Partnership for Work, Health and Safety

Research BRIEF

Performance of the COR® audit in BC construction firms: Do higher scores predict lower injury rates?

Background

The Partners in Injury and Disability Prevention Program established by WorkSafeBC is a voluntary program that recognizes and rewards employers who exceed legislative and regulatory requirements in implementing occupational health and safety management systems (OHSMS). Employers who pass an audit of their OHSMS practices receive a Certificate of Recognition (COR) and are eligible for a rebate of 10% of their WorkSafeBC premium.

A Partnership for Work, Health and Safety (PWHS) evaluation of the effect of the COR audit program on injury rates for BC firms found that certified firms had, on average, 12% lower short-term disability, long-term disability, and fatality claim rates, and an 11% lower serious injury claim rate, compared to non-certified firms, between 2003 and 2016, with a greater effect in more recent years. Lower claim rates associated with certification were also found by sector, in particular in the construction, manufacturing, and forestry sectors. Detailed findings are available at www.pwhs.ubc.ca.

In the BC construction sector, WorkSafeBC and the BC Construction Safety Alliance (BCCSA) collaborate to oversee the COR program. The BCCSA COR® audit tool is used to certify construction firms in BC. It is also used, with some modifications, by health and safety associations across Canada. Although such assessment tools have also been implemented worldwide, there have been few rigorous evaluations of their performance. Evaluation of the BCCSA COR® audit tool will help improve the design, delivery, and effectiveness of the program and guide improvements to OHSMS certification in BC and nationally.

Specifically, PWHS worked with the BCCSA and WorkSafeBC to assess:

1. The **measurement properties** of the audit tool.
2. The **predictive validity** of audit scores, including scores on individual elements and sub-elements of the audit tool—i.e., are higher scores associated with lower injury rates?

Based on research presented in:

McLeod C, Saffari N, Cliff R, Jones A. (2020). Assessment of the British Columbia Construction Safety Alliance Certificate of Recognition audit score measurement properties. Final Report to WorkSafeBC and the British Columbia Construction Safety Alliance. Vancouver: Partnership for Work, Health and Safety, University of BC.

McLeod C, Yousefi M, Jones A. (2020). What occupational health and safety management system components predict firm injury rates in the British Columbia construction industry? Assessing the predictive validity of the British Columbia Construction Safety Alliance's Certificate of Recognition Audit Tool. Final Report to the British Columbia Construction Safety Alliance. Vancouver: Partnership for Work, Health and Safety, University of BC.

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Measurement properties of the audit tool

Audit scores are used to determine eligibility for COR certification, and ideally also to incentivize firms to make improvements in low scoring areas of the audit. The audit tool includes 14 elements, each intended to capture an important component of an OHSMS in the construction industry. Assessment is conducted through document review, interview, and observation of management and workers, or a combination of these approaches. Characteristics of a well-designed measurement tool include **reliability** (i.e., consistent assessment across and within firms), **validity** (i.e., the elements and sub-elements assess what they are meant to measure), and **parsimony** (i.e., only what is needed to be measured is measured).

The first phase of the audit tool assessment examined score validity and reliability, with a focus on sources of score variability.

Predictive validity of audit scores

The second phase of the audit tool assessment examined the predictive validity of overall, element, and sub-element scores. Specifically, we examined if:

1. Higher overall audit scores were associated with (predict) lower firm injury rates;
2. Particular element and sub-element scores were associated with lower injury rates; and
3. A parsimonious set of sub-elements that collectively best predict lower firm injury rates could be identified.

What we did

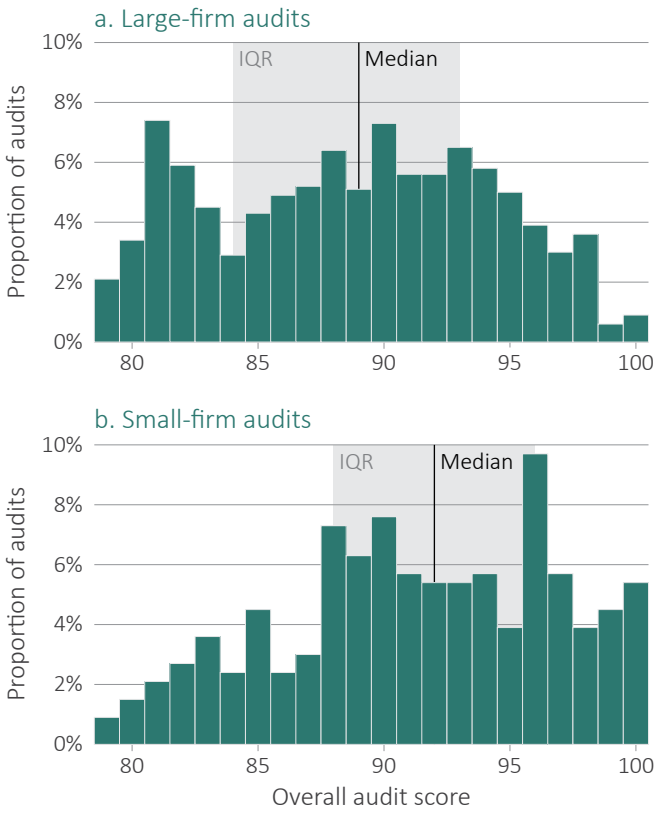
We created a database of all BCCSA COR® audits between 2012 and 2017, with data on overall audit scores, element scores, and sub-element scores. The audit tool includes 14 elements and up to 115 sub-elements. We linked all large- and small-firm certification, recertification, and maintenance audits to WorkSafeBC firm injury data. We analyzed audit scores overall and by characteristics including mode of administration, auditor type, and year of audit. We conducted regression analyses to determine the association between overall, element, and sub-element scores and firm injury rates, for all passed audits. We identified a reduced set of sub-elements that collectively explain the greatest variation in firm work injury rates.

What we found

Measurement properties

Overall audit scores were high, with firms completing the large-firm certification audit awarded a median score of 89 (interquartile range (IQR) 84-93) and firms completing the small-firm certification audit awarded a median score of 92 (IQR 88-96) (Figure 1).

Figure 1 | Distribution of overall audit scores, certification and recertification audits only, by firm size, 2012-2017



A subset of audit elements was associated with variation in the overall score; however, many audit sub-elements were almost uniformly passed, with 45 of 115 sub-elements having a pass rate of 95% or higher (i.e., less than 5% of audits receive a score of zero). This is known as a ceiling effect. Scores were lower for large firms compared to small firms, and for certification and recertification audits compared to maintenance audits. Overall audit scores decreased over time, especially for certification and recertification audits at large firms.

We found a marked effect of **auditor type** on overall, element, and sub-element scores. External auditors were more likely to assign a score of zero at the level of the sub-element. This effect carried over to the element and overall audit scores, which were lower for external auditors compared to internal ones. In addition, changes in the overall audit score over time were predominantly driven by external auditors.

We also found a strong effect of **mode of administration** on sub-element scores. Sub-elements scored using documentation were less likely to have a ceiling effect (i.e., lower pass rate). Sub-elements scored using interviews were more likely to have a ceiling effect (i.e., higher pass rate).

Elements on the BCCSA COR® audit tool

1. Company health and safety policy
2. Workplace hazard assessment and control
3. Safe work practices
4. Safe job procedures
5. Company rules
6. Personal protective equipment
7. Preventative maintenance
8. Training and communication
9. Inspections
10. Investigations and reporting
11. Emergency preparedness
12. Records and statistics
13. Legislation
14. Joint Occupational Health & Safety Committee

Predictive validity

The overall score on the audit is a strong predictor of firm injury rates. Firms scoring lowest had a 90% higher short-term disability (STD) injury rate than firms scoring highest, and a 57% higher serious injury rate (Figure 2).

The audit elements that contributed the most to this association were elements 2, 8, 10, 11 and 12. For element 10, firms failing three or more sub-elements had a 211% increase in the STD rate compared to firms passing all questions. For elements 2, 8, 11, and 12, the increase in the injury rate was 102%, 125%, 95% and 128%, respectively, for firms failing or three or more sub-element questions compared to firms passing all questions (Figure 3).

Figure 2 | Difference in likelihood of short term disability and serious injury for high, middle, and lowest scoring firms compared to the highest scoring firms, 2012-2017

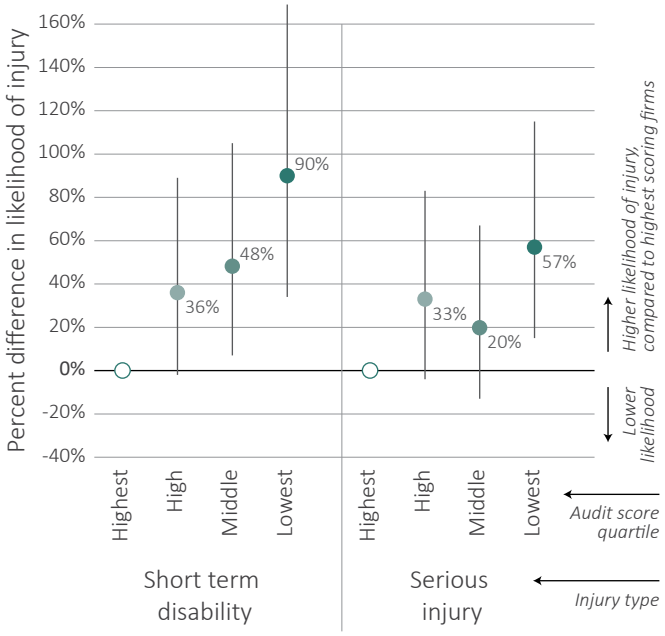
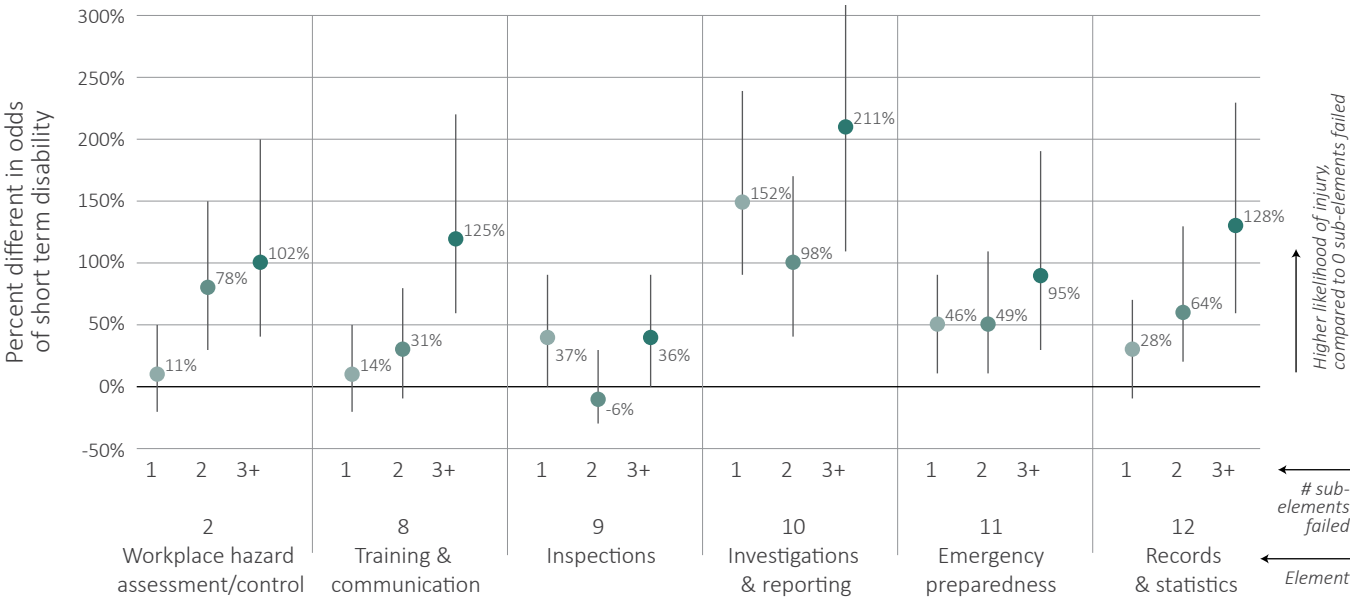


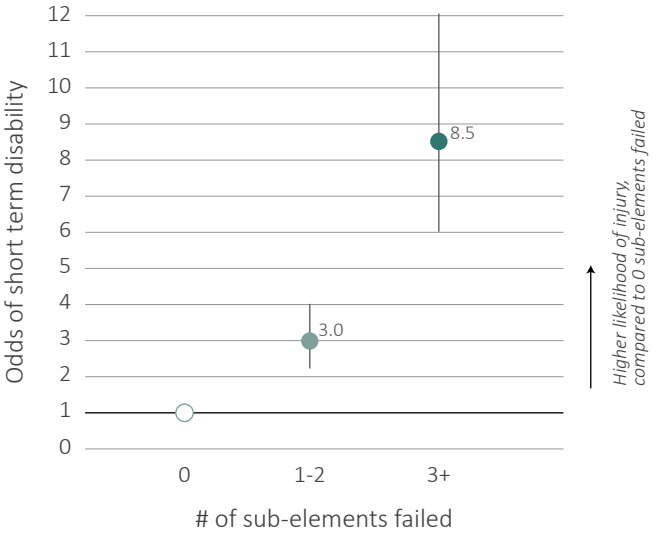
Figure 3 | Difference in odds of short term disability for firms failing 1, 2, and 3+ sub-elements, compared to firms failing none, for high variation elements only, 2012-2017



A combination of 21 sub-elements were found to best predict firm injury rates. Examples of these sub-elements include 10.7 *(no-loss time incidents being reported),* 8.9 *(supervisors received training in workplace inspections and health and safety),* and 2.2 *(employer uses an ongoing hazard assessment process)*. Compared to firms that passed all 21, firms that failed any one or two of the 21 sub-elements had three times higher odds of STD and firms that failed three or more had 8.5 times higher odds of STD (Figure 4). Thirteen of these sub-elements were from elements 2, 8, 10 and 12. No sub-elements from elements 1, 7, 13, or 14 were identified as influential.

Factors influencing elements and sub-elements not being predictive were ceiling effects, mode of administration (sub-elements assessed via documentation tended to be more predictive than those assessed via interview or observation), auditor type (audits conducted by external auditors were more predictive than those conducted by internal auditors), and face and construct validity (the content of the sub-element indicates that it might be weakly correlated to injury performance, especially in comparison to other questions).

Figure 4 | Odds of short term disability for firms failing 1-2 and 3+ sub-elements, compared to firms failing none, for the 21 sub-elements that best predict firm injury rates, 2012-2017



What this means

Overall, a firm's score on the BCCSA COR® audit is a strong predictor of their injury rate, but this is dependent on who does the audit and is driven by a portion of audit elements and sub-elements. Predictive elements tend to be those requiring demonstrated action and implementation of processes or procedures, rather than the presence of policies or demonstration of OHS knowledge.

Recommendations that could be applied to the BCCSA audit tool, and more generally to OHSMS certification, are:

- Expand the use of external auditors, and emphasize auditor training and quality assurance.
- Use documentation as part of the assessment where possible, and review the structure and assessment approach of interview and observation questions.
- Develop and apply a scoring approach that reduces sub-element ceiling effects.
- Develop a parsimonious OHSMS audit with a smaller set of questions. If improvements are made in question validity this could lead to improved or similar predictive ability compared to a longer audit.
- A combination of sub-elements largely drawn from elements 2, 8, 10 and 12 best explain variation in firm work injury rates. Performance on these elements could be the focus of future prevention activities in the construction sector.

Disclosure statement

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All inferences, opinions, and conclusions drawn in this brief are those of the authors, and do not reflect the opinions or policies of the BCCSA or WorkSafeBC.

More information

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