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Safety benefits of mandatory OSHA 10 h training

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ABSTRACT

Construction is an inherently dangerous industry. Its injury rates for the industry annually rank near the top of all U.S. industries. The Occupational Safety and Health Administration (OSHA) is charged with regulating U.S. workplace safety. Towards this end, they provide enforcement and promote training. A standardized 10 h training course sanctioned by OSHA is available for construction workers in all states. In 2004, Massachusetts became the first of seven states to legislate mandated OSHA 10 h training for construction workers on most public projects. Previous studies have shown that occupational safety training has beneficial effects on knowledge gain and improved behavior but there is weak evidence for improved safety outcomes. The natural experiment created by mandated training provided the opportunity to study the effects of mandated training on these outcomes. This study uses the Bureau of Labor Statistics (BLS) 2004–2012 State Occupational Injury and Illness data in a random effects multiple regression analysis and BLS 2008–2011 fatality data from the Census of Fatal Occupational Injuries to examine fatality trends across different strata. The results are highly encouraging but fall short of definitive evidence. The post-mandate fatality trend results compare favorably against other state groupings and the non-fatal injury regression indicated a nearly statistically significant marginal effect for mandated training. However these results are clouded by the short duration of trend data and injury data known to be underreported. Recommendations include more extensive recordkeeping for OSHA 10 h training and improved injury surveillance.

1. Introduction

Construction is an inherently dangerous industry. In 2012, there were 775 private sector construction fatalities in the U.S.[1]; more than any other industry. The Occupational Safety and Health Administration (OSHA) is charged with the regulation of construction safety. With approximately 2200 inspectors for 8 M worksites,[2] only a tiny percentage of worksites ever get inspected. Therefore, punishment for safety infractions may have limited effectiveness in accident prevention. Prevention through education and training appears to be the preferred and more effective alternative.

Recognizing the value of safety training, OSHA approves individuals and organizations to conduct a standardized 10 h course for construction workers. The OSHA 10 h construction training[3] teaches recognition and awareness of common hazards as well as prevention measures.

Construction unions have played a huge role in safety training during the last thirty years. In 1994, The Center for Construction Research and Training (CPWR) was a partner in forming the National Resource Center (NRC). The NRC worked with affiliated trade unions to structure an OSHA 10 curriculum and become an authorized education center eligible to train-the-trainers for OSHA 10. Commercial and industrial building trade unions have since made OSHA 10 a mandatory part of their apprenticeship programs and campaigned for government agencies to mandate the training on public construction contracts. As a result, it is estimated that 25 percent of U.S. construction workers (Sinyai et al., 2013) have now received this training from OSHA authorized trainers.

This ten hour training module must be conducted by OSHA authorized trainers who possess at least five years of construction safety experience supplemented by 60 h of train-the-trainer training. The ten hours of training topics always contains two hours of Introduction to OSHA, one hour each on the 'Focus Four' hazards (falls, electrocutions, struck by, and caught-in or between), and one hour on protective equipment and other construction health hazards. The remaining three hours consist of elective modules such as cranes and derricks, scaffolds, ladders, and power tools.

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[1] https://www.osha.gov/oshstats/commonstats.html.
[2] Includes all industries, not just construction.
[3] For ease of composition, this training will be referred to as just OSHA 10 hereafter.

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0925-7535/

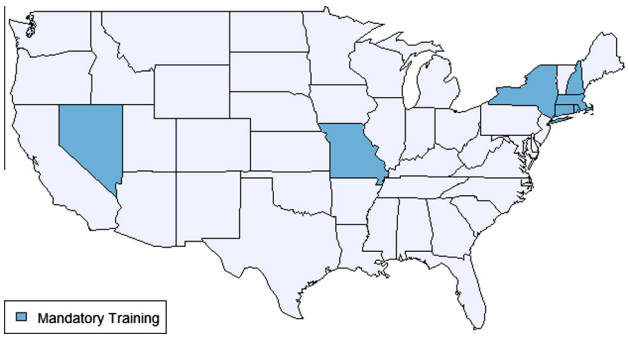

Fig. 1. States having mandatory OSHA 10 training.

In 2004, Massachusetts became the first of seven states[4] to legislate mandated OSHA 10 training for workers on public projects. In the study period public work comprised over 30 percent of all construction nationally.[5] Since the state mandates cover nearly all public construction falls in their jurisdiction, a measurable state level reduction in injuries and illnesses might be anticipated in those states.[6] One study (Roelofs, 2012) clearly demonstrated qualitative benefits from this mandated training within Massachusetts where union workers were much more likely to receive OSHA 10 (97 percent) than nonunion workers (17 percent). No follow up quantitative study has been made to determine if these seven mandates have yielded improvements in fatality and injury rates.

With seven states (see Fig. 1) now requiring OSHA 10 trained workers for most public projects, sufficient data is available to attempt a quantitative analysis.[7] The collective state mandates effectively created a natural experiment allowing the testing of a marginal effect on injury rates. Given sufficient data, marginal effects can be estimated by using regression analysis. Unfortunately, insufficient observations exist for regression on fatality data, but trend comparisons can be made.

2. Background

There is such an abundance of available literature regarding training's effectiveness as a component of occupational safety and health that a detailed review would be cumbersome. Many of the previous studies were small, narrowly focused, and of questionable quality. Therefore, gleaning useful information is extremely difficult except for the existence of three meta-analyses (Cohen and Colligan, 1998; Burke et al., 2006; Robson et al., 2012). These and a few other applicable studies supply the necessary background for previous studies on training effectiveness.

The three meta-analyses pose common questions in their evaluations. They are:

- Does training increase safety knowledge?
- Does training result in safer workplace behavior?
- Does training result in better safety outcomes?

See Table 1 for a summary of results. Given the relatively positive results on knowledge and behavior, it is puzzling that the evidence on improved outcomes is so weak.

Burke's work was alone in answering yes to all three questions. The amount of improvement and retained improvement was generally tied to the training's level of engagement. Lectures, videos, and pamphlets were considered the least engaging with hands-on exercises allowing development of knowledge in stages being the most engaging and successful. For knowledge, the most engaging produced three times the gain of the least engaging without knowledge loss after four weeks. Surprisingly, behavior improved similarly for all engagement levels. Lastly, the more engaging forms produced better safety outcomes on average. Using Burke's guidelines, OSHA 10 would be low to moderately engaging training.

Table 1
Meta-analyses selected results.

Study	Knowledge	Behavior	Outcomes
Cohen et. al.	+	+	?
Burke et al.	+	+	+
Robson et al.	?	+	?

+ Improved, ? Not Conclusive.

In contrast to Burke, Cohen and Colligan found no impact on outcomes and thought that some training might even be harmful. Referring to three separate smaller studies, they posit, "...one could argue that faulty or bad training may have worse consequences than no training at all". Of note, OSHA online training denounced by Roloefs' study, now comprises twenty percent of OSHA outreach training.[8]

In a study with important implications for an injury analysis, non-fatal injury rates were shown to be vastly underreported (Probst et al., 2008). The authors showed construction injuries were underreported by over 80 percent in organizations with negative safety climates and by 47 percent in those with positive safety climates. Other studies (Dong et al., 2011; Glazner et al., 1998) confirmed substantial injury underreporting in construction. Underreporting was more prevalent in firms with 20 or fewer employees.

Since both fatal and non-fatal injuries are to be considered here, it is relevant that the two have been shown to have a negative correlation (Saloniemi and Oksanen, 1998). In a study of Finnish workers, a strong negative relationship existed for the construction industry ($r = -0.82$ with $p < 0.001$). As a possible explanation, they hypothesized that different causations exist for differing construction accident types. Therefore, a reduction in either type is not to be assumed in the other.

When examining other correlations, another study (Conway and Svenson, 1998) found that lower injury rates were correlated with the business cycle. Specifically, lower injury rates accompanied the recession beginning in 1993. Another researcher (Dorman, 1996) stated "there is clearly a 'cyclical' component to safety: it rises during periods of economic hardship, and falls during periods of growth. This may be due either to the speedup in the pace of work when orders pile up (this is implicit in Okun's law, according to which fluctuations in output exceed fluctuations in employment), or to the influx of new, inexperienced workers when hiring expands". This correlation is also seen in the data for this study.

As mentioned earlier, Roelofs' 2012 Massachusetts work found a strong correlation between union membership and having received OSHA 10. This study interviewed 13 key informants and surveyed 100 Massachusetts construction workers to ascertain the perceived effectiveness of mandated OSHA 10. Almost universally, the surveyed union workers had received the training while non-union and immigrant workers were much less likely. Most

[4] The others are CT, NH, NY, NV, MO, and RI. Though MA legislated first, RI implemented earlier.

[5] U.S. Census Bureau, Historical Value Put in Place.

[6] Fatality reductions are harder to assess since individual state counts are typically small and subject to much annual variation.

[7] Data is available for six of the seven states. No data is available for NH.

[8] https://www.osha.gov/dte/outreach/outreachgrowth.html. Downloaded October 2013.