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Racial and Ethnic Differences in the Frequency of Workplace Injuries and the Prevalence of Work-Related Disability

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Abstract

Occupational injuries and illnesses lead to significant healthcare costs and productivity losses for millions of workers each year. This study tested for differences in the risk of workplace injuries and the prevalence of work-related disabilities for minorities compared to non-Hispanic white workers using national survey data. Non-Hispanic black workers and foreign-born Hispanic workers worked in jobs with the highest injury risk on average, even adjusting for education and gender. These elevated levels of workplace injury risk led to a significant increase in the prevalence of work-related disabilities for non-Hispanic black and Hispanic workers. These findings suggest that disparities in economic opportunities expose minorities to greater risk of workplace injury and disability.

Occupational injuries and illnesses are an important public health concern, imposing significant costs on injured workers, employers, and society at large. Recent evidence suggests that the costs of occupational injuries and illnesses are as high as \$250 billion per year.(1, 2) Studies focusing on the economic consequences of disabilities resulting from injuries in the workplace have found that workers lose up to 30 percent of their earnings even years after an injury.(3–5)

However, there has been less study of whether and how work-related injuries differentially impact minority populations. Evidence is mixed about the association between race and ethnicity and workplace injury rates. Most evidence suggests that minorities face higher workplace injury risk,(6–17) although some others find no association.(18–23) One reason this evidence is inconsistent might be that racial disparities in job risk are strongly influenced by the availability of different types of work. For example, evidence suggests that immigrant Hispanic construction workers face elevated risk of fatal and nonfatal injuries compared to native-born Hispanic or non-Hispanic workers.(24–27) Past work also indicates that the injury rate among non-Hispanic black workers is higher than it would be if they worked the same hours as non-Hispanic white workers.(28–30) Analyses of specific occupational diseases, including lung cancer(31–33) and silicosis(34, 35), have also shown

racial disparities in the incidence of disease. However, more work is needed to understand disparities in workplace injury risk and their longer-term consequences for minority populations.

We examined how workplace injury risk and the prevalence of work-related disability varied across different racial and ethnic groups. Our first objective was to describe how the risk of workplace injury varies according to racial differences in job type (that is, whether workers in different racial groups hold more or less risky jobs). Our second objective was to observe how differences in workplace injury risk of workers affects the prevalence of disability caused by workplace injuries. Combining these two analyses allowed us to assess how disparities in exposure to workplace injury risk affected disparities in work-related disabilities.

Study Data And Methods

We used two nationally representative large survey datasets published by the US Census Bureau to capture information on racial disparities in workplace injury risk: the 2006-2013 American Community Survey and the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation. The American Community Survey data were used to construct what we call “expected” workplace injury rates, defined as the average injury rates that people face based on the types of jobs held by workers with comparable demographics (specifically, race, age, gender and education).

The large size of the American Community Survey allowed us to compute reasonably precise measures of expected workplace injury rates. However, the data did not track information on health outcomes in a way that allowed us to test whether injury risk was associated with lasting impacts on health. The Survey of Income and Program Participation is a smaller survey, but contains similar data on demographics with more detailed information on disability. Past studies have used the survey to study labor market outcomes of disabled workers.(36–44) Importantly, for each respondent self-reporting a disability, the survey asks whether the disability was caused by an injury occurring at work.

All calculations were done using STATA MP version 14.0 and computed using survey weights that reflected each respective survey’s complex design. For more complete information on the data and methods used in the study, see the Appendix.(45)

Measuring workplace injury risk

One of the strongest predictors of workplace injury risk is a worker’s occupation; a construction worker clearly has higher injury risk than someone in a white-collar managerial position. To measure occupational risk, we matched American Community Survey respondents who were employed at least one week in the previous year to data from the Bureau of Labor Statistics on annual rates of workplace injuries involving days away from work. The Bureau of Labor Statistics publishes aggregate injury statistics in the annual Survey of Occupational Injuries and Illnesses, which include data on injury rates by detailed occupation. We focused on lost-workday injuries because they are more likely to result in long-term disabilities. We merged the Bureau of Labor Statistics injury data onto the

American Community Survey sample at the occupation level using 4-digit codes from the Standard Occupational Classification system. The survey and injury data were merged from 2006 to 2013, reflecting the years for which we had data from both sources.

We used these data to estimate the number of lost-workday injuries per 1,000 workers at the race-age-gender-education level. Note that we refer to this as the expected workplace injury rate because it is calculated by taking the weighted average of the injury rates across all jobs, with the weights being the share of people in each group in each job. If one race-age-gender-education combination had a relatively high share of individuals working in high-risk jobs such as construction, that group would have had a higher expected workplace injury rate (all else equal). Note that the BLS reports injury rates based on full-time equivalents (FTEs), based on an assumption of 2,000 hours per year. To adjust for possible differences in hours worked per year across racial groups, we adjusted the injury rate for each worker according to the percent of an FTE she worked (see the Appendix for more detail on how this adjustment was done).(45)

To test differences across racial groups, we compared the expected workplace injury rates of non-Hispanic white workers to the expected workplace injury rates of non-Hispanic blacks, Hispanics, Asians and a general category of “other race” (capturing groups that are too small in our samples to be broken out separately). Because average economic opportunities and job types differ substantially between native-born and foreign-born Hispanics, we considered these groups separately.

We calculated the expected workplace injury rates for each group, overall and by gender, to reflect known differences in the types of jobs held by women and men.(46) To allow for differences in workplace injury risk over the course of a worker’s life, we computed expected workplace injury rates for workers in the following age categories: 18 to 29, 30 to 39, 40 to 49 and 50 to 64. Similarly, we grouped individuals by education into groups of less than high school, high school with no college, some college, or 4-year college degree or higher. This yielded average expected workplace injury rates for 192 race-age-education-gender combinations.

To control for average demographic differences across racial groups, we computed regression-adjusted expected workplace injury rates by race holding age, gender and education constant at their mean values within each group (see the Appendix for more detail on the regression specification).(45) We interpreted this analysis as examining how differences in economic opportunities according to race affected exposure to workplace injury risk.

Measuring the prevalence of work-related disabilities

The Survey of Income and Program Participation collects information on respondents on a monthly basis for up to 4 years. Data are collected in four-month waves, and different waves include “topical modules” that ask supplemental questions on selected topics.

We used data from the four most recent panels 1996, 2001, 2004 and 2008 to collect demographic information on age, gender, education and race that was comparable to the

American Community Survey data for the working age population age 18 to 64. We did not require individuals to be currently working, as the disabled are less likely to be employed, but we did require them to have worked at some point in their life (otherwise they would not have had the opportunity to experience a workplace injury). Additionally, a topical module asked in the second wave of each panel includes questions that provide information on disability status. The sequence of questions asks (1) whether the respondent has a health limitation that affects whether or how much they can work, (2) if so, whether the condition was caused by an injury and (3) if so, whether the injury occurred at work.(47) Note that the wording of this question is such that it may not identify disabilities as being work-related if they were caused by work-related illnesses (as opposed to injuries). The Bureau of Labor Statistics injury data do include lost-workday cases due to work-related illnesses, but this is a small portion of all lost-workday cases (just 6.4 percent in 2014).(48)

We used these data to estimate the prevalence of disabilities that were caused by workplace injuries. We compared unadjusted disability across racial groups. Because we expect the prevalence of disability to increase over time, we compared prevalence for younger (age 18 to 29) and older (age 50 to 64) workers.

In order to assess whether racial differences in prevalence were related to other individual characteristics (particularly education, which is related to job type) we used multivariable logistic regression to test for racial differences in the odds of having a disability caused by a workplace injury, with and without conditioning on other factors. The other covariates included controls for gender, education, age, survey year, and the expected workplace injury rate (where the expected workplace injury rate was merged from the American Community Survey data at the race-age-education-gender level).

Finally, to identify how differences in expected workplace injury rates are associated with the prevalence of work-related disabilities, we used the logistic regression model to compare two sets of predicted probabilities (both holding all other covariates at their mean values). First, we computed the predicted probability of a work-related disability for each race under the hypothetical scenario where we held the expected workplace injury rate constant at the mean value for white workers. Second, we computed the predicted probability of a work-related disability with the expected workplace injury rate equal to the mean value for each race category. In both cases we focused on those age 50-64 because work-related disability prevalence is relatively low in younger populations. The difference between these two sets of probabilities indicates how disparities in the expected workplace injury rates based on job types are associated with disparities in the prevalence of work-related disability.

Limitations

Our study had several limitations, including our measure of workplace injuries. While widely used, past studies show that the Bureau of Labor Statistics undercounts injuries.(49–51) Additionally, our analytic approach implicitly assumed that within-job injury rates were the same across races. But if minorities are more likely to receive riskier job tasks even within the same listed occupation, as has been suggested by past studies (31, 52, 53), our findings will understate racial disparities in workplace injury risk.

Our work-related disability measure also had limitations. Self-reported disability measures are known to suffer from biases such as justification bias.(43, 54) It is also possible that focusing on disabilities caused by a specific event such as a workplace injury could introduce other biases such as recall biases. However, it is unknown whether these biases would differ across racial lines in such a way as to confound our results.

Finally, our focus on workplace injuries may cause us to understate the extent to which occupational factors contribute to poor health for minorities. In general, injury risk has fallen considerably over the past several decades, as technology has both led to safety improvements and to a shift away from dangerous jobs. Despite this, adverse working conditions can have consequences for health that manifest later in life and that are not always recognized as work-related.(55) To the extent that these conditions are correlated with injury risk, this could exacerbate the disparities found here.

RESULTS

Our data included 11,632,466 respondents from the American Community Survey and 198,308 respondents from the Survey of Income and Program Participation. Overall, the demographic features of the two samples were similar (for a summary of demographics, see Appendix Table 1).(45) The American Community Survey data had a slightly lower percentage of non-Hispanic whites compared to the Survey of Income and Program Participation (66.6 percent compared to 71.4 percent, respectively) and a lower share of Hispanics and Asians, possibly reflecting the more recent samples. It also had a higher share of males (52.5 percent compared to 49.9 percent), possibly because we restricted the American Community Survey sample to current workers as opposed to the Survey of Program Participation, which included those who ever worked.

We found significant differences in expected workplace injury rates by race in the American Community Survey data. As expected, the expected workplace injury rate was higher for men than for women, reflecting the fact that men tend to work in riskier jobs (Exhibit 1).(46) The pattern across races was similar for men and women, though the racial differences are somewhat more pronounced for women. Male foreign-born Hispanics had expected workplace injury rates that were significantly elevated over those of whites. The expected workplace injury rate for foreign-born Hispanic male workers was 13.7 per 1,000, compared to 11.8 for white males. However, for the overall population (women and men), the expected workplace injury rates for native-born Hispanics and Asians and other races were similar to whites. These findings were consistent when we used regression adjustment to control for confounding racial differences in gender, age or education (see Appendix Table 2).

Using the Survey of Income and Program Participation data, we compared the prevalence of work-related disability across different races. Black workers had the highest prevalence of work-related disability, at 2.0 percent compared to 1.7 percent for foreign-born Hispanics, native-born Hispanics and Asians, 1.6 percent for whites and 1.1 percent for other races (data not shown).

While work-related disability prevalence was similar across race categories, this masked heterogeneity across race at different age groups. For workers age 18-29, the work-related disability prevalence was low, presumably because workers had not been exposed to job related risks for very long (Exhibit 2). However, even at younger ages there were differences across racial groups, with notably higher rates for foreign-born Hispanics age 18-29 (0.7 percent compared with 0.3 percent for whites). For those 50-64, the rate of work-related disabilities for all of minority groups was significantly higher than for whites (except for the “other race” category). For older blacks, the rate of work-related disabilities was 4.4 percent compared to 2.5 percent for older whites.

We used logistic regression to examine how other observable characteristics — including age, gender, education and expected workplace injury rates — explained racial differences in the prevalence of work-related disabilities. In the unadjusted models that didn’t control for other covariates, whites consistently had lower odds of a disability from a workplace injury than blacks or Asians (Exhibit 3). Whites also had lower odds of a work-related disability than Hispanics among workers age 50-64. Adjusting for the other covariates eliminated the difference in disability between whites, blacks, and Hispanics at older ages, though the difference persisted for Asians. The expected workplace injury rate was positively associated with the prevalence of work-related disability overall, but the effect was significantly larger in the older age group.

We also used the logistic regression model to generate predicted probabilities of work-related disability for the hypothetical scenario where all race categories had the same expected workplace injury rate, and compared them to the predicted probabilities of work-related disability in a scenario that used the observed expected workplace injury rates. Note that the expected workplace injury rate for whites was 8.8 per 1,000 workers, compared to 12.3, 11.3, 13.5, 9.6 and 9.5 for black, native-born Hispanic, foreign-born Hispanic, Asian and other race workers, respectively.

Holding the expected workplace injury rate constant at that of white workers, the predicted probability of a work-related disability was within 0.4 percentage points for all race categories except Asians, which had a comparatively high injury rate (Exhibit 4). When we instead used the observed average expected workplace injury rate for each race category, disability prevalence rose significantly for blacks (0.9 percentage points, or 39 percent), native-born Hispanics (0.6 percentage points, 27 percent) and foreign-born Hispanics (1.0 percentage points, 57 percent). This suggests that differences in expected workplace injury rates due to job type is an important factor leading to higher rates of work-related disability for blacks and Hispanics but not for Asians.

DISCUSSION

In this study, we compared the workplace injury risks of different racial and ethnic groups in the US. We found that non-Hispanic white workers consistently had among the lowest risk of workplace injury, particularly at older ages. As a result, non-Hispanic black and Hispanic workers were more likely to experience a work-related disability. Foreign-born Hispanic workers had the highest expected workplace injury rates, but had comparatively low

disability rates. This was perhaps because of sample attrition due to injured and disabled workers returning to their home country if they were disabled and unable to work, or it could be due to some other factor such as ethnic differences in the perception of disability. Asians had comparatively low job risk but higher-than-expected prevalence of disability due to workplace injuries.

This study is similar to a recent study of occupational injury disparities at the national level which used occupational injury rates compared with occupational racial and ethnic composition to draw conclusions about disparities.(16) Similar to our findings, that study found a much greater proportion of non-Hispanic black and Hispanic workers and a smaller proportion of Asian workers employed in high-risk occupations. Our findings expand on this and other prior work by demonstrating that the elevated risk persists despite other demographic characteristics, including education. We also show how the risk of injury translates into long-term health effects from more work-related disabilities.

A key implication of our findings is that systematic differences in economic opportunities are strongly associated with minorities being subjected to greater workplace injury risk. Unfortunately, these disparities reflect a long history of racial minorities facing the worst job conditions. Almost 40 years ago, J. William Lloyd and colleagues (31) published a study on the mortality of steel workers and found that, among steel workers, the highest lung cancer mortality was found among coke oven workers. Moreover, black coke oven workers experienced systematically higher risk than whites. Lloyd and his colleagues determined that this group was relegated to working on the topside of the coke ovens, which worst jobs and resulted in more exposure to carcinogenic emissions. Even as the US workplace has gotten safer for all workers, our findings indicate that these kinds of disparities in job risk have not been eliminated.

Although our study clearly established the existence of disparities workplace injury risk, it was not designed to identify the underlying mechanisms causing these disparities. Assigning workers to job tasks on a discriminatory basis within jobs, such as the black coke workers being relegated to the worst positions, is a potential explanation. Another possibility is discrimination in hiring or promotion, so that equally qualified minority workers are unable to attain better and safer jobs. To the extent our results do reflect discrimination, it could be institutional, conscious, or implicit in nature. Nevertheless, we cannot rule out other explanations that may not be related to discrimination.

It is perhaps not surprising that people with limited labor-market opportunities not only have low wages but have poor working conditions, including greater risk of occupational injuries and illnesses. However, occupational safety and health professionals have historically focused more on identifying policies and practices that induce employers to improve conditions for current workers, either voluntarily or because of pressure from government regulators. Although potentially of great value, this would not directly address discrimination-based disparities in job risk. Based on our findings, policymakers and regulators may need to review whether employers are systematically assigning races different jobs or job tasks according to the risk.

Our results also imply that future efforts to eliminate workplace injuries should also consider the population of workers most affected. If workplace safety and health interventions increase labor costs, economic theory suggests that this could lead to lower wages, reduced employment opportunities, or both. Our results suggest that such outcomes would disproportionately affect minority workers. Care needs to be taken to ensure that efforts to make workplaces safer do not at the same time reduce economic opportunities for vulnerable populations. Finally, it is important to recognize that minority workers are a growing part of the labor force and the issues raised here will only become more salient and politically charged as the United States continues to become more diverse.

Conclusion

We found systematic disparities across racial and ethnic groups in the risk of workplace injuries. These findings suggest that disparities in economic opportunities in the United States result in minorities working in more hazardous jobs and, often as a result, experiencing worse health.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Notes

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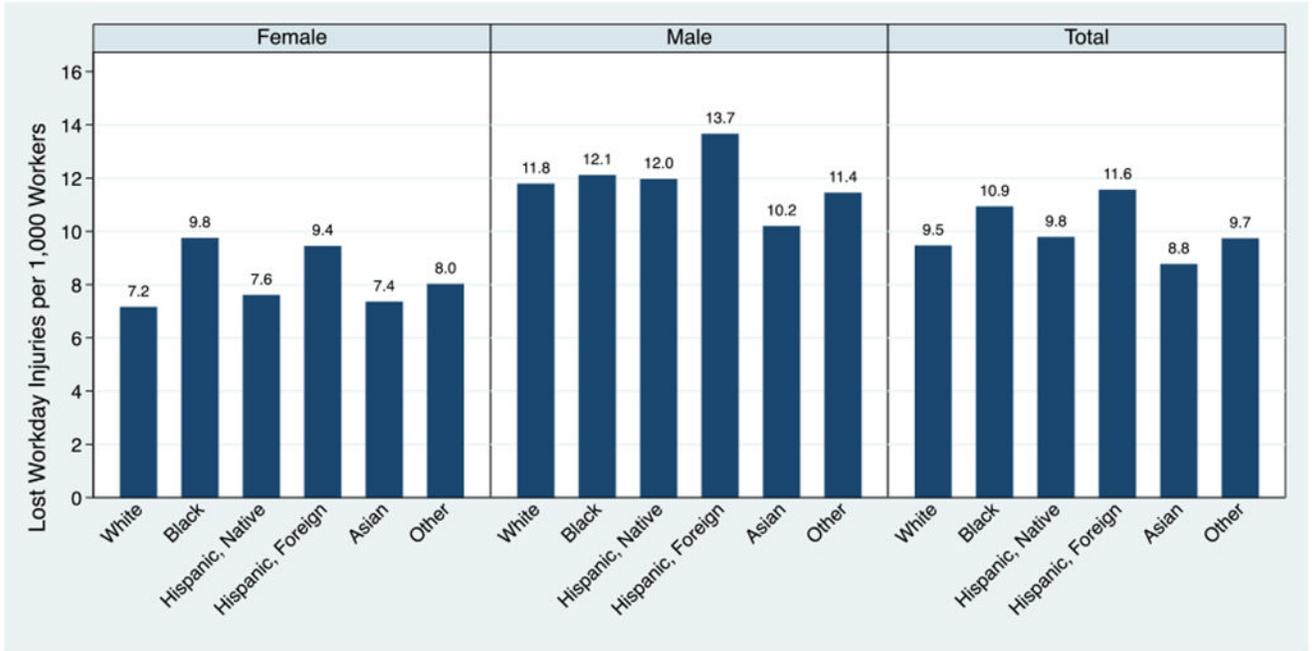


Exhibit 1. Expected workplace injuries per 1,000 workers per year, overall and according to race and gender

Notes: Figure reports the average annual expected number of lost-workday injuries for employed individuals age 18-64 according to gender and race and ethnicity. Data come from linking characteristics of survey respondents from the 2006-2013 American Community Survey (ACS) to injury rate data collected by the Bureau of Labor Statistics (BLS). BLS injury data are merged to ACS respondents based on the occupation of each respondent's longest held job in the previous year. Injury rates for individuals working less than full-time (defined as 2,000 hours in a year) are adjusted down proportional to the hours they worked. Means are calculated using sampling weights that reflect the survey design of the ACS.

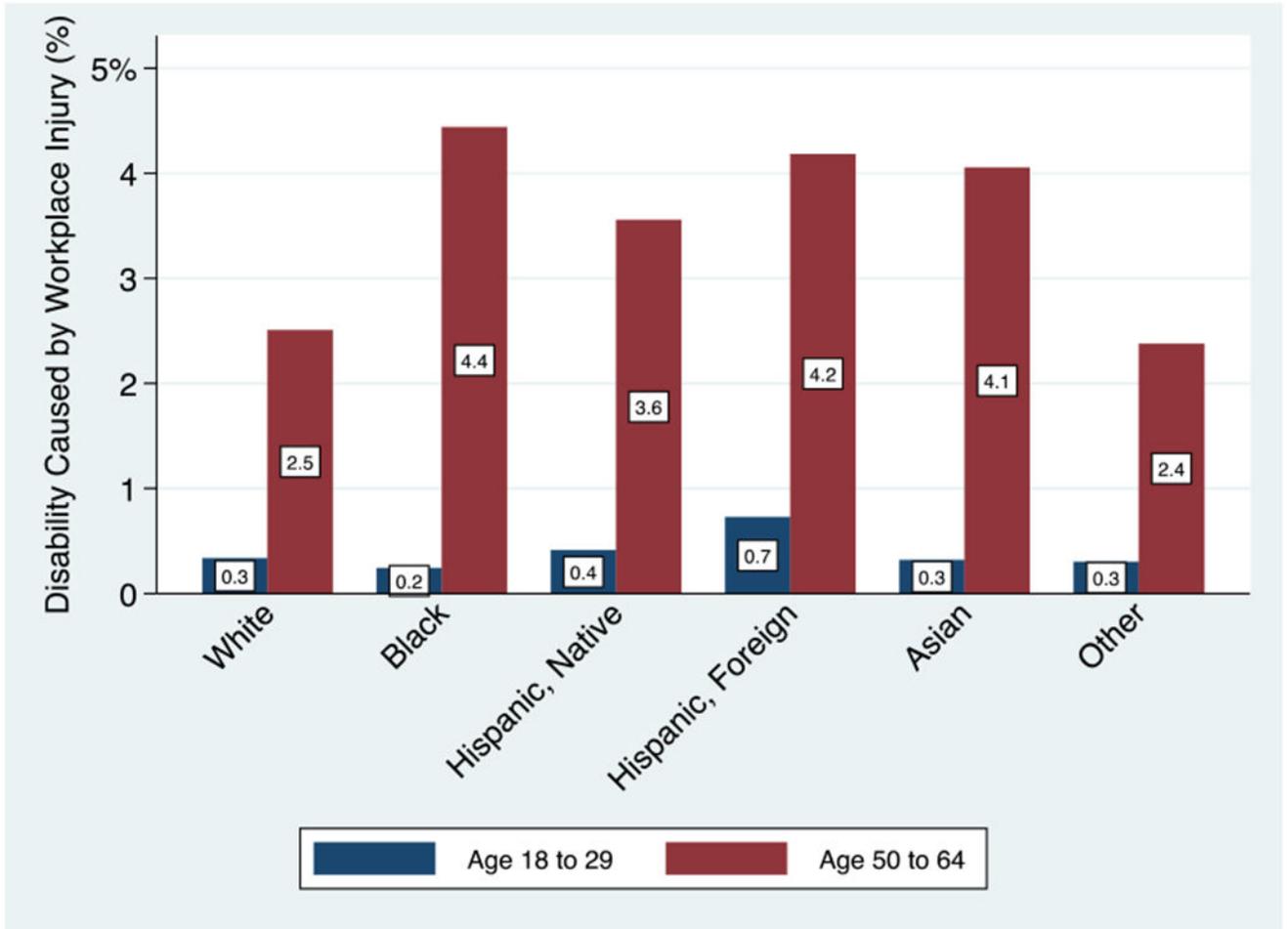


Exhibit 2. Prevalence of work-related disabilities by age and race

Notes: Figure reports the prevalence of disabilities attributed to work-related injuries for people age 18-29 and age 50-64 according to race and ethnicity. Respondents are flagged as having a disability caused by workplace injury if they self-report a health condition that limits the type or amount of work they can do, self-report that the condition was caused by an injury and self-report that the injury occurred at work. Data come from survey respondents age 18-64 from the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation (SIPP). Values are calculated using sampling weights to reflect the survey design of the SIPP.

Exhibit 3.

Unadjusted and adjusted odds ratios of a disability from a work-related injury by individual race and age

	Total		Age 18 to 30		Age 50 to 64	
	Unadjusted for other covariates	Adjusted for other covariates	Unadjusted for other covariates	Adjusted for other covariates	Unadjusted for other covariates	Adjusted for other covariates
Odds ratios for difference from White, Non-Hispanic (<i>p</i> -value)						
Black, Non-Hispanic	1.268****	0.820***	0.716	0.560*	1.806****	1.062
Hispanic, Native born	1.068	1.015	1.229	1.106	1.434**	0.987
Hispanic, Foreign born	1.022	0.582***	2.169***	1.172	1.698****	0.814
Asian	1.286***	1.452****	0.947	1.159	1.643****	1.638****
Other race	0.690***	0.774*	0.894	1.300	0.948	0.885
Expected workplace injury rate		1.171****		1.050		1.114****
Other Covariates	No	Yes	No	Yes	No	Yes

Notes: Table reports logistic regression estimates of the odds ratios for reporting a disability due to a work-related injury, comparing ethnic minorities to white, non-Hispanics. Data come from survey respondents age 18-64 from the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation (SIPP). The first column reports the results of a logistic regression model with no other covariates; the second column reports the results of a logistic regression model with controls for gender, age, education, survey year and the expected workplace injury rate. Columns 3 and 4 and Columns 5 and 6 report the same for workers age 18 to 30 and for workers 50 to 64, respectively. Variance estimates were computed using heteroskedasticity-consistent "robust" variance estimates. A * indicates statistical significance at the 5% level or better.

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Exhibit 4.

Racial differences in the predicated probability of a work-related disability based on expected workplace injury risk for workers age 50 to 64

	Predicted probability of disability from workplace injury		Difference (%)
	Fixed injury rate equal to that of white workers	Injury rate equal to observed mean for each race category	
White, Non-Hispanic	0.022	0.022	0.000 (0%)
Black, Non-Hispanic	0.024	0.033	0.009 (39%)
Hispanic, Native born	0.022	0.028	0.006 (27%)
Hispanic, Foreign born	0.018	0.029	0.010 (57%)
Asian	0.036	0.038	0.003 (8%)
Other	0.020	0.021	0.001 (7%)

Notes: Table reports the predicted probability of a disability caused by a workplace injury according to two scenarios about the expected workplace injury rate. Predicted probabilities are equal to the predicted value based on logistic regression of disability caused by workplace injury as a function of race, age, education, gender, survey year and expected workplace injury rate, with all variables except race and exposure held constant at their mean values for workers age 50 to 64. Column 2 reports the predicted values with expected workplace injury rate held constant across all groups at the average value for white workers, while Column 3 reports the predicted values using the average expected workplace injury rate for each race category. Regression data come from survey respondents from the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation (SIPP).