Royal Commission on Workers’ Compensation in British Columbia

Firm Level Organizational Practices

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1. **Objective**

Traditionally, Occupational Health and Safety (OHS) has been concerned with chemical, physical and biological hazards in the workplace. Thus, for example, physical hazards can include lighting and temperature, chemical hazards include airborne contaminants such as lead or vinyl chloride, and biological hazards in certain work groups concern infection passed onto a worker through contact with others, through needle stick injuries, or through other routes. Physical hazards that may result in accidental injuries have also been a major concern for OHS practitioners. In most industrialized countries, these concerns have diminished over the years, and increasing attention has been paid to "psychological" or "psychosocial" issues. Attention has been paid to the "stress" of the workplace\(^1\), and in some instances attempts have been made to redesign the nature of the work being done by each worker.

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\(^1\)The term "stress" is ambiguous, since it is used to refer both to the factors in the workplace that create a response and to the outcome of (response to) the workplace factors. I will use the term "stressors" to refer to the workplace factors.
This paper, though, will look at a different type of evidence. It will examine factors at the level of the workplace, rather than the level of the individual. I will begin by describing the meaning of "firm level organizational practices", and go on to review various types of evidence which link such factors to workplace safety. This will be followed by a discussion of the policy implications, especially on how to secure management commitment to safety in the workplace.

2. **Introduction**

2.1 Work Organization and Workplace Organization

I noted above that many workplaces have become concerned with stress. To deal with the stress, employers have commonly used stress management programmes. These attempt to show workers how they can deal with what are often seen as almost inevitable stressors in work, as well as daily life. These approaches have been criticised because they do nothing to relieve the workplace stressors that create the stress. (I once heard a sceptical view that these programmes “teach people how to feel good about feeling bad”). As well, there is even a report which suggests that stress management programmes can be harmful where the individual has no control over his or her stressful situation. (Dolan, 1994)

This has led people to consider the relevance of factors at the level of the workplace. How much do organizational practices, and in particular safety culture, influence the number and types of accidents and injuries that occur? There is perhaps a fairly fine line between work level and firm
level factors. In particular, the way in which the workplace as a whole is organized is critical in
determining the organization of work at an individual level. An obvious example of this is the
difference between automobile manufacture via an assembly line versus the policy adopted by
Volvo of having small groups of workers take responsibility for assembling a car from start to
finish.

2.2 Components of Workplace Organization

What can we identify as relevant in examining this issue? We can specify several components
that make up what we call workplace or firm level organization. These include:

- organizational structure and philosophy
- organizational philosophy on OHS
- labour markets and unions
- internal responsibility systems (the philosophy underlying much OHS legislation in Canada and
  elsewhere which relies on labour and management working together "internally" to solve OHS
  problems)
- organizational demography
- risk and physical conditions
- financial performance and profitability
2.3 Broad Evidence Linking Organizational Factors and Safety

An obvious question is why we might believe that these factors could make a difference in safety performance. For now I will look at some data that suggest at a broad level that workplace factors may be important. (Later I will examine evidence on which particular factors may make a difference.)

The first set of data concerns five automobile assembly plants in Ontario. Essentially, these do the same type of work - putting together cars, vans and trucks. Yet data from these plants for three successive years show a consistent pattern across the companies. Despite the similar nature of the work there is about a five-fold difference between the best and the worst companies in their workers’ compensation lost time claims rates. Interestingly, this does not occur just for back pain or upper extremity problems for which some discretion in reporting might be considered as an explanation, but the same pattern occurs also for acute injuries - which are much less likely to be susceptible to such reporting bias.

The next piece of evidence concerns the apparently limited effectiveness of health and safety approaches adopted during the 1980's in Canada. Most jurisdictions in Canada adopted new health and safety legislation in the late 1970's or early 1980's. Public attention focused on these issues and political pressure on governments to act ensued. Thus more intensive attention was paid to OHS. However, when the lost time claim rates for Canada generally and Ontario in particular are examined for the period between the late 1970's and 1990, little evidence of a
decline is seen. (This, in fairness, is not true for fatal accidents or all accidents, which include non-lost-time, both of which did decline significantly.) If the traditional approaches to OHS had been effective, we would expect to have seen a drop in lost time claim rates. That this did not occur raises questions about our current approaches to OHS.

(The drop since 1990 was probably associated with the recession in the early part of the decade. This is supported by the work of Brooker and Frank (Brooker, Frank, & Tarasuk, 1997), which showed in time series analyses an inverse relationship between the employment rates in different sectors and the Workers’ Compensation claim rates.)

At an even broader level there are differences across different jurisdictions. Fatal accident rates per 100,000 employee-years are lower in Scandinavian countries than in North America, where rates are in turn lower than those in developing (Third World) countries. While differences may be due to a number of factors, including cultural attitudes, types of industry, legislation, etc, the figures do show that improvements are indeed possible. However, this "big picture" view is somewhat beyond the scope of this paper, which concentrates on the intermediate level (the workplace), which falls between the macro-level (state, province, country) and the micro-level (the individual).

It is not just in the auto industry that major differences between organizations exists. Some companies in almost all types of business have consistently better safety performance than others. Accident rates can vary by ten- or even one hundred-fold within "rate groups" (groups of
companies in the same type of business). There are a number of possible explanations for such differences - reporting; workforce characteristics; chance findings; or real differences. I will examine arguments and evidence in favour of and against each of these possible explanations. And, in particular, if the conclusion is that real differences exist, then the obvious question is why? What is being done differently by the good companies? As I have already noted, this type of question differs from that posed by more traditional scrutiny and research on accidents/injuries, which tend to focus on the individual worker.

2.4 The Increasing Attention to Organizational Factors

This newer approach of looking at company-level variables has become fairly common, albeit only fairly recently. As Feyer and Williamson (Feyer & Williamson, 1998) point out: "the search for the major causes... of occupational accidents has really moved now to concentrate on the systemic and organizational aspects of work rather than on the immediate circumstances and behaviours that lead up to each individual accident."

Hale and Hovden (Hale & Hovden, 1998) consider attention to the management systems and culture to constitute the "third age of safety". The "first age of more scientific study of safety concerned itself with the technical measures" to prevent injuries. Research focussing attention on the individual worker started the second age. The rise of ergonomics and concern with probabilistic risk analysis in the 1960s and 1970s produced a linking of these two approaches.
Hale and Hovden note that in the 1980s there was "increasing dissatisfaction with the idea that health and safety could be captured simply by matching the individual to technology". They identified several reasons for the increased interest in organizational factors and management systems in the late 1980s. These reasons included several major disasters (including Bhopal, Seveso, the crash of the Challenger, etc), several of which occurred in settings with apparently well-developed safety systems - yet they showed clearly the role of organizational factors. Another reason was the cutbacks in the role of government, leading to less detailed regulation and less inspection of OHS at the workplace itself. Regulatory authorities wanted to find indicators of appropriate self-regulation by companies and they looked for these in the scope and functioning of the management systems.

Interestingly, those who study organizations have long realised the difficulty of changing the organization by changing individuals. Over 30 years ago Katz and Kahn wrote: “...attempts to change organizations by changing individuals have a long history of theoretical and practical failure... Its essential weakness can be labelled the psychological fallacy, the concentration on individuals without regard to the situational factors that shape their behaviours ...it is a great over-simplification” (Katz & Kahn, 1966). The “situational factors” are, of course, what I have been labelling firm level organizational practices.
3. **Types of Evidence Available**

I now move on to discuss evidence on what features (factors) of the organization and approaches to OHS are related to better safety performance. Before doing so, I first note that a number of attempts have been made to list organizational factors related to safety - but often based on little or no scientific evidence. This is not to say that experienced safety professionals are not correct in their judgements of what works and what does not work in safety. But as the ACSNI Human Factors Study Group wrote: “Before committing an organization to wide-spread change, however, it would be wise to consider evidence more objective than mere opinion. The first part of the report has described the history of safety management as perceived by employers, managers, and regulators. A striking feature of this history has been the small amount of research evidence that has been quoted to support the beliefs that have evolved” (ACSNI, 1993).

3.1 **Case Studies**

There are a number of companies known to have outstanding performance in health and safety. In some, injuries (or at least serious injuries) appear to have been virtually eliminated. One example of the literature scrutinising such companies is the work by Stewart (Stewart, 1996; Stewart, 1994; Stewart, 1993a; Stewart, 1993b) which has set out to identify characteristics of these outstanding companies. Stewart drew particularly on the experience of DuPont, the chemical manufacturer. In Canada, their injury frequency in the mid-1980s was 0.08 per 200,000
exposure hours, compared with the industry average of 0.40, and a rate in Ontario manufacturing of 7.0. Certainly, the nature of work in the chemical industry is different from that in other manufacturing - for example, in the automobile industry, assembly line work entails repetitive work in awkward postures with the consequent risk of back pain or upper extremity disorders. However, the chemical industry is well aware of the potential for disastrous accidents and has paid considerable attention to OHS. Its safety record, and DuPont’s in particular, is notable compared with other industries.

Stewart’s experience at DuPont led him to list several "keys to managing for superior safety". The first was that excellence in safety and in business performance can go together. As well, top management must be committed to safety and to the view that all injuries can be prevented. The "message" to all levels of the organization must be clear and aimed to engage the workforce. Safety must be accepted as a line responsibility with strong leadership from the CEO down. Safety systems, structures and processes should be in place, with well-trained resource people. Safety standards and rules should be understood by all and developed by those who will live with them - and discipline should reinforce the rules. Finally, all employees should be involved in safety activities.

3.2 Comparative Case Studies

One limitation of case studies is that they include no comparison. Thus while the characteristics of outstanding companies are identified, there is no guarantee that those characteristics are any
different from those of companies with mediocre or poor safety records. This is not to say that the findings of these reports are to be dismissed, but they should be interpreted with caution.

From a research methodology point of view, the ideal is to have in-depth studies of a large number of companies with both good and bad safety performance. In practice, though, a balance must be struck between the sample size (i.e. the number of companies studied) and the amount (or the depth) of information obtained on each company. Thus Verma and Irvine (Verma, Irvine, & Shannon, 1994) investigated several plants in the auto industry to understand differences in organizational practices in those plants with better and worse safety records.

They studied four companies, collecting data “through site visits using direct observation, in-depth interviews with key informants, representing several levels of the organizational hierarchy, and through the retrieval of organizational documents.” Verma and Irvine summarized their conclusions under six key points:

Firstly, where there had been improvements, there was some motivation to make changes. Indeed, they believed that these motivators were important in explaining the differences between organizations- why some workplaces do not use available knowledge to improve health and safety. In the plants studied, motivation came from poor safety performance history or sometimes poor safety audits, or both. In one case, the possibility of plant closure led management and union to collaborate on a wider range of measures for improvement.
Verma and Irvine noted that one factor that contributed to better safety performance was “local autonomy” at the workplace. This allowed those directly affected to take action as and when needed. In this respect, they noted that perceptions of safety differed depended on proximity to situation. Thus, a plant manager could have difficulty identifying appropriate changes throughout the plant. This meant it was important for workers to be able to use formal and informal channels to promote safety.

Thirdly, another factor contributing to the success of OHS programs “was the joint [i.e., from both labour and management] nature of response to safety and health issues” (It should be noted that all plants in their survey were unionized. The authors were unable to conduct similar explorations in non-unionized plants). The authors listed a number of ways in which labour and management collaborated. They noted that the mechanism by which joint action works was not identified - it was not a focus of the study - but indirect information led them to suggest that “the message of safety is conveyed more effectively to workers when it comes jointly from both the union and the management”.

A fourth factor was an appropriate mix of formal procedures as well as flexible practices within those structures. Thus certain activities such as formal audits were considered important and dealt with conscientiously; and that when action was needed more rapidly, the parties involved were able to use more informal mechanisms to ensure that what was needed got done.

A fifth factor related to OHS performance was accountability. Where performance was better, all parties - managers, union leaders and workers - were all involved in creating a safe environment.
One plant manager in particular took leadership in developing a safety culture and made others in the plant accountable for implementing recommendations from safety audits.

The final factor Verma and Irvine identified was the use of incentives to improve safety standards. In their sample, none of the plants offered rewards, but rather recognized high safety performers. An unusual “incentive” given to one plant by the company’s head office was a financial “cushion” to allow for changes in the assembly line. This allowed a slowdown of the line during the changeover from one model to another, a period which the literature suggests is associated with a higher number of accidents.

In their overall conclusions, Verma and Irvine pointed out that a “joint governance system...provides a foundation for effective health and safety performance”. They argued that new models of workplace governance might be needed, and suggested the need for future research to focus on this. In particular, they considered the view that health and safety issues are ones on which both labor and management can easily agree to be “simplistic”. This they felt meant new governance processes were needed even more strongly.

3.3 Quantitative Studies

As noted above, an alternative to studying a small number of companies in depth is to examine a large number of companies, but with comparatively less information on each. My colleagues and I at McMaster University conducted one such study (Shannon, Walters, Lewchuk, et al. 1996;

3.3.1 McMaster Study

We began with the list of factors comprising firm level organizational practices noted above, in Section 2.2. Our primary approach was via a survey of companies. The questionnaire was designed to refer to practices at the level of the workplace. We asked questions based on our theoretical understanding of the topic as well as the aims of the study, and we copied or adapted questions from other surveys. We developed separate questionnaires - one to send to workers and the other to management. The management questionnaire was long even after substantial pruning, so we divided it into three sections. This was to allow its completion by different people, depending on their position, expertise and knowledge. The targeted respondents were the senior manager, the human resources manager and the management co-chair of the Joint Health and Safety Committee (JHSC). The questionnaire for workers was directed to the worker co-chair of the JHSC. Some questions were identical in both the worker and management questionnaires. The questionnaire was pilot tested and appropriate revisions made. Since we wanted to make comparisons between workplaces with different levels of safety performance, we used workers' compensation lost time frequency rates to identify companies with "low", "medium", and "high" rates. We defined "low" as a rate less than or equal to 50% of the average injury rate of the rate group (a group of comparable businesses). Similarly, we called "high" a rate more than 50% above the rate group average. We identified six rate groups in manufacturing, and two in retail.
We considered only companies with more than 50 employees (in retail, more than 20), and divided organizations into those with less than 100 and greater and/or equal to 100 employees.

Overall, we chose roughly 1,000 workplaces. We received completed questionnaires from 54%, with a higher response (58%) from the manufacturing companies. Our phone call reminders to workplaces had suggested that the length of the questionnaire was a barrier to its completion in non-respondents. We therefore took a short list of questions from the original survey that could be answered in a 5-10 minute interview. We telephoned non-respondents to ask them to complete this short questionnaire, and roughly 75% of 200 companies randomly sampled from non-respondents did so. Their answers to these questions were very similar to those obtained from the mail survey. As well, the response rate was very similar in companies with low, medium and high frequency rates. We therefore concluded that comparisons we made between these three groups were valid.

Our main analysis compared each variable across the three groups. We looked for overall differences, as well as a possible "trend" across the three groups. We also conducted multiple regression using the lost time frequency rate as a percentage of the rate group average as our outcome.

Among the variables related to lower claim rates (at least in manufacturing, for which the sample size was much larger) were: delegation of authority; a high degree of worker autonomy and participation; and encouragement of career commitment. On the approach to OHS in particular,
factors related to lower claim rates included: health and safety being defined in each manager’s job description; health and safety constituting an important component of managers’ annual appraisals; participation of the workforce in health and safety decisions; and provision of group (but not individual) safety incentives. In contrast, factors related to higher rates included: high employee turn over; and number of grievances per 100 union members. Regarding the internal responsibility system, several variables were related to higher claim rates: little training for labour JHSC members; labour threats to take issues outside the JHSC; management threats of sanctions; and work refusals in the previous three years. As well, the state of worker-management relations was important, with more cooperative workplaces having lower rates, based on responses from management representatives. (A similar trend was seen with the responses of the worker representative, although it was not statistically significant.)

While this study was being conducted, a number of similar projects were also in progress. In a second report (Shannon, Mayr, & Haines, 1997), these and other reports are synthesized and variables consistently (from study to study) related to lower claim rates are identified. I now describe briefly each of these studies and their findings, concentrating on factors reported in more than one of the studies.
3.3.2 Shafai-Sahrai Study

The earliest study we identified was one conducted in Michigan (Simonds & Shafai-Sahrai, 1977; Shafai-Sahrai, 1973). In a monograph, adapted from his Ph.D. dissertation, Shafai-Sahrai and his supervisor identified eleven matched pairs of companies in the state. Each member of the pair was in the same industry and of roughly the same size, but had quite different accident rates. The ratios of accident rates of the two paired companies ranged from 1.3 to 4.5, with an average of roughly 3. All companies were visited and workplaces observed. Various executives were interviewed and relevant records were examined. The factors studied could be classified into four groups: involvement of management, various promotional efforts, characteristics of the workforce, and physical conditions. Of 26 companies contacted, 22 agreed to take part in the study - an excellent response rate. The companies ranged in size from 80 to 650 employees. As well as the interviews, the researchers used a rating form for the observed physical plant conditions. A number of factors were related to lower injury frequency rates: involvement of top management in safety; better recording systems for injuries; use of accident cost analyses; fewer workers under the aegis of each supervisor; existence of recreational programs for employees; higher average age of employees; a higher percentage of workers who were married; longer mean duration of employment with the company; better machinery safety protection; and roomy and clean shop environment. Factors not related to injury frequency included efforts to promote safety through the families of workers; and the quality and quantity of safety rules.
3.3.3 NIOSH Study

In the mid 1970s a number of studies were conducted by the National Institute for Occupational Safety and Health in the US (Cohen, Smith, & Cohen, 1975; Cohen, 1977). One of these (Cohen, Smith, & Cohen, 1975) met the eligibility criteria for inclusion in our overview. Using Wisconsin firms from six different industries, 96 matched pairs of companies were identified - 52% responded, with no difference in response proportions between high and low injury rate companies. As well, accident rates were similar in respondents and non-respondents. Data were used from 42 pairs. The primary data available came from self-administered questionnaires completed by safety personnel. The study defined within-pair high rate firms as those with at least double the accident rate of low rate firms. (Rates were of accidental injury requiring more than first aid treatment). While many of the results were not statistically significant, the authors described a number of factors and their relationship to accident rates as “suggestive”. Factors related to lower accident rates included: active role of top management; conduct of safety audits; safety incentives; safety training on a regular basis; use by company of community and family to promote health and safety; and use of personal protective equipment. Use of discipline was if anything related to higher accident rates. Factors unrelated to claim rates included number of workers per supervisor; completeness of accident investigations; presence of safety rules; and monitoring of unsafe behaviours of workers.
As noted above, the NIOSH group conducted other studies. These included a review (Cohen, 1977) of relevant research including, of course, their own. Cohen concluded that strong management commitment to safety and frequent close contact between workers, supervisors and management on safety matters were “the two most influential and dominant factors”.

3.3.4 ILO Study

In 1988 Chew reported a study from Thailand, India, and Singapore (Chew, 1988). Firms of moderate size (50-200 workers) from six different industries were identified, and 18 matched pairs were “selected” (the number eligible was not reported). Structured, unblinded interviews of the chief executive and safety personnel of the company were conducted. Further information was obtained by observation in a “walk through” of the plant. Using the combined fatality and lost time injury rate, a high rate firm was one whose rate was two to four fold higher than that of the low rate firm in the pair - where pairs were matched by nation, industry, and number of workers. Factors related to lower claim rates included: active role of top management; safety audits; and amount of safety training. Also important were good housekeeping and safety controls on machinery. Safety incentives and numbers of workers per supervisor were not related to accident rates, while presence of safety rules and use of personal protective equipment were each significant in one of the three countries.
3.3.5 Quebec Studies

Simard and colleagues (Simard & Marchand, 1994; Simard, Levesque, & Bouteiller, 1988) identified Quebec industrial firms with more than 70 employees. They selected from a random sample until 100 firms were willing to take part in the study. (To reach this number, they approached 258, so their response rate was 39%). Self-administered questionnaires were given to a variety of individuals in the company - managers, personnel directors, supervisors, safety personnel, management and union joint health and safety committee co-chairs, worker safety representatives, and the union president. The researchers identified firms with a below average lost time accident rate in each of two years (1986 and 1987). These companies were labelled as “more effective” - and other companies were considered “less effective”. The analysis was quite theoretical, but in terms of factors considered by other studies their data showed that lower accident rates were related to safety audits; correction of hazards; completeness of accident investigations; and younger age. (This was the only study which suggested younger people had lower accident rates. In general, studies show a reduced accident rate in older workers - see (Laflamme & Menckel, 1995).) Use of personal protective equipment, low turnover, and level of perceived risks by management were not significantly related to accident rate.

A second study of Quebec workers by Tuohy and Simard (Tuohy & Simard, 1993) was carried out in Quebec workplaces with more than 20 employees in nine industrial sectors. Of the 921 companies approached, 352 (38%) responded, and 117 had usable data (13%). Injury rates for three years were used to define a company’s status relative to its class (of companies in the same
type of business). Self administered questionnaires were completed by management Joint Health and Safety Committee (JHSC) representatives. Companies whose workers had more seniority and were older tended to have lower accident rates. However, a number of factors were not significantly related to injury rates. These included the representation of senior management on the JHSC; the presence of a safety director; worker and manager as co-chairs of the committee; and the use of threats to take matters outside the joint health and safety committee by members of the committee. Interestingly, some factors were both positively and negatively related to accident rates, depending on the subgroup of companies studied. Such factors included: institutionalized procedures for operation of the JHSC; a broad scope of activity for the committee; collective strategies to problem solving on the JHSC; and the profitability of the organization.

The authors explained the different results for smaller and larger companies by considering the timing of the formation of the JHSC. Larger companies, they argued, had had JHSCs in place for some time, sufficiently long for their effect to be noticeable. However, for smaller companies, the committees were more recent, and companies with poor safety records were using them to help solve their safety problems. The committees in such companies thus had much to do, so had a broad range of activities.

3.3.6 U.S. Mines Study

For our overview we identified a study conducted in US coal mines employing at least 150 underground miners (Mines Safety and Health Administration, 1983). Forty companies
participated, apparently all of those selected. Questionnaires were completed by various employees and management representatives. Injury incidence rates were used to distinguish high and low accident rate companies. Only a few of the factors measured overlapped with those in the other studies in our overview. None of the three was significantly related to injury rates: equipment well maintained; active role of top management; and the relative importance attached to safety compared with production.

Interestingly, after publishing our overview, I received a letter from Robert Peters who had conducted a similar type of review for the US Bureau of Mines (Peters, 1989). He identified a number of unpublished reports, although only the one just described was common to our review and his - all the other comparable studies he referenced were government documents outside the published (peer-reviewed) literature and were not found in our bibliographic search. In his summary of findings, Peters noted that ideally studies should use longitudinal designs, control groups, and multivariate analyses. He commented on the difficulty of finding companies willing to take part in research, and he also pointed out that "best practices" at large companies might not be feasible or practical for smaller mines and vice versa. Nevertheless, he identified some variables statistically significantly related to lower accident rates in multiple studies: better labor-management relations, greater employee involvement in decision making, management’s ability to communicate to the miner that they truly consider employee health and safety a top priority; and several aspects of first line supervisors’ interactions with miners. Peters observed that “most of the variables that appear to be playing a significant role in achieving a good mine safety record are within management’s ability to control".
3.3.7 Further Ontario study

Tuohy and Simard (Tuohy & Simard, 1993) studied not only Quebec companies but also firms in Ontario with more than 20 workers. They selected a random sample of “about” 3000 workplaces, of whom “2000” responded, and 920 provided usable data (31%). Self-administered questionnaires were sent to one worker member and one management member of each JHSC. A company’s safety performance was defined by its injury rate relative to its SIC (Standard Industrial Classification) group over a five year period. Seniority and low turnover were significantly related to lower injury rates; so too were number of workers represented on the JHSC; worker and manager as co-chairs; duration of training of JHSC members; institutionalized procedures for the operation of the JHSC; and a broad scope of activity for the committee. Factors not significantly related to the claim rate included senior management representation on the JHSC; presence of a safety director; executive/decision making status of the JHSC; advisory decision making status of the JHSC. Other variables produced ambivalent results depending on the size of company in the sub-group.

3.3.8 Studies from Upjohn Institute

Researchers at the Upjohn Institute have conducted two studies of organizational factors. The first one (Habeck, Leahy, Hunt, et al. 1991) studied Michigan firms with at least 50 workers (more than 100 in the health services field) who had at least some claims, and came from one of
four different industries. Of 284 companies, 44% (124) responded. There were no clear differences in response by number of workers or industry. Respondents, though, did have 20% fewer claims than non-respondents. Self administered questionnaires were sent to each chief executive officer. Compensation claim rates were used to define those with high rates (in the top 15%) and those with low rates (bottom 15%). A considerable number of variables were significantly related to lower claim rates: direct channels of communication and information; empowerment of the workforce; existence of profit sharing; presence of an employee assistance program; top management actively involved in safety; monitoring of unsafe worker behaviours; safety training on a regular basis; company committing resources to employee health; employee health screening; use of modified work following injury; low turnover; more seniority; and larger workforce. Presence of a union was related to higher claim rates. Executive/decision making status of the JHSC was not significantly related to claim rates; also not related were high grievance rates; supervisor training in interpersonal skills; presence of safety incentives; and several post injury behaviours.

In a later study from the same team (Hunt, Habeck, VanTol, et al. 1993), Michigan firms with over 100 workers were identified in seven different industries. This time the random sample was 477, of which 220 (46%) responded. Self administered questionnaires were sent to the chief executive officer or the director of human resources. The study used both claim rates and severity rates (lost work days per 100 workers) as outcomes. Factor analyses of the questions was conducted followed by a regression analysis of the injury rate against the identified factors. Among variables in constructs that were related to lower claim rates were: direct channels of
communication and information; empowerment of the workforce; encouragement of a long term commitment of the workforce; and good relations between management and workers. Specific factors for health and safety approaches that were associated with reduced claim rates included: evaluation of safety hazards; monitoring of unsafe worker behaviors; employee health screening; and provision of modified work. This latter factor was found in both Michigan studies, but in no others. This is because workers’ compensation applies in Michigan only after seven days’ lost time. Thus if successful efforts are made to return injured employees to work quickly, a compensation claim will not be made. Hunt and his colleagues also found that good housekeeping and safety controls on machinery were related to lower injury rates. Unlike almost all other studies, an active role in safety of top management was not significantly related to claim rates, nor were safety audits, hazard correction, or safety’s being important in performance appraisals.

3.3.9 Workwell Study

Another small study, by Lewchuk and his colleagues (Lewchuk, Brown, Groom, et al. 1990), examined the effectiveness of “Workwell”, an Ontario programme which gives companies a financial incentive to change practices and advises companies on what the new practices should involve. Workwell is linked to experience rating and encourages companies to employ formal health and safety programmes. The results of audits help determine if companies will have a surcharge imposed on their Workers’ Compensation (now Workplace Safety and Insurance) premium or receive a rebate on the premium. The authors examined four types of companies: (1) those with continuing high costs/claim rates which passed their audit; (2) those with high costs
which passed their audit, but which had reduced their accident frequency rate by at least 50% in the previous 12 months; (3) those with very low claim costs which passed their audit; and (4) those with very low costs which failed their audit. The first was considered a group not responding to the Workwell programme, while the others were considered likely to help understand how companies could reduce their accident rates and associated costs. For example, Group 4 consisted of companies which had avoided accidents despite the lack of a formal OHS programme (measured by the audit) and this might point to alternative safety approaches.

Although these were only seven companies in each of groups 3 and 4, and no formal statistical tests were conducted, the pattern of results led the authors to several conclusions. They noted that formal OHS programmes “were most successful when there was a strong managerial commitment and when employers were allowed to participate in decision making.” In contrast, formal programmes tended to be unsuccessful when these conditions were not present. Interestingly, the former (successful) situation occurred mainly with a largely male workforce, aged between 25 and 50, and with at least 2 years’ seniority. The unsuccessful programs were typically in companies with “a marginal work force” - young females with short seniority, and with limited communication ability in English.
3.3.10 Health and Safety Committees

I have found two studies that considered just one factor - the presence of Health and Safety Committees. Boden et al (Boden, Hall, Levenstein, et al. 1984) found “virtually no effect” in a sample of manufacturing companies in Massachusetts. (Interviews in a small sub-sample suggested that successful committees were characterized by commitment of management and labour, rather than by “objective” measures.)

Lewchuk, Robb and Walters (Lewchuk, Robb, & Walters, 1996) conducted a time series analysis of Ontario manufacturing and retail companies, taking into account when the companies set up their Health and Safety Committees - the manufacturing sector was required to have such committees from the early 1980s but retail operations had to do so only from 1990. In contrast to Boden et al, the authors’ results suggested that committees were linked to lower claim rates.

3.3.11 B.C. Forest Product Mills

As I was putting the finishing touches to this paper, I received a copy of a report submitted in late 1997 to the W.C.B. of B.C. (Havlovic & McShane, 1997). Its primary aim was to look at characteristics of Joint Health and Safety Committees, health and safety training, and management initiatives in forest product mills in B.C. in relation to injury rates. A secondary
purpose was to look at corporate and mill characteristics in relation to safety - and such variables were described as covariates in relation to the main questions. In this report, labelled “Preliminary Findings”, covariate analyses were not shown.

Data were received from 106 management and 59 employee representatives at 137 mills. The response rate was not stated, although this may be partially due to incorrect information in the records from which the list of BC mills was taken. The authors reported relationships with both minor and serious accidents. Interestingly, some classes of variables were more strongly associated with minor accidents (compared to serious ones), others with serious (rather than minor) accidents.

Overall, approximately 200 correlations were shown for each of minor and serious accidents. The authors concluded that there was “some support for the idea that structured JHSC activities help to reduce accident rates.” As well, better relations in various contexts between labour and management were related to some lower injury rates. The authors noted that mills with lower rates of serious accidents generally offered more training to management representatives on the JHSC; but there was not clear pattern for training offered to employee JHSC representatives. Finally, mills that were unionized had lower rates, particularly of serious accidents.
3.3.12 Summary of Quantitative Studies

Although the studies described can be considered quantitative, the data they provided did not allow a summary measure to be computed (e.g. via a meta-analysis) of the strength of each factor. Rather, the overview (Shannon, Mayr, & Haines, 1997) looked for consistency of the factors across the studies. Those consistently related to lower injury rates included: empowerment of the workforce; encouragement of a long-term commitment of the work force; good relations between management and workers; active role of top management; delegation of safety activities; conduct of safety audits; monitoring of unsafe worker behaviors; safety training - initial and continuing; low turnover and longer seniority; and good housekeeping. Factors not related to lower rates included: representative of senior management on the health and safety committee; written safety rules; and education/literacy of work force.

I should note that, even allowing for their design, the studies had certain limitations. For example, response rates were disappointing. Most did not state their power - in the smaller studies it would have been fairly low. Several had not been published in peer-reviewed journals and thus had not been through that “quality filter.” As well, the fact that each study considered its own set of variables (factors) with its own questionnaire makes comparison difficult, as does the different analysis conducted by each. Given these issues, it seems remarkable that we found as much consistency as we did. It suggests perhaps that the relationships found are strong ones, and some “real” ones may have been missed.
3.4 Workplace Interventions

Studies discussed up to this point show factors related to injury rates. However, correlation does not necessarily imply causation. Thus modifying these factors is not guaranteed to improve safety. We can, though, draw on data from interventions in the workplace that have been evaluated. Good evaluations, unfortunately, are relatively rare. It is unclear why this is so - it could be that those not reported were unsuccessful, or that companies consider such information to be proprietary and potentially a competitive advantage. In most cases, perhaps, evaluations are simply not done.

Nevertheless, Guastello has attempted to summarize the literature on what we really know about what works in safety (Guastello, 1993). He identified published papers reporting on the effectiveness of safety interventions. By computing an effect size, he was able to pool data from a variety of published reports. (By effect size he meant the proportional reduction in injury rate, taking into account the equivalent reduction in a comparison group.) He classified the interventions according to ten types. Several he identified could be considered interventions at the level of the workplace. Three categories that had substantial effect sizes (46-49%) included management procedures (based on three studies), comprehensive ergonomics (four studies), and a cooperative compliance program (seven comparisons). The last refers to an approach in California in the construction industry that can perhaps most concisely be described as intermediate between a regulatory approach and internal responsibility.
The International Safety Rating System attempts to look at the policies and procedures in place in a company with regard to safety. Four studies were identified that evaluated its effectiveness - which was modest (17%). The presence of safety committees was examined in six studies, giving an average effect size of 24%. Interestingly, the combined results of 30 studies that examined the effect of personnel selection (attempting to identify “accident prone” workers and either not hire them or place them in lower risk jobs) showed only a negligible effect (3%).

As well, considering health rather than safety, Polanyi and colleagues (Polanyi, Eakin, Frank, et al. 1996) reviewed evidence on workplace interventions instigated to improve employee health. Eligible interventions were those aimed at changing the workplace as a whole or the workplace organization, rather than attempting to change the individual (as is the case for smoking cessation or exercise programs, for example). As with safety interventions, the number of studies identified was disappointingly small and of limited quality. Nevertheless, the recommendations at the firm level may have some applicability to safety. The authors argued that organizational changes to improve workers’ health should involve unions or employee representatives, management and (if possible) outside researchers; and they should allow sufficient time for discussion of the interventions and their implications. Interventions should start with an assessment of current status and should be broadly based, taking into account a wide variety of factors. Finally, they suggested that large firms could make “comparative, best practice demonstrations in different organizational units” of their company. They also pointed to the lack of good evaluations of interventions that had been implemented.
In his review, Guastello required some aspects of good study design to be fulfilled for a paper to be eligible, but did not report a formal evaluation of each study. Good evaluations of OHS interventions, particularly more complex ones, are sadly lacking. Furthermore, many of those that are reported are of relatively poor quality. An editor of a safety journal told me that he often receives papers that do not follow basic methodological criteria. Yet these criteria are well known and some colleagues and I have written a paper to help journal readers understand how to identify a good quality study (Shannon, Robson, & Guastello, 1998). (We are also writing a monograph on how to do good evaluations - it should be completed later this year. An international group is helping to develop this material).

3.5 Alternative Explanations of the Results

In Section 2.3, I noted some alternative explanations for the differences in injury claims rates between companies. One was that these might be differences in workforce characteristics. For example, anecdotally it is believed that among automobile plants those with lower rates (may) have younger workforces who are less susceptible to back and other musculoskeletal disorders. Yet, as I noted above, the differences between companies persists for acute traumatic injuries, for which younger workers typically have higher rates. Thus this seems an implausible explanation. As well, some studies adjusted for workforce characteristics and still found organizational factors related to injury rates.
The play of chance is another possibility. However, the factors identified in the studies were statistically significantly related to injury rates. While such significant relationships could have occurred by change in perhaps one, maybe two, of the studies, the very purpose of the overview was to look for variables that were consistently related to safety performance in multiple studies - so that chance findings could be ruled out.

The issue of reporting - a third possibility - is of concern. Certainly it is known that compensable accidents that should legally be reported are not and it is often argued that some compensation claims are made fraudulently. Thus injury rates can be under- or over-reported. Measuring over-reporting is well-nigh impossible, while one study in Ontario (Research and Evaluation Branch, Ontario Workers’ Compensation Board, (1992) suggested the under reporting was relatively minor. If the misreporting as a whole is indeed minor, then it could not have materially affected the McMaster study (for example) in which there was at least a three-fold difference in claim rates between the ‘high’ and ‘low’ accident rate firms. Further, for mis-reporting to have biased the results, it would have to have been related to the factors under consideration. This could have been the case for some variables but likely not for others. “Random” misreporting, unrelated to the factors, will have introduced “noise” into the data, likely reducing the number of factors found to be significant, but not changing substantially the estimates of correlations, etc.
In short, then, while I do not have the space to do justice to the problem of misreporting, I believe it very unlikely to have seriously affected the results. This applies particularly to variables that were consistently related to injury rates in several studies across time and place. We are thus left with the fourth explanation - a real relationship between firm level factors and injury rates.

3.6 Summary of Data

Several primary factors seem relevant. Perhaps most important among them is the commitment of top management to safety. Regardless of the type of study, the finding that such commitment is important is consistently supported by study after study. It can perhaps been seen as the *sine qua non* for safety, since top management sends signals (of greater or lesser subtlety) on what it considers most important. Supervisors and workers will quickly determine whether the real priority is production. This, of course, leads to the question of course, of how to obtain management commitment - more easily said than done.

4. Management Commitment

Although it is somewhat beyond the scope of this paper, the literature review shows that management commitment is such an important question that I will address it briefly.

The work of Stewart (Stewart, 1993a) found a strong commitment to safety in companies that had a long history of such commitment or had a particular reason for acting - for example, a
fatality or serious accident had occurred or some other significant event had created an appropriate climate. Verma and Irvine made a similar point in their report. But neither explains how such commitment can be obtained in more ordinary circumstances. The only systematic and detailed attempt to investigate this issue that I am aware of is a book by Hopkins (based on his experience and research in Australia) entitled “Making Safety Work” (Hopkins, 1995). He first examines the “safety pays” argument - that is, that it is in the company’s economic interest to improve safety. Hopkins points out that this does not always work - and indeed that if it really did, there would be little or no need for regulations since it would be in management’s interest to deal well with safety. (Stewart argues that safety may well pay in very poor climates, but beyond a certain point the cost of injuries will not drive safety.) Hopkins describes his qualitative research showing that experience rating may lead to claims management - rather than safety or disability management. (The latter effect, he points out, calls into question the validity of lost time claim rates.)

Hopkins states that managers can be motivated by a belief in their obligation to obey the law; a wish to be seen to be doing the proper thing; and real concern for the welfare of (or at least lack of harm to) workers. He believes that government intervention is the best way to focus management attention on safety. From his interviews, he points out that small businesses are typically unaware of experience rating - but they do remember a visit from health and safety inspectors. Indeed he goes further and states that such visits are “the only thing that draws the attention of small employers to health and safety matters” (emphasis added).
He discusses the “enduring dilemma [for government agencies]...whether to punish or persuade.” The consensus of his contacts was that the best policy uses both, punishment and persuasion dependent on local conditions.

He argues strongly that there is a substantial impact of inspections. He further points out that, when they occur, prosecutions are most effective if they get senior managers (or company directors) onto the witness stand in court to explain company policy. He reports that many managers told him that fear of personal liability was by far the most important motivating factor to attend to. In a no doubt deliberately provocative statement, he writes that “a few show trials...would be extremely salutary.” Hopkins supports his argument by noting that risk management consultants emphasize personal liability ahead of financial benefits of improved safety, when they make their pitch for their services to management.

Overall, Hopkins’ arguments, being based on direct interviews with many managers, are quite persuasive. They do, though, promote approaches that are currently not fashionable and would likely be resisted strongly. To counter this, it could be argued that companies that obey the law and look after the safety and health of their employees have little to fear from a policy of prosecuting senior company officials.

One important limitation is that the most common types of work-related injuries are musculoskeletal - back pain and upper extremity disorders. These typically result from chronic exposures and while they can be quite disabling, are not life-threatening in the way that traumatic
injuries can be. Further, they may have a non-occupational component to their etiology, so will not seize the attention of managers and others as proposed by Hopkins, who was considering very severe or fatal accidents.

Another approach that has been used to try to change behaviour in other fields is to produce “league tables” of performance. Thus claim rates could be publicized, a policy that would draw attention to companies with poor records. This, though, might encourage managers to engage in claims management, rather than safety management. Hopkins quotes several examples of attempts to suppress reporting of injuries, rather than to prevent the injuries from occurring. And to the extent that time and resources are limited, attention to claims management will likely detract from the ability to engage in injury prevention.

Nevertheless, showing physicians how their adherence to certain guidelines compares with that of their colleagues has proven effective in changing their behaviour. Such an approach might well be useful in safety, provided the information reaches those with the power to take decisions and make changes.

Concluding Remarks

I have attempted to show how workplace organizational factors are related to safety performance. This is now accepted by many researchers and practitioners in the safety field, and represents a shift in focus from the individual worker to the workplace, i.e., the context in which the worker
operates. It does seem, though, that there are obstacles to applying the evidence towards accident prevention. I have already discussed the issue of obtaining management commitment. Another is that many interventions applied in the workplace are not properly evaluated and reported. Sometimes is seems “obvious” that the intervention should be successful (and in many cases it may well be) or those promoting or implementing it may have a vested interest in its success and be reluctant to put it to the test. For example, a safety professional may have worked hard to persuade management to pay attention to safety and implement a preventive measure at greater or lesser cost. In such cases, there is little incentive to open up the possibility that the measure was not effective. Evans (Evans ,1985), though, in the road safety field, has collated evidence showing the net effect of interventions can be nil or even that they do more harm than good! This shows that there is indeed an ethical reason to do quality evaluations.

Of course, in many cases the measures may be evaluated, but results of the evaluation are not widely reported. Companies may feel that effective measures give them a competitive advantage, or that there is no benefit to telling the world about measures that did not work as anticipated. Yet this would be useful - it could prevent others from repeating the same mistakes, or a careful examination of why the intervention failed could suggest revisions to the content or implementation of the safety measure.
How, then, can the conduct and reporting of evaluations be encouraged? One possibility is that companies that allow researchers to come in to their organizations, do the evaluations, and report them could be charged a reduced workers’ compensation premium. As well, publicity could be given to their willingness to contribute to the general good of the workforce.

In short, then, I am encouraging a climate in which safety measures are based on high quality evidence. Only in this way can we truly learn about what does and does not work in occupational safety and distinguish between studies of efforts to reduce claims of injuries from those which truly improve occupational health and safety.

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