Final Progress Report

Project Title: Racial Disparities in the Economic Outcomes of Work-Related Disabilities
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PI: Seth Seabury
University of Southern California

Co-I: Sophie Terp
University of Southern California

Co-I: Leslie I. Boden
Boston University

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Rosemarie Gonzales
Contract & Grant Officer
Email: rosemarie.gonzales@usc.edu
Univ. of So. Calif.
Dept. of Contracts & Grants
1640 Marengo St., Suite 701, MC 9263
Los Angeles, CA 90033-9263

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Abstract:

There has been considerable public effort to identify, understand and eliminate racial and ethnic disparities in health and economic opportunities in the United States. There is a significant body of work demonstrating the presence of disparities in population health across different subsets of the population, with racial and ethnic minorities subject to significantly higher morbidity and mortality from chronic disease on average. In addition to disparities in health, there is also widespread evidence documenting disparities in economic opportunity, with racial and ethnic minorities consistently earning lower pay for comparable work.

However, despite these prior efforts, there has been comparatively little effort to understand how different sections of the population are affected by accidents in the workplace. Work-related injuries and disabilities impose large costs on society, and often have significant and lasting impacts on labor market outcomes for injured workers. Past studies have considered how the frequency and severity of occupational injuries differs across different racial and ethnic groups, but with relatively few definitive conclusions. In particular, it is largely unknown how the economic outcomes of injuries differ according to race. Conceptually, this is a difficult question to answer. On the one hand, the fact that most minorities have fewer employment opportunities means that they are less likely to work and thus face less exposure to workplace injury risk. However, when they do work they tend to work in riskier jobs, increasing their potential risk. Moreover, the effect of injuries on economic outcomes is complicated by their baseline disparities in employment and health, requiring careful empirical work to disentangle.

Our study has developed new evidence about racial and ethnic disparities in the frequency and impact of work-related injury and disability. We used national data from several sources to examine differences in the frequency of work-related injuries between different racial and ethnic groups. We found that non-Hispanic black workers and foreign-born Hispanic workers experienced the highest injury risk, on average. These differences persisted even after adjustment for average differences in individual characteristics such as age, education and gender. Because they tend to work in riskier jobs, we also found that non-Hispanic black and foreign-born Hispanic workers were most likely to have a disability that resulted from a work-related injury. Differences in the occupation mix between racial and ethnic groups was among the biggest factor explaining differences in the prevalence of work-related injuries. These findings suggest that disparities in economic opportunities result in minority groups facing increased risk of workplace injury, and that this higher risk can have lifelong economic implications by resulting in higher prevalence of disability.

Section 1

Key Findings

Key finding #1: Some minority groups face increased risk of workplace injury. Our first key finding was that there were clear and systematic differences in the injury rates of workers based on race, ethnicity and immigration status. Males had higher injury rates than females of all races, because they work in riskier jobs. However, for both genders the rates of workplace injury and illness differed. For example, male foreign-born Hispanics had expected workplace injury rates that were higher than those of white males (13.7 per thousand versus 11.8 per thousand). However, for the total population (both women and men), the expected workplace injury rates for whites were similar to those of native-born Hispanics, Asians, and others.

Key finding #2: Minorities are more likely to have a work-related disability, especially at older ages. Our second key finding was that higher injury rates for minority workers had lasting impacts on worker health and employment, as reflected by a higher prevalence of work-related disabilities. For workers ages 18–29, the work-related disability prevalence was low because workers had not yet had much time to be exposed to workplace injury risk. However, even among young workers there were disparities in disability rates between racial and ethnic groups; young, foreign-born Hispanics had much higher disability prevalence than non-Hispanic whites (0.7 percent versus 0.3 percent). For older workers (ages 50–64), work-related disabilities were more common for all of minority groups than for whites. For example, in this age range, the percent of individuals with a work-related disability was 4.4 percent, compared to 2.5 percent for whites.

Key finding #3: Differences in occupation mix between racial and ethnic groups explained most of the disparities in the prevalence of work-related disabilities. Using our statistical models, we compared racial differences in the prevalence of work-related disabilities for older workers based on actual occupational mix to the hypothetical scenario in which all racial and ethnic groups had the same occupational mix, at least in terms of average injury rates. Doing so, we found that disability prevalence would have equalized significantly if all groups had the same workplace injury risk; the predicted probability of a work-related disability was within 0.4 percentage point for all groups except Asians, who had a comparatively high rate for unknown reasons.

Key finding #4: Higher workplace injury risks lead to substantial and lifelong earnings losses for affected minorities. All individuals who experience a work-related disability experience dramatically lower earnings (approximately 64% lower on average). The higher prevalence of work-related disability means that black workers, in particular, experience high lifetime earnings losses due to higher exposure to work-related injury risk.

Translation of Findings

Our research implies that minorities face higher work-related injury risk and that this leads to worse long-term health and economic outcomes. While perhaps not surprising, this fact has not traditionally been widely recognized by policymakers and stakeholders. We took several steps to

disseminate these findings and translate them to the academic and policy research communities and to the public at large. We presented this work at scientific conferences, including the *American College of Emergency Physicians Research Forum* and the *Workers' Compensation Research Group*. We published this work in a special issue of the journal *Health Affairs* dedicated to the relationship between work and health. This also included presenting at a symposium dedicated to the launch of this issue at a policy conference in DC hosted at the National Press Club, which was broadcast online and discussed on social media. We also disseminated the work locally through the Schaeffer Center's external affairs and media office, and I was interviewed about the piece for a segment on Los Angeles' largest public radio station, KPCC.

Research Outcomes/Impact

We believe that our research could pave the way for future studies and prevention efforts that could reduce disparities in workplace injury rates and disabilities. As we note in our study, occupational safety and health professionals have tended to focus more on employer policies and practices that improve current working conditions. But our findings indicate a need for policymakers and regulators to review whether employers are systematically assigning races different jobs or job tasks according to the risk. In other words, in order to reduce occupational health disparities, the safety and health community may need to coordinate and communicate with those who oversee employment practices to ensure that minority workers are not being unfairly exposed to harmful work conditions. On the other hand, our findings also suggest that the costs of efforts to reduce workplace injuries, to the extent that they are at least partially passed through to workers in the form of fewer jobs or lower wages, would disproportionately affect minority workers. Thus, care needs to be taken to ensure that efforts to make workplaces safer do not at the same time harm the economic opportunities of vulnerable populations.

Section 2

Scientific Report

The primary research goals for this study were:

- Compare differences in the frequency of workplace injuries across different populations by race, ethnicity, and immigration status.
- Examine differences in economic outcomes for workers experiencing a workplace injury according to race and ethnicity.

The specific aims we pursued to accomplish these goals were: (1) Gather survey data that include information on workplace injuries, workers' compensation claims, health, demographics and labor market outcomes; (2) Estimate the relationship between race and ethnicity and the probability of injury and disability conditional on other confounders (e.g., occupation/industry, education, exposure time, etc.); (3) Estimate the association between race and ethnicity and economic outcomes—including total earnings, hourly wages and weeks and hours worked—after

a workplace injury conditional on other cofounders; and (4) Evaluate the extent to which racial and ethnic disparities in different outcome variables can be explained by systematic differences in individual characteristics, or whether they reflect unobserved factors (including discrimination).

Data

To accomplish Aim 1, we combined data from multiple sources. First, we used data from 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 (ACS) and the 1996, 2001, 2004 and 2008 panels of the Survey of Income and Program Participation (SIPP). The ACS data were used to construct what we called "expected" workplace injury rates. These were equal to the rates of expected workplace injury that a person faces based on the types of jobs someone in that race-age-gender-education group typically faces. The SIPP data were used to estimate the prevalence disability due to workplace injury, which cannot be observed in the ACS. The expected workplace injury rates inform as to differences in exposure to workplace injury risk, while the prevalence of disability informs as to how the differential exposure (if any) contributes to differences in population health.

Constructing expected workplace injury rates

The key advantage of the ACS for our study was that it is very large, allowing us to incorporate differences in employment tendencies for fairly detailed breakdowns on age, education, gender and race at the 4-digit occupation level.[1]

To measure occupational risk, we identified individuals who were working age (18 to 64) and employed at least one week in the previous year using the ACS. We then identified the primary occupation – defined as the occupation that you worked for the most in the previous year – and linked workers on the basis of occupation to injury rate data from the Bureau of Labor Statistics (BLS). The BLS publishes annual data on work-related injuries from the annual Survey of Occupational Injuries and Illnesses (SOII). The BLS collects data from a sample of more than 200,000 firms annually and publishes aggregate statistics based on these reports (the SOII), including data on injury rates by detailed occupation. We focused on lost-workday injuries (as opposed to all injuries) because they are more likely to result in long-term health problems and disabilities. The ACS and BLS data were merged from 2006 to 2012, reflecting the years for which we had data from both sources. We merged injury data from both sources at the occupation level using 4-digit codes from the Standard Occupational Classification (SOC) system. SOC codes are created and maintained by the BLS for the purposes of classifying workers' occupations for data collection and reporting purposes. As of 2010, there were 840 detailed occupations in the SOC system.

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

[1] Detailed information on the ACS, including sampling procedures, data dictionaries, questionnaires and downloads, are available here: http://www.census.gov/programs-surveys/acs/data.html (accessed on September 3, 2016).

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. So, suppose someone worked 1,000 hours in a job that had a reported injury rate of 10 injuries per 1,000 workers. In this case, we would assign an expected workplace injury rate of 5 per 1,000 to that individual. This approach has some limitations, because it assumes injury risk is directly proportional to hours worked and ignores the possibility that part-time workers may differ systematically (e.g., they may work more dangerous shifts or have less skill, and be injured with a likelihood that is more than proportional to hours worked). However, we feel this approach is more consistent with the BLS data and we note that the qualitative findings are the same if we do not adjust for hours worked. Note that this approach means that individuals in groups that work fewer hours or are less likely to have any job will have lower injury rates even if the jobs they do have are riskier.

Constructing disability prevalence estimates

The SIPP is a smaller survey, that isn't as useful for providing breakdowns on the occupation level. However, the SIPP do contain similar data on demographics and labor market outcomes, and they also include detailed information on disability status. Importantly for the purposes of this study, the SIPP include (self-reported) detail on whether or not a disability was caused due to a work-related injury, which is not available in the ACS.[2]

The SIPP collects information on respondents on a monthly basis for up to 4 years. So, for individuals in the 2004 panel, core data elements are available monthly from January 2004 to December 2007. Data are collected in four-month waves, and different waves include "topical modules" that ask supplemental questions on selected topics. The survey units are households, and all members of the household age 15+ are surveyed. The topical modules can be linked to the core data files at the person level.

The SIPP was collected annually from 1984 to 1993, but after a redesign in 1996 it was collected at varying intervals (1996, 2001, 2004 and 2008). The 1996 redesign changed the panel structure of the data, resulting in larger sample but with fewer panels, though much of the actual survey was unchanged. We used only data from 1996+ because the race and ethnicity variables were different in the earlier years of the survey.

A topical module asked in the second wave of each panel includes questions that cover "functional limitations and disability; health and disability; health status and utilization of health care services; long-term care; medical expenses and work disability and work disability history." In particular, questions were asked about the presence and nature of any work limitations, the

[2] Detailed information on the SIPP, including sampling procedures, data dictionaries, questionnaires and downloads, are available here: http://www.census.gov/programs-surveys/sipp/data.html (accessed on September 3, 2016).

date at which any work limitation began, whether the respondent worked at the time the limitation began, whether the limitation was due to an accident or injury and whether the accident or injury occurred at work.

Specifically, the SIPP asks the following sequence of questions that we used to identify work-related disabilities:

> LMTVER
> I have recorded that [fill HISHER] health or condition limits the kind or amount of work [fill HESHE] can do. Is that correct? [Yes/No]
>
> MNCAUS
> MAIN CONDITION: [fill TEMP] ASK OR VERIFY: Was this condition caused by an accident or injury? [Yes/No]
>
> MNLOC
> ASK OR VERIFY: Where did the accident or injury take place? Was it...
> (1) ...on the job?
> (2) ...during service in the Armed Forces?
> (3) ...in the home?
> (4) ...or somewhere else?

Using these questions, we identified someone as having a work-related disability if they (1) answered yes to the first question (indicating they had a disability), (2) answered yes to the second question (indicating the disability was caused by an accident or injury), and (3) responded with 1 on the third question (indicating the disability was caused by an accident or injury at work). We use the term work-related disability even though we acknowledge that we miss some disabilities caused by work-related illnesses. While important, work-related illnesses cause a relatively small fraction of lost-workday cases (less than 10% typically). Despite this limitation, we use the term work-related disability as opposed to disability caused by a workplace injury for ease of exposition and because of word limitations.

We restricted the data to those individuals who had ever worked, because those who never work are by definition not subject to work-related disabilities. With these data, we estimated the overall prevalence of a work-limiting disability, the prevalence of a disability that was caused by a workplace injury (which we refer to as work-related disability), and the percent of disability attributable to disability.

Demographic breakdowns

For our racial breakdowns, we compared non-Hispanic whites to non-Hispanic blacks, Hispanics, Asians and a general category of "Other race" that captured groups that were too small in our samples to be broken out separately. Because average economic opportunities and job types may differ between native-born and foreign-born Hispanics, we considered these groups separately.

Note that in principle one might expect to see similar differences across other ethnic groups according to whether they were native-born or foreign born, but for most other races the share of

foreign-born individuals was too small (typically less than 10%, compared to roughly 50% for Hispanics). One exception was Asians, where the share was larger, but the average characteristics (e.g., education, earnings and job risk) were generally similar for foreign-born and native-born Asians, which was not the case for Hispanics.

In terms of education, we grouped individuals in terms of less than high school, high school diploma with no college, some college, or 4-year college degree or higher. We created broad age categories corresponding to 18 to 29 years, 30 to 39, 40 to 49 and 50 to 64. We dropped individuals less than 18 or over 64 to focus on the working-age population. In principle, we could have included the 65+ population for the disability prevalence sample, but we were concerned that there could be differences in self-reported disability for the retired population that would make it inconsistent with the working age population (e.g., individuals may not consider a health limitation to be work-limiting if they were already expecting to be retired).

Statistical Analysis

To accomplish Aims 2, 3 and 4, we conducted six separate analyses in the course of this study:

1. Unadjusted comparison of the expected workplace injury rates according to race, overall and separately by male/female. (Aim 2)
2. Adjusted comparison of the expected workplace injury rate by race while conditioning on age, education and race. (Aim 2)
3. Unadjusted prevalence of work-related disability by race for the younger (18 to 29) and older (50 to 64) age groups. (Aim 2 and 3)
4. Unadjusted and adjusted odds ratios of having a work-related disability for each racial group compared to non-Hispanic whites. (Aim 2 and 3)
5. Predicted probability of a work-related disability by race for two scenarios – one where expected job risk is the same for all groups (equal to the mean value for whites) and one in which different racial groups have their own mean value of expected job risk. (Aim 4)
6. Estimated differences in average monthly earnings from the SIPP based on disability status. (Aim 3)

Analyses 1 and 3 were simple unadjusted mean comparisons across different subpopulations. These means were constructed using sampling weights from the ACS and SIPP that reflected the design of each survey.

For Analysis 2, we used linear regression to estimate the impact of race on injury rate. Note that we used linear regression because the outcome variable was the expected workplace injury rate at the group level, not a binary indicator of whether any given individual was injured. This can be interpreted as examining the predicted injury rate for different racial groups as if each race category had the same breakdown of gender, age and educational mix. Standard errors and *p*-values for this regression were computed using heteroscedasticity-consistent "robust" variance estimates.

An alternative approach would have been to not aggregate to the group level before estimating the regression, and running an individual regression using each person's job risk as the dependent variable. In principle, as long as we cluster the standard errors at the occupation level, this approach should provide valid inference. However, we felt that the group-level regression was more intuitive and better represented what was available in the data. We also note that the choice is somewhat immaterial, because the results were nearly identical with the individual-level regression.

We used a different approach for Analysis 4. Because we had individual data on disability prevalence, we used multivariable logistic regression to test for racial differences in the probability of a work-related disability, with and without conditioning on other confounding factors. The logic behind comparing the unadjusted and adjusted odds ratios was to study the extent to which differences in disability prevalence across racial groups was explained by observable characteristics of individuals. The covariates included age, gender, and education. We also merged the expected workplace injury risk from the SIPP data at the race-age-education-gender level. Because we adjust for hours worked, this incorporates both the expected risk when a group is working and the possibility that they are less likely to work. We use the expected job risk to test for how the types of jobs someone in a certain demographic is more likely to hold predicts the prevalence of work-related disability.

Note that we did not include contemporaneous job characteristics—e.g., earnings or occupation—for the SIPP respondents as confounders. The reason for this is that these could be affected by the presence of health limitations. These factors could also be related to race and ethnicity, so including them could over-control for the disparities we are trying to detect. In this model, where we were interested in comparing the odds ratio estimates, we simply computed odds ratios overall and separately for the youngest and oldest individuals, rather than estimate a full set of interaction terms. As with Analysis 2, standard errors and *p*-values for this regression were computed using heteroscedasticity-consistent "robust" variance estimates.

For analysis 5, we used the logistic regressions to estimate the predicted probability that an individual has a work-related disability under two scenarios. The first scenario was a hypothetical in which 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. In the second scenario, 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.

For analysis 6, we reported average monthly earnings in the SIPP broken down by race and ethnicity overall and according to whether workers had a work-related disability. We then compared the "difference-in-differences" between whites and other groups to see whether the impact of the disability disproportionately affected minorities.

Key Findings and 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. 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.

Key Finding 1: Disparities in the rates of workplace injury (Aim 2). Our first key finding was to document the existence of clear and systematic differences in the expected injury rates of workers based on race, ethnicity and immigration status. Males had higher expected injury rates than females of all races, because they work in riskier jobs. However, for both genders the rates of workplace injury and illness differed, with non-Hispanic black and foreign-born Hispanic workers having the highest expected injury rates. For example, male foreign-born Hispanics had expected workplace injury rates that were higher than those of white males (13.7 per thousand versus 11.8 per thousand). However, for the total population (both women and men), the expected workplace injury rates for whites were similar to those of native-born Hispanics, Asians, and others. These findings were similar regardless of whether or not we used regression adjustment, indicating that they were not driven by underlying differences in education or other characteristics.

Key finding 2: Minorities were more likely to have a work-related disability, especially at older ages (Aims 2 and 3). For workers ages 18–29, the work-related disability prevalence was low because workers had not yet had much time to be exposed to workplace injury risk. However, even among young workers there were disparities in disability rates between racial and ethnic groups; young, foreign-born Hispanics had much higher disability prevalence than non-Hispanic whites (0.7 percent versus 0.3 percent). For older workers (ages 50–64), work-related disabilities were more common for all of minority groups than for whites. For example, in this age range, the percent of individuals with a work-related disability was 4.4 percent, compared to 2.5 percent for whites.

We also 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. 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.

Key finding 3: Differences in occupation mix between racial and ethnic groups explained most of the disparities in the prevalence of work-related disabilities (Aim 4). Using our statistical models, we compared racial differences in the prevalence of work-related disabilities for older workers based on actual occupational mix to the hypothetical scenario in which all racial and ethnic groups had the same occupational mix, at least in terms of average injury rates. Doing so, we found that disability prevalence would have equalized significantly if all groups had the same workplace injury risk; the predicted probability of a work-related disability was within 0.4 percentage point for all groups except Asians, who had a comparatively high rate for unknown reasons.

Key finding 4: Higher workplace injury risks lead to substantial and lifelong earnings losses for affected minorities (Aim 3). All individuals who experience a work-related disability experience dramatically lower earnings (approximately 64% lower on average). The higher prevalence of work-related disability means that black workers, in particular, experience high lifetime earnings losses due to higher exposure to work-related injury risk.

For example, Table 1 reports preliminary data on the impact of workplace injuries on earnings and hours worked.

Table 1. Differences in monthly earnings by race and work-related disability

	All Workers	With Work-Related Disability	Without Work-Related Disability
All Races	$2,262	$820	$2,288
White, Non-Hispanic	2,503	938	2,530
Black, Non-Hispanic Difference from white, $s (%)	1,627 -876 (-35%)	489 -449 (-48%)	1,651 -879 (-35%)
Hispanic Difference from white, $s (%)	1,511 -992 (-40%)	554 -384 (-41%)	1,529 -1,001 (-40%)
Other Race Difference from white, $s (%)	2,328 -175 (-7%)	877 -61 (-7%)	2,351 -180 (-7%)

Notes: Authors' calculations from the merged 1996-2008 SIPP data (N=221,614).

The first column reports the average monthly earnings for all workers, while the next two reports them for workers with and without a work-related injury, respectively. The table shows that all individuals with a work related disability experience dramatically lower monthly earnings ($820 compared to $2,262), and that white, non-Hispanic individuals have the highest average earnings. However, the table also shows that the difference for black and white individuals is largest (in percent terms) for those with a work-related disability, whereas the difference between white and Hispanic and other races is similar in percent terms for other races.

Publications

Proceedings

Seabury, S., L. Boden, and S. Terp. "184 Racial Disparities in the Frequency of Workplace Injuries." Annals of Emergency Medicine 66.4 (2015): S65-S66.

Journal Article

Seabury SA, Terp S, Boden LI. "Racial And Ethnic Differences In The Frequency Of Workplace Injuries And Prevalence Of Work-Related Disability." Health Affairs (Millwood); 36(2): 266-273. 2017.

Final Enrollment Table

This study used only publicly available, retrospective data and was determined to be human subjects exempt by the Institutional Review Board at USC.