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Marginal structural modeling of associations of occupational injuries with voluntary and involuntary job loss among nursing home workers

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Abstract

Objectives—Qualitative studies have highlighted the possibility of job loss following occupational injuries for some workers, but prospective investigations are scant. We used a sample of nursing home workers from the Work, Family, and Health Network to prospectively investigate association between occupational injuries and job loss.

Methods—We merged data on 1331 workers assessed four times over an 18-month period with administrative data that include job loss from employers and publicly-available data on their workplaces. Workers self-reported occupational injuries in surveys. Multivariable logistic regression models estimated risk ratios for the impact of occupational injuries on overall job loss, whereas multinomial models were used to estimate odds ratio of voluntary and involuntary job loss. Use of marginal structural models allowed for adjustments of multilevel list of confounders that may be time-varying and/or on the causal pathway.

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Competing interests None declared.

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Data sharing statement Data from the Work, Family and Health Network will be available for restricted and public use on the website: http://projects.iq.harvard.edu/wfhn/home.

Contributors CAO conceptualised the study, drafted the first draft, and worked with JB on data analysis, interpretation of findings and rewriting of the paper. EV and LBH assisted with review and edits of paper drafts.

Results—By 12 months, 30.3% of workers experienced occupational injury, whereas 24.2% experienced job loss by 18 months. Comparing workers who reported occupational injuries to those reporting no injuries, risk ratio of overall job loss within subsequent 6 months was 1.31 (95% CI=0.93–1.86). Comparing the same groups, injured workers had higher odds of experiencing involuntary job loss (OR:2.19; 95% CI:1.27–3.77). Also, compared to uninjured workers, those injured more than once had higher odds of voluntary job loss (OR:1.95; 95% CI: 1.03–3.67), while those injured once had higher odds of involuntary job loss (OR:2.19; 95% CI: 1.18–4.05).

Conclusions—Despite regulatory protections, occupational injuries were associated with increased risk of voluntary and involuntary job loss for nursing home workers.

Keywords

occupational injuries; vulnerable populations; nursing homes; personnel turnover

Introduction

Over the years, qualitative studies and case reports have highlighted job loss as a consequent occurrence for workers who experience occupational injuries.[1,2] Few quantitative prospective investigations of the purported association exist. The results of the two prospective studies found in the extant literature contradict one another.[3,4] A prospective study of male workers in the US National Longitudinal Survey of Youth study found no significant associations between occupational injuries and job loss among unionized workers.[4] In contrast, a study with a national sample of newly registered hospital nurses in the US (91% female) found that those who reported incidents of sprains and strains were more likely to report job loss.[3] Neither study differentiated between voluntary and involuntary job loss, which is a critical factors as workers may self-select out of the workforce due to their injuries accounting for voluntary, but not involuntary, job loss.

Job loss may occur voluntarily (workers chose to exit jobs) or involuntarily (employer terminates employment). Either way, associations between occupational injuries and job loss are important to understand. First, job loss could lead to negative personal, family, social, and economic consequences for affected workers.[5,6] Also, an association between occupational injuries and job loss may mean that occupational health professionals need to consider additional job protection measures when interacting with injured workers. In addition, risks of occupational injury are relatively higher during the first month in new work environments, compared to other times.[7] Therefore, a situation where injured workers differentially experience job loss would put these workers at increased risks for future experiences of occupational injuries if they transition to new work environments.

Though it may seem intuitive, a causal association whereby occupational injuries drive voluntary or involuntary job loss contradicts protections offered by US federal and state regulations. While specific protections for non-federal employees vary by state workers' compensation laws, US workers who have occupational injuries are protected from job loss, and have additional guarantees of compensation and reasonable accommodation to recover from occupational injuries.[8] The study capitalized on the opportunity to merge several sources of private and public data on workers in US nursing homes to test the hypotheses that, compared to workers who reported experiencing no occupational injury in the previous six months:

1. Those experiencing injury will have higher risk ratios of overall job loss versus no job loss in the subsequent six months.
2. Those experiencing injury will have higher odds of voluntary and involuntary job loss versus no job loss in the subsequent six months.
3. Those experiencing one injury, and those experiencing more than one injury will have higher risk ratios of overall job loss versus no job loss in the subsequent six months.
4. Those experiencing one injury, and those experiencing more than one injury will have higher odds of voluntary and involuntary job loss versus no job loss in the subsequent six months.

Causal Framework for Data Analysis

Prospective estimation of the direct effects of occupational injuries on job loss using longitudinal data requires addressing key modeling hurdles. First, values of both the exposure and covariate variables may vary over time in longitudinal analysis. This possibility of exposure and covariates varying over time produces the possibility of covariates that are simultaneously intermediate and confounding variables. For example, a measure of work-family organizational climate, which describes workers' perceived pressure to make family sacrifices for the sake of work, was collected at four time points. As depicted in Figure 1, work-family organizational climate is potentially a time-varying confounder. In this sample, a higher level of work-family climate is associated with reduced risks of occupational injuries and job loss; therefore, it is imperative to control for baseline differences in work-family organizational climate. However, the experience of occupational injuries is known to influence workers' subsequent assessments of work-family organizational climate, which would make subsequent work-family organizational climate intermediate variable. Although longitudinal data allows for the ability to distinguish between baseline and subsequent values of work-family organizational climate, both values are statistically related. While traditional regression strategies cannot adjust for such time-varying confounders that may also be intermediate variables, marginal structural models (MSM) do.[9]

METHODS

Study population and data collection

The study cohort was part of the Work, Family, and Health Network (WFHN) study, a group-randomized controlled trial investigating the impact of a workplace intervention to improve workers' work and family lives.[10] The study involved 30 nursing homes located in New England states (i.e., Massachusetts, Rhode Island, Connecticut, Maine, New Hampshire and Vermont) and owned by one for-profit company. Detailed descriptions of sampling for the WFHN and study protocols have been published elsewhere.[10,11] Briefly, the 30 nursing homes were chosen to maximize distribution of study sites based on size, urbanicity, quality rating, and patient and worker characteristics.[10] Eligible participants were direct care workers working 24 or more weekly hours who did not work night shifts exclusively. WFHN enrolled 1524 workers (85.5% response rate). The sample for the current analyses consists of 1332 workers (87.4% response rate) who consented to have their administrative data shared with WFHN researchers. One participant was eliminated from all analyses because of missing data on baseline occupational injury, thereby leaving 1331 participants for the analyses.

Data were collected from participants via computer-assisted interviews at baseline and 6, 12, and 18 months after baseline. Participants completed the interviews on company time and received $20 for each survey completion. Institutional review boards at WFHN sites approved all study materials and informed consent was obtained from participants. All data were collected between 2009 and 2012.

Predictors

Occupational injury—At baseline and months 6 and 12, participants answered yes or no to: *During the past 6 months, have you had an accident or experienced an injury at work, such as burns, crushing bruises, abrasions, cuts, sprains, strains, or slips*?[12] Response of 'yes'was classified as injured, and 'no' was classified as uninjured for each survey period. Responses from months 6 and 12 were used as predictors for the first two hypotheses.

A follow-up question, administered to workers who answered yes at the corresponding assessment, asked for number of injuries during that 6-month period. Answers to the additional question were used, in combination with the first question, to classify respondents according to number of times they were injured in each 6-month period (none, one injury, and more than one injury). These values from months 6 and 12 were used as predictors for hypotheses 3 and 4.

The study chose this validated self-report measure of occupational injury due to consistent findings of underreporting in US occupational injury databases.[13–16] Comparative studies demonstrate that underreporting occurs less in workers' self-reports as compared with workers' compensation and other databases.[15] For example, health care workers reported about 63% of reportable occupational injuries observed by researchers, whereas the workers' compensation database captured about one-third of these injuries.[15]

Outcomes

Job loss—Administrative records from the company were used to create a dichotomous variable termed *overall job loss*, indicating whether workers experienced job loss before 6-, 12-, and 18-month assessments (1=yes and 0=no). The administrative data also indicated whether job loss was *voluntary* or *involuntary*. Job loss before month 6 was used in calculation of weights, while values from months 12 and 18 were used as outcomes for testing the hypotheses. Dichotomous value for overall job loss (1=yes and 0=no) was the outcome for hypotheses 1 and 3. Hypotheses 2 and 4 involved the three category job loss (none, voluntary, and involuntary).

Covariates

Condition—All analyses controlled for potential unmeasured impact of the WFHN intervention by including a term indicating whether participants' worksites were randomized to WFHN intervention or usual practice groups.

Facility characteristics: Review of literature on both occupational injuries and job loss (also termed turnover) highlighted facility-level characteristics that could confound associations between the two because they indicate organizational priorities and determine workers' workload. These include profit status, staffing ratios, overall quality of care, and number of beds/residents.[17–21] All facilities in the study were for-profit; therefore, there was no need to control for profit status. Facility-specific values for staffing ratios, overall quality of care, and number of beds/residents were culled from Medicare.gov, which is a US government website containing facility-level organizational characteristics for nursing homes. Since these values, which are continuous, did not vary during the study period, facilities were assigned their baseline values.

Social and demographic characteristics: The study questionnaires supplied the values for all other covariates. Baseline surveys were used to ascertain covariates deemed time-invariant because values were not expected to change. These were race/ethnicity, educational attainment, and occupational position.

Values of time-varying covariates came from baseline and follow-up surveys. These include age in years (continuous), tenure at facility (continuous), marital status (married/living with romantic partner or not), and household poverty level, which was created using income from all sources and household size to classify workers in comparison to US federal poverty guidelines.[22]

Physical functioning (baseline): Limitations in workers' physical functioning could lead to occupational injury and job loss. Therefore, analyses controlled for baseline physical functioning by using the validated nine-item SF-36 subscale for assessing functional limitations.[23] The tenth question on ability to dress/bath oneself was eliminated, given that this basic function is required to be a worker.

Other worker/workplace confounders (assessed at baseline, and 6, 12, and 18 months): Previous studies indicate that the following variables could be confounders and were therefore included as covariates in all our models. Baseline values were used for turnover intentions and job satisfaction while work-family organizational climate was treated as a time-varying covariate.[24–26] All variables were averages from validated scales with Likert answers ranging from 1 (strongly disagree) to 5 (strongly agree).

Baseline turnover intention (Cronbach α=0.83)—Two questions assessed workers' estimations of their likelihood of leaving position; higher scores indicate greater turnover intentions.[27] *Baseline job satisfaction* (Cronbach α=0.81): Three questions assessed satisfaction, with higher scores indicating greater job satisfaction.[28]

Work-Family Organizational climate (Cronbach α=0.66)—Three questions assessed employees' perceived pressure to make family sacrifices for the sake of work; average scores were coded so that higher values indicate less pressure.[29]

Statistical analyses

Modeling started with descriptive univariate and bivariate analyses. All model estimations used SAS version 9.4 and a significance level of p=0.05. Risk ratios were estimated for overall job loss due to its high prevalence by using a log link function and binomial distribution in PROC GENMOD;[30,31] odds ratio were estimated for voluntary and involuntary job loss using PROC SURVEYLOGISTIC. The intra-class correlation coefficient among facilities for jobs loss was 0.20. All models employed robust standard errors to account for the clustering of subjects within facilities. The results of final hypotheses testing were compared to models that included only workers at control group worksites in order to test the possibility of time-varying effects of intervention condition. These tests found no evidence of time-varying effects; therefore, we controlled for potential effects of the WFHN intervention by including a term for study condition in all models.

Hypothesis testing was done using Marginal Structural Modeling (MSM). However, we also provide results from crude logistic mixed effect models to aid comparisons with crude MSM estimates. Analyses were designed so that assessments of occupational injuries always preceded the job loss outcome. Information from previous occurrences of the exposure is necessary for MSM effect estimation. Also, reports of occupational injuries at 18 months would not have allowed for observation of subsequent job loss since data collection ended at 18 months assessments. Therefore, the exposure, occupational injuries, were only investigated at 6 and 12 month assessments, while job loss was investigated starting after 6 months and through the end of the 18-month assessment. In addition to presenting information on overall job loss, which was how previous studies have investigated these associations, we present findings that separated voluntary and involuntary job loss given that associations of occupational injuries with involuntary job loss are of practical significance to the field of occupational health. MSM strategies are implemented in two stages. The first step was to estimate stabilized-inverse probability weights, W, of the form:

$$W_{ik}=\prod_{k=0}^{t}\frac{P(I=I_{ik}|I_{ik-1},L_i,J_{i0},F)}{P(I=I_{ik}|I_{ik-1},L_i,J_{i0},F,C_{ik-1})}$$

where I is the injury predictor of interest, L is a vector of time independent covariates, J is a vector of time dependent covariates, F is a vector of facility-level covariates and C is a measure of the work-family organizational climate. The numerator and denominator for these weights were obtained by calculating predicted probabilities; logistic regression models were used when we examined occupational injuries as a yes/no variable, while multinomial logistic regression models were used with the three category form of occupational injuries.

In the second step, we estimated the direct effect of occupational injury on job loss by running weighted regression models of the form:

$$Y_{ij}=\beta_0+\beta_1 \text{Injury}_{ij}+\beta_2 L_{ij}+e_{ij}$$

For hypothesis 1, Y was dichotomous form of overall job loss, and injury indicates whether the worker reported occupational injury in the survey assessment period before Y. L is a vector of time-independent covariates, and e is the individual-level error term. The right side of the equation was similar for hypothesis 2, but the Y was the three category form of job loss (none, voluntary and involuntary). For hypotheses 3 and 4, the exposure was the three category form of occupational injury (none, one injury and more than one injury), but the outcomes for hypotheses 3 and 4 were same as hypothesis 1 and 2, respectively. Weighted logistic regression models were used for overall job loss (hypothesis 1 and 3), while weighted multinomial models were used to estimate voluntary and involuntary job loss versus no job loss (hypotheses 2 and 4).

RESULTS

Descriptive statistics

Table 1 displays the baseline sociodemographic and other characteristics of the sample. Most workers were female (91.9%), non-Hispanic White (65.4%), and had high school education (32.9%) or some college/vocational training (49.4%). Correspondingly, Certified Nursing Assistants (CNA) comprised 68.3% of the overall sample. The mean age of the sample was 38.5 years (SD=12.5). At baseline, workers in the sample generally had high average job satisfaction (4.2 out of 5), low average turnover intentions (2.1 out of 5), and rated their work-family organizational climate as mid-range (2.9 out of 5).

Multivariable analyses

All multivariable Marginal Structural Models (MSM) estimates used stabilized weights to adjust for demographic and facility-level variables as well as baseline levels of turnover intentions, job satisfaction, and physical functioning and past reports of injury and, work-family organizational climate. Table 2 presents the results from models estimating risk ratios of overall job loss comparing injured to uninjured workers (Hypothesis 1). Compared to workers who reported experiencing no occupational injury, those who reported experiencing occupational injuries had significantly higher risks of subsequent overall job loss based on estimates from the unadjusted models. The statistical significance of the risk of subsequent overall job loss was not higher for workers who reported experiencing occupational injury, compared to workers who reported experiencing no occupational injury (RR:1.31; 95%CI: 0.93–1.86).

Results from multinomial models investigating odds of voluntary and involuntary job loss versus no job loss among injured compared to uninjured workers are presented in Table 3 (Hypothesis 2). Injured workers had higher odds of involuntary job loss compared with uninjured workers in crude models as well as in the multivariable model (OR:2.19; 95% CI: 1.27–3.77). The odds of voluntary job loss was not statistically significant (OR:1.06; 95% CI:0.69–1.64).

Table 4 displays results from crude and multivariable models differentiating the exposure by categorical number of reported occupational injuries. Separate models estimated overall job loss versus no job loss (hypothesis 3) and voluntary and involuntary job loss versus no job loss (hypothesis 4). The results did not support hypothesis 3. Overall job loss was not significantly predicted by experiencing occupational injury once (OR:1.04; 95% CI:0.66–1.64), or more than once (OR:1.61; 95% CI:0.96–2.71) in multivariable models. The results partially supported hypothesis 4. Compared to those who reported experiencing no occupational injury, those experiencing one injury had higher risks of involuntary job loss (OR:2.19; 95% CI:1.18–4.05), while those who reported experiencing more than one injury had higher risks of voluntary job loss (RR:1.95; 95%CI:1.03–3.67).

DISCUSSION

Despite regulatory protections embodied in the Occupational Health and Safety Act (OSHA) and state-level workers' compensation laws, the present study used longitudinal data to demonstrate associations between occupational injury and job loss among nursing home workers. In analyses that treated job loss as dichotomous outcome—without distinguishing voluntary from involuntary job loss, there were no significant associations between workers who reported experiencing occupational injury in previous six months and subsequent job loss within the following six months. However, cautionary patterns emerged after differentiating job loss as a three category outcome: voluntary, involuntary and none. Compared to workers reporting no experience of occupational injury in previous six months, those reporting injury were 119% more likely to subsequently experience involuntary job loss within the following six months. Multivariable model also jointly compared voluntary, involuntary and no job loss among workers who reported experiencing one injury, more than one injury, and no injury. In that model, workers experiencing more than one injury were 95% more likely to subsequently experience voluntary job loss. The present study is unique in that it demonstrates differential relationships not examined previously. The scant extant literature investigating occupational injury and job loss has not differentiated between voluntary and involuntary job loss and we argue that this distinction is critical given the possibility for workers to self-select out of a job following injury (voluntary). Involuntary job loss following injury is particularly troubling.

Our review of the extant literature yielded two prospective investigations of occupational injury and job loss among US workers.[3,4] Neither study distinguished between voluntary and involuntary job loss. Also, the studies used year intervals for injury occurrence and job loss, while the present study used six month interval. We ran MSM analyses using dichotomous injury and job loss categories and year intervals to compare the present results with previous studies. The findings from the present study are corroborated by findings from one of these studies, but contradictory to findings from the other. The study that found no significant associations included only male workers;[4] the corroborating study used newly registered nurses, 91% of whom were female.[3] Being unionized and male are two socially-protective factors scarce among nursing home workers. Nationally in the US, less than 10% of these workers were unionized in 2012, and about 89% of them are female.[32,33]

The self-reported 40.6% annual prevalence of occupational injuries found in the current study and the corresponding 42.3 occupational injuries per 100 Full Time Equivalent, while high, are similar to reports from studies with similar samples. The prospective study of newly registered nurses, which also relied on self-report of occupational injuries, found a 40% prevalence.[3] A national cross-sectional study of nursing assistants, who compose 68.3% of our sample, found a 60.2% annual prevalence of occupational injuries.[24] A different prospective study of health care workers in one nursing home estimated annual injury incidence rate of 45.8 per 100 FTE.[34]

Though popular discourses on occupational injuries frequently focus on over-reporting, research studies demonstrate that underreporting by both workplace and workers is more pervasive in the US.[13–16] Though frequently used in occupational health studies, workers' compensation databases are particularly vulnerable to underreporting of occupational injuries. Galizzi and colleagues found that health care workers reported about 63% of reportable occupational injuries observed by researchers whereas the workers' compensation database captured about one-third of these injuries.[15]

One limitation of the study is use of a predictor determined by one main question, which though validated and consistently used in occupational health literature, is self-reported.[12] Furthermore, we did not collect information on the types and severity of occupational injuries. Job loss was collected using administrative data meant to indicate if workers were still with the company, thus, eligible to continue in the WFHN study. There is small chance of the misclassification of voluntary and involuntary job loss due to actions by workers or employers (e.g. workers leaving voluntarily due to communications indicating that involuntary dismissal is imminent, or workers leaving voluntarily, but neglecting to resign, therefore forcing employer to terminate employment). Such misclassifications would lead to underestimation of the true associations between the exposures and outcomes.

Exposure misclassification is a possible threat to the internal validity of the analysis. One possible source of misclassification is that workers who experience both occupational injury and job loss between the 6 and 12 month assessments, or between the 12 and 18 month assessments were classified as uninjured. One possible concern is that classification of these workers as uninjured; hence attribution of their job loss as part of the unexposed group would lead to underestimation of the true association. However, the hypotheses tested in the analyses were specific in stating the timing of the exposure. The analyses compared workers who reported that they experienced injury in a previous six month period with those who reported experiencing no injury in that same six month period.

Nonetheless, differential underreporting of occupational injuries by job loss status could threaten the internal validity of the current analysis. For example, some workers may have reported that they experienced no occupational injuries in past six months when they actually experienced occupational injuries. We expect such exposure misclassification to be random, thus not to differ based on subsequent job loss. To further explore the threat of this exposure misclassification, we tested associations between baseline turnover intentions and subsequent reports of occupational injuries. This test was done among the workers who did not report occupational injuries at baseline in order to reduce potential bias that accrued from experiencing the exposure. We wanted to understand if an inclination toward job loss experience (expressed via turnover intentions) predicted assessments of occupational injuries in multivariable models. Results from these analyses demonstrated that levels of turnover intentions did not predict future reports of occupational injuries, and thus lent credibility to the workers' self-reported occupational injuries (Supplemental Table B). Conversely, experiencing occupational injuries predicted subsequent turnover intentions (Supplemental Table C).

Another limitation is the generalizability of study results. Our sample included workers in New England employed by facilities that, although diverse in size, urbanicity, staffing and patient characteristics, and quality ratings, were owned by the same large for-profit company. The findings may not apply to the 36% of workers in the nursing home labor market who work in non-profit owned facilities.[35] The proportion of workers to whom the results may be generalizable are noteworthy though, given that for-profit facilities employ larger share of the nursing home workforce and the proportion of the market owned by large multi-chain for-profit owners is growing.[36]

Last, unmeasured confounding remains an issue in any observational study even though we chose conservative analytical approaches and used a modeling strategy that accounted for a multilevel list of potential confounders, including those that could be on the causal pathway.

Our analytical approaches coupled with the study design are notable strengths. The sample included workers in 30 diverse facilities whom we followed prospectively and from whom we gathered four sets of survey and administrative data. The availability of the multiple individual as well as supervisor and facility-level data at multiple times strengthened our analytical designs.

Also, the use of prospective data allowed us to ensure temporal ordering of exposures before outcome. Furthermore, the outcome was objectively assessed using administrative data from the company and we were able to separately investigate risk of voluntary and involuntary job loss at different assessment periods.

There are several mechanisms through which occupational injuries could increase risks of job loss. With voluntary job loss, the association could indicate that injured workers exercised market power by exiting working conditions where occupational injury occurred; studies have demonstrated self-preservation where workers voluntarily exit jobs to mitigate injury.[37] The importance of self-preservation by voluntarily exiting hazardous jobs is underscored by another study, which observed higher turnover rates in positions where workers had clinically meaningful decline in low-back functioning even though the workers with back problems were not necessarily the ones who left.[38] In essence, workers were choosing to exit before they had severe injuries that were likely to lead to significant physical declines.

Another mechanism linking our exposures and outcomes is a troubling scenario where workers voluntarily leave their workplaces because of inability to perform job duties and/or because there has been a decline in job performance after an occupational injury. Such "voluntary" job loss should be of concern to occupational health for several reasons. First, US workers are supposed to have reasonable accommodation to ensure full recovery from occupational injuries.[8] Moreover, the associations found in the present study supports previous discussion of high worker turnover as important information, a so-called *canary in a coal mine*, for occupational injury surveillance.[38]

These finding have important implications for the ability of occupational injury surveillance systems to correctly capture injury rates for occupational positions in nursing homes. A national study of nursing assistants, who comprise 69% of the sample, found that one-third of these workers leave the nursing home industry entirely after job loss.[39] That finding, along with current findings of higher job loss among those who experience occupational injury, indicate that injury surveillance systems may have a short window of opportunity for capturing nursing home workers who experience occupational injury. It is likely that occupational injuries reported by these workers may be incorrectly attributed to their new industry by surveillance systems that capture prevalence of injury among workers.

The most problematic scenario for the field of occupational health concerns the greater risk of involuntary job loss among injured workers as compared with associated risk for uninjured workers. Though qualitative studies have indicated that selective dismissal of injured workers occurs, it is illegal in the US and most countries.[1,2,8] The present analysis was able to establish the temporal precedence of occupational injury to involuntary job loss; however, our access to workers' records did not include disciplinary records, and consequently, we were unable to control for prior disciplinary history before termination. Future studies should build on our analyses by obtaining data, such as disciplinary history for injured and uninjured workers, which would allow for testing of whether injured workers were dismissed primarily due to experiencing injury. Such studies could involve collection of prospective qualitative and quantitative data in order to capture the order of events from the worker and employer perspectives.

Analyses of continued underreporting of occupational injuries have often included questions about possible economic and social penalties for workers who report occupational injuries.[14,15] Findings in the present paper indicate a need for occupational health professionals to seriously evaluate the possibility of such penalties. We encourage future studies to replicate our findings among nursing home workers in other settings worldwide and among other types of vulnerable workers. Carefully done longitudinal research investigators are particularly important given worldwide demographic shifts where vulnerable worker groups, such as immigrants from developing countries, comprise an increasing proportion of workers in nursing homes.40

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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WHAT THIS PAPER ADDS

- Though qualitative studies indicate the possibility of an association between occupational injuries and job loss, the two prospective quantitative studies on the topic produced contrary results.
- The study demonstrates that compared to uninjured workers, nursing home workers who reported occupational injury within the past six months had higher risk ratios of involuntary job loss at the end of the subsequent six months relative to no job loss.
- Occupational health professionals may need to consider additional job protection measures as part of secondary and tertiary prevention measures when interacting with some injured workers.

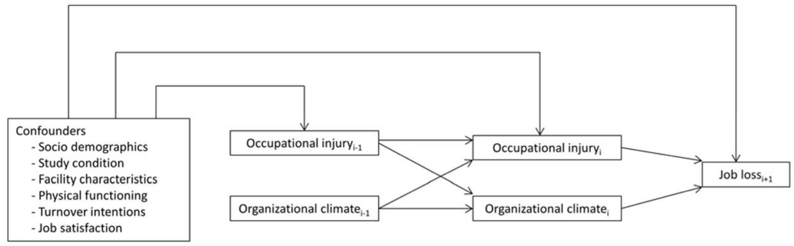

FIGURE 1.

Causal diagram of the hypothesized association between occupational injury in the last six months and job loss in subsequent six months

Table 1

Sociodemographic and other characteristics of Work, Family and Health Network study sample overall and by job loss experience (n=1,331)

Characteristic	N (%)	Job Loss, %	Voluntary, %	Involuntary, %
Overall	1,331	24.2%	16.6%	7.6%
Gender				
Male	8.1	10.2	10.9	8.9
Female	91.9	89.8	89.1	91.1
Race				
Non-Hispanic White	65.4	68.9	71.0	64.4
Non-Hispanic Black	12.2	10.3	8.1	14.9
Hispanic	13.9	13.4	14.0	11.9
Other/mixed	8.5	7.5	6.8	8.9
Educational attainment				
< High school (HS)	5.6	4.0	3.6	5.0
HS graduate	32.9	30.8	31.2	29.7
Some college or technical school	49.4	50.0	48.4	53.5
College graduate	12.1	15.2	16.7	11.9
Household income level				
< 100% Federal Poverty Level (FPL)	7.5	7.0	6.3	8.5
100 – 200% FPL	27.0	30.7	32.0	27.7
200 – 300 % FPL	25.8	27.0	28.2	24.5
> 300% FPL	39.7	35.3	33.5	39.4
Marital status				
Married/Living with a romantic partner	62.7	61.2	63.8	55.5
Not married or living with a partner	37.3	38.8	36.2	44.6
Occupational position				
Registered Nurse/Licensed Practical Nurse	28.3	24.2	22.2	28.7
Certified Nurse Assistants (CNA)	68.3	72.4	74.2	68.3
Other Positions	3.4	3.4	3.6	3.0
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Age (in years)	38.5 (12.5)	36.0 (12.6)	35.4 (12.4)	37.2 (12.9)
Tenure at facility (in years)	6.3 (6.6)	3.6 (4.1)	3.5 (4.1)	3.7 (4.3)
Physical functioning, scale range 0–100	92.2 (14.3)	92.0 (15.5)	91.8 (16.6)	92.7 (13.0)
Turnover intentions, scale range 1–5	2.1 (1.0)	2.3 (1.1)	2.4 (1.2)	2.3 (1.1)
Job satisfaction, scale range 1–5	4.2 (0.6)	4.1 (0.7)	4.1 (0.7)	4.0 (0.8)
Work-family organizational climate, scale range 1–5	2.9 (0.8)	2.7 (0.9)	2.8 (0.8)	2.6 (0.9)

Table 2

Marginal structural model (MSM) results of the associations between occupational injuries in the past 6 months and job loss at end of subsequent 6 months (N=1331).

	RR (95% CI)
Crude model	1.47 (1.05, 2.08)
Crude MSM model	1.44 (1.02, 2.03)
Final multivariable marginal structural model[a]	1.31 (0.93, 1.86)

[a]Marginal structural model is based on a two-stage estimation procedure. In the first stage, stabilized weights are calculated by estimating the probability of injury based on demographics (household income, race/ethnicity, gender, education, marital status, nativity, job tenure, age, study condition, occupational position), facility characteristics (number of residents, staffing ratio, quality measures), baseline levels of turnover intentions, job satisfaction, and physical functioning and past reports of injury and work-family organizational climate. In the second stage, the effect of injury is estimated by running weighted logistic regression model controlling for race/ethnicity, gender, occupational position, education, study condition, and baseline levels of turnover intentions and job satisfaction.

Table 3

Results from multinomial marginal structural models (MSM) of the associations between occupational injuries in the past 6 months and voluntary and involuntary job loss at end of subsequent 6 months.

	Voluntary vs. no job loss OR (95% CI)	Involuntary vs. no job loss OR (95% CI)
Crude model	1.31 (0.89, 1.93)	2.16 (1.33, 3.52)
Crude MSM model	1.27 (0.87, 1.86)	2.09 (1.27, 3.42)
Final marginal structural model[a]	1.06 (0.69, 1.64)	2.19 (1.27, 3.77)

[a]Marginal structural model is based on a two-stage estimation procedure. In the first stage, stabilized weights are calculated by estimating the probability of injury based on demographics (household income, race/ethnicity, gender, education, marital status, nativity, job tenure, age, study condition, occupational position), facility characteristics (number of residents, staffing ratio, quality measures), baseline levels of turnover intentions, job satisfaction, and physical functioning and past reports of injury and work-family organizational climate. In the second stage, the effect of injury is estimated by running weighted least squares regression model controlling for race/ethnicity, gender, occupational position, education ,study condition, and baseline levels of turnover intentions and job satisfaction.

Table 4

Results from marginal structural models (MSM) of associations between categorical number of occupational injuries in the past 6 months and overall, voluntary, and involuntary job loss at end of subsequent 6 months.

	Overall job loss vs. no job loss RR (95% CI)	Voluntary job loss vs. no job loss OR (95% CI)	Involuntary job loss vs. no job loss OR (95% CI)
Injured once vs. uninjured			
Crude MSM	1.12 (0.72, 1.75)	0.81 (0.49, 1.34)	1.90 (1.14, 3.16)
Multivariable MSM[a]	1.04 (0.66, 1.64)	0.67 (0.38, 1.17)	2.19 (1.18, 4.05)
Injured >1 vs. uninjured			
Crude MSM	1.94 (1.12, 3.35)	2.56 (1.36, 4.81)	1.34 (0.48, 3.74)
Multivariable MSM[a]	1.61 (0.96, 2.71)	1.95 (1.03, 3.67)	1.27 (0.38, 4.22)

[a]Marginal structural model is based on a two-stage estimation procedure. In the first stage, stabilized weights are calculated by estimating the probability of injury based on demographics (household income, race/ethnicity, gender, education, marital status, nativity, job tenure, age, study condition, occupational position), facility characteristics (number of residents, staffing ratio, quality measures), baseline levels of turnover intentions, job satisfaction, and physical functioning and past reports of injury and work-family organizational climate. In the second stage, the effect of injury is estimated by running weighted least squares regression model controlling for race/ethnicity, gender, occupational position, education, study condition, and baseline levels of turnover intentions and job satisfaction.