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Association of Race and Ethnicity With Late-Life Depression Severity, Symptom Burden, and Care

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Abstract

IMPORTANCE Knowledge gaps persist regarding racial and ethnic variation in late-life depression, including differences in specific depressive symptoms and disparities in care.

OBJECTIVE To examine racial/ethnic differences in depression severity, symptom burden, and care.

DESIGN, SETTING, AND PARTICIPANTS This cross-sectional study included 25 503 of 25 871 community-dwelling older adults who participated in the Vitamin D and Omega-3 Trial (VITAL), a randomized trial of cancer and cardiovascular disease prevention conducted from November 2011 to December 2017. Data analysis was conducted from June to September 2018.

EXPOSURE Racial/ethnic group (ie, non-Hispanic white; black; Hispanic; Asian; and other, multiple, or unspecified race).

MAIN OUTCOMES AND MEASURES Depressive symptoms, assessed using the Patient Health Questionnaire–8 (PHQ-8); participant-reported diagnosis, medication, and/or counseling for depression. Differences across racial/ethnic groups were evaluated using multivariable zero-inflated negative binomial regression to compare PHQ-8 scores and multivariable logistic regression to estimate odds of item-level symptom burden and odds of depression treatment among those with diagnosed depression.

RESULTS There were 25 503 VITAL participants with adequate depression data (mean [SD] age, 67.1 [7.1] years) including 12 888 [50.5%] women, 17 828 [69.9%] non-Hispanic white participants, 5004 [19.6%] black participants, 1001 [3.9%] Hispanic participants, 377 [1.5%] Asian participants, and 1293 participants [5.1%] who were categorized in the other, multiple, or unspecified race group. After adjustment for sociodemographic, lifestyle, and health confounders, black participants had a 10% higher severity level of PHQ-8 scores compared with non-Hispanic white participants (rate ratio [RR], 1.10; 95% CI, 1.04-1.17; $P < .001$); Hispanic participants had a 23% higher severity level of PHQ-8 scores compared with non-Hispanic white participants (RR, 1.23; 95% CI, 1.10-1.38; $P < .001$); and participants in the other, multiple, or unspecified group had a 14% higher severity level of PHQ-8 scores compared with non-Hispanic white participants (RR, 1.14; 95% CI, 1.04-1.25; $P = .007$). Compared with non-Hispanic white participants, participants belonging to minority groups had 1.5-fold to 2-fold significantly higher fully adjusted odds of anhedonia (among black participants: odds ratio [OR], 1.76; 95% CI, 1.47-2.11; among Hispanic participants: OR, 1.96; 95% CI, 1.43-2.69), sadness (among black participants: OR, 1.31; 95% CI, 1.07-1.60; among Hispanic participants: OR, 2.09; 95% CI, 1.51-2.88), and psychomotor symptoms (among black participants: OR, 1.77; 95% CI, 1.31-2.39; among Hispanic participants: OR, 2.12; 95% CI, 1.28-3.50); multivariable-adjusted odds of sleep problems and guilt appeared higher among Hispanic vs non-Hispanic white participants (sleep: OR, 1.24; 95% CI, 1.01-1.52; guilt: 1.84; 95% CI, 1.31-2.59). Among those with clinically significant

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Key Points

Question Do older adults from minority racial and ethnic groups differ from non-Hispanic white older adults regarding severity of depression, item-level depressive symptoms, and depression care?

Findings This cross-sectional study of 25 503 older community-dwelling adults found significant racial/ethnic disparities, with higher overall severity of depression scores, 1.5-fold to 2-fold higher odds of several item-level depressive symptoms, and lower prevalence of depression care among participants belonging to minority groups, after adjusting for confounders.

Meaning In this study, the observed racial and ethnic disparities among older adults in late-life depression severity, symptomatology, and treatment suggest the need for further examination of a broad range of patient-level and clinician-level factors that may drive these associations.

+ Supplemental content

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Abstract (continued)

depressive symptoms (ie, PHQ-8 score ≥10) and/or those with diagnosed depression, black participants were 61% less likely to report any treatment (ie, medications and/or counseling) than non-Hispanic white participants after adjusting for confounders (adjusted OR, 0.39; 95% CI, 0.27-0.56).

CONCLUSIONS AND RELEVANCE In this cross-sectional study, significant racial and ethnic differences in late-life depression severity, item-level symptom burden, and depression care were observed after adjustment for numerous confounders. These findings suggest a need for further examination of novel patient-level and clinician-level factors underlying these associations.

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Introduction

Depression is a leading cause of disability and global disease burden and poses serious consequences for affected individuals and society alike.[1] Late-life depression (LLD) is common. In a 2013 meta-analysis,[2] estimated current and lifetime prevalence rates of major depressive disorder among older adults were 3.3% and 16.5%, respectively; current prevalence of significant LLD symptoms (ie, encompassing major and minor depression) is higher, at 19%.[3] However, even with appropriate diagnosis and treatment, residual symptoms and dysfunction frequently occur in LLD.[4]

Current evidence indicates that older adults who belong to racial/ethnic minority groups encounter disparities in both depression burden and care. Race/ethnicity may be conceptualized as a complex multidimensional construct comprising heterogeneous societal and cultural factors; thus, in some contexts, race/ethnicity may appear as a proxy for social determinants of health.[5] For example, low socioeconomic status, low physical activity, and medical comorbidities are established determinants of LLD[6]; given that their distributions differ by race/ethnicity,[7] they may contribute to health disparities.[8] Disparities may also include underdiagnosis,[9] lower likelihood of receiving depression treatment, and differences in treatment quality.[10-12] Potential disparities[9,13] are concerning, given that the higher current depression burden,[14-17] symptom severity,[16] and depression-related role dysfunction[18] reported among older adults from minority groups may lead to greater adverse long-term health consequences from depression.[19,20] For example, older adults from minority groups bear a disproportionate share of the burden of dementia; it is plausible that a proportion of the variation in dementia risk among older adults from minority groups may be explained by LLD and its interplay with prevalent medical comorbidities.[21,22] Thus, it is critical to measure the extent of the disparities in symptom severity, burden, and care as well as to evaluate potential social, behavioral, and health status determinants that may partly underlie disparities.

There is also a need to address potential racial/ethnic variations in presenting symptoms of depression, especially given that these may be associated with how clinicians diagnose or treat LLD. Older adults appear less likely than younger adults to report certain features of depression, including dysphoria or sadness and guilt.[23] Symptoms such as sleep disturbance, fatigue, loss of interest, and hopelessness may be more prominent in LLD.[24] However, knowledge gaps remain regarding racial/ethnic variations in item-level depressive symptoms and overall levels of symptoms among older adults.

Identifying disparities in symptom presentation and treatment of LLD may guide approaches to reducing associated morbidity and mortality. Thus, this study leveraged the high-quality depression and other phenotypic data from participants in a large-scale randomized clinical trial to evaluate racial/ethnic differences in depression severity, item-level depressive symptom burden, and depression care.

Methods

Study Population

Participants were members of the Vitamin D and Omega-3 Trial (VITAL) and VITAL-Depression Endpoint Prevention (VITAL-DEP),[25] an LLD ancillary study to VITAL.[26-28] Overall, VITAL included 25 871 men aged 50 years and older and women aged 55 years and older (mean [SD] age, 67.1 [7.1] years), in a 2 × 2 factorial randomized clinical trial of cancer and cardiovascular disease prevention using vitamin D and/or fish oil; thus, VITAL and VITAL-DEP participants were free of heart disease or cancer at baseline. Inclusion and exclusion criteria are detailed elsewhere.[25,28] For this study, we included 25 503 VITAL participants, after excluding 368 without adequate depression data (ie, >2 items missing on the Patient Health Questionnaire–8 [PHQ-8]) (eFigure in the Supplement). Characteristics of included sample participants were comparable with those in the full cohort, eg, mean (SD) age (67.1 [7.1] years in both groups), number of women (13 085 [50.6%] vs 12 888 [50.5%]), and mean (SD) body mass index (BMI; calculated as weight in kilograms divided by height in meters squared; 28.1 [5.7] in both groups). All participants provided written informed consent, and the study was approved by the institutional review board at Brigham and Women's Hospital. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

Participant Characteristics

Characteristics were self-reported on study questionnaires. Demographic variables included age, sex, race/ethnicity (ie, non-Hispanic white, black, Hispanic, Asian including Pacific Islander, and other [ie, Native American, Alaskan Native, and other, multiple, or unspecified race/ethnicity]), education level, and yearly income. Lifestyle and behavioral characteristics included BMI; physical activity (total metabolic equivalent [MET] hours per week); cigarette smoking (ie, current, past, or never); alcohol use frequency (ie, never, rarely or monthly, weekly, or daily). Medical comorbidity variables included history of hypertension, diabetes, or high cholesterol.

Assessment and Measures of Depression

Depression was characterized in VITAL-DEP by using Boolean classification of depressive symptoms, diagnosis, and/or treatment data, consistent with our prior work[29] and other large-scale, high-quality studies of older adults.[30-32] Depressive symptoms were ascertained on annual questionnaires via the PHQ-8,[33,34] which has high validity for identifying clinical depression (eg, high sensitivity and specificity for major depressive disorder at the validated cutoff of PHQ-8 score ≥10)[33,35] and cross-cultural validity among diverse, community-dwelling older adults.[36-38] Depression severity was categorized using total PHQ-8 score as follows: no or minimal depression, 0 to 4; mild depression, 5 to 9; and moderate or more severe depression, at least 10. Item-level symptom burden was denoted by report of experiencing a symptom more than half the days or nearly every day on the PHQ-8. Depression care was determined by evaluating self-reported history of clinician diagnosis of depression, use of antidepressant medication, such as selective serotonin reuptake inhibitors, and/or counseling for depression.

Statistical Analysis

Demographic, lifestyle, health, and depression-related variables were summarized for the whole sample. Characteristics were also compared among racial/ethnic groups. Depression severity was modeled using multilevel zero-inflated negative binomial regression,[39,40] given that this was most appropriate for the distribution of PHQ-8 total score. The mean PHQ-8 score was 1.78 points, while the variance was several times larger, at 8.51 points, and 11 888 participants (46.6%) had zero values. The negative binomial portion is clinically interpretable as severity of total symptoms; the zero-inflated portion, which predicts likelihood of all zeroes (0 points) vs not (≥1 point), is not clinically interpretable in this context because of a lack of meaningful distinction between true and excess

zeroes using the PHQ-8. Thus, we focused on the negative binomial portion for addressing total depression severity.

Racial/ethnic differences in item-level depressive symptoms (eg, anhedonia, sadness, guilt, neurovegetative symptoms) were examined using logistic regression. Of note, black and Hispanic participants were slightly younger than participants from other racial/ethnic groups (by enrollment design in VITAL because of racial/ethnic differences in age-related risks of heart disease and cancer); thus, we conducted a sensitivity analysis using weighted odds ratios (ORs) to reduce possible bias in the estimates owing to the age-and-race structure of the sample.

Finally, we evaluated racial/ethnic differences in depression care when restricting the sample to participants who reported clinically significant depressive symptoms (ie, PHQ-8 score ≥10).[33] Furthermore, racial/ethnic differences in depression care were analyzed among those who reported both PHQ-8 scores of at least 10 and clinician-diagnosed depression. All previously mentioned regression models were sequentially adjusted for demographic factors and then for lifestyle factors and medical comorbidities, as described earlier. Statistical analyses were performed with SAS statistical software version 9.3 (SAS Institute). Statistical significance was defined as a 2-tailed $P < .05$.

Results

As shown in **Table 1**, there were 25 503 participants (mean [SD] age, 67.1 [7.1] years; 12 888 [50.5%] women). There were 17 828 (69.9%) non-Hispanic white participants, 5004 (19.6%) black participants, 1001 (3.9%) Hispanic participants, 377 (1.5%) Asian participants, and 1293 participants (5.1%) in the other, multiple, or unspecified race group. Participant characteristics are also presented by racial/ethnic groups (Table 1). Black and Hispanic participants were younger compared with other racial/ethnic groups (mean [SD] age: black, 63.3 [6.8] years; Hispanic, 67.3 [6.6] years; non-Hispanic white, 68.1 [6.8] years; Asian, 67.6 [6.7] years). Compared with non-Hispanic white participants, black participants, Hispanic participants, and participants in the other, multiple, or unspecified group had lower educational attainment (did not complete high school: non-Hispanic white, 80 [0.5%]; black, 174 [3.5%]; Hispanic, 49 [4.9%]; other, 42 [3.3%]) and annual household income (<$15 000: non-Hispanic white, 498 [3.1%]; black, 735 [16.2%]; Hispanic, 78 [8.5%]; other, 119 [10.3%]), higher BMI (mean [SD] BMI: non-Hispanic white, 27.4 [5.2]; black, 30.6 [6.7]; Hispanic, 28.7 [5.6]; other, 28.5 [5.8]), lower daily alcohol consumption (never: non-Hispanic white, 4718 [26.7%]; black, 2232 [46.0%]; Hispanic, 301 [31.1%]; other, 472 [37.4%]), higher current smoking (non-Hispanic white, 926 [5.2%]; black, 704 [14.3%]; Hispanic, 65 [6.6%]; other, 113 [8.8%]), and lower physical activity (median [interquartile range] MET h/wk: non-Hispanic white, 17.4 [5.9-33.0]; black, 9.2 [2.6-25.7]; Hispanic, 14.5 [3.8-32.6]; other, 13.2 [3.6-30.0]). Prevalence of diabetes was nearly 2-fold higher among patients from minority groups than among non-Hispanic white participants (non-Hispanic white, 1850 [10.4%]; black, 1191 [23.9%]; Hispanic, 200 [20.0%]; Asian 79 [21.0%]; other, 175 [13.6%]); the disparity in diabetes prevalence among Asian participants was notable, given lower mean (SD) BMI among Asian participants (24.8 [4.2]) compared with non-Hispanic white participants (27.4 [5.2]). Black participants had a higher prevalence of hypertension compared with non-Hispanic white participants (3361 [67.7%] vs 8424 [47.5%]).

Racial/ethnic variations were apparent for depression variables. Black participants, Hispanic participants, and participants from the other, multiple, or unspecified race group were more likely to have PHQ-8 scores of at least 10 (non-Hispanic white, 354 [2.0%]; black, 287 [5.8%]; Hispanic, 51 [5.1%]; other, 55 [4.3%]) and to endorse core features of depression (eg, felt sad for 2 weeks or longer in the past 2 years: non-Hispanic white, 1916 [10.8%]; black, 826 [16.7%]; Hispanic, 143 [14.3%]; other, 201 [15.6%]); however, black and Hispanic participants were less likely to report selective serotonin reuptake inhibitor use (non-Hispanic white, 1275 [7.2%]; black, 185 [3.8%]; Hispanic, 49 [5.0%]) or having been diagnosed with or treated for depression (non-Hispanic white, 3518 [21.4%]; black, 866 [19.1%]; Hispanic, 162 [17.5%]). Characteristics by depression severity level

Table 1. Baseline Demographic, Lifestyle, Behavioral, Health, and Depression Characteristics of the Sample by Race/Ethnic Groups

Characteristic	No./total No. (%)[a]	No. (%)				
		Race/ethnicity				
	Total cohort (N = 25 503)	Non-Hispanic white (n = 17 828)	Black (n = 5004)	Hispanic (n = 1001)	Asian (n = 377)[b]	Other, multiple, or unspecified (n = 1293)[c]
Demographic						
Age, mean (SD), y	67.1 (7.1)	68.1 (6.8)	63.3 (6.8)	67.3 (6.6)	67.6 (6.7)	68.3 (7.3)
Women	12 888/25 503 (50.5)	8573 (48.1)	3098 (61.9)	361 (36.1)	156 (41.4)	700 (54.1)
Education						
Did not complete high school	346/25 450 (1.4)	80 (0.5)	174 (3.5)	49 (4.9)	1 (0.3)	42 (3.3)
High school diploma or GED	2890/25 450 (11.4)	1372 (7.7)	1056 (21.2)	195 (19.5)	18 (4.8)	249 (19.4)
Attended or graduated from college	10 697/25 450 (42.0)	7243 (40.7)	2398 (48.1)	380 (38.0)	150 (39.8)	526 (40.9)
Postgraduate	11 517/25 450 (45.3)	9110 (51.2)	1353 (27.2)	377 (37.7)	208 (55.2)	469 (36.5)
Income, $						
<15 000	1445/22 993 (6.3)	498 (3.1)	735 (16.2)	78 (8.5)	15 (4.5)	119 (10.3)
15 000-29 999	2875/22 993 (12.5)	1508 (9.4)	982 (21.6)	166 (18.1)	28 (8.3)	191 (16.5)
30 000-49 999	4080/22 993 (17.7)	2700 (16.8)	941 (20.7)	166 (18.1)	51 (15.1)	222 (19.2)
50 000-69 999	3763/22 993 (16.4)	2674 (16.7)	730 (16.1)	135 (14.8)	50 (14.8)	174 (15.0)
70 000-89 999	2919/22 993 (12.7)	2235 (13.9)	408 (9.0)	109 (11.9)	40 (11.9)	127 (11.0)
90 000-120 000	3737/22 993 (16.3)	2929 (18.3)	440 (9.7)	132 (14.4)	76 (22.6)	160 (13.8)
>120 000	4174/22 993 (18.2)	3496 (21.8)	308 (6.8)	129 (14.1)	77 (22.9)	164 (14.2)
Lifestyle and behavioral factors						
BMI, mean (SD)	28.1 (5.7)	27.4 (5.2)	30.6 (6.7)	28.7 (5.6)	24.8 (4.2)	28.5 (5.8)
Total leisure-time physical activity and stair climbing, median (IQR), MET hours/wk[d]	15.5 (4.6-31.7)	17.4 (5.9-33.0)	9.2 (2.6-25.7)	14.5 (3.8-32.6)	16.9 (6.6-35.0)	13.2 (3.6-30.0)
Cigarette smoking						
Never	13 072/25 276 (51.7)	9166 (51.8)	2504 (50.8)	521 (52.8)	242 (65.2)	639 (49.8)
Past	10 384/25 276 (41.1)	7618 (43.0)	1718 (34.9)	401 (40.6)	117 (31.5)	530 (41.3)
Current	1820/25 276 (7.2)	926 (5.2)	704 (14.3)	65 (6.6)	12 (3.2)	113 (8.8)
Alcohol use						
Never	7880/25 093 (31.4)	4718 (26.7)	2232 (46.0)	301 (31.1)	157 (43.3)	472 (37.4)
Rarely to less than weekly	1878/25 093 (7.5)	1203 (6.8)	449 (9.3)	86 (8.9)	30 (8.3)	110 (8.7)
1-6 drinks/wk	8779/25 093 (35.0)	6308 (35.8)	1576 (32.5)	373 (38.5)	128 (35.3)	394 (31.3)
Daily	6556/25 093 (26.1)	5418 (30.7)	596 (12.3)	209 (21.6)	48 (13.2)	285 (22.6)
Comorbidity factors						
Hypertension[e]	13 142/25 366 (51.8)	8424 (47.5)	3361 (67.7)	508 (51.2)	187 (49.9)	662 (51.4)
Diabetes[f]	3495/25 462 (13.7)	1850 (10.4)	1191 (23.9)	200 (20.0)	79 (21.0)	175 (13.6)
High cholesterol	9462/25 219 (37.5)	6911 (39.1)	1573 (32.0)	366 (37.1)	157 (42.9)	455 (35.7)
Depression characteristics						
PHQ-8 score						

(continued)

are also shown (eTable 1 in the Supplement). Compared with the group with mild symptoms (PHQ-8 score 0-4), the group with moderate symptoms (PHQ-8 score ≥10) had lower mean (SD) age (66.0 [7.3] years vs 64.6 [7.1] years); had a higher proportion of women (1258 [57.5%] vs 445 [58.9%]), black participants (585 [26.7%] vs 287 [38.0%]), Hispanic participants (96 [4.4%] vs 51 [6.8%]), or participants from other, multiple, or unspecified race/ethnicity groups (123 [5.6%] vs 55 [7.3%]); higher mean (SD) BMI (30.0 [7.0] vs 31.5 [7.7]); lower median (interquartile range) physical activity (8.6 [2.1-23.8] MET h/wk vs 4.4 [0.7-15.1] MET h/wk); higher current smoking (261 [12.0%] vs 140 [18.8%]); lower daily alcohol consumption (never: 820 [38.4%] vs 350 [47.6%]); and higher medical comorbidity (eg, diabetes: 462 [21.2%] vs 204 [27.1%]).

We observed significant differences in depression severity by racial/ethnic group (**Table 2**). Compared with non-Hispanic white participants, black participants, Hispanic participants, and

Table 1. Baseline Demographic, Lifestyle, Behavioral, Health, and Depression Characteristics of the Sample by Race/Ethnic Groups (continued)

Characteristic	No./total No. (%)[a]	No. (%)				
		Race/ethnicity				
	Total cohort (N = 25 503)	Non-Hispanic white (n = 17 828)	Black (n = 5004)	Hispanic (n = 1001)	Asian (n = 377)[b]	Other, multiple, or unspecified (n = 1293)[c]
PHQ-8 score						
Median (IQR)	1.0 (0.0-2.0)	1.0 (0.0-2.0)	1.0 (0.0-3.0)	1.0 (0.0-3.0)	0.0 (0.0-2.0)	1.0 (0.0-3.0)
0	11 888/25 503 (46.6)	8464 (47.5)	2183 (43.6)	483 (48.3)	204 (54.1)	554 (42.9)
1-4	10 671/25 503 (41.8)	7651 (42.9)	1949 (39.0)	371 (37.1)	139 (36.9)	561 (43.4)
5-9	2189/25 503 (8.6)	1359 (7.6)	585 (11.7)	96 (9.6)	26 (6.9)	123 (9.5)
10-14	504/25 503 (2.0)	245 (1.4)	183 (3.7)	29 (2.9)	6 (1.6)	41 (3.2)
15-19	183/25 503 (0.7)	79 (0.4)	76 (1.5)	19 (1.9)	1 (0.3)	8 (0.6)
≥20	68/25 503 (0.3)	30 (0.2)	28 (0.6)	3 (0.3)	1 (0.3)	6 (0.5)
SSRI use	1603/25 140 (6.4)	1275 (7.2)	185 (3.8)	49 (5.0)	8 (2.2)	86 (6.8)
Ever diagnosed with, took medication for, or counseled for depression	4846/23 425 (20.7)	3518 (21.4)	866 (19.1)	162 (17.5)	30 (8.6)	270 (23.3)
If ever diagnosed, took medication or received counseling in the past 2 y	2626/4784 (54.9)	1906 (54.8)	436 (51.1)	99 (62.3)	17 (58.6)	168 (62.9)
Felt sad or depressed for ≥2 wk in the last 2 y	3126/25 389 (12.3)	1916 (10.8)	826 (16.7)	143 (14.3)	40 (10.6)	201 (15.6)

Abbreviations: BMI, body mass index (calculated as weight in kilograms divided by height in meters squared); GED, general education diploma; IQR, interquartile range; MET, metabolic equivalent of task; PHQ-8, Patient Health Questionnaire-8; SSRI, selective serotonin reuptake inhibitor.

[a] Figures for percentages may not add to 100 due to rounding.

[b] Asian group also includes Pacific Islander individuals.

[c] Other, multiple, or unspecified race/ethnicity group includes Native American and American Indian, Native Hawaiian, and other, multiple, unspecified race/ethnicity.

[d] Leisure-time physical activities included walking or hiking; jogging; running; bicycling; aerobic exercise, aerobic dance, and exercise machines; lower-intensity exercise, yoga, stretching, and toning; tennis, squash, and racquetball; lap swimming; weight lifting or strength training; and other exercise.

[e] Ever diagnosed with high blood pressure or ever use of antihypertensive medication.

[f] Ever diagnosed with diabetes or current use of antidiabetic medication.

Table 2. Differences in Depression Severity by Race/Ethnicity

Model[a]	Race/ethnicity								
	Non-Hispanic white (n = 17 828)	Black (n = 5004)		Hispanic (n = 1001)		Asian (n = 377)[b]		Others (n = 1293)[c]	
		RR (95% CI)	*P* value	RR (95% CI)	*P* value	RR (95% CI)	*P* value	RR (95% CI)	*P* value
Model 1[d]	1 [Reference]	1.64 (1.54-1.73)	<.001	1.51 (1.34-1.71)	<.001	1.12 (0.90-1.38)	.32	1.32 (1.19-1.47)	<.001
Model 2[e]	1 [Reference]	1.23 (1.16-1.30)	<.001	1.28 (1.14-1.43)	<.001	1.10 (0.90-1.33)	.36	1.15 (1.04-1.26)	.005
Model 3[f,g]	1 [Reference]	1.13 (1.07-1.20)	<.001	1.24 (1.11-1.39)	<.001	1.16 (0.95-1.40)	.14	1.12 (1.02-1.23)	.02
Model 4[g,h]	1 [Reference]	1.10 (1.04-1.17)	<.001	1.23 (1.10-1.38)	<.001	1.10 (0.91-1.33)	.34	1.14 (1.04-1.25)	.007

Abbreviation: RR, rate ratio.

[a] Results from the negative binomial portion of the zero-inflated negative binomial regression show RRs and 95% CIs, which reflect percentage differences in total depression severity on the Patient Health Questionnaire-8 among minority racial groups (eTable 2 in the Supplement).

[b] Asian group included Pacific Islander individuals.

[c] Other race/ethnicity included Native American and American Indian, Native Hawaiian, and other, multiple, unknown and unspecified race/ethnicity.

[d] Model 1 was analyzed as a univariate model.

[e] Model 2 was adjusted for demographic factors.

[f] Model 3 was adjusted for demographic, lifestyle, and behavioral factors.

[g] To avoid undefined physical activity estimates when using a missing indicator for physical activity, we imputed the median value for the small percentage (<1%) of participants who were missing information on physical activity.

[h] Model 4 was adjusted for demographic, lifestyle, behavioral, and comorbidity factors.

participants in the other, multiple, or unspecified race group had 10%, 23%, and 14% significantly higher depression severity levels, respectively, after adjusting for confounders (black: rate ratio [RR], 1.10; 95% CI, 1.04-1.17; *P* < .001; Hispanic: RR, 1.23; 95% CI, 1.10-1.38; *P* < .001; other: RR, 1.14; 95% CI, 1.04-1.25; *P* = .007). Compared with non-Hispanic white participants, black, Hispanic, and Asian participants had higher odds of excess zeroes (black: OR, 2.28; 95% CI, 1.76-2.96; *P* < .001; Hispanic: OR, 2.08; 95% CI, 1.43-3.02; *P* < .001; Asian: OR, 2.16; 95% CI, 1.20-3.89; *P* = .01); results of output from the zero-inflated negative binomial model, including the zero-inflated and negative binomial

portions, are detailed in eTable 2 in the Supplement. There was no evidence of interactions of race/ethnicity with sex on depression severity, except among Hispanic women, who had a higher estimate of depression severity than Hispanic men without reaching statistical significance (data not shown).

We observed significant differences in item-level symptoms across racial/ethnic groups (**Table 3**). Compared with non-Hispanic white participants, black and Hispanic participants had 3-fold to 4-fold higher unadjusted odds of burden from most item-level symptoms, including core features of depression (anhedonia among black participants: unadjusted OR, 3.71; 95% CI, 3.17-4.34; among Hispanic participants: unadjusted OR, 2.83; 95% CI, 2.09-3.84; sadness among black participants: unadjusted OR, 3.03; 95% CI, 2.55-3.59; among Hispanic participants: unadjusted OR, 3.03; 95% CI, 2.23-4.13). Multivariable-adjusted ORs were attenuated to 1.5-fold to 2-fold differences but remained statistically significant for most items (anhedonia among black participants: OR, 1.76; 95% CI, 1.47-2.11; among Hispanic participants: OR, 1.96; 95% CI, 1.43-2.69; sadness among black participants: OR, 1.31; 95% CI, 1.07-1.60; among Hispanic participants: OR, 2.09; 95% CI, 1.51-2.88; psychomotor symptoms among black participants: OR, 1.77; 95% CI, 1.31-2.39; among Hispanic participants: OR, 2.12; 95% CI, 1.28-3.50), except neurovegetative symptoms (eg, sleep, energy, appetite); higher ORs of burden from sleep problems and guilt remained statistically significant only among Hispanic participants after adjusting for confounders (sleep: OR, 1.24; 95% CI, 1.01-1.52; guilt: 1.84; 95% CI, 1.31-2.59). We observed statistically significant 2-fold higher odds of anhedonia and concentration difficulty among Asian participants compared with non-Hispanic white participants (anhedonia: OR, 2.14; 95% CI, 1.23-3.74; concentration: 2.26; 95% CI, 1.18-4.33). Among participants from the other, multiple, or unspecified race group, there were 1.5-fold higher multivariable-adjusted odds only of core features (ie, anhedonia and sadness) compared with non-Hispanic white participants (anhedonia: OR, 1.47; 95% CI, 1.07-2.02; sadness: OR, 1.46; 95% CI, 1.05-2.03). In exploratory analyses addressing possible interactions of race/ethnicity with sex, we observed 2-fold higher odds of anhedonia and guilt among Hispanic women vs men, but the results were not statistically significant (data not shown). Finally, in sensitivity analyses using weighted ORs that accounted for racial/ethnic differences in prevalence of age groups in VITAL, we did not observe any differences in the estimates comparing the weighted ORs with those from the primary models (data not shown).

Regarding depression care, we observed racial/ethnic differences in diagnosis and treatment use among those who had PHQ-8 scores of at least 10 (**Table 4** and **Table 5**). Because of low numbers of those reporting medication or counseling use in this subset, we combined the Hispanic, Asian, and other racial/ethnic groups. Compared with non-Hispanic white participants, black participants were 61% less likely to report depression treatment (ie, medications and/or counseling) (adjusted OR, 0.39; 95% CI, 0.27-0.56), but no differences were observed for the other minority group. When we further evaluated differences among those who reported both PHQ-8 scores of at least 10 and clinician diagnosis of depression, we observed that black participants were significantly less likely to report treatment compared with non-Hispanic whites (adjusted OR, 0.42; 95% CI, 0.24-0.74). In exploratory stratified analyses, we found suggestions of greater disparity among black women, although formal tests of race/ethnicity × sex interaction were not statistically significant. For example, among participants reporting both PHQ-8 scores of at least 10 and clinician diagnosis of depression, the adjusted OR of depression treatment was 1.48 (95% CI, 0.54-4.01) among black men compared with non-Hispanic white men; in contrast, the adjusted OR of depression treatment was 0.16 (95% CI, 0.07-0.36) comparing black women with non-Hispanic white women (data not shown).

Discussion

In this large cross-sectional study of a well-characterized and diverse cohort, we used novel approaches to evaluate racial/ethnic disparities in LLD by examining differences in overall severity of depression symptoms, item-level depressive symptom burden, and depression care. We found significantly higher overall depression severity among participants from the black, Hispanic, and

other, multiple, or unspecified race groups compared with those from the non-Hispanic white group. Item-level symptoms also varied significantly by race/ethnicity. For example, compared with Non-Hispanic white participants, all participants from minority groups had higher anhedonia; black

Table 3. Associations of Race/Ethnicity With Odds of Elevated Item-Level Depressive Symptom Burden

Symptom	OR (95% CI)				
	Non-Hispanic white (n = 17 828)	Black (n = 5004)	Hispanic (n = 1001)	Asian (n = 377)[a]	Others (n = 1293)[b]
Anhedonia					
Model 1[c]	1 [Reference]	3.71 (3.17-4.34)	2.83 (2.09-3.84)	2.07 (1.20-3.57)	2.12 (1.56-2.88)
Model 2[d]	1 [Reference]	2.12 (1.77-2.53)	2.03 (1.48-2.77)	2.13 (1.23-3.68)	1.59 (1.16-2.17)
Model 3[e,f]	1 [Reference]	1.81 (1.51-2.17)	1.99 (1.45-2.72)	2.24 (1.29-3.90)	1.47 (1.07-2.01)
Model 4[f,g]	1 [Reference]	1.76 (1.47-2.11)	1.96 (1.43-2.69)	2.14 (1.23-3.74)	1.47 (1.07-2.02)
Sadness					
Model 1[c]	1 [Reference]	3.03 (2.55-3.59)	3.03 (2.23-4.13)	1.27 (0.63-2.59)	2.11 (1.54-2.91)
Model 2[d]	1 [Reference]	1.57 (1.29-1.91)	2.15 (1.56-2.96)	1.29 (0.63-2.63)	1.58 (1.14-2.19)
Model 3[e,f]	1 [Reference]	1.36 (1.12-1.66)	2.13 (1.55-2.94)	1.32 (0.64-2.71)	1.46 (1.05-2.03)
Model 4[f,g]	1 [Reference]	1.31 (1.07-1.60)	2.09 (1.51-2.88)	1.25 (0.61-2.57)	1.46 (1.05-2.03)
Sleep					
Model 1[c]	1 [Reference]	1.57 (1.42-1.73)	1.44 (1.18-1.76)	0.77 (0.51-1.16)	1.28 (1.06-1.54)
Model 2[d]	1 [Reference]	1.13 (1.01-1.26)	1.27 (1.03-1.55)	0.80 (0.53-1.21)	1.09 (0.90-1.31)
Model 3[e,f]	1 [Reference]	1.03 (0.92-1.15)	1.26 (1.03-1.54)	0.88 (0.58-1.32)	1.05 (0.87-1.26)
Model 4[f,g]	1 [Reference]	0.97 (0.87-1.09)	1.24 (1.01-1.52)	0.82 (0.54-1.24)	1.05 (0.87-1.26)
Energy					
Model 1[c]	1 [Reference]	2.13 (1.91-2.38)	1.47 (1.15-1.87)	1.14 (0.75-1.75)	1.69 (1.38-2.08)
Model 2[d]	1 [Reference]	1.25 (1.11-1.42)	1.13 (0.88-1.46)	1.21 (0.79-1.86)	1.29 (1.05-1.60)
Model 3[e,f]	1 [Reference]	1.03 (0.90-1.17)	1.09 (0.85-1.41)	1.33 (0.86-2.06)	1.19 (0.96-1.47)
Model 4[f,g]	1 [Reference]	0.96 (0.84-1.09)	1.06 (0.83-1.37)	1.25 (0.80-1.93)	1.18 (0.96-1.47)
Appetite					
Model 1[c]	1 [Reference]	2.24 (1.96-2.57)	1.64 (1.23-2.19)	0.80 (0.42-1.51)	1.63 (1.26-2.11)
Model 2[d]	1 [Reference]	1.27 (1.09-1.48)	1.35 (1.00-1.81)	0.86 (0.45-1.62)	1.26 (0.97-1.64)
Model 3[e,f]	1 [Reference]	1.03 (0.88-1.20)	1.31 (0.97-1.77)	0.99 (0.52-1.89)	1.15 (0.88-1.51)
Model 4[f,g]	1 [Reference]	0.97 (0.83-1.14)	1.28 (0.95-1.73)	0.93 (0.49-1.78)	1.15 (0.88-1.51)
Guilt					
Model 1[c]	1 [Reference]	3.01 (2.54-3.58)	2.62 (1.89-3.63)	1.27 (0.63-2.59)	1.87 (1.34-2.62)
Model 2[d]	1 [Reference]	1.40 (1.15-1.70)	1.83 (1.31-2.57)	1.29 (0.63-2.63)	1.40 (0.99-1.97)
Model 3[e,f]	1 [Reference]	1.26 (1.03-1.53)	1.86 (1.33-2.61)	1.41 (0.69-2.90)	1.32 (0.94-1.87)
Model 4[f,g]	1 [Reference]	1.20 (0.98-1.46)	1.84 (1.31-2.59)	1.36 (0.66-2.80)	1.32 (0.93-1.86)
Concentration					
Model 1[c]	1 [Reference]	3.40 (2.80-4.13)	1.98 (1.29-3.04)	2.20 (1.16-4.18)	1.79 (1.20-2.67)
Model 2[d]	1 [Reference]	1.65 (1.32-2.06)	1.28 (0.83-1.99)	2.27 (1.19-4.33)	1.28 (0.85-1.91)
Model 3[e,f]	1 [Reference]	1.49 (1.20-1.87)	1.30 (0.83-2.01)	2.38 (1.24-4.56)	1.20 (0.80-1.80)
Model 4[f,g]	1 [Reference]	1.42 (1.13-1.78)	1.27 (0.82-1.97)	2.26 (1.18-4.33)	1.19 (0.79-1.80)
Motor					
Model 1[c]	1 [Reference]	3.86 (2.98-5.00)	3.06 (1.87-4.99)	1.27 (0.40-4.01)	2.36 (1.45-3.85)
Model 2[d]	1 [Reference]	2.12 (1.58-2.84)	2.12 (1.29-3.51)	1.32 (0.42-4.19)	1.70 (1.03-2.80)
Model 3[e,f]	1 [Reference]	1.85 (1.38-2.49)	2.12 (1.28-3.50)	1.29 (0.41-4.11)	1.57 (0.95-2.59)
Model 4[f,g]	1 [Reference]	1.77 (1.31-2.39)	2.12 (1.28-3.50)	1.27 (0.40-4.05)	1.56 (0.95-2.58)

Abbreviation: OR, odds ratio.

[a] Asian group included Pacific Islander individuals.

[b] Other race/ethnicity included Native American and American Indian, Native Hawaiian, and other, multiple, or unspecified race/ethnicity.

[c] Model 1 was analyzed as a univariate model.

[d] Model 2 was adjusted for demographic factors.

[e] Model 3 was adjusted for demographic, lifestyle, and behavioral factors.

[f] To avoid undefined physical activity estimates when using a missing indicator for physical activity, we imputed the median value for the small percentage (<1%) of participants who were missing information on physical activity.

[g] Model 4 was adjusted for demographic, lifestyle, behavioral, and comorbidity factors.

and Hispanic participants had higher anhedonia, sadness, and psychomotor symptoms; Asian participants had higher anhedonia and difficulty concentrating. Black participants were especially less likely to receive medication and/or counseling for depression relative to symptom levels. Finally, there were suggestions of additional variation by sex of observed racial/ethnic disparities; Hispanic women appeared more likely than Hispanic men to experience burden from core depressive symptoms and guilt; black women were more than 80% less likely than non-Hispanic white women to report receiving treatment, even when reporting both clinically significant symptom levels and clinician-diagnosed depression.

Our finding that older black adults had higher overall depression severity is consistent with prior literature.[7,14,15,41] However, to our knowledge, examining racial/ethnic disparities in item-level

Table 4. Association of Race/Ethnicity With Odds of Antidepressant Medication or Counseling Use Among Those Reporting Clinically Significant Depressive Symptoms[a]

	OR (95% CI)		
Outcome (n = 755)	Non-Hispanic white (n = 354)	Black (n = 287)	Hispanic, Asian, and other race/ethnicity (n = 114)
Model 1[b]	1 [Reference]	0.53 (0.39-0.72)	1.05 (0.68-1.61)
Model 2[c,d]	1 [Reference]	0.40 (0.28-0.57)	1.10 (0.70-1.73)
Model 3[d,e]	1 [Reference]	0.39 (0.27-0.56)	1.12 (0.71-1.76)
Model 4[d,f]	1 [Reference]	0.39 (0.27-0.56)	1.10 (0.69-1.74)

Abbreviation: OR, odds ratio.

[a] Clinically significant depressive symptoms defined as a score of at least 10 on the Patient Health Questionnaire–8. Medication/counseling use was determined based on self-reported use of selective serotonin reuptake inhibitors or other medications for depression and/or counseling for depression.

[b] Model 1 was analyzed as a univariate model.

[c] Model 2 was adjusted for demographic factors.

[d] In this small sample size analysis, to avoid quasi-separation issues and undefined estimates in the adjusted models, we imputed the mean value to missing body mass index, the median value to physical activity, and the largest education category to those missing education information. We combined some categories to create binary variables, including smoking use (ever vs never) and alcohol frequency use (daily vs nondaily use). For comorbidity variables, such as history of hypertension, diabetes, and high cholesterol, missing participants were combined to reference (ie, no) categories.

[e] Model 3 was adjusted for demographic, lifestyle, and behavioral factors.

[f] Model 4 was adjusted for demographic, lifestyle, behavioral, and comorbidity factors.

Table 5. Association of Race/Ethnicity With Antidepressant Medication or Counseling Use Among Those Reporting Clinically Significant Depressive Symptoms and Clinician Diagnosis of Depression[a]

	OR (95% CI)		
Outcome	Non-Hispanic white (n = 232)	Black (n = 165)	Hispanic, Asian, and other race/ethnicity (n = 69)
Model 1[b]	1 [Reference]	0.56 (0.35-0.89)	1.47 (0.68-3.20)
Model 2[c,d]	1 [Reference]	0.44 (0.26-0.74)	1.33 (0.60-2.96)
Model 3[d,e]	1 [Reference]	0.38 (0.22-0.66)	1.31 (0.58-2.97)
Model 4[d,f]	1 [Reference]	0.42 (0.24-0.74)	1.34 (0.59-3.05)

Abbreviation: OR, odds ratio.

[a] Clinically significant depressive symptoms defined as a score of at least 10 on the Patient Health Questionnaire–8. Medication/counseling use was determined based on self-reported use of selective serotonin reuptake inhibitors or other medications for depression and/or counseling for depression.

[b] Model 1 was analyzed as a univariate model.

[c] Model 2 was adjusted for demographic factors.

[d] In this small sample size analysis, to avoid quasi-separation issues and undefined estimates in the adjusted models, we imputed the mean value to missing body mass index, the median value to physical activity, and the largest education category to those missing education information. We combined some categories to create binary variables, including smoking use (ever vs never) and alcohol frequency use (daily vs nondaily use). For comorbidity variables, such as history of hypertension, diabetes, and high cholesterol, missing participants were combined to reference (ie, no) categories.

[e] Model 3 was adjusted for demographic, lifestyle, and behavioral factors.

[f] Model 4 was adjusted for demographic, lifestyle, behavioral, and comorbidity factors.

depressive symptoms has been a gap in the evidence to date; thus, the contribution of this study is novel in this regard. Overall, we substantively extend prior findings by examining disparities in both depression severity and item-level symptom burden in a large sample of more than 25 000 participants that included black older adults, Hispanic older adults, Asian older adults, and older adults from other minority groups and by having adequate power to address potential further differences by sex.

Observed disparities in depression care among black participants were also consistent with prior literature. Akincigil et al[42] found that black individuals with clinical diagnoses of depression were 55% less likely to be treated for depression compared with non-Hispanic white individuals. Similarly, data from the National Health and Nutrition Examination Survey[43] indicated that, while antidepressant use increased nationally by nearly 65% during a 15-year period (from 7.7% in 1999-2002 to 12.7% in 2011-2014), non-Hispanic white individuals were more likely to take antidepressants than black, Hispanic, and Asian individuals. Thus, our findings suggesting relative undertreatment of depression among older black adults are consistent with previous studies.[44-46] These disparities are striking given findings that older black adults appear as likely as older white adults to derive benefit from treatment when it is offered. For example, Hall et al[47] found that, given adequate prior antidepressant and psychotherapy exposure, black patients were no more likely than white patients to discontinue depression treatment. Finally, as noted earlier, this report includes important preliminary information regarding additional variation by sex in racial/ethnic disparities in depression care.

These findings demonstrate public health significance in several ways. First, we identified significant racial/ethnic disparities in the burden of depression. Given strong evidence that the risk of late-life cognitive impairment and dementia may be amplified by depression,[21,22,48] an implication of these racial/ethnic disparities in LLD may include increased risk of late-life cognitive dysfunction among individuals from minority groups. Second, we observed these depression disparities in the context of other concurrent health disparities (eg, comorbidities such as diabetes and hypertension) that may be exacerbated by the presence of depression. Gallo et al[49] showed that evidence-based treatment of depression in older adults led to a 24% reduction in mortality risk over 8 to 9 years of follow-up relative to usual care. Thus, an implication of high severity and burden of depression among older adults from minority groups, along with lower prevalence of depression care, is that these disparities may not only exacerbate risk of dementia or cognitive impairment and worse health status but also foreshorten life expectancy. Third, we adjusted for a comprehensive set of sociodemographic, lifestyle, behavioral, health, and comorbidity factors. While unadjusted estimates of increased risk were attenuated, significant differences remained. Therefore, although important social and health determinants, such as low household income, low physical activity, and higher medical comorbidity, were more prevalent among individuals who belonged to minority groups, these did not fully account for disparities. Thus, other factors, including novel social determinants, require further evaluation regarding their contributions to LLD disparities; these may include mistrust or bias, experiences of discrimination, stigma related to help-seeking, concerns about antidepressants, patient-physician communication issues, suboptimal care models, or lack of culturally responsive care.

Strengths and Limitations

Strengths of this study are noted. First, the cohort has excellent minority representation (ie, 30%). Second, participants were asked questions about comprehensive sociodemographic, lifestyle, behavioral, and health factors in a systematic, unbiased manner; furthermore, questionnaire participation rates were high (ie, 99%). Also, the PHQ-9 has evidence for criterion validity with respect to criterion-standard diagnoses of major and minor depression determined by structured psychiatric interviews, and high correlations between PHQ-8 and PHQ-9 have been demonstrated ($r > .99$).[50-52] Third, we addressed racial/ethnic differences in LLD on multiple levels, ie, total severity of symptoms, item-level burden of depressive features, and care variables. To our knowledge, prior

studies have not measured racial and ethnic disparities at the individual item-level of symptoms in LLD. Fourth, we explored whether racial/ethnic differences in depression severity, symptom burden, and care further varied by sex.

We acknowledge limitations. First, the study is cross-sectional; a longitudinal approach would provide further clarity regarding racial/ethnic differences in LLD outcomes. Second, self-reported race/ethnicity may signal differences in some social, cultural, and economic factors that were not explicitly measured in this study; thus, findings of racial/ethnic differences can be cautiously interpreted in this context. Third, VITAL included black and Hispanic participants who were slightly younger than other participants; however, point estimates of weighted ORs were nearly identical to the primary results. Fourth, we did not collect information on suicidal ideation, discrimination, cultural stress, mental health stigma, affordability of services, and other relevant psychosocial factors; thus, we could not address the full breadth of potential psychosocial and cultural associations with disparities in LLD. Fifth, although prior publications have reported cross-cultural validity of the PHQ-8 among diverse populations, we cannot exclude the possibility of bias in participants' interpretation of the meaning of item-level symptoms; we also cannot clinically interpret differences by race/ethnicity and model covariates in likelihood of excess zeroes on the PHQ-8 because of the lack of a clear clinical meaning of the zero-inflated portion of the zero-inflated negative binomial model. Sixth, participants were members of a long-term randomized clinical trial cohort and therefore may have been healthier or more knowledgeable about health than older adults in the general community. However, such a difference would be likely to render estimates more conservative; also, while this issue may affect generalizability, it does not detract from the internal validity of the findings.

Conclusions

In this study, we observed higher severity of depression among older adults from minority groups, especially black and Hispanic participants. Furthermore, there was racial/ethnic variation in the burden of item-level depressive symptoms, such as anhedonia, sadness, guilt, concentration, and psychomotor symptoms. There was also strong evidence of racial/ethnic disparities in antidepressant and counseling treatment among older adults with depression, particularly affecting older black women with depression. Future work in a longitudinal setting could clarify how the racial/ethnic differences observed in this study regarding LLD severity, symptom burden, and care may evolve over time.

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SUPPLEMENT.

eTable 1. Baseline Demographic, Lifestyle, Behavioral, Health, and Depression Characteristics of Study Cohort by Severity of Depression Symptoms

eTable 2. Regression Coefficients From the Fully Adjusted Zero-Inflated Negative Binomial Model, With Rate Ratios of Depression Symptom Counts (Negative Binomial Portion) and Odds Ratios of Zeroes (Zero-Inflated Portion) on the PHQ-8, for the Associations of Race/Ethnicity and Model Covariates

eFigure. Flow Chart of Study Participants

eReferences.