

Occupational Injury and Absence From Work Among African American, Hispanic, and Non-Hispanic White Workers in the National Longitudinal Survey of Youth

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Occupational injuries and illnesses represent a significant source of morbidity and mortality in the United States. The Bureau of Labor Statistics reported more than 5 million work-related injuries and illnesses in private industry workplaces in 2001, resulting in an annual rate of 5.7 cases per 100 full-time workers.¹ Historically, racial/ethnic minority workers have exhibited higher rates of work-related morbidity than have non-Hispanic White workers.²⁻⁴

The extent to which such inequalities persist today is less clear. Over time, notable trends such as improved workplace safety, decreased rates of fatal and nonfatal occupational injuries and illnesses, the expansion of affirmative action, and an increasingly diversified workforce are likely to have influenced both the types of occupations held by individuals of different races and ethnicities and occupational injury rates.^{1,5} The studies investigating this topic have yielded inconsistent findings; some suggest that minority workers are at greater risk of occupational injuries than their non-Hispanic White counterparts,^{4,6,7} whereas others have found comparable rates of occupational injuries between these groups.⁸⁻¹⁰

Racial and ethnic differences in occupational injury and illness rates are often attributed to the greater likelihood of minority workers being employed in more hazardous occupations.^{3,11,12} Minority workers, in turn, are employed in hazardous occupations largely because of lower educational attainment, greater difficulty finding work, and higher rates of poverty compared with non-Hispanic Whites, as well the effects of lingering racism.^{2,3,13} The occupational categories in which the greatest proportion of African American and Hispanic men are employed include machine operators, fabricators, and laborers, whereas the greatest

Objectives. We examined how race and ethnicity influence injury and illness risk and number of days of work missed as a result of injury or illness.

Methods. We fit logistic regression and negative binomial regression models using generalized estimating equations with data from 1988 to 2000 on currently employed African American, Hispanic, and non-Hispanic White participants in the National Longitudinal Survey of Youth.

Results. Occupational factors—having a blue-collar occupation, working full-time, having longer tenure, working 1 job versus 2, and working the late shift—were associated with increased odds of an occupational injury or illness. Although racial/ethnic minority workers were no more likely than Whites to report an occupational injury or illness, they reported missing more days of work. African American and Hispanic men missed significantly more days of work than non-Hispanic White men, and African American women missed significantly more days of work than non-Hispanic White women.

Conclusions. Factors associated with occupational health are multifaceted and complex. Our findings suggest that race/ethnicity influences the duration of work absence owing to injury or illness both indirectly (by influencing workers' occupational characteristics) and directly (by acting independently of occupational factors). (*Am J Public Health.* 2005;95:1226-1232. doi:10.2105/AJPH.2004.044396)

proportion of non-Hispanic White male workers are found in the managerial and professional specialties.¹⁴

The extent to which factors other than occupation may also contribute to racial/ethnic differences in work-related injuries and illnesses has not been adequately explored in the public health literature. Myriad factors in addition to occupation are believed to influence the risk of occupational injury, among them education, age, work experience, gender, shift worked, and union membership.^{9,15-17}

A number of methodological issues limits the conclusions of previous studies examining the relationship between race/ethnicity and risk of occupational injury and illness. First, the use of multiple data sources in some studies prevented linking demographic, occupational, and injury data at the individual level,^{4,7,10} limiting the inferences that can be drawn. Second, previous studies obtained data from state workers' compensation claims

systems,^{4,7} emergency department hospital records,^{10,12} and employer records,⁶ all of which depend upon injured workers having sought medical care or filed for workers' compensation. As occupational injuries and illnesses are highly underreported,² data drawn from these sources may not be fully representative of all injured workers. Third, the majority of studies have examined differences between African American and White populations without distinguishing or including Hispanics.^{4,8,18} Finally, few studies have utilized data from the past 15 years; injury rates and job opportunities have changed since the late 1980s, so it is important to reexamine this issue in a current context.

Additionally, few studies have considered the outcomes of occupational injuries and illnesses, such as the duration of absence from work, a variable likely influenced by a number of factors. Increased absence from work is costly to both society and the injured worker and is associated with the worker's reduced fu-

ture participation in the workforce.^{19,20} Examining this outcome may prove useful in further elucidating the relationship between occupational health and race/ethnicity. We used data from a nationally representative sample to (1) describe the occupational characteristics of non-Hispanic White, African American, and Hispanic workers; (2) examine the relationship between race/ethnicity and self-reported injuries and illnesses that caused respondents to miss work; and (3) assess the relationship between race/ethnicity and the number of workdays missed owing to the injury or illness.

METHODS

Data Source

The source of our data is the National Longitudinal Survey of Youth (NLSY), administered by the US Bureau of Labor Statistics. This sample of 12 686 youth was originally surveyed in 1979, when participants were 14 to 21 years old, and participants have been resurveyed every 1 to 2 years thereafter. The initial cohort constituted a nationally representative sample of the US population, with African Americans and Hispanics oversampled. Survey weights are available for drawing nationally representative inferences.²¹ Attrition has been low; follow-up rates ranged from 85% to 90% by 1998.²¹ The sample is currently highly representative of employed US adults in their 40s, not counting recent immigrants. We used data from 1988 through 2000, a total of 10 survey waves.

Variables

Dependent variables included respondents' self-reported injury status since their prior interview, and, among those injured, the number of workdays missed owing to an occupational injury or illness. NLSY data managers coded the injuries and illnesses according to a modified version of the *International Classification of Diseases, Ninth Revision*.²¹ Here, an injury or illness represents an incident that caused respondents to miss work for at least 1 day besides the day the injury occurred. NLSY respondents were asked: (1) "Since [date of last interview], have you had an incident at any job we previously discussed that resulted in an injury or illness to you?"

(2) "Did the [injury or illness] cause you to miss one or more scheduled days of work, not counting the day of the incident?" and (3) "Not counting the day of the incident, how many days was this?" Although individuals may have been injured more than once between interviews, data for this study pertain only to the most recent injury or illness for each survey wave.

The independent variable of interest was race/ethnicity, which was based on respondents' self-identification with a primary ethnic origin. Non-Hispanic White workers served as the reference group. Other independent and control variables included age, marital status, education level, gender, region of residence in 1988, and, in each survey year, respondents' occupation, industry, job tenure, membership in a collective bargaining agreement, work shift, hourly rate of pay, full-time status, having a second job, being paid hourly or salary, time in the workforce, and a variable representing each of the survey waves.

Respondents' industry and occupation were classified according to 3-digit census codes.²¹ Manufacturers and laborers served as the reference groups for industry and occupation, respectively. Age represented respondents' age at the first interview in 1979. Tenure was coded as the number of weeks respondents had worked at a particular job. Respondents were considered a member of a collective bargaining unit if they reported being in a union or if their wages were set by a collective bargaining agreement. Hourly rate of pay was based on respondents' self-report. The shift during which respondents most often worked was coded as "day," "evening," "night," or "other" (irregular, rotating, or split shift), with the day shift as the reference group. Time in the workforce represented the number of full-time equivalent (FTE) years worked since the last interview for each job. All occupational variables were collected for a second job where relevant and were considered new observations.

Statistical Analysis

In the data analysis we included individuals between the ages of 29 and 43 who reported currently working; who were African American, Hispanic, or non-Hispanic White; and who completed at least 3 interviews. This

age group comprises a large proportion of employed adults as well as injured or ill workers.²² Data from 1991 were excluded owing to missing injury data for that year.

We performed χ^2 tests and t tests to assess bivariate associations between race/ethnicity and demographic characteristics, occupational characteristics, and the mean number of workdays missed by injured respondents. Unadjusted injury rates per 100 FTE workers were calculated for each demographic and occupational category taking into account sampling weights and the average number of jobs held by respondents in each category.

To examine the association between the independent variables and injury status, we fit multivariate logistic regression models that incorporated sample weights. We used negative binomial regression to examine the association between the independent variables and the number of workdays missed among injured respondents. Negative binomial regression assumes a Poisson-like distribution and is used for nonnegative count data; however, unlike Poisson, the variance of the dependent variable is assumed to be larger than the mean.²³ We used generalized estimating equations to account for possible correlations between repeated observations using the "cluster(id)" option in Stata Statistical Software 7.0 (Stata Corp, College Station, Tex), which specifies an independent working correlation structure and robust variance estimates. Independent and control variables were included based on a priori considerations of variables believed to be associated with injury status. All analyses were stratified by gender.

For each regression, we analyzed age, education, tenure, hourly rate of pay, survey year, and time in the workforce as continuous variables. Survey year controlled for secular trends and the maturation of the cohort over time. Respondents' age at first interview controlled for relative differences in age and avoided collinearity with the survey year. We included age squared and education squared to control for nonlinearity between the dependent variables and age and education. Tenure and hourly rate of pay were log-transformed, as this was the most appropriate form for both variables. We analyzed membership in a collective bargaining agreement, full-time status, having a second job, and

being paid hourly or salary as dichotomous variables. Region of residence, marital status, shift worked, industry, and occupation categories were represented by dummy variables. All analyses were performed with Stata Statistical Software 7.0.

RESULTS

Table 1 presents the demographic and occupational characteristics reported in the 18 871 (52.8%) interviews with men and 16 839 (47.2%) interviews with women. Approximately 57% of the interviews were with non-Hispanic Whites, 15.1% were with Hispanics, and 27.9% were with African Americans. These interviews represented 3267 men and 3027 women. In general, Hispanics and African Americans reported significantly fewer years of education than non-Hispanic Whites.

We observed notable differences in occupational characteristics by race/ethnicity. Non-Hispanic White men were employed most often as craftsmen, managers/officials, and professional/technical workers, whereas the 3 most commonly reported occupations among Hispanic and African American men were craftsmen, machine operators, and service workers. Non-Hispanic White, Hispanic, and African American women were employed most often as professional/technical workers, clerical workers, and service workers, respectively. We also saw significant differences in the shift worked, with African Americans more likely to work evening and night shifts relative to other workers. Among both men and women, significantly more African Americans reported an hourly rate of pay in the lowest quintile compared with workers of other ethnicities. Racial/ethnic differences in tenure were most pronounced among men in the shortest and longest tenure categories; African American men were more likely than other men to report having worked less than 6 months at their current job and less likely to report having worked more than 10 years. Non-Hispanic White workers were the least likely to report being a member of a collective bargaining unit. The majority of respondents reported working full-time, yet non-Hispanic White women were significantly less likely than other women to report this.

Compared with non-Hispanic White and African American men, a significantly larger proportion of Hispanic men reported an injury or illness that resulted in lost work-time (3.2% and 3.2% vs 4.7%, respectively). Hispanic men who were injured also missed more days of work, on average, than other injured men. Among women, African Americans were significantly more likely to report a lost-worktime injury or illness compared with Hispanic and non-Hispanic White women (3.0% vs. 2.6% and 2.2%, respectively), and the mean number of workdays missed was similarly high for African American and Hispanic women.

Table 2 shows unadjusted lost-worktime injury and illness rates per 100 FTE workers by select demographic and occupational characteristics. African Americans exhibited the highest rate of lost-worktime injuries and illnesses among both men and women, followed by Hispanics among men and non-Hispanic Whites among women. In general, injury and illness rates fell with increasing years of education and varied considerably by occupation, with machine operators and laborers having the highest rates. Among men, the injury and illness rate was substantially higher for nighttime shift work than for other shifts, whereas, for women, evening and nighttime shift work exhibited similarly high rates.

Table 3 shows the adjusted odds ratios (ORs) of reporting a lost-worktime injury or illness and adjusted incidence rate ratios (IRRs) of the number of missed workdays among respondents. IRRs were obtained by exponentiating the coefficients produced by negative binomial models. For both men and women, the odds of reporting an injury or illness did not vary by race/ethnicity. However, among injured male workers, Hispanics missed 64% more workdays than non-Hispanic Whites (approximately 18 more days at the sample mean), and African Americans missed 66% more workdays than non-Hispanic Whites (approximately 19 more days at the sample mean). Among injured female workers, African Americans missed 110% more workdays than non-Hispanic Whites (approximately 26 more days at the sample mean). No significant differences were observed between Hispanic and non-Hispanic White female workers.

Several occupational characteristics were predictive of reporting a lost-worktime injury or illness. Overall, occupation was a much stronger predictor than industry. Compared with laborers, male and female managers and officials, sales, and professional/technical workers exhibited significantly lower odds of reporting an injury or illness. Working the evening shift increased odds of a lost-worktime injury or illness by nearly 150% in women, yet shift did not significantly affect men's odds of an injury or illness. Surprisingly, longer tenure was associated with being injured and with more missed work; for example, a 10% increase in tenure was associated with a 2.4% increase in the number of workdays missed among women (to facilitate interpretation, incidence rate ratios were converted to the percentage change in the number of missed workdays associated with a 10% change in the exposure). Working full-time significantly increased the odds of reporting an injury or illness for all respondents. Both male and female respondents who had 2 jobs had significantly lower odds of reporting an injury or illness than respondents reporting 1 job.

Considerably fewer occupational characteristics were significant predictors of the number of workdays missed by injured respondents. Among men, managers and officials, service workers, and professional/technical workers missed significantly fewer days of work than did laborers. In addition, men who worked irregular or rotating shifts missed 66% more days than men working the day shift. Occupation was not significantly associated with the number of workdays missed by women. Rather, working the night shift, longer tenure, and being a member of a collective bargaining unit significantly increased the duration of work missed by women.

DISCUSSION

We analyzed the occupational characteristics and occupational health experiences of currently employed non-Hispanic White, African American, and Hispanic individuals originally sampled for the NLSY in 1979. Our analysis addresses several gaps in the literature related to occupational injury and illness and race/ethnicity. First, we present esti-

**TABLE 1—Demographic and Work Characteristics of Current Workers, by Gender and Race/Ethnicity:
National Longitudinal Survey of Youth, 1988–2000**

	Men, %			Women, %		
	Non-Hispanic White (n = 10 969)	Hispanic (n = 2933)	African American (n = 4969)	Non-Hispanic White (n = 9408)	Hispanic (n = 2454)	African American (n = 4977)
Education						
Some high school	8.7**	21.6	9.0	4.3**	12.6	6.0
High school graduate	40.9**	42.5	52.0	40.5**	36.1	37.9
Some college	20.7**	24.3	22.8	24.8**	33.4	37.4
College graduate	16.7**	7.0	10.8	15.8**	7.8	11.8
Postgraduate	13.0**	4.5	5.3	14.6**	10.1	7.1
Mean age in 1988, y	27.5	27.7	27.6	27.7	27.6	27.7
Marital status						
Married/living as married	69.5**	65.9	48.9	68.3**	63.7	38.7
Separated/widowed/divorced	12.6**	14.1	17.9	17.8**	20.7	29.3
Never married	17.9**	20.0	33.2	13.9**	15.6	31.9
Industry						
Agriculture	4.5**	6.4	2.7	1.8**	1.1	0.2
Mining/construction	13.0**	10.0	10.1	1.8**	0.8	0.5
Manufacturing	21.7	22.2	20.7	12.4**	10.1	12.8
Transportation/communications/utilities	8.4**	10.5	12.2	4.2**	5.9	4.6
Wholesale/retail trade	16.1	16.3	15.1	17.1**	13.4	12.6
Finance/insurance/real estate	4.7**	3.7	3.3	8.0**	8.1	6.6
Business/repair services	8.6**	9.3	10.4	6.3	5.1	6.3
Personal services	1.6**	2.0	2.8	5.3**	6.9	6.7
Entertainment/recreational services	1.8**	1.4	1.0	1.5**	0.5	1.3
Public administration	6.6	6.7	7.5	7.3**	7.9	11.2
Professional services	13.1**	11.4	14.1	34.2**	40.4	37.3
Occupation						
Manager/official	18.6**	12.8	8.5	14.2**	9.7	9.1
Sales	4.9**	3.0	3.5	4.8**	4.0	3.2
Clerical	5.3**	7.3	8.1	24.5**	32.4	27.8
Craftsman	20.0**	20.8	15.2	2.6**	1.6	1.8
Machine operator	12.8**	18.5	20.7	5.7**	7.1	10.9
Laborer	6.8**	10.0	12.8	1.8*	1.0	1.4
Farmer/manager/laborer	1.7**	2.5	0.2	0.5**	0.5	0
Service	10.9**	15.1	19.9	20.8**	20.9	29.0
Professional/technical	19.0**	10.0	11.3	25.2**	22.7	16.8
Sustained a lost-worktime injury or illness	3.2**	4.7	3.2	2.2**	2.6	3.0
Mean number of days missed due to injury or illness	28.1	38.0	30.9	24.0	45.5	45.2 ^a
Shift worked						
Day	70.5**	70.8	63.8	71.7**	78.9	69.5
Evening	5.3**	7.2	10.7	5.5**	4.6	8.6
Night	3.9**	5.7	6.7	2.8**	2.6	6.1
Other	20.3	16.4	18.9	20.0	14.0	15.8
Hourly rate of pay						
1st quintile	11.8**	18.0	24.6	24.1**	24.5	31.7
2nd quintile	13.5**	18.1	22.0	20.1**	21.4	23.8
3rd quintile	19.5**	22.4	21.3	20.2**	21.6	18.6
4th quintile	24.2**	21.0	17.2	18.2**	18.8	16.0
5th quintile	31.0**	20.4	15.0	17.3**	13.8	10.0

Continued

TABLE 1—Continued

Tenure						
<6 months	10.3**	11.5	14.4	10.9*	11.1	12.3
6 mo–23 mo	20.5**	22.4	25.9	24.8	24.5	24.4
24 mo–59 mo	24.9	24.1	26.1	26.3	26.9	24.9
60 mo–119 mo	23.8**	22.3	20.7	21.2	23.4	21.6
≥10 y	20.5**	19.7	12.9	16.7**	14.1	16.8
Member of collective bargaining unit	19.0**	24.8	25.2	15.8**	18.8	24.3
Full-time employee	88.1**	87.8	85.8	66.7**	76.6	79.7
Have 2 jobs	8.7*	8.0	9.8	9.5**	7.5	9.4

Note. The sample size refers to the number of observations rather than to individual respondents.

* $P < .01$ for 2-sample t test comparing mean number of days missed due to injury among female African American and non-Hispanic White workers.

** $P < .05$ for χ^2 tests comparing differences by race/ethnicity; *** $P < .01$ for χ^2 tests comparing differences by race/ethnicity.

mates using recent data from a nationally representative data source, using self-reported occupational injury or illness serious enough to result in missed work as the outcome variable. Second, our large sample enables us to control for secular trends in work safety over this period. Third, our analysis controls for occupation and industry, as well as shift, tenure, hourly rate of pay, and collective bargaining membership—all variables that have frequently been omitted from past analyses.

Consistent with other studies, African American and Hispanic respondents were more likely than non-Hispanic Whites to be less educated, work in higher-risk occupations, receive a lower wage rate, work later shifts, and be members of a collective bargaining unit.^{4,11,13,14} In general, we did not find race/ethnicity to be a significant predictor of reporting a lost-worktime injury or illness. Although unadjusted injury rates per 100 FTE workers were higher for African American men and women and Hispanic men compared with non-Hispanic Whites, the adjusted odds of reporting an injury or illness were not significantly different.

Reporting a lost-worktime injury or illness may have been influenced by a number of factors, such as perceptions of what constitutes an injury, financial pressure to remain at work, level of job autonomy, and workplace discrimination against taking time off or filing for workers' compensation. As minority workers in this study were more likely than Whites to be less educated, work in blue-collar occupations, and receive a lower wage rate, it is

conceivable that such factors influenced their likelihood of reporting an injury or illness in ways that differed from White workers.

Occupational characteristics proved to be the most important contributors to respondents' risk of an occupational injury or illness. Such factors, principally occupation and work experience, are recognized in the literature as important variables potentially mediating the relationship between race/ethnicity and risk of occupational injury.^{4,9,11,13,15} We observed that having a white-collar occupation and working 2 jobs significantly reduced both male and female respondents' odds of being injured, whereas working full-time and having longer tenure significantly increased those odds. The finding that full-time status and working 2 jobs acted in opposite directions suggests that on-the-job exposure time plays a pivotal role in predicting occupational injuries and illnesses. These results may have important implications for the length of shifts in hazardous occupations. Additionally, possible alternative explanations involving different work or benefits patterns for part-time workers will need to be further explored in future research.

Evening shift work proved to be a source of occupational injury and illness for women but not men. Of 2 international studies investigating the relationship between shift and occupational injury, 1 observed similar injury rates on all shifts,¹⁶ and the other found night shift work to significantly increase one's risk of an occupational injury.¹⁷ In our study, the evening shift increased women's odds of injury by 150%.

An interesting finding is that demographic characteristics, such as age and education, were not associated with reporting an occupational injury or illness. The restricted age range in our sample (29 to 43 years) likely reduced potential differences owing to age. Education, however, varied considerably. Previous studies have found education to be an important determinant of occupational injury even after control for occupation and work experience.^{8,9,13} We observed decreasing injury and illness rates with increasing education; however, this relationship was not apparent in our multivariate analyses, suggesting that differences in education may be reflected in occupational characteristics.

Race/ethnicity was a significant predictor of the number of workdays missed in injured respondents. Among men, both Hispanic and African American respondents missed significantly more days than non-Hispanic Whites, and African American women missed significantly more days than non-Hispanic White women. This finding is supported by Johnson and Ondrich,²⁴ who found that, following an injury, Blacks and women were absent from work longer than White men. The implications of this finding are not entirely clear, as a combination of demographic, work-related, biomedical, economic, and psychosocial factors is believed to influence how long injured workers are absent from work.^{19,20,25}

Although results of studies investigating this issue are varied, evidence suggests that older age, female gender, lower socioeconomic status, more severe injuries, poor baseline health status, physically demanding work,

TABLE 2—Unadjusted Lost-Worktime Injury/Illness Rate, per 100 Full-Time Equivalent Workers

	Men	Women
Race/ethnicity		
Non-Hispanic White	2.7	2.5
Hispanic	4.0	2.3
African American	4.8	4.1
Education		
Some high school	4.8	5.3
High school graduate	4.2	2.9
Some college	2.9	3.1
College graduate	1.0	1.4
Postgraduate	2.9	3.1
Industry		
Agriculture	2.8	0.4
Mining/construction	5.0	1.8
Manufacturing	3.0	3.5
Transportation/communications/ utilities	2.8	4.0
Wholesale/retail trade	4.0	2.7
Finance/insurance/real estate	1.0	2.3
Business/repair services	2.0	2.2
Personal services	2.3	1.7
Entertainment/recreational services	2.4	1.0
Public administration	3.1	1.7
Professional services	1.8	2.8
Occupation		
Manager/official	0.9	2.1
Sales	0.7	2.8
Clerical	2.5	1.5
Craftsman	4.1	3.9
Machine operator	4.5	5.7
Laborer	7.3	4.5
Farmer/manager/laborer	4.2	3.5
Service	0.8	2.4
Shift worked		
Day	2.7	2.2
Evening	2.4	6.9
Night	9.1	6.4
Other	3.0	2.3
Tenure		
<6 months	3.1	1.3
6 mo–23 mo	2.7	3.0
24 mo–59 mo	2.6	3.1
60 mo–119 mo	4.0	2.7
≥10 y	2.6	2.4
Member of collective bargaining unit		
Yes	5.0	3.6
No	2.5	2.5
Full-time employee		
Yes	2.9	2.9
No	3.3	2.1
Have 2 jobs		
Yes	3.2	1.3
No	2.9	2.6

Note. Injury rates were calculated taking into account population weights and the average number of jobs held by respondents in each category.

TABLE 3—ORs for Reporting a Lost-Worktime Injury or Illness Among All Respondents and IRRs of the Number of Days of Work Missed Among Injured Respondents

	Men		Women	
	OR (95% CI) n = 18 871	IRR (95% CI) n = 644	OR (95% CI) n = 16 839	IRR (95% CI) n = 413
Race/ethnicity				
Non-Hispanic White	Reference	Reference	Reference	Reference
Hispanic	1.13 (0.84, 1.53)	1.64 (1.02, 2.64)	0.81 (0.54, 1.21)	1.50 (0.83, 2.72)
African American	0.83 (0.64, 1.09)	1.66 (1.03, 2.68)	1.04 (0.77, 1.43)	2.10 (1.37, 3.22)
Age, y	3.03 (0.89, 10.3)	1.04 (0.15, 7.48)	1.58 (0.32, 7.85)	0.58 (0.07, 5.17)
Education, y	1.29 (0.94, 1.77)	0.99 (0.60, 1.63)	0.76 (0.50, 1.16)	0.91 (0.63, 1.31)
Occupation				
Laborer	Reference	Reference	Reference	Reference
Manager/official	0.41 (0.25, 0.66)	0.44 (0.20, 0.99)	0.44 (0.21, 0.92)	1.27 (0.47, 3.41)
Sales	0.35 (0.15, 0.84)	0.87 (0.35, 2.11)	0.34 (0.13, 0.86)	2.64 (0.68, 10.32)
Clerical	0.66 (0.38, 1.15)	1.00 (0.43, 2.36)	0.24 (0.12, 0.45)	0.82 (0.31, 2.21)
Craftsman	0.91 (0.65, 1.29)	0.89 (0.54, 1.45)	0.57 (0.24, 1.33)	0.58 (0.19, 1.78)
Machine operator	1.06 (0.73, 1.54)	1.30 (0.74, 2.30)	0.73 (0.38, 1.41)	2.41 (0.86, 6.74)
Service	0.79 (0.51, 1.22)	0.48 (0.24, 0.97)	0.55 (0.29, 1.04)	1.42 (0.54, 3.73)
Professional/technical	0.37 (0.21, 0.64)	0.24 (0.09, 0.62)	0.40 (0.20, 0.81)	0.85 (0.29, 2.48)
Shift worked				
Day	Reference	Reference	Reference	Reference
Evening	0.70 (0.45, 1.09)	1.09 (0.49, 2.42)	2.49 (1.70, 3.66)	0.85 (0.49, 1.47)
Night	1.17 (0.75, 1.83)	0.65 (0.33, 1.26)	1.61 (0.97, 2.66)	2.28 (1.20, 4.31)
Other	1.17 (0.88, 1.55)	1.66 (1.02, 2.68)	1.17 (0.79, 1.74)	0.63 (0.38, 1.06)
Tenure (log)	1.19 (1.11, 1.30)	1.05 (0.89, 1.24)	1.22 (1.11, 1.35)	1.27 (1.02, 1.57)
Hourly rate of pay (log)	0.71 (0.58, 0.88)	1.18 (0.71, 1.98)	0.88 (0.69, 1.13)	1.35 (0.87, 2.09)
Member of collective bargaining unit	1.24 (0.95, 1.60)	1.39 (0.92, 2.11)	1.31 (0.94, 1.82)	1.60 (1.04, 2.47)
Full-time employee	2.20 (1.25, 3.88)	0.82 (0.40, 1.66)	2.67 (1.71, 4.15)	0.91 (0.54, 1.53)
Have 2 jobs	0.41 (0.19, 0.90)	0.87 (0.14, 5.35)	0.31 (0.13, 0.77)	1.57 (0.71, 3.49)
Wald statistic	308	81	182	267
P value	<.001	<.001	<.001	<.001

Note. OR = odds ratio; IRR = incidence rate ratio; CI = confidence interval. In addition to the variables listed above, these models were also adjusted for age squared, education squared, industry category, survey year, marital status, region of residence, and exposure time.

poor relations with coworkers, low job satisfaction, low job autonomy, and greater compensation for lost wages are likely to prolong absence from work.^{19,20,25} None of these studies examined the impact of race or ethnicity, so it is difficult to determine the extent to which the relationship between race/ethnicity and duration of work absence may be confounded by these factors.

In our study, the observation that significant differences by race/ethnicity persisted even after accounting for demographics, occupation, and specific work-related factors suggests that race/ethnicity exerts an influ-

ence on the number of days missed that is independent of these variables. Our results may indicate that the longer duration of work missed by minority workers represents more severe injuries and illnesses, differential wage replacement rates, poorer overall perceptions of work, or greater psychosocial issues related to work, perhaps owing to discrimination, compared with non-Hispanic White workers. However, we cannot validate these speculations.

Several limitations of this study should be noted. Because our data are based on self-report, our estimates of occupational injuries

and illnesses and the duration of missed work may not be accurate. However, interviews with workers would seem to provide a strong opportunity for investigating racial and ethnic differences in occupational injury and illness because these data are not reliant on reporting systems, claims data, or physician records. Another limitation stems from the lack of data on the number of injuries and illnesses sustained between survey waves. Unfortunately the NLSY does not collect such data, so our findings reflect information related only to the most recent injury or illness. However, in approximately 97% of the interviews, respondents reported that the most recent work-related injury or illness was the most severe one they had experienced since the previous interview, indicating that for many people the most recent injury or illness was their only one.

Conclusions

Controlling for a variety of covariates and using a recent, large data set, we found that racial and ethnic disparities exist in unadjusted occupational injury and illness rates but that these disappeared when job and individual attributes were controlled. The social determinants of occupational injury and illness in these data operate through racial differences in shift work, tenure, and occupation. Such results suggest that the poor labor market outcomes for African Americans and Hispanics are not limited to wages, but rather extend to job safety features as well. Moreover, differences in the duration of work absence suggest that the outcomes of occupational injuries and illnesses vary by race/ethnicity, even after accounting for occupational characteristics.

Although myriad factors are associated with occupational health, the results of our study strongly suggest that race and ethnicity act both through occupational characteristics (e.g., occupation, shift work, tenure) and independently of them. As long as work-related factors continue to be racially inflected, racial equality in the workplace demands improved workplace safety efforts around dangerous occupations. ■

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Contributors

L.L. Strong originated the study, conducted the analyses, and led the writing of the article. F.J. Zimmerman oversaw all aspects of the study and assisted with the analyses and writing. Both authors interpreted the findings and reviewed drafts of the article.

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Human Participant Protection

This study was exempted from review by the University of Washington institutional review board because it used only anonymous, preexisting data.

References

1. Bureau of Labor Statistics. *Workplace Injuries and Illnesses in 2001* [news release]. Washington, DC: Bureau of Labor Statistics, US Department of Labor; 2002. Available at: <http://www.bls.gov/iif/oshwc/osh/os/osnr0016.pdf>. Accessed April 11, 2005.
2. Friedmann-Jimenez G. Occupational disease among minority workers: a common and preventable public health problem. *AAOHN J*. 1989;37:64–70,84–86.
3. Murray LR. Sick and tired of being sick and tired: scientific evidence, methods, and research implications for racial and ethnic disparities in occupational health. *Am J Public Health*. 2003;93:221–226.
4. Robinson JC. Trends in racial inequality and exposure to work-related hazards, 1968–1986. *AAOHN J*. 1989;37:56–63.
5. Stout NA, Linn HI. Occupational injury prevention research: progress and priorities. *Inj Prev*. 2002;8 (suppl 4):iv9–iv14.
6. Simpson CL, Severson RK. Risk of injury in African American hospital workers. *J Occup Environ Med*. 2000;42:1035–1040.
7. Robinson JC. Exposure to occupational hazards among Hispanics, Blacks, and non-Hispanic Whites in California. *Am J Public Health*. 1989;79:629–630.
8. Wagener DK, Winn DW. Injuries in working populations: Black–White differences. *Am J Public Health*. 1991;81:1408–1414.
9. Oh JH, Shin EH. Inequalities in nonfatal work injury: the significance of race, human capital, and occupations. *Soc Sci Med*. 2003;57:2173–2182.
10. Chen GX, Layne LA. Where African-American women work and the nonfatal work-related injuries they experienced in the U.S. in 1996, compared to women of other races. *Am J Ind Med*. 1999;36(suppl 1):34–36.
11. Frumkin H, Walker ED, Friedman-Jimenez G. Minority workers and communities. *Occup Med*. 1999;14:495–517.
12. Anderson JT, Hunting KL, Welch LS. Injury and employment patterns among Hispanic construction workers. *J Occup Environ Med*. 2000;42:176–186.
13. Robinson JC. Racial inequality and the probability of occupation-related injury or illness. *Milbank Mem Fund Q Health Soc*. 1984;62:567–590.
14. Gabor M, Houlder D, Carpio M, eds. *Report on the American Workforce*. 5th ed. Washington, DC: Bureau of Labor Statistics, US Department of Labor; 2001.
15. Leigh JP. Individual and job characteristics as predictors of industrial accidents. *Accid Anal Prev*. 1986;18:209–216.
16. Oginski A, Oginska H, Pokorski J, Kmita W, Gozdziala R. Internal and external factors influencing time-related injury risk in continuous shift work. *Int J Occup Saf Ergon*. 2000;6:405–421.
17. Smith L, Folkard S, Poole CJ. Increased injuries on night shift. *Lancet*. 1994;344:1137–1139.
18. Loomis D, Richardson D. Race and the risk of fatal injury at work. *Am J Public Health*. 1998;88:40–44.
19. Turner JA, Franklin G, Turk DC. Predictors of chronic disability in injured workers: a systematic literature synthesis. *Am J Ind Med*. 2000;38:707–722.
20. Krause N, Frank JW, Dasinger LK, Sullivan TJ, Sinclair SJ. Determinants of duration of disability and return-to-work after work-related injury and illness: challenges for future research. *Am J Ind Med*. 2001;40:464–484.
21. Center for Human Resource Research. *NLSY79 User's Guide 1999*. Columbus: The Ohio State University; 1999.
22. Bureau of Labor Statistics. *Lost-Worktime Injuries and Illnesses: Characteristics and Resulting Days Away from Work, 2001* [news release]. Washington, DC: Bureau of Labor Statistics, US Department of Labor; 2003. Available at: <http://www.bls.gov/iif/oshwc/osh/case/osnr0017.pdf>. Accessed April 11, 2005.
23. Cameron AC, Trivedi PK. *Regression Analysis of Count Data*. New York, NY: Cambridge University Press; 1998. Econometric Society Monographs Series; No. 30.
24. Johnson WG, Ondrich J. The duration of post-injury absences from work. *Rev Econ Stat*. 1990;72:578–586.
25. Cheadle A, Franklin G, Wolfhagen C, et al. Factors influencing the duration of work-related disability: a population-based study of Washington State workers' compensation. *Am J Public Health*. 1994;84:190–196.