Injury Trends in Saskatchewan Construction: Evaluation of The IWH-OPM as an Effective Leading Indicator

June 2024 Update

Highlights

- Introduction of IWH-OPM as an accessible and widely used tool in safety culture assessment across Canada and its implications for Saskatchewan's construction industry.
- The significant correlation identified between the OPM score and future lost time injury rates, substantiating the use of safety culture surveys as a leading indicator for risk assessment.
- Comparison of safety culture in COR-certified vs. non-certified firms revealing the positive impact of certification on safety culture and potentially safety outcomes.

Background

In 2019, EHS Analytics began collaborating with the Saskatchewan Construction Safety Association (SCSA) to develop state-of-the-art data analytics solutions for the SCSA executive management team, staff, and members. As a crucial part of this collaboration, safety-performance data, including claims and metrics from the Saskatchewan Workers' Compensation Board (WCB) and audits and training conducted by the SCSA, was imported into the EHS DataHub. The DataHub's comprehensive data enabled quick design and implementation of various studies to examine the effects of different elements, such as safety audits, training, business size, and business growth, on the occupational health and safety (OHS) outcomes of SCSA members.

These studies highlighted the need for more advanced leading indicators, applicable at the industry level, to help the SCSA and its members identify emerging risks of workplace injuries. In 2022, we identified the assessment of safety culture – a workplace's shared values and beliefs regarding OHS – as a promising leading indicator. After evaluating multiple safety culture survey tools, the IWH-OPM was selected because it is concise, well studied and easy to administer at the industry level and can be completed in a few minutes.

The IWH-OPM is an evidence-based, eight-item questionnaire developed by the Institute for Work & Health (IWH) and Ontario's prevention system partners. It is one of the most widely implemented safety culture survey tools in Canada, with extensive examination of its applicability in assessing and improving organizational health and safety culture[1,2,3,4].

Starting in October 2021, EHS Analytics worked with the SCSA to administer the IWH-OPM to its members. Six surveys have been conducted so far, twice a year in the Fall (October) and Spring (April). Participation is voluntary, but SCSA members are encouraged to complete the survey at no cost. Members can access their survey results on their SCSA Analytics member dashboard, where they can also view other safety performance metrics such as WCB data

[1] IWH leading indicator tool wins over advocates across Canada

[2] IWH eight-item tool helping WorkSafeBC assess workplace cultures, interact with employers

[3] IWH-OPM impact case studies

[4] Saskatchewan's construction safety group uses IWH's safety culture tool to measure OHS among member employers

(claims, premiums, surcharges, discounts), COR© status, and training records (including NCSO and NHSA). They can also compare their safety culture results with benchmarks of their peers based on size groups and WCB rate codes.

To our knowledge, this is the largest safety culture survey of its kind administered at an industry scale. The results gathered from the last six surveys have provided sufficient data for statistical analysis and evaluation of the effectiveness of safety culture surveys as leading indicators. This article focuses on the outcomes of our study on the IWH-OPM surveys collected from SCSA members, addressing three key questions:

1. Is there any meaningful difference between the safety culture benchmarks in the Saskatchewan Construction Industry and those collected from previous studies?
2. Is there a meaningful difference between safety culture in COR-Certified firms and their non-certified peers?
3. Can safety culture survey results be used as a leading indicator to evaluate the risk of serious workplace injuries?

Data

We administered six surveys from October 2021 to April 2024, conducting them in the Fall (October) and Spring (April). Each survey period lasted two weeks, with an optional one-week extension. Before each survey, SCSA communicated the survey duration to members. Member firms had the option to invite their employees through a sign-up process, during which only email addresses were collected. We generated a dataset of members (identified by their WCB number) and their corresponding email addresses prior to each survey, and then collected surveys through two methods.

In method 1, we sent a unique survey link to all the email addresses we had on file for each member firm. These email addresses were sourced from the sign-up process or other datasets such as training records. Each participant had the option to invite more coworkers at the end of their survey by submitting their email addresses. Emails were sent every morning to those who had not completed the survey during the two-week safety culture survey period.

In method 2, members were encouraged to download a safety culture survey poster containing their unique QR code from their SCSA Analytics member dashboard and post it in their workplace. Employees could then participate in the survey by scanning the QR code.

Surveys were anonymous, and email addresses were only collected for survey administration purposes. A total of 3,150 unique surveys were collected from 794 unique SCSA members during the last six surveys. Table 1 provides an overview of the collected surveys.

Table 1: Overview of surveys collected

	OCT 21	APR 22	OCT 22	APR 23	OCT 23	APR 24
Surveys Collected	534	434	545	616	496	617
Members Participated	417	310	304	297	187	234
Survey Per Members	1.24	1.3	1.73	2.02	2.59	2.56

Methodology

To answer the first question, we compared the safety culture surveys collected from SCSA members to the IWH-OPM benchmark. The IWH-OPM benchmarking sample for the construction sector was based on 100 construction workplaces that completed the IWH-OPM questionnaire from 2011 to 2013[5]. We used a One-Sample T-Test and Cohen's d to examine the statistical significance and effect size of the differences, respectively.

To examine the safety culture differences between COR-Certified firms and their non-certified peers, Coarsened Exact Matching (CEM)[6] was used to minimize the effect of key covariates, particularly firm size and rate code. Our previous studies have shown that these factors can significantly affect a firm's OHS performance. We used a T-Test for Independent Samples and Cohen's d to assess

[5] IWH-Organizational Performance Metric (IWH-OPM) benchmarks

[6] Blackwell M., Iacus S., King G., & Porro G., The Stata Journal (2009) 9, Number 4, pp. 524–546

the statistical significance and effect size of the average OPM scores of the two groups, respectively.

To answer the third question, we studied the correlation between a member's average OPM score and their average lost time injury rate in the six-month period following the survey. Generalized Linear Model (GLM) negative binomial regression was used to estimate the correlation due to its ability to handle the over-dispersion (i.e., many zeros and few extreme high values) typical of injury rates.

To achieve a better statistical representation, we filtered out firms with less than three employees and a participation rate of 10%. The final dataset used for the analysis included 252 unique firms and 1643 unique surveys.

Results

Comparing SCSA and IWH OPM benchmarks

Figure 1 represents the comparison between IWH and SCSA OPM benchmarks. SCSA benchmark for all questions and the total score is higher than the IWH benchmark. Although the difference between all scores is statistically significant, two questions have particularly interesting trends in terms of Cohen's d effect size.

Question 1 has the only large effect size ($d > 0.8$) meaning SCSA members feel much stronger about formal safety audits at regular intervals being a normal part of their companies. Further analysis showed that this is most likely because we engaged many COR-Certified members. In fact, as we engaged more COR-certified members over time, we observed an increasing trend in the question 1 score.

Conversely, question 8 is the only question showing a small effect size ($d < 0.2$). This means although the difference between SCSA and IWH benchmarks has statistical significance, its size is small showing a little difference between these two. Question 8 asks workers if they believe that everyone in their organization has the tools and/or equipment they need to complete their work safely. The small difference between perception of Saskatchewan construction about question 8 and those collected about thirteen years ago from Ontario construction companies signifies that shortcomings in OHS performances in the Canadian construction industry are not highly related to lack of tools and equipment. To move the needle on safety, we need novel solutions implementing data to uncover hidden trends in safety.

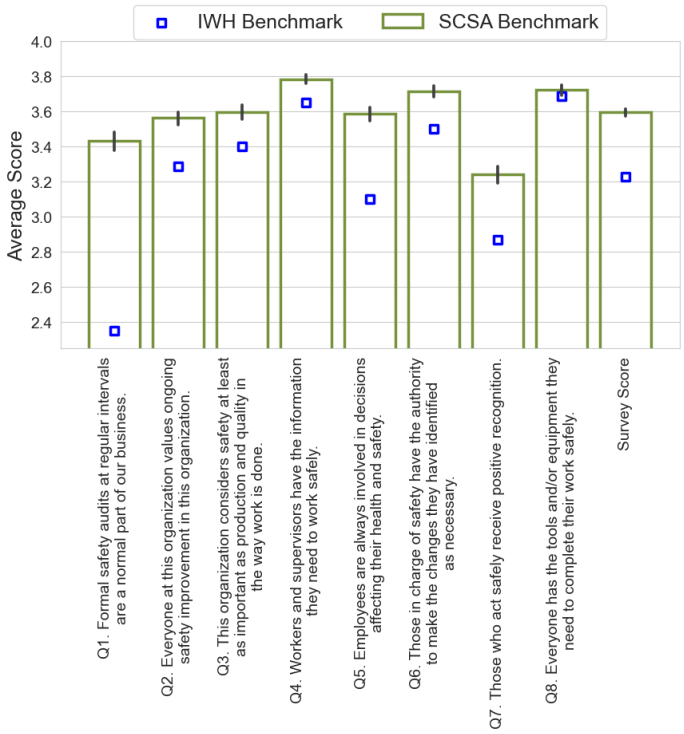

Figure 1: Comparison between IWH and SCSA benchmarks for OPM questions and total score.

COR vs. non-COR

COR-certified firms in Saskatchewan construction have submitted statistically significantly higher OPM scores compared to their peers. Figure 2 shows this difference clearly. The Cohen's d analysis showed that the effect size is 0.52 suggesting a moderate to substantial difference between the two groups. In practical terms, a Cohen's d of 0.52 indicates a moderate difference between the two groups' average scores. It suggests that the certification status has a noticeable but not overwhelming impact on the survey scores, and it also implies that about 66% of non-certified members submitted OPM scores that were below the average of the certified members.

This result confirms the effect of COR-certification on the safety culture of the member firms. Our previous studies have confirmed that COR is an effective tool in reducing workplace injuries, especially lost time and serious

injuries. This study also confirms that being COR-certified has a positive impact on the safety culture of the construction companies.

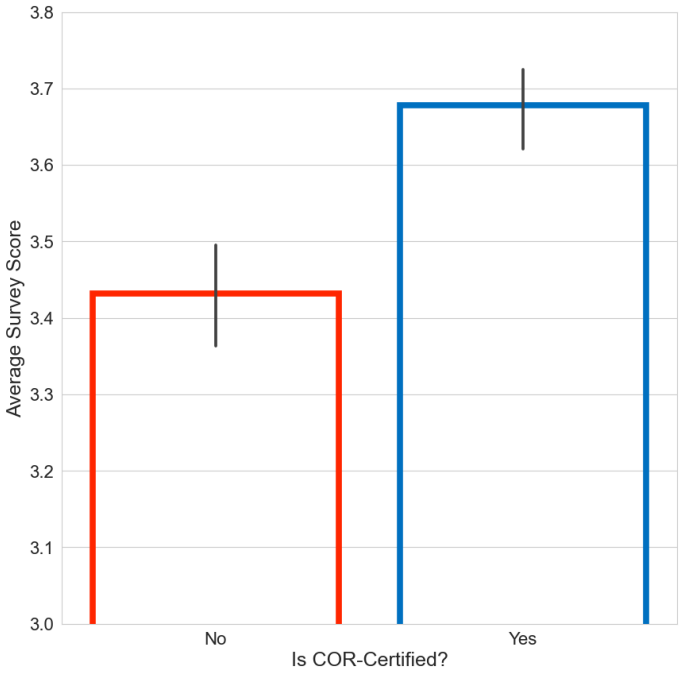

Figure 2: The average OPM score of COR-certified SCSA members in comparison to their non-certified peers.

OPM score as a leading indicator

To evaluate the effectiveness of the OPM survey score as a leading indicator, we studied the correlation between the non-COR certified member firm's survey score and their average lost time injury rate in the following 6-month window after the survey. We filtered out the COR-certified firms to avoid the mixed effect of COR-certification and OPM score. In fact, we were not able to construct a statistically significant correlation between the COR-certified firms and their OPM score. We chose the 6-month window because this is the time length between two surveys we administer each year. The time window bigger than 6-months may result in the mixed effect of multiple surveys.

To illustrate the correlation, we plotted the average lost time injury rate vs the OPM-Tier in Figure 3. We used the same definition suggested by IWH as follows:

- Tier 1: OPM score of 4 - to achieve this score a person must indicate 80-100% for all 8 questions
- Tier 2: OPM score of 3.375 to 3.875 - person could indicate 80-100% for only 7 of the questions at most
- Tier 3: OPM score of 2.875 to 3.375 - person could indicate 80-100% for only 6 of the questions at most
- Tier 4: OPM score of 0 to 2.875 - person could indicate 80-100% for only 5 of the questions at most

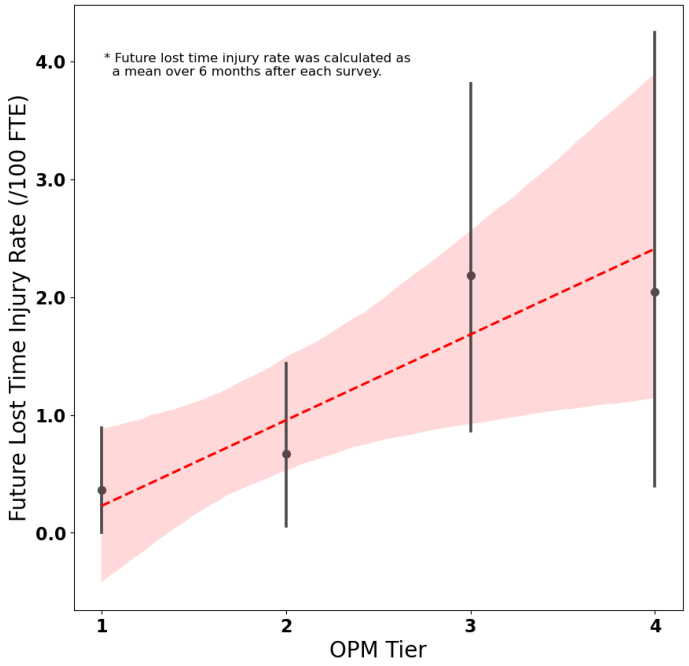

Figure 3: The correlation between OPM Tiers and the average lost time injury rate in the following 6 months after the survey.

More precise regression analysis based on negative binomial regression showed that there is a statistically significant correlation between the OPM score and average future lost time injury rate of non-COR-certified member firms. This analysis indicates that an average increase of one unit in the OPM score is associated with an average of 60% reduction in the lost time injury rate. For a firm improving its OPM Tier from 4 to 1, the accumulative decrease in the change on time loss injuries can add up to about 280%. This is a significant result confirming the applicability of OPM safety culture survey as a leading indicator for OHS performance.

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