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Prevalence and correlates of depression among black and Latino stroke survivors with uncontrolled hypertension: a cross-sectional study

Adebayo O Ogunlade,[1] Stephen K Williams,[1] Jennifer Joseph,[1] Deborah O Onakomaiya ,[1] Joseph P Eimicke,[2] Jeanne A Teresi,[2,3] Olajide Williams,[4] Gbenga Ogedegbe,[1] Tanya M Spruill[1]

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[1]Center for Healthful Behavior Change, Department of Population Health, New York University Grossman School of Medicine, New York, New York, USA
[2]Research Division, Hebrew Home at Riverdale, Bronx, New York, USA
[3]Columbia University Stroud Center, New York State Psychiatric Institute, New York, New York, USA
[4]Columbia University Medical Center, New York, New York, USA

Correspondence to
Adebayo O Ogunlade; adebayo.ogunlade@nyulangone.org

ABSTRACT

Objective To examine the prevalence and correlates of depression in a cohort of black and Hispanic stroke survivors with uncontrolled hypertension.

Setting Baseline survey data from 10 stroke centres across New York City.

Participants Black and Hispanic stroke survivors with uncontrolled hypertension (n=450).

Outcome measures Depressive symptoms were assessed with the 8-item Patient Reported Outcomes Measurement Information System (PROMIS) measure. Depression was defined as a PROMIS score ≥55. Other data collected included clinical factors, health-related quality of life (EuroQoL five dimensions (EQ-5D)), functional independence (Barthel Index, BI), stroke-related disability (Modified Rankin Score), physical function (PROMIS Physical Function) and executive functioning (Frontal Assessment Battery).

Results The mean age was 61.7±11.1 years, 44% of participants were women and 51% were black. Poststroke depression was noted in 32% of the cohort. Examining bivariate relationships, patients with depression were observed to have poorer function and quality of life as evidenced by significantly lower PROMIS physical function scores (36.9±8.32 vs 43.4±10.19, p<0.001); BI scores (79.9±19.2 vs 88.1±15.1, p<0.001); EQ-5D scores (0.66±0.24 vs 0.83±0.17, p<0.001) and higher Rankin scores (2.10±1.00 vs 1.46±1.01, p<0.001) compared with those without depression. Multivariate (model adjusted) significant correlates of depression included lower self-reported quality of life (OR=0.02 (CI 0.004 to 0.12) being younger (OR=0.94; 95% CI 0.91 to 0.97); not married (OR=0.46; CI 0.24 to 0.89)); and foreign-born (OR=3.34, 95% CI 1.4 to 7.97). There was a trend for higher comorbidity to be uniquely associated with depression (≥3 comorbid conditions, OR=1.49, 95% CI 1.00 to 2.23).

Conclusions Poststroke depression is common among black and Hispanic stroke survivors with higher rates noted among foreign-born patients and those with high comorbidity. These findings highlight the importance of screening for depression in minority stroke survivors.

Trial registration number http://www.clinicaltrials.gov. Unique identifier: NCT01070056.

Strengths and limitations of this study

- This is the first study to specifically examine poststroke depression among community-dwelling minority stroke survivors.
- The definition of depression was based on patient self-report using an interview administered validated screening tool, allowing the inclusion of undiagnosed depression.
- Data were only assessed in select cohort that survived the stroke event and recovered sufficiently to be discharged to the community.
- Findings can only be generalised to black and Hispanic stroke survivors as it did not consist of other minority groups.

INTRODUCTION

Poststroke depression (PSD) affects approximately one-third of stroke survivors, either in the early or in the late stages after stroke.[1 2] Depression among stroke survivors is associated with long-term physical disability,[3] cognitive impairments[4] and increased mortality risk.[5] At the same time, PSD remains underdiagnosed, particularly in minority populations[6] and little is known about correlates of PSD in community-dwelling minorities. Most studies that have evaluated PSD among minorities have either focused mainly on Hispanics or included very few (<25%) black patients.[3 7] Early identification of depression in this vulnerable cohort is essential to optimise poststroke recovery and decrease the high morbidity and mortality that is especially prevalent in minority populations post stroke. Our study addresses this critical knowledge gap by examining the prevalence and correlates of depression among community-dwelling black and Hispanic stroke survivors with uncontrolled hypertension.

Table 1 Cohort characteristics

Variables	Total (n=445)	Without depression (n=301, 67.6%)	With depression (n=144, 32.4%)	P value
Sociodemographics				
Age, mean (SD)	61.7 (11.1)	61.8 (11.4)	61.4 (10.4)	0.731
Female, n, (%)	196 (44.0)	118 (39.2)	78 (54.2)	0.003
Race, n (%)				0.169
Black, non-Hispanic	228 (51.2)	161 (53.5)	67 (46.5)	
Hispanic	217 (48.8)	140 (46.5)	77 (53.5)	
Married/domestic partnership, n (%)	187 (42.1)	137 (45.7)	50 (34.7)	0.174
Less than high school education, n (%)	208 (49.3)	136 (47.7)	72 (52.6)	0.458
Annual household income <US$25 000, n (%)	233 (72.6)	149 (68.3)	84 (81.6)	0.011
Foreign born, n (%)	321 (72.5)	209 (69.9)	112 (77.8)	0.078
Length of stay in the USA, n (%)	31.4 (15.0)	30.2 (14.7)	33.4 (15.6)	0.130
Clinical and lifestyle				
Systolic blood pressure, mean (SD)	149.18 (14.82)	150.43 (15.87)	146.58 (11.79)	0.005
Diastolic blood pressure, mean (SD)	87.91 (12.54)	88.28 (12.89)	87.14 (11.79)	0.370
Charlson Comorbidity Index, n (%)				0.014
0 comorbid conditions	88 (19.8)	66 (22.0)	22 (15.3)	
1–2 comorbid conditions	220 (49.5)	155 (51.7)	65 (45.1)	
≥3 comorbid conditions	136 (30.6)	79 (26.3)	57 (39.6)	
EuroQoL (EQ-5D; higher score indicates best health), mean (SD)	0.77 (0.21)	0.83 (0.17)	0.66 (0.24)	<0.001
Barthel Index (higher score indicates greater independence), mean (SD)	85.43 (16.96)	88.06 (15.14)	79.93 (19.15)	<0.001
PROMIS Physical Function (higher score indicates greater functional ability), mean (SD)	41.30 (10.09)	43.42 (10.19)	36.89 (8.32)	<0.001
Modified Rankin Score (higher score indicates greater disability), mean (SD)	1.67 (1.05)	1.46 (1.01)	2.10 (1.00)	<0.001
Frontal Assessment Battery (higher score indicates better performance), mean (SD)	13.37 (3.54)	13.69 (3.37)	12.68 (3.81)	0.010
Smoking, n (%)	63 (14.5)	41 (14.0)	22 (15.6)	0.807
Alcohol use, n (%)	129 (29.7)	99 (33.9)	30 (21.1)	0.006

EQ-5D, EuroQoL five dimension; PROMIS, Patient Reported Outcomes Measurement Information System.

METHODS

Sample: for these analyses, we used baseline data from a clinical trial of hypertension control strategies among 450 blacks and Hispanics with recent stroke (≈7 months after index stroke) recruited from 10 stroke centres in New York City; the study design is discussed in detail elsewhere.[8] All participants provided informed consent before inclusion in the study.

Measures: participants were interviewed at baseline to assess depressive symptoms over the past 7 days using the 8-item Patient Reported Outcomes Measurement Information System (PROMIS) Depression Short Form.[9] This measure has been found to perform well among ethnically diverse groups, evidencing little differential item functioning of high magnitude.[10] Internal consistency and unidimensionality estimates for the continuous PROMIS Depression scale for the current sample were high (ordinal alpha=0.949; McDonald's Omega total=0.949; Explained Common Variance=84.199). Depression was defined as a PROMIS score ≥55, which indicates at least mild depression according to the American Psychiatric Association classification.[11] Other data collected included sociodemographic factors, current smoking and alcohol use, Charlson Comorbidity Index,[12] health-related quality of life (EuroQoL five dimensions (EQ-5D)),[13] functional independence (Barthel Index),[14] physical function (PROMIS Physical Function Short Form),[15] stroke-related disability (Modified Rankin Score)[16] and executive functioning (Frontal Assessment Battery).[17]

Statistical approach: variables were summarised as mean±SD for continuous variables and percentage for categorical variables. Bivariate analyses were conducted using student t-tests and χ^2 tests for continuous and categorical variables, respectively. Multivariate logistic regression was performed to assess correlates of depression by adjusting for independent risk factors significantly associated with depression in addition to potential confounders

Table 2 Cross-sectional predictors of depression among blacks and Hispanics stroke survivors with uncontrolled hypertension*†

	Unadjusted model			Adjusted for demographics (n=307)		Adjusted for demographics to clinical to and lifestyle factors (n=278)	
	N	OR	95% CI	OR	95% CI	OR	95% CI
Age	445	1.00	(0.98 to 1.01)	**0.96**	**(0.94 to 0.99)**	**0.94**	**(0.91 to 0.97)**
Female	445	**1.83**	**(1.23 to 2.74)**	1.36	(0.79 to 2.36)	1.37	(0.72 to 2.64)
Black to non-Hispanic	445	0.76	(0.51 to 1.13)				
Hispanic	445	1.32	(0.89 to 1.97)	1.27	(0.69 to 2.36)	0.65	(0.31 to 1.36)
Systolic blood pressure (per 10 mm Hg unit rise)	445	**0.82**	**(0.71 to 0.95)**			0.83	(0.68 to 1.01)
Diastolic blood pressure (per 10 mm Hg unit rise)	445	0.93	(0.80 to 1.09)				
Married/domestic partnership	444	**0.63**	**(0.42 to 0.96)**	**0.51**	**(0.20 to 0.89)**	**0.46**	**(0.24 to 0.89)**
Less than High School education	422	1.21	(0.81 to 1.83)				
High school diploma/GED	422	0.99	(0.64 to 1.54)				
Employed/self-employed	438	**0.28**	**(0.14 to 0.55)**	**0.18**	**(0.07 to 0.50)**	0.44	(0.15 to 1.35)
Unemployed/not working	438	1.10	(0.56 to 2.17)				
Stroke type: ischaemic	424	1.25	(0.77 to 2.03)			0.79	(0.38 to 1.64)
EuroQol Index (EQ-5D) (higher score indicates best health)	445	**0.02**	**(0.01 to 0.06)**			**0.02**	**(0.004 to 0.12)**
Barthel Index (higher score indicates greater independence)	445	**0.97**	**(0.96 to 0.98)**				
Foreign born	443	1.51	(0.95 to 2.40)	**2.29**	**(1.11 to 4.70)**	**3.34**	**(1.40 to 7.97)**
Modified Rankin Score (higher score indicates greater disability)	444	**1.39**	**(1.22 to 1.58)**				
PROMIS Physical Function (higher score indicates greater functional ability)	444	**0.93**	**(0.91 to 0.95)**			0.97	(0.93 to 1.01)
Categorised Charlson Comobidity	444	**1.51**	**(1.13 to 2.03)**			1.49	(1.00 to 2.23)
Frontal Assessment Battery (higher score indicates better performance)	418	**0.92**	**(0.87 to 0.98)**			0.94	(0.84 to 1.05)

Significant relationships are in bold.
*OR with 95% CI in predicting PSD.
†Variables not included in the adjusted models were removed because of collinearity.
GED, General Educational Development; HS, High School.

in bivariate analyses; variables not included in the adjusted models were removed because of collinearity.

The primary analyses were performed examining blood pressure (BP) using 10 mm Hg units. Logistic regression analyses were performed using generalised estimating equations assuming a binomial distribution with a logit link and robust estimates for variance. The motivation was to produce ORs as measures of association. These are appropriate summary statistics if they are not interpreted as relative risks.[18]

The assumption of linearity between the logit and the continuous predictor was examined using the Box-Tidwell Test.[19] This test was performed by obtaining the natural log of the continuous predictor and adding an interaction between the continuous predictor and its natural log variable to the logistic model. A significant interaction term is indicative of a violation of this assumption (non-linearity). The only predictor found to violate this assumption at the univariate level was the Modified Rankin Scale. This scale was previously removed from further analysis because of collinearity with other predictors. No violations were observed in the other two models.

Several sensitivity analyses were performed. The first was to treat depression as continuous and perform a linear regression predicting PROMIS Depression. Additionally, prevalence ratio statistics were estimated using several methods described in the text. Prevalence ratios were computed directly using three different methods as described by Barros and Hirakata[20]; and Coutinho *et al*.[21] The first method used was the log-binomial method (assumes a binomial distribution with a log link). The second method was interval censored survival analysis using a binomial distribution with a complementary log-log link (used in place of Cox proportional hazards). The third method was to use Poisson regression with a log

Table 3 Sensitivity analysis using linear regression predicting continuous Patient Reported Outcomes Measurement Information System (PROMIS) depression (n=278)

	Unstandardised coefficients		Standardised coefficients			95.0% CI for B	
	B	SE	Beta	T	P value	Lower bound	Upper bound
(Constant)	82.624	7.315		11.295	<0.001	68.220	97.028
Age	**−0.143**	**0.051**	**−0.167**	**−2.781**	**0.006**	**−0.244**	**−0.042**
Female	0.682	1.140	0.035	0.598	0.550	−1.562	2.926
Hispanic	−2.336	1.209	−0.120	−1.932	0.054	−4.717	0.044
Systolic blood pressure (per 10 mm Hg unit rise)	−0.279	0.329	−0.044	−0.847	0.398	−0.927	0.370
Married/domestic partnership	−1.051	1.124	−0.054	−0.934	0.351	−3.264	1.163
Employed/self-employed	−1.802	1.397	−0.077	−1.290	0.198	−4.553	0.948
Stroke type: ischaemic	1.144	1.213	0.051	0.944	0.346	−1.244	3.532
EuroQoL Index (EQ-5D) (higher score indicates best health)	**−18.974**	**2.969**	**−0.418**	**−6.391**	**<0.001**	**−24.820**	**−13.128**
Foreign born	**3.466**	**1.345**	**0.159**	**2.578**	**0.010**	**0.818**	**6.113**
PROMIS Physical Function (higher score indicates greater functional ability)	−0.115	0.068	−0.120	−1.682	0.094	−0.249	0.020
Categorised Charlson Comobidity	0.522	0.763	0.039	0.684	0.495	−0.981	2.024
Frontal Assessment Battery (higher score indicates better performance)	−0.037	0.177	−0.013	−0.208	0.836	−0.386	0.312

EQ-5D, EuroQoL five dimensions; PROMIS, Patient Reported Outcomes Measurement Information System.

link. Robust estimates for the variances were used in all of the analysis.

Sensitivity analyses was also performed examining the possible influence of missing data on the results. The expectation–maximization (EM) algorithm was used to impute missing data in the covariates, with the imputed data entered into the linear and logistic regressions. Statistical analyses were conducted using IBM SPSS Statistics V.25. A two-sided $p<0.05$ was considered statistically significant.

Patient and public involvement: no patients or the public were involved in the study protocol design, the specific aims or research questions development, or in developing plans for recruitment, design or implementation.

RESULTS

Participant characteristics are shown in table 1. The 445 participants included in the study had an average age of 61.7±11.1 years, 44% were women and about half self-identified as black. Socioeconomic status was low, with over two-thirds reporting annual household income <US$25 000 and half completing less than high school education. Majority were foreign born (72.5%), with average length of US residence of 31.4 years.

Thirty-two per cent of participants had PSD. In bivariate analyses, a significantly larger proportion of patients classified as depressed patients as contrasted with those classified as non-depressed were women, and reported lower annual household income. Those classified as depressed reported a significantly lower quality of life, and higher levels of disability as measured by the Barthel Index, the PROMIS physical function scale and the modified Rankin, which measured stroke-related functional disability. Those classified as depressed evidenced lower systolic BP and higher comorbidity. Furthermore, patients with PSD had worse scores on the Frontal Assessment Battery measuring executive function (table 1).

As shown in table 2, after adjusting for all demographics, clinical, and lifestyle variables; patients who were foreign born (OR=3.34; 95% CI 1.40 to 7.97) evidenced higher odds of depression than those who were born in the USA those who were married or reported having a domestic partner (OR=0.46; 95% CI 0.24 to 0.89) and those who were older (OR=0.94; CI 0.91 to 0.97) had lower odds of depression than their unmarried and younger counterparts. There was a lower odds of being depressed if participants reported higher quality of life (OR=0.02; CI 0.004 to 0.12). There was a trend for higher comorbidity to be uniquely associated with depression (≥3 comorbid conditions, OR=1.49, 95% CI 1.00 to 2.23). Sensitivity analyses treating missing data using mean imputation for the logistic regression yielded consistent results with the main analysis with the exception of PROMIS physical function, which evidenced a significant association with depression with the imputed data, but not in the main analysis (results not shown). For example, the OR estimate for

Table 4 Cross-sectional predictors of depression among blacks and Hispanics stroke survivors with uncontrolled hypertension (bivariate results)

	Logistic regression (binomial distribution with logit link)			Log-binomial (binomial distribution with log link)		Interval censored survival (binomial distribution with complementary log-log link)		Poisson distribution with log link	
	N	OR*	95% CI	PR†	95% CI	PR†	95% CI	PR†	95% CI
Age	445	1.00	(0.98 to 1.01)	1.00	(0.99 to 1.01)	1.00	(0.98 to 1.01)	1.00	(0.99 to 1.01)
Female	445	**1.83**	**(1.23 to 2.74)**	**1.50**	**(1.15 to 1.97)**	**1.65**	**(1.18 to 2.29)**	**1.50**	**(1.15 to 1.97)**
Black to non-Hispanic	445	0.76	(0.51 to 1.13)	0.83	(0.63 to 1.08)	0.79	(0.57 to 1.10)	0.83	(0.63 to 1.08)
Hispanic	445	1.32	(0.89 to 1.97)	1.21	(0.92 to 1.58)	1.26	(0.91 to 1.75)	1.21	(0.92 to 1.58)
Systolic blood pressure (per 10 mm Hg unit rise)	445	**0.82**	**(0.71 to 0.95)**	**0.88**	**(0.79 to 0.97)**	**0.85**	**(0.75 to 0.96)**	**0.87**	**(0.79 to 0.97)**
Diastolic blood pressure (per 10 mm Hg unit rise)	445	0.93	(0.80 to 1.09)	0.95	(0.86 to 1.06)	0.94	(0.83 to 1.07)	0.95	(0.86 to 1.06)
Married/domestic partnership	444	**0.63**	**(0.42 to 0.96)**	**0.73**	**(0.55 to 0.97)**	**0.68**	**(0.48 to 0.96)**	**0.73**	**(0.55 to 0.97)**
Less than HS education	422	1.21	(0.81 to 1.83)	1.14	(0.87 to 1.50)	1.17	(0.84 to 1.64)	1.14	(0.87 to 1.50)
High school diploma/GED	422	0.99	(0.64 to 1.54)	0.99	(0.74 to 1.34)	0.99	(0.69 to 1.43)	0.99	(0.74 to 1.34)
Employed/self-employed	438	**0.28**	**(0.14 to 0.55)**	**0.38**	**(0.22 to 0.67)**	**0.33**	**(0.18 to 0.61)**	**0.38**	**(0.22 to 0.67)**
Unemployed/not working	438	1.10	(0.56 to 2.17)	1.07	(0.68 to 1.67)	1.08	(0.62 to 1.89)	1.07	(0.68 to 1.67)
Stroke type: Ischaemic	424	1.25	(0.77 to 2.03)	1.17	(0.83 to 1.63)	1.21	(0.80 to 1.81)	1.17	(0.83 to 1.63)
EuroQoL Index (EQ-5D) (higher score indicates best health)	445	**0.02**	**(0.01 to 0.06)**	–	–	**0.05**	**(0.03 to 0.10)**	**0.13**	**(0.09 to 0.19)**
Barthel Index (higher score indicates greater independence)	445	**0.97**	**(0.96 to 0.98)**	**0.99**	**(0.98 to 0.99)**	**0.98**	**(0.97 to 0.99)**	**0.98**	**(0.98 to 0.99)**
Foreign born	443	1.51	(0.95 to 2.40)	1.33	(0.95 to 1.86)	1.41	(0.95 to 2.09)	1.33	(0.95 to 1.86)
Modified Rankin Score (higher score indicates greater disability)	444	**1.39**	**(1.22 to 1.58)**	**1.23**	**(1.14 to 1.34)**	**1.3**	**(1.18 to 1.45)**	**1.24**	**(1.15 to 1.35)**
PROMIS Physical Function (higher score indicates greater functional ability)	444	**0.93**	**(0.91 to 0.95)**	**0.96**	**(0.95 to 0.97)**	**0.95**	**(0.93 to 0.96)**	**0.95**	**(0.94 to 0.97)**
Categorised Charlson Comobidity	444	**1.51**	**(1.13 to 2.03)**	**1.33**	**(1.09 to 1.62)**	**1.41**	**(1.11 to 1.80)**	**1.32**	**(1.08 to 1.61)**
Frontal Assessment Battery (higher score indicates better performance)	418	**0.92**	**(0.87 to 0.98)**	**0.95**	**(0.92 to 0.99)**	**0.94**	**(0.89 to 0.98)**	**0.95**	**(0.92 to 0.98)**

*OR with 95% CI in predicting poststroke depression (PSD).
†Prevalence ratio with 95% CI in predicting PSD.
GED, General Educational Development; PROMIS, Patient Reported Outcomes Measurement Information System.

foreign born in the sensitivity analyses treating missing data was 2.79, 95% CI 1.50 to 6.34; p<0.002.

Sensitivity analyses with a continuous depression outcome identified similar results (table 3). The only difference was that being married was not a predictor of depression in the linear regression, but was in the logistic regression (see table 3). Additionally, there was a trend (p=0.054) for Hispanics to evidence lower depression. Using mean imputation for the linear regression yielded consistent results with the linear regression above.

Tables 4 and 5 show the prevalence ratios for the bivariate associations using three methods (table 4) and the multivariate results using only two methods (table 5) due to lack of convergence for the log-binomial approach. Again, results were similar to those of the primary analyses, with age, marital status, foreign born status and quality-of-life emerging as the significantly, uniquely associated with the PSD classification.

DISCUSSION

In this cohort of black and Hispanic stroke survivors with uncontrolled hypertension, the prevalence of self-reported PSD was 32%. This is similar to the rate of PSD reported in cohorts of predominantly white stroke survivors and in previous studies of minority populations (20.7%–39.3%), including those in sub-Saharan Africa.[7 22 23] Independent correlates of PSD included being foreign born, being unmarried/not living with

Table 5 Cross-sectional predictors of depression among blacks and Hispanics stroke survivors with uncontrolled hypertension (adjusted for demographics, clinical, and lifestyle factors (n=278))

	Logistic regression (binomial distribution with logit link)		Interval censored survival (binomial distribution with complementary log-log link)		Poisson distribution with log link	
	OR*	95% CI	PR†	95% CI	PR†	95% CI
Age	**0.94**	**(0.91 to 0.97)**	**0.95**	**(0.93 to 0.98)**	**0.97**	**(0.96 to 0.99)**
Female	1.37	(0.72 to 2.64)	1.29	(0.78 to 2.13)	1.26	(0.89 to 1.78)
Hispanic	0.65	(0.31 to 1.36)	0.75	(0.43 to 1.31)	0.76	(0.51 to 1.12)
Systolic blood pressure (per 10 mm Hg unit rise)	0.83	(0.68 to 1.01)	0.87	(0.75 to 1.02)	0.9	(0.81 to 1.02)
Married/domestic partnership	**0.46**	**(0.24 to 0.89)**	**0.59**	**(0.35 to 0.98)**	**0.68**	**(0.48 to 0.97)**
Employed/self-employed	0.44	(0.15 to 1.35)	0.46	(0.18 to 1.16)	0.51	(0.22 to 1.17)
Stroke type: Ischaemic	0.79	(0.38 to 1.64)	0.82	(0.47 to 1.41)	0.87	(0.61 to 1.25)
EuroQoL Index (EQ-5D) (higher score indicates best health)	**0.02**	**(0.00 to 0.12)**	**0.06**	**(0.02 to 0.20)**	**0.19**	**(0.10 to 0.38)**
Foreign born	**3.34**	**(1.40 to 7.97)**	**2.49**	**(1.28 to 4.84)**	**1.95**	**(1.20 to 3.17)**
PROMIS Physical Function (higher score indicates greater functional ability)	0.97	(0.93 to 1.01)	0.98	(0.95 to 1.00)	0.98	(0.96 to 1.00)
Categorised Charlson Comobidity	1.49	(1.00 to 2.23)	1.30	(0.96 to 1.75)	1.19	(0.97 to 1.46)
Frontal Assessment Battery (higher score indicates better performance)	0.94	(0.84 to 1.05)	0.94	(0.87 to 1.03)	0.97	(0.92 to 1.03)

Significant relationships are in bold.
*OR with 95% CI in predicting poststroke depression (PSD).
†Prevalence ratio with 95% CI in predicting PSD.
EQ-5D, EuroQoL five dimensions; PROMIS, Patient Reported Outcomes Measurement Information System.

a partner, older age and lower health-related quality of life.[24]

Disparities in PSD rates are difficult to assess because of possible racial/ethnic differences in symptom endorsement and physician assessment and recognition. These factors may account for the Jia *et al* study that showed black and Hispanics were less likely to have a PSD diagnosis compared with their non-Hispanic white counterparts.[6] A novel finding from our present study is that the multivariate analyses identified a significant association of foreign-born status and self-reported PSD. This is in contrast to prior studies that have found that foreign-born adults are less likely to suffer from depressive symptoms compared with US born participants.[25–27] For example, Sala-Wright *et al*[27] evaluated the prevalence and comorbidity of mental disorders, including depression, among immigrants to the USA. They found that immigrants were significantly less likely than US-born individuals to meet criteria for a lifetime disorder (AOR=0.63, 95% CI 0.57 to0.71) or to report parental history of psychiatric problems.[27] This may be because the rates of depression among this group are underdiagnosed or under-reported due to differences in healthcare access and utilisation or cultural factors (eg, stigma related to mental health disorders). Alternatively, lower rates of depression may reflect protective factors related to one's native country and culture. Foreign-born participants in our study had been in the USA for a mean of 31 years, so it is possible that acculturation to the USA reduced any such protective factors. This is a finding that needs to be evaluated because many of the challenges immigrants experience, including social isolation and difficulty navigating the healthcare system, would be expected to be associated with PSD.

There were several limitations to this study. The diagnosis of PSD is most appropriately based on a structured exam and Diagnostic and Statistical Manual of Mental Disorders, fourth edition (DSM-IV) criteria; however, this is difficult to perform in most clinical trials. We did not collect data on history of depression prior to the index stroke or on depression treatment. We only assessed data in the select cohort that survived the stroke event and recovered sufficiently to be discharged to the community. The cross-sectional design limits interpretations about causality. In particular, the direction of the association between PSD and health-related quality of life cannot be determined. Finally, the findings cannot be generalised to other racial/ethnic groups or to the population of stroke survivors in general because this cohort consisted exclusively of black and Hispanic community dwelling stroke survivors with uncontrolled hypertension recruited from one geographical area.

Our study also had several important strengths. In previous studies that have evaluated PSD among minorities, blacks were usually under-represented despite being most at risk for poor stroke outcomes.[6 7] Unlike these studies, we included a large cohort of black and Hispanic community-dwelling stroke survivors, and the majority of participants were foreign born. The definition of depression was based on patient self-report using

interview administered validated screening tool, not clinical reporting, allowing us to include undiagnosed depression.

CONCLUSIONS

PSD is common among black and Hispanic stroke survivors with potential for dire poststroke outcomes, including mortality. Such high rates of depression mandate screening of minority stroke survivors for depressive symptoms in order to capture the full burden of the disease in this vulnerable community. Early intervention on PSD could improve recovery and reduce morbidity and mortality related to stroke. The finding of a higher odds for PSD in foreign-born survivors is novel and warrants further research to replicate the findings, assess long-term effects of PSD in this population, and ascertain whether specific tailored depression interventions should be tested. Such efforts could improve disparities in poststroke health outcomes affecting understudied and underserved minority populations.

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ORCID iD

Deborah O Onakomaiya http://orcid.org/0000-0003-1535-367X

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