Racial and Ethnic Differences in Mental Distress among Stroke Survivors

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Objective: African Americans, Hispanics and some Asian subgroups have a higher stroke incidence than non-Hispanic Whites (NHW). Additionally, African Americans and Hispanics have worse stroke outcomes than non-Hispanic Whites. Thus, we explored racial and ethnic differences in mental distress, a known risk factor for post-stroke disability.

Methods: National Health Interview Survey data from 2000–2010 were used to identify 8,324 community dwelling adults with self-reported stroke. Serious mental distress was identified by the Kessler-6 scale. Logistic regression models assessed racial/ethnic associations with serious mental distress after adjusting for demographics, comorbidities, disability, health care utilization and socioeconomic factors.

Results: Serious mental distress was identified in 9% of stroke survivors. Hispanics (14%) were more likely to have serious mental distress than African Americans (9%), non-Hispanic Whites (9%) and Asians (8%, $P=.02$). After adjustment, Hispanics (OR=1.06, 95% CI .76–1.48) and Asians (.84, 95% CI .37–1.90) had a similar odds of serious mental distress while African Americans had a lower odds of serious mental distress (OR=.61, 95% CI .48–.78) compared with non-Hispanic Whites. Younger age, low levels of education and insurance were important predictors of serious mental distress among Hispanics.

Conclusion: Serious mental distress is highly prevalent among US stroke survivors and is more common in Hispanics than NHWs, African Americans and Asians. Further study of the role of mental distress in ethnic differences in post-stroke disability is warranted. (*Ethn Dis.* 2015;25[2]:138–144)

Key Words: Stroke, Mental Distress, Race, Ethnicity

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Introduction

African Americans (AAs), Hispanic Americans (Hispanics) and some Asian American (Asian) subgroups have a higher incidence of stroke, particularly at younger ages, compared to non-Hispanic Whites (NHWs).[1–3] Additionally, AAs and Hispanics have greater post-stroke disability than NHWs.[4,5] Little is known about post-stroke disability among Asian Americans.

Reasons for racial/ethnic differences in post-stroke outcomes are largely unknown. One possibility may be differences in mental distress. The most commonly studied mental illness in stroke survivors is depression,[6] which is common with about one third of stroke survivors and can occur during the acute hospitalization or develop later in the recovery period.[6–8] Depression is associated with poorer stroke outcomes including an increased risk of disability and mortality.[9–11] Fortunately, depression among stroke survivors is treatable,[12] and limited data suggest that treatment and reduction in depressive symptoms is associated with improved functional outcomes.[13,14]

Many factors that predict post-stroke disability such as age and stroke severity are not modifiable.[15] Thus, exploring a modifiable factor or comorbidity such as mental distress may represent a key target to improve stroke outcomes and, in turn, to reduce racial and ethnic disparities. Therefore, we sought to explore racial/ethnic differences in mental distress among a geographically diverse sample of community-dwelling US stroke survivors. We hypothesized that AAs, Hispanics and Asians experience more mental distress than NHW stroke survivors. We then sought to explore the role of demographics, comorbidities, functional disability, health care utilization and socioeconomic factors in racial/ethnic differences in mental distress among stroke survivors.

We hypothesized that AAs, Hispanics and Asians experience more mental distress than NHW stroke survivors.

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Methods

Data Source and Patients

Stroke survivors were identified in the National Health Interview Survey (NHIS) from 2000–2010. The NHIS, conducted by the National Center for Health Statistics, is an annual face-to-face survey of approximately 100,000 civilian, non-institutionalized persons in 42,000 US households. The NHIS oversamples AAs, Hispanics and began oversampling Asians in 2006.[16] These cross-sectional data were obtained from the Integrated Public Use Microdata Series.[17] Stroke survivors were identified by the question "Have you ever been told by a doctor or other health professional that you had a stroke?" All respondents aged >18 years were included. Stroke survivors were based on

self-report and categorized into NHWs, non-Hispanic AAs, Hispanics (both Black and White) and Asians. Small numbers of respondents of other race/ethnicity precluded their inclusion in the analysis.

Outcome

The Kessler (K6) scale was used to screen for mental distress. The K6 scale was developed and validated, including oversampling of AAs and Hispanics, to screen for an Axis I DSM-IV disorder.[18,19] The K6 is a series of six questions querying the frequency of, in the preceding 30 days, feeling: 1) nervous; 2) hopeless; 3) restless/fidgety; 4) worthless; 5) so sad that nothing cheers them up; or, 6) that everything is an effort. Response options range from 0-none of the time to 4-all of the time. Our primary outcome was a score ≥13 indicating probable serious mental distress defined as meeting diagnostic criteria for a DSM IV diagnosis and experiencing significant impairment.[20] A K6 score of ≥13 has a sensitivity of .36 and a specificity of .96 in identifying serious mental distress when compared to structured clinical interviews.[18] Due to the low sensitivity of this cutpoint for detecting serious mental distress, a secondary outcome of a K6 score of ≥5 was used to identify moderate/serious mental distress.[21] A K6 score of ≥5 has a sensitivity of .76 and specificity of .75 for detecting moderate/serious mental distress, which is defined as requiring mental health treatment and causing impairments in functioning.[21]

Covariates

Covariates for inclusion in multivariable models were selected *a priori* based on our review of the literature and our clinical experience.[22,23] The covariates were categorized as demographics, comorbidities, functional disability, health care utilization and socioeconomic factors. Demographics included sex and age (≤64, 65–74, ≥75), which is a close approximation to the age tertiles. Comorbidity was based on a composite score of five major health conditions: hypertension, coronary heart disease, diabetes, emphysema and heart condition or disease (yes, no).[24] Scores ranged from 0–5. Functional disability due to any condition was included because it may confound the race/ethnicity and mental distress association. Disability was measured by asking about 12 tasks that assessed capacity and participation.[25] The response options were dichotomized into: no difficulty with the task (not at all difficult, do not do this activity, missing), scored a zero, compared with difficulty with the task (only a little difficult, somewhat difficult, very difficult, cannot do at all), scored as one, and summed to tabulate a total score ranging from 0–12.[26] Scores were divided into quartiles of low (0–1), moderate (2–5), severe (6–8) and very severe (9–12) disability. Current marital status (yes, no) was also included given its potential to confound the race/ethnicity and mental distress association.

Responses to questions querying whether the respondent saw or talked to a primary care physician and/or mental health professional (yes, no) in the last 12 months were used to measure health care utilization. Socioeconomic status measures included education (≤ 8th grade, high school, some college, college graduate, beyond college) and insurance status (private, Medicare, Medicaid, military and uninsured). Respondents were assigned to one insurance category with greater coverage taking precedence over lesser coverage.

Statistical Analysis

All analyses were conducted using survey weights to account for the complex sampling design of the NHIS. Demographics, socioeconomic status, comorbidities, functional disability, health care utilization, and mental distress (serious and moderate/serious) were compared by race-ethnicity using bivariate linear regression for normally distributed continuous variables, chi-squared tests for categorical variables or Somer's D for ordinal variables. These analyses were repeated comparing stroke survivors with serious mental distress to those without. We then fit unadjusted logistic regression models with the primary predictor of race/ethnicity modeled as a series of categorical variables with NHW as the referent to explore the associations with serious and moderate/serious mental distress separately. Multivariable logistic regression was then performed to evaluate the association of race/ethnicity and serious or moderate/serious mental distress after adjusting for possible confounders. We sequentially added groups of variables to the base model in the following order: 1) demographics: age, sex; 2) marital status, comorbidities and functional disability; 3) health care utilization: saw or spoke with PCP or mental health professional; and 4) socioeconomic status: education, insurance status. A sensitivity analysis was performed limited to only stroke survivors without any missing data for any model. US population-based estimates of the number of stroke survivors with mental distress were also calculated using the NHIS survey weights. Analyses were performed using STATA 11.0. This project was ruled exempt by the University of Michigan Institutional Review Board.

RESULTS

There were 8,792 stroke survivors identified. A total of 453 (5%) respondents were excluded from analysis due to incomplete K6 scales or race/ethnicity other than NHW, AA, Asian or Hispanic, resulting in 8,339 stroke survivors in the study population. There were more incomplete K6 scale scores among Asians (8%) than among NHWs, AAs and Hispanics (4% for each racial/ethnic group). Overall, 9% of stroke survivors had serious mental distress while 35% of stroke survivors had moderate/serious mental distress.

Table 1. Demographics, comorbidities, functional disability, health care utilization, socioeconomic status and mental distress by race/ethnicity among 8,339 community dwelling stroke survivors from the National Health Interview Survey 2000–2010[a]

	Non-Hispanic Whites *n*=5,627	African Americans *n*=1,623	Hispanics *n*=894	Asians *n*=195	*P*
Age, years, *N*=8,339	67 (67–68)	61 (60–62)	60 (59–61)	66 (64–69)	<.01
Female, *N*=8,339	53	60	53	49	<.01
Married, *N*=8,317	56	36	58	56	<.01
Comorbidities, *N*=8,204	1.7 (1.6–1.7)	1.7 (1.6–1.8)	1.6 (1.5–1.7)	1.7 (1.5–1.8)	.12
Functional disability, *N*=8,241	5.0 (4.9–5.1)	5.7 (5.4–5.9)	5.2 (4.8–5.2)	4.8 (4.1–5.4)	<.01
Saw/talked to mental health professional in last year, *N*=8,270	10	11	11	10	.62
Saw/talked to general doctor last year, *N*=8,271	90	86	80	83	<.01
Education, *N*=8,231					<.01
8th grade or less	10	15	39	12	
High school	50	55	38	39	
Some College	25	21	17	28	
College Graduate	10	7	3	12	
Advanced degree	5	3	3	9	
Insurance status, *N*=8,321					<.01
Private	19	16	19	26	
Medicare	56	36	29	40	
Medicaid	11	30	31	23	
Military	9	8	7	6	
Uninsured	5	9	15	5	
Serious mental distress, *N*=8,339	9	9	14	8	.02
Moderate/serious mental distress, *N*=8,339	34	38	45	26	<.01

[a] Data are mean (95% CI), or %.

Characteristics of the study population by race/ethnicity are presented in Table 1. AA and Hispanic stroke survivors were younger than NHWs and Asians. Significant differences in education were noted with 39% of Hispanics having an 8th grade education or less compared with 10% of NHWs, 15% of AAs and 12% of Asians (*P*<.01). AAs and Hispanics were more likely than NHWs and Asians to have Medicaid or to be uninsured. AAs reported more disability than NHW, Hispanic and Asian stroke survivors. Stroke survivors with serious mental distress were younger, more likely to be unmarried and female (Table 2) when compared to stroke survivors without severe mental distress. Stroke survivors with severe mental distress also had greater comorbidity, functional disability, less education and were more likely to be on Medicaid or uninsured than stroke survivors without severe mental distress.

Racial and ethnic comparisons of mental distress are shown in Table 1. Compared with NHWs, Hispanics were more likely to have serious mental distress (14% vs 9%, *P*=.02; unadjusted odds ratio (OR) 1.65, 95% CI 1.26–2.16) and moderate/serious mental distress (45% vs 34%, *P*<.01; unadjusted OR 1.57, 95% CI 1.31–1.87). Hispanic association with serious mental distress was attenuated after adjusting for age and sex (OR 1.36, 95% CI 1.02–1.81). Comorbidities, functional disability and health care utilization had little additional impact on the relationship between ethnicity and serious mental distress. Hispanic ethnicity was not significantly associated with serious mental distress after further accounting for educational attainment and insurance category (OR 1.06, 95% CI .76–1.48) (Table 3). A similar pattern was observed for moderate/serious mental distress such that no ethnic difference remained after full adjustment (OR 1.09, 95% CI .88–1.35) (Table 4).

There was no difference in serious mental distress (9% vs 9%, *P*=.67, unadjusted OR=1.04, 95% CI .85–1.28) between AAs and NHWs. However, AAs were more likely to have moderate/serious mental distress (38% vs 34%, *P*<.01, unadjusted OR=1.19, 95% CI 1.03–1.37) than NHWs (Table 1). After adjusting for age and sex (Table 3), AAs were less likely than NHWs to have serious mental distress (OR .83, 95% CI .67–1.02). After adjusting for marital status, comorbidities and functional disability, the race association was strengthened (OR .67, 95% CI .50–.84). There was no attenuation of the race association with serious mental distress after the addition of health care utilization factors to the models. Accounting for education and insurance category strengthened the protective association between AA race and serious mental distress compared to NHWs (OR= .61, 95% CI .48–.78). This pattern was similar for moderate/serious mental distress (Table 4). Between NHWs and Asians, we found no difference in serious mental distress (9% vs 8%, *P*=.02, unadjusted OR .91, 95% CI

Table 2. Demographics, comorbidities, functional disability, socioeconomic status by serious mental distress status among 8,339 community dwelling stroke survivors from the National Health Interview Survey 2000–2010[a]

	Total Sample *N*=8,339	No Serious Mental Distress *n*=7,532	Serious Mental Distress *n*=792	*P*
Age, years, *N*=8,339	66 (65–66)	66 (66–67)	59 (58–61)	<.01
Female, *N*=8,339	54	53	62	<.01
Married, *N*=8,317	53	54	44	<.01
Comorbidities, *N*=8,204	1.7 (1.6–1.7)	1.6 (1.6–1.7)	1.9 (1.8–2.0)	<.01
Functional disability mean, *N*=8,241	5.1 (5.0–5.2)	4.8 (4.7–4.9)	8.2 (7.9–8.5)	<.01
Saw/talked to mental health professional in last year , *N*=8,270	10	8	32	<.01
Saw/talked to general doctor last year, *N*=8,271	88	88	89	.79
Education, *N*=8,231				<.01
≤8th grade	13	12	19	
High school	49	49	56	
Some college	24	24	19	
College graduate	9	10	4	
Advanced degree	5	5	2	
Insurance Status *N*=8,321				<.01
Private	19	19	14	
Medicare	51	52	31	
Medicaid	16	14	31	
Military	8	8	10	
Uninsured	6	6	13	

[a] Data are mean (95% CI), or %.

.40–2.09) or moderate/serious mental distress (34% vs 26%, $P<.06$, unadjusted OR=.67, 95% CI .43–1.02). Limiting the analysis to only those stroke survivors without missing data for any model did not meaningfully alter the results of the study (data not shown).

Extrapolating the NHIS data to the US population shows that there are >467,000 NHW, AA, Hispanic and Asian stroke survivors with serious mental distress. Of these, >338,000 (72%) were NHWs while nearly 64,000 (14%) were AA, nearly 54,000 (12%) were Hispanic and nearly 10,000 (2%) were Asian. Additionally, >1.8 million NHW, AA, Asian or Hispanic stroke survivors had moderate/serious mental distress in the United States. Of these, >1.3 million (73%) were NHW while >276,000 (15%) were AA, >176,000 (10%) were Hispanic, and >31,000 (1.7%) were Asian.

DISCUSSION

In this geographically diverse sample of > 8,000 NHW, AA, Hispanic and Asian community-dwelling US stroke survivors, we found a high prevalence of serious mental distress. We found that 9% of stroke survivors experienced serious mental distress in the preceding 30 days compared to an estimated 3.1% of US adults.[27] Our results show a substantial burden of serious mental distress among stroke survivors and suggest the need for screening of mental distress in stroke survivors.

We also found important ethnic differences in mental distress. Compared to NHWs, Hispanics had a higher prevalence of both serious and moderate/serious mental distress. The higher odds of mental distress found among Hispanics when compared with NHWs is accounted for by the younger age of Hispanics, lower educational attainment and increased likelihood of being uninsured compared with NHWs. Many of these factors are amenable to public policy interventions, which may ultimately improve post-stroke outcomes among Hispanics.

African Americans, on the other hand, have a similar prevalence of serious mental distress but a modestly higher prevalence of moderate/serious mental distress than NHWs. AAs in the general population have been shown to have less serious mental distress than NHWs.[28] Given the overall lack of racial differences in mental distress among stroke survivors, mental distress is unlikely to explain the poorer stroke outcomes observed among AAs when compared to NHWs. AAs had lower odds of mental distress after adjustment for demographics, comorbidities, functional disability, health care utilization, and socioeconomics, suggesting further

We found that 9% of stroke survivors experienced serious mental distress in the preceding 30 days compared to an estimated 3.1% of US adults.[27]

Table 3. Logistic regression models for the association of race/ethnicity and serious mental distress among 8,339 community dwelling stroke survivors from the National Health Interview Survey 2000–2010[a]

	Model 1 Unadjusted *n*=8,339	Model 2 Adjusting for Demographics *n*=8,339	Model 3 Adjusting for Comorbidities and Functional Disability *n*=8,092	Model 4 Adjusting for Health Care Utilization *n*=8,034	Model 5 Adjusting for Socioeconomics *n*=7,923
Non-Hispanic Whites reference group					
African Americans	1.04 (.85–1.28)	.83 (.67–1.02)	.67 (.5–.84)	.70 (.56–.88)	.61 (.48–.78)
Hispanics	1.65 (1.26–2.16)	1.36 (1.02–1.81)	1.43 (1.06–1.95)	1.43 (1.04–1.96)	1.06 (.76–1.48)
Asians	.91 (.40–2.09)	.91 (.40–2.04)	.80 (.32–2.02)	.78 (.34–1.81)	.84 (.37–1.90)
Female		1.55 (1.29–1.85)	1.20 (.98–1.47)	1.26 (1.03–1.55)	1.27 (1.03–1.57)
18–64 years reference group					
65–74 years		.41 (.32–.52)	.38 (.30–.49)	.46 (.36–.60)	.50 (.38–.67)
≥75 years		.30 (.24–.39)	.24 (.19–.32)	.30 (.23–.40)	.33 (.24–.45)
Married			.74 (.60–.90)	.80 (.65–.99)	.87 (.70–1.08)
≥2 comorbidities			1.34 (1.09–1.66)	1.42 (1.14–1.77)	1.41 (1.12–1.77)
Moderate functional disability			3.57 (2.28–5.59)	3.21 (2.06–5.02)	3.50 (2.23–5.49)
Severe functional disability			7.09 (4.65–10.79)	6.22 (4.10–9.45)	6.30 (4.04–9.80)
Very severe functional disability			14.98 (9.82–22.85)	12.75 (8.41–19.35)	13.03 (8.41–20.18)
Saw/spoke to mental health in last year				3.61 (2.76–4.73)	4.02 (3.05–5.29)
Saw general medical doctor in last year				.77 (.56–1.06)	.89 (.64–1.24)
Beyond college reference group					
≤8th grade					3.03 (1.47–6.23)
High school					2.14 (1.08–4.23)
Some college					1.19 (.58–2.43)
College graduate					1.10 (.50–2.42)
Private insurance reference group					
Medicare					.91 (.62–1.33)
Medicaid					1.38 (.96–1.98)
Military					1.43 (.94–2.18)
Uninsured					2.32 (1.50–3.60)

[a] Data are OR (95% CI).

study of mental distress among AA stroke survivors may provide insight into ways to decrease mental distress among other racial/ethnic groups. A few small studies suggest that increasing resilience factors such as social support, personal strengths and positive emotions may provide protection from mood disorders and warrant further study in this population.[29,30] No differences in serious or moderate/serious mental distress were found between NHWs and Asians.

While most of the data surrounding mental distress among stroke survivors focuses on post-stroke depression, there are limited data on differences in post-stroke depression between NHWs and Hispanics.[11,31,32] One study of US veterans found that Hispanics were equally as likely to have post-stroke depression as NHWs after adjustment, which is consistent with our findings.[31] Among 139 stroke patients in the tri-ethnic Northern Manhattan Stroke Study, Hispanics were equally as likely to report depressed mood as NHWs in the week after their stroke in unadjusted analysis.[11] These findings are similar to our adjusted findings perhaps due to a more homogeneous population with respect to sociodemographics in the Northern Manhattan Stroke Study as compared with the national population used in our study. Our findings are also consistent with previous studies that found that AA race may be protective against post-stroke depression when accounting for confounders.[11,31]

There are several limitations to our work that warrant discussion. Our study relies on self-reported stroke, which is subject to recall bias and errors in reporting. However data suggest high accuracy of self-reported stroke, including in minorities and disabled elderly.[33,34] We cannot exclude that mental distress may affect the self-report of stroke or the participation of stroke survivors in NHIS. Data are not available for stroke subtype and location. Although studies have shown racial and ethnic variation in ischemic stroke subtype,[35] a systematic review found no association between infarction and hemorrhage location and depression.[36] We cannot determine the temporal relationship between mental distress and stroke and, thus, cannot determine whether race/ethnicity has differing causal effects on the risk of mental distress or the course of mental distress. We also cannot determine the temporal establishment of many of the covariates, particularly comorbidities and disability. We also

Table 4. Logistic Regression models for the association of race/ethnicity and moderate/serious mental distress among 8,339 community dwelling stroke survivors from the National Health Interview Survey 2000–2010[a]

	Model 1 Unadjusted *n*=8,339	Model 2 Adjusting for Demographics *n*=8,339	Model 3 Adjusting for Co-morbidities and Functional Disability *n*=8,092	Model 4 Adjusting for Health Care Utilization *n*=8,034	Model 5 Adjusting for Socioeconomics *n*=7,923
Non-Hispanic Whites reference group					
African Americans	1.19 (1.03–1.37)	1.03 (.89–1.19)	.86 (.73–1.01)	.88 (.74–1.04)	.78 (.66–.93)
Hispanics	1.57 (1.31–1.87)	1.41 (1.17–1.70)	1.41 (1.17–1.70)	1.40 (1.16–1.70)	1.09 (.88–1.35)
Asian	.67 (.43–1.02)	.66 (.44–1.01)	.61 (.38–.99)	.60 (.38–.93)	.64 (.39–1.03)
Female		1.52 (1.36–1.70)	1.23 (1.09–1.40)	1.27 (1.11–1.45)	1.29 (1.13–1.48)
18–64 years reference group					
65–74		.55 (.48–.63)	.47 (.40–.54)	.53 (.46–.63)	.54 (.45–.65
≥75		.52 (.45–.60)	.40 (.34–.47)	.47 (.39–.55)	.48 (.39–.59)
Married			.88 (.78–1.01)	.94 (.83–1.08)	1.04 (.91–1.20)
≥2 Comorbidities			1.30 (1.14–1.47)	1.33 (1.17–1.52)	1.31 (1.15–1.49)
Moderate functional disability			2.40 (1.95–2.96)	2.27 (1.84–2.80)	2.15 (1.74–2.65)
Severe functional disability			4.77 (3.88–5.87)	4.59 (3.71–5.69)	4.15 (3.34–5.15)
Very severe functional disability			9.68 (7.85–11.95)	9.11 (7.35–11.28)	8.05 (6.47–10.01)
Saw/spoke to mental health in last year				4.07 (3.27–5.07)	4.31 (3.43–5.41)
Saw general medical doctor in last year				.77 (.63–.93)	.84 (.70–1.02)
Beyond college reference group					
≤8th grade					2.07 (1.45–2.98)
high school					1.74 (1.25–2.43)
some college					1.38 (.98–1.94)
college graduate					1.15 (.75–1.78)
Private insurance reference group					
Medicare					1.22 (.98–1.53)
Medicaid					1.88 (1.47–2.40)
Military					1.48 (1.11–1.96)
uninsured					2.31 (1.75–3.04)

[a] Data are OR (95% CI).

cannot exclude the possibility of survival bias in our study. Stroke severity, which has been associated with depression after stroke,[23] was not available in our dataset but we did account for functional disability (though it could have preceded the stroke). We excluded stroke survivors who did not complete the K6 and thus our results do not extend to those with cognitive impairment or aphasia. Information about medications use for mental distress was not available in this dataset and is an area of future study. Finally, the NHIS is limited to community-dwelling respondents.

In summary, one in 11 US stroke survivors has serious mental distress. Mental distress was more common among Hispanics with much of this association due to socioeconomic factors. Further exploration of the role of mental distress in post-stroke disability among Hispanics is needed. There was little difference in the odds of mental distress in AAs and NHWs; thus, mental distress is unlikely to explain the increased post-stroke disability found among AAs. Further study of AA stroke survivors may identify protective factors that may buffer against mental distress among stroke survivors.

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REFERENCES

1. Morgenstern LB, Smith MA, Lisabeth LD, et al. Excess stroke in Mexican Americans compared with non-Hispanic Whites: the Brain Attack Surveillance in Corpus Christi Project. *Am J Epidemiol*. 2004;160(4):376–383.
2. Holland AT, Wong EC, Lauderdale DS, Palaniappan LP. Spectrum of cardiovascular diseases in Asian-American racial/ethnic subgroups. *Ann Epidemiol*. 2011;21(8):608–614.
3. Howard VJ, Kleindorfer DO, Judd SE, et al. Disparities in stroke incidence contributing to disparities in stroke mortality. *Ann Neurol*. 2011;69(4):619–627.
4. Lisabeth LD, Sánchez BN, Baek J, et al. Neurological, functional, and cognitive stroke outcomes in Mexican Americans. *Stroke*. 2014;45(4):1096–1101.
5. Burke JF, Freedman VA, Lisabeth LD, Brown DL, Haggins A, Skolarus LE. Racial differences in disability after stroke results from a nationwide study. *Neurology*. 2014;83(5):390–397.
6. Hackett M, Yapa C, Parag V, Anderson C. The frequency of depression after stroke:

a systematic review of observational studies. *Stroke*. 2005;36:1330–1340.
7. Sibon I, Lassalle-Lagadec S, Renou P, Swendsen J. Evolution of depression symptoms following stroke: a prospective study using computerized ambulatory monitoring. *Cerebrovasc Dis*. 2012;33(3):280–285.
8. White CL, McClure LA, Wallace PM, et al. The correlates and course of depression in patients with lacunar stroke: results from the secondary prevention of small subcortical strokes (SPS3) Study. *Cerebrovasc Dis*. 2011; 32(4):354–360.
9. House A, Knapp P, Bamford J, Vail A. Mortality at 12 and 24 months after stroke may be associated with depressive symptoms at 1 month. *Stroke*. 2001;32(3):696–701.
10. Everson SA. Depressive symptoms and increased risk of stroke mortality over a 29-year period. *Arch Int Med*. 1998;158(10):1133–1138.
11. Willey JZ, Disla N, Moon YP, et al. Early depressed mood after stroke predicts long-term disability. *Stroke*. 2010 2010;41(9):1896–1900.
12. Williams LS, Kroenke K, Bakas T, et al. Care management of poststroke depression: a randomized, controlled trial. *Stroke*. 2007;38(3): 998–1003.
13. Chemerinski E, Robinson RG, Kosier JT. Improved recovery in activities of daily living associated with remission of poststroke depression. *Stroke*. 2001;32(1):113–117.
14. Schmid AA, Kroenke K, Hendrie HC, Bakas T, Sutherland JM, Williams LS. Poststroke depression and treatment effects on functional outcomes. *Neurology*. 2011;76(11):1000–1005.
15. Weimar C, König IR, Kraywinkel K, Ziegler A, Diener HC. German Stroke Study Collaboration. Age and National Institutes of Health Stroke Scale Score within 6 hours after onset are accurate predictors of outcome after cerebral ischemia. *Stroke*. 2004;35(1):158–162.
16. About the national health interview survey [online]. cdc.gov/nchs/nhis/about_nhis.htm. Accessed August 5, 2012.
17. Minnesota Population Center and State Health Access Data Assistance Center, *Integrated Health Interview Series: Version 5.0*. Minneapolis: University of Minnesota, 2012. ihis.us. Accessed June 1, 2012.
18. Kessler RC, Barker PR, Colpe LJ, et al. Screening for serious mental illness in the general population. *Arch Gen Psychiatry*. 2003;60(2):184–189.
19. Kessler RC, Andrews G, Colpe LJ, et al. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychol Med*. 2002;32(06):959–976.
20. Kessler RC BP, Zhao S, et al. *The 12-month Prevalence and Correlates of Serious Mental Illness (SMI)*. Washington, DC: United States Government Printing Office; 1996.
21. Prochaska JJ, Sung H-Y, Max W, Shi Y, Ong M. Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. *Int J Methods Psychiatr Res*. 2012;21(2):88–97.
22. Berg A, Palomäki H, Lehtihalmes M, Lönnqvist J, Kaste M. Poststroke depression. *Stroke*. 2003;34(1):138–143.
23. Hackett ML, Anderson CS. Predictors of depression after stroke. *Stroke*. 2005;36(10): 2296–2301.
24. Levine DA, Kiefe CI, Houston TK, Allison JJ, McCarthy EP, Ayanian JZ. Younger stroke survivors have reduced access to physician care and medications: national health interview survey from years 1998 to 2002. *Arch Neurol*. 2007;64(1):37–42.
25. America CD, Field MJ, Jette A. *The Future of Disability in America*. National Academies Press; 2007.
26. Egede LE. Diabetes, Major Depression, and functional disability among U.S. adults. *Diabetes Care*. 2004;27(2):421–428.
27. Pratt LA, Dey AN, Cohen AJ. *Characteristics of Adults with Serious Psychological Distress as Measured by the K6 scale, United States, 2001-04*. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics; 2007.
28. Kessler RC, Berglund P, Demler O, Jin R, Merikangas KR, Walters EE. Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Arch Gen Psychiatry*. 2005;62(6):593–602.
29. Dowrick C, Kokanovic R, Hegarty K, Griffiths F, Gunn J. Resilience and depression: perspectives from primary care. *Health*. 2008;12(4):439–452.
30. Edward K. Resilience: A Protector From Depression. *J Am Psychiatr Nurses Assoc*. 2005;11(4):241–243.
31. Jia H, Chumbler NR, Wang X, et al. Racial and ethnic disparities in post-stroke depression detection. *Int J Geriatr Psychiatry*. 2010;25(3): 298–304.
32. Perrin PB HM, Uthe CE, Rittman MR. Caregiver mental health and racial/ethnic disparities in stroke: implications for culturally sensitive interventions. *Rehabil Psychol*. 2010;55(4):372–382.
33. Horner RD, Cohen HJ, Blazer DG. Accuracy of self-reported stroke among elderly veterans. *Aging Ment Health*. 2001;5(3):275–281.
34. Simpson CF, Boyd CM, Carlson MC, Griswold ME, Guralnik JM, Fried LP. Agreement between self-report of disease diagnoses and medical record validation in disabled older women: factors that modify agreement. *J Am Geriatr Soc*. 2004;52(1): 123–127.
35. White H, Boden-Albala B, Wang C, et al. Ischemic stroke subtype incidence among Whites, Blacks, and Hispanics. *Circulation*. 2005;111(10):1327–1331.
36. Carson AJ, MacHale S, Allen K, et al. Depression after stroke and lesion location: a systematic review. *Lancet*. 2000;356(9224): 122–126.

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