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Racial/ethnic differences in general physical symptoms and medically unexplained physical symptoms: Investigating the role of education

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Abstract

Objectives: Distressing physical symptoms (e.g., back pain, nausea), many of which lack medical explanation, are a common cause for medical help seeking. However, racial/ethnic and educational differences may complicate identification and explanation of such symptoms, potentially contributing to clinician misdiagnosis and patient dissatisfaction. To better understand this issue, we examined racial/ethnic differences in general physical symptoms (GPS), and more specifically, medically unexplained physical symptoms (MUPS), and whether differences varied by race/ethnicity and educational attainment.

Methods: A sample of 4,864 Latino, Asian, and non-Latino White community respondents (54% female; average age of 41 years), self-reported their GPS. Two experts then rated whether endorsed symptoms were likely to have a medical basis. We assessed the associations of GPS and MUPS with race/ethnicity, age, gender, educational attainment, chronic physical conditions, and past-year psychiatric diagnoses.

Results: Asian respondents reported significantly fewer GPS than non-Latino Whites and both Asian and Latino respondents endorsed significantly fewer MUPS than non-Latino Whites. When nativity and language were each included as covariates, racial/ethnic differences in GPS count were no longer observed; however, observed differences in MUPS count remained. Educational attainment did not demonstrate a significant relationship with either GPS or MUPS. Although

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comorbid mental health diagnoses were significantly related to both GPS and MUPS, age, gender, and comorbid physical conditions were the only significant predictors of GPS.

Conclusions: Results from this study question existing stereotypical views of racial/ethnic differences in somatization and suggest that educational attainment does not significantly contribute to reported physical symptoms—with or without medical explanation.

Brief Article Summary:

Individuals with psychological distress will sometimes express that distress in the form of physical suffering (e.g., back pain, nausea). It has long been assumed that individuals from racial/ethnic minority backgrounds were more prone to this physical form of emotional expression than non-Latino White individuals. However, this study suggests that Asian and Latino participants were *less* likely than non-Latino Whites to present with such physical symptoms and that educational attainment did not significantly impact that relationship.

Keywords

physical symptoms; race/ethnicity; education; somatization; NLAAS

The most common reason for primary care visits are distressing physical symptoms, such as cardiovascular pain or gastrointenstinal disturbances (Rief & Martin, 2014). More specifically, one in five primary care visits are due to physical symptoms which providers cannot attribute to an organic medical pathology or mental health disorder (Steinbrecher, Koerber, Frieser, & Hiller, 2011). These unexplained physical symptoms can range from acute to chronic and from mild to severe, and greatly contribute to individual disability and the global burden of disease (Rice, Smith, & Blyth, 2016).

Early theories about the development of unexplained bodily symptoms suggested that immigrants to Western countries and their progeny tended to manifest psychological distress through physical symptoms (Escobar, 1995; Farooq, Gahir, Okyere, Sheikh, & Oyebode,. Later theorists have warned against this stereotypical generalization (e.g., Kirmayer & Ryder, 2016) as it reflects a culturally reductive polarization (i.e., the psychologically expressive Western culture versus the somatizing non-Western cultures). This generalization is also mostly based on anecdotal observations and unsystematic comparisons between groups from heterogeneous settings (e.g., mental health clinics, primary care settings, general population) in the United States and Europe, which used multiple definitions of somatization (e.g., in strict psychiatric diagnostic terms, abridged constructs, or psychosocial descriptions). Thus, to overcome stereotypical views of this phenomenon, there is a need to clarify whether racial/ethnic or linguistic minorities are more likely than Whites to report any kind of physical symptoms (referred to here as general physical symptoms, or GPS) and more specifically, whether they are more likely to report physical symptoms without a known medical cause (referred to here as medically unexplained physical symptoms, or MUPS). It is also crucial to examine how other factors, such as educational attainment, a common proxy for socioeconomic status and a covariate of positive health outcomes, may impact apparent between-group differences.

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People with GPS and MUPS often meet criteria for other psychiatric disorders and medical conditions (Henningsen, 2018). Not surprisingly, the classification of GPS into medically explained or unexplained has proven difficult for physicians, limiting the interrater reliability and validity of providers' judgment in this area (Klaus et al., 2013). This challenge likely influenced a recent change in the Diagnostic and Statistical Manual of Mental Disorders (DSM) criteria for diagnosing somatic symptom and related disorders. Specifically, the updated criteria no longer includes a need for symptoms to have "no medical explanation" (American Psychiatric Association, 2013, p. 311). Although the distinction between physical symptoms with and without medical explanation no longer informs somatic symptom and related disorder diagnoses, the additional time, cost, disability, and patient dissatisfaction associated with medically unexplained physical symptoms indicates that further study is warranted (Konnopka et al., 2012; Reid, Wessely, Crayford, & Hotopf, 2002).

Currently, there is limited evidence for any effective treatment of MUPS (Creed, Kroenke, Henningsen, Gudi, & White, 2011), and generally, psychological therapies have been no more effective than enhanced care from medical doctors (Van Dessel et al., 2014). By detecting groups at higher risk for these physical symptoms, we might improve the likelihood of early identification of symptoms and development of appropriate treatment. Further, fleshing out typical characteristics of patients whose psychological distress manifests via MUPS might contribute to the development of psychoeducational interventions that can facilitate a common language to communicate this distress across cultural, gender, educational, or other divides.

Racial/Ethnic Differences in Somatization

Individuals' cultural backgrounds can complicate accurate diagnosis of physical symptoms and their causes, as racial/ethnic differences may reflect socially determined symptom presentation rather than differences in underlying psychopathology (Kirmayer & Weiss, 1997). Early research in this area suggested that patients of Hispanic or Asian origin often expressed psychological distress in somatic terms and frequently denied any potential link between psychological distress and physical symptoms (Escobar et al., 1987; Parker, Cheah, & Roy, 2001). More recent studies have called that interpretation into question. For example, a cross-sectional community study in an urban setting in Chile indicated that Hispanic subjects were generally aware of the link between physical symptoms and psychological health and did not attempt to hide or 'mask' their psychological symptoms (Skapinakis & Araya, 2011).

Rather than base explanations of racial/ethnic differences in somatization in assumptions of denial, scholars have described culture-specific models that may explain these differences. They note that metaphorical and/or somatic explanations may have developed over time within certain cultures, perhaps because the technical psychological or medical language had not yet been developed, was not preferred, or was less socially acceptable (Rohlof, Knipscheer, & Kleber, 2014). Additionally, Kim and Sherman (2007) have highlighted the importance of cultural meanings of self-expression and the moderating role of cultural beliefs on the psychological effect of self-expression. The degree of emotion conveyed in interaction across cultures has been described by ethnographic and clinical observation

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studies, such that Asians have been described as less expressive of emotions than European Americans (Tsai, Chentsova-Dutton, Freire-Bebeau, & Przymus, 2002). In other words, whereas Western cultures have been described as encouraging open emotional expression, East Asian cultures have been described as promoting emotional balance and control (Tsai & Clobert, 2019). In Mexican and other Latin American cultures, the open and vibrant expression of emotion is promoted, which contrasts with East Asian cultures that dictate control and subduing of emotional expression (Ruby, Falk, Heine, Villa, & Silberstein, 2012). Similarly, alexithymia, an "inability to express emotions" which then manifest via somatic complaints (Rohlof et al., 2014, p. 1801) is often observed outside of Western nations, such as in East Asian countries (Ryder et al., 2008).

Within the framework of the 'idiom of stress' hypothesis, Kleinman has stated that somatization is more common in cultures where stigma relates to psychiatric problems and the expression of psychological distress is inhibited (Kleinman, 1977). This hypothesis predicts that the association of somatization and mental health is influenced by culture, where somatization is a functional response that indirectly discloses distress and thereby relieves distress. Consciously or unconsciously, some individuals may prefer to present somatic problems rather than psychological problems because of a fear of ostracization from their community (Raguram, Weiss, Channabasavanna, & Devins, 1996). Given increased stigma against mental health challenges among members of racial/ethnic minority groups (Rao, Feinglass, & Corrigan, 2007), these men and women may be more likely than White individuals to express any psychological distress via physical symptoms.

Beyond racial/ethnic differences, physical experiences—like many mental health and health-related outcomes—may also vary by nativity. Soon after arriving in their new country, immigrants typically demonstrate lower rates of common mental health problems than the native population; however, over time, rates increase to become like those in the native-born population (Kirmayer et al., 2011). These observations support the 'healthy immigrant' hypothesis, which refers to the fact that foreign-born immigrants are typically healthier than the native-born population (Constant, García-Muñoz, Neuman, & Neuman, 2018; Vang, Sigouin, Flenon, & Gagnon, 2017). However, immigrants' health advantage declines with time spent in the host country and typically converges with (or even falls below) the health status of native residents (Constant et al., 2018). We might expect somatization rates to demonstrate the opposite trend, such that immigrants—particularly from cultures where somatization is more common (e.g., Asian cultures; see Ryder et al., 2008)— might initially demonstrate higher rates of somatization than native-born individuals; these rates might subsequently decrease (i.e., become more like native-born individuals) as immigrants spend more time in their host nation. However, this expectation may be complicated by findings suggesting that many immigrants from non-Western, sociocentric/collectivistic societies use both somatic and psychological attribution styles without one excluding the other (Bekker & Schepman, 2009).

Other Factors Linked to Somatization

The factors that may lead people to experience and explain their distress through physical symptoms have been extensively examined in general populations. For example, in a

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telephone survey of residents in a culturally diverse inner-city neighborhood in Canada, the only predictor of MUPS—defined as a "symptom for which a doctor could not find an explanation"—was psychological distress (Kirmayer, Groleau, Looper, & Dao, 2004, p. 665). A large-scale population study in Los Angeles found that somatization—defined as an above-cutoff number of reported physical symptoms that could not be "explained by physical illness, injury, or the use of medications, drugs, or alcohol"—was linked to sociodemographic and psychopathological factors such as older age, female gender, and psychiatric diagnosis, particularly major depressive and dysthymic disorders (Escobar et al., 1987, p. 838). Finally, in a study from the World Health Organization, lower levels of formal education were associated with higher rates of somatization among participants in 14 countries (Gureje, Simon, Ustun, & Goldberg, 1997). However, these investigations did not simultaneously explore the effects of race/ethnicity on somatization—doing so may suppress or magnify observed effects. To our knowledge, there has been no previous examination of how the interaction of education and race/ethnicity might impact the presentation of GPS/MUPS.

Education.

Studies investigating whether education level influences the presentation of GPS and MUPS have produced mixed findings. Early research with Western populations found that reported physical symptoms among primary care patients were not associated with educational level (Bridges & Goldberg, 1985; Kirmayer & Robbins, 1996). Yet studies with international and diverse sociodemographic samples have found a modest association, with higher frequency of physical symptoms reported among people with low educational attainment and socioeconomic status (Escobar, 1995; Gureje et al., 1997). In a community sample study, Chinese Americans with less than a college education were more likely to report a greater number of GPS, greater severity of symptoms, and more impairment (Mak & Zane, 2004). In another study, racial/ethnic differences in pain severity and pain-coping strategies were no longer observed after researchers controlled for educational attainment (Cano, Mayo, & Ventimiglia, 2006). Thus, research examining physical symptoms (e.g., physical pain) must consider the effects of both race/ethnicity and education on individuals' reported experiences.

We pay particular attention to the potential ways in which race/ethnicity and education may interact to impact somatization because education is one of the strongest and most consistent predictors of health, morbidity, and mortality in the United States (Walsemann, Gee, & Ro, 2013). Educational attainment, generally operationalized as years of schooling or degree attained, is an often-used measure of socioeconomic position. Education is a strong determinant of future occupation and income, yet compared to these socioeconomic indicators it is simpler to assess and less prone to bias or nonresponse error (Liberatos, Link, & Kelsey, 1988). In addition to serving as a proxy for socioeconomic status and access to quality health care, education may improve patients' receptivitiy to health education messages and communiciation while navigating health services (Galobardes, Shaw, Lawlor, Lynch, & Smith, 2006). However, the relationship between educational attainment and health is not observed equally among all racial/ethnic groups. Racial disparities in self-rated health are larger at higher levels of education, with significantly better health improvement

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observered in Whites than in racial/ethnic minorities in the United States. (Assari, 2017; Assari & Caldwell, 2017; Walton, Takeuchi, Herting, & Alegría, 2009). Given racial/ethnic disparities in the education/health relationship and mixed results regarding the relationship between education and physical symptoms, it is important to examine whether racial/ethnic differences in GPS and MUPS vary based on educational attainment.

Gender and age.

Additionally, prior work investigating gender differences in somatization suggests that physical symptoms are more common among women than men. For example, a systematic review of 47 studies examining the epidemiology of somatization disorder and hypochondriasis illustrated a clear female predominance in both disorders; this review also observed a consistent relationship between these disorders and fewer years of education and frequent comorbidity with anxiety and depressive disorders (Creed & Barsky, 2004). Additionally, somatization has often been linked to older age (Escobar, Rubio-Stipec, Canino, & Karno, 1989; Gureje et al., 1997). Specifically, individuals above 45 years of age have demonstrated a higher risk for unexplained physical symptoms than individuals 31 to 44 years of age (Gureje et al., 1997).

Depression and anxiety.

There are higher rates of depressive and anxiety disorders among people reporting MUPS compared to healthy controls or people with demonstrable organic pathology (Henningsen, 2018; Henningsen, Zimmermann, & Sattel, 2003). Studies controlling for individuals' comorbid depression and anxiety demonstrated that MUPS independently increased health care utilization (Barsky, Orav, & Bates, 2005) and disability (Harris, Orav, Bates, & Barsky, 2009) relative to people without these symptoms. Anxiety and depression can also worsen the severity of physical symptoms and their effects on other outcomes, like health care utilization (Barsky et al., 2005). Importantly, many people who present with MUPS—one-third of patients in primary care (Creed, 2006) and two-thirds of patients in specialist care (Jackson et al., 2006)—do not have depression or anxiety. Together, these findings indicate that although anxiety and depression are common among people with MUPS and can exacerbate physical symptoms, MUPS can also be an independent issue, not simply masking other psychiatric disorders. It remains unclear to what degree racial/ethnic differences in physical symptoms may vary based on depression and anxiety, as few studies specifically measuring GPS have controlled for psychiatric comorbidity.

Current Study

The current study seeks to examine racial/ethnic differences in GPS and MUPS with a particular focus on how those differences might vary based on educational attainment. Investigating this research question is important, as any clinical approach to addressing physical symptoms would differ depending on what best explains their manifestation. For example, racial/ethnic differences in number of MUPS despite adjusting for relevant covariates might suggest a need to more fully explore pertinent cultural concerns and techniques for intervention during clinical care. Alternatively, if differences in educational attainment better explain the development of these symptoms, concerns about addressing

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stigma and generating accessible language for psychological distress may be more relevant strategies for reducing them.

We generated several hypotheses based on the previous research described above. First, we hypothesized that racial/ethnic differences in physical symptoms would emerge, such that members of racial/ethnic minority groups would report more physical symptoms without medical explanation than White individuals. We also hypothesized that individuals with less formal education would demonstrate more physical symptoms than individuals with higher educational attainment and that race/ethnicity and education would interact to magnify the effect of both (i.e., members of racial/ethnic minority groups with less formal education would demonstrate the most physical symptoms). Additionally, we expected to observe significant positive relationships between physical symptoms and: female gender, older age, chronic physical conditions, and past-year psychiatric diagnosis. Finally, we hoped to explore whether nativity status or survey language—which tend to vary by race/ethnicity—would explain any racial/ethnic differences in physical symptom counts.

Methods

Sample and Participants

This study analyzed data from the National Latino and Asian American Study (NLAAS), a nationally representative survey of noninstitutionalized Latino and Asian adults (above 18 years of age) in the coterminous United States, carried out as part of the National Institute of Mental Health Collaborative Psychiatric Epidemiological Studies (Alegría et al., 2004; Heeringa et al., 2004). More details on the survey design and sampling procedure can be found in previous publications (Alegría et al., 2004; Heeringa et al., 2004). The current sample (N = 4,864) consisted of 2,554 Latino/Latino American participants (Mexican, Puerto Rican, Cuban, and other Latino), 2,095 Asian/Asian American participants (Chinese, Vietnamese, Filipino, and other Asian), and 215 non-Latino Whites. Respondents were mostly female (54%) and were, on average, approximately 41 years of age. Surveys were conducted in-person in participants' preferred language (i.e., English, Spanish, Mandarin, Tagalog, or Vietnamese). Written informed consent was obtained from all respondents and Institutional Review Boards from Cambridge Health Alliance, University of Washington, and University of Michigan approved all study procedures.

Measures

General physical symptoms (GPS).—Survey respondents were asked whether they experienced 14 examples of common physical symptoms (i.e., stomach pain; diarrhea; loose bowels or constipation; pain in arms, legs, or joints; chest pain; heart racing or pounding; shortness of breath or trouble breathing; back pain; nausea, gas, or indigestion; pain or problems related to menstruation; pain or problems during sex; dizziness; fainting; trouble swallowing; or numbness or tingling in body or extremities) that comprise the Somatic Symptom Index (SSI), an abridged somatization construct that has been linked to psychopathology and disability (Escobar et al., 1989). Like Escobar and colleagues (Escobar et al., 2010), we identified symptoms as present if a respondent described the symptom as frequent or severe and had sought medical help for the symptom during the previous 12

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months. Endorsed symptoms were then summed to create a total number of physical symptoms. Because women could report up to 14 symptoms, whereas men could only report up to 13 symptoms, we controlled for gender in all analyses examining GPS.

Medically unexplained physical symptoms (MUPS).—For each positively endorsed GPS item, respondents were asked to provide a description of the symptom and any health professionals' explanation for that symptom. All responses were recorded verbatim and later independently reviewed by two experts to assess whether the physical symptoms were likely medically explained or unexplained. 1 Symptoms were counted as medically unexplained when they were coded by *both* reviewers as either medically unexplained or possibly medically unexplained; if there was disagreement about a symptom, it was not labeled medically unexplained. The two reviewers agreed in approximately 80% of cases. After this procedure, the number of identified MUPS was summed for each respondent. Because the presence of MUPS is conditional on having at least one GPS and women can endorse an additional physical symptom compared to men, we controlled for both the number of GPS and gender in all analyses examining MUPS.

Variables of Interest and Covariates

The variables of interest included race/ethnicity (Latino, Asian, non-Latino White; White as reference category), and years of education (less than 6 years, 6–11, 12, 13–15, 16 years or more; 16 years or more as reference category). Across the course of the analysis process, we adjusted for several covariates, including age and gender (male, female; male as reference category). We also controlled for physical morbidity by incorporating the number of chronic physical conditions (i.e., arthritis or rheumatism, gastrointestinal ulcer, hypertension, heart disease, stroke, diabetes, cancer, asthma, lung disease, tuberculosis, or HIV/AIDS) endorsed by respondents into the model and controlled for whether respondents endorsed any past-year depressive disorder (i.e., dysthymia or major depressive disorder), any past-year anxiety disorder (i.e., social phobia, panic disorder, agoraphobia, or generalized anxiety disorder), or any past-year substance use disorder (alcohol or drug abuse or dependence). Any behavioral health diagnoses were identified through the use of the World Health Organization (WHO) Composite International Diagnostic Interview (CIDI) Version 3.0 (Robins et al., 1988).

Data Analysis

Analyses were conducted using Stata Version 14.2 (StataCorp, 2015). First, we generated descriptive statistics of the sample and determined whether racial/ethnic differences emerged for any of our independent or dependent variables; these results are displayed in Table 1. We then conducted bivariate analyses with each independent variable to determine whether it was significantly related to number of GPS (while controlling for gender) and/or number of MUPS (while controlling for both gender and number of GPS) in the examined sample. Then, we utilized two series of multiple regressions—one with number of GPS as the

[1]The expert reviewers were both trained as medical doctors and psychiatrists, both reviewers were of Latinx heritage and conducted cross cultural work. Additionally, both reviewers had developed expertise in somatic symptoms and were involved in guiding development of the DSM-5 Somatization Disorder diagnosis. When reviewing participants' reported physical symptoms and the additional information provided about those symptoms, the experts were instructed to rate whether the reported symptoms were likely to have an underlying medical explanation.

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outcome and the second with number of MUPS as the outcome—to evaluate the relationships between our variables of interest and our outcome variables when controlling for other covariates, such as age, chronic physical conditions, and past-year mental health comorbidities. Given our use of count variables as outcomes and the high frequency of respondents reporting zero GPS and MUPS, we used zero-inflated negative binomial regression models for these analyses.

Both series of analyses occurred in the following order: first, we examined the relationship between race/ethnicity and reported symptoms while controlling for age and gender (Model 1). Then, we incorporated educational attainment into the model as an additional independent variable (Model 2). We also tested an interaction of race/ethnicity and educational attainment to determine whether the relationship between race/ethnicity and reported symptoms varied by education. Finally, we incorporated physical health and mental health variables into the model, including: number of physical conditions, diagnosis of any depressive disorder (no, yes), diagnosis of any anxiety disorder (no, yes), and diagnosis of any substance disorder (no, yes); this analysis comprised Model 3. After completion of these analyses, additional sensitivity analyses were conducted. Specifically, for each outcome, we examined whether adding nativity status (US-born, foreign-born) or language (English, Spanish, Mandarin/Vietnamese/Tagalog) to Model 3 as a covariate would change previously observed relationships. Further, we examined whether nativity or gender served as moderating variables.

Power analysis.—To test whether our bivariate and multivariate analyses were sufficiently powered, we ran a series of Monte Carlo simulations to calculate power of an F-test for significant differences in GPS and MUPS across racial/ethnic groups at the 0.05 level. In each simulation, we drew random subsamples (with replacement) of 215—the size of our non-Latino White subsample—from each racial/ethnic group. Power calculations were based on 1,000 simulations. In bivariate models, results showed that we had 80.9% power to detect a significant difference in GPS by race/ethnicity, and 84.5% power to detect a significant difference in MUPS by race/ethnicity. In multivariate models, we had 79.6% power to detect a significant difference in GPS by race/ethnicity, and 80.0% power to detect a significant difference in MUPS by race/ethnicity.

Results

Descriptive Statistics

In the examined sample, 1,649 respondents (33.9%) endorsed at least one frequent and severe general physical symptom and, within that group, 525 individuals (31.8%) endorsed symptoms that were designated medically unexplained. Further descriptive information, organized by racial/ethnic group, is displayed in Table 1. Significant racial/ethnic differences were observed in general physical symptoms ($p < .001$) and medically unexplained symptoms ($p < .001$). Racial/ethnic differences were also observed in age ($p < .001$), nativity ($p < .001$), educational attainment ($p < .001$), and whether participants endorsed any chronic physical condition ($p = .034$), any depressive disorder ($p = .001$), any anxiety disorder ($p = .003$), or any substance use disorder ($p = .009$).

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Bivariate Analyses

Prior to conducting multivariate regression analyses, we conducted bivariate regression analyses with each of our independent variables and each of our two outcome variables (i.e., GPS, MUPS) while controlling for gender (GPS analysis) or gender and GPS count (MUPS analysis). Results of these bivariate analyses are displayed in Table 2.

General physical symptoms (GPS).—As noted above, race/ethnicity demonstrated a significant relationship with GPS, such that Asian respondents endorsed fewer GPS than White respondents, IRR = 0.56, 95% CI:[0.59, 1.02]. Significant age group differences in GPS were also observed, as respondents in each older age group (i.e., 35–49, 50–64, and 65 and older) endorsed more GPS than respondents between the ages of 18 and 34. Finally, number of chronic physical conditions, any past-year depressive disorder, any past-year anxiety disorder, and any past-year substance use disorder were all also significantly related to GPS. No significant relationship between educational attainment and self-reported GPS was observed. These results are displayed in more detail in Table 2.

Medically unexplained symptoms (MUPS).—Like for GPS, bivariate analyses investigating the relationship between race/ethnicity and MUPS count produced a significant result; here, both Latino, IRR = 0.44, 95% CI:[0.33, 0.58], and Asian, IRR = 0.55, 95% CI: [0.42, 0.72], respondents demonstrated fewer MUPS than White respondents. Further, no significant relationship between educational attainment and identified MUPS was observed. However, unlike the results of bivariate GPS analyses, no age group differences were observed for identified MUPS; nor were there significant differences based on number of chronic conditions, any depressive disorder, or any substance use disorder. Participants with any anxiety disorder were more likely to present with more MUPS than those participants with no anxiety diagnosis, IRR = 1.42, 95% CI:[1.03, 1.94]. These results are displayed in more detail in Table 2.

Multiple Regression Analyses: GPS

Our initial zero-inflated negative binomial regression (Model 1) demonstrated that race/ethnicity, gender, and age were significantly related to number of reported general physical symptoms. Specifically, Asian respondents reported significantly fewer symptoms than White respondents, IRR = 0.66, 95% CI:[0.52, 0.84]—no significant differences were observed between Latino and White respondents. Additionally, female respondents reported significantly more symptoms than male respondents, IRR = 1.85, 95% CI:[1.55, 2.19], and, compared to respondents between the ages of 18–34, respondents from each other age group reported significantly more GPS (IRRs ranged from 1.57 to 2.62). Results for these analyses —and all GPS analyses—are displayed in Table 3.

Next, we incorporated respondent educational attainment into the analysis (Model 2). Similar results emerged, as race/ethnicity, gender, and age were once again significantly related to self-reported GPS. As displayed in Table 3, the incidence rate ratios for these relationships were quite similar to those observed in Model 1. However, we failed to observe a significant relationship between educational attainment and GPS when controlling for age, gender, and race/ethnicity. We then examined whether the relationship between race/

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ethnicity and GPS count varied by educational attainment, but observed no significant interaction effect, $F(8, 62) = 1.29, p = .265$.

Our final model added several variables related to physical and mental health, including number of reported chronic physical conditions, past-year depressive disorder, past-year anxiety disorder, and past-year substance use disorder (Model 3). Results of this analysis are also displayed in Table 3, and suggest that race/ethnicity, gender, age, physical health, and mental health are all significantly related to number of self-reported GPS. Specifically, even when controlling for physical and mental health conditions, Asian respondents reported significantly fewer symptoms than White respondents, IRR = 0.72, 95% CI:[0.56, 0.93], women reported significantly more symptoms than men, IRR = 1.77, 95% CI:[1.51, 2.08], and respondents in the 35–49 age group, IRR = 1.28, 95% CI:[1.08, 1.52], and 50–64 age group, IRR = 1.27, 95% CI:[1.01, 1.59], both reported significantly more symptoms than respondents in the 18–34 age group. However, once we controlled for physical and mental health conditions, respondents ages 65 and older did not demonstrate a significant difference from the 18–34 age group in number of reported GPS, IRR = 1.20, 95% CI:[0.92, 1.56]. Additionally, number of chronic physical conditions demonstrated a significant positive relationship with self-reported GPS in our final model, such that an increase in the number of chronic physical conditions was linked to an increase in the number of GPS reported, IRR = 1.70, 95% CI:[1.58, 1.83]. Moreover, respondents who met criteria for any past-year depressive disorder, IRR = 1.75, 95% CI:[1.48, 2.08], or any past-year anxiety disorder, IRR = 1.76, 95% CI:[1.49, 2.10], endorsed significantly more general physical symptoms than those who did not meet the same diagnostic criteria. No significant differences in GPS count were observed based on past-year substance disorder diagnosis, IRR = 1.25, 95% CI:[0.88, 1.78]. [2]

Multiple Regression Analyses: MUPS

After conducting the above-described analyses, we repeated the same series of zero-inflated negative binomial regression analyses using number of reported symptoms identified by physicians as medically unexplained (i.e., MUPS) as the outcome variable. Our initial analysis, which examined race/ethnicity and age while controlling for gender and number of GPS (Model 1), indicated that Latino respondents, IRR = 0.44, 95% CI:[0.33, 0.59], and Asian respondents, IRR = 0.57, 95% CI:[0.44, 0.75], demonstrated significantly fewer MUPS than White respondents. Additionally, women demonstrated significantly more MUPS than men, IRR = 1.50, 95% CI:[1.16, 1.93], and GPS count was significantly related to MUPS count, IRR = 1.77, 95% CI:[1.67, 1.88]. Results for these analyses—and all MUPS analyses—are displayed in Table 4.

Next, we incorporated respondent educational attainment into the analysis (Model 2). Similar results emerged, as Latino respondents, IRR = 0.48, 95% CI:[0.36, 0.63], and Asian respondents, IRR = 0.58, 95% CI:[0.44, 0.75], presented with significantly fewer MUPS

[2]Because we failed to observe a significant relationship between educational attainment and GPS in both Model 2 and Model 3, we conducted an additional sensitivity analysis, estimating Model 3 without including education. The estimated incidence rate ratios for the remaining independent variables were quite similar to those values displayed for Model 3 in Table 3 (with no change in significance for any variable), suggesting that education is not a factor that significantly influenced reported number of GPS.

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than White respondents and gender and GPS count again demonstrated significant relationships with MUPS count, even when controlling for educational attainment. We then examined whether the relationship between race/ethnicity and MUPS count might vary by educational attainment, but observed no significant interaction effect, $F(8, 62) = 1.16, p = .335$.

Our final model, which added number of chronic physical conditions, any depressive disorder diagnosis, any anxiety disorder diagnosis, and any substance use disorder diagnosis (Model 3), indicated that race/ethnicity, gender, GPS count, and past-year depressive disorder were all significantly related to number of MUPS. Specifically, even when controlling for physical and mental health conditions, Latino respondents, IRR = 0.46, 95% CI:[0.34, 0.62], and Asian respondents, IRR = 0.57, 95% CI:[0.44, 0.74], still presented with significantly fewer MUPS than White respondents and female respondents still presented with significantly more MUPS than male respondents, IRR = 1.43, 95% CI:[1.10, 1.86]. Additionally, number of GPS demonstrated a significant positive relationship with number of MUPS, IRR = 1.74, 95% CI:[1.64, 1.84]. Finally, respondents who met criteria for any past-year depressive disorder presented with significantly more medically unexplained symptoms than those respondents who did not meet diagnostic criteria for a depressive disorder, IRR = 1.48, 95% CI:[1.02, 2.16]. [3]

Sensitivity Analyses

Sensitivity analyses were also conducted to investigate: 1) whether individually incorporating nativity status and survey language into the final regression model for each outcome would alter the significant relationships observed and 2) whether gender or nativity status served as moderating variables. First, to determine whether racial/ethnic differences in nativity status, $F(2, 68) = 75.61, p < .001$, would explain apparent racial/ethnic differences in general and medically unexplained physical symptom counts, we incorporated nativity status into the final models of both outcome variables. After incorporating nativity status into the GPS version of Model 3, significant differences between White and Asian respondents were no longer observed, IRR = 0.95, 95% CI:[0.27, 1.24]. However, in the MUPS version of Model 3, incorporating nativity as a predictor variable did not change any observed racial/ethnic differences; both Latino respondents, IRR = 0.43, 95% CI:[0.31, 0.60]), and Asian respondents, IRR = 0.52, 95% CI:[0.38, 0.71], continued to display fewer MUPS than White respondents.

To determine the potential effect of survey language on outcomes, we examined it as a Model 3 covariate in two different ways: by replacing race/ethnicity with language (given the strong relationship between these variables) and by including both race/ethnicity and language as covariates. Interestingly, for GPS, language was significant in both forms of the analysis and, when it was included as a covariate with race/ethnicity, no significant racial/ethnic differences in GPS count were observed. However, in the MUPS model, language did

[3]Like our findings with GPS as an outcome variable, we failed to observe a significant relationship between educational attainment and MUPS in both Model 2 and Model 3; thus, we conducted an additional sensitivity analysis, estimating Model 3 without including education. Again, the estimated incidence rate ratios for the remaining independent variables were quite similar to the ones displayed for Model 3 in Table 4 (with no change in significance for any variable), suggesting that education is not a factor that significantly influenced reported number of MUPS.

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not demonstrate a significant relationship with MUPS count and race/ethnicity remained significant when both were included.

Sensitivity analyses related to potential moderating variables focused on gender and nativity status. We tested whether each of these variables demonstrated significant interactions with race/ethnicity in the final models (i.e., Model 3) of both GPS and MUPS analyses. No significant race/ethnicity-gender interactions emerged for either outcome. For nativity status, no significant interactions were observed within the GPS model. For the MUPS analysis, although there was some evidence that nativity might serve as a moderator for both Latino respondents, IRR = 0.43, 95% CI: [0.20, 0.90], and Asian respondents, IRR = 0.46 95% CI: [0.22, 0.97], an omnibus test revealed that, jointly, the examined interactions were not significantly different from zero, $F(2, 68) = 2.77$, $p = .070$. Therefore, we cannot confidently suggest that nativity serves as a moderator for the relationship between race/ethnicity and MUPS, as the significant individual findings described might reflect Type I error from multiple comparisons. More detailed results of sensitivity analyses are available from the authors.

Discussion

Our study provides perspective for better understanding racial/ethnic differences in reported physical symptoms—whether medically explained or medically unexplained—rather than adding to the misperception surrounding somatization. Study findings challenge generalizations that racial/ethnic minorities “somaticize” and Whites “psychologize” their suffering and support the need to engage in an emic approach to diagnostics, examining how physical symptom endorsement may be related to culture, education level, gender, physical health, and mental health. A specific focus was given on educational attainment, as it is considered an important indicator of social and health inequalities in the general population (Walsemann et al., 2013).

Although we did observe racial/ethnic differences in GPS and MUPS, the relationship emerged in the opposite direction of what was expected. Specifically, Asian respondents reported significantly *fewer* GPS than non-Latino Whites and both Asian and Latino respondents endorsed significantly fewer MUPS than non-Latino Whites. This finding appears to contrast with previous studies suggesting that racial/ethnic minorities usually express more physical symptoms than members of the predominant racial/ethnic group in Western egocentric/individualistic societies (Escobar, 1995; Farooq et al., 1995). Thus, our study results also challenge stereotypical generalizations that assume individuals with “Eastern” cultural backgrounds display distress via somatization, perhaps for lack of ability to express emotion (Ruby et al., 2012; Tsai & Clobert, 2019). Interestingly, nativity and language each diminished differences in reported GPS between Asian and non-Latino White respondents when they were included in the model; however, racial/ethnic differences in MUPS count remained even when these covariates were simultaneously examined and physical and mental health comorbidities were controlled for in the analysis. Thus, the healthy immigrant effect alone does not appear to explain observed differences in somatization.

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Perhaps some aspects of Asian and Latino culture within the United States (e.g., valued relationships, links to extended family, more social support) are protective against somatization (Krueger, Chentsova-Dutton, Markon, Goldberg, & Ormel, 2003), despite differences related to expressiveness or increased concerns related to stigma. Future research might investigate these potential protective cultural factors. Further, it is important to recognize that substantial intracultural variations in preferred modes of expression of, explanation for, and personal and social response to psychological distress and dysfunction have been documented (Draguns & Tanaka-Matsumi, 2003). This pattern implies that it is impossible to consider immigrants and members of diverse ethnocultural communities as a homogeneous group when assessing risk for psychopathological conditions (Carta, Bernal, Hardoy, & Haro-Abad, 2005) or shared experiences related to bodily or psycho-emotional complaints (Canino, Rubio-Stipec, Canino, & Escobar, 1992).

Although prior research has suggested links between education and somatization (Escobar, 1995; Gureje et al., 1997), in the current study, both bivariate and adjusted analyses failed to demonstrate a significant relationship between educational attainment and either GPS or MUPS—nor did educational attainment impact the relationship between race/ethnicity and GPS or MUPS. Similarly, although we observed gender and age differences in endorsed GPS, no significant relationships were observed between these characteristics and MUPS count, contrary to expectations. It may be that cultural explanations for somatization differences are more useful and appropriate than hypotheses based on sociodemographics playing a role in these expressions. Instead, physical idiomatic expressions of suffering may be driven by cultural understandings of the self (Sneddon, 2003) rather than by educational attainment, gender, or age. Further, in terms of education, Walsemann and colleagues (2013) have suggested several areas of educational inequity beyond personal educational attainment, such as educational quality, school segregation, and the value of education among immigrants and ethnic minorities. Thus, using years of formal education alone may not sufficiently capture the breadth of experiences or learning processes that can impact health outcomes.

Finally, findings from the multivariate analyses were partly supportive of our hypothesis regarding physical and psychiatric comorbidity: comorbid physical conditions and anxiety and depression were linked to GPS count; however, only past-year depressive disorder diagnosis was significantly related to MUPS count. This finding aligns with general population studies demonstrating that, regardless of whether a clear biomedical cause exists, physical symptoms are associated with both physical and psychiatric diagnoses (Escobar et al., 2010; Kisely & Simon, 2006; van der Sluijs et al., 2015). Additionally, comorbidity between somatization and depressive disorders has been previously identified (De Waal, Arnold, Eekhof, & Van Hemert, 2004; Drayer et al., 2005). This relationship is likely further complicated by the fact that bodily pain (e.g., headaches, muscle aches) can serve as a symptom of depression and by the possibility that physical suffering contributes to or exacerbates existing depressive symptoms. As a result, it may be that factors contributing to somatization exist across cultures and, therefore, all individuals have the potential to express emotional pain via physical symptoms (Isaac, Janca, & Orley, 1996; Kirmayer & Young, 1999). The possibly ubiquitous nature of somatic expression of psychological distress further supports the importance of investigating characteristics of particularly vulnerable

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groups to improve the likelihood of accurate identification and adequate treatment of individuals in need.

In discussing our findings, we acknowledge existing study limitations. For example, because racial/ethnic minorities are not homogeneous groups of the general population, our study might have been improved if analyses were further broken down by Asian (i.e., Chinese, Vietnamese, Filipino, and others) and Latino (i.e., Mexican, Puerto Rican, Cuban, and others) subgroups. However, doing so would have severely limited the number of participants within each group for the purposes of analysis, thereby further reducing power to observe effects. Moreover, we recognize that our comparison group of non-Latino White respondents ($N = 215$) was considerably smaller than the groups of Latino ($N = 2,554$) and Asian ($N = 2,095$) respondents. However, results of a power analysis support the robustness of our findings despite this group size discrepancy.

Finally, we acknowledge that, as a whole, our sample endorsed low counts of both GPS and MUPS, especially considering that symptoms with shared physician uncertainty were included in the total MUPS count. Thus, our findings may have limited generalizability to groups (e.g., medical or mental health clinic patients) who typically report more unexplained physical symptoms (Interian et al., 2004; Simon, Gater, Kisely, & Piccinelli,1996). However, in addition to focusing on clinical samples, prior studies with greater prevalence rates used somatization measures comprised of 35 or more symptoms, as compared to the 14 symptoms used here and in more recent research (Escobar et al., 2010; Mereish, Liu, & Helms, 2012). When other studies have employed comparable measures within a general population, similar rates of GPS and MUPS have been observed (Escobar et al., 2010; Mereish et al., 2012; van der Sluijs et al., 2015). It may be that distressing physical symptoms—both GPS and MUPS—are a particular problem for a meaningful subset (i.e., about one-third) of the general population and future research might focus on this subset to better understand the factors contributing to reported symptoms and how best to treat them.

Overall, this study has provided innovative results for understanding bodily complaints as symptoms of physical and mental pathologies as well as omnipresent cultural symbols of illness experience. It challenged some longstanding stereotypes, such as that ethnic minorities “somatize” their suffering more than members of the predominant culture in Western societies. Future research in this area may address the risks and benefits to presenting psychological distress as physiological perturbances across diverse racial/ethnic groups. Additionally, future studies might include qualitative methodologies, such as in-depth individual interviews and focus group discussions, to better understand how individuals from different racial/ethnic groups and educational backgrounds make meaning of physical symptoms, as well as the value they place on these symptoms when compared to other forms of symptomotology. Finally, although the DSM-5 has removed the distinction between GPS and MUPS for the purposes of diagnosing somatic symptom disorder, research should seek to elicit opinions from providers about the ways in which they perceive and treat individuals with apparent MUPS. Clinical decision making may benefit from distinguishing between physical symptoms with and without medical explanation, but a lack of obvious medical explanation for a given symptom does not erase its negative effects on the individual experiencing it—nor does it preclude a medical explanation from later discovery.

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Recognizing and conveying these facts to patients may help providers facilitate a strong therapeutic relationship and improve future treatment outcomes.

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Table 1.

Weighted sociodemographic & health characteristics by race/ethnicity

	Latino (N = 2,554)		Asian (N = 2,095)		Non-Latino White (N = 215)		Test for Group Differences
	Unweighted N	**Weighted %**	**Unweighted N**	**Weighted %**	**Unweighted N**	**Weighted %**	***F* (df1, df2); *p***
Gender							3.07 (2, 68); $p = .052$
Female	1427	48.5	1097	52.5	110	51.8	
Male (ref)	1127	51.5	998	47.5	105	48.2	6.38 (6, 68); $p < .001$
Age							
18–34 (ref)	1068	49.0	799	39.5	57	27.9	
5–49	801	30.1	716	32.2	89	31.0	
50–64	454	13.4	416	18.0	42	21.6	
65 and older	231	7.5	164	10.3	27	19.4	
Nativity							75.61 (2, 68); $p < .001$
US-born	919	41.4	454	23.1	196	92.0	
Foreign-born	1630	58.6	1639	76.9	19	8.0	26.44 (8, 68); $p < .001$
Educational attainment							
Less than 6 years	204	10.3	87	4.8	4	1.9	
6–11 years	789	34.2	229	10.4	16	6.1	
12 years	633	24.5	372	17.7	47	19.5	
13–15 years	567	20.8	529	25.3	68	31.5	
16 or more years (ref)	361	10.2	878	42.0	80	40.9	
Any chronic physical condition	1075	37.3	822	38.8	100	50.4	3.55 (2, 68); $p = .034$
Any mood disorder	254	8.8	101	4.9	17	5.8	7.43 (2, 68); $p = .001$
Any anxiety disorder	252	8.4	114	5.5	25	10.6	6.41 (2, 68); $p = .003$
Any substance disorder	65	2.9	28	1.3	10	3.9	5.06 (2, 68); $p = .009$
	Latino		Asian		Non-Latino White		Test for Group Differences
	M	*SE*	*M*	*SE*	*M*	*SE*	*F*(df1, df2); *p*
Total GPS count	0.79	0.04	0.57	0.03	1.04	0.14	13.31 (2, 68); $p < .001$
Total MUPS count	0.16	0.02	0.15	0.01	0.37	0.05	7.82 (2, 68); $p < .001$

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Table 2.

Bivariate analyses examining links to general physical symptoms (GPS) and medically unexplained symptoms (MUPS) (N = 4,864)

	GPS[a]			MUPS[b]		
	IRR	**95% CI**	***F* (df1, df2); *p***	***IRR***	**95% CI**	***F* (df1, df2); *p***
Race/ethnicity						
White (reference)	--	--	13.46 (2, 68) $p < .001$	--	--	17.41 (2, 68) $p < .001$
Latino	0.78	[0.59, 1.02]		0.44***	[0.33, 0.58]	
Asian	0.56***	[0.42, 0.75]		0.55***	[0.42, 0.72]	
Age group						
18–34 (reference)	--	--	26.67 (3, 67) $p < .001$			2.47 (3, 67) $p < .069$
35–49	1.58***	[1.32, 1.89]		0.86	[0.64, 1.16]	
50–64	2.24***	[1.79, 2.80]		0.93	[0.70, 1.23]	
65 and older	2.68***	[2.02, 3.56]		1.47	[0.99, 2.17]	
Educational attainment						
Less than 6 years	1.05	[0.72, 1.53]		0.65	[0.38, 1.13]	
6–11 years	0.90	[0.71, 1.14]		0.64	[0.40, 1.03]	
12 years	0.84	[0.62, 1.15]	0.88 (4, 66) $p = .480$	0.82	[0.55, 1.24]	1.78 (4, 66) $p = .142$
13–15 years	0.84	[0.64, 1.11]		0.93	[0.56, 1.55]	
6 or more years (reference)	--	--		--	--	
Number of chronic conditions	1.81***	[1.69, 1.94]	--	1.03	[0.93, 1.15]	--
Any mood disorder	2.67***	[2.17, 3.28]	--	1.38	[0.95, 2.01]	--
Any anxiety disorder	2.62***	[2.14, 3.21]	--	1.42*	[1.03, 1.94]	--
Any substance disorder	1.72*	[1.06, 2.80]	--	0.99	[0.52, 1.88]	--

* $p < 0.05$

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** $p < 0.01$

*** $p < 0.001$

[a] All GPS models include gender as a covariate.

[b] All MUPS models include gender and GPS count as a covariate.

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Table 3.

Examining factors linked to general physical symptoms (GPS) among NLAAS respondents (N = 4,864)

	Model 1		Model 2		Model 3	
	IRR	**95% CI**	***IRR***	**95% CI**	***IRR***	**95% CI**
Race/ethnicity						
White (reference)	--	--	--	--	--	--
Latino	0.94	[0.76, 1.18]	1.02	[0.81, 1.30]	0.99	[0.76, 1.30]
Asian	0.66**	[0.52, 0.84]	0.67**	[0.53, 0.85]	0.72*	[0.56, 0.93]
Gender						
Male (reference)	--	--	--	--	--	--
Female	1.85***	[1.55, 2.19]	1.84***	[1.56, 2.18]	1.77***	[1.51, 2.08]
Age group						
18–34 (reference)	--	--	--	--	--	--
35–49	1.57***	[1.32, 1.87]	1.58***	[1.32, 1.89]	1.28**	[1.08, 1.52]
50–64	2.21***	[1.79, 2.73]	2.25***	[1.82, 2.79]	1.27*	[1.01, 1.59]
65 and older	2.62***	[2.00, 3.42]	2.73***	[2.07, 3.59]	1.20	[0.92, 1.56]
Educational attainment						
Less than 6 years	--	--	0.77	[0.54, 1.09]	0.71	[0.45, 1.11]
6–11 years	--	--	0.81	[0.66, 1.01]	0.70**	[0.56, 0.88]
12 years	--	--	0.88	[0.67, 1.17]	0.83	[0.66, 1.05]
13–15 years	--	--	0.90	[0.69, 1.16]	0.89	[0.73, 1.08]
16 or more years (reference)	--	--	--	--	--	--
Number of chronic conditions	--	--	--	--	1.70***	[1.58, 1.83]
Any mood disorder	--	--	--	--	1.75***	[1.48, 2.08]
Any anxiety disorder	--	--	--	--	1.76***	[1.49, 2.10]
Any substance disorder	--	--	--	--	1.25	[0.88, 1.78]

* $p < 0.05$

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** $p < 0.01$

*** $p < 0.001$

Note: Model 1 simultaneously examined race/ethnicity, gender, and age group; Model 2 examined race/ethnicity, gender, age group, and educational attainment; Model 3 examined race/ethnicity, gender, age group, educational attainment, number of chronic physical condition, any past-year mood disorder, any past-year anxiety disorder, and any past-year substance use disorder.

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Table 4.

Examining factors linked to medically unexplained physical symptoms (MUPS) among NLAAS respondents (N = 4,864)

	Model 1		Model 2		Model 3	
	IRR	**95% CI**	***IRR***	**95% CI**	***IRR***	**95% CI**
Race/ethnicity						
White (reference)	--	--	--	--	--	--
Latino	0.44***	[0.33, 0.59]	0.48***	[0.36, 0.63]	0.46***	[0.34, 0.62]
Asian	0.57***	[0.44, 0.73]	0.58***	[0.44, 0.75]	0.57***	[0.44, 0.74]
Gender						
Male (reference)	--	--	--	--	--	--
Female	1.50**	[1.16, 1.93]	1.48**	[1.14, 1.91]	1.43**	[1.10, 1.86]
Age group						
18–34 (reference)	--	--	--	--	--	--
35–49	0.79	[0.60, 1.03]	0.79	[0.60, 1.04]	0.80	[0.60, 1.05]
50–64	0.81	[0.61, 1.08]	0.84	[0.61, 1.15]	0.92	[0.69, 1.22]
65 and older	1.12	[0.78, 1.61]	1.19	[0.82, 1.73]	1.30	[0.87, 1.95]
GPS count	1.77***	[1.67, 1.88]	1.77***	[1.67, 1.87]	1.74***	[1.64, 1.84]
Educational attainment						
Less than 6 years	--	--	0.86	[0.50, 1.48]	0.88	[0.51, 1.52]
6–11 years	--	--	0.84	[0.53, 1.36]	1.05	[0.54, 1.39]
12 years	--	--	1.02	[0.68, 1.53]	1.24	[0.71, 1.56]
13–15 years	--	--	1.07	[0.67, 1.72]	1.00	[0.69, 1.75]
16 or more years (reference)	--	--	--	--	--	--
Number of chronic conditions	--	--	--	--	0.98	[0.88, 1.08]
Any mood disorder	--	--	--	--	1.48*	[1.02, 2.16]
Any anxiety disorder	--	--	--	--	1.28	[0.97, 1.71]
Any substance disorder	--	--	--	--	0.82	[0.43, 1.57]

*$p < 0.05$

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** $p < 0.01$

*** $p < 0.001$

Note: Model 1 simultaneously examined race/ethnicity, gender, and age group; Model 2 examined race/ethnicity, gender, age group, and educational attainment; Model 3 examined race/ethnicity, gender, age group, educational attainment, number of chronic physical condition, any past-year mood disorder, any past-year anxiety disorder, and any past-year substance use disorder.