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Neighborhood Socioeconomic Deprivation and Depression Symptoms in Adults From the Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

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Abstract

Socioeconomic factors appear to impact mental health conditions such as depression, but little is known about the relative and combined role of neighborhood and personal socioeconomic deprivation among Hispanics/Latinos. This study examined cross-sectional associations of neighborhood and personal socioeconomic deprivation with depression symptoms in a US Hispanic/Latino population from the San Diego Field Center of the Hispanic Community Health Study/Study of Latinos (n = 3,851). Depression symptoms were assessed with the ten-item Centers for Epidemiological Studies in Depression Scale. Neighborhood socioeconomic deprivation was a composite of eleven variables (e.g., neighborhood income, education, employment, household crowding). Greater personal socioeconomic deprivation based on education, income, and employment was generally associated with higher depression symptoms, including after adjusting for neighborhood socioeconomic deprivation. Greater neighborhood socioeconomic deprivation was associated with higher depression symptoms in females but not males, but the association in females became non-significant when adjusting for personal socioeconomic deprivation. Neighborhood socioeconomic deprivation did not significantly interact

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Conflict of interest

There are no conflicts of interests to disclose.

with personal socioeconomic deprivation in relation to depression symptoms. The present findings support the association of personal socioeconomic status with mental health (indicated by depression symptoms) among Hispanic/Latino populations, whereas neighborhood socioeconomic deprivation did not relate to depression beyond the impact of personal indicators.

Keywords

Health disparities; Mental health; Neighborhood; Social determinants; Social epidemiology

Introduction

More than 300 million individuals are estimated to be living with depression, the leading cause of disability globally (World Health Organization, 2018). In the United States (US) during 2017, it was estimated 7.1% (or 17.3 million) of adults 18 years or older had experienced at least one episode of major depression (National Institute of Mental Health, 2019). Depression affects an individual's physical health, relationships, work ability, and economic prosperity, as well as the family system, local community, and healthcare systems (Chapman et al., 2005; Naiker et al., 2013; Wassertheil-Smoller et al., 2014). Health factors such as depression are particularly important to study among Hispanics/Latinos, who represent a large and growing portion of the population but have been under-represented in mental health research (Perreira et al., 2019; Wessertheil-Smoller et al., 2014).

Though numerous factors can impact whether an individual experiences depression symptoms, such as biological factors, social and interpersonal factors, and life events, one key factor that has been identified in previous research is socioeconomic deprivation (Almeida et al., 2012; Cole & Dendukuri, 2003; Hölzel et al., 2011; Lorant et al., 2003; Sareen et al., 2011). Socioeconomic deprivation refers to the relative disadvantage experienced by an individual or a social group in terms of access to and control over economic, social, or material resources and opportunities (Lamnisos et al., 2019). Sources of disadvantage may be in the form of low personal education or income, or living in a low-income area. Socioeconomic deprivation is likely to relate to depression symptoms in ways that are in alignment with the structural conceptualization of power provided by Neal and Neal (2011). This conceptualization states that power derives from occupying an advantageous position within the pattern of relationships through which resources are exchanged. Resources can include tangible (e.g., money) and intangible (e.g., friendships) items that satisfy physical and psychological needs. When these needs are not met adequately, physical or psychological distress can occur. Individuals who possess fewer resources have fewer opportunities for resource exchange, thereby holding less power and control in relationships and depending on others for resources (Emerson, 1962). Thus, individuals and groups with greater socioeconomic deprivation can be disadvantaged due to their lack of structural power, leading to unmet physical and psychological needs (Neal & Neal, 2011). The link between socioeconomic deprivation and depression may also be bidirectional. Socioeconomic deprivation can lead to negative life events or situations, such as having difficulties covering expenses or experiencing day-to-day burdens/stressors, and to difficulties obtaining needed healthcare services (Ridley et al., 2020). Socioeconomic

deprivation can also result from experiencing negative life events that foster depression symptoms, such as the loss of employment (Fell & Hewstone, 2015; Ridley et al., 2020).

Social-ecological models conceptualize an individual's health as reflecting multiple levels of influence, including personal-, interpersonal-, and community-level factors, with interplay occurring across levels (Bronfenbrenner, 1977; Stokols, 1996). In this regard, socioeconomic deprivation can manifest at multiple levels, particularly at the personal and community/neighborhood levels. Research guided by social-ecological models has supported a growing recognition that contextual factors, such as neighborhood socioeconomic characteristics, may affect mental health over and above personal-level socioeconomic factors (Lakhan & Ekúndayò, 2013; Oakes et al., 2015; Richardson et al., 2015). Individuals living in neighborhoods with greater levels of socioeconomic deprivation (e.g., areas where many families live below the poverty line; unemployment rates are high; households are often crowded) may experience poorer social ties due to lower social capital (Daoud et al., 2016; Delany-Brumsey et al., 2014) and higher levels of neighborhood disorder and crime (Mair et al., 2008; Visser et al., 2020), while also having restricted access to mental and other health services (Mair et al., 2008; Visser et al., 2020).

Studies that investigate both personal- and neighborhood-level socioeconomic characteristics are important to understand the relative role of each of these and their interplay with respect to depression symptoms (Molina-Azorín et al., 2019). Notably, such studies have shown that the role of neighborhood-level socioeconomic deprivation can vary by an individual's level of personal socioeconomic deprivation (Almeida et al., 2012; Cruwys et al., 2013). In accordance with cross-level interactions posited by social-ecological models, the double jeopardy hypothesis states that the beneficial impacts of residing in a neighborhood with lower socioeconomic deprivation will be stronger for individuals with a higher level of personal socioeconomic deprivation (Ferraro & Farmer, 1996). This is due to those with higher levels of both personal and neighborhood socioeconomic deprivation tending to have fewer resources at multiple levels, thus compounding health risks (Ferraro & Farmer, 1996). For example, Boylan and Robert (2017) found lower neighborhood socioeconomic deprivation was associated with better cardiovascular health for those with higher, but not lower, levels of personal socioeconomic deprivation.

Previous research among Hispanics/Latinos found that social-contextual factors, including greater levels of discrimination and lower levels of acculturation and social support/capital, were associated with greater levels of depression and other symptoms of poor mental health (Perreira et al., 2019). Depression symptoms were also higher among Hispanic/Latino females than males (Wassertheil-Smoller et al., 2014), though it is not known whether factors contributing to depression symptoms differed between females and males. Less is known regarding whether, and the extent to which, personal and neighborhood socioeconomic deprivation relate to depression symptoms in Hispanic/Latino population groups. Additionally, most research in this area has not investigated the relative and combined role of each level of factors, neighborhood- and personal-level deprivation, in relation to depression, particularly among Hispanics/Latinos. For example, less is known in this population group about the extent to which neighborhood deprivation relates to depression over and above personal deprivation, and how the two levels of deprivation may

interact in relation to depression. The interaction between neighborhood- and personal-level socioeconomic deprivation in relation to depression symptoms is important to investigate among Hispanics/Latinos in particular, given they are more likely to reside in neighborhoods with higher levels of socioeconomic deprivation than non-Hispanic Whites, independent of household income (Logan, 2011).

The aim of the present study was to investigate associations of both personal-level and neighborhood socioeconomic deprivation with depression symptoms in a population-based study of Hispanics/Latinos in southern San Diego, California. We hypothesized that higher levels of both personal and neighborhood deprivation would be independently associated with depression symptoms, and consistent with the double jeopardy hypothesis, personal deprivation would moderate the association between neighborhood deprivation and depression symptoms.

Methods

Participants

Participants for this analysis were enrolled in the Hispanic Community Health Study/Study of Latinos (HCHS/SOL), which is a multicenter, community-based cohort study of adults aged 18–74 years who self-identified as Hispanic or Latino and were living in the US (N = 16,415). The four field centers were located in the Bronx, NY, Chicago, IL, Miami, FL and San Diego, CA. To support a broad representation of the target population in the HCHS/SOL and to minimize bias in the cohort selection and recruitment process, a stratified two-stage probability sampling was used to select household addresses in each field center (Lavange et al., 2010). The SOL Community and Surrounding Areas (SOL CASAS) is an ancillary study of the HCHS/SOL that collected information about the built and social neighborhood features present in the immediate area surrounding participants' homes (Gallo et al., 2019). SOL CASAS was performed only with participants from the San Diego field center.

The present cross-sectional study used baseline data from the San Diego site collected in 2008–2011 from the HCHS/SOL and neighborhood data collected by the 2015–2017 SOL CASAS substudy to examine associations between neighborhood socioeconomic deprivation and depression symptoms. The current analysis included only those HCHS/SOL participants who completed the baseline clinic visit and had neighborhood environment variables collected as part of the SOL CASAS (N = 3,851). Over half of the weighted study population was comprised of females (64%), and the population weighted mean age was 39 years. The majority of the population self-identified as being of Mexican heritage (93%), which is consistent with the overall HCHS/SOL San Diego cohort and the San Diego Hispanic/Latino population (United States Census Bureau, 2017). Almost 80% of the population had lived in the US for more than ten years, and 41% had no current employment and were not retired. Detailed descriptions of the sampling design and procedures for the HCHS/SOL (Lavange et al., 2010; Sorlie et al., 2010) and SOL CASAS (Gallo et al., 2019) can be found elsewhere.

Measures and Procedures

Surveys were interviewer-administered by centrally trained bi-lingual research personnel in participants' preferred language (Spanish or English). All measures used for depression symptoms and socioeconomic deprivation were validated for both Spanish and English-speaking Hispanic/Latino populations. These assessments were performed at the cohort's baseline visit and occurred roughly concurrently.

Depression Symptoms—Depression symptoms were assessed at the HCHS/SOL baseline exam with a ten-item version of the Centers for Epidemiological Studies in Depression Scale (CES-D-10; Radloff, 1977), which has been shown to be reliable and valid for both Spanish and English respondents in the current cohort (González et al., 2017). Respondents answered questions regarding how often in the past week they experienced symptoms of clinical depression, such as feelings of guilt, worthlessness, or hopelessness. Four response categories ranged from "rarely or none of the time" to "all of the time." A summary score with a range of zero to 30 was calculated, with higher scores indicating greater depression symptoms.

Sociodemographic and Socioeconomic Variables—The following sociodemographic characteristics were collected at the HCHS/SOL baseline examination via self-report and are detailed in Table 1: sex, age, marital status, years lived in the US, and Hispanic/Latino background (i.e., country or region of heritage; Mexican, Dominican/Cuban or Puerto Rican, Central or South American, Other Hispanic/South American). Personal socioeconomic characteristics collected included education, annual household income, and employment status. All sociodemographic and socioeconomic variables were analyzed categorically except age, which was analyzed on a continuous scale. For the regression analyses, personal socioeconomic deprivation variables were dichotomized as follows. 1) Income was grouped as less than $30,000 versus $30,000 or more; 2) Education was grouped as high school education, preparatory school, GED or less versus more than high school education; and 3) Employment was grouped as employed (part- or full-time) or retired versus not employed and not retired.

Neighborhood Socioeconomic Deprivation—Socioeconomic deprivation was a composite of variables from the 2008 to 2012 American Community Survey and the 2010 US Census (United States Census Bureau, 2008; United States Census Bureau, 2010). Socioeconomic deprivation was calculated from eleven variables provided at the Census block group level: education (percent over 25 years with no High School diploma), employment (percent unemployed), tenure (percent houses rented), crowding (percent households with more than one person per room), rent as burden (percent households where gross rent is 50% or greater as a percentage of household income in past twelve months), poverty (percent households with income below federal poverty line and percent households earning less than $30,000 per year as a San Diego County-specific poverty line), vulnerability (percent female-headed households with dependent children and percent of households with no car), and government assistance (percent households on public assistance and percent of residents with only public health insurance).

The aforementioned variables were combined to represent socioeconomic deprivation using principal component analysis with varimax rotation. This was done for all Census block groups in San Diego County. The eigenvalue of the first component was 5.2 with an explained variance of 47.3%. Greater socioeconomic deprivation scores corresponded to lower socioeconomic status. Each participant's home address was then geocoded and buffered using a circular buffer with an 800-meter radius, and their socioeconomic deprivation score was calculated as a weighted average of the scores for the block groups intersecting the home buffer. No participants in the present study were from the bottom 6.4% or top 22.1% of values for the entirely of San Diego County (i.e., the least and most affluent neighborhoods in the San Diego metropolitan area; range of values for San Diego County = −1.87 to 3.75; range of values for SOL CASAS = −1.51 to 2.51). All spatial analysis was conducted in ArcMap 10.6.1 (Environmental Systems Research Institute, Inc., Redlands, California).

Socioeconomic deprivation was used both as a continuous and categorical variable. The categorical variable was used only when describing baseline socioeconomic characteristics, and it was coded as low (−1.51 to −0.17)medium (−0.16 to 1.17), and high (1.18 to 2.51) based on dividing the socioeconomic deprivation range (−1.51 to 2.51) into three groups with approximately equal ranges.

Statistical Analyses

All analyses were conducted using procedures in SPSS version 25 (IBM SPSS®, Armonk, New York; IBM Corp. Released, 2017) to incorporate the complex sampling design and the sampling weights. Since the selection of the sample was disproportionate (with an oversampling of adults 45–75 years of age), and to partially adjust for any bias due to variance in response rate at the household and personal level, all reported frequency estimates and means were weighted. T-tests were conducted for comparison of continuous variables and chi-square tests for comparison of categorical variables between males and females. To determine whether there were statistically significant differences in characteristics across the three levels of neighborhood socioeconomic deprivation, one-way analysis of variance (ANOVA) was used for continuous variables and chi-square tests for categorical variables. Weighted means and standard errors (SEs) are presented in tables to show the precision of the population estimates as is appropriate for analyses of complex samples. For the primary study outcome variable (depression symptoms), unweighted standard deviations are presented in the results section to more directly show the level of variability in the outcome. Pearson correlations were used to test associations of neighborhood socioeconomic deprivation with the dichotomous variables representing personal education, income, and employment.

Associations between the primary exposure variables (personal-level and neighborhood socioeconomic deprivation) and depression symptoms were tested using multi-variable linear regression. Separate models were first used to test personal-level (Model 1) and neighborhood (Model 2) deprivation variables. Next, personal-level and neighborhood deprivation measures were tested together in the same model (Model 3). Unstandardized regression coefficients (Bs) are presented with 95% confidence intervals. Interaction tests

were used to explore whether the association of neighborhood socioeconomic deprivation with depression symptoms was similar between males and females and in people with higher versus lower personal education (less than high school, high school graduate, or GED, versus more than high school or GED), with higher versus lower personal household income (less than $30,000 versus $30,000 or more), and who were employed (part- or full-time or retired) versus unemployed (and not retired). Dichotomous variables were created to facilitate the investigation of interactions. For the tests of effect modification, each of the independent variables comprising the interaction was standardized to have a mean of zero and standard deviation of one, which produced orthogonal interaction terms. Stratified analyses were conducted when the interaction *p*-value was less than .150. This more liberal *p*-value was selected for probing interactions because power to detect interactions is lower than for detecting main effects (McClelland & Judd, 1993), and we sought to minimize risk for Type II error when investigating group differences. Since there was evidence that the association between neighborhood socioeconomic deprivation and depression symptoms may be moderated by sex (for test of interaction, $p = .13$), all study analyses and descriptive information were stratified by sex.

Results

Baseline sociodemographics are shown in Table 1, stratified by sex. The weighted mean value on the depression scale was 6.30 (unweighted $SD = 5.1$), which was significantly higher among females (7.03, unweighted $SD = 5.58$), than males (5.45, unweighted $SD = 4.43$). Females were also less likely to have full-time employment compared with males (22% versus 47%) and to report an annual household income of $75,000 or more (6% versus 14%).

Table 2 shows the personal sociodemographic characteristics by level of neighborhood socioeconomic deprivation. Overall, 53% of the population lived in neighborhoods with moderate socioeconomic deprivation, 39% in areas with high socioeconomic deprivation, and 8% in neighborhoods with low socioeconomic deprivation. With regard to personal sociodemographic and socioeconomic characteristics, the neighborhood deprivation groups differed only on country or region of descent, level of education, and household income. As expected, those living in neighborhoods with a low level of socioeconomic deprivation had higher household incomes and personal educational attainment compared to those living in high socioeconomic deprivation neighborhoods (<.01). When examined as a continuous variable, higher neighborhood socioeconomic deprivation was associated with lower educational level (unweighted $r = .170$; $p = <.001$), lower income (unweighted $r = .213$; $p = <.001$), and unemployment (unweighted $r = .037$; $p = .179$).

Statistically significant associations among both males and females were seen between higher personal socioeconomic deprivation and higher depression symptoms (Table 3). The strength of association between personal education and depression symptoms and personal income and depression symptoms was similar between males and females (Bs = .96 and .88 for education and income, respectively, among males and .76 and 1.10 for education and income, respectively, among females in the fully adjusted models), whereas the strength of association between personal employment and depression symptoms was much stronger

among males (B = 1.53) than females (B = .74). The associations between personal socioeconomic deprivation and depression symptoms generally remained significant among both males and females when adjusting for neighborhood socioeconomic deprivation. However, many effect sizes became smaller, and the association between personal education and depression symptoms among females became non-significant (B = .76; p = .08).

With regard to neighborhood deprivation, there was a statistically significant association between higher neighborhood socioeconomic deprivation and higher depression symptoms among females (B = .94; p < .01) but not males (B = .24; p = .40). However, a smaller amount of the variance in depression symptoms was explained in the models testing neighborhood deprivation (Model 2) than the models testing personal deprivation, and this was true for both males and females (e.g., among females, R-squared was 0.030 when testing neighborhood deprivation [Model 2] vs. 0.049 when testing personal deprivation [Model 1]). Additionally, after including the personal and neighborhood deprivation variables in the same model, the association between neighborhood deprivation and depression symptoms among females was no longer statistically significant (p = .11). Relatedly, the models that included both personal and neighborhood socioeconomic deprivation variables (Model 3) did not account for a meaningful amount of additional variance in depression symptoms as compared to the models including only personal socioeconomic deprivation variables (e.g., among the total population, the difference in R-squared between Model 3 and Model 1 was 0.002 [0.066 vs. 0.064]).

Tests of neighborhood by personal socioeconomics interaction effects in relation to depression symptoms were all non-significant (ps = .170–.928). This finding, paired with the main effects shown for Model 3 in Table 3, indicated that the association between neighborhood deprivation and depression symptoms was null (i.e., similar) for both higher and lower levels of personal socioeconomic deprivation, and associations between the personal deprivation measures and depression symptoms did not vary based on neighborhood deprivation.

Discussion

Findings from the present study highlight the relationship between higher personal socioeconomic deprivation (i.e., lower socioeconomic status) and higher depression symptoms among Hispanics/Latinos. The present findings did not, however, support the hypotheses based on social-ecological models (Bronfenbrenner, 1977; Stokols, 1996), as neighborhood socioeconomic deprivation did not relate to depression symptoms when accounting for each person's level of personal socioeconomic deprivation. Moreover, hypothesized cross-level interactions based on social-ecological models and the double jeopardy hypothesis (Ferraro & Farmer, 1996) were not supported. Taken together, these cross-sectional findings provide support for the idea that personal socioeconomic factors are an important factor in depression among Hispanics/Latinos.

The present findings regarding associations between higher personal socioeconomic deprivation and higher symptoms of poor mental health (i.e., depression symptoms) are in alignment with previous research among large cohorts and nationally representative

samples in the US and other countries (Everson et al., 2002; Freeman et al., 2016; Miech & Shanahan, 2000; Sareen et al., 2011; Zimmerman & Katon, 2005). However, Hispanics/Latinos have largely been excluded from, or included in small numbers in previous research. Thus, the present findings are important to expanding understanding specifically among Hispanics/Latinos, a rapidly growing population group in the US that experiences high rates of socioeconomic deprivation. While previous research in the HCHS/SOL cohort found greater levels of discrimination and lower levels of acculturation and social support/capital were associated with greater levels of depression (Perreira et al., 2019), the present study is the first to show the importance of socioeconomic deprivation. The mechanisms behind associations between socioeconomic deprivation and mental health are likely complex and bidirectional, with one potential explanation aligning with the structural conceptualization of power provided by Neal and Neal (2011). According to this conceptualization, power derives from occupying an advantageous position within the pattern of relationships through which resources are exchanged. Related postulations from other research groups capture the likely bi-directional relationship between personal socioeconomic deprivation and depression, specifically that economic poverty can lead to symptoms of poor mental health, and/or that symptoms of poor mental health can reduce employment and therefore income (Ridley et al., 2020). Importantly, the current study found education, income, and employment status were each independently associated with depression symptoms. This finding suggests that experiencing deprivation in even just one of these indicators may negatively impact mental health.

Although the present study found that higher neighborhood socioeconomic deprivation was associated with higher depression symptoms among females, this association was attenuated when accounting for personal levels of socioeconomic deprivation. This is in contrast to numerous previous studies that found neighborhood socioeconomic status related to depression even after adjusting for personal level factors (Julien et al., 2012; Lakhan & Ekúndayò, 2013; Richardson et al., 2015). Associations of neighborhood deprivation with mental health are likely to reflect varied mechanisms including social capital (Delany-Brumsey et al., 2014), disorder and crime (Mair et al., 2008; Visser et al., 2020), access to mental and other healthcare services (Mair et al., 2008; Visser et al., 2020), and resources for recreation and active living (Mammen & Faulkner, 2013; Sallis et al., 2011). More research is needed to explore these specific constructs, which provide more direct measures of the characteristics of the neighborhood environment than does socioeconomic deprivation alone, and thus may show stronger and more consistent associations with mental health symptoms.

Disentangling the relative impact of neighborhood versus personal socioeconomic deprivation is difficult, because these two variables are highly interconnected (Helbich, 2018; Lauwers et al., 2020). This was exemplified in the present study by a strong association of both personal income and education with neighborhood deprivation (shown in Table 2). The lack of an independent association between neighborhood socioeconomic deprivation and depression symptoms in the present study may have also been due to a restricted range in the neighborhood deprivation index in the population studied. Our results showed that only 8% of the study population resided in the lowest one third of neighborhoods in San Diego County based on the socioeconomic deprivation index (i.e.,

the highest one third of neighborhoods in the county based on socioeconomic status). Future studies should aim to capture more variability in neighborhood deprivation, though such measures are likely to be confounded with race/ethnicity, making it difficult to draw conclusions for specific at risk racial/ethnic groups such as Hispanics/Latinos.

The present findings also provided little support for cross-level interactions (personal by neighborhood deprivation) posited by social-ecological models (Bronfenbrenner, 1977; Stokols, 1996) and the double jeopardy hypothesis (Ferraro & Farmer, 1996). The double jeopardy hypothesis specifies a specific pattern of interaction whereby the association between neighborhood socioeconomic deprivation and health markers is more pronounced among individuals with higher rather than lower levels of personal deprivation. Support for the double jeopardy hypothesis has been provided in previous mental health and physical health research (e.g., cardiovascular disease; Boylan & Robert, 2017). By contrast, the present findings suggest that personal socioeconomic deprivation may be similarly important among Hispanics/Latinos across levels of neighborhood socioeconomic deprivation. However, the strong association of personal income and education with neighborhood deprivation and limited variability in both neighborhood and personal socioeconomic deprivation in this study (e.g., only about 10% of the population had an annual household income above the approximate median for San Diego County, $79,079; [Data USA, 2021]) may have contributed to a lack of power for detecting such interactions.

The present findings point to several differences between males and females that have important implications. Females had higher levels of depression symptoms than males, which is in agreement with previous studies in the HCHS/SOL population (Wassterheil-Smoller et al., 2014) and with findings from systematic reviews of national studies (Cavanagh et al., 2017; Essau et al., 2010; Kuehner, 2017; Luppa et al., 2012; Salk et al., 2016). The finding that higher neighborhood socioeconomic deprivation was associated with higher depression symptoms among females but not males suggests that neighborhood characteristics may be more important for females than males in relation to depression. Since females in the present study and in many population groups tend to be more likely to be unemployed or employed part time than males, they may spend more time in their homes and neighborhoods and thus benefit from more resources and social capital near home. This suggests that neighborhood-based interventions could be particularly opportune for reaching female residents' symptoms did not differ by sex, unemployment had a stronger association with depression symptoms in male than in female residents. In accordance with vocational models from Richardson and colleagues (Richardson, 2004; Richardson & Schaeffer, 2013), there may be differences in how vocation and employment relate to self-worth and purpose between male and female residents. Males, in particular, may experience lower self-worth when unemployed, whereas unemployed female residents may be more likely to engage in unpaid activities that contribute to self-worth, such as caregiving. Relatedly, previous research has shown that among male but not female residents, unemployment was associated with lower self-esteem, which in turn was related to greater depression symptoms, though such work has not previously focused on Hispanics/Latinos residing in the US (Álvaro et al., 2019). Another possible explanation is that female residents are often more likely to engage in community activities that support social capital and self-worth (Ahern & Hendryx,

2008; Bassett & Moore, 2013). These phenomena may be in part explained by differences in gender/cultural norms.

Implications for Intervention

Although the present findings are based on cross-sectional data, their addition to a large body of evidence linking personal socioeconomic status with depression (Everson et al., 2002; Freeman et al., 2016; Lund et al., 2010; Miech & Shanahan, 2000; Sareen et al., 2011; Zimmerman & Katon, 2005) suggests that improving one's personal socioeconomic position may have a meaningful impact on improving mental health. Since Hispanics/Latinos tend to experience higher rates of personal socioeconomic deprivation and reside in areas with higher socioeconomic deprivation than non-Hispanic White populations, Hispanics/Latinos may be particularly susceptible to depression symptoms. Promising intervention strategies for addressing these concerns may include targeting both mental health and economic services among individuals experiencing socioeconomic deprivation. For example, supporting quality education opportunities can improve economic conditions, but impacts can take time to observe (Arango et al., 2018). Employment assistance services can support individuals seeking employment opportunities and have more rapid impacts, though since the link between employment and depression is likely to be bidirectional, addressing depression symptoms among unemployed individuals is also likely to be important.

Findings also suggest that employing sex-specific intervention strategies may be advantageous. For example, unemployed males could be encouraged to engage in community activities or supported to identify other sources of self-worth outside of employment. Among Hispanic/Latino females, a multilevel approach targeting both personal and neighborhood socioeconomic factors may be beneficial. This could involve efforts that concurrently address underlying causes of socioeconomic inequality as well as the negative impacts socioeconomic deprivation can have on neighborhoods, such as through improving safety and the social and physical environment (Blair et al., 2014; Diez Roux & Mair, 2010). Both shorter- and longer-term strategies are likely needed to make meaningful impacts.

Strengths and Limitations

A strength of this study was the use of probability sampling within pre-selected neighborhoods, which was intended to yield a more representative result than commonly used convenience samples (Lavange et al., 2010). However, the population studied was limited to one metropolitan area and findings may not generalize to Hispanic/Latino populations in other geographic areas or from other backgrounds (i.e., other than primarily Mexican heritage). The HCHS/SOL population is largely from relatively low socioeconomic areas, consistent with US population demographics for Hispanics/Latinos, and limited variability in neighborhood socioeconomic deprivation could have led to a decreased ability to detect associations in the current study. No information was available on how long the participants had been residing in their neighborhoods, and variation in participants' durations of exposure could have affected the results. It is important to recognize that individuals may self-select into preferred neighborhoods, with those having lower personal socioeconomic deprivation having more autonomy in choosing the neighborhoods where they reside (Oakes, 2004). This prevented us from being able to completely disentangle

the relative role of neighborhood vs. personal socioeconomic deprivation in relation to depression symptoms. Because the number of participants in each block group varied widely, with some block groups having very few participants, we did not partition variance in depression symptoms into within- and between-neighborhood variances. This study used a cross-sectional design, which prevents establishment of causation and temporality. Further complicating interpretation, associations between personal socioeconomic status and depression are likely to be bi-directional in nature (Ridley et al., 2020; i.e., socioeconomic deprivation can lead to negative life events that impact depression as well as result from experiencing negative life events that impact depression, such as loss of employment).

Conclusion

An accumulation of evidence suggests that socioeconomic deprivation is linked to symptoms of poorer mental health, and present findings expand this evidence to Hispanics/Latinos. In contrast to previous research, the present study did not identify associations between neighborhood socioeconomic deprivation and depression symptoms after accounting for personal socioeconomic deprivation, indicating a greater importance for personal rather than neighborhood economic factors among Hispanics/Latinos. However, the large overlap between personal and neighborhood economic factors in this population suggests both levels of socioeconomic influence (personal and neighborhood) are likely to be important, particularly among female residents. Efforts to address these factors may be enhanced through public policy efforts that aim to mitigate the causes of socioeconomic deprivation and inequality. Targeting interventions to Hispanics/Latinos appears particularly critical due to the consistent associations observed between socioeconomic deprivation and depression symptoms in this population-based study and high rates of socioeconomic deprivation among this population.

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High Lights

- Depression symptoms are an important mental health concern in Hispanics/Latinos.
- We examined associations of neighborhood and personal socioeconomics with depression symptoms.
- Females living in neighborhoods with higher socioeconomic deprivation had higher depression symptoms.
- This association was found to be largely due to personal socioeconomic factors.
- Findings may be informative to geographic targeting of mental health services to Hispanics/Latinos.

TABLE 1

Baseline characteristics (weighted) overall and by sex: SOL San Diego

	Total (*n* = 3851) Mean ± SE	**Male (*n* = 1355) Mean ± SE**	**Female (*n* = 2496) Mean ± SE**	***p*-value**
Age (years) 39 ± 0.5	39 ± 0.5	38 ± 0.6	40 ± 0.6	.028
CES-D 10 item summary score 6.30 ± 0.2	6.30 ± 0.2	5.45 ± 0.2	7.03 ± 0.2	.021
	%	**%**	**%**	***p*-value**
Hispanic/Latino background				
Mexican	93	90	95	.001
Dominican/Cuban/Puerto Rican	2	4	1	
Central/South American	2	2	2	
More than one/Other heritage	3	4	2	
Marital status				
Single	30	33	27	<.001
Married/living with a partner	57	59	55	
Separated/divorced/widow	13	8	18	
Years lived in the US				
US born	0	0	0	.033
Less than 10 years	21	15	19	
10 years or more	79	85	81	
Education				
Less than high School	28	27	29	.004
High School/preparatory school/GED	29	32	25	
More than High School/ GED	43	41	46	
Household income				
<$10,000	10	8	12	<.001
$10,001–$20,000	24	21	27	
$20,001–$40,000	35	33	36	
$40,001–$75,000	21	24	19	
>$75,000	10	14	6	
Employment status				
Retired and not currently employed	6	6	5	<.001

	Total (*n* = 3851) Mean ± SE	Male (*n* = 1355) Mean ± SE	Female (*n* = 2496) Mean ± SE	*p*-value
Not retired and not currently employed	41	31	50	
Employed part time (≤35 hours/week)	20	16	23	
Employed full-time (>35 hours/week)	33	47	22	
Variables included in socioeconomic deprivation index	**Mean ± SE**	**Mean ± SE**	**Mean ± SE**	***p*-value**
Education (%25+ years with no HS diploma)	16.3 ± 0.7	16.1 ± 0.8	16.5 ± 0.7	.011
Employment (% adults unemployed)	13.9 ± 0.5	13.8 ± 0.5	13.9 ± 0.4	.273
% households in poverty (Income below poverty line)	16 ± 0.8	15.8 ± 0.9	16.2 ± 0.8	.577
% female-headed households with dependent children	28.7 ± 0.4	28.4 ± 0.5	28.9 ± 0.4	.063
% households with income <$30,000 per year as a San Diego specific poverty line	29.1 ± 1.3	28.7 ± 1.5	29.3 ± 1.2	.030
% households on public assistance	4.3 ± 0.2	4.2 ± 0.2	4.4 ± 0.2	.330
% of population on public health insurance	19.7 ± 0.9	19.5 ± 1	20.0 ± 0.8	.026
% households with no car	8.1 ± 0.5	8 ± 0.5	8.2 ± 0.5	.488
% households with more than 1 person/room	14.2 ± 0.7	13.7 ± 0.8	14.6 ± 0.7	.650
% houses rented	47–5 ± 1.9	46.8 ± 2.1	48.1 ± 1.8	.013
Socioeconomic deprivation Principal Component	0.9 ± 0.1	0.9 ± 0.1	1.0 ± 0.1	<.001

Note. n indicates unweighted sample size. Means/% are weighted and account for complex survey design. *p*-values are from t-tests (continuous variables) or chi-square tests (dichotomous variables) and indicate differences between females and males. Some participants had missing values for marital status, education, household income, and/or employment status.

TABLE 2

Baseline characteristics by low-, medium-, and high socioeconomic deprivation neighborhoods: SOL San Diego

Low neighborhood socioeconomic deprivation (*n* = 151) Mean ± SE	**Medium neighborhood socioeconomic deprivation (*n* = 1922) Mean ± SE**	**High neighborhood socioeconomic deprivation (*n* = 1743) Mean ± SE**	**Total (*n* = 3816) *p*-value**
Age (years)	41 ± 1.7	39 ± 0.6	42 ± 1.43
.436			

	%	**%**	**%**	***p*-value**
Hispanic background				
Mexican	83	94	94	.021
Dominican/Cuban/Puerto Rican	3	2	2	
Central/South American	6	2	1	
More than one/Other heritage	8	2	3	
Marital status				
Single	24	31	28	.580
Married/living with a partner	65	56	58	
Separated/divorced/widow	11	13	14	
Years lived in the US				
US born	0	0	0	.967
Less than 10 years	23	21	21	
10 years or more	77	79	79	
Education				
Less than high school	11	25	36	<.001
High school/preparatory school/GED	23	28	31	
More than high school/ GED	66	47	33	
Household income				
<$10,000	5	10	11	<.001
$10,001–$20,000	7	22	31	
$20,001–$40,000	21	35	39	
$40,001–$75,000	33	23	16	
>$75,000	34	10	3	
Employment status				

	%	%	%	*p*-value
Retired and not currently employed	8	5	6	.179
Not retired and not currently employed	39	44	39	
Employed part time (≤35 hours/week)	16	18	23	
Employed full-time (>35 hours/week)	37	33	32	
Sex				
Female	46	54	54	.144
Male	54	46	46	
Total	294	2024	1495	

Note. n indicates unweighted sample size. Means/% are weighted and account for complex survey design. *p*-values are from ANOVAs (continuous variables) and chi-square tests (categorical variables) and indicate difference across levels of neighborhood socioeconomic deprivation. Categorical neighborhood socioeconomic deprivation was defined as low (−1.51 to −0.17), medium (−0.16 to 1.17), and high (1.18 to 2.51).

Table 3

Linear associations between neighborhood socioeconomic deprivation and depression symptoms

	CES-D 10					
	Total (*n* = 3851)		**Male (*n* = 1355)**		**Female (*n* = 2496)**	
	***B* (95% CI)**	***p*-value**	***B* (95% CI)**	***p*-value**	***B* (95% CI)**	***p*-value**
Main effects						
Model 1[a]						
Personal education	0.799 (0.255–1.344)	.004	0.938 (0.313–1.563)	.004	0.892 (0.083–1.702)	.031
Personal household income	1.183 (0.699–1.667)	<.0001	0.855 (0.141–1.569)	.019	1.272 (0.455–2.090)	.002
Personal employment status	1.251 (0.740–1.762)	<.0001	1.536 (0.629–2.444)	.001	0.715 (0.085–1.345)	.026
Model R squared		.064		.081		.049
Model 2[a]						
Neighborhood socioeconomic deprivation	0.648 (0.262–1.035)	.001	0.236 (−0.316–0.788)	.399	0.936 (0.315–1.557)	.003
Model R squared		.025		.015		.030
Model 3[b]						
Neighborhood socioeconomic deprivation	0.290 (−0.143–0.723)	.188	−0.093 (−0.694–0.508)	.760	0.541 (−0.118–1.201)	.107
Personal education	0.730 (0.154–1.305)	.013	0.962 (0.297–1.627)	.005	0.762 (−0.093–1.618)	.080
Personal household income	1.090 (0.550–1.630)	<.0001	0.884 (0.105–1.662)	.026	1.101 (0.268–1.934)	.010
Personal employment status	1.268 (0.763–1.774)	<.0001	1.530 (0.637–2.422)	.001	0.742 (0.117–1.367)	.020
Model R squared		.066		.081		.053
Interaction tests[b]						
Model 4: socioeconomic deprivation × personal household income	0.065 (−0.171–0.300)	.578	0.076 (−0.329–0.481)	.711	0.120 (−0.176–0.415)	.426
Model 5: socioeconomic deprivation × personal education	0.112 (−0.069–0.292)	.223	0.173 (−0.075–0.422)	.170	−0.016 (−0.262–0.231)	.901
Model 6: socioeconomic deprivation × personal employment status	0.010 (−0.213–0.234)	.928	−0.109 (−0.475–0.257)	.557	0.130 (−0.110–0.371	.285

Note. n indicates unweighted sample size. All estimates (Bs) are weighted unstandardized regression coefficients and account for complex survey design. Higher values on the socioeconomic measures correspond with higher deprivation and thus lower income, lower education, and unemployment.

[a]Adjusted for age, background, marital status, and years lived in the US.

[b]Fully adjusted (includes all aforementioned covariates, neighborhood socioeconomic deprivation, and personal socioeconomic variables entered in same model).