LIBERTY MUTUAL RESEARCH INSTITUTE FOR SAFETY

Scientific Update Anniversary Issue 1954–2014
Dear Readers:

The Liberty Mutual Research Institute for Safety celebrates its 60th anniversary amid some exciting transformations that will considerably enhance the value and impact of future research. What will not change is the mandate to generate scientific knowledge to help reduce injuries and disability. That noble goal, which aligns with Liberty Mutual’s stated endeavor to help people live safer, more secure lives, will continue to serve as our strategic compass.

We can look back with pride at the stunning accomplishments of the past 60 years—accomplishments that have improved safety and health throughout the world and that have earned the Institute a global reputation for innovative, multidisciplinary scientific research. Still, we must constantly challenge ourselves to address the relentless and enormous burden of unintentional injuries. With this in mind, we are changing the nature and scope of the research program and putting a deliberate focus on knowledge translation.

At the core of our realignment is the redefinition of our key research areas. I am very pleased to note that in each of the four new areas of focus—Driving, Built Environment, Workplace, and Disability—we are undertaking cutting-edge research that will allow us to get ahead of the injury and disability curve. Our new research streams better address the diverse interests of Liberty Mutual Insurance as a responsible insurance carrier and reflect the accelerating power of technology, important demographic changes in the population and the increasing complexity of workplaces, transportation and built environments.

A second major change is the establishment of the Knowledge Translation Unit, which will focus on engaging business partners and creating opportunities to more effectively leverage the work of the Institute. The Knowledge Translation Unit is charged with developing close working relationships across the various departments of Liberty Mutual Insurance in order to use research findings to support best-in-class service delivery, control risk and improve managed care performance. As we embrace the opportunities to carry our mission into the future, I am confident that the transformations now underway will position the Institute for heightened success.

In closing, I would like to pay tribute to the many scientists who have contributed to the Institute’s work over the past 60 years. Successive generations of Institute researchers have built upon earlier discoveries and innovations, and together, we should all be proud to be part of this unique and dynamic world-class research operation.

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In 1954, Liberty Mutual Insurance opened a facility dedicated to safety and health research—something no other insurer had ever done.

Built on 80 acres of farmland in Hopkinton, Massachusetts, the original 4,800-square-foot research center housed a small staff of scientists studying the causes of workplace injuries in order to develop effective interventions. From its humble beginnings, the Research Institute has evolved into an internationally recognized, award-winning research organization with more than 45 dedicated staff members and 12 state-of-the-art laboratories.

Over the years, the Research Institute has subjected its studies to the highest standards of objective scientific scrutiny through peer-reviewed publication of findings. We are committed to sharing our research with the global community, and our findings have formed the basis for numerous innovations, safety improvements and standards. This commitment to publication and dissemination of findings is one of the ways the Institute supports Liberty Mutual’s broader mission of “helping people live safer, more secure lives.”

Building upon this rich, 60-year legacy, the Institute is now undergoing a strategic realignment that expands the scope of our research program to encompass injuries that occur at home, at work, on the road and in the community. To achieve this, we have aligned our program into four main research streams: Driving, Workplace, Built Environment and Disability. With this adjustment, the research program is better positioned to meet the changing needs of business and today’s society. An integral part of this change is a greater focus on Knowledge Translation—a function that promotes the application of findings by facilitating communication between knowledge producers and knowledge users.

The following pages highlight the new research streams as well as the new Knowledge Translation Unit, while looking back at some of our innovations and milestones.
**Driving**

**Focus:** Driving behavior-related injuries

**Objective:** To understand the risk factors for crashes and injuries—specifically those related to distraction, fatigue and driver perceptions—and to examine how telematics and automation may be used to help reduce risk

As technology evolves and affects driving practices, understanding the connection between driving decisions and behaviors, risk perception and auto-related injuries has become increasingly important.

In its early years, the Institute’s driving research focused on vehicle crashworthiness—studying ways to make cars safer through vehicle design and safety features. Today, researchers study driver behaviors and perceptions as they relate to crash risk—especially the risks associated with distraction and fatigue, among the most common causes of crashes today.

A recent study, featured on ABC News, examined the effects of fatigue on driver behaviors in a controlled environment. The study’s preliminary findings showed that drivers who had completed an overnight shift just prior to driving had twice the rate of lane departures and a higher number of near-crash events than those who had slept for a total of five hours prior to the test.

The National Highway Traffic Safety Administration (NHTSA) estimates that 7.5 million drivers each month nod off while driving. Our research examines the effects of fatigue on driving performance. We also investigate the use of telematics and automation devices to help reduce driving risks.
In 2012, distracted drivers killed 3,328 people in the U.S. and injured 421,000 more (NHTSA). Using an instrumented vehicle (above) and a state-of-the-art driving simulator, our researchers study driving distractions and examine driver impairment and risk perceptions.

In another Institute study, researchers observed drivers as they performed cell phone tasks while driving on a closed-loop track. In general, drivers did not accurately perceive the impact of distraction on their driving performance. This was especially true for younger male drivers who perceived the lowest, but exhibited the largest, distraction effects on performance. The study also showed that drivers did not typically postpone tasks (such as cell phone use) when faced with increasing road demands.

Our researchers also are investigating the effectiveness of telematics devices to assess and modify driver safety. Building upon prior research on the topic, we are currently conducting focus groups of teen drivers and their parents to understand how telematics data can be useful.

Knowledge gained through these and other studies will guide our efforts to reduce driving-related fatigue and distraction and will help us better assess the risks and benefits of evolving technologies and autonomous vehicles.

Cost of injuries related to driving:

$276.5 billion

In the 1980s, personal computers began transforming the way we work and live. Our researchers examine the stresses involved in intensive computer work and identify ways to help reduce the associated symptoms.

Focus: Work-related injuries

Objective: To understand why and how workplace injuries occur in order to develop effective preventive recommendations and tools

The nature of the workplace—and the work people do—has changed dramatically since the founding of the Institute 60 years ago. The U.S. has shifted from a manufacturing to a service economy, computers have proliferated and workforce demographics have changed. Building upon a rich legacy of occupational safety research, the Institute is responding to changes in the nature of work and the workforce.

Over the years, the Institute’s workplace safety research has focused primarily on physical work hazards. These studies provided the scientific basis for tools and strategies that continue to help businesses reduce on-the-job injuries. Today, our workplace research extends beyond physical exposures to organizational, societal and technological factors contributing to occupational injuries.

In our laboratories, researchers continue to study physical exertions and ways to reduce exposures, especially those caused by overexertion, repetitive motions and falls, all of which are cited in the Liberty Mutual Workplace Safety Index as leading causes of work-related injury. Our recent work uses 3-D motion-sensing technology to measure repetitive stresses involved in lifting tasks and in computer work. If proven effective, such technologies could become the standard for real-time,
Our researchers conduct studies to help better understand, predict and pinpoint the causes of shoulder injuries. In 2012, there were nearly 70,000 work-related shoulder injuries, and many more occurred at home, in the community and on the playing field.

Field-based assessments. Our researchers are also developing a biomechanical model to help address shoulder injuries—one of the most prevalent work-related musculoskeletal disorders. We are also examining the use of portable technologies to assess physical task risks.

Outside the laboratory, our researchers explore the impact of organizational practices and societal trends on safety outcomes. For example, a recent study explored how an organization’s safety climate (employees’ shared perceptions of their commitment to safety) affects injury outcomes. This research produced a safety climate scale that helps businesses improve their safety cultures and injury rates. Other studies of recent societal trends found that obesity is associated with a 25 percent higher risk of on-the-job injury, and multiple-job holders have a 27 percent higher rate of work-related injury and a 34 percent higher rate of non-work-related injury than single-job holders do.

As our studies evolve, the research findings continue to inform tools, systems and recommendations to help improve workplace safety across industries.

Cost of work-related injuries:

$175.6 billion

**Built environment**

**Focus:** Injuries that occur in built environments, such as, homes, commercial buildings, schools, parks, transportation terminals, walkway systems and public buildings

**Objective:** To understand how injuries, such as falls, occur in these environments with an emphasis on prevention by design

The physical design and construction of built environments directly impacts the safety of people who inhabit or frequent them. The Institute’s built environment research is dedicated to understanding and identifying potential injury risks in built environments and developing recommendations to inform design guidelines.

Fall-related injuries are the dominant issue in built environments. Over the years, the Research Institute has focused on the causes and prevention of slips and falls, developing tools, methods and recommendations aimed at reducing these events. Even as we explore other areas related to safety in the built environment, slips and falls are our principal research focus.

One of our current studies examines balance control among older adults (one of the most at-risk groups) as they negotiate stairs, a common location of falls at home or in other environments.
Slipping is the leading cause of fall-related injuries. Therefore, our researchers are always looking for practical ways to identify slip hazards. Our recent research suggests that subjective measures may be as effective as objective measurements in predicting slips.

Researchers collect measures of neuromuscular control, inter-joint coordination and balance from adults aged 65 and over as they perform repeated stair-climbing trials in a controlled laboratory setting. The study findings will contribute to the development of fall assessment tools and prediction models aimed at reducing stair-related injuries and fatalities.

As part of a large field study, we recently found that employee perceptions of floor slipperiness can help accurately assess and predict the risk of slips and falls. Survey data from 475 restaurant employees indicated that actual slipping rates nearly tripled with each one-point increase in the employee perception of slipperiness (measured on a four-point scale). This suggests that employee risk perception surveys provide a scalable approach for identifying slipping hazards in businesses, public spaces and other built environments.

Findings from these and future studies of built environments will form the scientific basis for interventions and design strategies to enhance safety at home and in the community.

Cost of injuries related to the built environment: $341.7 billion

Disability

Focus: Disability and recovery after injury or illness

Objective: To identify innovative and effective medical care, rehabilitation services and other interventions that will improve functional recovery and prevent work disability

Each year in the U.S., more than 28 million people suffer disabling injuries that keep them out of work or prevent them from participating in their usual activities. Millions more are unable to work as a result of chronic illness. Born out of Liberty Mutual’s long-standing commitment to rehabilitate injured workers, the Institute’s disability research strives to find ways to improve people’s return to work and functional recovery.

Early research looked at ways to reduce work-related disability. One study found that training supervisors how to effectively communicate with and accommodate injured workers can significantly reduce disability. Based on this study, we developed a supervisor training program to help companies provide the support injured workers need to return to their jobs sooner. We are currently investigating whether this program can help reduce disability from nonoccupational causes.

When injury or illness results in a long-term work absence, the financial and emotional strain for individuals, families and employers can be extreme. Our researchers found that training supervisors how to properly respond when a person is injured can dramatically improve return-to-work and recovery outcomes.
One in four U.S. workers will develop significant health-related limitations before retirement. Our researchers are studying disabilities associated with recent societal trends to help improve return-to-work and recovery outcomes among people with these conditions.

More recently, our disability researchers have endeavored to find ways to help those with chronic health conditions (such as arthritis, diabetes and depression), avoid long-term disability. This is especially important in light of the increasing number of older workers who are delaying retirement or entering new jobs after retirement. Recently, we studied a group of 612 older workers (age 55+) who suffer from osteoarthritis, the most common chronic illness affecting work function. We found a number of significant predictors of premature work loss that will help us develop targeted strategies to better support this segment of the workforce.

Our researchers also examine factors associated with significant differences in disability outcomes, such as geographic location, medical treatments and psychosocial factors. Findings from these and other research studies provide the basis for tools, programs and protocols to help improve recovery and minimize disability.

Work disability-related costs to employers: $948 billion

Estimated direct and indirect cost developed from U.S. Dept. of Labor, BLS, Table 1, June 2014, and Goetzel et. al, JOEM 2003, 45(1): 5-14.
Knowledge translation

Focus: Knowledge translation and exchange

Objective: To enhance our research programs and promote broader application of scientific findings

The recent establishment of the Knowledge Translation Unit (KTU) is among the many exciting new developments at the Research Institute. The KTU mission—to facilitate exchange of knowledge between our scientists and Liberty Mutual Insurance constituents—will enhance our research programs and promote broader application of scientific findings.

“In our field especially, it is so important to communicate and apply scientific findings to address real-world needs,” says Teodora Abbatine, MBA, director of the emerging KTU. “The Knowledge Translation Unit is developing strategies to disseminate Institute findings to internal and external audiences, in a way that fosters the integration of the scientific knowledge into practice.” The KTU will spearhead the Institute’s new communications initiatives, which aim to translate scientific findings into practical information that can be easily understood and put to use by business professionals.

“Equally important is the other piece of knowledge translation at the Institute: the flow of safety-related information from our service providers back to our researchers. This is where practice informs science,” says Abbatine. The Research Institute will work with Liberty Mutual Insurance strategic

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Teodora Abbatine, MBA
Director, Knowledge Translation Unit
business units and collaborate with business partners, including four technical advisory groups, which are aligned with our research areas (Driving, Workplace, Built Environment and Disability). This collaboration will help identify opportunities for research studies that will have direct relevance and impact in the outside world.

“Knowledge translation is now at the forefront of the Research Institute’s long-held commitment to world-class safety research,” explains Abbatine. “We have a tremendous opportunity to further Liberty Mutual’s position as a leader in developing science-based safety solutions that make a difference in people’s lives.”

**Why knowledge translation?**

Knowledge translation differentiates Liberty Mutual Insurance in both the insurance marketplace and the safety research communities. The overall goal of knowledge translation at the Institute can be summarized as follows: Practice is informed by science; science is informed by practice.


For examples of our translated scientific research, view our online issues of *Scientific Update.*
Innovations & Milestones

Since 1954, the Liberty Mutual Research Institute for Safety has advanced occupational safety in the U.S. and around the world through the dedication and hard work of its researchers. Here are a few examples of significant innovations and milestones achieved along the way. For a detailed history of the Institute, go to www.libertymutualgroup.com/researchinstitute.

Pioneers in Psychophysics

In the early 1960s, Liberty Mutual researchers were the first to apply psychophysical methods to study the injury risks involved in manual handling tasks. Researchers used data from these studies to produce tables of maximum acceptable weights and forces that workers can lift, lower, push, pull, or carry without excessive fatigue. For decades, the Liberty Mutual Tables have helped safety experts design tasks to reduce injury risks.

Innovators in Disability Research

For more than 50 years (1943–2000), Liberty Mutual operated a medical service center near Boston, where injured workers received treatment to help them recover and return to work safely. This early effort helped inspire and fuel the Institute’s later disability research efforts, formalized with the establishment of the Center for Disability Research in 2000.

Architects of Vehicle Safety

Liberty Mutual partnered with Cornell University in the early 1950s to develop Survival Cars I and II. In a time when cars were designed almost solely for looks and function, these prototype vehicles introduced the world to safety features such as collapsible steering columns, arm and headrests, air bags and seatbelts, 17 of which have since become standard in all U.S. automobiles, helping to dramatically reduce the rates of crash-related injuries and fatalities.
Champions of Floor Safety

In the 1960s, Liberty Mutual researchers developed and patented the first Horizontal Pull Slipmeter™, a portable device for evaluating floor slipperiness. By providing an objective measure of slipperiness, this device—a forerunner of modern floor surface assessment tools—helped researchers and safety practitioners develop prevention strategies. It also provided a valuable tool for investigating floor surface assessment methods and cleaning protocols.

Assessors of Ergonomic Risk

Throughout the 1970s, ‘80s and ‘90s, researchers developed and patented several tools for evaluating ergonomic risks associated with common workplace tasks. These tools included CompuTask™ for manual handling tasks, VidLiTeCTM for lifting tasks and the Musculoskeletal Stress Measurement Kit™ for repetitive hand tool tasks.

Experts in Epidemiology

In 2000, Institute epidemiologists produced the first reliable, published ranking of the 10 leading causes of U.S. disabling workplace injuries and their direct costs to industry. Produced annually since then, the Liberty Mutual Workplace Safety Index has been cited in various mainstream and business publications, including USA Today, U.S. News & World Report, The Wall Street Journal, Risk & Insurance and Occupational Hazards.

Frontrunners in Safety Research

Since the start of the new millennium, the Institute has added an 1,800 square foot biomechanics laboratory, a centralized telephonic data collection system, a state-of-the-art driving simulator and other technological enhancements. In addition, we have built investigative capacity in several new areas of expertise including demography, sociotechnical systems safety, and pain self-management.

Generating knowledge to help people live safer, more secure lives...
The Liberty Mutual Research Institute for Safety is an internationally recognized safety and health research facility. Through its broad-based investigations, the Institute seeks to advance scientific, business-relevant knowledge in safety and work disability. The Institute’s findings are published in the open, peer-reviewed literature, and they often serve as the basis for recommendations, guidelines and interventions used to help reduce injuries and disability.

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