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The Prevalence of Spirituality, Optimism, Depression, and Fatalism in a Bi-ethnic Stroke Population

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Abstract

To provide insight into the reduced post-stroke all-cause mortality among Mexican Americans, we explored ethnic differences in the pre-stroke prevalence of (1) spirituality, (2) optimism, (3) depression, and (4) fatalism in a Mexican American and non-Hispanic white stroke population. The Brain Attack Surveillance in Corpus Christi (BASIS) project is a population-based stroke surveillance study in Nueces County, Texas. Seven hundred ten stroke patients were queried. For fatalism, optimism, and depression scales, unadjusted ethnic comparisons were made using linear regression models. Regression models were also used to explore how age and gender modify the ethnic associations after adjustment for education. For the categorical spirituality variables, ethnic comparisons were made using Fisher's exact tests. Mexican Americans reported significantly more spirituality than non-Hispanic whites. Among women, age modified the ethnic associations with pre-stroke depression and fatalism but not optimism. Mexican American women had more optimism than non-Hispanic white women. With age, Mexican American women had less depression and fatalism, while non-Hispanic white women had more fatalism and similar depression. Among men, after adjustment for education and age, there was no ethnic association with fatalism, depression, and optimism. Spirituality requires further study as a potential mediator of increased survival following stroke among Mexican Americans. Among women, evaluation of

the role of optimism, depression, and fatalism as they relate to ethnic differences in post-stroke mortality should be explored.

Keywords

Spirituality; Mexican Americans; Stroke

Introduction

A gradient exists within populations in which people with inferior socioeconomic positions have poorer health (Blane 1995; Marmot et al. 2008). In the United States, social determinants such as poverty, lower education, working in service-oriented occupations, unemployment, and African American race are associated with higher mortality risk (Howard et al. 2000; Marmot and Bell 2009; Sorlie et al. 1995; Wong et al. 2002). The mechanisms by which social determinants affect individual health are complex and require further study to better inform attempts at alleviating the disproportionate health burden (Blas et al. 2008; Marmot et al. 2008).

The *Hispanic paradox* is the observation that despite lower socioeconomic status and increased biological risk factors, such as diabetes mellitus, all-cause mortality and infant mortality rates are similar or lower among Mexican Americans (MAs) compared to non-Hispanic whites (NHWs) (Hummer et al. 2007; Markides and Coreil 1986; Sorlie et al. 1993). However, the existence of the Hispanic paradox is debated, given the potential for measurement error and the fact that some studies have reported greater mortality in Hispanics than whites (Hunt et al. 2003; Pandey et al. 2001). Interestingly, research supports the *Hispanic Paradox* among stroke patients. Among a population of MA and NHW stroke patients in Nueces County, Texas, MAs were less likely to have graduated from high school and more likely to have a family income less than \$20,000 per year, yet MAs in this population have better post-stroke survival (Lisabeth et al. 2006a; Morgenstern et al. 2004; Smith et al. 2003; Zahuranec et al. 2006). The improved survival following ischemic stroke is not explained by traditional medical factors influencing post-stroke mortality such as age, stroke severity, stroke subtype, risk factors, or stroke recurrence (Lisabeth et al. 2006a, b; Uchino et al. 2004). Because MA stroke patients experience a survival advantage despite lower socioeconomic status, this population provides a unique opportunity to explore social factors that may positively influence health and in particular, stroke outcomes. It may be that factors such as spirituality, optimism, depression, and fatalism play an important role in mediating the adverse effects of social determinants on health outcomes in the MA population (Hill et al. 2005; Perez-Stable et al. 1992).

Spirituality and optimism positively affect both physical and mental health and are associated with decreased mortality risk. For example, attendance at religious services was linked to increased life expectancy comparable in magnitude to both physical activity and statin use (Hall 2006). Among MAs specifically, religion has been shown to have a protective effect on both depression and cognitive decline (Hill et al. 2005; Levin et al. 1996; Reyes-Ortiz et al. 2008). Additionally, increased optimism, defined as generally believing that good rather than bad things will happen, is associated with a faster rate of recovery and lower re-hospitalization following coronary artery bypass surgery, earlier return to normal activities following inguinal hernia repair, and decreased all-cause and cardiovascular mortality (Bowley et al. 2003; Giltay et al. 2004; Scheier et al. 1989, 1999; Tindle et al. 2009). In contrast, depression and fatalism are negatively linked to health and health behaviors. Depression is associated with increased mortality risk (Schulz et al. 2000). Fatalism, defined as the belief in external control over life chances, is associated with other

poor health behaviors such as decreased cancer screening (Peek et al. 2008; Perez-Stable et al. 1992; Randolph et al. 2002). Overall, spirituality, depression, and feelings of optimism and fatalism may affect the health outcomes of MAs following stroke, a concept that warrants additional study.

The relationships of these proposed mediators of social determinants of health and stroke have been understudied; yet, there are a few studies to note. For example, a protective effect of pre-stroke church attendance and post-stroke feelings of optimism is associated with improved functional outcomes and health-related quality of life following stroke (Berges et al. 2007; Teoh et al. 2009). In contrast, higher degrees of fatalism and depression are associated with worsened stroke outcomes including mortality (Everson et al. 1998; Gump et al. 2005; Herrmann et al. 1998; House et al. 2001; Lewis et al. 2001; Williams et al. 2004). Additionally, Finnish researchers found an increased incidence of stroke in people with higher levels of pre-stroke pessimism (Nabi et al. 2010). In light of these findings, we hypothesized that the better post-stroke survival among MAs compared to NHWs may be due, at least in part, to the fact that MA stroke patients have a greater prevalence of positive pre-stroke factors, including spirituality and optimism, and a lower prevalence of negative pre-stroke factors, including depression and fatalism, than their NHW counterparts. For these reasons, the objectives of this study were to explore ethnic differences in the prevalence of the following factors in a bi-ethnic stroke population: (1) spirituality, (2) optimism, (3) depression, and (4) fatalism.

Methods

The Brain Attack Surveillance in Corpus Christi (BASIC) project is a population-based stroke surveillance study designed to capture all strokes in Nueces County, Texas. Nueces County is a geographically isolated, urban area composed primarily of NHWs and MAs. Our previous work has shown that the population is primarily non-immigrant with 87% of MAs and 93% of NHWs born in the United States. Individuals have lived in the United States for an average of 60 years (range, 19 to 86 years). All MAs not born in the United States were born in Mexico (Smith et al. 2003).

Detailed methods of BASIC have previously been described (Morgenstern et al. 2004; Smith et al. 2004). In brief, active and passive surveillance were used to identify strokes. Active surveillance included abstractors screening admission and ER logs for a validated set of symptoms or diagnostic terms. A study neurologist, blinded to the patients' age and ethnicity, then validated the cases using source documentation (Piriyawat et al. 2002). In addition, monthly lists of all hospital discharges in Nueces County with International Classification of Diseases, Ninth Revision (ICD-9) codes 430–438 (cerebrovascular disease) were obtained. This passive surveillance was then compared to active surveillance, and any discrepancies were further evaluated. The method of active and passive surveillance is superior to either alone (Piriyawat et al. 2002). Included in this study were ischemic stroke, transient ischemic attack (TIA), intracerebral hemorrhage, and subarachnoid hemorrhage patients. Patients under the age of 45 years, stroke as a result of head trauma and non-Nueces county residents were excluded. Identification of strokes began in August of 2004. Ischemic strokes and intracerebral hemorrhage patients were identified until November of 2008. Subarachnoid hemorrhage identification ended May, 2007, and TIA identification ended July, 2007.

After validation of the strokes, from August 2004 to September 2007, a random sample of 75% of the stroke patients, and then after September 2007, all stroke patients were approached for an in-person interview. The formal, structured interview includes demographic, risk factor and social determinants of health questions. Patients were asked a

series of brief orientation questions to establish their cognitive/language ability to participate in the interview. Subjects with cognitive/language impairment as evidenced by their inability to correctly answer the orientation questions were excluded. Due to the personal nature of the scales, interviews occurred as quickly as possible after the stroke. Interviewers are bilingual, and all interview questions have been translated for Spanish speaking participants and back translated for accuracy. The interviews were not recorded. Interviewers are bilingual to accommodate patients who only speak Spanish or who prefer the Spanish language. Scales not available in Spanish were translated into Spanish and then back translated to English for standardization. In addition, to determine stroke severity the National Institutes of Health Stroke Scale (NIHSS) score was calculated retrospectively from the medical chart (Williams et al. 2000). Scores range from 0 to 42 with higher numbers indicating more severe strokes. Written informed consent was obtained from all subjects, and the study was approved by the Institutional Review Board at University of Michigan and the Nueces County hospital systems.

Measurement Scales

Patients were queried on their pre-stroke spirituality, optimism, depression, and fatalism using existing scales. Where applicable, responses to individual questions were tallied to determine an overall score for the scale. Spirituality was measured using two non-organizational religious items from the religiosity scale proposed by Strawbridge et al. (1998). The questions queried the importance of religious or spiritual beliefs to the patients meaning in their life and in their daily activities. For each question, respondents indicated level of importance on a Likert scale ranging from 1 (agree strongly) to 4 (strongly disagree). The revised Life Orientation Test (LOT-R) was used to assess optimism (Scheier et al. 1994). Patients responded to questions with level of agreement on a Likert scale. The neutral response to the LOT-R statements was removed. Scores ranged from 6 to 24 with higher scores corresponding to less optimism (Cronbach's $\alpha = 0.72$). Depression was evaluated using the Patient Health Questionnaire (PHQ-9). This scale has been validated in stroke patients and Spanish speaking patients admitted to the hospital (Diez-Quevedo et al. 2001; Williams et al. 2005). Scores range from 0, no depressive symptoms, to 27, all 9 symptoms occurring daily (Cronbach's $\alpha = 0.82$). In a previous study of stroke patients, scores ≥ 10 had 91% sensitivity and 89% specificity for major depression (Williams et al. 2005). Fatalism (low mastery) was assessed using a modified version of the Mental Adjustment for Stroke Scale (MASS) and the Pearlin scale (Lewis et al. 2001; Pearlin and Schooler 1978; Roberts et al. 2000). Patients responded to individual questions with level of agreement on a Likert scale ranging from 1, strongly agree, to 5, strongly disagree (Cronbach's $\alpha = 0.66$). Scores ranged from 8 to 40 with higher scores indicating less fatalism. Both the optimism and fatalism scales required an element of reverse coding as questions were worded in the negative and positive directions.

Statistical Analysis

Continuous variables were summarized as means and standard deviations (SD), and categorical variables were summarized as frequencies and percents. Demographics and stroke risk factors were compared by ethnicity using *t*-tests or chi-square tests. For the continuous scales (optimism, depression, fatalism), unadjusted ethnic comparisons were made using linear regression models. In order to explore the impact of modification or confounding by age and gender on the estimated associations between ethnicity and the continuous SDH scales, we conducted exploratory analyses using generalized additive regression models (GAMs). These models are similar to linear regression, but instead of assuming a linear association between age and the outcomes, the association is estimated in a data-adaptive fashion. In these models, we found a lack of linearity with respect to age and that the age-SDH scale patterns differed by gender for some scales (e.g., linear among

women, U-shaped among men). Therefore, in subsequent analyses, we categorized age into three commonly used age cutoffs (45–59, 60–74, 75+) for stroke populations and modeled it with indicator variables in linear regression models. The models included the three-way gender–ethnicity–age interaction and all two-way interactions. The models were adjusted for education (high school degree versus no high school degree). Ethnic-, gender-, and age-specific means were estimated from these models and plotted. Within groups defined by gender, we tested for deviations from a linear age association or assessed the significance of the age trend when the association appeared linear and tested whether the age patterns differed by ethnicity (e.g., ethnic difference in the age-SDH scale association within women). When differences in age trends were not significantly different by ethnicity, we used contrasts to estimate average ethnic differences within gender. If age patterns differed by ethnicity within gender, we estimated age- and gender-specific ethnic differences (depression and fatalism). We used residual plots to check model assumptions. Because the residuals were skewed and showed some indication of lack of constant variance, we used robust standard errors to compute confidence intervals and derive tests statistics and P -values. Robust standard errors help ensure correct inference in the presence of violations of model assumptions. For the categorical spirituality variables, ethnic comparisons were made using Fisher's exact tests. Comparisons were also stratified by age (<75 vs. 75) and gender to evaluate the confounding and modifying effects of these variables. All tests were 2-tailed, and the probability of Type 1 error was set at 0.05.

Results

A total of 1,838 stroke patients were approached for interview during the study time frame and 1,151 agreed to participate. There were no differences in age ($P = 0.22$), gender ($P = 0.77$), and ethnicity ($P = 0.31$) among interview participants and non-participants. Of the 1,151 interview participants, 441 patients were excluded due to cognitive/language impairment leaving 710 stroke patients for the current study. There was no difference in gender ($P = 0.9$) among patients included in the analysis and those excluded due to cognitive/language impairment. Compared with the included patients, patients excluded for cognitive/language impairment were older (75.4 vs. 66.7, $P < 0.01$) and had a higher NIHSS (3.7 vs. 9.5, $P = 0.01$). There was also a suggestion that MA patients ($P = 0.07$) were more often excluded due to cognitive/language impairment.

Baseline characteristics of the stroke cases are presented in Table 1. MAs comprised 53% ($n = 376$) of the study population. MAs (mean = 63, SD = 11) were significantly younger than NHWs (mean = 71, SD = 12; $P < 0.01$). There were no differences in gender ($P = 0.17$) or NIHSS stroke scale ($P < 0.70$) between the ethnic groups. MAs were more likely to not have graduated from high school ($P < 0.0001$). MAs were also more likely to have diabetes ($P < 0.0001$) and less likely to have atrial fibrillation ($P < 0.0001$) than NHWs.

Ethnicity was associated with both spirituality endpoints (Table 2). Eighty percent of MA stroke cases reported religious beliefs to be very important for what they do every day compared with 64% of NHW stroke cases. Twenty-one NHW cases (6.3%) responded that religious beliefs were not at all important for what they do every day, while 5 (1.3%) MA cases provided this response. Similar responses were provided for the question related to religious beliefs as a source of meaning in their lives. Ethnic associations with the spirituality endpoints did not differ by gender or age group (data not shown).

Table 3 displays the means and standard deviations of the continuous scales and the results of the unadjusted linear regression models. Overall, patients were not depressed and had moderate scores on the fatalism and optimism scales. In the unadjusted models, there were no significant associations between ethnicity and the optimism and fatalism scales. There

was a borderline significant association ($P = 0.09$) between ethnicity and depression, with MA stroke cases reporting greater depression scores than NHW stroke cases ($\beta = 0.72$, $SE = 0.42$).

Figure 1 displays education-adjusted, ethnic-, gender-, and age-specific mean optimism, fatalism, and depression scores. There was a significant ethnicity–age interaction among women with respect to fatalism ($P = 0.05$). MA women experienced a non-significant decrease in fatalism with age ($P = 0.47$), while NHW women experienced an increase in fatalism ($P = 0.04$) with age. Among men, there was a nonlinear age trend with fatalism ($P = 0.03$), and the age association was similar among both ethnic groups ($P = 0.98$). Men experienced greater fatalism at younger and older ages, while between the ages of 61–75, they experienced less fatalism (i.e., U-shaped relationship).

There was some suggestion among women that age modified the ethnicity depression association ($P = 0.11$). Older MA women had less depression than younger MA women ($P < 0.001$), whereas NHW women experienced a non-significant decrease in depression with age ($P = 0.32$). Both MA and NHW men were less depressed with age ($P = 0.002$).

The ethnic association with optimism differed by gender but not age. Among women, after adjustment for age and education, MAs had more optimism than NHWs ($P = 0.05$). There was no ethnic difference in optimism among men ($P = 0.47$) after adjustment for age and education.

Discussion

MAs reported significantly more pre-stroke spirituality than NHWs, while overall this biethnic stroke population reported high levels of spirituality. The ethnic association of spirituality was consistent across age and gender subgroups. Given that spirituality has been shown to be protective against mortality, in many, but not all, previous studies, ethnic differences in spirituality as demonstrated in the current study may contribute to the improved survival of MA stroke patients (Blumenthal et al. 2007; Hill et al. 2005; McCullough et al. 2000; Strawbridge et al. 1997). Our previous research found no difference in stroke severity among MA and NHW stroke patients (Morgenstern et al. 2004). Thus, if spirituality is associated with decreased all-cause mortality, it is likely not via stroke severity. Exploration of the association of spirituality with all-cause mortality requires further study.

As a result of the high level of spirituality demonstrated in MAs, spirituality may provide a unique means to achieve primary or secondary stroke prevention efforts in this population. Church-based interventions have been utilized to access populations that are more difficult to reach via traditional mechanisms (Campbell et al. 2007) and have been successful in many African American communities (Campbell et al. 1999; Resnicow et al. 2004; Voorhees et al. 1996). In comparison with African American communities, few church-based behavioral intervention projects have been conducted in MA communities (DeHaven et al. 2004). One successful study utilized promotoras (peer counselors) to increase breast cancer screening awareness (Sauaia et al. 2007). Currently underway is the Stroke Health And Risk Education (SHARE) project, a culturally tailored, faith-based intervention among MAs and NHWs that targets health-related behaviors to reduce the risk of stroke (Zahuranec et al. 2008).

Prior to their strokes, this bi-ethnic population was not depressed and had moderate scores with respect to optimism and fatalism. Interesting patterns of pre-stroke depression, fatalism, and optimism were observed among women. MA women were more optimistic compared to NHW women after adjusting for age and education. Among women, age modified the ethnic

associations with pre-stroke depression and fatalism. With age, MA women had less fatalism, whereas NHW women had more fatalism after adjusting for education. Similarly, MA women had less depression with age, while depression scores for NHW women did not change with age. The greater optimism and decreased depression and fatalism with age may, at least partially, contribute to improved post-stroke survival among MA women. This requires further study. Overall, there was no ethnic difference in optimism, depression, or fatalism among men. Exploration of alternate factors mediating improved post-stroke survival among MA men is warranted.

Researchers have found that pre-stroke depression is associated with increased stroke mortality (Everson et al. 1998; Gump et al. 2005). However, gender, age, and ethnic variation with respect to pre-stroke depression have not been explored. Within the general population, the association of ethnicity and depression has been mixed. Researchers using the Health and Retirement Survey data have shown that depression is more frequent in elderly Hispanics and African Americans than NHWs (Dunlop et al. 2003). On the other hand, using two other national surveys, researchers have found that NHWs were more likely to have major depression than Hispanics and African Americans (Hasin et al. 2005; Riolo et al. 2005). A recent study using longitudinal Health and Retirement Study data explored the relationship of aging and ethnicity with respect to depression. Researchers found that Hispanics have higher levels of depression, but have a greater decrease in depression symptoms with age compared to NHWs. (Xiao et al. 2010). To our knowledge, no studies have evaluated ethnic and/or gender, age variation in pre-stroke optimism or fatalism. Thus, our findings of age- and gender-specific ethnic associations with respect to optimism, depression, and fatalism in stroke patients are novel.

There are several limitations to the current work that deserve discussion. Religiosity is very complex and difficult to measure. Currently, there is no standard approach to measure religiosity (Hall et al. 2008). Most commonly, studies of the association of religion and outcomes query the frequency of religious attendance, termed organizational religiousness (Hall et al. 2008). However, more personal forms of religion also exist, such as private prayer or meditation, which is often termed spirituality or non-organized religion (Hall et al. 2008; Strawbridge et al. 1998). This form of religion lacks social network/support, which may be a component of the protective mechanism of religion (George et al. 2002). Even in a pre-stroke patient population, measuring religious attendance introduces bias as the person must be healthy enough to attend religious services. Thus, we queried the importance of religious or spiritual beliefs to everyday life and as a source of meaning in stroke patients' lives, using a validated measure, to attempt to account for any possible physical limitations, which may prevent participation in religious services.

Due to the highly personal nature of the SDH questions, we did not use proxies for patients who were unable to complete the surveys. Thus, our study is biased towards less severely affected stroke patients. Also, we included patients who have had either TIA, ischemic stroke, intracerebral hemorrhage, or subarachnoid hemorrhage, which may differ with respect to potential mediators of SDH or other factors that influence SDH. In addition, ethnicity was self-reported and based on broad census-based categories. There are likely non-homogeneities within these ethnic groups that we did not capture. Small sample size is a limitation and may have contributed to some of the borderline significant results. Interviews were not recorded, and we are unable to explore the influence of interviewer phraseology on the questionnaire responses. However, the use of structured English and Spanish interviews reduces the likelihood of phraseology problems during interviews. Finally, there are likely other mediators, such as social support and neighborhood characteristics, that may be important components of the pathway by which social determinants affect health that were not explored. We suggest that additional mediators should be examined.

In summary, pre-stroke spirituality was associated with ethnicity. Ethnic associations with pre-stroke depression, fatalism, and optimism varied by gender and age. Spirituality may, in part, explain improved post-stroke survival in MAs compared with NHWs, while less fatalism and depression and more optimism in MA women compared with NHW women may be related to better post-stroke survival in this subgroup. These hypotheses require further study.

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Fig. 1. Results of the education-adjusted general additive models comparing fatalism, optimism, and depression by ethnicity, gender, and age among stroke patients in Nueces County, Texas, The Brain Attack Surveillance in Corpus Christi (BASIC) Project

Table 1

Sociodemographic and stroke risk factors (n = 710) among stroke patients in Nueces County, Texas, The Brain Attack Surveillance in Corpus Christi (BASIC) Project

Variable	MA % (n)	NHW % (n)	P value
Age (mean (SD))	63.1 (10.9)	70.7 (12.2)	<0.0001
Gender			0.17
Female	52.1 (196)	47.0 (157)	
Male	47.9 (180)	53.0 (177)	
High school education	50.0 (188)	85.3 (285)	<0.0001
Stroke type			0.31
Ischemic stroke	70.7 (266)	67.4 (225)	
TIA	20.7 (78)	26.1 (87)	
ICH	7.5 (28)	5.4 (18)	
SAH	1.1 (4)	1.2 (4)	
NIH stroke scale (mean (SD))	3.9 (4.3)	3.8 (5.0)	0.70
Risk factors			
Hypertension	77.9 (293)	77.8 (260)	0.98
History stroke/TIA	23.9 (88)	22.7 (75)	0.71
Diabetes	52.9 (199)	28.7 (96)	<0.0001
Atrial fibrillation	5.1 (19)	14.1 (47)	<0.0001
High cholesterol	43.1 (162)	43.4 (145)	0.93
Coronary heart disease	27.9 (105)	34.1 (114)	0.07

36 interviews (5%) were in Spanish all among MAs

Missing data on country of origin for 113 people. Of the remaining 597, 96.8% of NHWS (270/279) were born in United States and 90.6% of MAs (288/318) were born in United States

Table 2

The association of spirituality and ethnicity (n = 705) among stroke patients in Nueces County, Texas, The Brain Attack Surveillance in Corpus Christi (BASIC) Project

	MA		NHW		P
	n	%	n	%	
How important are your religious or spiritual beliefs for what you do every day?					
Very important	298	79.7	211	63.8	<0.0001
Fairly important	55	14.7	69	20.9	
Little important	16	4.3	30	9.1	
Not at all important	5	1.3	21	6.3	
How important are your religious or spiritual beliefs as a source of meaning to your life?					
Very important	299	80.2	206	62.1	<0.0001
Fairly important	55	14.8	68	20.5	
Little important	14	3.8	34	10.2	
Not at all important	5	1.3	24	7.2	

Five cases were missing data on the spirituality questions

MA Mexican American, NHW non-Hispanic white

Table 3

Results of the linear regression models comparing fatalism, optimism, and depression by ethnicity among stroke patients in Nueces County, Texas, The Brain Attack Surveillance in Corpus Christi (BASIS) Project

Scale	MA		NHW		β^a		SE	P
	N	Mean	Std	N	Mean	Std		
Fatalism	370	30.5	5.4	332	30.9	5.5	0.41	0.44
Optimism	366	11.1	3.4	322	11.0	3.6	0.27	0.63
Depression	370	6.1	5.6	323	5.3	5.5	0.42	0.09

^a Beta represents the mean difference in the given scale comparing MAs with NHWs

Eight cases were missing data on fatalism, 22 cases were missing data on optimism, and 17 cases were missing data on depression