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Race and Ethnic Group Differences in Comorbid Major Depressive Disorder, Generalized Anxiety Disorder, and Chronic Medical Conditions

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Abstract This study tested whether race and ethnic group differences exist for lifetime major depressive disorder and/or general anxiety disorder with one or more chronic medical conditions. Data from the National Survey of American Life, which included 3570 African American, 1438 Caribbean Black, and 891 non-Hispanic White adults were analyzed. Outcomes included at least one and multiple chronic medical conditions, from a list of 14 medical conditions (e.g., arthritis, cancer, diabetes, kidney disease, stroke, heart disease, etc.). Logistic regressions were fitted to data to determine how the association between major depressive disorder, general anxiety disorder, and one or more chronic medical conditions vary across race and ethnicity. Lifetime major depressive disorder (but not lifetime general anxiety disorder) was associated with at least one chronic medical condition among African Americans and Caribbean Blacks, but not non-Hispanic Whites. Lifetime major depressive disorder was similarly associated with multiple chronic medical conditions among African Americans, Caribbean Blacks, and non-Hispanic Whites. For Caribbean Blacks, stronger associations were found between major depressive disorder and general anxiety disorder with one or more chronic medical conditions compared to African Americans and non-Hispanic Whites. Findings suggest that race and ethnicity may shape the links between comorbid psychiatric disorders and chronic medical conditions. Mental health screening of individuals with chronic medical conditions in primary health-care settings may benefit from tailoring based on race and ethnicity. More research is needed to understand why associations between physical and mental health vary among race and ethnic groups.

Keywords Anxiety · Chronic medical condition · Depression · Ethnicity · Psychiatric disorders · Race

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Introduction

Previous studies have underscored the challenges associated with making a psychiatric diagnosis within the context of race and ethnicity [1]. Despite this, however, few studies have addressed these challenges alongside the additional complexity associated with comorbid mental health and chronic medical conditions [see 2–5 for exceptions]. Mixed findings have come from prior research on comorbid mental health conditions and chronic medical conditions among race and ethnic groups. For example, among patients with heart disease, some studies have suggested that Whites are more likely to be depressed than African Americans, while other studies suggest that elevated depressive symptoms are associated with cardiovascular disease mortality in older Blacks but not Whites [6–8]. As for the latitude of these studies, most of them have focused on gender differences [9]; within group differences among Caribbean Blacks [10]; and the prevalence of one or more chronic medical conditions among men of various race and ethnic groups [4]. The implications of race and ethnicity—together, as well as apart from one another—for determining mental and physical health outcomes is clear [10–16]. What remains unclear is how race and ethnic groups are different in how their chronic medical conditions are influenced by major depressive disorder (MDD) and generalized anxiety disorder (GAD). This paper uses cross-sectional data from the National Survey of American Life (NSAL) to examine race

and ethnic differences in MDD and GAD among respondents with at least one chronic medical condition.

Major Depressive Disorder and Generalized Anxiety Disorder

The contextual complexities of race and ethnicity are present in mental health reports from both community and epidemiologic studies. National studies examining the prevalence and persistence of MDD have found that while prevalence rates of lifetime MDD were higher among non-Hispanic Whites (17.9 %), followed by Caribbean Blacks (12.9 %) and African Americans (10.4 %), the percent of those who have lifetime MDD who also have 12 month MDD was higher for African Americans (56.5 %) and Caribbean Blacks (56 %) compared to non-Hispanic Whites (38.6 %) [15]. Some negative beliefs regarding treatment are also known to be more prevalent among Blacks [17], compared to Whites. For example, African Americans are more likely to prefer non-pharmacologic approaches (e.g., counseling and prayer), are less likely to believe that medications are effective, and are more likely to believe that antidepressants are addictive when treating depression [17]. This implies that the long-lasting effects and course of MDD may be more severe within and across racial and ethnic minority groups compared to Whites.

With GAD, anxiety about a number of events or activities occurs for a period of at least 6 months [18]. Compared to MDD, less is known about anxiety disorders within and between groups of African Americans, Caribbean Blacks, and non-Hispanic Whites. Some studies have reported significantly higher rates of anxiety disorders, including phobias, among African Americans compared to Whites [19–21]. Other studies have found that when Caribbean Blacks and African Americans met criteria for an anxiety disorder, they usually experienced higher levels of severe mental illness and functional impairment compared to Whites [22].

Comorbid Mental and Physical Health Conditions

Previous studies on comorbid mental and physical health conditions have spanned various topical areas, including gender differences [9], differences within groups of Caribbean Blacks [10], and the prevalence of one or more chronic medical conditions among marginalized men [4]. However, despite the research on comorbid mental and physical health conditions, few reports emphasize racial and ethnic differences within their samples. This oversight contributes to challenges with understanding the etiology, expression, and thereby, the roles of MDD and GAD in comorbid chronic medical conditions among non-Hispanic Whites, Caribbean Blacks, and African Americans. Though some studies have reported the correlates of MDD and GAD by gender across race and ethnicity [5, 10], few discuss comorbid mental and physical health conditions [3–5].

Previous studies on comorbid mental and physical health conditions tend to favor some conditions over others. For instance, a review of the literature found cardiovascular disease to be among the physical health condition often coexisting with depression. Race and ethnic group variations have also been reported among these more favored mental and physical health conditions. For example, among patients with heart disease, one study reported that Whites were more likely to be depressed than African Americans [7], while another study reported that Blacks were more likely to meet criteria for comorbid cardiovascular disease and depression. The disease burden of depression in this study was also highest among Black respondents [6]. An emerging body of research suggests that depressive symptoms may confer an "accelerated risk" for cardiovascular disease in Blacks compared with Whites. In a study on the association between depressive symptoms and overall cardiovascular disease mortality between Blacks and Whites elevated depressive symptoms were associated with cardiovascular disease mortality in Blacks but not Whites. Similar findings were observed for coronary artery disease mortality and stroke mortality. The study suggested that elevated depressive symptoms may increase cardiovascular disease in older Blacks but not in Whites [8].

Rationale for the Current Study

Reports from previous studies infer a couple of trends in the literature. First, previous studies on comorbid mental and physical health conditions seem to link heart disease and depression more than other mental and physical health conditions (e.g., anxiety and/or depression being associated with diabetes, kidney problems, stroke, cancer, and asthma) [6–8]. Because comorbidity is becoming more of a challenge among patients entering the health-care system, it will be important to explore these various mental and physical health groupings in health research. The second trend that previous studies have inferred is that the inclusion of racial group membership leads to a more comprehensive picture of prevalence rates [23] and thus a clearer picture of mood and anxiety disorders within and across various groups. Therefore, it would behoove researchers to include measures of racial and ethnic group identity in their studies of comorbid mental and physical health conditions.

In understanding mental and physical health concurrently, it would also be helpful to ascertain the conditions under which someone would be most likely to meet criteria for MDD or GAD and how MDD or GAD exists concurrently with other physical health conditions. Despite previous research in this area, meager efforts toward understanding comorbid MDD or GAD and physical health conditions (defined as chronic medical conditions, henceforth)—and the race and ethnic group difference therein—have been made. Not

examining such complexities in comorbid mental and physical health research can result in challenges with assessment, diagnosis, and treatment, particularly with high risk, racial, and ethnic minority groups. The purpose of this study is to examine race and ethnic group differences in one or more chronic medical conditions (CMCs), as they co-occur with MDD and/or GAD among a nationally representative sample of African Americans, Caribbean Blacks, and non-Hispanic Whites. We were particularly interested in understanding how MDD and GAD coexist with CMCs. Thus, careful attention was given to whether respondents met criteria for lifetime MDD and/or GAD, as well as if they reported one or more CMCs. Though comorbid physical and mental health findings from the NSAL are reported elsewhere [4, 9, 10], we sought to extend the work of our colleagues by addressing this comorbidity among African American, Caribbean Black, and non-Hispanic White men and women.

Conceptual Framework

Our study is guided by a theory-driven model that disentangles physical and mental health disparities over the life course across racial groups. The model was developed by Jackson and colleagues [24, 25] to help explain the why Black Americans tend to have lower rates of mood/anxiety disorders and other psychiatric diagnoses compared to White Americans. Additionally, it helps clarify why Black Americans tend have higher rates of chronic physical health conditions when compared to White Americans. Specifically, the model proposes that individuals who experience significant stress tend to engage in negative health behaviors (e.g., smoking or overeating) that provide short-term relief from the psychological and physiological damages of stress. Although these behaviors are often viewed as protective of one's mental health, engaging in these behaviors to cope with chronic stress can lead to negative physical health consequences. Previous studies have supported constructs of this model by Jackson and colleagues [25, 26], however, findings also underscore the need for more research to explain patterns of comorbid mental health and chronic physical health conditions among marginalized populations.

Methods

Study Sample

All respondents from the National Survey of American Life (NSAL), conducted between 2001 and 2003, were included in the analyses [27]. The adult sample (aged 18+) of the NSAL was a national household probability sample of 6082 persons, of which 5191 were Black Americans or Blacks of Caribbean descent and 891 were non-Hispanic Whites. The Black Americans were drawn from a nationally representative sample of households within the 48 contiguous states with at least one Black adult 18 years of age or older. The sample of non-Hispanic Whites, representing 14 % of the White population of the USA, was a stratified, disproportionate sample of White American adults from households selected from census tracts and city blocks with a Black American representation of 10 % or more. The response rates for the survey were 72.3 % overall, 70.7 % for African Americans, 77.7 % for Caribbean Blacks, and 69.7 % for non-Hispanic Whites.

Measures

Sociodemographic Factors

The sociodemographic factors included in the study were age, education level, marital status, household income, employment status, race, and ethnicity. Age and education level were measured in number of years. Marital status was categorized as married, partnered, never married, divorced, separated, and widowed. Household income was measured in US dollars and adjusted for household size by dividing the household income by the square root of the household size [28]. Employment status was categorized as either employed, unemployed, or not in the workforce, and respondents reported their race as either White or Black, but were also asked whether they were of Caribbean or West Indian descent to capture their ethnic origins and nativity.

Major Depressive and Generalized Anxiety Disorders

Major depressive and generalize anxiety disorders were measured using lifetime major depressive disorder (MDD) and/or lifetime generalized anxiety disorder (GAD) from the World Health Organization's Composite International Diagnostic Instrument (CIDI). We used lifetime rates (and not 12-month rates) because 12-month rates are presumed to be included in responses to the lifetime MDD and GAD items. The Diagnostic and Statistical Manual of Mental Disorders [18] World Mental Health Composite International Diagnostic Interview (WMH-CIDI), a fully structured lay-administered diagnostic instrument, was used to assess lifetime DSM-IV major depressive disorder and generalized anxiety disorder [29]. The mental disorders sections used in the NSAL are slightly modified versions of those developed for the World Mental Health project initiated in 2000 and the instrument used in the National Comorbidity Survey-Replication (NCS-R) [29].

Lifetime MDD and/or GAD were defined as an episode that took place at any time during the respondents' life. MDD requires the presence of one or more major depressive episodes—the presence of depressive symptoms, including either depressed mood and/or loss of interest or pleasure, lasting 2 weeks or longer, most of the day, nearly every day, as

well as clinically significant distress or impairment—without a history of manic, mixed, or hypomanic episodes. The depressive episode must not be due to the direct physiological effects of drug abuse, a medication, or toxic exposure, nor better accounted for by schizophrenia or another psychotic disorder. GAD involves excessive anxiety and worry that occurs more days than not for a period of at least 6 months. With GAD, the individual finds it difficult to control the worry and the worry is accompanied by at least three additional symptoms (i.e., restlessness, easily fatigued, difficulty concentrating, irritability, muscle tension, and disturbed sleep).

Chronic Medical Conditions

There were two distinct outcomes assessed for the chronic medical condition measure: (1) the presence of one chronic medical condition and (2) the presence of multiple chronic medical conditions. These outcomes were determined by respondents who answered "yes" to the question that asked if respondents had ever had one or more chronic medical conditions. Respondents had to choose from a list of 14 conditions such as a blood circulation problem or "hardening of the arteries," heart trouble or heart attack, hypertension or "high blood pressure," diabetes or "sugar," a kidney problem or "kidney trouble," stroke, cancer, asthma, chronic bronchitis, or emphysema. We used these responses to create the chronic medical condition (CMC) variable to categorize each respondent into two mutually exclusive groups: one chronic medical condition (1 CMC) or two or more chronic medical conditions (multiple CMCs). The CMCs included in these analyses were selected based on their consistency with previous literature [30].

Data Analysis

To account for the NSAL's multistage sampling design, we used Stata 12.0 for data analysis. Subpopulation survey commands were applied to run the logistic regression models [31]. Taylor's series method was used for approximation of standard errors of the complex data. The study had two main outcomes: one CMC and multiple CMCs and separate models were fitted for each outcome. In the first model, we examined the unadjusted associations between MDD and the CMC outcomes. In the second model, we examined the unadjusted associations between MDD, GAD, and the CMC outcomes. For the third model we ran MDD, GAD, age, sex, education, and income and the CMC outcomes. Finally, in the last model we included MDD, GAD, age, sex, education, and income, with the addition of marital status, employment, and nativity to assess the CMC outcomes. Since the sample was nationally representative, we applied weights to all the analyses due to strata, clusters, and non-response [32]. Adjusted odds ratios (OR) and 95 % confidence intervals (CI) were reported, and p values less than 0.05 were considered statistically significant. Since our analysis focused on the role of race and ethnicity as tertiary variables among the associations between MDD or GAD (independent variables) and CMCs (dependent variables), the primary aim was not to estimate magnitude of association between psychiatric disorders and CMCs. Readers interested in point estimates within race and ethnic group (instead of comparisons across groups) should note the differences between odds ratio and prevalence ratios [33, 34]. As we used logistic regression, the measures of associations we report are odds ratios and not prevalence ratios. It should also be noted that when prevalence rates for the outcome are high, the odds ratio does not approximate relative risk (and should not be misinterpreted as it compares the prevalence rates by group membership).

Results

Demographic data for the race and ethnic groups are presented in Table 1. Males and females were represented, respectively, across the Caribbean Blacks (51 vs. 49 %), African Americans (44 vs. 56 %), and Whites (47 vs. 53 %). Across each race and ethnic group, the majority of respondents were married, had a mean education level of 12.89 years, and were in their early forties. Approximately 86 % of African American, 83 % of Caribbean Black, and 85 % of non-Hispanic White respondents reported at least one CMC. Approximately 72 % of African Americans, 71 % of Caribbean Blacks, and 71 % of non-Hispanic Whites reported multiple CMCs (Table 2). Thirteen percent of Caribbean Blacks, 10 % of African Americans, and 19 % of non-Hispanic Whites met criteria for lifetime MDD. Two percent of Caribbean Blacks, 3 % of African Americans, and 5 % of non-Hispanic Whites met criteria for lifetime GAD. Below, we present the results of the two outcome variables, at least one CMC and multiple CMCs.

MDD and/or GAD with at Least One CMC

Among African Americans, the odds of having at least one CMC were greater for participants who experienced lifetime MDD compared to those without MDD in the bivariate (model 1; OR=1.50, 95 % CI=1.04–2.14), GAD adjusted (model 2; OR=1.46, 95 % CI=1.01–2.09), demographic adjusted (model 3; 2.54, 95 % CI=1.75–3.69), and fully adjusted models (model 4; OR=2.63, 95 % CI=1.79–3.87) (Table 3). Comparable yet stronger associations were suggested for Caribbean Blacks. Among Caribbean Blacks, the odds of having at least one CMC were greater for participants who

Table 1 Socio-demographic data for Caribbean Blacks, African Americans, and Non-Hispanic Whites

Demographic data	Race and ethnicity							
	Caribbean Black		African American		White		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Sex								
Male	643	50.87	1271	44.03	372	47.26	2286	45.87
Female	978	49.13	2299	55.97	519	52.74	3796	54.13
Marital status								
Married	559	37.56	960	32.91	383	47.36	1902	40.25
Partner	131	12.58	260	8.74	44	6.59	435	7.81
Separated	128	5.37	286	7.16	37	3.11	451	5.08
Divorced	178	9.29	524	11.75	147	13.06	849	12.31
Widowed	78	4.29	353	7.90	103	7.83	534	7.74
Never married	542	30.92	1170	31.55	173	22.05	1885	26.81
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Education	12.93	1.00	12.43	2.23	13.32	5.00	12.89	2.65
Age (years)	40.28	5.78	42.33	14.50	44.98	31.11	43.57	16.61
Income ($ US)	47,017	15,242	36,846	33,236	47,397	75,266	42,455	39,594

SD standard deviation

experienced lifetime MDD compared to those without MDD in the bivariate (model 1; OR=2.24, 95 % CI=1.06–4.71), GAD adjusted (model 2; OR=2.17, 95 % CI=1.05–4.51), demographic adjusted (model 3; OR=3.17, 95 % CI=1.33–7.58), and fully adjusted models (model 4; OR=2.71, 95 % CI=1.21–6.05). In contrast, no significant associations between lifetime MDD and experiencing at least one CMC were identified among non-Hispanic Whites. The directions of the associations, however, were consistent with the findings for African Americans and Caribbean Blacks.

MDD and/or GAD with Multiple CMCs

Among African Americans, the odds of having multiple CMCs were greater for participants who experienced lifetime MDD compared to those without MDD in the demographic adjusted (model 3; OR=2.89, 95 % CI=2.00–4.17) and fully adjusted models (model 4; OR=2.92, 95 % CI=2.01–4.24) (see Table 4). Among Caribbean Blacks, the odds of having multiple CMCs were greater for participants who experienced lifetime MDD compared to those without MDD in the

Table 2 Distribution of MDD, GAD, at least one CMC, and multiple CMCs among Caribbean Blacks, African Americans, and Non-Hispanic Whites

	Caribbean Blacks (*n*=3570)			African Americans (*n*=1438)			Non-Hispanic Whites (*n*=891)		
	Percent	Lower 95 % CI	Upper 95 % CI	Percent	Lower 95 % CI	Upper 95 % CI	Percent	Lower 95 % CI	Upper 95 % CI
At least one CMC									
No	16.50	12.68	20.32	13.64	12.12	15.17	15.00	10.53	19.47
Yes	83.50	79.68	87.32	86.36	84.83	87.88	85.00	80.53	89.47
Multiple CMCs									
No	29.07	26.24	31.91	28.32	26.54	30.09	28.56	22.63	34.49
Yes	70.93	68.09	73.76	71.68	69.91	73.46	71.44	65.51	77.37
MDD									
No	87.18	81.90	92.45	89.69	88.51	90.86	80.79	78.24	83.35
Yes	12.82	7.55	18.10	10.31	9.14	11.49	19.21	16.65	21.76
GAD									
No	97.89	96.29	99.49	96.74	96.02	97.46	94.72	91.39	98.06
Yes	2.11	0.51	3.71	3.26	2.54	3.98	5.28	1.94	8.61

CI confidence interval, *CMC(s)* chronic medical condition(s), *MDD* lifetime major depressive disorder, *GAD* lifetime general anxiety disorder

Table 3 Association between lifetime MDD, lifetime GAD, and at least one CMC among African Americans, Caribbean Blacks, and non-Hispanic Whites

	African Americans (n=3570)		Caribbean Blacks (n=1438)		Non-Hispanic Whites (n=891)	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Model I						
MDD	*1.49*	*1.04–2.14*	*2.24*	*1.06–4.71*	1.20	0.57–2.54
Model II						
MDD	*1.46*	*1.01–2.09*	*2.17*	*1.05–4.51*	1.21	0.64–2.32
GAD	1.53	0.74–3.18	1.42	0.44–4.66	0.90	0.21–3.92
Model III						
MDD	*2.54*	*1.75–3.69*	*3.17*	*1.33–7.58*	1.46	0.59–3.61
GAD	1.86	0.83–4.15	2.40	0.61–9.42	1.49	0.46–4.92
Age	1.07	1.05–1.08	1.08	1.06–1.10	1.07	1.04–1.11
Sex	1.000		1.00		1.00	
Education	0.88	0.74–1.05	0.94	0.57–1.5	1.02	0.69–1.49
Income	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00
Model IV						
MDD	*2.63*	*1.79–3.87*	*2.71*	*1.21–6.05*	1.53	0.57–4.13
GAD	1.77	0.79–3.99	1.57	0.41–6.04	1.43	0.50–4.06
Age	1.06	1.05–1.08	1.11	1.08–1.14	1.08	1.04–1.13
Sex	1.00		1.00		1.00	
Education	0.89	0.75–1.06	1.00	0.62–1.62	0.99	0.71–1.40
Income	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00
Nativity	0.29	0.14–0.67	0.47	0.18–1.19	0.30	0.08–1.13
Employment[a]						
Unemployed	0.930	0.60–1.43	1.89	0.86–4.19	0.59	0.11–3.23
Not in labor force	1.150	0.83–1.59	1.18	0.37–3.80	0.71	0.33–1.54
Marital status[b]						
Divorced/separated/widowed	0.985	0.69–1.41	0.59	0.34–1.04	0.55	0.19–1.54
Never married	0.979	0.71–1.34	1.59	0.94–2.68	0.95	0.46–1.95

Italicized values indicate statistical significance at the $p<0.05$ level. Model I examined the unadjusted associations between MDD and the outcomes; model II included all the variables from model I with the addition of GAD; model III examined all the variables from model II with the addition of age, gender, education, and income; model IV examined all the variables from model III with the addition of marital status, employment, and nativity

OR adjusted odds ratio, *CI* confidence interval, *MDD* lifetime major depressive disorder, *GAD* lifetime general anxiety disorder

[a] Reference category: employed

[b] Reference category: married/cohabiting

bivariate (model 1; OR=2.13, 95 % CI=0.90–5.02), demographic adjusted (model 3; OR=3.91, 95 % CI=1.44–10.59), and fully adjusted models (model 4; OR=3.66, 95 % CI=1.26–10.62). Among non-Hispanic Whites, the odds of having multiple CMCs were greater for participants who experienced lifetime MDD compared to those without MDD in the demographic adjusted (model 3; OR=2.54, 95 % CI=1.23–5.22) and fully adjusted models (model 4; OR=2.54, 95 % CI=1.25–5.17). These results suggest the unadjusted associations between lifetime MDD and both experiencing one CMC and experiencing multiple CMCs were confounded by multiple demographic and socioeconomic measures.

Discussion

The purpose of this study was to examine race and ethnic group differences among MDD and/or GAD and their influence on one or more chronic medical conditions (CMCs) for African Americans, Caribbean Blacks, and non-Hispanic Whites. Specifically, we sought to explore race and ethnic group variations among respondents who reported one or more CMCs, as they co-occur with MDD and/or GAD. The findings extend the work of previous studies because the sample includes African American, Caribbean Black, and non-Hispanic White men and women and we consider how MDD and/or GAD co-occur with

Table 4 Association between lifetime MDD, lifetime GAD, and multiple CMCs among African Americans, Caribbean Blacks, and non-Hispanic Whites

	African Americans (n=3570)		Caribbean Blacks (n=1438)		Non-Hispanic Whites (n=891)	
	OR	95 % CI	OR	95 % CI	OR	95 % CI
Model I						
MDD	1.26	0.92–1.72	*2.13*	*0.90–5.02*	1.35	0.68–2.67
Model II						
MDD	1.24	0.91–1.70	2.02	0.83–4.93	1.36	0.74–2.48
GAD	1.19	0.74–1.95	2.09	0.77–5.73	0.97	0.26–3.58
Model III						
MDD	*2.89*	*1.99–4.17*	*3.91*	*1.44–10.59*	*2.54*	*1.23–5.22*
GAD	1.68	0.96–2.93	4.95	1.23–19.85	*2.53*	*0.84–7.65*
Age	1.07	1.06–1.08	1.07	1.04–1.09	1.08	1.06–1.12
Sex	1.00		1.00		1.00	
Education	0.96	0.86–1.07	1.03	0.64–1.66	0.97	0.79–1.19
Income	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00
Model IV						
MDD	*2.92*	*2.01–4.24*	*3.66*	*1.26–10.62*	*2.54*	*1.25–5.17*
GAD	1.59	0.90–2.82	2.88	0.77–10.81	*2.59*	*0.99–6.73*
Age	1.07	1.05–1.08	1.08	1.05–1.113	1.08	1.06–1.11
Sex	1.00		1.00		1.00	
Education	0.98	0.88–1.09	1.05	0.65–1.69	0.98	0.78–1.24
Income	1.00	1.00–1.00	1.00	1.00–1.00	1.00	1.00–1.00
Nativity	0.42	0.15–1.18	0.52	0.22–1.24	0.38	0.05–2.85
Employment[a]						
Unemployed	1.23	0.88–1.70	1.21	0.58–2.53	0.99	0.29–3.35
Not in labor force	1.09	0.78–1.53	0.96	0.43–2.15	0.94	0.63–1.39
Marital status[b]						
Divorced/separated/widowed	0.90	0.67–1.22	0.38	0.16–0.94	0.81	0.44–1.51
Never married	0.74	0.53–1.02	0.77	0.38–1.57	0.66	0.18–2.39

Italicized values indicate statistical significance at the $p<0.05$ level. Model I examined the unadjusted associations between MDD and the outcomes; model II included all the variables from model I with the addition of GAD; model III examined all the variables from model II with the addition of age, gender, education, and income; model IV examined all the variables from model III with the addition of marital status, employment, and nativity

OR adjusted odds ratio, *CI* confidence interval, *MDD* lifetime major depressive disorder, *GAD* lifetime general anxiety disorder

[a] Reference category: employed

[b] Reference category: married/cohabiting

one or more CMCs. Overall, we found that respondents who met criteria for either a mood or anxiety disorder also reported having at least one or more CMCs. Therefore, our findings are aligned with previous studies that report the co-occurrence of mental and physical health conditions among race, ethnic, and gender groups [3, 4].

Additionally, we found that lifetime MDD (but not lifetime GAD) was associated with at least one CMC among African Americans and Caribbean Blacks, but not among non-Hispanic Whites. These findings suggest that for Black Americans, MDD and at least one CMC are uniquely associated, insomuch that MDD may be linked to at least one physical health condition for Black Americans more than Whites. The findings are similar to those of previous studies regarding the depressive experiences of Black Americans and how closely these experiences are associated with other comorbid conditions [3, 4, 10]. After controlling for MDD, we found that lifetime GAD did not have a residual effect when paired with at least one CMC for African Americans and Caribbean Blacks. This is aligned with previous studies that suggested non-Hispanic Whites are at a higher risk for developing GAD than Blacks [22]. The rates of GAD for non-Hispanic Whites compared to African Americans and Caribbean Blacks in the present study also support this. It is clear that the way GAD is experienced by non-Hispanic Whites may be different than how GAD is experienced by Blacks and should be explored further in future studies.

A study comparable to the present study examined non-Hispanic Black and White adults (n=32,752) using data from from the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions study and reported that among those with MDD, Blacks were significantly more likely to report hypertension, obesity, and liver disease. Blacks were also less likely to receive outpatient services and be prescribed medications for MDD and less likely to receive emergency room and inpatient treatment. MDD was more frequently associated with initial insomnia, early morning awakening, and restlessness among Blacks compared to Whites [35]. The association between MDD and heart disease has also been found to be larger among African Americans than Whites [36]. Likewise, the additive effects of anxiety on obesity (after controlling for depression) may also vary based on race, ethnicity, and gender [37]. For instance, another study suggested that being labeled as hypertensive was associated with high depressive symptoms among Blacks but not Whites [38]. Race and ethnic differences in the effects of "labeling" may explain some of the race and ethnic variations in the associations between chronic medical diseases and mental health. Our study, as well as the aforementioned ones, have suggested that the link between mental and physical conditions may depend on race, ethnicity, and culture.This is an area in need of further inquiry.

As for MDD and/or GAD and multiple CMCs, we found that lifetime MDD was not associated with multiple CMCs among African Americans and non-Hispanic Whites, but it was marginally associated with multiple CMCs among Caribbean Blacks. Adding GAD to the models for African Americans and non-Hispanic Whites did not change the association it had with multiple CMCs. However, the addition of the various sociodemographic factors led to noteworthy associations between MDD and multiple CMCs for African Americans and non-Hispanic Whites. This was not true for Caribbean Blacks, as the associations between lifetime MDD and multiple CMCs were apparent early in the analyses. Then when lifetime GAD and the various sociodemographic variables were added to the model, MDD remained statistically significant. For Caribbean Blacks, such ethnic differences (i.e., African Americans being different from Caribbean Blacks, but similar to non-Hispanic Whites) with regard to psychiatric disorders and multiple CMCs speak to issues of acculturation and nativity, which have been examined in previous psychiatric studies [13, 15, 16].

For example, previous studies have suggested that among those with MDD, Blacks have significantly higher odds of hypertension, obesity, and liver disease compared to Whites [35]. Other studies have found the association between MDD and heart disease to be larger among African Americans compared to Whites in a more recent study of racial differences in comorbid conditions [36].

Evidence suggests that in the presence of multiple conditions and stressors, a new chronic disease may be more disabling among Blacks than Whites [39]. Race and ethnic group differences in access to health care, social position, severity of disease [40], or time between diagnosis and treatment of a chronic condition may contribute to different vulnerabilities to medical and psychiatric conditions between Blacks and Whites [41]. Our findings, corroborated by those from previous reports, have research, practice, and policy implications for how comorbidities are assessed, diagnosed, and treated across racial groups. Future studies should further explore the presence of multiple comorbid disorders, as they have also been associated with impulsive behaviors and suicide attempts [13]. Given the large health disparities and premature mortality rates among people with mental illness our findings also have implications for the integration of health services and health promotion programs in mental health settings.

Limitations

Despite the contributions this study makes to our understanding of comorbid MDD and/or GAD and CMCs, the results should be interpreted in light of a few limitations. First, this study combined fourteen CMCs, therefore not allowing us to examine the associations between each medical condition (individually) and MDD and/or GAD. Aggregating the data in such a way makes it difficult to understand the individual effects of each CMC on the disorders (e.g., whether respondents who reported being diagnosed with diabetes also met criteria for MDD). Therefore, the current study should be considered an initial examination of how comorbid psychiatric disorders and CMCs vary by race and ethnicity. Future studies may consider disaggregating psychiatric disorders and CMCs for a closer look at the relationships therein. Second, though the list of mood disorders were assessed across all racial and ethnic groups reported in the NSAL, only four of the six anxiety disorders were assessed for the non-Hispanic White respondents (e.g., obsessive compulsive disorder and post-traumatic stress disorder were excluded). Future reports may consider including the full list of mood disorders and anxiety disorders from the NSAL and other nationally representative samples. Finally, the assessment of MDD and GAD was based on self-report. We do not know the extent to which cultural factors could affect the willingness of respondents to either admit or recall the presence of DSM-IV-TR symptoms during their lifetime or whether impaired memory recall could affect subgroups differentially. Finally, the NSAL is a cross-sectional study. Therefore, the measured were only assessed at one point in time, and the cross-sectional design of the study does not permit an analysis of the respondents' development or the presence of CMCs and psychiatric disorders over the life course. As a result, we can only speculate about the mental

and physical health conditions of NSAL respondents before and after the data were collected. Despite these limitations, this study underscores important aspects of the coexistence of mental and physical health conditions as well as ways to think about services for patients with CMCs who are at the apex of various racial, ethnic, and mental health intersections.

Conclusion

This study tested whether race and ethnic group differences exist for one or more CMCs among African Americans, Caribbean Blacks, and non-Hispanic Whites in the context of lifetime MDD and/or GAD. When examining co-occurring mental and physical health conditions, it is important to move beyond the traditional, standardized measures and consider the intersecting factors that may influence mental and physical health outcomes. This study has larger public health relevance because of the mental health screening of individuals with CMCs in primary health-care settings and how this may benefit from a closer examination of (and tailoring by) race and ethnicity. Given the importance of race, ethnicity, and culture in the context of health conditions, deeper investigation and introspection of health-care professionals into the health practices and experiences of their patients will lead to improved measures, diagnoses, and treatments for patients with comorbidities.

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Conflict of Interest Daphne C. Watkins, Shervin Assari, and Vicki Johnson-Lawrence declare that they have no conflict of interest.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all participants included in the study.

Animal Studies No animal studies were carried out by the authors for this article.

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