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Race/ethnicity, nativity, and lifetime risk of mental disorders in U.S. adults

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Abstract

Purpose—There has been no comprehensive examination of how race/ethnicity and nativity intersect in explaining differences in lifetime prevalence of mental disorders among Asian, Black, Latino, and White adults. This study aims to estimate racial/ethnic differences in lifetime risk of mental disorders and examine how group differences vary by nativity.

Methods—Survival models were used to estimate racial/ethnic and nativity differences in lifetime risk of DSM-IV anxiety, mood, and substance use disorders in a nationally representative sample of over 20,000 respondents to four U.S. surveys.

Results—Asians had the lowest lifetime prevalence of mental disorders (23.5%), followed by Blacks (37.0%), Latinos (38.8%), and Whites (45.6%). Asians and Blacks had lower lifetime risk than Whites for all disorders even after adjusting for nativity; Latinos and Whites had similar risk after adjusting for nativity. Risk of disorder onset was lowest for foreign-born respondents in years before migration. There were significant race/ethnicity and nativity interactions for mood and

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Declaration of Interest

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research. The other authors declare no competing interests.

substance use disorders. Odds of mood disorder onset were higher for Whites with at least one U.S.-born parent. Odds of substance use disorder onset among Asians were higher for U.S.-born respondents; for Latinos, they were higher for those with at least one U.S.-born parent.

Conclusions—Parental foreign-born nativity is associated with low risk of mental disorders, but not uniformly across racial/ethnic groups or disorders. Exposure to the U.S. context may be associated with greater mental disorder risk for Latinos and Whites particularly. Investigations of cultural processes, including among Whites, are needed to understand group differences.

The proportion of Asian, Black, and Latino people in the U.S. population has increased rapidly in recent decades, fueled in part by immigration. Despite the expectation that the mental health of racial/ethnic minority and immigrant groups would be negatively affected by social disadvantages disproportionately experienced by these groups [1,2], prior studies in the U.S. have found that the prevalence of most mental disorders is lower for Asian, Black, and Latino adults when compared to White adults [3–5].[1] At the same time, a recent rise in mortality among middle-aged White people has been attributed to increases in suicide rates and deaths related to substance use disorders, prompting renewed attention to the mental health of Whites relative to other groups [6]. Research that considers the effects of race/ethnicity versus nativity (i.e., immigrant generation status) is needed to understand these differences in mental health risk across groups.

Studies have found that risk for first onset of a mental disorder is lowest when immigrants are in their home countries and increases after U.S. migration [7,8]. Once in the U.S., research has demonstrated a pattern of varying risk of psychiatric disorder by individual nativity. Specifically, foreign-born members of racial/ethnic minority groups often demonstrate better mental health than their U.S.-born counterparts, a pattern referred to as the ‘immigrant paradox’[9,10]; yet there is less consensus regarding the effects of parental nativity [9,7,11,12]. Asian and Latino foreign-born adults have lower rates of mental disorders compared to their U.S.-born counterparts [9,8]. Risk for substance use disorders has also been found to increase across immigrant generations for Asian, Black and Latino people, with those with U.S.-born parents having the highest risk [13,14,8]. Some research indicates that the immigrant paradox may extend to Whites; for example, research from the National Comorbidity Survey Replication (NCS-R) found that foreign-born adults overall had lower lifetime risk of mental health disorders compared to U.S.-born adults, regardless of race/ethnicity [11]. Yet, most prior research on mental health disparities focuses on either race/ethnicity or nativity (i.e. U.S. versus foreign-born) but rarely the intersection of the two or with analyses that detail the effects of both individual and parental nativity [15,7,8,14].

Analysis of the intersection between race/ethnicity and nativity should also consider the underlying processes that may explain the relationship between these demographic variables and risk of mental disorders. Increased risk for mental disorders within those of U.S. nativity may result from the effects of acculturation, meaning adopting U.S. cultural elements and norms [16,17]. Language proficiency in English is often used as a proxy for acculturation

[1] We use the terms Asian, Black, Latino, and White in order to distinguish between racial/ethnic groups in this paper, noting that these terms reflect broad sociopolitical categories in the United States and are not biological categories. In this paper, “Black” means “non-Latino Black” and “White” means “non-Latino White.”

when more nuanced measures are unavailable [18,19]. Conversely, high levels of ethnic identity reflect greater enculturation, or identification with and pride in the individual's heritage culture [18]. Ethnic identity may serve as a protective factor against discrimination, and consequently development of mental disorders [20].

The current report analyzes data from four U.S. national household surveys with a combined sample of over 20,000 Asian, non-Latino Black, Latino and non-Latino White adults, including foreign-born respondents and non-English-speaking Asians and Latinos. Racial/ethnic categories only reflect broad sociopolitical categories in the U.S. rather than biological entities, but are linked to the allocation of resources and experiences of discrimination. Our analyses extend prior research by examining how differences in the mental health of various racial/ethnic groups vary by nativity status and how the association of lifetime disorder risk with nativity status varies within racial/ethnic groups. We also investigate whether these differences in lifetime mental disorders can be explained after adjusting for racial/ethnic identity, language proficiency (a proxy for acculturation), and individual and parental educational attainment (a proxy for socioeconomic status), to disentangle the effects of self-identified race/ethnicity from these related cultural and sociodemographic factors. The study provides the most detailed examination to date of differences in lifetime risk of anxiety, mood, and substance use disorders in the U.S. by race/ethnicity and nativity.

Methods

Sample

The four surveys analyzed are the National Comorbidity Survey-Replication (NCS-R) [21], the National Latino and Asian American Study (NLAAS) [22], the National Survey of American Life (NSAL) [23] and the National Comorbidity Survey Re-Interview (NCS-2) [24]. The NCS-R, NLAAS, and NSAL were conducted in coordination to assess mental health among U.S. household residents from varying racial/ethnic groups. NCS-2 was the second wave study of a national household survey of English-speaking participants. Previous reports combined data from the first three surveys into a pooled sample known as the Collaborative Psychiatric Epidemiology Studies (CPES) Dataset [25]; we added the NCS-2 and reweighted the data to make the total sample representative of the U.S. household population with respect to the crossclassification of age, sex, urbanicity, Census division and race/ethnicity. All surveys were conducted between 2001 and 2003 and included adults ages 18 years and older, except the NCS-2 which included only 25–64-year-old respondents. African American and Caribbean Black people were oversampled in the NSAL, while Asians/Asian Americans and Latinos were oversampled in the NLAAS [25]. All surveys excluded institutionalized persons and those living on military bases; non-English speakers were excluded from the NCS-R, NCS-2 and NSAL [25]. The NLAAS survey was conducted in English, Spanish, Mandarin, Cantonese, Tagalog and Vietnamese. Interviews in all surveys were conducted by the professional field staff of the Survey Research Center in the Institute for Social Research, University of Michigan, with language fluency for NLAAS interviewers evaluated by certified examiners. A more detailed discussion of the sample is presented elsewhere [26,25] and summarized, along with sample sizes and response rates, in

Online Resource 1. Recruitment, consent and field procedures were approved by the Human Subjects Committees of the University of Michigan, Harvard Medical School, Cambridge Health Alliance and the University of Washington.[2] Informed consent was obtained before conducting surveys for all participants.

Measures

Information on survey measures, including cross-cultural validity of measures, has been detailed in prior publications [23,26,27] and in Online Resource 1. The current study is based on a dataset constructed to ensure comparability of measures across studies; only items and measures available across all studies were utilized in the analysis.

Diagnostic assessment—*DSM-IV* diagnoses were based on Version 3.0 of the Composite International Diagnostic Interview (CIDI) [28], a fully structured lay interview that generates diagnoses according to the criteria of both the World Health Organization's International Classification of Diseases, 10th Revision [29] and the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition Revised DSM-IV [30]. Disorders assessed in all surveys included anxiety disorders (panic disorder, generalized anxiety disorder, agoraphobia without panic disorder, social phobia, posttraumatic stress disorder), mood disorders (major depressive disorder, dysthymic disorder) and substance use disorders (alcohol and drug abuse and dependence). As described elsewhere [31], generally good concordance was found between DSM-IV diagnoses based on the CIDI and those based on blinded clinical reappraisal interviews with the Structured Clinical Interview for DSM-IV (SCID) [32].

Race/ethnicity—Race and ethnicity were assessed separately by participant self-report to questions based on U.S. Office of Management and Budget Standards. Responses were then used to distinguish groups across broad combined race/ethnicity categories. Responses to questions about race/ethnicity—which allowed multiple selections—were used to categorize respondents as Asian, Latino, non-Latino Black and non-Latino White using a hierarchical system. All respondents who reported being Asian were coded Asian regardless of any additional response provided. The same approach was used for the remaining respondents who reported being Latino, then those who reported being Black. Remaining respondents were coded as being White if they reported no other race or ethnicity in addition to being White. This approach led to slightly different totals for each race than previously reported for the individual surveys.

Nativity status—Nativity was coded into five categories. The first three included all respondents born in the U.S.: those with two U.S.-born parents (Nativity 1); one U.S.-born parent (Nativity 2); and neither parent born in the U.S. (Nativity 3). The last two categories included all foreign-born respondents; Nativity 4 included person-years from after the respondent moved to the U.S., and Nativity 5 included person-years from before the respondent moved to the U.S.[3]

[2] NSAL PI James Jackson is affiliated with the University of Michigan. NCS-R and NCS-2 PI Ronald Kessler is affiliated with Harvard Medical School. At the time of the study, NLAAS study PIs Margarita Alegria and David Takeuchi were affiliated with Cambridge Health Alliance/Harvard Medical School and the University of Washington, respectively.

Covariates—Respondents were asked about racial/ethnic identity, with a question about how close they felt in their ideas and feelings to other people of the same racial/ethnic descent *(very close* or *somewhat close* versus *not very close* or *not close at all).* Language preference was assessed for NLAAS respondents. Parent and respondent education were classified into four categories: less than high school education, high school graduate/GED, some post-secondary education and a college degree or more. All models controlled for respondent age (18–29, 30–44, 45–59 and 60+), sex, census division (residence in the following regions of the country, based on Federal Information Processing Standards codes: New England and Middle Atlantic; East North Central, West North Central, and East South Central; West South Central, Mountain, and Pacific)[33] and urbanicity (metropolitan/urban counties, other urban and non-urban). Census division and urbanicity were included as controls due to different distributions of racial/ethnic groups in regions of the country and in urban versus non-urban areas.

Analysis methods—All descriptive statistics are based on weighted data. Multiple imputation [34] was used to impute missing values (see proportions of imputed values in Online Resource 2). We used cross-tabulations to calculate lifetime prevalence estimates of DSM-IV/CIDI anxiety, mood and substance use disorders. The actuarial method [35] was then used to study age-of-onset (AOO; meaning age at which the individual first experienced the disorder) distributions of each class of disorders separately across the four race/ethnicity samples. Finally, discrete-time survival analysis with person-year as the unit of analysis and a logistic link function [36] was used to estimate racial/ethnic differences in lifetime risk of each of these three outcomes. The survival models were based on retrospectively-reported AOO to define year of onset of each outcome disorder. Controls were included in the survival models for person-year, sex, age, census division and urbanicity (Model 1).

Subsequent models added racial/ethnic identity, survey language preference, and interactions between covariates found to be significant in prior analyses (Model 2); then all of these variables plus nativity (Model 3). Models examining the association of nativity with mood and substance use disorders separately in each race/ethnicity subsample included all previous controls (Models 4a, b, and c). Models stratified by race/nativity categories included all previous controls (Model 5) and parent and respondent educational attainment (Model 6). Parent education was coded as a time-invariant predictor. We allowed for the possibility of decay in the association of parent education with odds of disorder onset over time by allowing parent education to have different odds ratios (ORs) for person-years 0–17 and 18+. Respondent education was coded as a time-varying predictor, with high school graduation coded as occurring at age 18 and college education at age 22 for all respondents.

Survival coefficients and their standard errors were exponentiated and are reported as ORs and 95% confidence intervals (CIs). To adjust for clustering and weighting of the data, standard errors were calculated using the Taylor series method in the SURVEY procedures of SAS software, Version 9.4 of the SAS System for Windows. Copyright © 2013 SAS

[3] Nativity is often defined in terms of generation status. First generation refers to people born in another country and now living in the U.S. (this corresponds to our Nativity 4 and 5 categories). Second generation refers to people born in the U.S. to at least one foreign-born parent (our Nativity 2 and 3 categories), and third generation refers to being born in the U.S. to U.S. born parents (our Nativity 1 category).

Institute Inc. SAS and all other SAS Institute Inc. product or services names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA. Multivariate significance tests were conducted using F-tests based on coefficient variance-covariance matrices adjusted for design effects using the Taylor series method. Denominator degrees of freedom for F-tests in a multiply-imputed discrete time logistic regression analysis framework were calculated using a method derived by Raghunathan and Dong [37,38]. Statistical significance was evaluated using two-sided design-based tests and the $p < 0.05$ level of significance. Only when multivariate tests were significant did we interpret the significance of individual coefficients. This decision rule was used to guard against the possibility of false positive coefficients given the large number of individual coefficients. Although use of omnibus tests reduces the chance of false positive findings, the only definitive protection against this problem is replication in independent datasets.

Results

Racial/ethnic differences in socio-demographic and geographic characteristics

The consolidated sample included 21,024 respondents (10.6% Asian, 17.3% Latino, 29.6% Black, and 42.4% White; Table 1). Asian, Black, and Latino respondents were generally younger and more likely to live in metropolitan areas than White respondents. Asians and Latino adults more often lived in the West than Black and White respondents.

Almost all Black and White respondents reported that they were born in the U.S. (93.9% and 96.6%, respectively). Nearly half of Latinos and more than three-fourths of Asians, in comparison, were born in another country. Consistent with these differences, 30.7% of Latinos and 24.2% of Asians chose to be interviewed in a language other than English. Parent and respondent educational levels differed substantially by racial/ethnic group.

Racial/ethnic differences in lifetime prevalence of mental disorders

Lifetime prevalence of any DSM-IV/CIDI disorder was highest among White respondents (45.6%), somewhat lower among Latino (38.8%) and Black respondents (37.0%) and substantially lower among Asians (23.5%; see Table 2). Across each disorder class, prevalence was highest among White respondents (18.8–26.1%) and lowest among Asian respondents (5.1–13.1%; see Table 2 for specific patterns).

AOO curves were used to project lifetime risk to 74 years of age (the upper age in the sample before data became too sparse for projection). The median AOO of any disorder was in the late teens for all groups (detailed results available on request). The onset distribution of anxiety disorders was latest for Asians (median in mid-20s versus late teens for the other groups), of substance use disorders latest for Black respondents (median in mid-20s versus late teens for other groups) and of mood disorders latest overall but especially for Latinos (mid-30s versus mid-20s for other groups; see Online Resource 2).

Racial/ethnic differences in disorder onset

In a model controlling respondents' age, sex, urbanic ity and Census division (Table 3, Model 1), odds of any lifetime disorder among racial/ethnic minorities was significantly

lower than for Whites, with ORs ranging from 0.41–0.76 for anxiety disorders, 0.44–0.68 for mood disorders, and 0.19–0.68 for substance use disorders. In each case, Asians had the lowest OR. In a second model introducing preferred language of interview and racial/ethnic identity (Table 3, Model 2), ORs attenuated but nearly all remained significant—however, Latinos no longer had lower rates of substance use disorders than White respondents. In a third model adding nativity (Table 3, Model 3), only the ORs comparing Black and Asian respondents to White respondents were significant across the three types of disorder.

Nativity differences within racial/ethnic groups

Interactions between race/ethnicity and nativity were observed for mood disorders ($F_{12,32956}$=2.11, p=.013) and substance use disorders ($F_{12,10760}$=2.34, p=.005) but not anxiety disorder ($F_{12, 37726}$=0.99, p=.45; Detailed results available upon request). To explore this variation more concretely, we estimated models for the associations of nativity with mood and substance use disorders separately in each race/ethnicity subsample (Table 3, Models 4a, 4b, and 4c), where nativity was divided into five categories as described above: the respondent and both parents were born in the U.S. (Nativity 1); the respondent and one parent were born in the U.S. (Nativity 2); the respondent but neither parent was born in the U.S. (Nativity 3); and neither the respondent nor either parent was born in the U.S. (Nativity 4 and 5). Given that we were working with person-year models, the latter group was divided into person-years after the respondent moved to the U.S. (Nativity 4) and person-years before (Nativity 5).

It is noteworthy that a consistent pattern was found in Table 4 in which odds of disorder onset across all nativity groups for all outcomes were lowest for foreign-born respondents in the years before moving to the U.S. (Nativity 5). However, given that no information was available for people from the countries of origin who did not move to the U.S., this result was difficult to interpret. As a result, we excluded person-years prior to first moving to the U.S. from further analysis and focused on the four other nativity categories. Relative-odds of disorder onset were found to vary significantly across nativity groups in only three comparisons seen in Table 4: (i) mood disorders among White respondents ($F_{3,8855.2}$=4.3, p=.005) due to higher odds of disorder onset among respondents with at least one parent born in the U.S. than with neither parent born in the U.S.; (ii) substance use disorders among Asians ($F_{3,5448.6}$=3.5, p=.016) due to higher odds of disorder onset among respondents born in the U.S. than those not born in the U.S.; and (iii) substance use disorders among Latinos ($F_{3,933.86}$=8.0, p<.001) due to higher odds of disorder onset among respondents with at least one parent born in the U.S. than those with neither parent born in the U.S..

We then distinguished within racial/ethnic groups by nativity in ways suggested to be important based the 3df significance tests in Table 4. Specifically, individually significant odds ratios dictated the grouping of racial/ethnic and nativity categories for subsequent models in Table 5. We estimated new models of racial/ethnic difference in odds of lifetime prevalence of DSM-IV/CIDI anxiety, mood, and substance use disorders with these revised race/ethnicity-by-nativity categories. (Table 5, Model 5). These analyses excluded person-years prior to first moving to the U.S. For anxiety disorders, results were very similar to those in Table 2, with White respondents highest and Asians lowest (OR=0.63) and the

relative-odds of Asian and Black respondents (OR=0.79), but not of Latinos (OR=0.85), significantly different from White respondents. For mood disorders, all racial/ethnic minority groups in addition to White respondents with no parents born in the U.S. (whether or not the respondent was born in the U.S.) had significantly lower odds than White respondents who had at least one parent born in the U.S. Latinos again were closest to the contrast category of White respondents (OR=0.75) and all other groups had comparable ORs (OR=0.56–0.59). The situation was different yet for substance use disorders, where odds of disorder onset were lowest among Asians not born in the U.S. (OR=0.19); higher, but still significantly less than White respondents, among other Asians (OR=0.55), Latinos with 0 parents born in the U.S. (0.57), and Black respondents (OR=0.74); and significantly higher among Latinos with one or more parents born in the U.S. relative to White respondents (OR=1.21).

Association with parent and respondent educational level

Finally, we evaluated the extent to which these racial/ethnic differences could be explained by parental and respondent differences in level of education (a proxy for SES). Parental education was coded as time invariant but was allowed to have different ORs person-years 0–17 and 18+. Results were virtually unchanged when these controls were introduced into the models. (Table 5, Model 6) This was true despite the substantial racial/ethnic differences in both parental education and respondent education documented in Table 1, due to the fact that these education variables were not strongly predictive of the outcomes. To ensure this negative finding was not because the predictive effects of race/ethnicity, nativity and/or education varied across the life course, we evaluated the possibility of interactions between model predictors and person-year and did not find that these explained our results. (Detailed results are available upon request.)

Discussion

Findings from this study have important implications for our understanding of racial/ethnic variation in mental health disorder risk. Asian, Black, and Latino adults had lower lifetime risk for all major classes of mental disorder compared to White adults—a pattern consistent with prior studies [39,3]. We anticipated that the lower risk for mental disorders among Asian, Black, and Latino groups in the sample could be partially explained by the protective effects of ethnic identity [40] and foreign-born nativity [9,7,11,41,12], as well as lack of English language proficiency among Latinos and Asians (a proxy for lower U.S. acculturation) [19,18]. In our models, all three variables were negatively associated with mental disorder onset and the association of race/ethnicity and disorder onset was somewhat attenuated after adjusting for them. However, the racial/ethnic differences described above remained largely unchanged for Black adults, indicating that the association of racial/ethnic group with disorder onset was not fully explained by ethnic identity, nativity, or English language proficiency. For Asian adults, odds of mental disorder onset increased substantially as these variables were added, indicating they do partially explain the overall lower risk of lifetime disorders among this group. Odds of mental disorder remained significantly lower for Asians as compared to White adults, suggesting factors beyond nativity status should be considered to explain lower overall rates of mental disorders among Asians.

On the other hand, differences in lifetime risk of disorders for Latinos relative to White adults became non-significant after adjusting for ethnic identity, language, and nativity status. This result suggests that overall differences in mental health risk between Latino and White adults are driven, in part, by lower rates of mental disorders among non-English-proficient and foreign-born Latinos [15]. Prior studies have found that U.S. acculturation is a risk factor for mental disorders among Latinos [17,42,16], and we similarly found that when controlling for these acculturation and enculturation proxies, risk for mental health disorders among Latino adults approximates risk among White adults. This finding might reflect subtle changes due to acculturation: erosion of collectivistic cultural values [43], such as family obligation and affiliation [44], loss of extended family support [9] and increase in intergenerational conflicts [45]—which can be associated with mental health risk.

Despite making the groups in this study as similar as possible in terms of ethnic identity and language, we still found that the odds of disorder onset varied significantly by parental nativity for mood disorders among White adults, and substance use disorders among Asian and Latino adults. Results suggest that there is an elevated risk for mood disorders among White adults with one or two U.S.-born parents (relative to U.S.-born Whites with two foreign-born parents, foreign-born Whites, and all other racial/ethnic groups in the study). This finding is noteworthy as few studies have explored the effect of nativity status, including both respondent and parental nativity, on prevalence of mental disorders among White Americans [12]; however, some literature suggests a “healthy immigrant” effect for physical health among White people which declines with length of residence in the U.S. [46] or Canada [47]. Parental foreign nativity may be a proxy for exposure to values, norms and social interactions from other cultural contexts that are protective factors against mood disorder onset [48,7]. For example, an emphasis on family interdependence in Asian and Latin American countries has been identified as a protective factor for these groups once in the U.S. [7,48,49], and White immigrant parents may similarly pass down protective cultural processes and values from their own countries.

Yet the higher risk for mood disorders among White adults with one or two U.S.-born parents is striking. First, it is expected that increased stressors due to social disadvantage faced by immigrant and racial/ethnic minority individuals would place them at greater risk for mood disorders than White individuals [1,2]; indeed, numerous studies have detailed the negative mental health impact of experiences associated with minority status, such as racial discrimination [50,51]. Second, as members of the dominant racial/ethnic group, U.S. born White people with U.S. born parents benefit from social policies historically favoring White Americans, such as access to higher quality neighborhoods and housing, which should support better mental health [52]. Like recent findings on the increased health risks faced by middle-aged White people [6], these results raise the question of what in the U.S. context might explain greater risk for mood disorders among a relatively more advantaged group – or conversely, what protective effects might explain lower risk for the other groups? A recent review summarizes several lines of research suggesting that in the U.S. context, the mental health of White people is more strongly affected by thwarted expectations for success as members of the dominant group, while traditionally disadvantaged groups have developed more strategies for thriving in the face of adversity [52].

For Asians and Latinos, results indicate that risk for substance use disorders increases across generations, consistent with prior studies [8,13]. This remains true in our study even after applying multiple statistical controls expected to reduce the effect of nativity status, suggesting that increased U.S. exposure and longer familial history in the U.S. are a strong risk factor for substance use disorders. Stronger social sanctions against substance abuse in immigrant countries of origin may explain these differences; countries like Mexico and China have particularly low rates of substance use disorders compared to the U.S.[53,54]. When compared across groups, however, Asian adults of any generation status still have substantially lower risk compared to White adults, as do Latino adults with two foreign-born parents. Latino adults with at least one U.S.-born parent have a greater risk for substance use disorder than White adults, again suggesting a differential process of U.S. acculturation for Latinos compared to Asians. Future studies should aim to identify dimensions of U.S. acculturation among White adults that can be used to compare processes across groups and identify what about the U.S. context may affect White and Latino adults differently than other groups.

Of interest is our finding that Asians consistently had the lowest disorder prevalence. In models that stratified by nativity we saw that both U.S. and foreign-born Asian participants had lower rates of disorders than White participants. This disaggregation of race/ethnicity and nativity is new and suggests that factors other than nativity may partly explain the much lower rates of disorders among Asians. Previously, researchers have questioned whether the lower prevalence of disorders among Asians may be a methodological artifact due to under-reporting or a different conceptualization of disorders than among White respondents [55]. This explanation should be considered along with possible protective factors found in Asian communities. For example, Hornsey and colleagues [56] demonstrate that members of holistic cultures, such as those shaped by Buddhism, Confucianism, Hinduism, and Taoism, have more moderate expectations of their ideal levels of characteristics such as happiness, health and selfesteem when compared to non-holistic cultures. Other studies show that cultures vary in the extent to which experiencing negative affect is associated with psychological functioning; in one study comparing the U.S. and Japan, experiencing negative affect predicted poor health (including psychological well-being) in both countries, but the magnitude of the effect was weaker in Japan than in the U.S. [57]. These studies indicate that members of holistic and collectivistic cultures (which are often found in Asian countries) may interpret negative experiences and affect in a more neutral manner than members of individualistic cultures (which are often found in countries like the United States)—this tendency may in turn provide protection against the development of mental disorders.

Our analysis of the effects of education on racial/ethnic group and nativity differences failed to find effects of either parent or respondent education, though this finding is consistent with some prior studies [58]. Education may not be an equal marker of socioeconomic status across racial/ethnic groups, as groups that are more socially disadvantaged may experience less upward mobility even with increased education; for example, at higher levels of education, Black men and women earn less than their White counterparts [59]. Future analyses of this data will explore how race and socioeconomic status may interact in predicting mental health disorders.

Our study does not find that the intersection of race/ethnicity and nativity status explains lower risk for mental disorders among Black adults, despite prior analyses of the National Survey of American Life (NSAL; one of the studies comprising this sample), finding lower rates of mental disorders among first generation Caribbean Black adults compared to second and third generation [14]. In combining our samples, the overall weighted percentage of Black participants who were foreign-born or had foreign-born parents becomes lower than it was in the NSAL, perhaps limiting our ability to detect a Black nativity effect. Prior research has also indicated that patterns of mental health risk among Black Caribbean adults relative to African-American adults varied by gender [14], and these subgroup differences were not explored in this analysis. Finally, this study did not include variables that may explain lower risk of mental disorder among African-Americans, such as religiosity and personal psychological resources; future studies should examine differences in these variables when comparing across race/ethnicity groups. Black adults in this study had the highest level of ethnic identity as measured by one question, and a more comprehensive ethnic identity measure may have allowed us to further examine its role in reducing risk of mental disorders.

In addition to noteworthy findings, it is also important to recognize this study's limitations. First, diagnoses were based on fully-structured lay interviews rather than on gold standard semi-structured interviews. However, evidence suggests that CIDI diagnoses had good concordance with blinded clinical diagnoses [32]. Second, results are subject to recall bias because lifetime disorders and AOO of those disorders were assessed retrospectively. These biases typically lead to under-reporting of diagnoses [60,61]. Third, timing of respondent educational attainment was not assessed in the surveys. In order to model respondent's educational attainment as a time-varying covariate, we assumed high school completion at age 18 and college at age 22, though actual completion may have occurred at a later age. Variations in age of completion may have particularly impacted respondents in the study who were born outside the U.S. Fourth, we limited our analysis to cultural variables that were available across all surveys, precluding more fine-grained analysis of constructs such as ethnic identity and acculturation. Fifth, we were not able to disaggregate subgroups of Asian, Black, and Latino people in the study, despite prior research that has found subgroup differences [15,14], due to low sample size when combined with nativity categories. Our findings may not apply to all subgroups within a larger category. Similarly, we were not able to disaggregate by age group within race/ethnicity/nativity categories, though risk factors may vary within distinct age groups such as older adults. Finally, we had low power for some interaction analyses given few respondents with particular combinations of race/ethnicity, nativity, and parent/respondent education. Thus, such negative findings should be interpreted with caution.

Overall, results demonstrate that both racial/ethnic group membership and nativity status continue to be salient factors in predicting lifetime risk of mental disorders, and that the effect of group membership is not fully accounted for by related sociodemographic factors. While some prior studies have undertaken in-depth analyses of cultural factors and acculturation processes within racial/ethnic groups, studies measuring and comparing these cultural dimensions across racial/ethnic and nativity groups – including both U.S. and

foreign-born White groups – are needed to understand the mechanisms driving group differences in mental health outcomes.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Distributions of all predictors used in the analysis by race/ethnicity

	Asian (N = 2234)	Latino (N = 3646)	Black (N = 6227)	White (N = 8917)	Total (N=21,024)
	Col% (SE)[a]	Col% (SE)[a]	Col% (SE)[a]	Col% (SE)[a]	F3, Denom DF, P-value
Age at Interview					
18–29	27.1(1.74)	36.0(1.27)	25.2(1.15)	19.7(1.20)	F3,19256=28.94, P= <.0001
30–44	36.1(1.79)	35.0(1.04)	34.2(0.90)	28.4(0.81)	F3,33254=13.60, P= 0.0035
45–59	23.5(1.57)	18.3(0.99)	24.5(1.04)	28.8(1.00)	F3,19255=16.81, P= 0.0008
60+	13.3(1.84)	10.7(0.95)	16.1(0.76)	23.1(1.06)	F3,34255=25.90, P= <.0001
Male Sex	45.7(1.40)	52.3(1.41)	43.9(0.75)	48.2(0.86)	F3,13955=11.87, P= 0.0078
Urbanicity (USDA rural-urban codes)					
Metro Urban (1–3)	96.5(1.50)	91.9(3.34)	87.6(1.81)	75.6(5.64)	F3,55079=6.52, P= 0.0002
Other Urban (4–5)	3.1 (1.46)	5.6(3.15)	3.0(1.88)	10.1(4.19)	F3,10513=2.41, P= 0.0650
Non-Urban (6–9)	0.5(0.41)	2.5(1.00)	9.4(1.96)	14.3(4.16)	F3,3309=5.68, P= 0.0007
Census Division					
New England and Middle Atlantic	15.0(3.17)	14.7(1.22)	17.0(1.05)	21.5(2.92)	F3,32656=1.84, P= 0.6055
East North Central, West North Central, and East South Central	9.2(1.89)	10.4(1.67)	25.9(2.42)	33.5(3.54)	F3,44556=17.99, P= 0.0004
South Atlantic	7.0(1.97)	10.1(1.57)	34.4(2.95)	19.0(3.56)	F3,2157=31.14, P= <.0001
West South Central, Mountain, and Pacific	68.8(3.94)	64.9(3.14)	22.7(2.89)	26.0(3.14)	F3,25955=35.64, P= <.0001
Racial/ethnic identity					
	83.8(1.25)	80.2(1.36)	84.7(0.93)	71.8(0.99)	F3,69855=28.09, P= <.0001
Preferred Survey in Language other than English					
	24.2(2.06)	30.7(2.76)	0	0	F3,20829=16894.3, P= <.0001
Respondent Not Born in US					
	77.3(2.88)	45.2(2.14)	6.1(0.82)	3.4(0.44)	F3,1357=229.90, P= <.0001

	Asian (N = 2234)	Latino (N = 3646)	Black (N = 6227)	White (N = 8917)	Total (N=21,024)
	Col% (SE)[a]	Col% (SE)[a]	Col% (SE)[a]	Col% (SE)[a]	F3, Denom DF, P-value
# of Parents Born in US					
0	83.7(2.06)	57.0(1.76)	6.7(0.88)	6.6(0.69)	F3,1577=293.13, P= <.0001
1	6.9(1.05)	11.9(1.01)	1.9(0.21)	5.5(0.51)	F3,64574=64.77, P= <.0001
2	9.4(1.35)	31.2(1.48)	91.4(0.89)	87.9(1.05)	F3,2186=465.20, P= <.0001
Respondent Education					
0 to 11 years	13.4(1.37)	40.4(1.77)	22.9(1.05)	13.1(0.80)	F3,2467=86.15, P= <.0001
12 years (HS)	19.1(1.82)	27.8(1.15)	36.8(0.83)	31.4(1.31)	F3,4617=21.75, P= <.0001
13 to 15 years	25.4(1.54)	21.8(1.18)	25.8(0.84)	28.3(0.95)	F3,3436=6.05, P= 0.0004
16+ years	42.0(1.95)	10.1(0.78)	14.5(0.86)	27.2(1.25)	F3,627903=131.80, P= <.0001
Highest Education of Parent					
0 to 11 years	33.9(1.79)	63.0(1.49)	40.7(1.60)	28.0(1.05)	F3,26783=115.88, P= <.0001
12 years (HS)	22.7(1.66)	20.1(1.03)	35.6(1.18)	35.4(0.95)	F3,10576=49.64, P= <.0001
13 to 15 years	11.9(0.95)	6.6(0.52)	12.9(0.81)	13.9(0.54)	F3,18115=27.53, P= <.0001
16+ years	31.6(1.93)	10.4(0.89)	10.8(0.59)	22.7(1.21)	F3,42006=91.80, P= <.0001

[a]Significance of differences in row percentages is calculated across columns. For a discussion of F tests in multiple imputation, see Lewis, T (2013) Analyzing Categorical Variables from Complex Survey Data Using PROC SURVEYFREQ. SAS Paper AA-10–2013; Berglund, PA. (2010) An Introduction to Multiple Imputation of Complex Sample Data Using SAS v9.2. SAS Paper 265–2010.

Table 2.

Lifetime prevalence of DSM-IV/CIDI disorders in the consolidated sample (n=21,024)[a]

	Asian	Black	Latino	White	Total	F-test[a]
	Row%(SE) (N)	Row%(SE) (N)	Row%(SE) (N)	Row%(SE) (N)	Row%(SE) (N)	
Any Anxiety	13.1 (1.26) (262)	21.7(0.81) (1343)	19.8(1.36) (820)	26.1(0.71) (3482)	24.7(0.56) (6098)	F3,462=22.73*
Any Mood	12.0 (1.24) (259)	13.6(0.68) (869)	17.3(0.99) (766)	22.6(0.64) (3045)	20.8(0.53) (5096)	F3,462=39.50*
Any Substance	5.1%(0.67) (113)	13.7(0.68) (736)	16.2(1.29) (547)	18.8(0.56) (2812)	17.7(0.50) (4344)	F3,462=29.97*
Any Disorder	23.5%(1.67) (495)	37.0(0.93) (2259)	38.8(2.04) (1511)	45.6(0.92) (5871)	43.3(0.77) (10407)	F3,462=33.49*

[a]Denominator degrees of freedom = (PSU-strata)*(numerator df-1) (Lewis, T (2013) Analyzing Categorical Variables from Complex Survey Data Using PROC SURVEYFREQ. SAS Paper AA-10–2013)]

*P < 0.0001

Table 3.

Associations of race/ethnicity with lifetime DSM-IV/CIDI anxiety, mood, and substance use disorders in the consolidated sample[a,b]

	Model 1 OR (95% CI)	Model2 OR (95% CI)	Model 3 OR (95% CI)
Any Anxiety			
Asian	0.41(0.32,0.53) *	0.48(0.38,0.62) *	0.61(0.46,0.80) *
Black	0.76(0.68,0.85) *	0.78(0.69,0.88) *	0.79(0.70,0.89) *
Latino	0.69(0.58,0.80) *	0.83(0.69,0.99) *	0.88(0.73,1.06)
White	1	1	1
F3, denom df^	3,1283.3=16.09	3,1315.8=10.09	3,971.38=5.91
	P<.0001	P<.0001	P=0.0005
Any Mood			
Asian	0.44(0.34,0.57) *	0.50(0.38,0.65) *	0.66(0.49,0.88) *
Black	0.55(0.49,0.63) *	0.57(0.50,0.65) *	0.57(0.50,0.65) *
Latino	0.68(0.59,0.78) *	0.78(0.67,0.91) *	0.87(0.74,1.02)
White	1	1	1
F3,denom df^	3,14448=38.89	3,12392=28.85	3,14184=24.35
	P<.0001	P<.0001	P=<.0001
Substance			
Asian	0.19(0.14,0.26) *	0.25(0.18,0.34) *	0.43(0.30,0.61) *
Black	0.68(0.59,0.78) *	0.72(0.62,0.83) *	0.74(0.64,0.85) *
Latino	0.64(0.54,0.76) *	0.90(0.75,1.07)	1.04(0.85,1.26)
White	1	1	1
F3, denom df**	3,4478.6=43.59	3,3636.1=28.69	3,9714.1=14.56
	P<.0001	P<.0001	P=<.0001

[a] Derivation of denominator degrees of freedom described elsewhere.[31]

[b] Model 1 controlled for person-year, sex, age at interview, census division, and urbanicity. Model 2 controlled for all variables in Model 1 plus racial/ethnic identity, preferred survey language, and, for substance use disorder, the interaction between racial/ethnic identity and preferred language due to this interaction being significant for substance use disorder only in a baseline model). Model 3 controlled

for all variables in Model 2 plus nativity. Due to systematic sampling of the person-year data (to reduce computational time), the number of people retained in the data sets used for each outcome for the models varies: for any anxiety, the models are based on a sample of 20,647 of the original 21,024; for any mood, models are based on a sample of 20,831 of the original 21,024; for any substance the models are based on a sample of 20,957 of the original 21,024.

*Significantly different from Whites at the .05 level, two-sided test.

Table 4.

Associations of nativity with lifetime DSM-IV/CIDI anxiety, mood, and substance use disorders within each race/ethnicity group[1]

		Model 4a Any Anxiety	Model 4b Any Mood	Model 4c Any Substance
		OR(95% CI)	OR(95% CI)	OR(95% CI)
TOTAL SAMPLE	Nativity1	1.69(1.33,2.14)*	1.96(1.48,2.60)*	4.40(2.44,7.95)*
	Nativity2	2.06(1.51,2.79)*	2.13(1.56,2.92)*	5.41(2.93,9.96)*
	Nativity3	1.42(1.03,1.94)*	1.35(0.93,1.95)	3.64(2.03,6.51)*
	Nativity4	1.50(1.19,1.90)*	1.52(1.12,2.07)*	2.46(1.42,4.29)*
	Nativity5	1	1	1
	F3,n-k-1,	**F3,35505=2.83,P=0.0368**	**F3,7741.3=4.59,P=0.0033**	**F3,1152.7=7.68,P=<.0001**
	F4,n-k-1	**F4,45598=5.95,P=<.0001**	**F4,14087=7.62,P=<.0001**	**F4,2080.3=8.45,P=<.0001**
Asian	Nativity1		2.17(1.18,4.01)*	8.95(3.32,24.15)*
	Nativity2		1.79(0.79,4.05)	11.81(4.12,33.88)*
	Nativity3		3.17(1.69,5.95)*	8.01(2.61,24.57)*
	Nativity4		2.16(1.32,3.52)*	3.12(1.11,8.77)*
	Nativity5		1	1
	3df F, p-value		F3,11231=0.66,P=0.5759	**F3,5448.6=3.46,P=0.0156**
	4df F, p-value		**F4,23240=3.87,P=0.0038**	**F4,10785=6.82,P=<.0001**
Black	Nativity1		2.69(1.51,4.77)*	20.62(6.02,70.60)*
	Nativity2		3.01(1.30,7.00)*	19.27(4.85,76.53)*
	Nativity3		4.16(1.27,13.6)*	46.53(9.66,224.03)*
	Nativity4		4.11(1.93,8.75)*	17.00(4.10,70.53)*
	Nativity5		1	1
	3df F, p-value		F3,3978.4=1.09,P=0.3518	F3,2070.5=0.96,P=0.4089
	4df F, p-value		**F4,7206.3=3.93,P=0.0035**	**F4,3002.3=6.28,P=<.0001**
Latino	Nativity1		1.36(0.89,2.07)	6.20(2.96,13.01)*
	Nativity2		1.05(0.65,1.70)	6.97(3.01,16.13)*
	Nativity3		1.19(0.72,1.99)	3.88(1.99,7.54)*
	Nativity4		1.10(0.72,1.70)	2.35(1.12,4.94)*
	Nativity5		1	1
	3df F, p-value		F3,7251.6=1.29,P=0.2762	**F3,933.86=7.98,P=<.0001**
	4df F, p-value		F4,14474=1.17,P=0.3234	**F4,1814.3=8.38,P=<.0001**
White	Nativity1		2.50(1.28,4.86)*	2.55(1.02,6.38)*
	Nativity2		3.00(1.53,5.90)*	3.13(1.22,8.06)*

	Model 4a Any Anxiety	Model 4b Any Mood	Model 4c Any Substance
	OR(95% CI)	OR(95% CI)	OR(95% CI)
Nativity3		1.27(0.55,2.93)	2.23(0.82,6.04)
Nativity4		1.66(0.77,3.59)	2.01(0.70,5.77)
Nativity5		1	1
3df F, p-value		**F3,8855.2=4.29,P=0.0049**	F3,1731.2=1.55,P=0.2005
4df F, p-value		**F4,10984=5.38,P=0.0003**	F4,2850.1=2.14,P=0.0738

*Significantly different from Nativity 5 at the .05 level, two-sided test.

[1]All models controlled for the predictors in Model 3. The 4 degree of freedom F tests evaluated significance across the five nativity subgroups. The 3 degree of freedom F tests evaluated significance among the four nativity subgroups other than foreign-born groups during years prior to moving to the U.S. Significant F tests (p<.05) are in bold.

[2]Nativity 1 = Two U.S. born parents; Nativity 2 = One U.S. born parent; Nativity 3 = No U.S. born parents; Nativity 4 = foreign-born, person-years after moving to the U.S.; Nativity 5 = foreign-born, person-years before moving to the U.S.

Table 5.

Associations of race/ethnicity-by-nativity with lifetime DSM-IV/CIDI mood, anxiety, and substance use disorders with and without adjustments for parent and respondent educational level in the consolidated sample[a]

	Model 5	Model 6
Any Anxiety (versus White)		
Asian	0.63(0.46,0.86)*	0.63(0.47,0.86)*
Black	0.79(0.68,0.92)*	0.77(0.66,0.90)*
Latino	0.85(0.69,1.03)	0.81(0.67,1.00)
3-df Test for Race Effects	F3,1345.9=5.23, P=0.0014	F3,1275=5.61, P=0.0008
Any Mood (versus White with 1–2 parents born in U.S.)		
Asian	0.59(0.44,0.78)*	0.59(0.44,0.78)*
Black	0.56(0.49,0.64)*	0.56(0.49,0.65)*
Latino	0.75(0.65,0.87)*	0.75(0.65,0.87)*
White with 0 parents born in U.S. (whether or not respondent born in U.S.)	0.57(0.42,0.78)*	0.56(0.41,0.77)*
4-df Test for Race Effects	F4,21540=27.35, P=<.0001	F4,20478=27.71, P=<.0001
Any Substance (versus White)		
Asian born in U.S.	0.55(0.41,0.76)*	0.57(0.42,0.78)*
Asian not born in U.S.	0.19(0.10,0.36)*	0.20(0.11,0.37)*
Black	0.74(0.63,0.85)*	0.69(0.60,0.80)*
Latino 1–2 parents born in U.S.	1.21(1.01,1.47)*	1.11(0.89,1.37)
Latino with 0 parents born in U.S. (whether or not respondent born in U.S.)	0.57(0.42,0.77)*	0.51(0.36,0.72)*
5-df Test for Race Effects	F5,6880=16.51, P=<.0001	F4,5761.3=12.66, P=<.0001

[a]Reference categories for each outcome vary as they were based on prior analyses conducted (see paper Table 4 3df tests). Control variables also vary based on prior analyses as follows: Model 4: Race/nativity (groupings based on 3 df F-tests in Table 3); adjusted for person-year, sex, age at interview, census division, urbanicity, racial/ethnic identity, preferred survey language, (FOR SUBSTANCE ONLY: interaction between racial/ethnic identity and preferred language; FOR ANXIETY ONLY: adjusted for nativity1–3 vs. 4). Model 5: Model 4 + adjusted for respondent education (HS+) and parent education within person-years < 18 (HS+), (FOR ANXIETY ONLY: adjusted for nativity1–3 vs. 4)