from Research to Reality

Safety Climate
New Promise for Injury Prevention

LIBERTY MUTUAL RESEARCH INSTITUTE FOR SAFETY

SCIENTIFIC UPDATE
Dear Readers

In the world of injury prevention, many new concepts and research initiatives come and go, but some stand the test of time. One such time-proven concept is safety climate. A relatively new area of research for the Liberty Mutual Research Institute, safety climate is a measurable construct that reflects employee perceptions of the true safety priorities within their organizations. It has significant implications for helping businesses improve their organizational safety cultures and outcomes.

In this issue, we profile our first large-scale field study on this topic, examining safety climate among lone mobile and remote workers (see pp. 4–6). Our research extends current methodology and reaffirms safety climate as a leading indicator of safety performance, even in atypical work environments. Ultimately, we aim to use the information gained to develop a scientifically sound approach to collecting safety climate data that is diagnostic enough to identify specific intervention opportunities.

I hope you enjoy this issue, and we continue to welcome your candid feedback.

Ian Noy, Ph.D.
Vice President and Director
An Emerging Concept in Occupational Injury Research

“We know that most companies espouse safety as a top priority in their formal communications, websites, meetings, policies and procedures,” explains Zohar. “However, the true priority of safety is reflected in daily decisions made by management—from supervisors all the way up to senior managers—on whether to prioritize safety versus competing demands. That is what the safety climate scale measures.”

Safety climate gained worldwide attention following the 1987 Chernobyl nuclear disaster. Several investigations, conducted by the International Atomic Energy Commission, cited a faulty safety culture as the underlying reason for the catastrophe. “The Chernobyl investigations revealed that in the daily routines of the workers, competing demands were often prioritized ahead of safety,” notes Zohar. “It is a story that has been repeated in subsequent industrial disasters.”

Defined as the shared employee perceptions of the true priority of safety in the workplace, safety climate is the only measurable aspect of safety culture. Researchers administer carefully crafted surveys asking workers to identify discrepancies between what management says and what they actually do on a daily basis when faced with production deadlines, delivery demands, personal comfort issues, or other workplace circumstances that may take precedence over safety.

Scientists throughout the world continue to explore the relevance of safety climate in injury prevention. Researchers from several universities recently published a series of meta-analyses involving safety climate studies and found a strong association between safety climate and accidents and injury outcomes. “The results of these analyses underscored the value of our own involvement in this area of research,” explains Marvin Dainoff, Ph.D., director of the Institute’s Center for Behavioral Sciences (CBS). With the arrival of Dr. Zohar as the Institute’s 2009 Visiting Scholar, CBS researchers decided to study the impact of safety climate among non-traditional workers. “Prior to this point, safety climate research had focused exclusively on traditional work environments—no one had studied safety climate among workers who perform their jobs alone, on the road, or at off-site locations,” notes Dainoff. With cooperation from eight national trucking companies and two utility companies, the Institute began field studies of safety climate involving more than 10,000 lone and remote workers.

“For many industries, safety climate is an indicator...like a thermometer. When a negative safety climate is indicated—meaning workers perceive safety to be secondary to other management demands—it’s like a ‘fever’ indicating problems in the organization,” explains Dainoff. “The ultimate goal of our safety climate research is to understand the issues that are causing the ‘fever’ so that companies can take proactive measures to avoid negative safety outcomes.”

In 1980, the Journal of Applied Psychology published a landmark study on a new concept called safety climate. The study’s author, Dov Zohar, Ph.D., of Israel Institute of Technology, had developed and applied a safety climate scale at 20 industrial organizations, and his findings supported safety climate as a key construct for understanding occupational injuries. Since then, more than 200 scientific papers have been written on the subject of safety climate and the concept has gained increased importance in the safety research and practice community.
“Unless we understand what drives workers to engage in unsafe behaviors, traditional engineering and training solutions won’t have the impact they should,” says Marvin Dainoff Ph.D., director of the Research Institute’s Center for Behavioral Sciences (CBS). To illustrate this point, Dainoff cites the example of scientifically designed handrails to help commercial drivers exit and enter their vehicles more safely. “We know that properly designed and installed handrails, combined with training, can go a long way toward decreasing worker falls. We also know that many times drivers do not use the available handrails, and get injured as a result. Our research aims to find out what influences observed worker behaviors, so we can better address their safety needs.”

To better understand worker behaviors at both organizational and individual levels, researchers study safety climate—a measure of employee perceptions about safety priority in the workplace (see “Safety Climate: An Emerging Concept in Occupational Injury Research,” p. 3). Research has shown that a company’s safety climate can reliably predict its employees’ injury outcomes. However, most safety climate studies have focused on traditional work environments, in which supervisors and workers interact under the same roof throughout the day. Little research has been done to examine how a company’s safety climate influences lone workers or those who work in remote locations with little or no direct supervision.

“We have known for a long time that we can apply a safety climate scale to predict injury outcomes in industries such as manufacturing or services,” says leading safety climate expert and study collaborator Dov Zohar, Ph.D. “But we didn’t know if safety climate could also be predictive for lone and remote workers who work away from peers and supervisors.”

To address the lack of safety climate research on lone and remote workers, the CBS researchers launched a large-scale field investigation involving long-haul truck drivers and utility workers. Yueng-hsiang (Emily) Huang, Ph.D., the study’s principal investigator, explains: “Truck drivers typically drive alone for long stretches of time, and utility workers work remotely, either alone or in small groups. Both types of workers lack direct supervisory interaction and often encounter time constraints, weather, speed limits, and traffic conditions, all of which can take precedence over safety. Our study examined whether workers in lone and remote work situations develop a sense of their employers’ true safety priorities, and if so, whether these perceptions ultimately link to safety behaviors and injury outcomes.”
Trucking Survey Development and Testing

In early 2009, CBS researchers developed and refined a scientific survey to assess safety climate among lone mobile workers and their supervisors (see Table 1). The initial survey consisted of 100 questions derived from extensive interviews with subject matter experts (e.g., supervisors and drivers from a national long-haul trucking company and truck drivers at truck stops). They then refined the survey questions based on cognitive evaluation and feedback and selected those that best captured employees’ perceptions of the true priority of safety at both the direct supervisory level and at the top management level. “We knew from the literature that employees’ safety perceptions differ with respect to these two levels, so it was important that we looked at both,” notes Huang.

Researchers then pilot-tested the initial survey among 2,030 drivers employed by a national trucking company as well as 200 drivers randomly recruited from several New England truck stops. Based on statistical analyses of the survey responses, they selected the final 40 survey items. “Our pilot test results provided initial evidence that the survey was valid, intelligible, reliable, and feasible for use in large trucking companies,” notes Huang. Towards the end of 2009, the CBS researchers recruited seven more trucking companies to participate in the main study.

Data Collection, Analysis, and Feedback Workshops

Throughout the first six months of 2010, researchers administered the safety climate survey to employees of seven additional long-haul carriers, bringing the total number of drivers surveyed to 8,095. That summer, they compiled the survey data and presented it to the top management of each participating company in a series of individual debriefing workshops. “This was a very valuable exercise for the participants because they were able to benchmark their safety climate scores against other major trucking companies and identify their relative strengths and weaknesses,” recalls Huang. “It was also a valuable exercise for us, because it reinforced the value of our research and the potential to ultimately use the information gained to shape interventions. Some of the companies in the study did, in fact, use the data as the basis for safety improvements.”

As working partners in the study, the participating companies provided real-world, objective safety performance data (e.g., injury frequency and severity) over the subsequent six-month period. Researchers used this data to examine whether a link exists between drivers’ perceptions of the company’s safety climate and their actual safety performance. When the researchers compared the survey data with the objective data, they found a significant association between workplace safety climate and safety outcomes (see Chart 1, next page). “We now know that even though truck drivers work alone, they develop a sense of the true safety priorities of their companies, and their perceptions can be used to predict future safety outcomes,” explains Huang.

The findings also indicated that a generic safety climate scale can be used to predict injury outcomes among lone mobile workers but that a scale incorporating various factors specific to the trucking industry provides much stronger predictive value. “We now have evidence that supports industry-specific safety climate scales as a powerful measure of employee safety perceptions and behaviors. This finding suggests a great potential for helping companies develop effective interventions,” reports Huang.

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Preliminary data analyses also suggested that lone workers’ perceptions of safety climate are highly reflective of top-level management messages. As Zohar explains, “In the case of trucking, the safety messages that are coming from upper management are aligned with actual safety practices. This is very good news for trucking companies, because it shows that consistent, clear communications combined with management’s backing of safety priorities can be an effective approach to reducing injuries.”

**Utility Worker Survey Development, Testing, and Implementation**

Using a process similar to that used to develop the trucking survey, CBS researchers worked with a regional utility company to design a safety climate survey for utility workers. This time, however, they supplemented the survey questions with on-site field observations and input from individual utility workers. “The utility worker job is complex. We needed to understand what they do and how they do it in order to develop an effective safety climate survey for these workers,” says Huang.

After testing a final version of the utility worker safety climate survey, researchers implemented it among more than 1,500 electrical workers at the pilot company along with 861 workers recruited from a second company. They then presented initial findings to officials at both participating companies and began to collect objective safety performance data. As with the trucking results, the utility worker data indicated a significant association between safety climate and safety performance.

“We now have clear evidence that safety climate is linked to workplace safety behaviors and to injury outcomes among lone and remote workers,” says Huang. “This is very important because it gives companies a starting point. They now know that, among lone and remote workers, a negative safety climate is indicative of problems that need to be addressed. We hope that further research in this area will uncover effective ways to promote and sustain a positive climate in these types of non-traditional work settings.”

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**CHART 1**

Injury Rate Versus Safety Climate Score for the Eight Participating Carriers
A driver is en route to an important customer’s site and something changes in road conditions—perhaps an accident scene, construction, a detour, or heavy traffic. Unless he speeds, the delivery will late. The customer is waiting; the boss is expecting results. What does the driver do?...The pressure is on all utility crews to restore power for an especially important customer. Despite having already worked a regular shift, the worker feels obligated to work longer. He knows the company’s reputation is on the line, and the boss is being pressured, but exhaustion has set in and he and can’t even think straight...what should the worker do?

Every day, truck drivers, utility workers, and other lone workers encounter situations in which safety conflicts with the demands of the job. Because of their remote work environment, these workers must often resolve the conflicts alone—without the support or input of supervisors or management. Preliminary findings from the Institute’s field study of truck drivers and utility workers showed that a company’s safety climate is strongly associated with safety behaviors and injury outcomes among lone and remote workers.

We asked three Liberty Mutual industry safety experts, with a combined 118-plus years of field experience, to comment on the initial findings of our safety climate research project:

“Very often, top-level managers want assurance that the safety changes they are considering will have a positive impact on their business. The findings from this study provide real evidence that safety climate can be measured effectively and used to predict injury outcomes, even among those who work alone, away from peers and supervisors,” says Liberty International Managing Director of Global Road Safety, David Melton, who served as an advisor to the research team. “This is powerful and actionable information that should help convince companies to take proactive measures to correct a negative safety climate, rather than just reacting when injuries occur.”

“Heavy is really the starting point that most organizations are looking for when they talk about changing their safety culture,” states Loss Control Advisory Services (LCAS) Technical Director, James Houlihan, who notes that the terms “climate” and “culture” are often mistakenly interchanged. “Unlike safety culture, which can be interpreted to mean many different things, safety climate is tangible. It can be measured, and the data obtained through surveys can identify significant discrepancies between a company’s safety message and its actual safety practices.”

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Houlihan, who served as an internal consultant to the study, believes the promise of safety climate research resides in these discrepancies, which once identified, can be addressed. “Imagine a company that has a policy prohibiting cell phone use while driving. But within that same company, supervisors routinely call their drivers, clearly violating the policy. That would show up as a discrepancy in a safety climate survey. Once brought out into the light, this problem could be addressed appropriately.”

“The lone or unsupervised worker develops a view of the organization through minimal contact with management but must carry out their duties based on the philosophy of that organization. As a result, the message coming down the management chain is extremely important,” notes LCAS Technical Director and transportation industry expert David Money, CDS, CDT. The study findings suggest that drivers’ perceptions of their companies’ true safety priorities reflect top-level management’s safety messages. “That’s important information for trucking companies because it reaffirms the fact that consistent safety communication, supported and lived out by management, can and does make a difference.”

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Five Tips to Promote a Positive Safety Climate Among Lone Mobile Workers...

1. **Orientation**
   Provide information on the organization’s philosophy and beliefs to all new employees entering the organization. Make sure the orientation includes contact with top management, and well as other employees, to demonstrate both safety attitudes and processes.

2. **Expectations**
   Communicate the organization’s and department’s safety expectations, not only for new employees, but for all. Be sure they are written and performance rewarded.

3. **Supervisor Contact**
   Plan for lone or mobile workers to have frequent contact with their supervisors. Make it reflective of the safety culture/climate of the organization.

4. **Tools & Equipment**
   Provide appropriate tools for the task (vehicles, mechanized equipment, hand tools, etc.). Then, ensure that these are maintained and replaced as necessary.

5. **Follow Up**
   When processes change, or new equipment is purchased to correct safety program deficiencies, follow up with the employee to ensure that they understand the new methods and expectations.

Concludes Money, “We are on the leading edge of discovery in the area of safety climate. I believe that the insights gained from this research will be beneficial to a variety of industries that are working to improve safety at the organizational level.”

**David F. Melton, CRSP, CDS, CCSP**
As Managing Director, Global Road Safety for Liberty International, David Melton is responsible for implementing an internal roadway safety strategy within the Liberty International group of companies. He supports transportation-related safety services delivered by Liberty Mutual consultants around the world. He also advocates and participates in research projects at the Liberty Mutual Research Institute for Safety, is a frequent speaker at national and international conferences, and a contributor to numerous articles on transportation safety. During his 42-year career with Liberty Mutual, Mr. Melton has held positions in both field and executive management.

**James J. Houlihan, CSP, ARM, MA**
With more than 33 years of safety consulting and management experience, James Houlihan serves as technical director – organizational safety performance for Liberty Mutual Loss Control Advisory Services. In this role, he is responsible for developing strategies and resources to support organizational safety performance consulting services delivered to companies worldwide. His extensive work designing and helping companies implement process improvement strategies has yielded tangible and measurable benefits for several large, multi-site, national and international companies. Mr. Houlihan has delivered more than 100 presentations, including over three dozen keynote addresses, at professional and customer conferences.

**David M. Money, CDS, CDT**
David Money has more than 35 years of experience in the traffic safety field and is currently the technical director, transportation services, for Liberty Mutual’s Loss Control Advisory Services Group. In this position, he manages transportation related products and services and develops new systems, methods, technologies and other support materials to enhance customer training. In addition to producing technical references on numerous driving related topics, Mr. Money is responsible for Liberty Mutual’s award-winning Decision Driving Training programs, attended by hundreds of commercial vehicle driver trainers each year.
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