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Racial and Ethnic Disparities in Work-Related Injuries and Socio-Economic Resources Among Nursing Assistants Employed in US Nursing Homes

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Background *We aimed to estimate the proportion of nursing assistants (NAs) in the US with work-related injuries and insufficient socio-economic resources by race/ethnicity.*
Methods *Data from the 2004 National Nursing Assistant Survey (NNAS), a nationally representative sample survey of NAs employed in United States nursing homes, were analyzed accounting for the complex survey design.*
Results *Among 2,880 participants, 44% reported "scratch, open wounds, or cuts" followed by "back injuries" (17%), "black eyes or other types of bruising" (16%), and "human bites" (12%). When compared to non-Hispanic white NAs, the adjusted rate ratio (RR) for wound/cut was 0.74 for non-Hispanic black NAs (95% confidence interval [CI]: 0.65–0.85). RRs for black eyes/bruises were 0.18 for non-Hispanic black NAs (95% CI: 0.12–0.26), and 0.55 for Hispanic NAs (95% CI: 0.37–0.82).*
Conclusions *Minority racial and ethnic groups were less likely to report having experienced injuries compared with non-Hispanic white NAs. Future research should focus on identifying preventable risk factors, such as differences by race and ethnicity in the nature of NA jobs and the extent of their engagement in assisting patients with activities of daily living.* Am. J. Ind. Med. 53:951–959, 2010. *Published 2010 Wiley-Liss, Inc.*†

KEY WORDS: nursing home; nursing assistant; work-related injury; health disparity

INTRODUCTION

With the increasing number of elderly, the demand for long-term care is projected to grow substantially in the coming years. Long-term care is defined as the provision of medical and personal care to those with disabilities or chronic illnesses, and includes providing assistance with activities of daily living (ADLs) such as bathing, dressing, toileting, eating, and transferring. The total number of Americans in need of long-term care is projected to more than double from 13 million in 2000 to 27 million in 2050 [HHS and DOL, 2003]. Long-term care is provided both in the recipient's home as well as in institutional settings such as assisted living facilities and nursing homes. In 2006, nursing assistants (NAs) (including orderlies and attendants) made up ~72% of the direct care workforce in nursing homes [BLS, 2008]. As the main provider of "hands on care" in these institutional settings, NAs help residents with their ADLs, as well as keep records of services delivered, and changes in the client's condition. The total number of NAs, orderlies, and attendants in the US workforce is expected to increase by 18% by 2016 (from 1.45 million in 2006 to 1.71 million in 2016) [BLS, 2008].

Since NAs provide most of the direct care in nursing homes, they are at highest risk of various occupational injuries

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compared with other healthcare occupations. Heavy lifting and the risk of back injuries among NAs has been documented previously [Jorgensen et al., 1994]. Nursing aides, orderlies, and attendants have nearly three times the risk of work-related back pain compared with female workers in general [Guo et al., 1999]. Nursing aides, orderlies, and attendants had the highest rate of non-fatal occupational injuries and illnesses involving days away from work in 2006, 526/10,000 full-time workers, followed by construction laborers (488/10,000 full-time workers) [BLS, 2007].

NAs are at greater risk for workplace violence compared to registered nurses [Estryn-Behar et al., 2008]. A study conducted in Minnesota using 1992 State Workers' Compensation files found that, among specific occupational categories, nursing aides, orderlies, attendants, and health aides accounted for 42% of all workers compensated for work-related assault injuries, while licensed practical nurses and registered nurses accounted for 7% [LaMar et al., 1998]. Furthermore, a Swedish study that examined seven major healthcare occupations who worked with the elderly or persons with developmental disabilities, showed that the highest risk groups were direct patient care givers and NAs [Viitasara et al., 2003].

Although previous studies have documented work-related injuries and risk factors among NAs [Meyer and Muntaner, 1999; Myers et al., 2002, 2005, 2007], few have examined the associations between race/ethnicity and work-related injuries as well as other work factors among NAs. One previous study showed that in 1997 African American workers at a large Midwestern metropolitan hospital were 2.3 times more likely to experience a work-related injury compared to whites and that nurses and nurse's aides (nurse's aide is another term for NA) were the two most common job titles held by African Americans; however, that study did not control for occupation [Simpson and Severson, 2000].

In 2004, the National Center for Health Statistics conducted the National Nursing Assistant Survey (NNAS), to better understand health and other working conditions affecting NAs employed in nursing homes. This survey provides the first large nationally representative sample of these nursing home employees. Given the large and nationally representative sample captured in the NNAS, this survey provides a valuable opportunity to not only examine work-related injury rates but also explore differences across race and ethnicity. Using the NNAS data, we aim to estimate the population rate of work-related injuries among NAs who are employed in the US nursing homes and their socio-economic resources, and to examine the difference in such measures by race and ethnicity.

METHODS

The 2004 National Nursing Home Survey (NNHS) is part of a continuing series of nationally representative sample surveys of United States nursing homes, and their services, staff, and residents. The NNAS was conducted as a supplement to the 2004 NNHS. Data for the NNHS are collected via on-site interviews with administrators and staff who work at the sampled facilities. For the NNAS, NAs were sampled from a subset of nursing homes participating in the NNHS. The survey was administered as a face-to-face interview. The sample design for the NA survey was developed with the primary goal of preparing nationally representative and reliable estimates of NAs. The survey instrument consisted of sections on recruitment, training and licensure, job history, family life, management and supervision, client relations, organizational commitment and job satisfaction, workplace environment, work-related injuries, and demographics. The procedures to select the sample and collect information have been described in detail elsewhere [Squillace et al., 2007].

Study Population

NAs eligible to participate in the NNAS included only NAs who were certified by the state to provide Medicare or Medicaid reimbursable services. Contract workers and NAs who worked <16 hr/week were excluded from the survey to ensure that respondents would have had enough exposure and experience in the sampled nursing homes to accurately report on their work experience. From a total of 582 eligible facilities that agreed to participate in the NNAS, 4,542 NAs were selected to be in the sample. From each facility, 1–9 randomly selected NAs were interviewed (average of 6.2 NAs per facility). Of these, 4,274 were eligible and 3,017 NAs from 485 nursing homes completed an interview, which yielded a response rate of 70.6% among eligible NAs. Among the 3,017 NAs, the 2,880 NAs (67% of eligible NAs) who were both working at the time of survey and had no missing information on demographics, work-related injuries, and other work factors, were included in this analysis. Some of the descriptive statistics can be found in the website (http://www.cdc.gov/nchs/nnhs/NursingAssistantTables.htm).

Measures

All measures were self-report including working conditions, demographic characteristics, and injury experience.

Work-related injuries were defined as those injuries occurring at the nursing home facility in the past year or since the NA started working at the facility if their job tenure was <12 months and included: (1) back injuries (including pulled back muscles), (2) other strains or pulled muscles, (3) human bites, (4) scratches, open wounds, or cuts, and (5) black eyes or other types of bruising. NAs who reported losing more than one-half day of work because of these injuries, were defined as NAs who had lost work days (during the past 12 months/since NA started his/her job).

Socio-economic resource variables [Krieger et al., 2003, 2005; Barbeau et al., 2004] included job tenure, work hours, health insurance, household income, pay increase, and education. Job tenure as a NA was categorized into three groups: 12 months or less, 1–5 years, and more than 5 years. Work hours were measured by the question, ''How many hours do you usually work in an average week for the current facility?'' NAs were categorized by their work hours into two groups: (1) 40 hr or less per week and (2) over 40 hr per week. NAs with no health insurance were defined as those who have no health insurance coverage available at the current job or through a spouse or partner's job, nor participate in any government programs that pay for medical care such as Medicare, or Medicaid. Low-income NAs were defined as those who reported that the total household income last year (before taxes) was less than $20,000. Pay increase was defined as those who were given a pay increase during the past 12 months at the current facility.

Working condition indicators were examined. NAs who had to work mandatory overtime were defined as those who answered affirmatively to the question, ''Are you ever required to work mandatory overtime at the current facility even if you do not want to?'' NAs were also asked whether they had enough time to provide all necessary ADLs to residents. NAs were asked how much turnover of NAs there is at their facility. A high turnover rate for the facility was defined as those reporting turnover as ''a lot.'' Other response (i.e., some, a little, or none) were considered as not high turnover.

Other variables included age, gender, education, race, and ethnicity. Age was categorized into five groups of which the first group (18–24 years) was used as the reference group. A dichotomous variable was created for education; respondents with high school (or GED) or higher education (12 years or more), and respondents with <12 years of education. For race/ethnicity, subjects were categorized into non-Hispanic white, non-Hispanic black, Hispanic, and other. NAs were also asked whether they were born in US.

Statistical Analysis

The analytic data set included the 2,880 eligible participants between 18 and 64 years of age. Descriptive analyses quantified the distribution of the participants' socio-demographic and working conditions, along with work-related injuries of interest in this study. All analyses were completed using the Software for the Statistical Analysis of Correlated Data (SUDAAN v9.0) package to take into account sample weights and design effects due to the complex sample survey design [Research Triangle Institute, 2004]. Variance estimates were adjusted for the population survey units, strata, and sampling weights assigned by NCHS. The weighted population size, proportion of work-related injuries and working conditions were estimated by race and ethnicity. The SUDAAN Loglink program with a Poisson distribution assumption was used to estimate rate ratios (RRs) and the 95% confidence intervals (CI) for work-related injuries and working conditions by race/ethnicity adjusted for the effect of age, sex, education, work hours (40 hr/week vs. more than 40 hr/week), and job tenure categories using non-Hispanic white NAs as the reference group.

RESULTS

From our analyses, the total number of NAs working at nursing home facilities in the US was estimated to be 677,103 in 2004. A total of 46.9% of NAs were non-Hispanic white, 37.0% were non-Hispanic black, 9.4% were Hispanic, and 6.6% were all other racial and ethnic groups (Table I). Almost 80% of NAs were born in US. Overall, 92% of participating NAs were female and more than 60% were between 18 and 44 years old. The weighted average age among NAs in 2004 was 38.5 years, and 11% had a job tenure of <12 months. Table II reports the proportion of work-related injuries by race and ethnic group and results of the multiple regression analyses evaluating the association between race/ethnicity and selected outcome variables.

The most common injury experienced among NAs was ''scratch, open wounds, or cuts'' (44%) followed by ''black eyes or other types of bruising'' (16%). Back injuries experienced during the year before their interview were reported by 17% of NAs. Twelve percent of NAs experienced injuries from human bites during the past year (Table I).

At least one-third of the study population reported having experienced at least one type of work-related injury due to aggression by resident(s) within the past year, with the experience spanning from about 25% for non-Hispanic black NAs to 35% for Hispanic NAs and 44% for the non-Hispanic white NAs (Table I). A large disparity in the proportion of injury among racial and ethnic groups was found. Non-Hispanic white NAs were more likely to report work-related injuries compared with all other racial and ethnic groups. The same pattern of work-related injuries was evident for human bites, which is a specific type of physical assault from residents.

Back injury at work in the past year was reported by 19% of non-Hispanic white NAs, 17% Hispanic NAs, and 15% of non-Hispanic black NAs. When compared with non-Hispanic white NAs, non-Hispanic black NAs were significantly less likely to report back injury (RR 0.76, 95% CI: 0.59–0.98) (Tables I and III).

Nearly a quarter of NAs had <12 years of education (Table I). Hispanic NAs were most likely to have <12 years of education (39%, RR 1.53, 95% CI: 1.22–1.91). The weighted proportion of NAs who reported having no health insurance was 29%. One in three NAs reported an annual household income of less than $20,000. Non-Hispanic black

TABLE I. Percentage of Certified Nursing Assistants Currently Working in Nursing Homes Who Were Injured at Work in the Past Year, by Type of Injury Received: United States, 2004–2005 (n = 2,880)

			Injuries (% (SE))				
Variable	Category	Estimated population in thousand (%)	Wound, cut, scratch	Back injury	Black eyes, bruises	Strain, pulled muscle	Human bite
Total		677.1 (100.0)	44.4 (1.0)	17.3 (1.2)	16.2 (1.1)	15.5 (1.7)	11.5 (0.3)
Age category (years)	18–24	115.1 (17.0)	60.2 (2.5)	19.2 (2.3)	27.5 (2.4)	14.2 (2.0)	17.7 (2.1)
	25–34	159.4 (23.5)	46.4 (2.3)	17.7 (1.9)	16.3 (1.7)	15.5 (1.7)	11.1 (1.5)
	35–44	166.8 (24.6)	36.2 (2.3)	15.6 (1.9)	13.5 (1.7)	14.5 (1.9)	9.8 (1.6)
	45–54	153.1 (22.6)	41.2 (2.5)	18.4 (2.2)	12.1 (1.6)	17.9 (2.1)	11.2 (1.7)
	55+	82.7 (12.2)	40.8 (4.0)	15.7 (2.8)	13.2 (2.4)	14.8 (2.6)	7.8 (2.2)
Gender	Male	52.0 (7.7)	34.6 (3.9)	17.0 (3.0)	6.0 (1.8)	8.3 (2.1)	9.2 (2.6)
	Female	625.1 (92.3)	45.2 (1.3)	17.4 (1.0)	17.0 (1.0)	16.1 (1.0)	11.7 (0.9)
Race/ethnicity	Non-Hispanic white	317.2 (46.9)	52.9 (1.9)	19.3 (1.4)	27.1 (1.5)	17.7 (1.4)	15.6 (1.3)
	Non-Hispanic black	250.9 (37.0)	35.0 (2.1)	14.7 (1.6)	4.1 (0.8)	13.1 (1.5)	7.0 (1.2)
	Hispanic	64.0 (9.4)	44.4 (3.6)	17.7 (3.1)	11.9 (2.3)	15.0 (2.6)	11.2 (2.1)
	Other	45.0 (6.6)	36.7 (4.4)	17.4 (4.1)	12.4 (2.8)	14.2 (3.5)	7.6 (2.3)
Education	12 years or more	479.6 (70.8)	44.4 (1.5)	17.6 (1.1)	16.4 (1.1)	15.1 (1.1)	11.6 (1.0)
	<12 years	197.5 (29.2)	44.3 (2.3)	16.7 (1.7)	15.7 (1.6)	16.4 (1.7)	11.3 (1.4)
Household income	$20,000 or more	432.7 (63.9)	44.7 (1.6)	16.7 (1.2)	16.1 (1.1)	15.2 (1.2)	11.2 (1.1)
	Less than $20,000	244.4 (36.1)	43.8 (2.1)	18.5 (1.7)	16.3 (1.4)	16.1 (1.5)	12.0 (1.3)
Pay raise	No	251.5 (37.5)	41.4 (1.9)	16.6 (1.5)	16.8 (1.5)	13.8 (1.3)	11.5 (1.3)
	Yes	425.6 (62.5)	46.2 (1.7)	17.8 (1.2)	15.8 (1.1)	16.5 (1.2)	11.5 (1.1)
Work hours per week	40 hr or less	612.9 (90.5)	44.5 (1.3)	17.8 (1.0)	16.5 (1.0)	15.5 (1.0)	11.5 (0.9)
	Over 40 hr/week	64.2 (9.5)	43.3 (4.3)	13.3 (2.6)	13.6 (2.5)	16.1 (2.7)	11.8 (2.7)
Job tenure	1 or more years	601.5 (88.9)	44.3 (1.4)	17.1 (1.0)	15.6 (0.9)	15.9 (1.0)	11.2 (0.9)
	<12 months	75.6 (11.1)	45.0 (2.9)	19.5 (2.7)	21.0 (2.6)	12.1 (1.9)	13.6 (2.1)
Health insurance	No	193.2 (28.5)	45.6 (2.1)	16.3 (1.6)	17.3 (1.5)	13.7 (1.5)	13.2 (1.5)
	Yes	483.9 (71.5)	43.9 (1.5)	17.7 (1.2)	15.7 (1.1)	16.3 (1.8)	10.8 (0.9)
Time for ADL	Enough	387.4 (57.2)	37.3 (1.7)	12.9 (1.1)	12.7 (1.1)	11.7 (1.1)	8.4 (1.0)
	No enough	289.7 (42.8)	53.8 (2.0)	23.3 (1.5)	20.8 (1.5)	20.6 (1.5)	15.6 (1.5)
Mandatory overtime	No	609.5 (90.0)	43.3 (1.4)	16.9 (1.0)	15.8 (1.0)	14.3 (0.9)	10.7 (0.9)
	Yes	67.6 (10.0)	53.8 (4.0)	21.4 (3.4)	19.2 (2.6)	26.2 (3.6)	19.0 (2.9)
US born	No	140.9 (20.8)	35.5 (2.8)	14.7 (2.2)	5.8 (1.2)	14.8 (2.5)	8.1 (1.9)
	Yes	536.2 (79.2)	46.7 (1.4)	18.0 (1.0)	18.9 (1.1)	15.7 (1.0)	12.4 (1.0)
Facility turnover	A lot	338.2 (49.9)	50.3 (1.9)	20.8 (1.4)	19.8 (1.3)	17.3 (1.3)	14.5 (1.3)
	Not a lot	338.9 (50.1)	38.4 (1.6)	13.9 (1.2)	12.6 (1.1)	13.8 (1.2)	8.5 (1.0)

SE, standard error.

NAs were 1.9 times more likely to report low household incomes compared to non-Hispanic white NAs (Table II). Over 60% of NAs received a pay raise in the past year (Table I). All minority racial and ethnic groups were less likely to receive a pay raise in the past year than non-Hispanic white NAs (from 58% to 64%, compared with 67% for non-Hispanic white NAs). The proportion stating they had to work overtime even though they did not want to ranged from a high of 14% among the ''other'' race and ethnic group to a low of 6% among Hispanic NAs.

The proportion reporting that they did not have enough time to provide all necessary ADLs to residents was significantly lower for non-Hispanic black NAs than non-Hispanic white NAs (37% and 49%, respectively).

Overall, NAs born in US had more favorable socio-economic resources than other race/ethnicity groups. Other working conditions were not significantly different between NAs born in US and those not except for working over 40 hr a week.

DISCUSSION

Work-related injuries, many of which reflect the presence of adverse working conditions, are commonly

TABLE II. Adjusted Rate Ratios of Socio-Economic Resource Variables and Other Working Condition Indicators Among Nursing Assistants in US Nursing Homes (n = 2,880)

Outcome	Race/ethnicity	Weighted %[a]	SE	RR[b]	95% CI	
Income less than $20,000	Non-Hispanic white	28.5	2.4	1.00		
	Non-Hispanic black	46.5	5.6	**1.90**	1.65	2.19
	Hispanic	35.8	5.6	**1.47**	1.17	1.84
	Other	32.1	6.9	**1.49**	1.08	2.04
	Born in US	38.0	1.5	**1.49**	1.22	1.83
	Not born in US	28.9	2.7	1.00		
No health insurance	Non-Hispanic white	25.0	4.2	1.00		
	Non-Hispanic black	33.1	4.3	**1.48**	1.25	1.75
	Hispanic	29.4	7.0	**1.31**	1.01	1.71
	Other	26.7	9.9	1.37	0.98	1.92
	Born in US	30.2	1.3	**1.47**	1.14	1.90
	Not born in US	22.3	2.6	1.00		
Pay raised	Non-Hispanic white	66.9	8.8	1.00		
	Non-Hispanic black	57.6	12.3	**0.85**	0.77	0.94
	Hispanic	58.3	12.1	0.92	0.80	1.06
	Other	64.1	12.2	0.96	0.82	1.13
	Born in US	64.1	1.4	1.11	0.98	1.27
	Not born in US	56.4	3.6	1.00		
Mandatory overtime	Non-Hispanic white	12.4	1.0	1.00		
	Non-Hispanic black	7.1	0.6	**0.52**	0.35	0.76
	Hispanic	6.2	1.6	**0.41**	0.21	0.79
	Other	14.2	3.8	0.97	0.57	1.64
	Born in US	9.9	1.0	0.74	0.48	1.15
	Not born in US	10.2	1.8	1.00		
Not enough time for ADL	Non-Hispanic white	48.7	1.8	1.00		
	Non-Hispanic black	37.4	2.2	**0.78**	0.66	0.87
	Hispanic	40.1	3.6	0.83	0.68	1.03
	Other	34.6	5.0	**0.71**	0.52	0.96
	Born in US	44.1	1.4	1.02	0.83	1.25
	Not born in US	37.8	3.3	1.00		
Job tenure <12 months[c]	Non-Hispanic white	14.3	7.2	1.00		
	Non-Hispanic black	7.0	4.9	**0.59**	0.42	0.83
	Hispanic	14.8	8.6	1.07	0.75	1.53
	Other	7.4	6.3	0.58	0.33	1.01
	Born in US	11.7	0.9	0.82	0.55	1.22
	Not born in US	9.3	1.7	1.00		
Work over 40 hr/week[c]	Non-Hispanic white	10.3	1.6	1.00		
	Non-Hispanic black	8.7	0.9	0.91	0.63	1.31
	Hispanic	9.0	1.4	1.01	0.59	1.73
	Other	8.9	1.5	1.05	0.56	1.98
	Born in US	10.2	1.3	**1.63**	1.03	2.59
	Not born in US	6.6	1.0	1.00		
Education <12 years[d]	Non-Hispanic white	30.0	1.6	1.00		
	Non-Hispanic black	27.2	2.0	0.96	0.80	1.14
	Hispanic	39.4	3.8	**1.53**	1.22	1.91
	Other	19.7	3.9	0.77	0.51	1.16
	Born in US	30.8	1.2	**1.45**	1.09	1.92
	Not born in US	22.8	3.1	1.00		

95% CI, 95% confidence interval.

[a]Weighted percentage of certified nursing assistants reporting outcomes of interest.

[b]Rate ratios: models were adjusted for age, gender, education, job tenure, and working hours (<40 hr vs. over 40 hr) except where noted.

[c]Rate ratios were adjusted for age, gender, US born, and education.

[d]Rate ratio was adjusted for age, gender, and US born.

TABLE III. Adjusted Rate Ratios (RR) of Work-Related Injuries Among Certified Nursing Assistants in US Nursing Homes (n = 2,880)

		Injuries at work									
		Wound, cut, scratch		Back injury		Black eyes, bruises		Strain, pulled muscle		Human bite	
Variable	Category	RR[a]	95% CI	RR	95% CI	RR	95% CI	RR	95% CI	RR	95% CI
Race/ethnicity	Non-Hispanic white	1.00		1.00		1.00		1.00		1.00	
	Non-Hispanic black	**0.74**	0.65–0.85	0.85	0.65–1.10	**0.18**	0.12–0.26	**0.77**	0.58–1.00	**0.50**	0.35–0.74
	Hispanic	0.93	0.78–1.11	1.03	0.71–1.50	**0.55**	0.37–0.82	0.86	0.58–1.28	0.79	0.52–1.20
	Other	0.80	0.62–1.04	1.07	0.67–1.72	**0.64**	0.40–1.01	0.83	0.49–1.41	0.59	0.31–1.10
Born in US	Yes vs. no	1.04	0.87–1.24	1.10	0.79–1.54	**1.56**	1.01–2.40	0.87	0.58–1.30	0.96	0.59–1.59
Household income	Less than $20,000 vs. $20,000 or more	0.99	0.88–1.11	1.19	0.95–1.49	1.12	0.90–1.39	1.22	0.96–1.54	1.09	0.82–1.45
Health insurance	Yes vs. no	0.97	0.86–1.08	1.15	0.90–1.45	0.94	0.78–1.13	1.19	0.90–1.56	0.84	0.64–1.09
Pay raised	Yes vs. no	1.11	0.99–1.24	1.08	0.86–1.35	0.90	0.72–1.11	1.13	0.89–1.43	1.01	0.76–1.34
Work hours per week	Over 40 hr/week vs. 40 hr or less	0.94	0.77–1.15	0.70	0.48–1.03	0.80	0.56–1.15	0.95	0.68–1.34	0.95	0.59–1.54
Job tenure	<12 months vs. 1 year or more	0.89	0.78–1.02	1.13	0.84–1.54	0.94	0.73-1.22	0.82	0.58–1.17	0.96	0.69–1.33
Enough time for ADL	No vs. yes	**1.35**	1.20–1.51	**1.72**	1.39–2.13	**1.38**	1.12–1.69	**1.65**	1.26–2.20	**1.61**	1.20–2.15
Mandatory overtime	Yes vs. no	1.13	0.97–1.32	1.14	0.82–1.59	0.99	0.76–1.28	**1.67**	1.26–2.20	**1.45**	1.06–1.98
Facility turnover	A lot vs. not a lot	**1.20**	1.08–1.35	**1.32**	1.05–1.65	**1.34**	1.09–1.64	1.08	0.86–1.31	**1.47**	1.12–1.94

SE, standard error; 95% CI, 95% confidence interval.
[a]Rate ratios: models were adjusted for all other variables in addition to age, gender, and education.

reported among the US NAs [BLS, 2007]. This study provides results from the first large nationally representative sample of NAs and underscores their high work-related injury rate. The most common work-related injury category was ''wound, cut, and scratch'' (44%). The percentage of NAs without health insurance coverage was 29% which is nearly twofold higher than that of the US population in 2003 (15.6%) but is better than those with low income (e.g., among those living below the U.S. Census Bureau's poverty threshold of $19,307 for a family of four, 41% had no health insurance coverage) [Skala and Hellander, 2006; U.S. Bureau of the Census, 2008]. A previous study showed that NA's risk of injury from violent assault at work exceeded that of other health care workers [Gerberich et al., 2004].

In the healthcare setting, literature related to disparities in health and working conditions have focused primarily on social position and economic status [Hertting et al., 2005; Gillen et al., 2007; Myers et al., 2007]. However, the findings from this study support an emerging theory of occupational racial segregation [Chung-Bridges et al., 2008]. This theory holds that for occupations with a high proportion of African-Americans (>20%), there is a higher rate of adverse health outcomes among all workers, both White and African-American. Lipscomb et al. [2006] have also argued that workers' job characteristics (i.e., workplace exposures, job benefits, job effects on family and community, and policies that determine how and where people work) should be considered explicitly for their contribution to health disparities in the United States [Lipscomb et al., 2006]. For all of the work-related injuries that were examined, non-Hispanic white NAs were found to have the highest proportion of injuries among all race and ethnicity groups. However, non-Hispanic white NAs were less likely to report ''low household income (less than $20,000)'' and ''lack of health insurance.'' Non-Hispanic black NAs were more likely to report having no health insurance, less likely to receive pay raises, and reported significantly lower proportion of injuries. It has previously been noted that black, Hispanic, and other NAs are more likely to have second jobs [Table 15 in NCHS, 2008]. This difference may explain the higher proportions of mandatory overtime and working more than 40 hr among white NAs, compared to blacks and Hispanics. However, it does not explain the higher proportion of mandatory overtime among other race/ethnicity group (14%), since this group also was more likely to hold second jobs.

To the best of our knowledge, this is the first study to present the proportion of work-related injuries in nursing homes stratified by race/ethnicity. Our findings present a paradox because they indicate that minority racial and ethnic groups are less likely to report work-related injuries compared with non-Hispanic white NAs. Previous studies have suggested that minorities experience higher rates of occupational injury because they are employed in more

hazardous occupations [Chen and Layne, 1999; Frumkin et al., 1999; Anderson et al., 2000; Murray, 2003; Strong and Zimmerman, 2005].

One explanation is that race and ethnicity among NAs are simply surrogates for their work characteristics. Some of these work characteristics may be hazardous and predictive of work-related injuries. For example, non-Hispanic black NAs reported a lower proportion of mandatory overtime work than that of white NAs. Mandatory overtime work may contribute to the circumstances leading to physical assaults from residents, being hurt by equipment or lifting a resident. However, when we adjusted the RRs for mandatory overtime and total hours worked per week (40 hr/week or less vs. over 40 hr/week), the disparity in race and ethnicity remained virtually the same (i.e., lower proportion ratios of work-related injuries for minority racial and ethnic groups than non-Hispanic white NAs). The disparities persisted even after we controlled for the participants' job tenure in addition to their age and education, since these factors could potentially influence NA's willingness to report any injuries or negative aspects of their work. However, one factor that this study did not investigate was the type of residents that NAs deal with everyday. Since some types of residents might be more prone to committing physical assaults (i.e., residents with Alzheimer disease), the type of residents that NAs assist should be evaluated in subsequent studies.

Additional factors that may explain these disparities include recall bias and differences in language proficiency. There is a growing recognition that culture and language affect perceptions, behaviors, and presentation of illness. Disparities in health outcomes by the level of proficiency with the English language have been clearly documented in the research literature [Kandula et al., 2007]. The link between acculturation and health is also observed in other racial and ethnic groups, including Asian and Pacific Islanders and Hispanics [Shetterly et al., 1996; Kandula et al., 2007]. However, our findings suggest that among NA's, language proficiency does not appear to influence the reporting of work-related injuries. When we stratified the multiple regression analysis by language proficiency—whether or not NAs have difficulty communicating with residents because they speak different languages—the racial and ethnic disparities in work-related injuries in these strata were essentially identical with our main findings. To explain these disparities, future research will need to explore other aspects of the work environment and work characteristics that might vary between workers of different racial/ethnic groups.

Limitations

In this study we relied on self-reported experience of work-related injuries and socio-economic resources. Both over- and underreporting of injuries are possible, due to factors affecting perception and interpretation of work-related injuries, and recall of experiences. Some NAs may be less likely to report sensitive data because they think this information will lead to negative consequences (e.g., job retaliation). To examine whether there is an indication of this concern, we stratified the regression models for work-related injuries by the NA's perception about their supervisors support, intention to leave, and household income per year (<$20,000 vs. above $20,000). The significantly lower proportions of minority NAs reporting work-related injuries compared to non-Hispanic white NAs did not change even after the analyses were stratified by NA's perception about the supervisor's support (supportive vs. not supportive) and their intention to leave (dichotomous variable). In addition, racial and ethnic disparity in work-related injuries did not notably differ among workers with low household income versus those with household income over $20,000 per year. We note that there is a potential survivor effect. Since minority NAs have much lower socio-economic resources (i.e., low income and no health insurance) it is possible that when NAs experience work-related injuries minority NAs may decide to leave the job while non-Hispanic white NAs stay. However, it was impossible to examine whether or not this actually occurred. A previous report involving the National Health Interview Survey showed that memory recall of even a 3-month time window introduced errors resulting in low estimates of the actual injury incidence [Warner et al., 2005]. In contrast, the NNAS required recall of a 12-month time window, and this longer time period may be prone to even greater reductions in the estimates of the true work-related injury rates. Another limitation, as described earlier, is the lack of details on the work characteristics among NAs (e.g., the type of residents that NAs deal with everyday). Also, unknown is whether non-response to the survey is differential among racial and ethnic groups. Finally, agency NAs who work for outside contractors that provide particular services to nursing homes and other healthcare facilities (i.e., home care facility) were excluded from the survey. Given that the pressure to reduce costs may increase injury risks, one could hypothesize that contract NAs may have a higher rate of injuries than those NAs who participated in NNAS.

Recommendations

There is increasing evidence of disparities in health by socio-demographic characteristics, mostly related to social position, such as gender, race/ethnicity, income, education, and immigration status [Krieger, 2004]. However, many previous occupational health studies excluded black and other minority racial and ethnic groups from analysis on the grounds that their sample size was too small to permit statistical validity. Identification of race/ethnicity disparities will require future surveillance and occupational health research to routinely undertake the collection of detailed race and ethnicity data along with occupational titles. This will

allow the calculation of race- and ethnicity-specific rates of injury and disease across occupations [Murray, 2003].

Healthcare workers, including NAs, also face a number of risk factors in the workplace for musculoskeletal disorders such as excessive back and shoulder loading due to manual patient handling, applying excessive forces during pushing and/or pulling of objects, use of awkward postures during patient care, working long hours, and shiftwork [Waters et al., 2006]. Many ergonomic interventions are available and should be widely adopted to assist lifting or moving patients or residents who are partially or totally dependent by supporting their entire body weight during the transfer [Collins et al., 2006].

Given the scarcity of data on racial and ethnic disparities with respect to work-related injuries among NAs in the United States, future efforts should include: (1) investigations to better understand their actual working conditions, (2) qualitative research to help identify attitudinal or behavioral factors that might be associated with the elevated risk of work-related injuries among non-Hispanic white NAs, and (3) in depth studies examining the association between work-related injuries among NA's and characteristics of nursing home residents (or patients), such as their chronic illnesses, and their race and ethnicity.

In conclusion, this large nationally representative survey of NAs documented high levels of work-related injuries consistent with previous studies. The experience of work-related injuries among NAs working in US nursing homes may vary across race and ethnic groups. Our findings imply that racial and ethnic minority groups may experience work-related injuries less often than non-Hispanic white NAs in nursing home settings. Despite having the same job title (NA), the work characteristics of these minorities, the characteristics of the residents with whom they work, and their willingness to report injuries may differ. The observed racial and ethnic disparities in work-related injuries should only be interpreted as surrogates of the underlying causes, which have yet to be identified. Future research should focus on identifying preventable risk factors, such as the difference in the nature of their jobs and the extent of their engagement in assisting patients with their ADLs.

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