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ORIGINAL ARTICLE

Race–ethnicity and poverty after spinal cord injury

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Study design: Secondary analysis of existing data.

Objective: Our objective was to examine the relationship between race–ethnicity and poverty status after spinal cord injury (SCI).

Setting: A large specialty hospital in the southeastern United States.

Methods: Participants were 2043 adults with traumatic SCI in the US. Poverty status was measured using criteria from the US Census Bureau.

Results: Whereas only 14% of non-Hispanic White participants were below the poverty level, 41.3% of non-Hispanic Blacks were in poverty. Logistic regression with three different models identified several significant predictors of poverty, including marital status, years of education, level of education, age and employment status. Non-Hispanic Blacks had 2.75 greater odds of living in poverty after controlling for other factors, including education and employment.

Conclusion: We may need to consider quality of education and employment to better understand the elevated risk of poverty among non-Hispanic Blacks in the US.

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INTRODUCTION

Spinal cord injury (SCI) is associated with a significant financial burden due to the direct costs of medical care, attendant care and equipment. Additionally, indirect costs related to lost earnings and low income compound the difficult economic circumstances, as employment rates are typically below 30% in the United States.[1–3] According to Berkowitz et al.,[4] SCI costs amount to >$9.73 billion each year (based on 1996 dollars). The initial year after injury costs approximately $223 261 per survivor in direct costs.[4] Indirect costs which account for loss of productivity (for example, loss of work and/or income and low income) total nearly $13 566 per year and may be particularly perilous for those with significantly low incomes and/or living in poverty.[5]

Race and ethnicity are primary factors related to employment and economic outcomes after SCI. Over the span of 30 years, studies of employment have typically found young, non-Hispanic Whites to have the highest employment rate in the SCI community.[6–9] Research studies on race–ethnicity, employment and disability show these findings are consistent before SCI as well as 1, 5, 10 and even 20 years post injury.[10,11] For example, Arango-Lasprilla et al.[8] depicted compelling racial-ethnic differences in employment outcomes post injury where the odds of being competitively employed at 1, 5 and 10 years after injury were, significantly, 1.58, 2.55 and 3.02 times greater for Whites than for African Americans and 1.71, 1.86 and 1.71 times greater for Whites than for Hispanics. Similar to the general population, non-Whites with SCI who find employment typically earn lower than their White counterparts with SCI.[12–14]

The significantly diminished probability of work and low earnings among those employed raises concerns about the portion of those living in poverty, particularly among non-Whites and those of Hispanic origin.[14] Both the general population and SCI community display similar trends where minorities have an increased poverty rate.[14,15] According to the US Census Bureau,[14] the poverty rate in the general population for non-Hispanic Whites (9.8%) is much lower than the poverty rate for non-Hispanic Blacks (27.6%) and Hispanics (25.3%). Dismuke et al.[15] identified substantially higher poverty rates in an SCI cohort of 1405 participants compared with the general population. The disparity was much greater for non-White or Hispanic participants where the poverty rate was 42.4% compared with 22.7% for non-Hispanic Blacks in the general population. Unfortunately, no data were available on the number of people in the household (a key parameter for estimating poverty), and participants were classified only as non-Hispanic Whites and Others, limiting comparisons related to race–ethnicity.

When reviewing poverty rates by race–ethnicity in the Southeastern US (where the current data collection took place), both Georgia and South Carolina display significantly higher poverty rates for African Americans and Hispanics.[16] In Georgia, more African Americans (34%) and Hispanics (42%) live in poverty compared with Whites (16%); additionally, in South Carolina more African Americans (38%) and Hispanics (36%) live in poverty compared with Whites (17%).[16] Hence, non-Whites in both the general population and the SCI community are more susceptible to poverty and its effects, especially non-Whites residing in the Southeastern region of the United States.[14–16]

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In conclusion, research suggests an increasing number of non-Whites with SCI live in poverty, earn lesser wages and/or are underemployed.[6–9,15–17] Simultaneously, the number of non-Whites acquiring SCI is significantly increasing as seen in the past four decades.[17] The percentage of non-Hispanic Blacks with SCI reported by the National SCI Statistical Center[17] nearly doubled from 14.2% in 1973–1979 to 26.2% in 2005–2011. An increase was also seen in Hispanics with SCI from 5.9% in 1973–1979 to 8.3% in 2005–2011.[17] Therefore, any observed differences related to race–ethnicity and poverty will be of increasing importance over time as the demographics of SCI change and more non-White SCI survivors experience racial-ethnic disparities.

Purpose

Our purpose was to conduct a secondary analysis of existing data to identify the relationships between race and ethnicity with poverty after SCI, before and after controlling for demographic, injury, educational and employment status. We used a larger participant cohort than Dismuke *et al.*,[15] including number of people within the household to better classify poverty status, and broke down race–ethnicity into four groups rather than the two general groups previously reported.

Hypotheses

1. Poverty will be related to race–ethnicity, with non-Hispanic Whites reporting significantly lower odds of poverty than non-Hispanic Blacks, Hispanics and American Indians.
2. The relationship between poverty and race–ethnicity will be mediated by employment status, such that the observed relationships will be diminished, but not disappear, after accounting for differences in employment status.

MATERIALS AND METHODS

Participants

After receiving institutional review board approval, mail-in self-report measures were collected from participants identified through records at a large specialty hospital in the Southeastern United States. There were three inclusion criteria: (1) traumatic SCI with residual effects, (2) age ⩾18 years at the time of assessment, and (3) minimum of 1 year post injury. Of the 3669 participants meeting the eligibility criteria, 2614 returned usable materials (71.2% response rate). The sample was further reduced by eliminating 65 ineligible participants, reducing the sample to 2549. Eliminating participants with missing information on at least one key variable further reduced the sample to 2043. The excluded cases were more likely to have missing information on race or ethnicity, were non-classifiable within the other category or were Asian American (excluded based on too few cases).

Procedures

Data collection occurred from 2010 to 2013. Participants received preliminary letters 4–6 weeks in advance of the packet of study materials. A second packet was sent to non-respondents. Third mailings were sent to those who confirmed an interest in participation but had misplaced or discarded the materials. Return of the materials was taken as implied consent. Participants received $50 in remuneration.

Measures

The mail-in survey included diverse sets of items related to biographic and injury characteristics, education, employment and other outcomes. We extracted items related to poverty, educational and vocational predictors and fundamental control characteristics that included other biographic and injury-related characteristics. We defined poverty according to the definition of the US Census Bureau, which uses a set of income thresholds that vary by family size and composition to determine poverty.[18] Family income (all sources) was categorized into eight categories consistent with the Behavioral Risk Factor Surveillance System.[19] Poverty was indicated when the following conditions were met: (1) income was <$10 000 and household number ⩾1; (2) income was between $10 000 and $14 999 and household number ⩾2; (3) income was in the range $15 000–$19 999 and household number ⩾4; (5) income was in the range $20 000–$24 999 and household number ⩾6; and (6) income was in the range $25 000–$34 999 and household number ⩾8.

Analysis

Using STATA 9.0 for all analysis, logistic regression with three different models was used to identify the effects of different sets of predictive factors. For any given variable, the reference group was set to 1.0, with higher scores indicating a greater risk of poverty compared with the reference group and scores <1.0 indicating a lower risk of poverty compared with the reference group. Race–ethnicity was the only variable entered in the first stage and was classified as follows based on the combination of race and ethnicity: (1) non-Hispanic White, (2) non-Hispanic Black, (3) Hispanic, and (4) American Indian. Individuals with mixed race were categorized according to the least prevalent group (American Indian being the least prevalent). Those reporting both Hispanic ethnicity and American Indian heritage were categorized as American Indian. Non-Hispanic White was the reference category.

In stage 2, demographic variables included: gender, marital status, education, age, and residence. For gender, the reference category was male. For marital status, the reference category was unmarried. Education was categorized into four groups: less than high school certificate (reference category), high school certificate, some college, college degree, or higher. Age at injury onset was broken down as <25, 25–44, 45–59 and ⩾60 years (reference category). Residence was classified as urban or rural via postal codes, and the classification scheme from the US Center for Medicare and Medicaid Services (urban was the reference category) to control for systematic differences between four racial ethnic groups that may relate to poverty status. Ambulatory status was used as an indicator of injury severity (ambulatory was the reference group). Etiology was classified as violent and non-violent (reference category), as this dichotomy has been widely utilized in the literature.[20] Duration of injury was included in the model as a continuous variable.

Employment status was added in the final stage (currently employed were the reference group). Unemployed participants were broken down into two groups—those who had never been employed after SCI and those who had been employed at some time but had since become unemployed. This three-stage procedure allows us to isolate the initial magnitude of the relationship between race–ethnicity and poverty, adjust for demographic, injury and educational status and then isolate the effects of gainful employment and corresponding changes in the relationship between race–ethnicity and poverty status. Odds ratios (OR) and 95% confidence intervals (CI) are reported.

Statement of ethics

We certify that all applicable institutional and governmental regulations concerning the ethical use of human volunteers were followed during the course of this research.

RESULTS

The majority of participants were non-Hispanic White (74.9%), with non-Hispanic Blacks comprising the second largest group (21.2%). The cohorts of Hispanics and American Indians were substantially smaller (1.9% and 2.1%, respectively). Males comprised 75% of the sample. The average age at the time of the study was 45.3 years, and average age at the time of injury was 32.7 years. The majority had a high school diploma (85.8%), and 28% had a 4-year college degree. The majority were not married (58.7%). Over 27% were currently employed, with another 21.1% having been employed since SCI onset but currently unemployed, and the remaining 51.5% never having

been employed. In all, 65.6% lived in an urban setting. Table 1 summarizes these characteristics as a function of race–ethnicity.

Univariate analyses

Overall, 20.3% was classified as in poverty. Poverty rates ranged from only 14.1% of non-Hispanic White participants to 41.3% for non-Hispanic Blacks. The rates for American Indians and Hispanics were 26.2% and 29.0%, respectively. Variables significantly related to poverty included: race, severity, etiology, residence, marital status, education, age and employment status (Table 2). Persons currently employed were rarely living in poverty (3.4%).

Logistic regression

In stage 1, race–ethnicity was statistically significant (Table 3), as, compared with the reference group (non-Hispanic Whites),

non-Hispanic Blacks had the greatest odds of poverty (OR = 4.31, CI = 3.39–5.48). Significant differences were also observed between non-Hispanic Whites and Hispanics (OR = 2.49, CI = 1.22–5.10) and American Indians (OR = 2.17, CI = 1.07–4.38). The latter three groups were not significantly different from each other.

After the addition of demographic, injury and educational predictors in the second stage, only non-Hispanic Black participants

Table 1 Demographic characteristics by race and ethnicity

	Non-Hispanic White (%)	Non-Hispanic Black (%)	Hispanic (%)	American Indian (%)
N	1530	433	38	42
Gender				
Male	74.1	78.1	84.2	69.0
Female	25.9	21.9	15.8	31.0
Marital status				
Not married	54.4	73.4	57.9	66.7
Married	45.6	26.6	42.1	33.3
Age				
<25 years	42.0	34.4	36.8	37.5
25–44 years	36.8	46.7	52.6	42.5
45–59 years	15.6	15.1	10.5	20.0
⩾60 years	5.5	3.8	0.0	0.0
Level of education				
Less than high school	10.9	24.0	31.6	19.0
High School	22.2	33.9	21.1	23.8
Some college	33.4	28.9	23.7	38.1
College degree	33.5	13.2	23.7	19.0
Residence status				
Urban	67.1	79.4	89.2	66.7
Rural	32.9	20.6	10.8	33.3
Cause of injury				
Violence (assault)	3.5	29.1	18.4	4.8
Non-violence	96.5	70.9	81.6	95.2
Level of injury severity				
C1–C4	10.1	11.1	5.3	14.3
C5–C8	25.0	26.6	26.3	23.8
Non-cervical	33.3	31.4	50.0	31.0
Ambulatory	31.6	30.9	18.4	31.0
Employment Status				
Employed	31.9	12.7	21.0	21.4
Unemployed	22.0	18.2	13.2	23.8
Never employed	46.1	69.1	65.8	54.8

Table 2 Univariate analysis of demographic factors by poverty level

Demographic factors	Above poverty level (N = 1627), n (%)	Below poverty level (N = 416), n (%)	P-value
Race			0.000
Non-Hispanic White	1315 (85.95)	215 (14.05)	
Non-Hispanic Black	254 (58.66)	179 (41.34)	
Hispanic	27 (71.05)	11 (28.95)	
American Indian	31 (73.81)	11 (26.19)	
Gender			0.805
Male	1222 (79.77)	310 (20.23)	
Female	405 (79.26)	106 (20.74)	
Severity			0.001
Ambulatory	535 (83.99)	102 (16.01)	
Non-ambulatory	1092 (77.67)	314 (22.33)	
Cause			0.000
Non-violent	1517 (81.82)	337 (18.18)	
Violent	110 (58.20)	79 (41.80)	
Residence			0.016
Urban	1088 (81.19)	252 (18.81)	
Rural	539 (76.67)	164 (23.33)	
Years since injury	(12.67)	(12.41)	0.626
Marital status			0.000
Unmarried	870 (72.50)	330 (27.50)	
Married	757 (89.80)	86 (10.20)	
Years of education	(14.22)	(12.01)	0.000
Education level			0.000
Less than high school diploma	145 (49.83)	146 (50.17)	
High school diploma	372 (73.66)	133 (26.34)	
Some college	557 (84.27)	104 (15.73)	
College degree or higher	553 (94.37)	33 (5.63)	
Chronological age	(45.86)	(43.16)	0.005
Categorical age, years			0.000
<25	635 (78.69)	172 (21.31)	
25–44	602 (76.30)	187 (23.70)	
45–59	271 (87.14)	40 (12.86)	
⩾60	88 (88.89)	11 (11.11)	
Employment status			0.000
Never employed	753 (71.51)	300 (28.49)	
Currently unemployed	334 (77.49)	97 (22.51)	
Currently employed	540 (96.60)	19 (3.40)	

Table 3 Logistic regression model results in race and poverty

	Model 1	Model 2	Model 3
	Odds ratio (95% CI)		
Race (vs non-Hispanic White)			
Non-Hispanic Black	4.31 (3.39–5.48)	2.89 (2.15–3.88)	2.75 (2.03–3.73)
Hispanic	2.49 (1.22–5.10)	1.72 (0.72–4.10)	1.70 (0.68–4.21)
American Indian	2.17 (1.07–4.38)	1.74 (0.81–3.79)	1.70 (0.78–3.72)
Gender (vs male)			
Female		1.58 (1.19–2.10)	1.60 (1.20–2.14)
Severity (vs ambulatory)			
Non-ambulatory		1.35 (1.02–1.79)	1.19 (0.89–1.59)
Etiology (vs non-violent)			
Violent cause		1.27 (0.85–1.88)	1.23 (0.82–1.86)
Residence (vs urban)			
Rural		1.25 (0.97–1.62)	1.25 (0.96–1.64)
Years since injury		1.00 (0.98–1.01)	1.00 (0.98–1.01)
Marital status (vs unmarried)			
Married		0.41 (0.31–0.55)	0.43 (0.32–0.57)
Education (vs< high school diploma)			
High school diploma		0.32 (0.23–0.46)	0.34 (0.24–0.47)
Some college		0.17 (0.12–0.25)	0.20 (0.14–0.29)
College degree or higher		0.07 (0.05–0.11)	0.10 (0.06–0.16)
Age at injury (vs ⩾60years)			
<25 years		1.91 (1.04–3.53)	2.24 (1.20–4.18)
25–44 years		1.97 (1.08–3.57)	2.20 (1.21–4.03)
45–59 years		1.04 (0.53–2.02)	1.09 (0.56–2.14)
Employment (vs currently employed)			
Currently unemployed			6.55 (3.91–10.97)
Never employed since injury			6.03 (3.65–9.96)

Abbreviation: CI, confidence interval.

were significantly different than non-Hispanic Whites. The odds ratio decreased substantially (OR = 2.89, CI = 2.15–3.88). Gender, ambulatory status, marital status, age and education were significantly associated with poverty. Women had 1.58 greater odds of poverty than men (CI = 1.19–2.10), and non-ambulatory participants had 1.35 greater odds of poverty than ambulatory participants (CI = 1.02–1.79). Those married had lower odds of poverty (OR = 0.41, CI = 0.31–0.55). Compared with participants aged ⩾60 years, participants aged <25 years and those between the ages of 25 and 44 years had significantly greater odds of poverty (OR = 1.91, CI = 1.04–3.53; and OR = 1.97, CI = 1.08–3.57, respectively). Education was protective of poverty (that is, a lower odds of poverty), with the lowest odds observed for those with a college degree (OR = 0.07) compared with those without a high school diploma

(CI = 0.05–0.11). The odds of poverty for those with a high school diploma (OR = 0.32; CI = 0.23–0.46) or some education beyond high school (OR = 0.17, CI = 0.12–0.25) were also significantly lower than for the group with <12 years of education but higher than for those with a college degree. Etiology, urban-rural residence and years post injury were unrelated to poverty status.

In the final stage, the addition of employment status resulted in only modest decreases in the odds of poverty between the racial-ethnic groups, as only non-Hispanic Blacks had significantly greater odds of poverty than non-Hispanic Whites (OR = 2.75, CI = 2.03–3.73). Employment status itself was a powerful predictor of poverty, as much greater odds of poverty were experienced by both those who had never been employed since SCI onset (OR = 6.03, CI = 3.65–9.96) and those who had been employed but were currently unemployed (OR = 6.55, CI = 3.91–10.97). The two unemployed groups were not significantly different from each other.

DISCUSSION

Despite the low employment rates after SCI[21] and the prominent focus on health-care needs,[22] there has been very limited research on poverty and SCI. Poverty, by definition, represents insufficient income, and racial-ethnic differences in poverty levels exist within the general population.[14] Our current findings document the high levels of poverty among those with SCI, 20.3% across the study sample, and an elevated risk particularly among non-Hispanic Blacks. These rates are somewhat higher than estimates for the general population in the same geographic region (Georgia = 18.5%; South Carolina = 16.6%),[23] although direct comparisons are tentative as the current SCI data are not population based and may select for those with greater resources who are able to pay for clinical care. The findings also help to identify the factors leading to elevated risk of poverty, which may become the focus of interventions to improve outcomes.

Our first study hypothesis was generally confirmed, as the poverty rate for non-Hispanic Whites (14.1%) was substantially lower than for the three other groups, particularly non-Hispanic Blacks (41.3%) who had the highest poverty rate. The second hypothesis, that accounting for differences in employment status would diminish the strength of the relationships between race–ethnicity and poverty, was not supported. The primary decrease in the odds of poverty for non-Hispanic Blacks was related to the addition of demographic, injury and educational characteristics (stage 2 predictors), as the OR decreased from 4.31 to 2.89, with minimal further decreases to 2.75 after the addition of employment status. Therefore, although employment status was highly predictive of poverty status overall, differences in employment status did not explain differences in poverty as a function of race–ethnicity beyond that accounted for by the demographic, injury and educational predictors.

Just as changes in demographics by racial groups have been noted in the general population,[24,25] the trend in racial groups after SCI has also seen a change.[17] With the portion of non-Hispanic Blacks and Hispanics with SCI increasing, the likelihood exists that the poverty issue may worsen in the SCI population. If so, although the changes with SCI would likely parallel those in the general population, based on the current findings, we may expect the absolute portion of people with SCI in poverty to increase substantially.

Although not related to the study hypotheses, women were at greater risk of poverty compared with males, even after controlling for all other characteristics. This could be related to differences in quality of employment, as previous research has indicated women often work fewer hours[3] and have lower earnings when they are working.[12,13]

As expected, poverty rates were dramatically different as a function of education and employment. This finding suggests the need for significant training after SCI and maximizing educational potential, rather than achieving the minimum amount of education required to return an individual to employment. Quality of education may be a key factor in diminishing the risk of poverty, as might be the timing of education and its fit with post-injury interests and abilities. For instance, some research indicates employment outcomes are more highly related to post-injury education than to pre-injury education, even when the educational attainment is the same.[26]

Although those who were employed were also substantially less likely to be in poverty, having been employed at some time post injury (but not being currently employed) provided no additional protection against poverty. Therefore, job retention should be a high priority, and supports should be put in place to help individuals maintain employment as they face challenges over time, such as declining function or the onset of additional secondary health conditions.

Limitations
All data are self-reported, which is susceptible to inaccuracy of reporting. However, because the study data were protected by a certificate of confidentiality and the information was only used for research purposes, intentional distortion of income seems unlikely. Second, poverty was based on the information available from secondary analysis of existing data. Rates of poverty vary in different regions of the country, so the overall observed poverty rate may not generalize to other regions, and our definition of poverty may not accurately reflect the capacity of a family to purchase goods and services (among them health-care services, health insurance premiums and co-pays). Third, not all underserved populations were represented, as there were too few Asian Americans to form a separate group in the analysis. Furthermore, the size of the cohorts for Hispanics and American Indians were relatively small ($n = 38$ and $n = 42$, respectively). Having a larger sample size would result in more power to identify truly significant differences in poverty. Because of the relatively small sample sizes of some cohorts, we were unable to perform an analysis of additional predictors. We restricted the analysis of employment to employment status. A more detailed breakdown of hours per week, job retention and job type may have led to more precise poverty estimates.

Future research
Larger studies are needed to specifically investigate the parameters comprising poverty and help quantify differences in income as a function of race–ethnicity. These studies should attend to enrollment of underserved populations, including Hispanic and American Indian groups that were minimally represented in the current study and Asians who were not represented. Geographic and subcultural differences also need to be identified, as the current participant cohorts were restricted to the southeastern United States. Comparisons of poverty globally among those with SCI and other disabling conditions would help further define the scope of the problem. Of even greater importance is the need to identify a broader range of antecedent factors of poverty. Because of the highly significant differences in poverty as a function of education, it is important to consider additional educational indicators that may lead to even stronger relationships (for example, quality of the educational program or school). The ultimate goal of this research should be informing public policy to narrow economic gaps between those with SCI and other disabling conditions within the general population and between different racial and ethnic groups among those with SCI.

DATA ARCHIVING
There were no data to deposit.

CONFLICT OF INTEREST
The authors declare no conflict of interest.

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