Race and the Risk of Fatal Injury at Work

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ABSTRACT

Objectives. This study examined employment patterns of African-American and White workers and rates of unintentional fatal injuries.

Methods. Medical examiner and census data were used to compare occupational fatality rates for African Americans and Whites in North Carolina and to adjust for racial differences in employment patterns.

Results. African Americans' occupational fatality rate was higher by a factor of 1.3 to 1.5. Differences in employment structure appear to explain much of this disparity. However, the fatality rate for African-American men would have been elevated even if they had had the same employment patterns as White men.

Conclusions. Inequalities in access to the labor market, unequal distribution of risk within jobs, and explicit discrimination are all potential explanations for racial disparities in occupational injury mortality. These conditions can be addressed through a combination of social and workplace interventions, including efforts to improve conditions for the most disadvantaged workers. (*Am J Public Health*. 1998;88:40–44)

Introduction

During the first half of this century, dirty, dangerous jobs, collectively known as "Negro work," were openly reserved for Black workers.[1] Such discrimination in hiring and assignment of tasks led to high exposures to industrial hazards and elevated rates of occupational disease among African-American workers in some settings.[2,3] Well-known instances include the case of a largely African-American group of tunnel builders in the 1930s who were heavily exposed to silica dust and suffered 60% mortality within 5 years[4] and the observation, in the 1960s, of excess lung cancer among steelworkers that was almost entirely attributable to an 11-fold increase in lung cancer mortality among African-American workers assigned to the top side of coke ovens, where exposures to coke fumes were highest.[5]

African Americans are still disadvantaged at work today. Relative to White Americans, they have more difficulty finding work, and, when employed, their jobs pay less and are of lower quality.[6,7] As they do with respect to general health,[8] African Americans appear to fare worse in terms of occupational health and safety.[9] In particular, African Americans are at high risk of dying from occupational injuries.[10-12] Throughout the 1980s, the national rate of occupational fatality was higher for African Americans than for any other group, averaging 6.5 per 100 000 workers, in contrast to 5.8 per 100 000 for White workers.[13] Greater differentials have been observed in some states, such as North Carolina.[11]

Discussions in the public health literature have focused on the extent to which racial differences in the risk of being fatally injured at work are explained by labor market forces that might concentrate African

Americans in inherently dangerous types of jobs.[12,14,15] However, differential occupational injury rates could also arise if African-American workers had greater risks of injury than Whites doing the same jobs, perhaps because of institutional or personal racism that segregates exposure to hazards within workplaces.

To empirically assess whether differences in employment structure and differences in risk within jobs help to explain the racial gap in fatal occupational injury rates, we analyzed African-American and White workers' employment patterns and rates of unintentional fatal injury on the job in North Carolina from 1977 to 1991.

Methods

Fatal unintentional occupational injury cases were identified through North Carolina's statewide medical examiner system, which provides high-quality data for epidemiologic studies of occupational injuries.[11,16] Medical examiner cases for the period January 1, 1977, to December 31, 1991, were eligible for the study if computer records indicated that the investigating medical examiner reported the manner of death as "accident" and if the fatal injury occurred while the decedent was "at work" in North Carolina. Deaths that occurred in North Car-

olina but resulted from injuries sustained in other states, as well as persons of unknown age or younger than 17 years, were excluded because the relevant population information was unavailable from the census. Cases in which the interval between injury and death was more than 30 days were not considered because the long interval from injury to death might have resulted in their being different from the majority of cases and might have reduced the number of such cases coming to a medical examiner's attention.

Information describing the race of decedents is collected by funeral directors from next of kin or other informants and coded by the Office of the Chief Medical Examiner in predetermined categories. For this study, only persons whose race was coded as "Black" or "White" were included. The number of deaths among workers of other races was small (30).

Unintentional injury deaths were identified via the manner of death assigned by the medical examiner and via the standard codes of the ninth revision of the *International Classification of Diseases* for external causes of death. Decedents' occupation and industry at the time of injury were abstracted and coded according to the 1990 US census classification system for industry and occupation.[17]

Estimates of workforce size by age, sex, race, occupation, and industry were based on a 5% sample of the 1980 and 1990 population censuses,[18,19] with occupation and industry recoded to the system used in 1990. Worker populations in intercensal years were estimated by a linear model, and the estimated number of workers in each stratum was summed over time to estimate person-years at risk. The cases and population estimates were used to estimate crude and adjusted rates of injury mortality per 100 000 worker-years. Age- and sex-adjusted mortality rates were directly standardized to the age and/or sex distribution of the entire state workforce.

To evaluate employment structure and job factors as potential explanations for the difference in injury mortality rates between the races, we used an indicator related to the standardized mortality ratio. Similar statistics have been used for international comparisons of mortality.[20] To control for racial differences in job distribution, we estimated what the ratio of the total occupational injury death rate among African Americans relative to Whites would have been in 1977 through 1991 if Black and White workers had had the same distribution of jobs by occupation within industry. The fatal occupational injury rate expected among African Americans if their job distribution had been the same as that of Whites was computed by weighting occupation- and industry-specific injury rates for African Americans by the number of Whites employed in the same occupations and industries. This hypothetical rate was divided by the rate observed among White workers to obtain the mortality ratio adjusted for employment structure. Ninety-five percent confidence intervals for rate ratios were computed via a method based on Feiller's theorem.[21]

Results

There were 2039 deaths from unintentional traumatic injuries at work during the study period among eligible African-American and White workers. The number of deaths was largest among White workers, but the crude injury rate for African Americans was 36% higher after adjustment for age and sex (Table 1). Differential mortality was observed for both African-American women and men relative to White workers of the same sex, African-American men having the highest fatality rate of any group (Table 1). Rate ratios for women were imprecise as a result of the small number of deaths. Adjustment for sex produced notable changes in rate ratios, but age adjustment had little effect and was omitted in further analyses.

The principal causes of death were the same for both races (data not shown). However, the occupational structure of African-American and White workers was different: notably larger proportions of Whites were employed in managerial, administrative, and sales jobs with low fatality rates, while African Americans were somewhat more likely to be employed in several of the most hazardous jobs, including logging, farming, motor transport, and material moving (Table 2).

African-American workers experienced higher mortality than Whites in a number of occupations (Table 2); rate ratios for Black vs White mortality ranged from 1.08 among farmers and farm laborers to 5.49 among fishers, hunters, and trappers. However, the mortality of White workers exceeded that of Blacks in many other occupations (Table 2).

The overall difference in fatality rates between African-American and White workers was essentially eliminated by adjusting for employment structure (Table 3). However, the importance of this adjustment differed by sex. Among men, adjustment for employment structure failed to remove all of the difference in fatality rates between Black and White workers; the adjusted rate ratio indicated that the fatal injury rate would still be elevated by a factor of 1.13 among African-American men if their job distribution were the same as White men's (Table 3). Among women, in

TABLE 1—Rates of Fatal Unintentional Injury at Work (per 100 000 Worker-Years) for African-American and White Workers: North Carolina, 1977 through 1991

Sex and Race	No. Deaths	No. Worker-Years	Crude Rate	Crude Rate Ratio	Adjusted Rate	Adjusted Rate Ratio	95% Confidence Interval
Both sexes combined							
White	1587	34 556 204	4.59	Referent	4.51[a]	Referent	...
African American	452	8 198 288	5.51	1.20	6.13[a]	1.36	1.22, 1.51
Men							
White	1542	19 510 338	7.90	Referent	7.87[b]	Referent	...
African American	434	4 165 505	10.42	1.32	10.69[b]	1.35	1.22, 1.50
Women							
White	45	15 045 867	0.30	Referent	0.30[b]	Referent	...
African American	18	4 032 783	0.45	1.50	0.45[b]	1.52	0.78, 2.54

[a]Adjusted for age and sex.
[b]Adjusted for age only.

TABLE 2—Person-Years of Observation and Rates of Fatal Unintentional Injury at Work (per 100 000 Worker-Years) by Occupation for African-American and White Workers: North Carolina, 1977 through 1991

| Occupation Category | Person-Years, % | | Crude Rate | | Rate Ratio[b] | |
	African American (n = 8 198 288[a])	White (n = 34 556 204[a])	African American	White	Crude	Sex Adjusted
Managerial and professional specialty	11.4	22.4	0.64	0.71	0.91	1.12
Technical and related support	2.2	3.1	1.10	3.66	0.30	0.43
Sales and administrative support	14.6	25.4	0.25	0.73	0.34	0.44
Private household and building service	8.4	1.7	0.73	4.40	0.17	0.23
Protective service	1.3	1.3	0.00	4.80	0.00	0.00
Food preparation and service	4.4	2.6	0.55	0.34	1.64	2.35
Health services	3.4	1.1	0.36	0.00	∞	∞
Other services	1.8	1.7	0.69	0.69	1.00	0.97
Farming and farm labor	2.5	1.9	23.86	25.14	0.95	1.08
Other agricultural occupations	0.7	0.5	14.81	17.57	0.84	0.76
Forestry and logging	0.3	0.2	193.03	138.90	1.39	1.39
Fishing, hunting, and trapping	<0.1	0.1	414.71	88.00	4.71	5.49
Auto mechanics and repair	0.8	1.3	7.40	6.30	1.18	0.41
Nonauto machinery mechanics and repair	0.9	1.3	2.60	3.22	0.81	0.83
Other mechanics and repairers	1.0	1.6	4.94	3.81	1.30	1.40
Construction	4.7	5.9	19.65	15.40	1.28	1.20
Natural resource extraction	<0.1	0.1	24.97	5.25	4.76	4.87
Precision metal working	1.8	3.0	0.66	3.04	0.22	0.21
Precision wood working	0.3	0.3	0.00	0.95	0.00	0.00
Other precision production	1.5	1.3	2.43	1.30	1.87	2.43
Machine operators, wood working	0.4	0.4	5.71	11.70	0.49	0.47
Machine operators, textiles	8.3	4.6	0.44	0.57	0.78	0.93
Other machine operators	12.6	7.8	2.42	2.44	0.99	1.03
Motor vehicle transport	4.0	2.9	26.72	27.75	0.96	0.88
Rail transport	0.1	0.1	35.97	17.83	2.02	2.00
Water transport	<0.1	<0.1	0.00	12.47	0.00	0.00
Other material movers and equipment operators	1.4	0.8	18.75	20.27	0.92	0.83
Material moving equipment operators (nontruck)	0.1	0.2	11.43	20.20	0.57	0.58
Material handlers, helpers, and laborers	6.4	3.1	10.53	5.40	1.95	1.89
Military	4.7	3.3	3.60	10.56	0.34	0.27

[a]Worker-years of observation.
[b]African Americans relative to Whites.

contrast, the adjustment reversed the disparity, predicting lower mortality for African-American women if they had the same job structure as White women (Table 3).

Discussion

In North Carolina, during the period 1977 to 1991, African-American workers' rate of death from unintentional traumatic injuries on the job was 30% to 50% higher than the rate among White workers. This differential existed for both men and women. However, it did not hold for all occupations: African Americans had the higher mortality in some occupations, while that of Whites was higher in others.

The jobs held by Whites and African Americans in North Carolina were different, and this distinction appears to account for much of the overall mortality differential. For men and women combined, the gap in occupational fatality rates would be essentially eliminated if African Americans and

Whites were to work in the same kinds of occupations and industries. The influence of employment patterns was less important for men than for women. Adjusting for labor force structure reduced the mortality rate ratio for Black relative to White men from 1.32 to 1.13, providing some support for the argument that African-American men are concentrated in more hazardous kinds of jobs. However, the 13% excess risk that remained for African-American men after accounting for differences in employment structure suggests that other within-job factors also contribute to the disparity in risk.

Fatal injury rates among women must be interpreted cautiously because of the uncertainty resulting from small numbers. Nevertheless, our findings suggest that, within jobs, Black women have lower exposure to occupational hazards than White women, but that Black women's employment structure leads to higher overall fatality rates.

The public health literature offers few explanations for the different occupational

fatality rates of White and Black workers. However, social science research on inequality in pay and job quality provides useful insights. A recent study found that the majority of jobs in North Carolina remain racially segregated and that jobs held primarily by African Americans pay less and do not offer as much autonomy or opportunity for advancement as jobs with mostly White incumbents.[6] Workers' education and experience explain some of these differences, but there is no indication that workers themselves choose segregated jobs. To the extent that occupational hazards are associated with low-paying, poor-quality jobs, these processes may help to explain Black-White differences in occupational fatality rates in North Carolina. Black North Carolinians' collective disadvantages in education, health, and other objective determinants of success in the labor market[22-24] are likely to contribute to differences in employment patterns and thereby explain some of the sorting of hazardous jobs along racial lines.

TABLE 3—Effect of Adjusting for Employment Patterns on the Rate Ratio Comparing Fatal Occupational Injury Rates among African-American and White Workers

	Expected African-American Rate[a]	White Rate	Rate Ratio[b]	95% Confidence Interval
All workers[c]	4.71	4.57	1.03	0.90, 1.16
Men	8.89	7.91	1.13	0.99, 1.26
Women	0.17	0.30	0.56	0.20, 1.04

[a]Occupational fatality rate expected among African Americans if their employment patterns were the same as those of Whites.
[b]Ratio of expected rate for African Americans to observed rate for Whites.
[c]Adjusted for sex.

However, the inability of labor force structure to explain all of the disparity in occupational fatality rates among men indicates that other factors may also differentiate hazards within equivalently classified jobs. White and Black workers classified in the same census occupation and industry categories may work for different employers with different levels of capital investment or divergent attitudes and practices concerning safety. Within employers, White and Black workers with equivalent occupational titles may be assigned to different tasks or work environments. Employers may be economically motivated to create segregated jobs in order to take advantage of cheaper minority labor,[6] or segregated structures could result from explicit racism on the part of managers or advantaged workers.

Differences in exposure to labor activism and government occupational safety programs are unlikely explanations for the racial disparity shown in fatality rates. The effectiveness of the state's occupational safety and health program during the study period has been criticized,[25] and North Carolina's unionization rates are among the lowest in the nation.[7]

Despite the generally high quality of North Carolina's medical examiner data, the data used in this study have important limitations. Our research questions were ecological ones about workforce structure and comparative risks of the races within jobs. With the data available, we could not make direct inferences about factors operating at the personal level, such as exposure to safety hazards or the experience of face-to-face discrimination. Our statistical data apply only to North Carolina, although the widespread nature of some underlying socioeconomic processes may render inferences based on them relevant to other areas as well. Finally, while the information available about race operationally defines distinct populations, it does not reflect all of the dimensions of the complex construct of race.

Comparable enumeration of the study populations is also an area of uncertainty. The consistency of medical examiners' determinations of whether a given fatal injury occurred on the job may vary according to factors such as the victim's occupation and age.[26] Whether this affects the enumeration of fatal injuries by race has not been examined. In addition, minority groups, notably young African-American men, have been undercounted in the census at large,[27] but the magnitude of the undercount (if any) in the labor force has not been evaluated. In the general population, African-American women and men are undercounted by 4% to 5% (10% in age strata with the most severe undercounts), whereas White women and men are undercounted by about 2%.[27] These relatively small discrepancies cannot account for the 40% to 50% disparity in risk between races, but they may have had a greater influence on the adjusted rate ratios because of their smaller magnitude. Undercounts in the labor force are likely to be smaller, however.

Like the well-known gap in overall mortality,[8] the racial disparity in occupational fatality rates is a complex problem whose resolution will probably require action on several fronts. Policies to address inequality in employment opportunity, to deter the creation of segregated jobs, and to ensure equal pay for equal work would enhance African-American people's access to desirable, safe work. Setting safety standards and ensuring compliance is also important. As long as the existence of hazardous jobs is tolerated, the most economically and socially disadvantaged workers will continue to be at the greatest risk. □

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