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**Dawn N. Castillo, James Collins. *Reflecting on the 5th National Occupational Injury Research Symposium and looking forward.* Pages 3-5.**

For 2-1/2 days in October, 2011, more than 200 researchers convened at the 5th National Occupational Injury Research Symposium (NOIRS) to celebrate advances and successes in the field, to learn from each other about recent and ongoing occupational injury research, and to network and establish new professional relationships to advance occupational injury research in the future. This special issue highlights some of the research presented at that meeting. There has been considerable progress in research and worker safety since the first NOIRS in 1997, with demonstrated reductions in worker deaths and injury, an increased depth and breadth of research, and the development and validation of prevention strategies. Despite this progress, occupational injuries continue to exert too high a toll on workers, employers and society, and there are numerous challenges that need to be addressed to continue advancements in worker safety.

**Highlights:** ▶ The 5th National Occupational Injury Research Symposium (NOIRS) was held in 2011. ▶ This special theme issue highlights some of the research presented at the 5th NOIRS. ▶ There has been considerable progress in worker safety, but more is needed. ▶ There are numerous challenges for future research to prevent occupational injuries.

**Elyce Anne Biddle. *Is the Societal burden of fatal occupational injury different among NORA industry sectors?* Pages 7-16.**

#### Problem

Since the implementation of the Occupational Safety and Health Act, safety and health in the work environment has seen marked improvement. Although these improvements are laudable, workplace hazards continue to plague the American worker. Understanding the economic burden of fatalities by industry sector is important to setting broad occupational safety and health research priorities. Cost estimates provide additional information about how fatal injuries affect society and hence can improve injury prevention program planning, policy analysis, evaluation, and advocacy.

#### Method

This study estimated the total, mean, and median societal costs by worker and case characteristic in 2003-2006 for the industry sectors identified in the National Institute for Occupational Safety and Health National Occupational Research Agenda (NORA). Analyses were conducted with restricted access to the Bureau of Labor Statistics Census

of Fatal Occupational Injuries data. These data exclude military personnel, decedents with unknown age or sex, and fatalities occurring in New York City. Societal costs were estimated using the cost-of-illness approach, which combines direct and indirect costs to yield an overall cost of a fatal occupational injury.

#### Results

During this period, the cost of the 22,197 fatal occupational injuries exceeded \$21 billion. The mean and median costs of these fatalities were \$960,000 and \$944,000 respectively. Total societal costs by NORA sector ranged from a high of \$5.8 billion in Services to a low of \$530 million in Healthcare and Social Assistance with mean costs ranging from the nearly \$800,000 in Agriculture, Forestry, and Fishing to almost \$1.1 million in Mining.

#### Discussion

The societal costs—total, mean, and median costs—of case and worker characteristics for occupational fatal injuries varied within each NORA sector.

#### Impact on Industry

To have the greatest societal impact, these costs can be used to target resources for public and private sector research by industry.

**Highlights:** ▶ 22,197 fatal occupational injuries in 2003-2006 had a total societal cost of over \$21 billion, ranging from \$5.8 billion in Services to \$530,000 in Healthcare. ▶ Mean and median costs were \$960,000 and \$944,000 respectively, ranging from about \$800,000 in Agriculture to nearly \$1.1 million in Mining. ▶ Societal burden varied greatly by case and demographic characteristics among sectors. ▶ Costs can assist in targeting research to prevent human and reduce economic loss.

- **Keywords:** fatal occupational injury; occupational injury cost; NORA; burden of injury; occupational safety

**Xiuwen Sue Dong, Sang D. Choi, James G. Borchardt, Xuanwen Wang, Julie A. Largay. *Fatal falls from roofs among U.S. construction workers.* Pages 17-24.**

#### Introduction

This study examined trends and patterns of fatal falls from roofs in the U.S. construction industry over an 18-year period (1992–2009), with detailed analysis for 2003–2009.

#### Methods

Two large national datasets were analyzed: the U.S. Bureau of Labor Statistics' Census of Fatal Occupational Injuries and the Current Population Survey.

#### Results

Roof fatalities accounted for one-third of fatal falls in construction in 1992–2009. A disproportionately high percentage (67%) of deaths from roof falls occurred in small construction establishments (1–10 employees). Roofers, ironworkers, workers employed with roofing contractors, or working at residential construction sites, had a higher risk of roof fatalities. A higher rate of roof fatalities was also found among younger (< 20 years) and older (> 44 years) workers, Hispanics, and immigrant workers.

#### Conclusion

Roof fatalities corresponded with economic cycles and differed among construction subgroups and worksites. Impact on Industry: Prevention strategies should target high-risk worker groups and small establishments.

**Highlights:** ▶ Roof fatalities were more sensitive to economic cycles than other types of fatal injuries. ▶ About 67% of deaths due to falls from roofs in construction occurred to small establishments with 10 or fewer employees. ▶ Workers working at residential construction sites had a higher risk of roof fatalities.

- **Keywords:** Fatality trends; Hispanic workers; Small establishments; Residential construction; Injury prevention

**Cammie Chaumont Menéndez, Srinivas Konda, Scott Hendricks, Harlan Amandus. *Disparities in work-related homicide rates in selected retail industries in the United States, 2003–2008. Pages 25-29.***

**Problem**

Segments within the retail industry have a substantially higher rate of work-related fatality due to workplace violence compared to the retail industry overall. Certain demographic subgroups may be at higher risk.

**Method**

National traumatic injury surveillance data were analyzed to characterize the distribution of fatality rates due to workplace violence among selected retail workers in the United States from 2003 through 2008.

**Results**

Overall, the highest fatality rates due to work-related homicide occurred among men, workers aged  $\geq 65$  years, black, Asian, foreign-born and Southern workers. Among foreign-born workers, those aged 16–24 years, non-Hispanic whites and Asians experienced substantially higher fatality rates compared to their native-born counterparts.

**Conclusions**

The burden of work-related homicide in the retail industry falls more heavily on several demographic groups, including racial minorities and the foreign-born. Further research should examine the causes of these trends. Interventions designed to prevent workplace violence should target these groups.

**Highlights:** ▶ Retail industries experience substantially higher work-related homicide rates ▶ We examined 6 years of occupational fatality surveillance data for United States ▶ Homicide rates were not uniformly distributed across demographic groups ▶ Men, racial minorities and foreign-born workers experience higher homicide rates ▶ Preventive interventions, including safety training, should target these groups

- **Keywords:** Occupational injuries; Workplace violence; Foreign-born; Disproportionate; CFOI

**Gerald S. Poplin, Hugh Miller, Joseph Sottile, Chengcheng Hu, John R.M. Hill, Jefferey L. Burgess. *Enhancing severe injury surveillance: The association between severe injury events and fatalities in US coal mines. Pages 31-35.***

This report evaluates the potential of using high degree (or severe) injuries as a proxy for fatal events. Injuries occurring at bituminous coal mines within the United States during the years 1996-2006 were classified by the degree of severity according to the Abbreviated Injury Scale (AIS). Using multivariate discrete and logistic models (via generalized estimating equations) and adjusting for number of employees and underground v. surface status, high degree (AIS  $\geq 3$ ) injuries in the prior year were associated with an increased risk (OR 2.02, 95% CI 1.17 to 3.46) of fatalities within the same mine. While there is a need for improvements and standardization of injury surveillance and reporting, the findings support the study hypothesis that mining conditions resulting in high degree injuries can also result in fatalities, thus expanding the use and versatility of high degree injury surveillance data. With an improved understanding of the conditions and activities behind these two injury event types, these results enhance the ability for industry to more readily identify and develop technological advancements for safety and mitigating disasters.

▪ **Keywords:** injury; mining; surveillance

**Lisa J. Steiner, Robin Burgess-Limerick, Brianna Eiter, William Porter, Tim Matty. *Visual feedback system to reduce errors while operating roof bolting machines. Pages 37-44.***

#### Problem

Operators of roof bolting machines in underground coal mines do so in confined spaces and in very close proximity to the moving equipment. Errors in the operation of these machines can have serious consequences, and the design of the equipment interface has a critical role in reducing the probability of such errors.

#### Methods

An experiment was conducted to explore coding and directional compatibility on actual roof bolting equipment and to determine the feasibility of a visual feedback system to alert operators of critical movements and to also alert other workers in close proximity to the equipment to the pending movement of the machine. The quantitative results of the study confirmed the potential for both selection errors and direction errors to be made, particularly during training.

#### Results

Subjective data confirmed a potential benefit of providing visual feedback of the intended operations and movements of the equipment.

#### Impact

This research may influence the design of these and other similar control systems to provide evidence for the use of warning systems to improve operator situational awareness.

**Highlights:** ▶ Roof bolter operators often make control selection errors and control movement directional errors. ▶ Results confirm that the potential for selection and direction errors especially during training situations. ▶ Visual Feedback System shows promise of reducing selection and direction errors by providing visual feedback of the intended operations and movements of equipment. ▶ Visual Feedback System is likely to improve the situational awareness especially in training situations and in emergency situations.

▪ **Keywords:** Mining; Control compatibility; Equipment design; Situational awareness; Visual feedback system

**Keshia M. Pollack, Nathan Yee, Michelle Canham-Chervak, Lauren Rossen, Kathleen E. Bachynski, Susan P. Baker. *The Narrative text analysis to identify technologies to prevent motor vehicle crashes: Examples from military vehicles. Pages 45-49.***

#### Introduction

The purpose of this research is to describe the leading circumstances of military vehicle crashes to guide prioritization and implementation of crash avoidance and/or warning technologies.

#### Methods

A descriptive study using narrative text analysis on 3,944 military vehicle crash narratives. Crash data on drivers, from 2001 to 2006, were assembled from the U.S. Army Combat Readiness/Safety Center. Reviewers collected information on the circumstances of crashes and determined if vehicle technology could have prevented the crash.

#### Results

Nearly 98% of the crashes were nonfatal; 63% occurred in the U.S. and 24% in Iraq. Among crash events where the direction of the impact was recorded, 32% were to the

front of the vehicle and 16% involved a vehicle being rear-ended. Rollovers were mentioned in 20% of the narratives. Technology was determined to have the potential to prevent 26% of the crashes, with the forward collision warning system, rear end collision avoidance, emergency brake assistance, and rollover stability control system likely to have the greatest impacts.

#### Conclusions

Some technologies available for civilian vehicles may prevent certain military crash circumstances.

#### Impact on Industry

The results of this research are significant in light of ongoing global military operations that rely on military vehicles. Improving the preventive technology featured on military vehicles may be an effective strategy to reduce the occurrence of military crashes.

**Highlights:** ▶ We conducted a narrative text analysis on military vehicle crash data. ▶ We aimed to determine if crash avoidance technology could prevent military crashes. ▶ Crash avoidance technology prevented at least 26% of military vehicle crashes. ▶ The forward collision warning system may prevent the greatest number of crashes. ▶ Crash avoidance technology could help reduce the occurrence of military crashes.

- **Keywords:** Narrative text analysis; Motor vehicle; Technology; U.S. Army; Occupational injury

### **Terry Bunn, Svetla Slavova, Medearis Robertson. *Motor vehicle injuries among semi truck drivers and sleeper berth passengers. Pages 51-55.***

#### Introduction

Injuries and fatalities due to large truck and other vehicle crashes have decreased over the last decade, but motor vehicle injuries remain a leading cause of death for both the working and general populations. The present study was undertaken to determine semi truck driver and sleeper berth passenger injury risk in a moving semi truck collision using a matched-pair cohort study.

#### Method

Study data were obtained from the Kentucky Collision Report Analysis for Safer Highways (CRASH) electronic files for 2000–2010. A matched-pair cohort study was used to compare the odds of injury of both drivers and sleeper berth passengers within the same semi truck controlling for variables specific to the crash or the semi truck. The crude odds ratio of injury was estimated and a statistical model for a correlated outcome using generalized estimating equations was utilized.

#### Results

In a moving semi truck collision, the odds for an injury were increased by 2.25 times for both semi truck drivers and sleeper berth passengers who did not use occupant safety restraints compared to semi truck drivers and sleeper berth passengers who used occupant safety restraints at the time of the collision. The driver seat or sleeper berth position in the vehicle was not a significant factor ( $p$ -value = 0.31) associated with a moving semi truck collision injury.

#### Conclusion

Nonuse of occupant safety restraints by either drivers or sleeper berth passengers significantly increased the odds of an injury in a moving semi truck collision; semi truck seating position (driver's seat or sleeper berth) did not increase the odds for an injury in moving collisions.

#### Impact on Industry

Trucking companies should include the mandatory use of occupant safety restraints by both semi truck drivers and sleeper berth passengers in their company safety policies.

**Highlights:** ▶ Motor vehicle injuries are a leading cause of worker death. ▶ The odds of injury in a moving semi truck collision significantly increased for those semi truck drivers and sleeper berth passengers who did not use an occupant safety restraint. ▶ The driver seat or sleeper berth position in the semi truck was not a significant factor in predicting injury in a moving semi truck collision injury.

▪ **Keywords:** Sleeper berth; Occupant safety restraints; Semi truck; Driver; Injury

**Lisa Pompeii, John Dement, Ashley Schoenfisch, Amy Lavery, Megan Souder, Claudia Smith, Hester Lipscomb. *Perpetrator, worker and workplace characteristics associated with patient and visitor perpetrated violence (Type II) on hospital workers: A review of the literature and existing occupational injury data. Pages 57-64.***

#### Problem

Non-fatal type II violence experienced by hospital workers (patient/visitor-on-worker violence) is not well described.

#### Methods

Hospital administration data (2004-2009) were examined for purposes of calculating rates of type II violent events experienced by workers. We also conducted a review of the hospital-based literature (2000-2010) and summarized findings associated with type II violence.

#### Results

484 physical assaults were identified in the data, with a rate of 1.75 events/100 full-time equivalents. Only few details about events were captured, while non-physical events were not captured. The literature yielded 17 studies, with a range proportion of verbal abuse (22%–90%), physical threats (12%–64%) and assaults (2%–32%) reported. The literature lacked rigorous methods for examining incidence and circumstances surrounding events or rates of events over time.

#### Discussion

For purposes of examining the impact of type II violence on worker safety, satisfaction and retention, rigorous surveillance efforts by hospital employers and researchers are warranted.

**Highlights:** ▶ The literature lacks details of risk factors for hospital-based Type II violence. ▶ Workers' compensation Type II violence claims have limited event details. ▶ Rigorous surveillance of Type II violence by hospitals and researchers is needed. ▶ Preliminary recommendations for surveillance data collection measures are outlined.

▪ **Keywords:** Workplace violence; Violence; Hospital workers; Surveillance; Type II violence

**Hope Tiesman, Srinivas Konda, Scott Hendricks, Dan Mercer, Harlan Amandus. *Workplace violence among Pennsylvania education workers: Differences among occupations. Pages: 65-71.***

#### Problem

The purpose of this study was to measure the prevalence and characteristics of physical and non-physical WPV in a state-based cohort of education workers.

#### Method

A sample of 6,450 workers was drawn using de-identified union membership lists, stratified on gender, occupation, and school location. A cross-sectional survey was mailed to participants.

#### Results

An estimated 7.8% (95%CI = 6.6 – 9.1) of education workers were physically assaulted and 28.9% (95%CI = 26.4 – 31.5) experienced a non-physical WPV event during the 2009–2010 school year. Special education teachers were significantly more likely to be physically assaulted and experience a non-physical WPV event compared to general education teachers (Prevalence Rate Ratio = 3.6, 95% 2.4-5.5; PRR = 1.4, 95%CI = 1.1 – 1.8).

#### Discussion

Special education teachers were at the highest risk for both physical and non-physical WPV. If not already present, schools should consider implementing comprehensive WPV prevention programs for their employees.

#### Impact on Industry

Special education teachers have unique workplace hazards. Strategies that protect the special education teacher, while still protecting the special education student should be considered.

**Highlights:** ▶ We performed a cross-sectional survey of unionized Pennsylvania education workers. ▶ We asked about the prevalence, characteristics, & impact of workplace violence (WPV). ▶ 8% had been physically assaulted and 29% experienced a non-physical WPV event in the 2009–2010 school year. ▶ Special education teachers were at the highest risk for physical & non-physical WPV compared with all other education workers.

- **Keywords:** nonfatal injuries; workplace violence; education; occupational safety and health; surveillance

**Chia Wei, Susan G. Gerberich, Bruce H. Alexander, Andy D. Ryan, Nancy M. Nachreiner, Steve J. Mongin. *Work-related violence against educators in Minnesota: Rates and risks based on hours exposed.* Pages: 73-85.**

#### Problem

Violence is a major occupational problem; yet, rigorous studies focused on educators to address this problem are limited. The objective was to identify educators' potential risks for physical assault (PA) and nonphysical violence (NPV), based on hours exposed.

#### Methods

A total of 4,731 licensed kindergarten through grade 12 Minnesota educators, identified from the Minnesota Department of Education database, participated. Specially designed mailed questionnaires (12-month recall) enabled data collection. Calculated PA and NPV rates, per 100,000 working hours, used Poisson regression. Directed acyclic graphs identified confounders for multivariable analysis, adjusted for non-response and unknown eligibility.

#### Results

The total PA rate was 5.3; PA risks increased for educators who: were non-married versus married; held master's degrees, or education specialist degrees, versus associate/bachelor's degrees; worked in public alternative and various school types, versus public schools; worked as social workers, in special education or multiple activities, versus standard classroom teaching; worked with < 10, versus 10 to < 25 students in the class. The total NPV rate was 26.4; subcategory rates were: threat (34.8); sexual harassment (7.6); verbal abuse (55.5); bullying (19.6). Increased risks for NPV included: 30–39 and 60–79, versus 50–59 years of age; non-married versus married; working in public alternative versus public schools; working part-time or substitute, versus full-time; teaching in special education or multiple activities, versus standard classroom teaching; teaching in class sizes < 10 and ≥ 25, versus 10–24 students; teaching in grades 3–12 and multiple grades, versus kindergarten to second grade. The investigated results for PA and NPV were similar, with a few exceptions.

#### Discussion and Impact on Industry

Results from this study provided information about factors associated with increased and decreased risks for violence against educators, based on hours worked. In addition, they provided a basis for further investigations to reduce violence against educators in the school environment.

**Highlights:** ▶ Novel examination: risks for occupational violence, based on hours exposed. ▶ Overall, non-physical violence (NPV) were higher than physical assault (PA) rates. ▶ Working in special education was associated with increased PA and NPV risks. ▶ PA and NPV risks were increased among educators teaching < 10 vs. 10 + students. ▶ Decreased PA and NPV risks were identified working in private vs. public schools.

- **Keywords:** Occupational violence; Physical assault; Nonphysical violence; Risk factors; Directed Acyclic Graphs (DAG)

**Pete Kines, Dorte Andersen, Lars Peter Andersen, Kent Nielsen, Louise Pedersen. *Improving safety in small enterprises through an integrated safety management intervention.* Pages: 87-95.**

This study tests the applicability of a participatory behavior-based injury prevention approach integrated with safety culture initiatives. Sixteen small metal industry enterprises (10–19 employees) are randomly assigned to receive the intervention or not. Safety coaching of owners/managers result in the identification of 48 safety tasks, 85% of which are solved at follow-up. Owner/manager led constructive dialogue meetings with workers result in the prioritization of 29 tasks, 79% of which are accomplished at follow-up. Intervention enterprises have significant increases on six of eight safety-perception-survey factors, while comparisons increase on only one factor. Both intervention and comparison enterprises demonstrate significant increases in their safety observation scores. Interview data validate and supplement these results, providing some evidence for behavior change and the initiation of safety culture change. Given that over 95% of enterprises in most countries have less than 20 employees, there is great potential for adapting this integrated approach to other industries.

**Highlights:** ▶ An integrated behavior/culture-based intervention implemented in small enterprises. ▶ Fourteen small metal enterprises are randomly assigned the intervention or not. ▶ Managers and workers identify 77 safety tasks and 83% are completed at follow-up. ▶ Interventions improve on 6 of 8 safety culture scales, comparisons on only 1 scale. ▶ The intervention effectuated problem solving and culture change as measured here.

- **Keywords:** Small and medium enterprises (SME); Safety culture; Behavior based safety (BBS); Coaching; Safety observation

**Katherine Elizabeth Schofield, Bruce H. Alexander, Susan Goodwin Gerberich, Andrew D. Ryan. *Injury rates, severity, and drug testing programs in small construction companies.* Pages: 97-104.**

Problem

Construction work is hazardous and workers consistently rank in the top of all occupations and industries for illicit drug and heavy alcohol use.

Methods

Drug-testing programs were classified into three categories: no program, pre-employment/post-accident, and pre-employment/post-accident/random/suspicion. We

analyzed workers' compensation claims from 1,360 construction companies over a six-year period to assess the possible association of testing program with injury rate.

#### Results

Compared to no program, results respectively were RR = 0.85 (CI = 0.72 – 1.0) and RR = 0.97 (CI = 0.86 – 1.10) for all injuries, and RR = 0.78 (CI = 0.60 – 1.03) and RR = 1.01 (CI = 0.86 – 1.19) for lost-time injuries. Variability of results was exhibited across trade and union status, among other categories.

#### Summary

Drug-testing programs may be associated with lower, non-significant, injury rates in this population.

#### Impact on Industry

Drug-testing programs may be associated with lower injury rates, but care should be exercised to ensure accurate injury reporting, characterize underlying safety practices of a company, and to determine quality and consistency of testing.

**Highlights:** ▶ We examined the effect of drug testing programs on small construction companies. ▶ Workers' compensation claims and hours at-risk were used to determine injury rates. ▶ Drug testing programs were associated with lower risk of injury claims. ▶ Testing programs were associated with lower risk of both lesser and more severe claims. ▶ Associations varied by testing program, trade, union status, and claim type.

▪ **Keywords:** occupation; injury; construction; drug testing; workers' compensation

**Jennifer M. Lincoln, Mary B. O'Connor, Kyla D. Retzer, Ryan D. Hill, Theodore D. Teske, Chelsea C. Woodward, Devin L. Lucas, Philip D. Somervell, Jason T. Burton, Nicolle A. Mode, Brad J. Husberg, George A. Conway. *Occupational Fatalities in Alaska: Two Decades of Progress, 1990-1999 and 2000-2009. Pages: 105-110.***

#### Introduction

Alaska had the highest work-related fatality rate of any state during 1980–1989. The National Institute for Occupational Safety and Health established the Alaska Field Station (AFS) to address this problem.

#### Methods

AFS established surveillance systems to provide scientific assessments of occupational hazards. Interventions were developed in collaboration with partners and evaluated.

#### Results

During 2000–2009, Alaska experienced a 42.5% decline in work-related fatalities over the previous decade of 1990–1999. In 2009, the workplace fatality rate for Alaska was 5.6/100,000 workers. Commercial pilot deaths were reduced by 50% and Bering Sea crab fishing death rates were reduced by 60%. Building on this success, AFS established national programs to improve safety in the commercial fishing and oil and gas extraction industries.

#### Impact on Industry

A focused, epidemiological approach to reducing fatalities in high-risk occupations is effective. Ongoing commitment to this type of approach will assist in continued success in Alaska and elsewhere.

**Highlights:** ▶ Alaska has experienced a 42.5% decline in work-related fatalities. ▶ Focused interventions led to commercial pilot deaths being reduced by 50% in Alaska. ▶ Bering Sea crab fishing death rates were reduced by 60%. ▶ In 2009, the workplace fatality rate for Alaska was 5.6/100,000 workers. ▶ Based on these successes, national programs have been established to improve safety.

- **Keywords:** Injury surveillance; Commercial fishing; Drowning prevention; Aviation safety; Oil and gas

**Vicki Kaskutas, Ann Marie Dale, Hester Lipscomb, Brad Evanoff. *Fall prevention and safety communication training for foremen: Report of a pilot project designed to improve residential construction safety. Pages: 111-118.***

#### Problem

Falls from heights account for 64% of residential construction worker fatalities and 20% of missed work days. We hypothesized that worker safety would improve with foremen training in fall prevention and safety communication.

#### Method

Training priorities identified through foreman and apprentice focus groups and surveys were integrated into an 8-hour training. We piloted the training with ten foremen employed by a residential builder. Carpenter trainers contrasted proper methods to protect workers from falls with methods observed at the foremen's worksites. Trainers presented methods to deliver toolbox talks and safety messages. Results from worksite observational audits (n = 29) and foremen/crewmember surveys (n = 97) administered before and after training were compared.

#### Results

We found that inexperienced workers are exposed to many fall hazards that they are often not prepared to negotiate. Fall protection is used inconsistently and worksite mentorship is often inadequate. Foremen feel pressured to meet productivity demands and some are unsure of the fall protection requirements. After the training, the frequency of daily mentoring and toolbox talks increased, and these talks became more interactive and focused on hazardous daily work tasks. Foremen observed their worksites for fall hazards more often. We observed increased compliance with fall protection and decreased unsafe behaviors during worksite audits.

#### Discussion

Designing the training to meet both foremen's and crewmembers' needs ensured the training was learner-centered and contextually-relevant. This pilot suggests that training residential foremen can increase use of fall protection, improve safety behaviors, and enhance on-the-job training and safety communication at their worksites.

#### Impact on industry

Construction workers' training should target safety communication and mentoring skills with workers who will lead work crews. Interventions at multiple levels are necessary to increase safety compliance in residential construction and decrease falls from heights.

**Highlights:** ▶ Many inexperienced construction workers do not receive adequate worksite mentorship and training to prepare them to work at heights ▶ Construction worker mentoring and worksite training improve with foremen's fall prevention and safety communication educational program ▶ Training of residential construction foremen increases use of fall protection and decreases unsafe worker behaviors ▶ Construction workers' training should target safety communication and mentoring skills with workers who will lead work crews

- **Keywords:** Falls; Construction industry; Residential construction; Carpenter; Training

**Robert M. Park, Anasua Bhattacharya. *Uncompensated consequences of workplace injuries and illness: Long-term disability and early termination. Pages: 119-124.***

#### Problem

Costs related to early retirement, termination, or long-term disability could fall outside workers' compensation (WC).

#### Method

Statistical models examined early retirement, long-term disability status, or early termination related to WC claims.

#### Results

The WC-associated early-termination rate ratio was 1.20 (95% CI = 1.14–1.28) for hourly nonunion employees, 1.05 (95% CI = 0.97–1.13) for hourly union employees, and 3.43 (95% CI = 3.11–3.79) for salaried nonunion employees. In the manufacturing-durable sector the WC-associated rate ratio was 1.58 (95% CI = 1.42–1.76) for hourly nonunion employees and 1.23 (95% CI = 1.10–1.38) for union hourly employees. In contrast, in transportation–utilities–communications, the rate ratio was 0.52 (95% CI = 0.46–0.59) for hourly nonunion and 1.22 (95% CI = 1.08–1.38) for union hourly employees.

#### Discussion

Uncompensated costs of workplace injuries and illnesses may result from adverse events previously compensated by WC. In some workplaces reduced termination rates with prior WC suggests added costs to employers.

#### Summary

Conditions leading to WC claims have cost implications related to early — or delayed — removal from the workforce.

#### Impact on industry

Additional costs from work-related injury or illness that are not covered by workers compensation may result from the effect of continuing impairment on the subsequent early termination (or prolonging) of employment. These costs would accrue to both employers and employees and are not generally included in global estimates of the burden of workplace injuries and illnesses.

**Highlights:** ▶ It is well-known that medical costs and lost wages from workplace injuries and illnesses are not fully compensated. ▶ Another consequence of these injuries or illnesses that can result in inadequate compensation could be long-term disability or early termination of employment. ▶ This study observed an association between prior workers compensation claims and the incidence rate of long-term disability or early termination. ▶ Depending on the employers and employee status, such as hourly vs. salaried or union membership, this association could go in either direction.

▪ **Keywords:** workers' compensation; health insurance; occupational disease