumented noncitizens (PR 0.28, 95% CI 0.16, 0.48; p<0.0001); this association was attenuated to some degree in the fully adjusted model (aPR 0.49, 95% CI 0.27, 0.87; p=0.01). In adjusted models, prevalence of medication use for depression among naturalized citizens and US-born citizens was similar to that of documented non-citizens.

Sensitivity analyses controlling for health insurance produced similar results (Supplemental Tables 1 **and** 2), as did sensitivity analyses utilizing definitions for anxiety and depression that did not include reported use of medications (Supplemental Tables 3 **and** 4).

DISCUSSION

In a large probabilistic sample of Hispanics/Latinos living in the US, we found that the relative prevalence of both anxiety and depression as measured in HCHS/SOL were similar among undocumented and documented non-citizens, and were substantially lower than those of US-born citizens. Among participants meeting criteria for depression, prevalence of medication use for this disorder was markedly and statistically lower among undocumented non-citizens compared to all other groups; similar findings were observed for anxiolytic use among participants meeting criteria for anxiety, but did not reach statistical significance. Together, these findings suggest that place of birth, rather than immigration status, may be a more significant driver of anxiety and depression among immigrant Hispanic/Latinos, and that undocumented Hispanic/Latinos are less likely to use medications to treat these disorders.

When adjusted for baseline characteristics, prevalence of anxiety and depression were similar among undocumented non-citizens, documented non-citizens and naturalized citizens. Moreover, prevalence ratios for depression were substantially lower among all three groups compared to US-born citizens. Similar findings were observed in models examining anxiety among participants <45 years of age. These findings are comparable to those of other studies demonstrating that among Hispanic/Latinos, foreign-born persons report fewer

anxiety and depression symptoms than US-born individuals,[21,22] a phenomenon sometimes attributed to the "healthy immigrant effect." Our results add to this literature by suggesting that undocumented immigration status may not substantially modify this association.

There are several potential explanations for the observed results. It is possible that our findings reflect the positive health selection of Hispanic/Latino undocumented non-citizens, who despite potential exposure to trauma and unique stressors related to their immigration status harbor a high degree of resilience and tolerance for adversity that is protective against mental health disorders.[23] This theory is supported by a recent analysis of farm workers using nationally representative data, which found a substantially lower incidence of chronic conditions among undocumented compared to documented immigrants.[24] In addition, undocumented non-citizens in HCHS/SOL tend to have arrived in more recent Hispanic/ Latino immigrant cohorts to the compared to naturalized citizens and documented non-citizens, and research has shown that more recent cohorts report more favorable health.[25] The relatively low prevalences of anxiety and depression among undocumented non-citizens may also be related to social networks: in small studies of undocumented non-citizens and refugees, factors such as family and social support and feelings of belonging to a community have been identified as protective against mental health conditions.[26–27] Undocumented non-citizens in the U.S. tend to live in the same areas,[28] and it is also possible that this geographic clustering has health-protective effects, as has been observed in other populations.[29] Finally, Hispanic/Latino undocumented non-citizens may poentially favorably compare their current circumstances with less stable ones left behind, decreasing the potential impact on mental health of psychological stressors related to their immigration status.[30]

It is also possible that the mental health of undocumented non-citizens willing to participate in HCHS/SOL may not be representative of the overall burden of anxiety and depression among Hispanic/Latino undocumented non-citizens in the US. For example, a much larger proportion of undocumented non-citizens in this analysis reported living in the US for >10 years compared to national estimates,[31] which may be protective against some of the stressors associated with undocumented status.[9] Similarly, undocumented non-citizens participating in HCHS/SOL may live in geographic areas that subject them to fewer mental health stressors than the broader Hispanic/Latino undocumented non-citizen population. In a recent ecologic analysis, US states with more inclusionary policy climates (including three of the four states where HCHS/SOL sites are located) had lower rates of poor mental health days among study participants than in states with less inclusionary policies.[32] Conversely, undocumented non-citizens may be less willing than persons with documented immigration status to report symptoms of poor mental health secondary to social desirability bias.[33] Finally, because undocumented and documented Hispanic/Latino immigrants often reside and work in the same communities, there may be "spillover" effects of both positive (e.g. social support) or negative (e.g. exclusionary policies) factors that influence anxiety and depression, which may explain the similarities observed across all three foreign-born groups in our study.[34]

In analyses of participants meeting criteria for anxiety and depression, we found a much lower prevalence of self-reported medication use for these disorders among undocumented

non-citizens compared to documented non-citizens. Medication use was also substantially lower among undocumented non-citizens than either US-born or naturalized citizens, although we did not directly make comparisons between these groups. These differences persisted even when adjusting models for socio-demographic and medical characteristics, although were not statistically significant for the outcome of anxiety. In sensitivity analyses that included health insurance as a covariate, this variable did not substantially modify the association between immigration status and use of medications for mood disorders. This may be because of the endogenous statistical relationship between these variables or may reflect the relatively stronger influence of other unmeasured factors influencing medication access. Although few studies have examined mental health care utilization among Hispanic/Latino undocumented non-citizens in the US, a study of 197 Hispanic/Latinos in New York City found that undocumented individuals attended fewer mental health appointments and had overall lower outpatient treatment utilization than documented persons, even when accounting for differences in sociodemographic and clinical characteristics.[35] We are aware of only one study that compared prescription medication use of undocumented and documented immigrants, finding no significant differences between these groups;[36] however, studies have demonstrated an overall lower rate of healthcare utilization among Hispanic/Latino undocumented non-citizens compared to those with legal immigration status.[18] While medications are only one of several modalities used to treat anxiety and depression, our results suggest that undocumented non-citizens use medications for these disorders at lower rates than other groups. Possible explanations for the observed findings include limited access to social and medical services,[18] immigration-related fear of accessing health care[37], and competing stressors that deprioritize seeking mental health care.[36] The lack of empirical data on treatment of mood disorders among undocumented Hispanics/Latinos suggest that additional research is needed to investigate the potential patient-, provider and systems barriers to mental health treatment in this population.

Several limitations of this study are worth noting. HCHS/SOL did not explicitly inquire about undocumented immigration status, although we used methods to estimate this that have been utilized previously.[19] This analysis did not include important variables that may influence the association between immigration status and mood disorders, including measures of social support, discrimination, and history of traumatic experiences such as persecution or abuse. Similarly, we did not measure stressors unique to undocumented non-citizens (e.g. fear of deportation, stigma related to undocumented status) that may influence mental health yet may not be captured using standardized scales of anxiety and depressive symptoms. Additional research is needed to develop and validate contextually-sensitive measures to capture anxiety and depression in this population. HCHS/SOL does not collect data on utilization of other types of treatment for mental health care (e.g. individual or group therapy) that may be preferred among certain groups and perhaps more appropriate among individuals with milder mood disorders; we were therefore unable to examine associations between immigration status and use of these services. A substantial number of participants were lost between Visit 1 and Visit 2, and we were not able to ascertain whether there was differential drop out by immigration status since this was not measured in Visit 1. This may limit generalizability to the overall undocumented Hispanic/Latino population in the four geographical areas of the HCHS/SOL study. Finally, this study may not have captured the

effect of substantial recent changes in US immigration policy and the increasingly negative political climate around immigration, an important area for further investigation given reports of rising anxiety and depression among foreign-born Hispanics/Latinos in the last few years.[38]

In conclusion, using data from a large, population-based sample of US Hispanics/Latinos representative of four major metropolitan areas in the US, we found that undocumented noncitizens were no more likely to meet criteria for anxiety or depression than documented noncitizens, suggesting that undocumented immigration status may not confer additional risk for these disorders. These results may reflect the resilience of a population facing significant legal, occupational and psychosocial stressors. Nevertheless, the low observed prevalence of medication use for depression among undocumented non-citizens indicate a need for improved access to care for this population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGMENTS AND FUNDING SOURCES

Abbreviations:

HCHS/SOL	Hispanic Community Health Study / Study of Latinos
GAD-7	Generalized Anxiety Disorder 7-item scale
CES-D10	10-item Center for Epidemiological Studies Depression Scale
PR	prevalence ratio
CI	confidence interval

REFERENCES

1. Rosenblum MR, Ruiz Soto AG. An Analysis of Unauthorized Immigrants in the United States by Country and Region of Birth. Washington, D.C.: Migration Policy Institute (US); 2015.

2. Ornelas IJ, Perreira KM. The role of migration in the development of depressive symptoms among Latino immigrant parents in the USA. Soc Sei Med. 2011;73(8):1169–77.

3. Perreira KM, Ornelas I. Painful Passages: Traumatic Experiences and Post-Traumatic Stress among Immigrant Latino Adolescents and their Primary Caregivers. Int Migr Rev. 2013;47(4).

4. Hacker K, Chu J, Leung C, Marra R, Pirie A, Brahimi M, et al. The impact of Immigration and Customs Enforcement on immigrant health: perceptions of immigrants in Everett, Massachusetts, USA. Soc Sci Med. 2011;73(4):586–94. [PubMed: 21778008]

5. Martinez O, Wu E, Sandfort T, Dodge B, Carballo-Dieguez A, Pinto R, et al. Evaluating the impact of immigration policies on health status among undocumented immigrants: a systematic review. J Immigr Minor Health. 2015;17(3):947–70. [PubMed: 24375382]

6. Garcini LM, Pena JM, Galvan T, Fagundes CP, Malcarne V, Klonoff EA. Mental disorders among undocumented Mexican immigrants in high-risk neighborhoods: Prevalence, comorbidity, and vulnerabilities. J Consult Clin Psychol. 2017;85(10):927–36. [PubMed: 28956948]

7. Hasin DS, Sarvet AL, Meyers JL, Saha TD, Ruan WJ, Stohl M, et al. Epidemiology of Adult DSM-5 Major Depressive Disorder and Its Specifiers in the United States. JAMA Psychiatry. 2018;75(4):336–46. [PubMed: 29450462]

8. Kessler RC, Petukhova M, Sampson NA, Zaslavsky AM, Wittchen HU. Twelve-month and lifetime prevalence and lifetime morbid risk of anxiety and mood disorders in the United States. Int J Methods Psychiatr Res. 2012;21(3): 169–84. [PubMed: 22865617]

9. Young MT, Pebley AR. Legal Status, Time in the USA, and the Well-Being of Latinos in Los Angeles. J Urban health. 2017;94(6):764–75. [PubMed: 28875414]

10. Garcini LM, Renzaho AMN, Molina M, Ayala GX. Health-related quality of life among Mexican-origin Latinos: the role of immigration legal status. Ethn Health. 2018;23(5):566–81. [PubMed: 28158950]

11. Lavange LM, Kalsbeek WD, Sorlie PD, Aviles-Santa LM, Kaplan RC, Barnhart J, et al. Sample design and cohort selection in the Hispanic Community Health Study/Study of Latinos. Ann Epidemiol. 2010;20(8):642–9. [PubMed: 20609344]

12. Sorlie PD, Aviles-Santa LM, Wassertheil-Smoller S, Kaplan RC, Daviglus ML, Giachello AL, et al. Design and implementation of the Hispanic Community Health Study/Study of Latinos. Ann Epidemiol. 2010;20(8):629–41. [PubMed: 20609343]

13. Spitzer RL, Kroenke K, Williams JB, Lowe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. Arch Intern Med. 2006;166(10):1092–7. [PubMed: 16717171]

14. Mills SD, Fox RS, Malcarne VL, Roesch SC, Champagne BR, Sadler GR. The psychometric properties of the generalized anxiety disorder-7 scale in Hispanic Americans with English or Spanish language preference. Cultur Divers Ethnic Minor Psychol. 2014;20(3):463–8. [PubMed: 25045957]

15. Radloff LS. The CES-D scale: A self report depression scale for research in the general population. Appl Psychol Meas. 1977;1:385–401.

16. Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). Am J Prev Med. 1994;10(2):77–84. [PubMed: 8037935]

17. Gonzalez P, Nunez A, Merz E, Brintz C, Weitzman O, Navas EL, et al. Measurement properties of the Center for Epidemiologic Studies Depression Scale (CES-D 10): Findings from HCHS/SOL. Psychol Assess. 2017;29(4):372–81. [PubMed: 27295022]

18. Pourat N, Wallace SP, Hadler MW, Ponce N. Assessing health care services used by California's undocumented immigrant population in 2010. Health Aff (Millwood). 2014;33(5):840–7. [PubMed: 24799582]

19. Goldman DP, Smith JP, Sood N. Legal status and health insurance among immigrants. Health Aff (Millwood). 2005;24(6): 1640–53. [PubMed: 16284039]

20. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. J Chronic Dis. 1987;40(5):373–83. [PubMed: 3558716]

21. Alegría M, Mulvaney-Day N, Torres M, Polo A, Cao Z, Canino G. Prevalence of psychiatric disorders across Latino subgroups in the United States. Am J Public Health. 2007;97(1):68–75. [PubMed: 17138910]

22. Perreira KM, Gotman N, Isasi CR, Arguelles W, Castaneda SF, Daviglus ML, et al. Mental Health and Exposure to the United States: Key Correlates from the Hispanic Community Health Study of Latinos. J Nerv Ment Dis. 2015;203(9):670–8. [PubMed: 26237134]

23. Castaneda H, Holmes SM, Madrigal DS, Young ME, Beyeler N, Quesada J. Immigration as a social determinant of health. Annu Rev Public Health. 2015;36:375–92. [PubMed: 25494053]

24. Hamilton ER, Hale JM, Savinar R. Immigrant legal status and health: legal status disparities in chronic conditions and musculoskeletal pain among Mexican-born farm workers in the United States. Demograph. 2019;56(1): 1–24.

25. Hamilton TG, Palermo T, Green TL. Health assimilation among Hispanic immigrants in the United States: The impact of ignoring arrival-cohort effects. Journal of health and social behavior. 2015 12;56(4):460–77. [PubMed: 26589971]

26. Goodman RD, Vesely CK, Letiecq B, Cleaveland CL. Trauma and Resilience Among Refugee and Undocumented Immigrant Women. J Couns Dev. 2017;95(3):309–321.

27. Pulvirenti M, Mason G. Resilience and Survival: Refugee Women and Violence. Curr Issues Crim Just. 2011;23(1):37–52.

28. Passei JS, Cohn D. 2019 "20 metro areas are home to six-in-ten unauthorized immigrants in U.S." Pew Research Center, March 2019. https://www.pewresearch.org/fact-tank/2019/03/11/us-metro-areas-unauthorized-immigrants/. Accessed on: June 20, 2019.

29. Kramer MR, Hogue CR. Is segregation bad for your health? Epidemiol Rev. 2009; 31:178–194. [PubMed: 19465747]

30. Suarez-orozco MM. Hispanic Americans: comparative considerations and the educational problems of children. Int Migr. 1987;25(2): 141–64. [PubMed: 12159544]

31. Passel JS, Cohn D. 2016 "Overall Number of US Unauthorized Immigrants Holds Steady Since 2009." Pew Research Center, September 2016.

32. Hatzenbuehler ML, Prins SJ, Flake M, Philbin M, Frazer MS, Hagen D, et al.Immigration policies and mental health morbidity among Latinos: A state-level analysis. Soc Sci Med. 2017;174:169–78. [PubMed: 28043019]

33. Deshields TL, Tait RC, Gfeller JD, Chibnall JT. Relationship between social desirability and self-report in chronic pain patients. Clin J Pain. 1995; 11(3): 189–93. [PubMed: 8535037]

34. Perreira KM, Pedroza JM. Policies of Exclusion: Implications for the Health of Immigrants and their Children. Annu Rev Public Health. 2019 4 1;40:147–166. [PubMed: 30601722]

35. Perez MC, Fortuna L. Chapter 6.Psychosocial Stressors, Psychiatric Diagnoses and Utilization of Mental Health Services Among Undocumented Immigrant Latinos. J Immig Refug Stud. 2005;3(1–2):107–23.

36. Vargas Bustamante A, Fang H, Garza J, Carter-Pokras O, Wallace SP, Rizzo JA, et al. Variations in healthcare access and utilization among Mexican immigrants: the role of documentation status. J Immigr Minor Health. 2012; 14(1): 146–55. [PubMed: 20972853]

37. Hacker K, Anies M, Folb BL, Zallman L. Barriers to health care for undocumented immigrants. Risk Manag Healthc Policy. 2015; 8: 175–183. [PubMed: 26586971]

38. Roche KM, Vaquera E, White RMB, Rivera MI. Impacts of immigration actions and news and the psychological distress of US Latino parents raising adolescents. J Adolesc Health. 2018;62(5): 525–531 [PubMed: 29503033]

Table 1:

Characteristics of 9,257 eligible Hispanics/Latinos attending Visit 2 of HCHS/SOL, by immigration status [a,b]

	Undocumented non-citizens (N=1403)	Documented non-citizens (N=2872)	Naturalized citizens (N=3766)	US-born citizens (N=1216)	P
Field Center [c], n (%)					<0.0001
Bronx	132 (22%)	422 (18%)	650 (21%)	178 (21%)	
Chicago	817 (40%)	591 (11%)	780 (9%)	218 (12%)	
Miami	257 (20%)	1001 (42%)	1231 (42%)	92 (12%)	
San Diego	197 (18%)	858 (28%)	1105 (27%)	728 (55%)	
Hispanic/Latino background [c], n (%)					<0.0001
Dominican	31 (3%)	323 (12%)	519 (16%)	61 (8%)	
Central American	279 (17%)	363 (10%)	445 (8%)	55 (4%)	
Cuban	20 (2%)	614 (31%)	806 (33%)	67 (10%)	
Mexican	933 (70%)	1290 (39%)	1562 (33%)	818 (60%)	
South American	127 (7%)	232 (6%)	356 (7%)	32 (2%)	
Mixed/other	10 (2%)	42 (2%)	65 (2%)	174 (18%)	
Age in years, n (%)					<0.0001
44	625 (66%)	496 (37%)	462 (27%)	661 (77%)	
45–64	710 (32%)	1896 (51%)	2231 (46%)	438 (19%)	
65	68 (2%)	480 (12%)	1073 (27%)	117 (4%)	
Sex (male)	533 (47%)	1071 (50%)	1261 (43%)	515 (54%)	<0.0001
Interview language Spanish (n, %)	1382 (97%)	2767 (95%)	3531 (90%)	406 (28%)	<0.0001
>10 years residing in US	1231 (86%)	2316 (75%)	3502 (89%)	1201 (100%)	<0.0001
Completed high school, n (%)	693 (52%)	1663 (68%)	2536 (75%)	990 (84%)	<0.0001
Household income < $30,000 / yr	943 (66%)	1704 (54%)	2034 (50%)	438 (33%)	<0.0001
Currently employed, n (%)	1061 (78%)	1748 (70%)	1910 (55%)	820 (77%)	<0.0001
Charlson comorbidity index, mean (SE) [d]	0.29 (0.02)	0.47 (0.03)	0.62 (0.03)	0.25 (0.02)	<0.0001

HCHS/SOL = Hispanic Community Health Study / Study of Latinos

[a] Actual sample sizes with weighted proportions to account for probability sampling design of HCHS/SOL

[b] Note: numbers may not add up to total due to missingness

[c]Data collected as part of HCHS/SOL Visit 1

[d]Standard errors adjusted to account for probability sampling design of HCHS/SOL

Table 2.

Bivariate associations between immigration status and outcomes of anxiety, depression and use of anxiolytic and antidepressant medication among Hispanics/Latinos attending HCHS/SOL Visit 2[a]

	Undocumented non-citizens (N=1403)	Documented non-citizens (N=2872)	Naturalized citizens (N=3766)	US-born citizens (N=1216)	P[b]
Anxiety					
Mean GAD-7 score (SE)	3.1 (0.15)	3.6 (0.12)	3.3 (0.10)	4.3 (0.19)	<0.0001
Anxiety[c], n (%)	159 (9%)	493 (15%)	652 (16%)	209 (18%)	<0.0001
Use of anxiolytic[d], n (%)	27 (17%)	202 (41%)	335 (54%)	88 (37%)	<0.0001
Depression					
Mean CESD-10 score (SE)	5.6 (0.22)	5.9 (0.19)	5.7 (0.14)	6.3 (0.21)	0.10
Depression[e], n (%)	320 (20%)	744 (24%)	977 (25%)	310 (25%)	0.07
Use of antidepressant[f], n (%)	34 (7%)	209 (27%)	342 (36%)	85 (23%)	<0.0001

HCHS/SOL = Hispanic Community Health Study / Study of Latinos; GAD-7 = Generalized anxiety disorder 7-item scale[13]; CES-D10 = Center for Epidemiologic Studies Depression 10-item scale[15]; SE = Standard Error

[a] Estimates weighted and standard errors adjusted to account for probability sampling design of HCHS/SOL

[b] P values determined using Wald F-tests for mean scores and chi-squared test of independence for proportions

[c] defined as GAD-7 score ≥ 10 or self-reported use of medication for anxiety

[d] among participants classified as having anxiety

[e] defined as CES-D10 score ≥ 10 or self-reported use of medication for depression

[f] among participants classified as having depression

Table 3.

Modeled prevalence of anxiety and use of anxiolytic medication among Hispanics/Latinos attending HCHS/SOL Visit 2[a]

	Documented non-citizens	Undocumented non-citizens	Naturalized citizens	US-born citizens
Anxiety[b] among participants <45 years (N=2199)				
Unadjusted model, PR (95% CI)	Ref	0.75 (0.48–1.15)[c]	1.04 (0.68–1.61)[c]	1.85 (1.26–2.70)[d]
Multivariable model‡, aPR (95% CI)	Ref	0.73 (0.46–1.13)[c]	1.00 (0.65–1.54)[c]	1.85 (1.29–2.65)[e]
Anxiety[b] among participants 45 years (N=6859)				
Unadjusted model, PR (95% CI)	Ref	0.62 (0.45–0.84)[d]	1.06 (0.89–1.27)[c]	0.89 (0.67–1.18)[c]
Multivariable model[f], aPR (95% CI)	Ref	0.78 (0.57–1.08)[c]	0.98 (0.82–1.17)[c]	0.95 (0.72–1.25)[c]
Use medication for anxiety among participants with anxiety (all ages) (N=1487)				
Unadjusted model, PR (95% CI)	Ref	0.42 (0.25–0.70)[d]	1.35 (1.10–1.66)[d]	0.90 (0.67–1.21)[c]
Multivariable model[g], aPR (95% CI)	Ref	0.69 (0.41–1.16)[c]	1.14 (0.95–1.36)[c]	1.10 (0.80–1.51)[c]

HCHS/SOL = Hispanic Community Health Study / Study of Latinos; PR = prevalence ratio; CI = confidence interval; GAD-7= Generalized anxiety disorder 7-item scale[13]

[a] Estimates weighted and standard errors adjusted to account for probability sampling design of HCHS/SOL

[b] defined as GAD-7 score 10 or self-reported use of medication for anxiety

[c] p NS

[d] p<0.01

[e] p<0.001

[f] adjusted for Hispanic background, field center, sex, education, employment status, Charlson comorbidity index[25]

[g] adjusted for Hispanic background, field center, age, sex, education, employment status, Charlson comorbidity index[25]

Table 4.

Modeled prevalence of depression and use of antidepressant medication among Hispanics/Latinos attending HCHS/SOL Visit 2[a]

	Documented non-citizens	Undocumented non-citizens	Naturalized citizens	US-born citizens
Depression[b] (N=9058)				
Unadjusted model, PR (95% CI)	Ref	0.84 (0.70–1.01)[d]	1.06 (0.92–1.21)[d]	1.05 (0.87–1.28)[d]
Multivariable model[c], aPR (95% CI)	Ref	0.94 (0.77–1.13)[d]	0.97 (0.84–1.11)[d]	1.41 (1.16–1.75)[f]
Use medication for depression among participants with depression (N=2313)				
Bivariate model, PR (95% CI)	Ref	0.28 (0.16–0.48)[g]	1.36 (1.09–1.70)[e]	0.87 (0.69–1.27)[d]
Multivariable model[c], aPR (95% CI)	Ref	0.49 (0.27–0.87)[e]	1.17 (0.97–1.42)[d]	1.02 (0.72–1.44)[d]

HCHS/SOL = Hispanic Community Health Study / Study of Latinos; PR = prevalence ratio; CI = confidence interval; CES-D10 = Center for Epidemiologic Studies Depression 10-item scale[15]

[a]Estimates weighted and standard errors adjusted to account for probability sampling design of HCHS/SOL

[b]defined as CES-D10 score 10 or self-reported use of medication for depression

[c]adjusted for Hispanic background, field center, sex, education, employment status, Charlson comorbidity index[25]

[d]p NS

[e]p <0.01

[f]p <0.001

[g]p <0.0001