Showcase highlights transportation safety research

Greg Winfree, USDOT Assistant Secretary of Transportation for Research and Technology, opened the Roadway Safety Showcase: Safety Innovations for Today and Tomorrow, a one-day event highlighting the latest work by researchers from the Roadway Safety Institute (RSI). The May 21 showcase was held in St. Paul in conjunction with the University of Minnesota’s (U of M) Center for Transportation Studies annual Transportation Research Conference.

RSI’s goal is to prevent crashes that reduce fatalities and life-changing injuries—which fits well with the USDOT’s vision for the future of transportation safety, according to Winfree.

“The first 50 years of transportation safety focused on occupants surviving crashes,” Winfree said. “The next 50 years will be about avoiding those crashes altogether.”

Showcase attendees learned how RSI researchers are developing solutions for some of today’s most pressing safety problems. Researchers shared updates on projects related to tribal nation road safety, connected vehicle technology, bicycle and pedestrian safety, wrong-way driving, automated speed enforcement, alcohol-related hot-spot analysis, a decision-support system for older drivers, and commercial vehicle driver safety.

The event featured researchers from three U of M campuses and other RSI member institutions that included the University of Illinois at Urbana-Champaign (UIUC) and University of Akron.

One of the event’s featured sessions focused on railroad grade crossing safety. More than 200 people lose their lives at railroad crossings in the United States each year, and railroad incidents involving hazardous material pose significant threats to safety, public health, and the environment. Although the number of crashes has been declining in recent decades, the result of a vehicle–train collision is often catastrophic.
Three RSI researchers from UIUC described how they are working to improve safety at and around railroad grade crossings through a three-part project. Their work includes developing modeling techniques that provide a better understanding of crash occurrence, contributor factors, and crash prediction at rail crossings; predicting train arrival times to facilitate emergency response management and alert drivers at unsignalized crossings; and strategically allocating emergency responders and resources in the event of a rail incident, even across jurisdictional boundaries.

Collaborating with American Indian communities to learn about risks on tribal lands

The fatality rate for motor vehicle crashes is higher for American Indians than for any other ethnic or racial group in the United States. A project that is exploring the challenges of roadway safety on tribal lands was featured at the Roadway Safety Showcase: Safety Innovations for Today and Tomorrow.

In opening remarks, USDOT Assistant Secretary of Transportation for Research and Technology Greg Winfree noted the importance of the tribal transportation issue not only from a safety perspective, “but from [its] ability to uplift all Americans and guarantee...ladders of opportunity,” he said.

Winfree introduced assistant professor Kathryn Quick and research associate Guillermo Narváez, researchers at the University of Minnesota’s Humphrey School of Public Affairs who are exploring this issue. In a project sponsored by the Roadway Safety Institute (RSI), Quick and Narváez are collaborating with American Indian communities to better understand the transportation safety risks on tribal lands and develop strategies to mitigate these risks.

While the rate of motor vehicle fatalities was decreasing for the nation as a whole from 1975-2002, the crash rate for American Indians increased by 52 percent, Quick noted. “These are huge disparities. Clearly, there’s a story that needs to be explored.”

Quick and Narváez are focusing on gathering on-the-ground knowledge about the nature of roadway risks and options to improve safety on reservations in Minnesota. “We’re also actively and intentionally trying to build and sustain relationships with tribal communities to address these kinds of issues over the long term,” Quick said.

The researchers are reviewing crash data, collaborating with the Advocacy Council on Tribal Transportation, and conducting interviews with key stakeholders. They have collaborative research agreements with four tribal governments: the Red Lake Band of Chippewa, Leech Lake Band of Ojibwe,
Fond du Lac Band of Lake Superior Chippewa, and Mille Lacs Band of Ojibwe. Narváez and Quick are interviewing people responsible for road construction and maintenance, law enforcement, and injury prevention programs on the reservation, as well as professional drivers who know the roads particularly well and residents. This is producing rich data about what local experts know about the sources of risk, how they manage those risks, and what they recommend to improve data. From these participants and from other tribal land locations and researchers, they are also gathering success stories.

Preliminary findings suggest that tribal transportation safety problems may not be so different from rural safety problems, except for a much greater concern for pedestrian safety.

Many reservation residents, by choice or necessity, travel on foot in the roadway as a way to get around, and several tribal governments are actively promoting walking, jogging, and biking for their recreational and health benefits. However, people feel unsafe because of narrow road shoulders, poor lighting, vegetation, or wildlife. In addition, there are many concerns that drivers who are not from the reservation do not expect or anticipate pedestrians in some locations, as well as concerns about congestion and speeding by non-locals, especially during peak tourism periods.

Tribal transportation leaders have not mentioned alcohol-impaired driving as a top challenge, Quick said, which is a bit surprising given popular perceptions and some previous studies. “We will be continuing to probe that as we develop relationships and trust with them.”

The team has also heard themes around enforcement and how it’s key not just for supporting safety but also for reporting and monitoring safety issues.

“There are some collaborative issues...around data quality, data sharing...and barriers to interpreting that data. There are also many jurisdictional and coordination issues relating not only to data sharing but also around setting priorities for safety resources,” Quick said.

On this issue, the team is collaborating with RSI researcher Tom Horan. That project is investigating the potential of new advances in GIS and how can it enhance the collection, availability, and use of information related to transportation safety within the tribal environment.

Uncovering why policymakers support—or oppose—traffic safety countermeasures

Mounting evidence shows that certain traffic safety countermeasures consistently save lives on our nation’s roadways. Examples include motorcycle helmet laws, primary enforcement of seat belt use, sobriety checkpoints, graduated driver licensing (GDL), mandatory ignition interlock, and automated speed enforcement. But despite the effectiveness of these countermeasures, states that have tried to implement them have had varying levels of success in garnering the support needed from policymakers.

Currently, Roadway Safety Institute (RSI) researchers are working to determine why this support varies by assessing the factors that affect the adoption of evidence-based approaches to road safety by state legislators and policy leaders. In addition, the researchers are examining the role of federally required state safety programs and are identifying best practices for states. The research project, “Assessing Factors Affecting Policy Leadership in Adopting Road Safety Countermeasures,” is being led by Lee Munnich, director of the State and Local Policy Program at the University of Minnesota’s Humphrey School of Public Affairs.
“We know that if certain policy countermeasures are adopted more broadly by state legislatures, we would likely see measureable and significant reductions in roadway fatalities and serious injuries,” Munnich says. “In this project, we’re asking why state legislators and policy leaders support or oppose certain evidence-based countermeasures. For example, are they not convinced of the evidence? Are they concerned about constituent response? And how do things like public opinion surveys, lobbying groups, and law enforcement organizations affect their decisions in support or opposition?”

Munnich’s team recently completed the first phase of this project, which included reviewing state strategic highway safety plans and Toward Zero Deaths (TZD) programs for the six RSI member states (Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin). As part of that work, the researchers prepared a draft case study for each state. The case study on Minnesota, for example, found that the state has demonstrated mixed results in implementing policy countermeasures. Minnesota has been successful in legislating primary enforcement of seat belt use, GDL program upgrades, and mandated ignition interlock implementation in certain cases, but it does not require universal motorcycle helmet use or authorize automated speed enforcement or use of sobriety checkpoints. This means the state legislature could do considerably more to make advances in those areas, the researchers say.

The team also developed a methodology for developing an assessment tool for TZD programs, conducted policy interviews with state legislators and safety policy leaders, and analyzed results. During the next year, continued work on this project will include developing and testing the new assessment tool, conducting roadway safety policy roundtables, and completing the final research report and policy brief.

Ultimately, Munnich hopes this work will help shape the future of roadway safety policy in the United States. “Safety strategies require policy leadership as well as institutional collaboration for continued improvements in roadway safety,” says Munnich. “We hope that the assessment tool will help policymakers to re-evaluate their positions to push for evidence-based road safety policy countermeasures.” This research, he adds, will contribute to further developing and successfully implementing roadway safety policy strategies at the state and local level—in addition to providing best practices and strategies for legislators, state DOTs, public safety offices, and state and local elected officials in adopting proven legislative policies and effective TZD approaches to reduce traffic deaths and serious injuries.

**Researcher Spotlight: Yanfeng Ouyang**

Roadway Safety Institute (RSI) researcher Yanfeng Ouyang is an associate professor in the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign (UIUC). Ouyang has worked at UIUC since 2005, where he conducts research on developing strategic and operational models and solutions for issues facing transportation systems.

Ouyang is currently working with his colleagues on an RSI-sponsored project that is exploring how to effectively position emergency response resources around railroad crossings. The collaborative project includes developing crash prediction models, predicting train arrival times, and positioning emergency response resources as well as coordinating responsibilities between different jurisdictions.

“There are a lot of hazardous materials passing through the Midwest in trains, so if [a crash] occurs, it’s likely to be catastrophic and it’s likely to disrupt the roadway systems, which are closely integrated with railway systems,” Ouyang says. “With this project we’re really trying to understand how to make the best decisions about deploying resources so that we are prepared to respond to unexpected crashes in real time.”

**Yanfeng Ouyang presented at the Roadway Safety Showcase**
The study could eventually lead to relocation of emergency response resources such as first-responder stations, allowing them to reach crash sites more quickly and without blockage. Ouyang says the best part of his job is the ability to study topics he finds both interesting and important.

“I enjoy having the freedom to explore topics that are both theoretically challenging and practically important to society,” he says. “With RSI, we use a combination of interdisciplinary approaches from different research fields. The projects are often challenging and we have to deal with many different aspects of a complex system, but the work is very rewarding.”

Ouyang serves as an editor for several academic journals and as a reviewer for more than 40 journals and 10 international conferences. He is a member of multiple transportation-related societies and his work has received numerous awards, including the Walter L. Huber Civil Engineering Research Prize from the American Society of Civil Engineers and the Faculty Early Career Development Award from the U.S. National Science Foundation.

Ouyang holds a B.Eng. in civil engineering from Tsinghua University in Beijing, China; an M.S. in civil engineering from the University of Washington; an M.S. in industrial engineering and operations research from the University of California at Berkeley; and a Ph.D. in civil engineering from UC Berkeley.

Researcher Spotlight: Nichole Morris

Nichole Morris is a research associate in the RSI-affiliated HumanFIRST Laboratory in the Department of Mechanical Engineering at the University of Minnesota. She has worked at the HumanFIRST lab for nearly four years, where she conducts research focusing on high-risk drivers, human factors related to roadway safety, and human-computer interactions with transportation-related technologies.

“Human-factors research is an approach to transportation design, safety, and training that accounts for human cognition and limitations in order to improve transportation systems to make them safer and easier to use,” Morris says.

Morris is currently working on an RSI-sponsored project to expand and adapt HumanFIRST's Teen Driver Support System smartphone application into a system to assist older drivers. The aim of the project is to help drivers maintain their independence in later life and help reduce the disproportionately high crash rates for older drivers. Individuals with mild cognitive impairment are of particular interest for the effort because they have begun to experience cognitive declines that are likely to interfere with safe travel, Morris says. Work is also under way on other RSI-sponsored research, including a series of simulation studies looking at potential applications of new connected vehicle technologies. These emerging technologies will eventually facilitate information exchange between drivers, vehicles, and infrastructure to improve roadway safety and efficiency.

Additionally, Morris is the principal researcher on the design and creation of a new electronic crash report interface to replace Minnesota’s outdated system of crash reporting by law enforcement. The two-year project involves human-computer interaction research, interim testing, and crash report analysis to design an easy-to-use reporting system that will provide more accurate crash data.

“In the future, we expect that crash data in Minnesota are going to be more extensive and thorough,” Morris says. “We’re going to know a lot more about what’s going on with crashes in the state. These data will help us learn what we need to prevent fatal and serious injury crashes.” The crash report usability and design project recently received the Best Practices in Traffic Records Project Award from the Association of Transportation Safety Information Professionals.

Morris says she enjoys the variety of research work done at the HumanFIRST lab, which allows her to
work closely with engineers to address Minnesota’s transportation safety issues in a comprehensive, interdisciplinary way.

“We don’t really get beholden to one specific track of research. We do a lot of contract work for the state where we address the state’s needs as they arise. This allows us to be responsive and dynamic,” Morris says.

Morris holds a B.A., M.A., and Ph. D. in psychology (human factors) from Wichita State University. She currently represents the University of Minnesota on the USDOT’s Traffic Records Coordinating Committee.

Summer camps engage next generation of transportation workforce
The University of Minnesota (U of M) Extension has a longstanding partnership with the White Earth Nation in northwestern Minnesota to operate a summer day-camp program for 40 reservation youth in grades 4 to 8. This year, the Roadway Safety Institute (RSI) sponsored one day of the two-week camp in June. The program focuses on hands-on learning and uses Indian culture and heritage as a vehicle for studying math, science, and engineering.

RSI staff taught several classes about safe travel in a variety of modes. Students experimented with reflectivity to understand safe pedestrian and bike travel and studied GIS mapping. The dangers of distracted driving and walking were also demonstrated by testing students’ reaction time. Connections to students’ heritage included Ojibwe vocabulary lessons and discussions of local animals’ travel patterns and traits and associating them with GIS maps.

Through these interactive lessons, students deepened their understanding of safe travel practices,” says Colleen O’Connor Toberman, program coordinator for the RSI. “Our goal is that they become models for safe travel in their community.”

“It was our pleasure having the RSI team at the White Earth program. The lessons were very engaging, and our students enjoyed the varied topics,” says Deb Zak, regional director of the U of M Extension’s Northwest District. “We would love to have RSI participate in our camp again in 2016.”

The Institute also participated in several other summer camps. Two camps were part of the USDOT’s National Summer Transportation Institute (NSTI) program, which is designed to attract and introduce students from diverse segments of society to education and career opportunities in transportation. RSI hosted 10 students in grades 7–11 from the Red Lake Nation on June 15 as part of its NSTI summer camp program. Students toured the Minnesota Traffic Observatory (MTO) and learned about traffic safety from Chen-Fu Liao, MTO’s senior systems engineer.

In July, RSI staff helped introduce the next generation of the workforce to transportation safety topics and careers during a two-week NSTI summer camp held on the U of M—Twin Cities campus. Twenty-nine students entering seventh through ninth grade attended, getting hands-on experience with topics ranging from distracted driving to aeronautics to traffic management.
The camp was sponsored by the Center for Transportation Studies with funding from the Federal Highway Administration that was administered by the Minnesota Department of Transportation (MnDOT). As part of the program, attendees toured campus, visited the U of M's transportation-related labs, and learned about aspects of transportation that included human factors, roadway safety, bridge design, surveying, and traffic simulation. RSI/CTS program coordinator Colleen O’Connor Toberman presented a session on retroreflectivity; RSI researcher Nichole Morris and research assistant J.P. Plummer led a session on human factors and gave a tour of the HumanFIRST driving simulator; and senior research analysis specialist Katie Fleming, with MnDOT, led a session on crash data analysis.

In post-program evaluations, parents reported that their children had learned valuable information about transportation topics, careers, and related education opportunities. “[The program] opened up my daughter’s horizon for future career choices and major focus areas after high school,” one parent said.

The Institute also participated in the University of Minnesota College of Science and Engineering’s DiscoverSTEM summer program, with Morris and Plummer leading a session on human factors. The twenty-five high school students attending listened to a lecture and toured the driving simulator.