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RESEARCH ARTICLE

Racial and ethnic differences in the association between depressive symptoms and cognitive outcomes in older adults: Findings from KHANDLE and STAR

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Abstract

INTRODUCTION: Depressive symptoms are associated with higher risk of dementia, but how they impact cognition in diverse populations is unclear.

METHODS: Asian, Black, Latino, or White participants ($n = 2227$) in the Kaiser Healthy Aging and Diverse Life Experiences (age 65+) and the Study of Healthy Aging in African Americans (age 50+) underwent up to three waves of cognitive assessments over 4 years. Multilevel models stratified by race/ethnicity were used to examine whether depressive symptoms were associated with cognition or cognitive decline and whether associations differed by race/ethnicity.

RESULTS: Higher depressive symptoms were associated with lower baseline verbal episodic memory scores (−0.06, 95% CI: −0.12, −0.01; −0.15, 95% CI: −0.25, −0.04), and faster decline annually in semantic memory (−0.04, 95% CI: −0.07, −0.01; −0.10, 95% CI: −0.15, −0.05) for Black and Latino participants. Depressive symptoms were associated with lower baseline but not decline in executive function.

DISCUSSION: Depressive symptoms were associated with worse cognitive outcomes, with some evidence of heterogeneity across racial/ethnic groups.

KEYWORDS
Alzheimer's disease, cognitive function, depressive symptoms, longitudinal data, mental health, race and ethnicity

HIGHLIGHTS

- We examined whether baseline depressive symptoms were differentially associated with domain-specific cognition or cognitive decline by race/ethnicity.
- Depressive symptoms were associated with worse cognitive scores for all racial/ethnic groups across different domains examined.
- Higher depressive symptoms were associated with faster cognitive decline for semantic memory for Black and Latino participants.
- The results suggest a particularly harmful association between depressive symptoms and cognition in certain racial/ethnic groups.

1 | BACKGROUND

The older adult US population is projected to both grow and become more racially and ethnically diverse.[1] Given the higher burden of dementia among Black and Latino individuals, uncovering modifiable risk factors of Alzheimer's disease (AD) and related dementias (ADRD) is essential.[2] Convincing evidence – derived predominantly in samples comprising non-Hispanic Black and White-identified participants – supports the notion that depression increases the risk of cognitive decline.[3–9] Non-clinical depressive symptoms associated with disease risk can be effectively screened with commonly used indices in the clinical setting or on a population level.[10] Since depression can be effectively treated with a conjunction of pharmacotherapy, intervention from a mental health professional, and behavior change, it is an identifiable modifiable risk factor for the prevention or attenuation of cognitive decline in older adults.[11] However, the relationships between race/ethnicity and depressive symptoms and between depressive symptoms and cognition are complex.[12,13]

Minority stress theory (MST) asserts that exposure to racial discrimination and acculturative stress constitutes a hostile psychological environment leading to negative health consequences. In addition, studies have shown that racial differences in socioeconomic status (SES) are an important contributor to racial disparities in health.[14] The reserve capacity model (RCM) posits that certain subgroups of the population, such as individuals of lower SES, are more vulnerable to the negative health effects of depression because increased exposure to chronic stress diminishes reserve capacity.[15] In other words, MST in conjunction with RCM suggests that racially minoritized individuals may or may not experience depression more often than White individuals, but they experience more severe health consequences of depression when it is present. The literature on the prevalence of depressive symptoms across race and ethnicity is mixed; some studies found the prevalence to be lower among White participants compared to Black and Latino participants,[16] whereas other studies found a lower prevalence of depressive symptoms among Black and Latino participants.[17–19] Furthermore, studies show that when depression affects Black individuals, it is usually untreated, more severe, and disabling than in White individuals. This suggests that the burden of depressive disorders may be higher among Black than White participants.[17]

Currently, the relation of depressive symptoms with late life cognition across racial/ethnic groups is only partially understood. To our knowledge, this is among the first studies to investigate, in a multiethnic older adult sample, the associations of depressive symptoms with baseline cognition and cognitive decline. We hypothesized that the prevalence of depressive symptoms among racially minoritized versus socially dominant older adults would contribute to both lower baseline cognition and accelerated cognitive decline.

2 | METHODS

2.1 | Data

This study used data from the Kaiser Healthy Aging and Diverse Life Experiences (KHANDLE) and the Study of Healthy Aging in African Americans (STAR) cohorts. KHANDLE comprises community-dwelling older adults in the San Francisco Bay and Sacramento regions of California who were aged 65 or older as of January 1, 2017 and were long-term members of Kaiser Permanente Northern California. KHANDLE participants were eligible for inclusion if they spoke either English or Spanish and participated in at least one voluntary health checkup (Multiphasic Health Checkup [MHC]) with Kaiser Permanente between 1964 and 1985. Exclusion criteria included a previous diagnosis of dementia or other neurodegenerative disease (frontotemporal dementia, Lewy body disease, Pick's disease, Parkinson's disease with dementia, Huntington's disease) or a diagnosis related to poor health that might interfere with study participation or study interviews

(defined by hospice activity in the past 12 months, history of severe chronic obstructive pulmonary disease in the past 6 months, congestive heart failure hospitalizations in the past 6 months, and history of end-stage renal disease or dialysis in the past 12 months). Participants selected for inclusion in KHANDLE were randomly sampled from this eligible participant pool within strata of race and ethnicity and educational attainment to achieve balanced numbers of participants who reported Asian, Black, Latino, and White race and ethnicity with diverse educational backgrounds.

The STAR study is similarly composed of community-dwelling older adults from the San Francisco Bay area but enrolled only participants who identified as Black or African American that participated in at least one MHC exam and who were aged 50 or older as of January 1, 2018. The STAR study used the same exclusion as KHANDLE, outlined previously. More information about the KHANDLE and STAR cohorts can be found in cited materials.[20–23] At wave 1, which we will hereafter refer to as baseline, KHANDLE had 1712 participants and STAR had 764 participants ($N = 2389$). Participants were excluded from the analysis set if they were missing or refused to answer race and ethnicity data or if they were missing information on any of the primary model covariates (including age at baseline, sex, education, income, and marital status). Four participants who self-reported as Native American were excluded due to concerns about small numbers and identifiability. The final analysis cohort was made up of 2227 participants. (Figure S1).

RESEARCH IN CONTEXT

1. **Systematic review**: The authors reviewed the existing literature on the association between depressive symptoms with cognition and cognitive decline among older adults across racial and ethnic groups.
2. **Interpretation**: Our findings suggest a particularly harmful association for Black and Latino participants, between greater depressive symptoms with worse cognitive scores and faster cognitive decline in specific domains examined.
3. **Future directions**: Future research should include more representative data of underrepresented racial and ethnic groups and investigate the robustness of these results to better understand how depressive symptoms are associated with late-life cognitive function longitudinally.

2.2 | Exposure

The primary exposure of interest was depressive symptoms reported at baseline interviews. The KHANDLE cohort used the four-item Patient-Reported Outcomes Measurement Information System (PROMIS) computer adaptive testing (CAT) version 1.0 administered through National Institutes of Health (NIH) Toolbox and the STAR cohort used the eight-item PROMIS-57 administered through DatStat. We followed the depressive symptoms scoring manual from PROMIS to standardize the PROMIS scores across forms between the two cohorts. These depressive symptom scores were transformed into theta scores, which were standardized to the US adult population so that a difference in one unit represented a standardized difference in depressive symptoms, which were centered around zero for the average US adult. Depressive symptom theta scores were treated as a continuous variable.

2.3 | Outcomes

Cognitive function was assessed across three waves using the Spanish and English Neuropsychological Assessment Scales (SENAS). Both KHANDLE and STAR assessed cognition using SENAS three times between 2017 and 2021. The SENAS includes three cognitive domains (executive function, verbal episodic memory, and semantic memory) and was administered in either English or Spanish, with language of administration determined by an algorithm that considered preferred language and everyday language usage in a variety of settings. The SENAS is a battery of cognitive tests that has undergone extensive development for valid comparisons of cognitive change across racial and ethnic and linguistically diverse groups.[24] Briefly, item response theory and confirmatory factor analysis methods were used to construct measures that are psychometrically matched across domains with respect to level of reliability across the ability continuum.[25] The Episodic Memory Score is derived from a multitrial word-list-learning test. The semantic memory measure is a composite of highly correlated verbal (object-naming) and non-verbal (picture association) tasks. The executive function composite is constructed from component tasks of category fluency, phonemic (letter) fluency, and working memory (digit-span backward, list sorting). Administration procedures, measure development, and psychometric characteristics of the SENAS battery are described in detail elsewhere.[24,26] We were unable to assess semantic memory, which uses visual stimuli, during the third waves of KHANDLE and STAR because SENAS was administered by phone during the COVID-19 pandemic. SENAS measures were standardized into z-scores using baseline values for analysis across the two study cohorts prior to restricting to complete cases. These z-scores can be interpreted as standard deviations away from the mean of zero for the average individual in the analysis set at baseline.

2.4 | Covariates

Race and ethnicity were self-reported at baseline. Individuals were able to select more than one racial and ethnic category, which were collapsed for these analyses as Latino, Black, Asian, or White using that assignment order. Other baseline sociodemographic information included age (in years at time of assessment), biological sex (female/male), educational attainment (operationalized as college

degree or higher vs no college degree), household income (operationalized as greater than 55 k annually vs less than 55 k), and marital status (operationalized as married or living with partner vs not). Sensitivity analyses included additional covariates that could potentially mediate associations between depressive symptoms and cognitive decline: daily socializing, daily physical activity, smoking history, heavy drinking, and self-reported health. More information on these variables is provided in the supplementary material (Methods S1).

2.5 | Statistical analysis

We first descriptively compared the distributions of depressive symptoms across race/ethnicity subgroups (following Ward et al.),[27] as well as the distributions of SENAS cognitive domains across these groups. To assess the association between depressive symptoms and cognition and cognitive decline, we used multilevel linear regression with random intercepts for individuals to separately assess the associations of depressive symptoms with baseline and longitudinal change in each SENAS domain (executive function, verbal episodic memory, and semantic memory). We used a multilevel approach as studies have shown that using the paired difference as an outcome is less efficient and vulnerable to bias.[28] An interaction term between depressive symptoms and years since baseline was included to test for differences in decline in the cognitive domain over time. In an additional sensitivity analysis, we also fit a model with interactions between time, and all included covariates to control for confounding on estimates of cognitive decline. Specifying a random intercept model without random slopes allowed us to test the hypothesis that the change in cognitive decline might differ by race/ethnicity in the stratified analysis. In addition, with only —two or three time points, the random intercept model is more efficient (tighter confident intervals) and less vulnerable to convergence difficulties. To examine race/ethnicity as a potential effect modifier of the association between depressive symptoms and cognitive function and subsequent cognitive decline, we used a three-step approach. First, we included an interaction term between race/ethnicity and depression for each cognitive outcome and used a joint likelihood ratio test to determine whether the model including the interaction term was a better fit to the data compared to the nested model without interaction terms. Second, we evaluated associations in models stratified by race and ethnicity. Third, we evaluated heterogeneity in the associations between depressive symptoms and cognitive health by computing the differences of the estimate of interest (eg, depressive symptoms) obtained from each race/ethnicity subgroup in stratified models.[29] In this analysis, we selected Black participants as the comparison group for two reasons: (1) it was the subgroup with the biggest sample size, which would allow more statistical power for comparisons; and (2) we are interested in de-institutionalizing the requirement for White participants as the comparison group to demonstrate health inequity (following Adkins-Jackson).[30] Confidence intervals for these differences were calculated through bootstrapping with 1000 iterations. We did not adopt format multiple comparisons because reducing the type I error for null associations increases the type II error for those associations that are not null.[31]

Our main results are based on complete case analysis ($N = 2227$). We also performed supplementary analysis with multiple imputation using chained equations (MICE) on the sample with and without missing covariates ($N = 2469$).[32] We imputed missing values across 10 datasets, conditional on the distribution of complete case data for all main model variables in addition to study cohort, potential mediating variables (daily socializing, daily physical activity, smoking history, heavy drinking, and self-reported health), and practice setting where the interview took place in each wave. Models were fit to each of the 10 imputed datasets, and then results were pooled, adjusting for variability within and between the standard errors of the datasets using Rubin's Rules.[33] We also performed a sensitivity analysis that additionally adjusted for the lifestyle covariates described above. We further adjusted for a wave indicator and the practice setting to account for practice effects.[34] To assess non-linear associations of depressive symptoms with cognitive health, we used natural splines with three to four knots based on the Akaike information criterion. Finally, given the age difference between KHANDLE and STAR participants, and given that age is a known risk factor for cognitive function and decline, we further analyzed these associations only among KHANDLE participants. We followed current STROBE reporting guidelines that recommend not to include a column containing inferential statistics (eg, p values). [35–37] Instead, we based meaningful differences on both the magnitude of observed estimates and consistency with causal theory. Analyses were conducted using R software version 4.1.3.[38] All code used for this analysis can be found at https://github.com/SpatialHealth/KHANDLE-STAR_Depression_Cognition.[39]

3 | RESULTS

Among the 2227 individuals included in the analysis, 17% ($n = 380$) were classified as Asian, 48% ($n = 1076$) as Black, 14% ($n = 318$) as Latino, and 20% ($n = 453$) as White (Table 1). The average age of the cohort at baseline was 72.7 years (SD = 8.0), and the majority were female (62%). Education, income, and other sociodemographic factors varied across race and ethnicity (Table 1). Depressive symptom levels were somewhat lower among Asian and Black participants compared to Latino and White participants (Figure 1).

3.1 | Baseline cognitive function

Table 2 shows the estimates for the association of depressive symptoms with baseline cognitive function for the full sample and stratified by race and ethnicity. In the full sample, higher depressive symptoms were associated with −0.06 (95% CI: −0.10, −0.02) SD units lower executive function and −0.05 (95% CI: −0.09, −0.007) SD units lower verbal episodic memory. We did not observe an association between depressive symptoms and semantic memory score in the full sample. The likelihood ratio test suggested a better goodness of fit when

TABLE 1 Characteristics of complete case participants in KHANDLE and STAR by race and ethnicity at baseline (*N* = 2227).

Characteristic	Overall Cohort *N* = 2227	Asian American participants *N* = 380	Black participants *N* = 1076	Latino participants *N* = 318	White participants *N* = 453
Cohort *N*(%)					
KHANDLE	1535 (68.9)	380 (100.0)	390 (36.2)	312 (98.1)	453 (100.0)
STAR	692 (31.1)	0 (0.0)	686 (63.8)	6 (1.9)	0 (0.0)
Depression theta score median [SD]	−0.18 [0.75]	−0.19 [0.79]	−0.25 [0.77]	−0.01 [0.77]	−0.01 [0.63]
Female gender *N* (%)	1386 (62.2)	199 (52.4)	739 (68.7)	186 (58.5)	262 (57.8)
Age at baseline median [SD]	72.7 [8.0]	74.3 [6.4]	70.5 [8.5]	74.5 [6.3]	75.5 [6.9]
Education *N* (%)					
Less than college degree	1224 (55.0)	128 (33.7)	690 (64.1)	214 (67.3)	192 (42.4)
College degree or further education	1003 (45.0)	252 (66.3)	386 (35.9)	104 (32.7)	261 (57.6)
Total household income *N* (%)					
Less than or equal to USD55,000	750 (33.7)	83 (21.8)	396 (36.8)	139 (43.7)	132 (29.1)
More than USD55,000	1477 (66.3)	297 (78.2)	680 (63.2)	179 (56.3)	321 (70.9)
Marital status *N* (%)					
Married or living with a partner	1044 (46.9)	118 (31.1)	604 (56.1)	134 (42.1)	188 (41.4)
Not married or partnered	1183 (53.1)	262 (68.9)	472 (43.9)	184 (57.9)	265 (58.5)
Baseline executive function median [SD]	0.04 [0.98]	−0.19 [0.9]	−0.03 [0.9]	−0.20 [0.9]	0.59 [1.1]
Baseline verbal episodic memory median [SD]	0.03 [0.98]	0.10 [1]	0.06 [0.9]	−0.23 [1]	0.06 [1.1]
Baseline semantic memory median [SD]	0.05 [0.98]	−0.13 [1.1]	−0.21 [0.8]	0.31 [0.9]	0.82 [0.8]

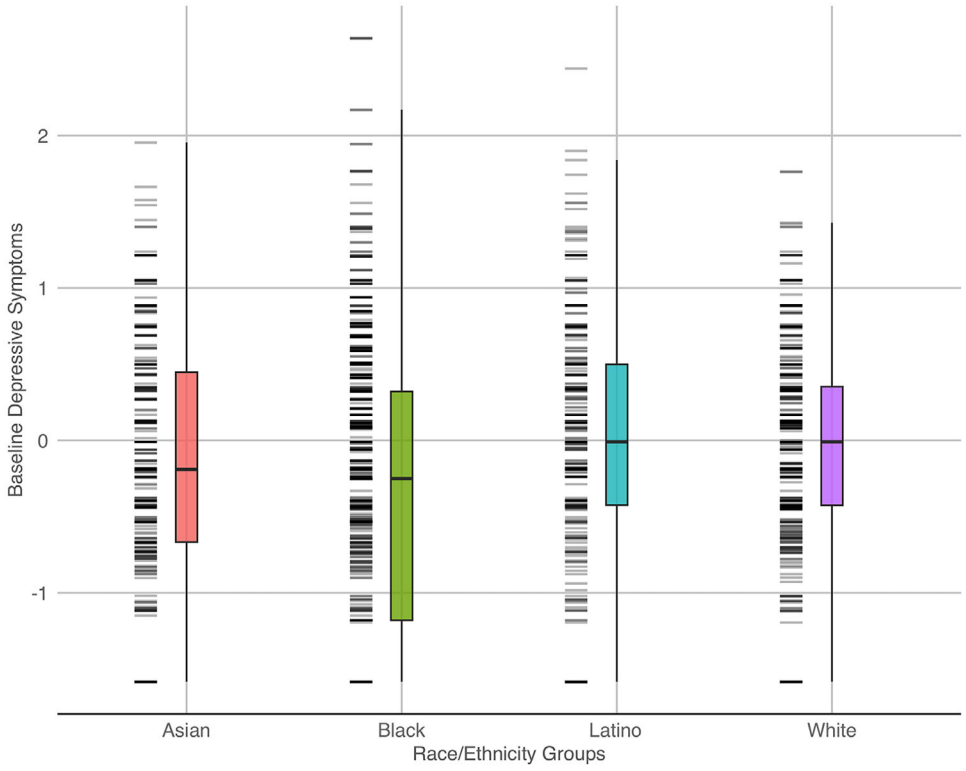

FIGURE 1 Distribution of baseline depressive symptoms by race and ethnicity group in KHANDLE and STAR (*N* = 2227).

TABLE 2 Estimated associations between depressive symptoms and baseline cognitive function among participants in KHANDLE and STAR ($N = 2227$).

Group	*N*	Executive function score	Verbal episodic memory score	Semantic memory score[a]
Overall	2227	−0.06 (−0.10, −0.02)	−0.05 (−0.09, −0.007)	−0.03 (−0.07, 0.01)
Asian	380	−0.03 (−0.13, 0.06)	−0.01 (−0.11, 0.10)	−0.01 (−0.13, 0.12)
Black	1076	−0.06 (−0.12, −0.01)	−0.06 (−0.12, −0.01)	−0.01 (−0.07, 0.04)
Latino	318	−0.17 (−0.28, −0.06)	−0.15 (−0.26, −0.04)	−0.15 (−0.27, −0.04)
White	453	0.04 (−0.09, 0.17)	0.02 (−0.09, 0.14)	−0.00 (−0.10, 0.10)

Notes: Models adjusted for age at baseline, year of follow-up, sex, college education, income greater than USD55,000, and marital status. Overall model also adjusted for race/ethnicity.
[a]Only two waves of data available for analysis.

interaction terms between depressive symptoms and race/ethnicity group were included. Analyses stratified by race and ethnicity suggested that higher depressive symptoms at baseline were associated with lower executive function and verbal episodic memory scores among Black and Latino participants (eg, −0.06 SD, 95% CI: −0.12, −0.01; −0.17 SD, 95% CI: −0.28, −0.06 for executive function for Black and Latino participants, respectively). Higher depressive symptoms at baseline were associated with lower semantic memory scores among Latino participants (−0.15, 95% CI:−0.27, −0.04), but not among Asian, Black, or White participants. This finding aligns with our analysis of the difference in stratified effect estimates for depressive symptoms and baseline cognition, which showed that the estimate for Latino participants was significantly different compared to the estimate from Black participants (eg, difference in point estimate for executive function −0.11, 95% CI: −0.20, −0.01; Table S1). This suggested a particularly harmful association between depressive symptoms and cognition for Latino participants. We did not observe a difference in the point estimates for Asian or White participants (Table S1). The results of the sensitivity analysis using the multiply imputed data showed similar associations between baseline depressive symptoms and lower scores on specific cognitive domains. For example, in the full sample, higher depressive symptoms were associated with −0.07 (95% CI: −0.11, −0.03) SD units lower executive function and −0.06 (95% CI: −0.10, −0.02) SD units lower verbal episodic memory (Table S2). The spline analysis did not show evidence of non-linear relationships between depressive symptoms and baseline cognitive function, though results of the executive memory models might suggest the existence of a threshold for worse cognitive health among Asian participants with greater than average depressive symptoms (Figure S2). Further research would be needed to investigate this.

3.2 | Cognitive decline

In the full sample, we observed that higher depressive symptoms were associated with accelerated decline in semantic memory score (difference in annual rate of change = −0.04 SD, 95% CI: −0.06, −0.02; Table 3). In the stratified models, higher depressive symptoms among Black participants were associated with accelerated decline in verbal episodic memory (difference in annual rate of change = −0.03 SD, 95% CI: −0.05, −0.001) and semantic memory score (difference in annual rate of change = −0.04 SD, 95% CI: −0.07, −0.01; Table 3). Higher depressive symptoms were associated with a rate of decline in semantic memory score that was faster by −0.10 SD (95% CI: −0.15, −0.05) among Latino participants. Depressive symptoms were not associated with rate of decline in semantic memory among Asian or White participants (Table 3). We did not observe associations between depressive symptoms and rate of decline in executive function score in the full sample or in stratified results. In the analysis assessing the difference in stratified effect estimates for depressive symptoms and cognitive decline, we observed that more depressive symptoms were associated with a slower decline in verbal episodic memory for White participants compared to Black participants (eg, difference in point estimate for decline in verbal episodic memory 0.07, 95% CI: 0.02, 0.12; Table S3). This suggested a particularly harmful association between depressive symptoms and cognitive decline for Black participants. The results of the sensitivity analysis using the multiply imputed data showed similar associations between baseline depressive symptoms and accelerated decline (eg, difference in annual rate of change in semantic memory for the full sample = −0.04 SD, 95% CI: −0.06, −0.02; Table S4). Further, in models including interaction terms of time for all covariates, results were similar (eg, difference in annual rate of change in semantic memory for the full sample = −0.04 SD, 95% CI: −0.06, −0.02; Table S5). Finally, further adjusting for additional lifestyle covariates, wave indicator and practice setting attenuated and reduced precision around the estimates (Tables S6–S7). Results considering only participants in the KHANDLE cohort were similar in magnitude and direction, although the confidence interval for Black participants included the null potentially due to a smaller sample size (Tables S8 and S9).

4 | DISCUSSION

In a diverse sample of adults aged at least 50, more depressive symptoms were associated with worse baseline cognitive function as well as faster cognitive decline over 4 years for Black and Latino participants in specific cognitive domains over time. Associations differed across cognitive domains and differed by race and ethnicity. Associations were

TABLE 3 Estimated associations between depressive symptoms and annual rate of cognitive decline among participants in KHANDLE and STAR ($N = 2227$).

Group	N	Executive function score	Verbal episodic memory score	Semantic memory score[a]
Overall	2227	−0.01 (−0.02, 0.01)	0.00 (−0.02, 0.02)	−0.04 (−0.06, −0.02)
Asian	380	0.00 (−0.02, 0.03)	0.00 (−0.04, 0.04)	−0.03 (−0.08, 0.01)
Black	1076	−0.02 (−0.03, 0.003)	−0.03 (−0.05, −0.001)	−0.04 (−0.07, −0.01)
Latino	318	−0.03 (−0.06, 0.01)	0.02 (−0.03, 0.07)	−0.10 (−0.15, −0.05)
White	453	0.01 (−0.02, 0.04)	0.04 (−0.002, 0.09)	0.00 (−0.04, 0.04)

Notes: Models adjusted for: age at baseline, sex, college education, income greater than USD55,000, and marital status. Overall model also adjusted for race/ethnicity.
[a]Only two waves of data available for analysis.

especially large for Latino individuals, with effect sizes several times the magnitude as in White respondents.

Our findings on lower baseline depressive symptoms among Asian and Black participants compared to Latino and White participants are consistent with previously documented racial and ethnic differences in depression. For example, Asian American adults, particularly if foreign-born, have been reported to have the lowest lifetime prevalence of mental health disorders, such as depression, compared to Black, Latino, and White participants.[40,41] In addition, according to the National Center for Health Statistics, non-Hispanic Asian adults in 2019 were least likely to experience depressive symptoms compared with Hispanic, non-Hispanic White, and non-Hispanic Black adults.[42] Black individuals have been reported to have lower lifetime and 12-month rates of major depressive disorder compared with White individuals.[43] The "Black-White depression paradox" describes the lower prevalence of depression among non-Hispanic Black (relative to non-Hispanic White) individuals despite their greater exposure to major life stressors, a phenomenon that remains unexplained.[44] The combination of higher average levels of depressive symptoms and greater association with cognitive outcomes among Latino individuals elevates the likely population impact of depressive symptoms on cognitive outcomes among Latino older adults.

In models including the full sample, depressive symptoms were associated with worse scores in both executive function and episodic memory. This is consistent with previous studies reporting that depression may negatively impact risk of mild cognitive impairment[45] and neurocognitive functions. We found that associations were particularly marked in a multi-ethnic older sample for cognitive domains that are governed by fronto-subcortical networks, such as executive functions.[46] Further, our results suggested effect modification by race and ethnicity in associations of depressive symptoms and baseline cognitive function for some cognitive domains. We observed inverse associations between depressive symptoms and cognition (executive function and verbal episodic memory scores) among Black and Latino participants, but not among Asian or White participants. Our results on higher depressive symptoms associated with lower executive function and verbal episodic memory scores among Black participants are consistent with an analysis that showed that depressive symptoms were associated with worse task-switching, inhibition, and episodic memory among Black participants; taken together, this suggests that Black older adults may be more vulnerable than their White counterparts to negative effects of depressive symptoms on cognition.[47] Our results on higher depressive symptoms associated with lower executive function and verbal episodic memory scores among Latino participants aligns with previous work among Caribbean Hispanic older adults showing that greater depressive symptoms were associated with worse episodic memory.[48] Among Asian participants, prior findings are mixed regarding associations between depressive symptoms and cognition, with a cross-sectional study showing increased prevalence of depressive symptoms in cognitively impaired Chinese American participants,[49] while a longitudinal study found that more severe depressive symptoms were associated with better cognitive function among patients in China.[50] When taken together, the results suggest a particularly harmful association between depressive symptoms and baseline executive function scores for Black and Latino participants, but not for Asian or White participants. These results are in agreement with previous studies that showed that depressive symptoms were more strongly related to executive functioning among Black older adults.[47,51,52]

With regard to cognitive decline, in models including the full sample, we observed that more depressive symptoms were associated with a faster rate of cognitive decline in semantic memory scores but not in other cognitive domains. Null associations between depressive symptoms and change in cognitive performance across time were also observed in a randomized trial of 445 middle-aged to older adults designed to compare the effectiveness of Internet cognitive behavioral therapy relative to an online attention control.[53] In our sample, the association between depressive symptoms and cognitive decline was modified by race and ethnicity. More depressive symptoms were associated with a faster rate of cognitive decline in verbal episodic memory among Black participants. This is consistent with a recent finding from the Washington/Hamilton Heights Inwood Columbia Aging Project (WHICAP), a multi-ethnic cohort including White, Black, and Hispanic participants, that reported that a higher baseline level of depressive symptoms was associated with a faster decline in episodic memory.[5] The results on rate of cognitive decline for Black participants despite the lower scores for depression symptoms (compared to Latino and White participants) could be due to the fact that when depression

affects Black participants, it is often untreated and more severe compared to White participants, and therefore, when Black participants report heightened depressive symptoms, they may more significantly influence cognitive functioning than in other groups.[17] Simultaneously, researchers have observed that Black participants have reduced access to mental health services and often receive poorer quality care than White participants.[54] Along these lines, disparities in primary care (eg, counselling/referrals for counseling, antidepressant medications) persist, with Black and Latino participants having less access to care than White participants.[12] Thus, higher depression symptoms in Black participants might be indicative of untreated depression and seemed associated with a steeper decline in cognition. More depressive symptoms were associated with a faster rate of cognitive decline in semantic memory scores among Black and Latino participants, although these results should be interpreted with caution due to limited time point availability. Finally, we observed no association between depressive symptoms and rate of cognitive decline in analyses restricted to Asian or White participants. The reasons for this may include the low prevalence of depressive symptoms among Asian and White participants, resulting in imprecise estimates with wide confidence intervals for these groups.[55] When taken together, the results suggest a particularly harmful association between depressive symptoms and a faster rate of cognitive decline in verbal episodic memory for Black participants, but not for Latino, Asian, or White participants.

Several limitations in this study should be noted. First, disease mechanisms common to depression and cognitive health may explain the associations observed. It remains controversial whether depressive symptoms increase risk of dementia, are an early symptom of neurodegeneration, or are a reaction to early cognitive deficit. To account for this, we used longitudinal data including three repeated measurements of cognitive performance to evaluate trajectories of cognitive decline. We note that prior studies with much longer follow-up helped establish temporal order; for example, a study from Denmark demonstrated that depression diagnoses predicted incident dementia over 20 years later.[5] The major contribution in the current study is to demonstrate the relevance of depressive symptoms for Black and Latino adults, who were often not represented in prior work. However, we only had two assessments of semantic memory outcome due to the shift to phone administration of KHANDLE visits during the COVID-19 pandemic; our estimates of semantic memory decline over time have a shorter follow-up and are less precise. Second, Latino participants include ethnic/regional subgroups (eg, Mexicans, Dominicans, Puerto Ricans) with important intergroup differences; Asian Americans are similarly heterogeneous. However, we were underpowered to assess Latino or Asian subgroup differences in the association between depression symptoms and cognitive health. Larger-scale studies that are racially and ethnically diverse are needed.

Despite these limitations, this study has notable strengths. The use of longitudinal data in the KHANDLE and STAR cohorts allowed us to examine prospective associations between depression and cognitive decline. The study was conducted in an exceptionally diverse cohort, with rich data on covariates that allowed us to adjust for important confounders. Using a well-validated neuropsychological assessment scale enabled us to examine domain-specific associations.

Among participants in KHANDLE and STAR, greater depressive symptoms were associated with worse cognitive health and potentially faster cognitive decline among certain cognitive domains and race and ethnicity groups. Our findings provide support for the hypothesis that Black and Latino participants are more susceptible to the negative effects of depressive symptoms on cognitive health.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest. Author disclosures are available in the supporting information.

CONSENT STATEMENT

All human subjects provided informed consent.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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