



Published in final edited form as:

J Immigr Minor Health. 2016 August ; 18(4): 749–763. doi:10.1007/s10903-015-0293-y.

MAJOR DEPRESSIVE DISORDER AND DYSTHYMIA AT THE INTERSECTION OF NATIVITY AND RACIAL-ETHNIC ORIGINS

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INTRODUCTION

Major depressive disorder (MDD) and dysthymia carry a significant human and social burden [1–3]. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) [4] classifies depressive disorders as mood disorders characterized by episodes of depressed mood. MDD is defined as one or more major depressive episodes – that is, at least two weeks of depressed mood or loss of interest accompanied by at least four additional symptoms of depression, for example, sleep disturbance, agitation, and fatigue. Dysthymia is characterized by at least two years of depressed mood for more days than not, accompanied by additional depressive symptoms that do not meet criteria for MDD. Not all racial and ethnic groups in the United States (US) are equally affected by depressive disorders [3, 5]. For example, non-Hispanic blacks are 40% less likely than non-Hispanic whites to experience depression in their lifetime [3]. Depression is also less common among newly arrived immigrants than US-natives [6–8]. The lower risk of depressive disorders among foreign-born has been reported in studies grouping immigrants into a single group [9, 10] or into racial-ethnic categories such as Hispanic [11], non-Hispanic black [12], non-Hispanic white [7], and Asian-American [13, 14]. However, exceptions to the lower risks have been found when grouping individuals by country or region of origin [6, 10, 15, 16]. In addition, any protective effect of foreign birth has been shown to wear off over time, resulting in the immigrants' risk for depressive disorders resembling that of non-immigrants of the same national origin [14, 17].

Several explanations have been offered for differential risk of depressive disorders between the foreign-born and the US-born [18]. The *acculturation* explanation assumes that experiences that immigrants have after arrival in the host country can protect against or

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exacerbate mental health problems among immigrants. Acculturation may take several forms: assimilation, integration, separation, or marginalization [19, 20]. Integration is sometimes linked with favorable outcomes compared with other types of acculturation, but it is not true for all ethnic and immigrant groups. Acculturative experience intertwined with major life changes can result in *stress* which can manifest itself in poor mental health, feelings of alienation, and heightened psychosomatic symptoms [19]. The *stress* hypothesis points to psychosocial stressors as potential triggers for depressive disorders among immigrants. Stress is a multi-faceted, multilevel concept that is not easily defined [21]. In biological terms, it is a physiological response of the body in the presence of *stressors*, or “conditions of threat, challenge, demands, or structural constraints” (p. 300) [21]. Two types of stress – stressful life events, so-called “events stress,” and chronic stress, for example, experiences with discrimination – are often addressed from the psychosocial perspective and are known to affect mental health problems among minority populations [22, 23]. Stress can be buffered by social support, but social isolation and lack of social networks in the host country may deprive immigrants of needed emotional and instrumental support. This may be compounded by immigrant family separations and culture shock stemming from conflicting norms and values between the original and host society. Experiences of prejudice and discrimination in the host country based on race and ethnicity may cause additional stress for immigrants, leading to poorer mental health outcomes including depression [24] and lower assessments of mental well-being, for example as measured by the Mental Component Summary of the Medical Outcomes Study Short Form 12 [25].

Race, ethnicity, and nativity are overlapping but distinct concepts that have complex relationships to mental health. Research tends to treat these concepts separately and rarely as a primary focus of investigations [26]. Past research on depressive disorders among immigrants has also often excluded factors such as acculturation or discrimination, or, due to data limitations, has been unable to analyze differences in the onset and continuation of depressive disorders across different subgroups defined by race, ethnicity, and nativity. To close some of these gaps, the current study used US-based survey data to estimate variations in prevalent, acquired, and persisting major depressive and dysthymic disorders by race, ethnicity, and nativity while statistically adjusting for acculturation, social integration, stress, and sociodemographic factors. The first set of outcomes in the study was the prevalence rates of MDD and dysthymia, DSM-IV-based diagnoses. The second set of outcomes was the rates of acquired and persisting cases of MDD and dysthymia over a three-year period. The unique contribution of this study was the estimation of both prevalence and three-year changes in MDD and dysthymia among US adults based on nativity and racial-ethnic origin, before and after adjustment for substantive and sociodemographic factors.

METHODS

Data

The data for the study are derived from Wave 1 and Wave 2 of the *National Epidemiologic Survey on Alcohol and Related Conditions* (NESARC), a representative sample of the US civilian, non-institutionalized population of individuals 18 years or older [27–29]. Wave 1 was conducted during 2001–2002 while Wave 2 was conducted during 2004–2005. The

sample sizes for Wave 1 and Wave 2 were 43,093 and 34,653, respectively. The time-frame for the study was three years. Further information about the NESARC can be found at <http://www.niaaa.nih.gov/research/nesarc-iii>.

A total of 3.6% of cases that had missing data on one or more outcome, nativity, or race-ethnicity variables were excluded from the analysis. Additional 9.1% of the data were missing on other independent variables, 0.02–1.5% per variable; these cases were excluded as the variables were entered into the analysis. Preliminary analyses showed no differences in results whether or not multiple imputation was used to recover missing values. The unweighted sample size for this analysis was 33,373 (see Appendix 1 for descriptive statistics) or 30,322, depending on the model being tested. This study was approved by the institutional review boards at the authors' respective institutions.

Measurement

See Table 1. NESARC's diagnostic classifications were based on the Alcohol Use Disorder and Associated Disability Interview Schedule—DSM-IV Version (AUDADIS-IV), a state-of-the-art, semi-structured diagnostic interview schedule designed for use by lay interviewers. The reliability and validity of this instrument have been documented in many studies [30]. The diagnostic questions for low mood assessment are very detailed and based on DSM-IV diagnostic criteria. Based on these questions, the NESARC constructed dichotomous variables for diagnoses of MDD and dysthymia. These NESARC-provided measures were refined as described in Table 1 for use in this study. All interview questions are available online at <http://www.niaaa.nih.gov/research/nesarc-iii/questionnaire>.

Procedure of Analysis

The first set of outcomes in this study was the prevalence rates of MDD and dysthymia. The second set of outcomes was the rates of acquired and persisting cases of MDD and dysthymia over a three-year period. The analysis proceeded as follows.

First, statistics on the prevalence, or percent with standard error, of MDD and dysthymia by nativity and racial-ethnic origin were generated. The subsequent multivariable analysis entailed testing four predictive logistic regression models for each of the outcomes using a nested approach. The baseline model (Model 1) estimated the effects of nativity status on the likelihood of having MDD by race-ethnicity, without accounting for any other variables. US-born Europeans were used as the reference category; however, the reference category was rotated in the analyses to generate all nativity-origin comparisons. The baseline model of dysthymia did not include race-ethnicity due to having too few cases for several racial-ethnic categories. In this model, foreign-born and US-born (reference) were compared, without accounting for other factors. The next step involved testing models that built on the baseline models but added sociodemographic factors (Model 2), sociodemographic and health-related factors (Model 3), and sociodemographic and health-related and explanatory, or substantive, factors: acculturation, stress, and social integration variables (Model 4).

Finally, an assessment was conducted of the contribution of nativity, racial-ethnic origin, and substantive factors to the likelihood of 1) developing MDD or dysthymia over a three-year period (acquired cases=diagnosis at three years but not at baseline) and 2) continuing versus

recovering from MDD or dysthymia over a three-year period (persisting cases=diagnosis both at baseline and at three-year follow-up). For these analyses, the count and percentage distributions with standard errors were first computed for the acquired and persisting cases, separately, by nativity and race-ethnicity for MDD and by nativity for dysthymia. Then logistic regression was used to model the likelihood of acquiring and continuing MDD over a three-year period by nativity and race-ethnicity, adjusting in a step-wise manner for sociodemographic, sociodemographic and health-related, and substantive factors. The primary reference category was US-born European, considering the group's typically higher rates of depression compared with immigrants, but the reference category was rotated to conduct all pairwise group comparisons. The likelihood of acquiring and continuing dysthymia over a three-year period was examined by nativity only.

All statistical analyses were conducted using SAS software (version 9.3; SAS Institute, Cary, NC). Specifically, the survey-related procedures SURVEYMEANS, SURVEYFREQ, SURVEYREG and SURVEYLOGISTIC, which accommodate complex survey designs, were used. Thus, all estimates and tests accounted for the stratification, clustering, and unequal weighting in the sampling design. For all regression models, odds ratios (OR) with 95% confidence intervals (CI) were generated.

FINDINGS

The prevalence of MDD was higher among US-born versus foreign-born, but dysthymia was more prevalent among foreign-born than US-born respondents (Table 2). The prevalence of MDD was the highest for Puerto Ricans (PR) and the lowest for Africans. Dysthymia was the most prevalent among “other Hispanics or Latinos” and the least prevalent among Africans. Furthermore, immigrants typically had lower rates of MDD or dysthymia compared with their US-born counterparts, with one exception: 10% of those born in Puerto Rico (PR-PR) had MDD, double the rate of US-born Puerto Ricans (PR-US).

The findings from the multivariable analyses for prevalence of MDD and dysthymia (first set of outcomes) are presented first, followed by the findings for acquired and persisting cases of MDD and dysthymia (second set of outcomes).

Prevalence of MDD and Dysthymia by Nativity and Racial-Ethnic Origin

MDD—For most racial-ethnic origin groups, regression results confirmed a significantly lower likelihood of having MDD among immigrants compared to US-born Europeans in the unadjusted model (Table 3, Model 1). Odds ratios (OR) for the immigrant groups ranged between 0.426 for foreign-born Asians to 0.765 for foreign-born Europeans, but PR-PR were more likely (OR = 2.121) than US-born Europeans to have MDD. Examining pairwise differences (Appendix 2, Model 1) revealed that US-born Asians, Mexicans, and “other Hispanics or Latinos” were more likely than their foreign-born counterparts to have MDD. On the other hand, PR-US were less likely than PR-PR to have MDD (OR of 0.397; $P < 0.001$). There were no significant differences between foreign-born and US-born Africans.

The addition of sociodemographic and health-related factors did not substantively affect the pattern of associations among the different racial-ethnic origin groups (Table 3, Models 2–

3). Adding the measures of acculturation, stress, and social integration, however, did alter the pattern of associations among some of the racial-ethnic groups (Model 5). In particular, US-born Africans and Mexicans and PR-US had lower likelihoods of MDD than their foreign-born counterparts (Appendix B, Model 4). On the other hand, US-born Asians and “other Hispanics or Latinos” continued to have higher likelihoods of MDD than their foreign-born counterparts. There was no difference observed between foreign-born and US-born Europeans in the fully adjusted model.

Dysthymia—Confirming our bivariate analyses, immigrants had a higher likelihood of having dysthymia than US-born (Table 3, Model 1). This association persisted with the inclusion of sociodemographic and health-related factors, and measures of acculturation, stress, and social integration (Table 3, Model 4).

Substantive factors—The measures of acculturation, stress, and social integration had significant associations with the likelihood of having MDD, adjusting for sociodemographic and health-related factors, and the associations were mostly in the expected direction (Table 4). Among the measures of acculturation, years in US and racial-ethnic orientation (greater acculturation) were associated with an increased likelihood of having MDD. However, English language preference and preference for other ethnic groups socially did not have significant associations with MDD net of the other measures. Among the stress variables, stressful life events, stress in personal life, and stress in controlling life all had positive associations with MDD, but perceived discrimination in health care had a negative association with MDD and perceived discrimination in other domains had no association with MDD, when controlling for other factors. Finally, among the measures of social integration, social network-close ties and social support were associated with a reduced likelihood of MDD.

In the final model of dysthymia (Table 4), among the measures of acculturation, preference for English language had a negative association while years in US had a positive association with dysthymia. In addition, stress in personal life, stress in control of life, and perceived discrimination in health care were positively associated with the likelihood of having dysthymia, but stressful life events did not have a significant association. Finally, social network-close ties and social support, but not social network-instrumental ties, were associated with a lower likelihood of having dysthymia.

Acquired and Persisting Cases

MDD—The percentage of individuals who developed MDD over a three-year study period was lower for foreign-born than for US natives, and the rates ranged 4–6% among the race-ethnicity groups (Table 5). However, the recovery from MDD between the baseline and the three-year assessment appeared less likely among foreign-born than among US natives. The rates of persisting cases varied from 17.5% among Africans to 23.9% among PR.

After adjusting for sociodemographic and health-related and substantive factors (Table 6, Model 1), PR-PR and Mexicans were more likely while foreign-born Asians were less likely than US-born Europeans to develop MDD over a three-year period. There were no significant differences between foreign-born Africans, Europeans, and “other Hispanics or

Latinos” and US-born Europeans in developing MDD over time. However, several significant differences were observed between immigrants and natives within the same race-ethnicity. After adjusting for all factors, US-born Africans and Mexicans, and PR-US had a lower likelihood of acquiring MDD over time than their non-native counterparts (Appendix 2). In contrast, US-born Asians and “other Hispanics or Latinos” had a higher likelihood of developing MDD over time than their foreign-born counterparts.

Among the acculturation factors, English language preference was associated with a lower and years in the US and racial-ethnic orientation with a higher likelihood of acquiring MDD over time (Table 6, Model 1). Among the measures of stress, stress life events, social stress-personal life and social stress-controlling life were associated with an increased likelihood of developing MDD while perceived racial-ethnic discrimination in health care was associated with a reduced likelihood of developing MDD. Finally, social network-close ties and social support were both associated with a reduced likelihood of developing MDD.

In terms of persisting cases of MDD, foreign-born Africans, Asians, Mexicans, and PR-PR had higher likelihoods of continuing the disorder compared with US-born Europeans, after adjusting for other factors (Table 6, Model 2). Other foreign-born groups did not differ from the latter group. However, in a fully adjusted model, US-born Africans and Mexicans and PR-US had lower likelihoods of continuing the disorder than their foreign-born counterparts (Appendix 2). Other foreign-born groups did not differ on this outcome from their racial-ethnic US-born counterparts, when adjusting for other factors. In the full model, preference for other racial-ethnic groups socially and all stress variables were associated with a higher likelihood of persisting MDD (Table 6). On the other hand, social network-close ties was associated with a lower likelihood of persisting MDD. Other substantive variables did not have significant associations with persisting MDD.

Dysthymia—There were few cases of acquired and persisting dysthymia (Table 5). The analysis was limited to examining nativity-based differences in the likelihood of acquiring dysthymia over a three-year period (Table 6). The results showed that foreign-born respondents had a higher likelihood of acquiring dysthymia than US-born respondents, after adjusting for sociodemographic, health-related, and substantive factors. Among the acculturation factors, English language preference was associated with a reduced likelihood and years in US was associated with an increased likelihood of developing dysthymia. Among the measures of stress, stress-personal life, stress-controlling life, and perceived racial-ethnic discrimination-health care were all associated with an increased likelihood of developing dysthymia. Finally, social network -close ties and social support were both associated with a decreased likelihood of developing dysthymia.

DISCUSSION

The unique contribution of this study was the estimation of both prevalence and three-year changes in MDD and dysthymia among US adults based on nativity and racial-ethnic origin, before and after adjustment for measures of acculturation, stress, and social integration, as well as sociodemographic factors. The results of the study confirm past reports of generally lower rates of MDD among immigrants compared to the US-born population [10, 18, 31].

However, prevalence of dysthymia was found to be higher for foreign-born than US-born. This is the first study to report the presence of this disparity even after all adjustments. In addition, the study showed considerable variation in the outcomes between foreign-born and US-born based on racial-ethnic origin and type of condition – prevalent, acquired, or persisting. Among immigrants, PR, in particular, but also Mexicans and Africans, appeared to be at a higher risk of prevalent and acquired MDD than their US-born counterparts. In contrast, Asians and other Hispanics or Latino appeared to be protected against prevalent and persisting MDD. No differences were found based on nativity among individuals of European heritage.

The findings from this study support and extend the past literature. Past research has shown that PRs have the highest lifetime prevalence of depressive disorders among all Latino groups [32]. Furthermore, immigrant Latinos have been reported to have a lower prevalence of depressive disorders than non-immigrant Latinos, but analyses stratified by nativity and adjusted for sociodemographic factors showed further variations [31]. Also, research including a broader range of origin groups has indicated no association between US-born status and risk for mood disorders among individuals of Western European and PR descents [10]. In terms of PR, as previously stated [33], they “are U.S. citizens, which makes their migratory patterns and exposure to U.S. culture different from those of other Latino groups” (p. 365). Exposure to US culture appears to be a mental health risk for PR while other Latino groups are protected by their non-US cultures. Data for immigrant Africans are limited, but this population has been identified as exhibiting high levels of trauma and depression [34, 35]. Overall, the literature indicates diverse findings for US Asian, Black, and Latino immigrants, with some groups being at a higher and some being at a lower risk of depressive, anxiety, and substance abuse disorders [14]. This can be explained, in part, by methodological differences among the studies, for exemplifying sampling or measures of immigration. However, other factors such as gender or acculturation modes may vary across racial-ethnic groups, contributing to these diverse findings about depressive disorders [14].

To further the literature, this study considered a broad range of explanatory and correlated factors. Past research suggests that social standing of immigrants helps to explain the health status of immigrants [18]. However, social status variables provided limited explanation of the relationships between nativity, race-ethnicity, and the depressive disorders in our study. In comparison, measures of acculturation, stress, and social integration, helped to explain the nativity and racial-ethnic differences in the outcomes, though the associations were mixed (Table 7), as they are in other studies [36]. For example, English language preference appeared to protect immigrants against acquired MDD and prevalent and acquired dysthymia but it had no association with prevalent MDD. It is possible that those immigrants who quickly learn and use English might experience less stress than others and are less likely to develop dysthymia. Consistent with this interpretation is prior research showing that greater proficiency in English lowers the risks for depressive disorders among men of Asian descent [14].

Furthermore, in this study, perceived racial-ethnic discrimination related to health care was associated with a lower risk of prevalent and acquired MDD but positively associated with prevalent and acquired dysthymia. For immigrants and racial-ethnic minorities, this may be

due to perceived discrimination lowering health service utilization, leading to lower rates of diagnoses among these groups. Discrimination and prejudice are major stressors that have been linked to poor psychological well-being [24, 25, 37, 38]. Other research suggests that while discrimination may heighten psychological distress, it has less of an impact on depression than recent and chronic stressors such as lifetime adversity or traumatic events [23].

The findings regarding social ties also support and extend prior literature. Having a perception of high social support has beneficial effects on mental health by reducing psychological distress and buffering the impact of stressful events [39, 40] and can reduce the nativity effect on psychological distress and disorder [41]. However, immigrants may have less support than US-born individuals. Social support may have moderating or mediating effects on the stress experienced by ethnic and immigrant groups. Ethnic groups tend to rely on social support from the extended family versus friends, neighbors, or co-workers. For example, among Southeast Asian refugees in Canada, social support modified the effects of pre-migration trauma experiences on psychological well-being [42]. Some research finds that avoiding acculturation and maintaining ties with one's own racial-ethnic group protects against psychological distress [43, 44], though others find that crossing racial-ethnic lines in social relations promotes psychological well-being, especially among immigrants [45].

This study had several limitations. For example, this study did not address other factors shaping the patterns of depressive disorders among US immigrants, such as age at immigration or historical cohort [10, 41, 46]. Social stress indicators were also limited in this study. In particular, this study focused on post-immigration social stress and could not address distress due to stressful experiences pre-immigration and during the migration process. Past trauma and other displacement-related factors are known to be associated with poor mental health outcomes [47]. In addition, there is the potential for misdiagnosis of mental disorders among minorities. Diagnosis of individuals from minority groups can be challenging because the manifestations of depressive disorders, such as idioms of distress and somatization, vary with race, ethnicity, and culture, and words such as "depression" may be absent in some languages [48, 49]. Immigrants may be less likely than US-natives to perceive distress as depression or may report milder symptoms, which could, in part, contribute to their higher rates of dysthymia versus MDD. Furthermore, the survey method and self-reports used in the study can differ from clinical assessments and have its limitations. Finally, the definition of race-ethnicity was also limited in this study. Broad racial-ethnic categories tend to mask cultural heterogeneity of individuals from different countries and cultures. It is also unclear to what extent members of the same ethnic group are similar and different in terms of acculturation modes [18].

These limitations notwithstanding, this study provides further insights into social epidemiology of MDD and dysthymia in US foreign-born and native populations – with attention to racial-ethnic ancestry. The picture is quite complex and no one set of findings can provide a full explanation. More research is needed to disentangle the pathways linking nativity, race-ethnicity, and social factors to different depression outcomes and their trajectories over time. These pathways could be examined using path analytic techniques,

such as structural equation modeling. Also, future studies should include age at immigration, historical cohort information, and a more complete set of stressors in the examination of depressive disorders among immigrants.

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APPENDIX 1

Descriptive statistics: NESARC Wave 2

	Unweigh ted n	Weighted %			Chi- squa re p- valu e	Mean			t-test p- value
		Ove rall	US- born	Foreign- born		Ove rall	US- born	Foreign- born	
Total	33373								
Nativity									
US-born	28083	85.9							
Foreign-born	5290	14.2							
Racial-ethnic origin									

	Unweigh ted n	Weighted %			Chi- squa re p- valu e	Mean			t-test p- value
		Overall	Ove rall	US- born		Foreign- born	Ove rall	US- born	
African	6640	11.8	12.3	8.4	<.0001				
Asian/Pacific Islander	1131	5.0	1.7	25.0					
European	19174	70.9	79.3	19.7					
Mexican	3556	6.8	3.7	25.7					
Puerto Rican	786	1.3	.9	3.9					
Other Hispanic/Latino	2086	4.2	2.1	17.2					
Sociodemographic variables									
Female	19324	52.0	52.2	50.7	<.0001				
Age						48.2	48.7	45.2	<.0001
Married	17130	60.7	59.9	65.6	<.0001				
Cohabiting	1030	3.2	3.0	4.1					
Previously married	8790	18.7	19.5	14.1					
Never married/not cohabiting	6423	17.4	17.6	16.3					
Number of children						.6	.6	.8	<.0001
Less than high school	5217	13.6	11.1	29.2	<.0001				
High school degree	9064	27.4	28.4	21.0					
Attended college	10392	31.5	33.0	22.0					
College graduate	8700	27.5	27.5	27.8					
Work full-time	17241	53.2	52.6	57.0	<.0001				
Work part-time	3526	10.8	11.0	10.0					
Not working	12606	35.9	36.4	32.9					
Northeast	5848	17.7	18.1	15.5	<.0001				
Midwest	6341	18.6	17.9	22.5					
South	12670	38.3	38.6	36.5					
West	8514	25.4	25.4	25.6					
MSA	11075	32.6	32.6	32.8	0.0183				
MSA but not in central city	16888	51.0	51.1	50.2					
Not in a MSA	5410	16.4	16.3	17.0					
Income						61884	62946	55438	<.0001
Health-related variables									
Health insurance	29104	87.7	89.8	75.4	<.0001				
Current tobacco use	7481	23.5	25.3	12.5	<.0001				
Tobacco use -- current	333	1.0	1.0	.7					
Tobacco use -- prior to W2	7728	23.8	25.0	16.7					
Lifetime tobacco use -- never used	17831	51.7	48.7	70.1					
Religious activity						-.025	-.028	-.007	.4353

	Unweigh	Weighted %			Chi-square p-value	Mean			t-test p-value
	ted n	Overall	US-born	Foreign-born		Overall	US-born	Foreign-born	
<i>Substantive factors</i>									
Acculturation									
English language preference					.074	.351	-1.622	<.0001	
Years in US					44.98	48.68	22.56	<.0001	
Preference for other raciasocially-ethnic groups					-.099	-.129	.080	<.0001	
Race-ethnic orientation					.069	.134	-.330	<.0001	
Stress									
Stressful life events					1.524	1.568	1.255	<.0001	
Social stress -- personal life					-.037	-.079	.223	<.0001	
Social stress -- control					-.030	-.009	-.160	<.0001	
Perceived racial-ethnic discrimination health care					-.051	-.078	.116	<.0001	
Perceived racial-ethnic discrimination other					-.063	-.088	.089	<.0001	
Social integration									
Social network--number of close ties					10.404	10.499	9.822	.0003	
Social network--number of instrumental ties					8.575	8.906	6.545	<.0001	
Social support					.037	.053	-.058	.0002	

APPENDIX 2

Odds ratios for selected pairwise comparisons of US-born and foreign-born (FB) respondents of different racial-ethnic origins

	Major depression ^a				Change in major depression ^b	
	Model 1	Model 2	Model 3	Model 4	Model 1 ^c	Model 2 ^d
African US vs. FB	1.167	0.915	0.876	0.424***	0.524***	0.082***
Asian US vs. FB	3.223***	2.29***	2.165***	1.622***	2.104***	0.403
European US vs. FB	0.765***	0.764***	0.772**	1.122	1.219	0.8
Mexican US vs. FB	1.596***	1.056	1.068	0.46***	0.624***	0.056***
PR-US vs. PR-PR	0.397***	0.272***	0.258***	0.15***	0.136***	0.197***
Other Hispanic/Latino US vs. FB	2.642***	2.171***	2.064***	1.363**	1.433**	1.729

PR-US = US-born Puerto Rican; PR-PR = Puerto Rico-born

^aSee Table 3

^bSee Table 6

^cAcquired major depression
^dPersisting major depression

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Table 1

Description of study measures

Dependent variables	
Mood disorders were defined based on the DSM-IV and assessed by using a state-of-the-art diagnostic interview [27–29]; minor deviations from the DSM-IV exclusion criteria are noted below. The outcome variables were measured at Waves 1 and 2 as dummy-coded variables, with individuals not having (0) or having (1) a condition at the given time.	
<i>Major depression disorder (MDD)</i>	MDD during the last 12 months was defined as depressed mood or loss of pleasure and interest for at least most of the day for at least a 2-week period, with endorsement of 4 out of 7 additional symptoms, excluding illness-induced and substance-induced cases, cases due to bereavement, diagnoses of manic or hypomanic disorder, and self-report of lifetime occurrence of schizophrenia/psychotic illness (a proxy for schizoaffective disorder).
<i>Dysthymia</i>	Dysthymia was defined as 2 years of depressed mood for more days than not, with no longer than 2 months without depressive symptoms and excluding manic or hypomanic episodes, self-reported schizophrenia/psychotic illness (lifetime occurrences), and MDD in the last 12 months.
Independent variables (substantive factors)^a	
Immigrant background	
<i>Nativity</i>	US-born (primary reference group) versus born outside of 50 US states (“foreign-born,” except Puerto Rico-natives)
<i>Racial-ethnic origin</i>	Self-report of the respondents’ race and ethnicity using country of origin or racial-ethnic descent (59 response categories). Given that some groups had small cell sizes, we used the following 6 racial-ethnic origin categories: African, European, Asian/Pacific Islander, Mexican, Puerto Rican, and other Hispanic/Latino.
Acculturation^b	
<i>English language preference</i>	Seven questions on language preference asked respondents about which language: they generally read and speak; they spoke as a child; they usually speak at home; they usually think in; they usually speak with friends; of the TV and radio programs they usually listen to; and, of the movies and TV and radio programs they <i>prefer</i> to watch and listen to. Response categories for the 7 questions used a 5-point scale and were: only non-English language (e.g., Spanish, Chinese, or another non-English language); more non-English language than English; both equally; more English than non-English language; and, only English. Factor analysis was used to generate a single factor on language preference (Cronbach’s alpha = 0.970). Higher values indicated greater acculturation (e.g., more use of English).
<i>Years in US</i>	Difference between year of entry and year of birth for foreign-born and individual’s age value for US-born respondents
<i>Racial-ethnic social preference</i>	Respondents were asked how often, in the past year, they have felt that they were not able to control the important things in their life; felt confident about their ability to handle personal problems; felt things were going their way; and, felt difficulties piling up so high that they could not overcome them. The response categories for each question were: never, sometimes, fairly often, and very often. The perceived stress scale was intended to assess the cognitively mediated emotional response to objective stressful events. Factor analysis was used to construct two perceived stress measures: stress related to personal life (Cronbach’s alpha = 0.70) and stress related to a lack of control in life (Cronbach’s alpha = 0.64).
<i>Racial-ethnic orientation</i>	Respondents were asked how strongly they agreed or disagreed that: they have a strong sense of self as a member of their racial-ethnic group; they identify with other people from their racial-ethnic group; racial-ethnic heritage is important in their life; and, they are proud of their racial-ethnic heritage. The scale’s Cronbach’s alpha was 0.829. Higher values on the measure indicated less identification with one’s own racial-ethnic group, reflecting greater acculturation and assimilation.
Stress^b	

<i>Stressful life events</i>	Stressful life events was the total number of the following 12 events that respondents reported experiencing in the 12 months prior to the interview: any family member or close friend died; any family or close friend had serious illness or injury; moved/anyone new came to live with you; fired or laid off from a job; unemployed and looking for a job for more than a month; trouble with their boss or a coworker; changed job, job responsibilities, or work hours; marital separation or divorce or breakup of a steady relationship; had problems with neighbor, friend, or relative; financial crisis, declaration of bankruptcy, or being unable to pay their bills; respondent or family member had serious trouble with the police or law; and, respondent or family member being crime victim.
<i>Perceived stress</i>	Respondents were asked how often, in the past year, they have felt that they were not able to control the important things in their life; felt confident about their ability to handle personal problems; felt things were going their way; and, felt difficulties piling up so high that they could not overcome them. The response categories for each question were: never, sometimes, fairly often, and very often. The perceived stress scale was intended to assess the cognitively mediated emotional response to objective stressful events. Factor analysis was used to construct two perceived stress measures: stress related to personal life (Cronbach's alpha = 0.70) and stress related to a lack of control in life (Cronbach's alpha = 0.64).
<i>Perceived racial-ethnic discrimination</i>	Respondents were asked about how often they experienced discrimination related to their race or ethnicity in a variety of situations during the last 12 months. These include experiencing discrimination in their ability to obtain health care or health insurance; in how they are treated when they got health care; in public, (on the street, in stores, or in restaurants); in any other situation (jobs, school or training program, in courts or with police, or obtaining housing); being called a racist name because of their race-ethnicity; and, being made fun of, picked on, pushed, shoved, hit or threatened with harm because of their race-ethnicity. All respondents were asked these questions regardless of race or ethnicity, though the question phrasing was more specific to type of race or ethnicity for respondents who were Hispanic or of Asian/Pacific Islander descent. Factor analysis was used to generate two factors indicating perceived discrimination related to health care services (Cronbach's alpha = 0.75) and perceived discrimination in other aspects of life (e.g., in jobs, schooling, housing, in businesses, or by police; Cronbach's alpha = 0.75).
<i>Social integration^b</i>	
<i>Social Network Index</i>	Social Network Index indicated the total number of different types of people respondents see or talk to on the phone or via internet at least once every two weeks. The responses were used to create continuous (summed) indicators for the number of close ties (e.g., grown children, own parents, or close friends) and the number of instrumental ties (e.g., students, teachers, or co-workers, or people in organizations at which they volunteer) respondents have in their social network. Higher values indicated a larger network.
<i>Level of social support</i>	Interpersonal Support Evaluation List (ISEL12) had 6 questions on how true it is respondents could find someone to help them or join them in a variety of situations, including: help with daily chores if sick, seek advice about handling problems with family, go to a movie, deal with personal problems, have lunch, and get ride if stranded 10 miles from home. Factor analysis was used to create a scale of level of social support (Cronbach's alpha = 0.79). Higher values indicate higher levels of social support.

^aAdditional variables included sociodemographic and health-related correlates: age, gender, marital status, number of children in the household, education, employment status, US region, community type, household income, health insurance, tobacco use, and religiosity

^bData collected for all respondents regardless of nativity; assessed at Wave 2 only

Table 2

Prevalence of major depression disorder and dysthymia, total and by nativity and racial-ethnic origin:
NESARC Wave 2

	Major Depression		Dysthymia	
	%	SE	%	SE
Total	5.9	0.1	0.3	0.0
Nativity	**		**	
US-born	6.1	0.1	0.3	0.0
Foreign-born	4.6	0.1	0.4	0.0
Racial-ethnic origin	**		**	
African	4.9	0.2	0.3	0.0
Asian/Pacific Islander	5.1	0.2	0.3	0.0
European	6.1	0.1	0.3	0.0
Mexican	5.2	0.2	0.6	0.0
Puerto Rican	7.1	0.1	0.4	0.0
Other Hispanic/Latino	6.7	0.2	0.7	0.1
Racial-ethnic origin × nativity				
African	**		**	
US-born	5.0	0.2	0.3	0.0
Foreign-born	3.4	0.2	0.1	0.0
Asian/Pacific Islander	**		**	
US-born	8.6	0.4	0.7	0.0
Foreign-born	3.6	0.2	0.2	0.0
European	**		**	
US-born	6.1	0.1	0.3	0.0
Foreign-born	4.8	0.3	0.2	0.0
Mexican	**		**	
US-born	6.3	0.3	0.2	0.0
Foreign-born	4.3	0.1	0.9	0.0
Puerto Rican	**		**	
Born in US states	4.9	0.1	0.3	0.0
Born in Puerto Rico	10.3	0.1	0.4	0.0
Other Hispanic/Latino	**		*	
US-born	8.2	0.5	0.9	0.2
Foreign-born	5.6	0.1	0.5	0.0

Significant differences between nativity and racial-ethnic groups are indicated

* $P < 0.05$

** $P < 0.01$ (two-tailed test)

Table 3

Modeling the prevalence of major depression disorder and dysthymia by nativity and racial-ethnic origin

	Model 1	Model 2	Model 3	Model 4
Outcome = Major depression				
African US- born	0.833 *** [0.767,0.905]	0.681 *** [0.621,0.746]	0.697 *** [0.636,0.763]	0.590 *** [0.533,0.652]
African foreign-born	0.714 *** [0.610,0.835]	0.744 *** [0.633,0.874]	0.795 ** [0.675,0.936]	1.391 ** [1.086,1.783]
Asian US-born	1.372 *** [1.233,1.527]	1.159 * [1.035,1.297]	1.174 ** [1.045,1.319]	1.174 * [1.018,1.354]
Asian foreign- born	0.426 *** [0.360,0.503]	0.506 *** [0.425,0.602]	0.542 *** [0.456,0.645]	0.724 ** [0.572,0.916]
European US-born (referent)				
European foreign-born	0.765 *** [0.657,0.892]	0.764 *** [0.655,0.891]	0.772 ** [0.662,0.901]	1.122 [0.897,1.404]
Mexican US- born	0.981 [0.894,1.076]	0.763 *** [0.689,0.845]	0.815 *** [0.737,0.902]	0.754 *** [0.678,0.838]
Mexican foreign-born	0.615 *** [0.555,0.680]	0.723 *** [0.653,0.800]	0.763 *** [0.689,0.846]	1.638 *** [1.445,1.858]
Puerto Rican born in US states	0.841 *** [0.774,0.914]	0.662 *** [0.609,0.719]	0.670 *** [0.612,0.734]	0.643 *** [0.574,0.719]
Puerto Rican born in Puerto Rico	2.121 *** [1.972,2.280]	2.436 *** [2.299,2.581]	2.595 *** [2.419,2.783]	4.288 *** [3.715,4.950]
Other Hispanic/Latino US-born	1.481 *** [1.322,1.659]	1.296 *** [1.149,1.462]	1.322 *** [1.171,1.492]	1.392 *** [1.220,1.587]
Other Hispanic/Latino foreign-born	0.561 *** [0.491,0.640]	0.597 *** [0.512,0.695]	0.640 *** [0.547,0.749]	1.021 [0.863,1.208]
Outcome = Dysthymia				
US-born (referent) Foreign-born	1.456 *** [1.220,1.737]	1.397 *** [1.172,1.665]	1.622 *** [1.396,1.885]	1.876 *** [1.525,2.308]

Odds ratios [95% confidence intervals]. Model 1 is unadjusted. Model 2 adds sociodemographic variables. Model 3 adds sociodemographic and health-related variables. Model 4 adds sociodemographic and health-related variables as well as substantive factors (acculturation, stress, and social integration)

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$ (two-tailed test)

Table 4

Associations between depressive disorders, major depression and dysthymia, and substantive factors, adjusting for sociodemographic and health-related correlates (see Table 3, Model 4)

Substantive Factors	Major depression	Dysthymia
Acculturation		
English language preference	0.953 [0.908,1.000]	0.726 *** [0.631,0.835]
Years in US	1.020 *** [1.012,1.028]	1.039 *** [1.023,1.056]
Preference for other racial-ethnic groups socially	1.016 [0.979,1.055]	1.052 [0.938,1.179]
Race-ethnic orientation	1.114 *** [1.079,1.151]	0.903 [0.776,1.050]
Stress		
Stressful life events	1.194 *** [1.172,1.216]	1.036 [0.992,1.083]
Social stress -- personal life	1.464 *** [1.413,1.516]	1.499 *** [1.276,1.761]
Social stress -- control	2.186 *** [2.123,2.251]	1.729 *** [1.599,1.870]
Perceived racial-ethnic discrimination -- health care	0.910 *** [0.886,0.935]	1.126 *** [1.053,1.204]
Perceived racial-ethnic discrimination -- other	1.025 [0.991,1.060]	0.995 [0.938,1.055]
Social integration		
Social network -- closeties	0.986 *** [0.981,0.991]	0.958 ** [0.932,0.984]
Social network -- instrumental ties	0.999 [0.997,1.002]	1.000 [0.994,1.007]
Social support	0.944 ** [0.910,0.978]	0.893 *** [0.839,0.950]

Odds ratios [95% confidence intervals]

* $P < 0.05$,

** $P < 0.01$,

*** $P < 0.001$ (two-tailed test)

Rates of depressive disorders, major depression and dysthymia, acquired^a and persisting^b over a three-year period, by nativity and racial-ethnic origin

Table 5

	Major depression			Dysthymia ^c				
	Acquired		Persisting	Acquired		Persisting		
	%	SE	%	SE	%	SE		
Total	4.9	0.1	21.8	0.7	0.3	0.0	3.9	0.6
Nativity								
US-born	5.1	0.1	21.8	0.7	0.3	0.0	3.3	0.7
Foreign-born	4.0	0.1	22.4	1.4	0.4	0.0	7.4	0.7
Racial-ethnic origin								
African	4.3	0.2	17.5	1.3				
Asian/Pacific Islander	4.5	0.2	20.3	3.5				
European	5.1	0.1	22.4	0.8				
Mexican	4.5	0.2	21.8	0.6				
Puerto Rican	5.6	0.1	23.9	0.9				
Other Hispanic/Latino	6.0	0.2	21.1	1.7				

^aCondition present in Wave 2 but not in Wave 1

^bCondition present in Wave 1 and Wave 2

^cNot enough cases to examine changes in dysthymia by racial-ethnic origin or to model persisting cases of dysthymia

Table 6

Regression results predicting changes in depression disorders, major depression and dysthymia, at 3-year follow-up by nativity, racial-ethnic origin, and substantive factors, adjusting for sociodemographic and health-related correlates

	Major Depression		Dysthymia ^a
	Acquired ^b Model 1	Persisting ^c Model 2	Acquired ^b
<i>Nativity by racial-ethnic origin</i>			
African US-born	0.619 *** [0.554,0.691]	0.569 *** [0.460,0.704]	
African foreign-born	1.182 [0.919,1.522]	6.971 ** [2.052,23.677]	
Asian US-born	1.349 *** [1.158,1.571]	0.982 [0.530,1.820]	
Asian foreign-born	0.643 *** [0.501,0.824]	2.434 * [1.053,5.629]	
European US-born (referent)			
European foreign-born	1.219 [0.971,1.531]	0.8 [0.392,1.636]	
Mexican US-born	0.852 ** [0.756,0.960]	0.379 *** [0.246,0.583]	
Mexican foreign-born	1.366 *** [1.187,1.573]	6.725 *** [3.653,12.383]	
Puerto Rican born in US states	0.597 *** [0.532,0.671]	0.779 [0.530,1.145]	
Puerto Rican born in Puerto Rico	4.383 *** [3.878,4.953]	3.954 *** [2.292,6.822]	
Other Hispanic/Latino US-born	1.525 *** [1.294,1.798]	0.966 [0.688,1.357]	
Other Hispanic/Latino foreign-born	1.065 [0.889,1.275]	0.559 [0.253,1.233]	
<i>Nativity</i>			
US-born (referent)			
Foreign-born	1.892 ***		[1.531,2.339]
<i>Substantive factors</i>			
<i>Acculturation</i>			
English language preference	0.938 **	1.038	0.715 ***

	Major Depression		Dysthymia ^a
	Acquired ^b Model 1	Persisting ^c Model 2	Acquired ^b
	[0.901,0.977]	[0.742,1.450]	[0.620,0.825]
Years in US	1.018 ***	1.034	1.039 ***
	[1.014,1.022]	[0.978,1.094]	[1.023,1.056]
Preference for other racial-ethnic groups socially	0.981	1.139 *	1.067
	[0.946,1.017]	[1.015,1.278]	[0.951,1.197]
Race-ethnic orientation	1.120 ***	1.050	0.900
	[1.086,1.156]	[0.969,1.138]	[0.769,1.052]
<i>Stress</i>			
Stressful life events	1.217 ***	1.077 ***	1.045
	[1.192,1.242]	[1.038,1.117]	[0.998,1.094]
Social stress -- personal life	1.457 ***	1.388 ***	1.466 ***
	[1.406,1.509]	[1.256,1.533]	[1.256,1.711]
Social stress -- control	2.229 ***	1.574 ***	1.702 ***
	[2.165,2.295]	[1.459,1.698]	[1.585,1.827]
Perceived racial-ethnic discrimination -- health care	0.926 ***	0.819 ***	1.121 **
	[0.898,0.955]	[0.772,0.870]	[1.040,1.208]
Perceived racial-ethnic discrimination -- other	1.009	1.085 *	0.983
	[0.971,1.049]	[1.006,1.171]	[0.925,1.045]
<i>Social integration</i>			
Social network -- close ties	0.989 ***	0.971 ***	0.959 **
	[0.984,0.995]	[0.959,0.983]	[0.933,0.986]
Social network -- instrumental ties	0.998	1.002	1.001
	[0.996,1.001]	[0.997,1.008]	[0.994,1.008]
Social support	0.943 **	0.964	0.899 ***
	[0.907,0.981]	[0.882,1.054]	[0.854,0.945]

Odds ratios [95% confidence intervals]

^aNot enough cases to examine changes in dysthymia by racial-ethnic origin or to model persisting dysthymia

^bCondition present in Wave 2 but not in Wave 1

^cCondition present in Wave 1 and Wave 2

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$ (two-tailed test)

Summary of findings for acculturation, stress, and social integration relationships with depressive disorders, major depression and dysthymia

Table 7

	Major depression			Dysthymia ^a	
	Prevalen t	Acquired b	Persisting b	Prevalen t	Acquired b
Acculturation					
English language preference	NS	-	NS	-	-
Years in US	+	+	NS	+	+
Preference for other racial-ethnic groups socially	NS	NS	+	NS	NS
Race-ethnic orientation	+	+	NS	NS	NS
Stress					
Stressful life events	+	+	+	-	NS
Social stress -- personal life	+	+	+	+	+
Social stress -- control	+	+	+	+	+
Perceived racial-ethnic discrimination -- health care	-	-	+	+	+
Perceived racial-ethnic discrimination -- other	NS	NS	+	NS	NS
Social network/social support					
Social network -- close ties	-	-	+	-	-
Social network -- instrumental	-	-	NS	-	NS
Ties	NS	NS	NS	NS	-
Social support	NS	NS	NS	NS	-

Symbols indicate if association was positive (+), negative (-), or not significant (NS), net of other factors (nativity, racial-ethnic origin, and sociodemographic and health-related factors).

^aNot enough cases to model the prevalence of persisting dysthymia

^bOver a three-year period