Effectiveness of OSHA Outreach Training on Construction Work-Related Injury Rates

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ABSTRACT

Despite the size and breadth of the Occupational Safety and Health Administration’s (OSHA) Outreach Training program for the construction industry, there is limited information on its impact on rates of work-related injury. In a 9-year (2000-2008) dynamic cohort of approximately 17,000 union carpenters in Washington State, the effectiveness of OSHA Outreach Training on rates of workers’ compensation injury claims and related outcomes was explored. OSHA Outreach Training resulted in a 13% (non-significant) reduction in rates of injury overall. The effect was more pronounced for carpenters in their apprenticeship years, drywall installers, and with increasing time since training. Hazard awareness and protection training, coupled with more efficient approaches to injury control, should be standard practice in the construction industry. In line with the observed effect in this study, it is unrealistic to expect OSHA Outreach Training alone to have a large effect on union construction workers’ rates of work-related injury.

KEY FINDINGS

- This study demonstrates the feasibility, as well as the strengths and limitations, of using multi-source longitudinal surveillance data in the appraisal of long-term evaluations of the effectiveness of workplace safety interventions such as training.

- OSHA Outreach Training resulted in a 13% non-significant reduction in rates of workers’ compensation injury claims. Though modest, this finding is in line with realistic expectations of the effect of OSHA Outreach Training alone on union carpenters’ rates of injury.

- The protective effect of OSHA Outreach Training was more pronounced for carpenters in their apprenticeship years and for those with a predominant type of work of drywall installation.

- An increasingly protective effect of training was observed with increasing time since training.

- A large proportion of carpenters who completed OSHA Outreach Training through the union did not meet the study cohort entry criterion of working at least three months of union hours, likely reflective of attrition during the apprenticeship period.

- In addition to overcoming methodological challenges to understanding the effect of training on work-related injury outcomes, future studies should consider specific worker sub-groups for whom training may be particularly beneficial (e.g., apprentices).

ACKNOWLEDGMENTS

We thank Thomas Barrett and Jeff Jewell at the Pacific Northwest Regional Council of Carpenters Training Centers for their support and access to data on carpenters’ completion of OSHA Outreach Training courses. We thank Lin Conley and Randy Parker at the Carpenters Trusts of Western Washington for their support to establish the cohort and update it with training data. Finally, we thank Darrin Adams at the Safety and Health Assessment and Research for Prevention Program in the Washington State Department of Labor and Industries for prior work providing the matched workers’ compensation records. This report was made possible by CPWR – The Center for Construction Research and Training through cooperative agreement number U60-OH009762 from the National Institute of Occupational Safety and Health (NIOSH). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CPWR or NIOSH.
INTRODUCTION

Safety training is frequently recommended and prescribed for preventing work-related injury and illness. For workers in the dangerous construction industry, safety training may lead to important increases in worker knowledge and attitudes about occupational safety (Sokas et al. 2009, Williams et al. 2010, Forst et al. 2013) as well as measures of safety behavior (Trabeau et al. 2008, Kaskutas et al. 2013, Ruttenberg 2013). Though evidence supporting safety training’s prevention of adverse health outcomes (e.g., injuries, illnesses) is limited (Cohen et al. 1998, Robson et al. 2010, Robson et al. 2012, Mullan et al. 2015), encouraging examples can be found among plumbers/pipefitters (Kinn et al. 2000), laborers (Dong et al. 2004, Williams et al. 2010), carpenters/drywall tapers (Johnson and Ruppe 2002), residential construction workers (Darragh et al. 2004), and railway construction workers (Bena et al. 2009).

When the Occupational Safety and Health Act of 1970 was established, the OSHA Training Institute (OTI) developed a series of short hazard awareness training courses, including 10-hour (for entry level workers) and 30-hour (for workers with safety responsibilities) courses for the construction industry. OTI trained federal occupational safety personnel to deliver the courses to federal employees in locations around the US. The training courses cover the “recognition, avoidance, abatement, and prevention of safety and health hazards in workplaces” and provide “information on workers’ rights, employer responsibilities and how to file a complaint” (OSHA 2014). In the 1990s, OSHA began permitting authorized providers to offer this training in the private sector, and industry demand drove explosive growth in delivery of “OSHA-10” and “OSHA-30” for construction. Trainers had issued less than 20,000 OSHA-10 and OSHA-30 cards each year in the early 1990s; since 2010, more than 500,000 workers per year have earned an OSHA-10 or OSHA-30 card. Joint labor-management apprenticeship programs providing vocational training to North America’s union-sector construction workers were among the earliest and largest adopters of OSHA Outreach Training. Today nearly all construction trade unions have incorporated OSHA-10/OSHA-30 training into their apprenticeship curricula. It may be required by an employer (Wilkins 2011), and some states mandate it prior to working on publicly-funded building projects (Sinyai et al. 2013, Taylor 2014).

Safety-forward gains in construction workers’ knowledge and attitudes (Sanyang 2007, Sokas et al. 2009, Wilkins 2011) and behavior (Ruttenberg 2013) have been observed following OSHA-10 training. However, evaluations of the effect of OSHA Outreach Training in preventing adverse construction work-related outcomes are few (Taylor 2014). An understanding is called for to “strengthen and extend the reach of quality training and education” (NORA Construction Sector Council 2008) with the goal of improving construction workers’ safety and health.

OBJECTIVES

Building on an existing, robust, longitudinal cohort of union carpenters in Washington (WA) State over the years 2000 through 2008, the goal of this study is to explore the effectiveness of OSHA Outreach Training on carpenters’ work-related injury rates. The specific aims are:

- Link existing records of union carpenter OSHA Outreach Training to union eligibility, membership, and workers’ compensation (WC) claims data for a cohort of approximately 17,000 union carpenters in WA State between 2000 and 2008.

- Describe carpenters’ OSHA Outreach Training experience by calendar time, worker characteristics (i.e., gender, age, time in the union), and predominant type of work.
• Stratified by calendar time, worker characteristics, and predominant type of work, quantify rates, rate ratios (RR), and 95% confidence intervals (CI) examining the relationship between outcomes and OSHA Outreach Training. Contrast patterns in rates observed for work-related injuries overall, by paid time loss (TL) and costs, and for specific mechanisms of injury.

METHODS

As part of prior research, the researchers – with assistance from the Carpenters Trusts of Western WA (CTWW) and the WA State Department of Labor and Industries (L&I) – created a cohort of union carpenters examine patterns in work-related injury rates (McCoy et al. 2013). The cohort comprises union eligibility, membership, and WC claims data files, linked at the individual level in a de-identified manner through use of a unique member number.

• Union eligibility and membership files, from the CTWW, contain for each carpenter: a unique member number (assigned by CTWW and lacking identifying details), date of birth, gender, monthly union hours worked, data of union entry, and union local. The union membership files contained information on all union members, regardless of hours worked. However, the study cohort was limited to individuals who worked ≥3 months of union hours, with observation beginning in the month eligibility criteria were met (i.e., the 3rd month of union work). As in prior research with these data (e.g., (Lipscomb et al. 2014)), carpenters were assigned a predominant type of work based on the work most commonly performed by the union local to which they belong: residential building, light/heavy/mixed commercial, drywall installation, millwrighting, and piledriving. Some carpenters were affiliated with a union local outside of WA State for which predominant type of work information was not available.

• WC claims data files, provided by the WA State Department of L&I, contain for each claim: date of event; date of claim; open/close status; ANSI/OIICS codes describing the event nature, mechanism, body part affected, and source; TL status; number of paid TL days (with TL compensation paid after the 3rd calendar day of being medically unavailable for work, not including the day of injury, in WA State); and associated costs. A TL claim is one in which there was not approved work available for the injured worker within the medical restrictions. Cost estimates are limited to payment types reported consistently between state fund and self-insured claims, improving the consistency of costs across payers, but excluding the medical portion of claims costs. All costs are adjusted using the US Consumer Price Index to 2015 dollars and assume all dollars were paid on the date of injury. Although the claim pool was extracted April 2010 for prior research (McCoy et al. 2013), the extract was updated April 2016 to reflect L&I’s current methodology and estimates of paid TL and costs.

These files were linked at the individual level to union carpenter training records. The training file, provided by the CTWW, is composed of individual-level data on the dates of completed OSHA-10, -30, and -500 level courses completed through face-to-face, in-class instruction at the Pacific Northwest Regional Council of Carpenters’ (PNWRCC) affiliated training centers.

Some US states, employers, and unions require that workers re-take an OSHA Outreach Training course every 3 to 5 years. Thus, a carpenters’ union work hours were categorized as “trained” if the carpenter completed an OSHA Outreach Training course within the prior 5 years. It is this definition on which the presented analyses are based. However, OSHA Outreach Training completion cards do not expire, and sensitivity analyses were conducted in which a cohort member was defined as “trained” for all time following course completion. Also, given the dynamic nature of the study cohort, a subset of the cohort was in the union prior to January 1, 2000. These “prevalent members” (who made up 52.9% of the cohort and contributed 76.8% of
the time at risk) may have completed OSHA Outreach Training prior to cohort entry. For the presented analyses, these members were categorized as “trained” when they completed an OSHA Outreach Training course during the study period, and for the 5 years following course completion. Sensitivity analyses were conducted in which prevalent members were also categorized as “trained” for the first 5 years of follow-up (January 1, 2000 - December 31, 2004).

Carpenters’ characteristics and union work hours with and without OSHA Outreach Training, and by type of OSHA Outreach Training course, were described. Time at risk (union work hours) and work-related outcomes were stratified by categories of OSHA Outreach Training (yes/no), age, gender, time in the union, predominant type of work, and calendar time. Age, time in the union, and predominant type of work varied over time with union work hours and number of events accumulating in the appropriate strata over the 9-year period. Injury rates (events per 200,000 union work hours), unadjusted and adjusted RR, and 95% CI were calculated using Poisson regression, with ln(union work hours) as the offset (Nizam 2014) and scaling to correct for overdispersion (Pearson $\chi^2$/degrees of freedom>1.5). In addition to examining the effect of training on work-related injuries overall, sub-analyses examined the effect of training on rates of “Fatal Four” injuries emphasized in OSHA Outreach Training: falls from elevation, electrocutions, struck by events, and caught in/between events. For analyses of TL days and costs - outcomes which are highly skewed - negative binomial models (Hilbe 2011) were used to examine rates, RR, and 95% CI, with generalized estimating equations (GEE) (Zeger et al. 1988) to account for within-subject correlation.

Finally, recognizing the potential for a differential OSHA Outreach Training effect by time since training, related models were constructed to examine RR before and after such training (Figure 1). In successive “lagged” models, 6-month increments of time at risk and work-related outcomes following training were removed. This approach allowed assessment of time periods in which the effect of training was most pronounced. For this training intervention, it is plausible to assume an enhanced effect immediately following the training class. It is also plausible to observe a gradually increased effect over time as trained workers spend more time in the field gaining experience applying training-based knowledge.

Figure 1. Lagging approach

<table>
<thead>
<tr>
<th>Regression model comparing trained vs. non-trained with:</th>
<th>OSHA Outreach Training</th>
<th>Months since OSHA Outreach Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>No months of lag time</td>
<td>Non-trained</td>
<td>6</td>
</tr>
<tr>
<td>6 months of lag time</td>
<td>Non-trained</td>
<td>12</td>
</tr>
<tr>
<td>12 months of lag time</td>
<td>Non-trained</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>DROP</td>
<td>24</td>
</tr>
<tr>
<td></td>
<td>DROP</td>
<td>etc.</td>
</tr>
</tbody>
</table>


RESULTS AND DISCUSSION

The study cohort is composed of 17,106 carpenters who worked 99,411,000 union hours in WA State between 2000 and 2008. Carpenters’ average age increased from 41.3 years in 2000 to 44.9 in 2005, and down to 42.0 in 2008 (McCoy et al. 2013), and nearly all are male (97.7%). A total of 9,894 WC claims were reported and accepted for the cohort, and 15.3% (n=1,514) resulted in paid TL. The rate of injuries overall and with paid TL declined 42% and 54%, respectively, over the study period. Patterns in rates across categories of worker demographic and work-related characteristics are similar to those reported previously (McCoy et al. 2013); adjusted rates of injury were higher among females, increased with increasing age, decreased with increasing time in the union, and were higher among residential carpenters and drywall installers. A total of 2,910 (29.4%) injuries were characterized as a Fatal Four mechanism: fall from elevation (5.0%), electrocutions (0.3%), struck by (21.3%), and caught in/between (2.8%).

During the study period, 1,017 cohort members took 1,089 OSHA Outreach Training courses through PNWRCC-affiliated training centers, and 7% (n=67) took more than one OSHA Outreach Training course. Most of the courses taken were “OSHA-10 Construction” (85%), followed by “OSHA-30 Construction” (10%) and “OSHA-500 (or OSHA-502) Construction” (3%). When individual-level training data were merged to the study cohort of members who contributed ≥3 months of union hours, 57.5% (n=585) of union carpenters who took OSHA Outreach Training during 2000-2008 did not link to the study cohort. Similar linkage patterns have been observed in the authors’ prior work with these data and are not surprising given the literature on construction apprentice attrition and retention (Bilginsoy 2003, Byrd and Weinstein 2005, Glover and Bilginsoy 2005). Analyses related to the characteristics of workers taking OSHA Outreach Training, as well as those related to OSHA Outreach Training effectiveness, are based on training data from the 432 carpenters who linked to the study cohort. They completed 464 OSHA Outreach Training courses.

Most OSHA Outreach Training took place in carpenters’ early years in the union, and particularly in the first year for carpenters completing OSHA-10 training (Table 1). As expected, the average number of years in the union was lower among union members who completed OSHA-10 training (3.4, 95% CI 2.7-4.1) compared to those who completed OSHA-30 training (7.2, 95% CI 5.1-9.4). Nearly 80% of OSHA-10 training was among carpenters likely in an apprenticeship period (i.e., <4 years in union). No difference was observed in the average age of members completing OSHA-10 compared to OSHA-30 training. Carpenters doing light/heavy commercial work had a higher proportion of trained hours compared to carpenters in other trades, and drywall installers had a lower proportion of trained hours.

Table 1. Stratified by years in the union, OSHA training courses completed by union carpenters through the PNWRCC training centers, 2000-2008

<table>
<thead>
<tr>
<th>Years in the union</th>
<th>OSHA-10</th>
<th>OSHA-30</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>&lt;1</td>
<td>250</td>
<td>(66.3)</td>
</tr>
<tr>
<td>1 to &lt;2</td>
<td>31</td>
<td>(8.2)</td>
</tr>
<tr>
<td>2 to &lt;4</td>
<td>15</td>
<td>(4.0)</td>
</tr>
<tr>
<td>4 to &lt;6</td>
<td>16</td>
<td>(4.2)</td>
</tr>
<tr>
<td>6 to &lt;8</td>
<td>9</td>
<td>(2.4)</td>
</tr>
<tr>
<td>8 to &lt;10</td>
<td>14</td>
<td>(3.7)</td>
</tr>
<tr>
<td>10 to &lt;20</td>
<td>24</td>
<td>(6.4)</td>
</tr>
<tr>
<td>20+</td>
<td>18</td>
<td>(4.8)</td>
</tr>
</tbody>
</table>
Participation in OSHA Outreach Training was associated with a 13% reduction in rates of reported and accepted WC injury claims (RR_{Trained vs. Non-Trained} 0.87, 95% CI 0.72-1.06) (Table 2). This relative difference did not vary significantly across categories of age or calendar time, and it was similar for Fatal Four injuries (RR 0.81, 95% CI 0.55-1.18). The effect was more pronounced, however, among workers during their apprenticeship years (<4 years in the union). Although findings were not statistically significant and were attenuated in adjusted analyses, they bore similarities to patterns observed by Dong et al. (2004) who evaluated the effect of safety training on rates of work-related injury among union laborers in WA State over two years in the mid-1990s. The authors observed 12% lower injury rates among trained versus untrained workers. This effect was greater among younger workers — a finding the authors attributed to less informal on-the-job training and a greater propensity of younger and less experienced workers to benefit from injury prevention training material (Dong et al. 2004). Findings from both studies suggest that workers with the least experience receive the most benefit from safety training. Appropriately, the Carpenters’ construction apprenticeship program mandates OSHA-10 Outreach Training for incoming apprentices, and first-year union members accounted for a majority of the OSHA-10 students during the period under study.

A protective, significant effect of training was observed among carpenters whose predominant type of work was drywall installation (RR 0.34, 95% CI 0.15-0.75). Drywall installers have high rates of work-related injury compared to workers in other construction trades, including in this cohort of union carpenters (Lipscomb et al. 2000, Lipscomb et al. 2003, Schoenfisch et al. 2013, Schoenfisch et al. 2014, Schoenfisch et al. 2015, Lipscomb et al. 2015), perhaps allowing more of an effect of OSHA Outreach Training to be observed. Carpenters who receive OSHA Outreach Training may also be more likely to work for safer contractors; this pattern may be particularly true for carpenters in the drywall trade.

No significant difference was observed in the proportion of injuries resulting in paid TL days (trained: 21.2%; non-trained: 18.6%), the median number of paid TL days per TL injury (trained: 105; non-trained: 92), or the rate of TL injury by training status (RR 1.00, 95% CI 0.65-1.53). However, the number of paid TL days per 200,000 hours worked was lower among trained carpenters (trained: 547 per 200,000 union hours worked; non-trained: 1,752 per 200,000 union hours worked). Similar patterns were observed for cost rates (trained: $0.79 per union work hour; non-trained: $1.92 per union work hour). OSHA Outreach Training may indeed effectively reduce rates of severe work-related injury events. However, the data were not robust enough to allow exploration of this finding beyond a comparison of simple rates.

In lagged analyses, an increasingly protective effect of training was observed with increasing time since training, though results are statistically non-significant (e.g., RR_{36-month lag} 0.66, 95% CI 0.35-1.25) (Figure 2). This protective effect was greater among carpenters with <4 years in the union, compared to their more experienced counterparts. This finding may be attributable to improved application of classroom knowledge with increased on-the-job experience, safer firms seeking out safety-trained workers (and vice versa), or some combination of these and/or other unidentified factors.

Sensitivity analyses were conducted to compare the presented findings to those obtained when removing the 5-year expiration on carpenters’ training. Thus, a member who completed OSHA Outreach Training remained categorized as “trained” any time following training. With this change, no meaningful differences were observed in the effect of training, including on rates of work-related injury overall (RR 0.92, 95% CI 0.78-1.10) and those with paid TL (RR 0.93, 95% CI 0.60-1.44). Analyses were also conducted in which prevalent members were included and assumed to be trained at the start of study follow-up, only being categorized as “not trained” if
Table 2. Injury frequencies, time at risk, rates, rate ratios, and 95% CI of WC claims for injury by OSHA Outreach Training, overall and by worker age, time in the union, type of work, and calendar year

<table>
<thead>
<tr>
<th>OSHA Outreach Training through PNWRCC in past 5 years</th>
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<tbody>
<tr>
<td></td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hours</td>
<td>#</td>
<td>injuries</td>
<td>Rate(^a) (95% CI)</td>
<td>Hours</td>
<td>#</td>
</tr>
<tr>
<td>Injuries, Overall</td>
<td>1,138,147</td>
<td>99</td>
<td>17.4 (14.3-21.2)</td>
<td>98,272,853</td>
<td>9,787</td>
<td>19.9 (19.5-20.3)</td>
</tr>
<tr>
<td>By carpenter age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30 years</td>
<td>269,493</td>
<td>26</td>
<td>19.3 (13.1-28.3)</td>
<td>16,423,237</td>
<td>1,820</td>
<td>22.2 (21.2-23.2)</td>
</tr>
<tr>
<td>30 to &lt;40 years</td>
<td>356,751</td>
<td>27</td>
<td>15.1 (10.4-22.1)</td>
<td>28,177,004</td>
<td>2,960</td>
<td>21.0 (20.3-21.8)</td>
</tr>
<tr>
<td>40+ years</td>
<td>506,276</td>
<td>45</td>
<td>17.8 (13.3-23.8)</td>
<td>53,538,101</td>
<td>4,999</td>
<td>18.7 (18.2-19.2)</td>
</tr>
<tr>
<td>By time in the union</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Apprentices (&lt;4 years)</td>
<td>355,427</td>
<td>33</td>
<td>18.6 (13.2-26.1)</td>
<td>23,586,374</td>
<td>2,890</td>
<td>24.5 (23.6-25.4)</td>
</tr>
<tr>
<td>Journeymen (≥4 years)</td>
<td>782,720</td>
<td>66</td>
<td>16.9 (13.3-21.5)</td>
<td>74,686,479</td>
<td>6,897</td>
<td>18.5 (18.0-18.9)</td>
</tr>
<tr>
<td>By predominant type of work</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercial</td>
<td>676,655</td>
<td>70</td>
<td>20.7 (16.4-26.2)</td>
<td>51,217,796</td>
<td>4,911</td>
<td>19.2 (18.7-19.7)</td>
</tr>
<tr>
<td>Drywall</td>
<td>155,565</td>
<td>6</td>
<td>7.7 (3.5-17.2)</td>
<td>21,141,980</td>
<td>2,418</td>
<td>22.9 (22.0-23.8)</td>
</tr>
<tr>
<td>Other(^c)</td>
<td>300,541</td>
<td>20</td>
<td>13.3 (9.0-20.6)</td>
<td>24,871,732</td>
<td>2,282</td>
<td>18.4 (17.6-19.1)</td>
</tr>
<tr>
<td>By calendar year</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000-2002</td>
<td>74,999</td>
<td>13</td>
<td>34.7 (20.1-59.7)</td>
<td>31,806,516</td>
<td>3,806</td>
<td>23.9 (23.2-24.7)</td>
</tr>
<tr>
<td>2003-2005</td>
<td>347,504</td>
<td>29</td>
<td>16.7 (11.6-24.0)</td>
<td>27,597,535</td>
<td>2,713</td>
<td>19.7 (19.0-20.4)</td>
</tr>
<tr>
<td>2006-2008</td>
<td>715,644</td>
<td>57</td>
<td>15.9 (12.3-20.7)</td>
<td>38,868,803</td>
<td>3,268</td>
<td>16.8 (16.3-17.4)</td>
</tr>
</tbody>
</table>

\(^a\) Injuries per 200,000 work hours

\(^b\) Compares rate of injury among trained versus rate of injury among non-trained. Unadjusted and adjusted analyses yielded similar findings; the unadjusted estimates are presented.

\(^c\) Includes residential, piledriving, millwrighting, and work out of WA State
they did not complete OSHA Outreach Training within 5 years. With this categorization and adjusting for potential confounders, change was observed in the effect estimate related to rates of work-related injury overall (RR 1.12, 95% CI 1.03-1.22), but not for that of rates of paid TL injuries (RR 0.93, 95% CI 0.65-1.33).

The true benefits of training and strength of effectiveness are not fully apparent through use of WC claims data alone; there are important practices that cannot be explored in these data. The effect of safety training on injury prevention through improved hazard awareness and control may "spill-over" to non-trained workers (Dong et al. 2004, Williams et al. 2010, Forst et al. 2013, Ruttenberg 2013). Further, training may influence reporting practices by educating workers on their rights to a safe workplace and providing instruction on how to report a work-related injury (Dong et al. 2004, Williams et al. 2010, Forst et al. 2013, Ruttenberg 2013).

**Limitations and Strengths**

There are well-known limitations inherent in the cohort data of relevance to the research questions. No direct measures of job tasks or work-related exposures are available in this cohort, although predominant type of work provides a meaningful categorization for analyses. Also, the data do not include ethnicity or language spoken. In some construction trades in the Pacific Northwest, high-risk, high-priority minority populations are prevalent, and efforts are needed (NORA Construction Sector Council 2008) to deliver targeted safety training (Williams et al. 2010, Wilkins 2011, Forst et al. 2013). Additionally, we recognize that we are gathering data from union carpenters who are part of an apprenticeship program, limiting the generalizability of findings (Roelofs 2012, Amick III et al. 2015). However, focusing on the union segment of the industry, with existing union apprenticeship programs, labor-management relations, and (in this case) a longstanding collaborative partnership with an academic research team, allowed the research questions to be addressed to carry out this work with the resources available through CPWR’s Small Study funding mechanism.
Our statistical analysis reflected carpenters with OSHA Outreach Training that we were able to identify. Presumably a substantial number of journeyman carpenters in this cohort received OSHA Outreach Training prior to the period under study, but records for that time were unavailable. Additionally, data on carpenters’ OSHA Outreach Training through other means (e.g., online) were not available. Though training records indicated that 1,017 workers received OSHA Outreach Training during the period, fewer than half met the cohort requirement of ≥3 months of union work - likely a consequence of apprentice attrition (Bilginsoy 2003, Byrd and Weinstein 2005, Glover and Bilginsoy 2005).

Finally, measuring WC claims activity is not the same as measuring occupational injuries. It is well-documented that a large number of work-related injuries are not reported to WC (Azaroff et al. 2002, Shannon and Lowe 2002, Leigh et al. 2004, Fan et al. 2006, Rosenman et al. 2006, Friedman and Forst 2007, Welch et al. 2007, Government Accountability Office 2009, Lipscomb et al. 2013, WelILLner and Bonauto 2014, Lipscomb et al. 2015). Firms with high-quality safety and health programs may encourage reporting of all workplace injuries. OSHA Outreach Training includes instruction on injury reporting and on workers’ legal protections under OSHA. Such incentives may increase the propensity of workers to report minor injuries, in which case the 13% reduction in WC claims associated with OSHA Outreach Training observed in this study would be an underestimate of the true relative difference.

This study demonstrates both the utility and importance of robust, longitudinal surveillance data in the appraisal of long-term evaluations of the effectiveness of workplace safety interventions, as well as challenges in clearly evaluating training effects in this dangerous industry. Similar exploration of construction workers’ training and injury experience outside of this dynamic cohort is unrealistic, if not impossible, in the open shop environment or otherwise. Time at risk and reported injuries were well defined, allowing for the calculation of injury rates and their examination over time surrounding documented training. This study also demonstrates the complexity of occupational safety training effectiveness evaluations and the related importance of framing an analytical approach and interpreting results in context. Although statistical power was limited to address all of the planned analyses, the framework presented provides a guide for future research considerations.

Relevance and Practical Application

Recent systematic reviews point to the paucity of research demonstrating that occupational safety training can improve health outcomes, as well as a lack of well-designed controlled studies (Cohen et al. 1998, Robson et al. 2010, Robson et al. 2012). Yet training is not delivered in a randomized controlled manner, and it never happens in isolation. Even OSHA-10 training can be variable depending on the instructor’s points of emphasis, delivery method, and learners’ characteristics. Studies must consider the time needed for an intervention effect to be observed, the potential “spill-over” of a training intervention to non-trained workers, and the mobility of construction workers from project to project and employer to employer. In addition to working to address known methodological needs, future studies should focus on improving the accessibility, quality, and relevance of training, as well as its application in practice. Regardless of the study design, evaluations that focus on outcomes alone will be inherently limited without information on intervention fidelity; the effect of OSHA Outreach Training on rates of work-related injury will reflect, in part, the effectiveness of teaching methods (Wilkins 2011) and trainees’ ability to apply well-learned material on worksites (Williams et al. 2010).
Construction worker training in hazard awareness, injury prevention and mitigation, workers’ rights, and how to report adverse work-related events should be standard practice. Yet, such training alone cannot be expected to prevent work-related injuries to a significant degree in this dangerous industry. For such reduction to be realized, more concrete and efficient injury prevention approaches that eliminate or reduce hazardous exposures must be made available to workers (Herrick and Dement 1994, Castillo et al. 2011, Lipscomb HJ and Schoenfisch AL 2014). Union construction workers often receive OSHA Outreach Training as part of a formal apprenticeship program for which training may be an essential component of broader efforts to prevent work-related injury. Thus, as expected, these data do not demonstrate the likelihood that OSHA Outreach Training alone meaningfully decreases injury rates among union construction industry workers, although noteworthy benefits may be observed within specific worker sub-groups (e.g., by trade or experience) for whom efforts to improve retention – including through improved training participation – are needed for as the demand for a skilled construction workforce increases (Bilginsoy 2003, Glover and Bilginsoy 2005).

PRESENTATIONS, PUBLICATIONS, & DISSEMINATION PLANS


- Future dissemination plans:
  - (In progress) Brief report for a trade journal, discussing training effectiveness from and economic perspective.
  - Select published materials and a brief 1-page summary will be provided to the PNWRCC, PNWRCC Training Centers, and CTWW.
REFERENCES


Roelofs, C. (2012). "Evaluation of the implementation and impact of a Massachusetts construction OHS training rule." Center for Construction Research and Training (CPWR), Silver Spring MD 20910.


