Worker Populations at Risk for Work-related Injuries across the Life Course

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Abstract

Background—Workplace injuries can have a substantial economic impact. Rates of workplace injuries differ across age groups, yet occupations/industry sectors at highest risk within age groups

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have not been identified. We examined workplace injury risk across industry sectors for three age groups using nationally-representative U.S. data.

Methods—Data from 1997–2009 National Health Interview Survey (NHIS) were pooled for employed adults by age groups: 1) 18–25 (n=22,261); 2) 26–54 (n=121,559); and 3) 55+ (n=24,851). Workplace injury risk comparisons were made using logistic regression, with the Services sector as the referent and adjustment for sample design, gender, education, race/ethnicity, age, and income-to-poverty ratio.

Results—Overall 3-month injury prevalence was 0.88%. Highest risk sectors for workers aged 18–25 included: Agriculture/forestry/fisheries (Odds Ratio=4.80; 95% Confidence Interval 2.23–10.32), Healthcare/social assistance (2.71; 1.50–4.91), Construction (2.66; 1.56–4.53), Manufacturing (2.66; 1.54–4.61); for workers 26–54: Construction (2.30; 1.76–3.0), Agriculture/forestry/fisheries (1.91; 1.16–3.15), and Manufacturing (1.58; 1.28–1.96); for workers 55+: Agriculture/forestry/fisheries (3.01; 1.16–7.81), Transportation/communication/other public utilities (2.55; 1.44–4.49), and Construction (2.25; 1.09–4.67).

Conclusions—Agriculture/forestry/fisheries and Construction were among the sectors with highest workplace injury risk for workers across all age groups. Differences in highest risk industries were identified between the youngest and oldest industry groups. Our results indicate a need for age specific interventions in some industries, and a need for more comprehensive measures in others.

Keywords

Introduction

Occupational injuries comprise approximately one-third of all injuries sustained and can have a substantial economic impact due to lost income, compensation costs, long-term health problems, etc. [Wilkins and Mackenzie 2007, Boden and Galizzi 1999]. Risk and consequences of workplace injuries are not uniform across age groups. While injuries in older workers often lead to more disability [Silverstein 2008, Wegman, et al. 2004], injuries in young workers are more prevalent and can have a substantial impact on the rest of their work life [Silverstein 2008, Jackson 2001, Salminen 2004, Lewis, et al. 1998]. While older workers are currently the fastest growing worker group [Hobbs, et al. 2006], injured workers aged 16–24 years report significantly lower earnings in the following year [Breslin, et al. 2007]. Thus, identifying industry sectors with the highest injury risk within each age group, especially the extremes of work life, is important for development of effective preventive interventions.

Materials and Methods

This study included 168,671 adult participants (aged 18 and older) of the 1997–2009 National Health Interview Survey (NHIS), who were employed (i.e. worked for pay) in the week prior to the interview. Data were obtained from the Persons, Sample Adult, and Injury Episode NHIS files. Industry was classified using the National Occupational Research Agenda (NORA) sectors: 1) Agriculture/forestry/fisheries; 2) Construction; 3) Healthcare/social assistance; 4) Manufacturing; 5) Mining; 6) Services; 7) Transportation/communication/other public utilities; and 8) Wholesale trade/retail [NIOSH 2006]. The Services sector was chosen as a reference group due to having the largest proportion of workers across all age groups. Injuries captured by NHIS were those occurring within three months prior to the interview for which medical attention was sought. Injuries were

classified as work-related if the participants responded "Working at a paid job" to the question about what they were doing at the time of injury. Work-related injury was treated as a dichotomous variable (yes/no). One injury event per individual was analyzed in cases of multiple events. Workers were classified into three age categories: 1) 18–25 years, 2) 26–54 years, and 3)55+ years. Because secondary data was used, participants' signed informed consents were not obtained. This study was approved by the University of Miami Institutional Review Board for Human Subjects.

Statistical Analysis

Statistical Analysis System (SAS) 9.2 (SAS Institute, Inc, Cary, NC) was used for all analyses. Multivariable logistic regression models were run for each age group. All models were adjusted for gender, race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, other), education (<high school (HS), HS or equivalent, >HS), and income-to-poverty ratio. Adult file sampling weights were utilized and adjusted for multiple years of data.

Results

A total of 4,768 participants reported being injured; of these 1,484 were injured at work (Table I). These represent respectively 2,671,571(SD=47,683) and 837,649(SD=26,368) employed adults annually. In multivariable modeling, gender, race/ethnicity, NORA sector, and income-to-poverty ratio were significantly associated with work-related injuries for the overall sample (Table II). Of non-occupational factors, male gender had the highest association with workplace injuries overall (odds ratio=1.71;p<0.0001) and for age groups 18–25 (2.33;p<0.0001) and 26–54 (1.63;p<0.0001). For the overall sample, lower risk of injury was associated with Hispanic (0.55;p<0.0001) and other (0.57;p=0.0006) races/ ethnicities. Similar associations were observed for age groups 18–25 and 26–54. Education was not associated with injury risk in any group, however it was left in the model as an indicator of socio-economic status. For workers 55+, only industry sector was associated with injury risk.

Across NORA sectors, the highest risk of workplace injuries for the overall sample was in Agriculture/forestry/fisheries (2.41;p<0.0001), Construction (2.38;p<0.0001), and Manufacturing (1.75;p<0.0001). Agriculture/forestry/fisheries and Construction were among the highest risk sectors across all age groups (age 18–25: 4.80;p<0.0001 and 2.66;p=0.0004; age 26–54: 1.91;p=0.011 and 2.30;p<0.0001; age 55+: 3.01;p=0.019 and 2.25;p=0.037 respectively). Manufacturing was among the highest risk industries for the two younger groups (18–25: 2.62;p=0.0006; 26–54: 1.59;p<0.0001). In addition, there was a higher risk associated with being in Healthcare/social assistance for workers aged 18–25 (2.71;p=0.001), and Transportation/communication/other public utilities for workers aged 55+ (2.55;p=0.002).

Discussion

Risk factors for workplace injury (i.e. male gender, non-Hispanic white race/ethnicity) were similar for the two youngest groups, and echo those in the overall population. However, for workers 55+, only Industry was associated with injury risk. Agriculture/forestry/fisheries and Construction were consistently among the highest risk industries across all age groups, and risk of injury was increased in Manufacturing for workers in the two younger groups. In addition, older workers in Transportation/communication/other public utilities and younger workers in Healthcare/social assistance sectors were at increased injury risk. These results are consistent with previous studies that found an increased risk of fatal workplace injury in Agriculture/forestry/fishing and Construction [Purschwitz and Field 1990, Tiesman, et al. 2011, Bell, et al. 1990]. We showed that workers in these industries are generally at the

highest risk of workplace injuries across all age groups even after adjustment for social class factors including education and poverty status. Transportation was also previously reported as having increased fatal injury risk [Tiesman, et al. 2011, Bell, et al. 1990], and we found it to be an especially high-risk industry for older workers.

Much of the occupational injury research so far has focused on injuries in specific occupations (e.g. construction workers) or a subset of injuries (e.g. fatal, brain), and virtually no recent studies exist comparing injury risk across industries. Several studies comparing age-specific injury risks have been done, however reasons for differences in risk across age groups are still not clear. Explanations offered include: greater lengths of employment and greater experience among older workers [Chau, et al. 2010], ability to withstand higher physical demand among younger workers [Chau, et al. 2009], and particular kinds of injuries that different age groups are prone to [Kemmlert and Lundholm 2001, Laflamme 1997, Landy, et al. 2011]. Workers of different ages also differ in patterns of employment within industries. While age-targeted interventions could be implemented within high-risk industries, it is important to understand age-specific exposures within those industries that put workers at higher risk.

Limitations

The NHIS collects information on injuries for which medical attention was sought and which happened in the three months prior to the survey. Therefore these data represent an underestimate of actual injuries, and contain no information on less severe injuries or death, or on injured workers who subsequently lost or quit their jobs. Nevertheless, the NHIS is currently one of the most important population-based sources of injury information.

Conclusions

Across the U.S. workforce, opportunities exist for age-targeted injury prevention interventions. Given that the risk of work-related injury for workers in the Agriculture/ forestry/fisheries and Construction sectors was among the highest for all age groups, development of effective workplace injury prevention strategies is essential for these sectors. There is also a need for better injury prevention programs targeting specific age groups at risk in Healthcare/social assistance and Transportation/communication/other public utilities sectors.

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Table I

Prevalence of workplace injuries in employed adults by socio-demographic subgroups, 1997–2009 National Health Interview Survey.

Sample Characteristics	Overall					Age 18–25				Age 26–54				Age 55+			
	NHIS sample	Estimated population	Work-related injuries	Prevalence, %*	Prevalence SE	NHIS sample	Work-related injuries	Prevalence, %*	Prevalence SE	NHIS sample	Work-related injuries	Prevalence, %*	Prevalence SE	NHIS sample	Work-related injuries	Prevalence, %*	Prevalence SE
Total:	168,671	95,461,938	1,484	0.88	0.03	22,261	247	1.15	0.09	121,559	1,082	0.87	0.03	24,851	155	0.61	0.05
Gender:																	
Male	83,854	51,642,030	969	1.14	0.04	10,869	173	1.61	0.15	60,636	704	1.13	0.05	12,349	92	0.72	0.08
Female	84,817	43,819,908	515	0.57	0.03	11,392	74	0.63	0.08	60,923	378	0.57	0.04	12,502	63	0.47	0.07
Education:																	
Less than high school	21,479	10,612,527	220	1.11	0.09	3,325	49	1.53	0.26	14,546	147	1.07	0.10	3,608	24	0.77	0.18
High school	44,865	25,985,803	492	1.13	0.06	6,344	88	1.47	0.19	31,416	358	1.15	0.07	7,105	46	0.63	0.10
More than high school	102,327	58,863,609	772	0.72	0.03	12,592	110	0.88	0.10	75,597	577	0.72	0.03	14,138	85	0.56	0.07
Race/ethnicity:																	
Hispanic	26,079	10,677,018	171	0.69	0.06	4,516	33	0.60	0.12	19,260	122	0.68	0.07	2,303	16	0.84	0.25
Non-Hispanic White	112,167	70,234,177	1,077	0.93	0.03	13,699	182	1.33	0.12	79,728	774	0.92	0.04	18,740	121	0.61	0.06
Black	22,883	10,188,532	189	0.85	0.07	3,037	27	0.99	0.23	16,979	151	0.89	0.09	2,867	11	0.36	0.13
Other	7,542	4,362,212	47	0.51	0.08	1,009	5	0.36	0.17	5,592	35	0.53	0.10	941	7	0.59	0.24
Industry sector:																	
Agriculture, forestry, fisheries	3,231	1,726,275	45	1.80	0.33	465	14	3.63	1.21	2,180	25	1.48	0.35	586	6	1.40	0.64
Construction	11,434	6,986,907	205	1.83	0.16	1,572	39	2.35	0.43	8,595	154	1.84	0.19	1,267	12	1.08	0.33
Healthcare and social assistance	23,764	12,607,542	164	0.60	0.06	2,462	27	1.24	0.29	17,429	114	0.52	0.05	3,873	23	0.46	0.10
Manufacturing	22,597	12,919,537	266	1.19	0.08	2,031	40	2.03	0.40	17,558	196	1.13	0.09	3,008	30	0.89	0.17
Mining	647	389,520	7	1.36	0.53	63	1	1.44	1.44	501	6	1.55	0.67	83	0	-	-
Services	69,093	39,323,920	417	0.58	0.03	8,707	54	0.61	0.10	49,514	314	0.61	0.04	10,872	49	0.43	0.07
Transportation, communication, and other public utilities	10,722	6,053,892	113	1.11	0.12	934	15	1.72	0.54	8,288	83	1.03	0.13	1,500	15	1.16	0.27
Wholesale Trade and Retail	27,183	15,454,346	267	0.95	0.07	6,027	57	1.00	0.18	17,494	190	1.03	0.09	3,662	20	0.51	0.13

NHIS: National Health Interview Survey; SE: standard error.

*
- Prevalence estimates represent 3-month prevalence rates due to the length of the recall period in NHIS.

Table II

Overall and age group-specific weighted multivariable logistic regression for workplace injury predictors, 1997–2009 NHIS.

	Overall			Age 18–25			Age 26–54			Age 55+		
	OR	95% Confidence Limits		OR	95% Confidence Limits		OR	95% Confidence Limits		OR	95% Confidence Limits	
Race/Ethnicity:												
White	1.00	-	-	1.00	-	-	1.00	-	-	1.00	-	-
Hispanic	0.55****	0.45	0.68	0.31****	0.20	0.51	0.57****	0.45	0.74	1.29	0.67	2.48
Black	0.90	0.74	1.09	0.74	0.44	1.22	0.97	0.77	1.21	0.59	0.29	1.20
Other	0.57***	0.41	0.79	0.30*	0.11	0.78	0.60**	0.41	0.88	0.96	0.41	2.26
Education:												
Less than high school	1.00	-	-	1.00	-	-	1.00	-	-	1.00	-	-
High school	1.05	0.87	1.28	0.94	0.61	1.46	1.10	0.86	1.41	0.86	0.46	1.59
More than high school	0.83	0.68	1.02	0.66	0.42	1.03	0.87	0.68	1.12	0.83	0.44	1.56
Gender:												
Female	1.00	-	-	1.00	-	-	1.00	-	-	1.00	-	-
Male	1.71****	1.49	1.96	2.33****	1.66	3.27	1.63****	1.39	1.92	1.22	0.81	1.82
Industry sector:												
Services	1.00	-	-	1.00	-	-	1.00	-	-	1.00	-	-
Agriculture, forestry, fisheries	2.41****	1.63	3.56	4.80****	2.23	10.32	1.91*	1.16	3.15	3.01*	1.16	7.81
Construction	2.38****	1.89	3.00	2.66***	1.56	4.53	2.30****	1.76	3.01	2.25*	1.09	4.67
Healthcare and social assistance	1.18	0.94	1.47	2.71**	1.50	4.91	0.95	0.74	1.22	1.14	0.67	1.94
Manufacturing	1.75****	1.45	2.11	2.66***	1.54	4.61	1.58****	1.28	1.96	1.93*	1.18	3.18
Transportation, communication, and other public utilities	1.66****	1.30	2.13	2.42*	1.18	4.97	1.46*	1.09	1.96	2.55**	1.44	4.49
Wholesale trade and retail	1.47***	1.21	1.78	1.51	0.93	2.46	1.51***	1.21	1.89	1.16	0.64	2.08
Other covariates:												
Income-to-poverty ratio	0.96***	0.94	0.97	0.96*	0.92	1.00	0.96****	0.94	0.98	1.02	0.96	1.09

Significant at:

*
− 0.05,

**
— 0.01,

***
—0.001,

****
—<0.0001 level.

All models were adjusted for gender, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, other), education (<high school (HS), HS or equivalent, >HS), and income-to-poverty ratio. Stable estimates could not be obtained for Mining due to small sample sizes in this sector. OR: odds ratio; NHIS: National Health Interview Survey