

# from Research to Reality

*Safety Climate*

**Predicting Risk  
With Science**

LIBERTY MUTUAL RESEARCH INSTITUTE FOR SAFETY

SCIENTIFIC UPDATE



**Liberty Mutual.**  
RESEARCH INSTITUTE FOR SAFETY

**60** YEARS  
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INJURIES AND DISABILITY



# Safety Climate

## *A Leading Safety Indicator — Backed by Science*

### Safety Climate @ a Glance

#### What is Safety Climate?

Safety climate is described as employees' shared perceptions of the relative priority of safety in an organization.

#### What does that mean?

Despite what looks like a strong emphasis on safety, a company may have a poor safety climate. That means that even in organizations that have implemented safety programs and protocols, when business demands are high, safety may take a backseat to other priorities such as productivity and efficiency.

Risk managers can assess safety at a company by surveying workers about management's commitment to and support of safety and health.

#### Why is it important?

Safety climate is a leading indicator of safety outcomes and is the only measurable dimension of organizational safety culture.

#### What are the implications?

Companies that understand and monitor safety climate can identify where problems may lie and take appropriate steps to proactively improve safety.

*In recent years, safety climate has captured the attention of companies and scientists looking to reduce accidents and injuries. A leading indicator of safety outcomes, safety climate reflects what happens when the rubber (safety decisions and protocols) meets the road (competing demands such as production and delivery deadlines). It is the only measurable dimension of a company's safety culture.*

*A leader in safety climate research, the Liberty Mutual Research Institute for Safety provides the science behind safety climate assessment tools and insights that are used to help companies improve safety from the ground up.*

# LMRIS Safety Climate Research Paves the Way for Risk Control Innovations

*Hindsight is 20/20, especially when it comes to safety. We know this from major tragedies like the Chernobyl nuclear disaster in 1986 and the BP Deepwater Horizon oil spill in 2010. In the investigative follow-up to each of these incidents, experts cited poor organizational safety culture as a major underlying factor. Safety culture refers to the beliefs, practices and attitudes that shape employees' safety behaviors. It is complex and not directly measurable. But in recent years, safety climate has emerged as a key measure of organizational safety culture and a leading indicator of safety outcomes.*

## Predicting Risk With Science

Defined by scientists as “employees’ shared perceptions of their organization’s policies, procedures and practices regarding the relative value and importance of safety,” safety climate is the key to a new survey-based risk management approach. Using scientifically designed safety climate surveys, practitioners can assess how employees practice safety on a day-to-day basis when faced with competing demands such as production and delivery deadlines.

“Most companies profess a commitment to safety that is sincere. But carrying out that commitment on a daily basis is a complex challenge,” explains Marvin Dainoff, Ph.D., director of the Liberty Mutual Research Institute for Safety (LMRIS) Center for Behavioral Sciences. “Safety climate assessment surveys measure how a company is or isn’t meeting that challenge and provide a solid point of reference for making safety improvements.”

“Safety climate ... can help companies recognize and address emerging problems before accidents happen.”

“Companies often don’t become aware of a safety problem until an accident occurs, when it is too late. Safety climate, properly assessed, can help companies recognize and address emerging problems before accidents happen,” says Yueng-Hsiang (Emily) Huang, Ph.D., an organizational psychologist and lead safety climate researcher at LMRIS. “Our safety climate research initiative provides the science behind this more proactive approach to safety that does not replace, but builds on, traditional engineering and design approaches.”

## New Frontiers in Safety Climate Research

With ample existing research to support safety climate as a predictor of safety outcomes among on-site workers, Institute researchers decided to focus on off-site or “lone” workers. “Lone workers perform their day-to-day jobs away from colleagues and supervisors,” explains Huang. “We wanted to know if safety climate could predict injury even among those who work in relative isolation. In other words, does safety climate have an impact when no one is looking?”

“...does safety climate have an impact when no one is looking?”

Researchers identified trucking and utility companies as prominent industries that employ large numbers of lone workers, and they recruited 10 representative companies to participate in the study. They applied rigorous scientific protocols to develop lone worker safety climate surveys for each industry. “Anyone can put questions on a page and call it a survey, but our safety climate surveys are firmly rooted in science,” says Huang, noting that researchers employed best scientific practices to develop the surveys. “Our survey questions are based on an extensive review of the existing science, input from industry experts, cognitive testing of survey questions and on-site field observations.”

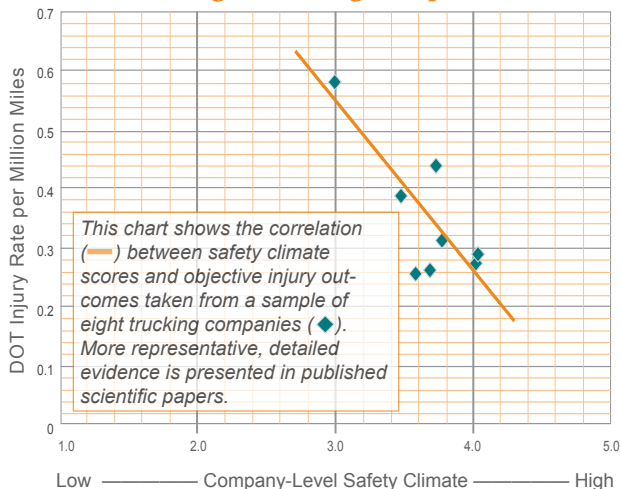
Once the surveys were developed and pilot-tested, LMRIS introduced them in the field. In 2010, researchers administered the lone worker safety climate surveys to more than 9,000 drivers and supervisors employed at eight trucking companies. In 2011, researchers surveyed more than 2,400 utility workers and supervisors from two utility companies. In addition to the survey data, researchers obtained objective injury frequency and severity data from each participating company.

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## What the Science Shows

“Our primary goal was to determine whether our lone worker surveys could be used to predict safety outcomes among off-site workers,” explains Huang. “The data analyses confirmed that our surveys are scientifically valid and reliable. But even more exciting, we found a significant association between the safety climate scores and objective injury data for both the trucking (see chart) and utility industries. This showed us that, even among lone workers, safety climate is a valid predictor of safety outcomes.”

**Safety Climate and Injury Rate for Eight Trucking Companies**



“We now know that companies can readily survey workers — even those who work alone — and identify actionable items for safety improvements,” says Dainoff. “We intend to build on this research by exploring targeted interventions to help companies improve safety climate.”

As a secondary goal, researchers adapted a generic lone worker survey and tested its results against those of the industry-specific survey. They discovered that the generic survey was sufficiently predictive of injury outcomes, but the more detailed industry-specific survey was more predictive.

“Developing industry-specific surveys is very research-intensive,” notes Huang. “So the fact that generic surveys are effective is good news for companies that want to conduct safety climate assessments, but may not have the resources to develop industry-specific surveys.”

## Supervisors or Workers: Who Rates?

In subsequent analyses, researchers compared the safety climate scores of company supervisors and those of workers. What they found out was notable.

“The data showed that supervisors consistently score safety climate higher than workers do, and that their responses are not predictive of safety outcomes,” explains Huang. The discrepancy between supervisor and worker safety climate scores raises important questions about organizational dynamics. Why do supervisors perceive safety climate more favorably? How can supervisors become more attuned to workers’ perceptions of safety climate? “These questions require more in-depth exploration. The answers will help shape future safety climate research,” asserts Huang.

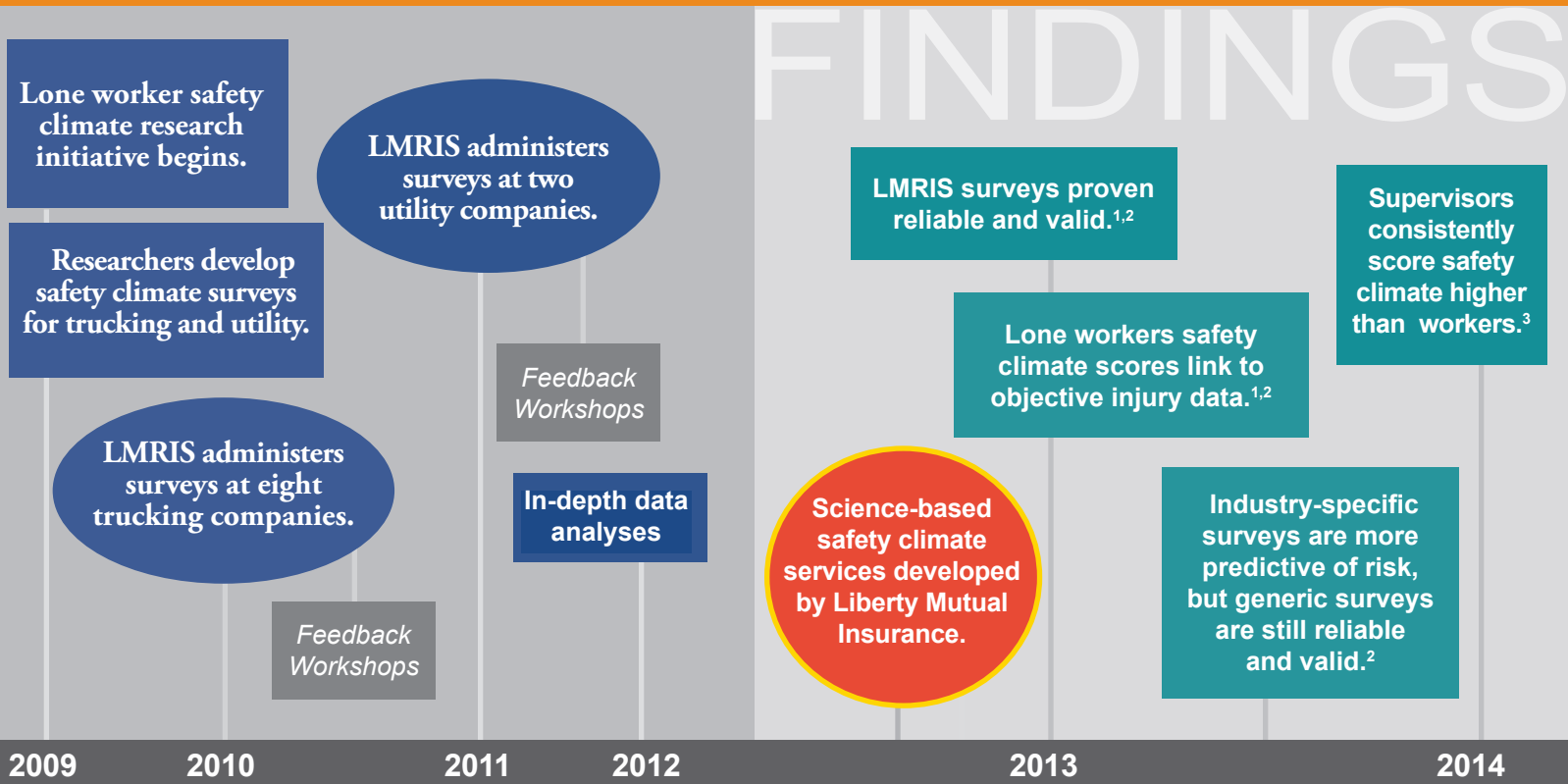
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“As a researcher and industrial organizational psychologist, it is gratifying to see scientists and practitioners looking beyond traditional approaches to safety,” notes Huang. “Certainly engineering controls and job design are critical safety factors, but there is more going on ‘behind the scenes’ that cannot be put onto a checklist. Safety climate encompasses this broader view, and can shed light on some of these hidden safety issues that can — if left unchecked — lead to disaster.”

## Safety Climate Collaboration Brings Research Focus

In 2009, LMRIS invited Dov Zohar, Ph.D., a leading expert in organizational safety systems research, to serve as a visiting scholar. While a professor at the Israel Institute of Technology, Zohar conducted the landmark study that coined the term “safety climate” and showed that it was possible to measure employees’ perceptions of organizational safety priorities. During his tenure at LMRIS, Zohar collaborated with Institute scientists to identify areas of focus for a growing safety climate research program. They determined that the topic of safety climate among lone workers presented a unique opportunity to contribute to the existing body of research.

# LMRIS LONE WORKER SAFETY CLIMATE RESEARCH MILESTONES



The above time line marks significant advancements in the Research Institute's lone worker safety climate research program. This research was an outgrowth of earlier LMRIS efforts dating back to 2001 to better understand the impact of safety climate on safety outcomes.

## Relevant Publications:

<sup>1</sup>Huang, Y.H., Zohar, D., Robertson, M.M., Garabet, A., Murphy, L.A. & Lee, J. (2013). Development and validation of safety climate scales for remote workers using utility/electric workers as exemplar. *Accident Analysis and Prevention*, 59, 76-86.

<sup>2</sup>Huang, Y.H., Zohar, D., Robertson, M.M., Garabet, A., Lee, J. & Murphy, L.A. (2013). Development and validation of safety climate scales for lone workers using truck drivers as exemplar. *Transportation Research Part F: Traffic Psychology and Behavior*, 17, 5-19.

<sup>3</sup>Huang, Y. H., Robertson, M. M., Lee, J., Rineer, J., Murphy, L. A., Garabet, A. & Dainoff, M. J. (2014). Supervisory interpretation of safety climate versus employee safety climate perception: Association with safety behavior and outcomes for lone workers. *Transportation Research Part F: Traffic Psychology and Behavior*, 26, 348-360.

Lee, J., Huang, Y. H., Robertson, M. M., Murphy, L. A., Garabet, A. & Chang, W. R. (2014). External validity of a generic safety climate scale for lone workers across different industries and companies. *Accident Analysis and Prevention*, 63, 138-145.

Zohar, D., Huang, Y. H., Lee, J. & Robertson, M. M. (2014). A mediation model linking supervisory leadership and work ownership with safety climate as predictors of truck driver safety performance. *Accident Analysis and Prevention*, 62, 17-25.



# Research to Reality

## *Safety Climate Assessment Service Puts Research into Practice*

*What if companies could identify opportunities for safety improvements before injuries and accidents occur? According to safety experts, they can. In the past decade, scientists have established safety climate as a reliable leading indicator of safety outcomes. More recently, Liberty Mutual Insurance risk control professionals have developed assessment tools and services to help companies capture safety climate data and put it to work to improve safety.*

Developed through a unique collaboration involving Liberty Mutual scientists, risk control professionals and real-world companies, Liberty Mutual's safety climate assessment services use employee perceptions to identify areas for safety improvements. This innovative safety approach goes beyond what meets the eye to help companies make continuous safety improvements. It is a natural complement to conventional risk control strategies.

"Traditional, engineering-based risk control strategies such as workplace design, protective equipment, procedures and training address factors you can see, touch and feel. But risk control specialists have known for a long time that there is more to safety than what is physical or tangible," explains Liberty Mutual Risk Control Services (RCS) technical director, Don Tolbert. "Our research confirmed that employee perceptions of safety – properly assessed – can provide a powerful basis for safety improvements. That knowledge is the basis for our safety climate assessment services."

Scientifically validated surveys are at the heart of Liberty Mutual's safety climate assessment services. These surveys gauge employee perceptions of senior management's commitment to safety and can reveal when there is a disconnect between an organization's official safety policies and the messages employees receive from management and supervisors on a daily basis.

"The safety climate surveys were developed within the framework of scientific methodology, and that framework continues to evolve," says Tolbert, who notes that RCS consultants assist companies with survey administration. "Our involvement helps ensure that findings are

based on a representative sample and that confidentiality is maintained throughout the process." According to Tolbert, Liberty Mutual risk control consultants also provide a supportive role as companies analyze survey responses and develop safety action plans based on the findings.

“ Practical application of the safety climate survey can help companies identify ways to make focused adjustments to safety management systems that, over time, can strengthen their safety culture. ”

"Practical application of the safety climate survey can help companies identify ways to make focused adjustments to safety management systems that, over time, can strengthen their safety culture," says James Blaser, service director, Liberty Mutual RCS. He adds that the safety climate survey is primarily for companies with strong safety records that want to improve further. "This is most effective in companies where management is already highly engaged in safety policy, where safety processes are based on best practices rather than just regulatory compliance, and where injury rates are lower than industry average."

One such company is MDU Construction Services Group of Bismarck, North Dakota. Comprising 17 construction and specialty trade companies, MDU implemented Liberty Mutual Safety Climate Surveys in early 2014. "We view the survey as a leading indicator of future safety performance for our companies," says

Frank Richard, vice president, Human Resources and Risk Control for MDU. “We’re really striving to get metrics in place that get beyond the rearview mirror. Our safety climate results were about where we thought they would be – solid. We did, however, find areas where we have placed greater emphasis. Our senior management is getting out into the field more often. We’re doing more safety inspections and more safety awareness events.”

“The more employees see and believe that upper management and supervisors are committed to their safety ... the more they become committed to safety and tend to follow policies and procedures more closely.”

Since 2014, when Liberty Mutual introduced its safety climate services to customers, 47 companies have successfully administered surveys to more than 50,000 employees. “The more employees see and believe that upper management and supervisors are committed to their safety,” explains Blaser, “the more they become committed to safety and tend to follow policies and procedures more closely, and therefore have fewer accidents and injuries.”



### ***When is Safety Climate Assessment a Good Idea?***

Safety climate assessments are a valuable tool for organizations that have 100 or more employees. However, it is important that companies have the structures in place to follow through on survey results. Some indicators that a company is “ready” for safety climate assessment:

- Ability to make the survey available electronically
- A safety process that has decreased the rate of incidents and/or subsequent costs
- High interest in improving the strength, pace, and sustainability of safety processes
- Belief in continuous safety improvement
- Strong collaboration between management and production employee functions
- Commitment to using data to inform decision-making



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Volume 17 | Number 2 | SUMMER 2015

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