



ROADWAY SAFETY INSTITUTE

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Modeling for bike and ped traffic to improve planning, safety

Getting more people to bike or walk to their destinations has been a high priority for transportation planners in recent years. But as the number of pedestrians and bicyclists using the transportation system increases, so does the potential for serious—even deadly—crashes involving these high-risk road users.

“To best prevent bicycle and pedestrian crashes, transportation planners need a better idea of how many people are using non-motorized transportation and what their exposure to risk is,” says Greg Lindsey, an RSI researcher and professor in the University of Minnesota’s Humphrey School of Public Affairs. Lindsey’s research is developing new methods and tools to help transportation engineers estimate bicycle and pedestrian traffic volumes and assess how risky it is to bike or walk.

Lindsey’s RSI-sponsored project—Performance Measures for Bicycle and Pedestrian Safety: Methodologies for Monitoring Traffic Volumes and Assessing Exposure to Risk—has several key goals. Researchers are collecting bicycle and pedestrian counts in several Minnesota case communities, ranging in size from the large Twin Cities metropolitan area to much smaller cities such as Grand Marais and Bemidji. Because most studies of exposure and risk have occurred in larger urban areas, researchers expect the results from the smaller communities to be particularly useful.

With these counts complete, researchers are developing models to adjust and extrapolate the data to measure the average annual daily number of bicyclists and pedestrians for specific road segments and networks. They are also creating models that estimate exposure to risk for nonmotorized traffic, and then combining those models with traffic volume estimates to help predict and better understand the potential for being involved in a crash or other hazardous situation. This information will help illustrate the

need for countermeasures or different traffic controls at specific locations.

“Within our case study communities, these results will be used to inform decision making about strategies that can reduce the risk of crashes for bicy-



clists and pedestrians," says Lindsey. "In addition, they'll be useful for developing performance indicators and measuring progress toward them."

Lindsey began work on the project in 2014. While the final study has not yet been published, early papers based on the research are already earning national recognition. In a paper presented at the Transportation Research Board's 2016 Annual Meeting, researchers outlined a simplified model that can be used to easily generate spatial estimates of pedestrian and cyclist traffic volumes in the field.

"Our results indicate that this simplified model can explain nearly as much of the observed variation in bicycle and pedestrian traffic as more complex, fully specified models while offering the advantage of being easier to apply and interpret," says Lindsey. "We were also able to confirm previous research that shows that factors influencing pedestrian traffic and bicycle traffic are different, and as a result these two modes must be modeled separately."

Work on this project is ongoing, and a final report will be published later this year. The research is expected to have many benefits, including an improved understanding of bicycle and pedestrian traffic volumes and patterns; new tools, models, and guidance for monitoring traffic and assessing exposure to risk; and new insights on the relationship between exposure and risk, Lindsey says.

Murphy named RSI Outstanding Student of the Year

Each year, the Roadway Safety Institute selects one graduate student for its Outstanding Student of the Year Award sponsored by the U.S. Department of Transportation (USDOT). This year's recipient is Brendan Murphy, a 2015 graduate of the University of Minnesota's civil engineering master's program. Murphy is currently the lead data scientist at the Accessibility Observatory and a research fellow in the Department of Civil, Environmental, and Geo-Engineering at the University of Minnesota (U of M).

Murphy's graduate work focused on connecting bicycle and pedestrian infrastructure with safe, multimodal transportation systems and the intelligent use of data in transportation and city planning. His approaches were used to help solve two key challenges identified in existing research of nonmotorized travel safety: the need for metrics that reflect the risk exposure produced by cross-modal traffic volume interactions, and the need for risk models that can be applied in local contexts such as individual streets and intersections.

In a project led by Andrew Owen, the director of the U of M's Accessibility Observatory, Murphy is helping to develop a risk model for pedestrian and bicycle travel for individual intersections and road segments in urban areas. The researchers are using the city of Minneapolis as their test bed for data collection and analysis and hope to extend their analysis to other cities as data become available to them, Murphy says.

His current work at the Accessibility Observatory continues to build on these efforts; Murphy assists in developing and maintaining tools and systems for collecting and analyzing data describing transportation systems and accessibility.

"My research interests lie at the intersection of urban connectivity, transportation equity, environmental sustainability, and livability," Murphy says. "I use GIS analytics and data to study the evolution of transportation networks over time and examine how these metrics relate to issues such as user safety. Far too many pedestrians and bicyclists are injured or killed in collisions with cars and trucks on our cities' streets, but we can reduce these rates through more intelligent multimodal roadway design when we have a better understanding of exactly how people get around in our urban areas."

As part of the award, Murphy traveled to the Transportation Research Board Annual Meeting held in Washington DC, where he was recognized for his achievement by officials from the USDOT.



USDOT Assistant Secretary of Transportation for Research and Technology Greg Winfree, Brendan Murphy, and Council of University Transportation Centers president Joel Volinski

"I found it invigorating and inspiring to be surrounded by so many other young researchers focused on attacking the problems of sustainability, population growth, and our transportation future from a wide variety of angles," Murphy says. "The location of the conference in our nation's capital also gave attendees a glimpse of how our cities' urban fabric should be woven—with a focus on walkable, connected spaces, usable bike sharing, and useful rail-based mass transit."

In addition to his master's degree, Murphy also holds a bachelor's degree in mathematics from the University of Minnesota. In the future, Murphy plans to continue developing and applying his spatial data analytics skills to solving problems in the nation's urban transportation networks and environments. In addition, he hopes to help empower more people to choose walking and biking over driving and to advance understanding of the design and transportation network principles that can foster safer, more sustainable cities.

Researcher spotlight: Frank Douma



Frank Douma

As director of the State and Local Policy Program at the University of Minnesota's Humphrey School of Public Affairs, Frank Douma specializes in projects that examine the role public policy, particularly law, plays in improving transportation safety. Douma also manages research projects related to several areas of transportation policy, including impacts of emerging transportation technologies.

Previous work with the Canadian Pacific Railway, the Metropolitan Airports Commission, and the Minnesota Department of Transportation have given Douma broad experience in the legal aspects of transportation policy and in policymaking for multimodal urban and rural transportation systems. He holds a master's degree in public affairs and a law degree from the University of Minnesota as well as a bachelor's degree in political science from Grinnell College.

"In my research, I am often looking into questions of efficiency, equity, and effectiveness," says Douma. "In terms of roadway safety, this work has manifested itself in evaluating the impacts of existing laws, such as mandatory seat belt laws and laws relating to the enforcement of speed limits."

Douma has been involved in a number of projects related to transportation safety policy, including assessing the impacts of Minnesota's primary seat belt law and investigating the political and institutional barriers related to automated speed enforcement technologies.

"My work for the Roadway Safety Institute focuses primarily on the nature of the controversy surrounding automated speed enforcement," says Douma. "A significant amount of research shows that this technology is effective at regulating driver speeds, but implementation has been slow at best. Through my research, I've learned how widely enforcement varies among states and investigated the relationship between the stringency of speed enforcement methods and the resulting safety impacts."

According to Douma, a large component of roadway safety relates to the behavior of the individual driver. In fact, the National Highway Traffic Safety Administration estimates that as many as 95 percent of all transportation fatalities are due, at least in part, to human error. Until technology becomes advanced enough to replace human drivers, Douma advocates for laws and policies that define the safest driving behaviors and ensure that they are followed.

"We face a conundrum: the human driver is currently the safest and most responsible way to operate a vehicle, yet statistics show we are also the most common cause of crashes, injuries, and fatalities," says Douma. "This shows the terrific need for public discussion about the relationship between our desire to protect our individual independence in our driving behavior and our collective interest in maximizing public safety on our roads."

Researcher spotlight: Ron Van Houten

Ron Van Houten is a professor in the Department of Psychology at Western Michigan University and a researcher with the Roadway Safety Institute. He is a behavior analysis expert in the areas of traffic safety,

pedestrian safety, intelligent transportation systems, traffic calming, bicycle safety, seat belt use, and reducing impaired driving.

Van Houten says he was drawn to the field of psychology when, as an engineering student, he took a course in behavioral psychology as an elective. "It got my attention because it looked very much like behavioral engineering," he says. His research interests include all aspects of traffic and pedestrian safety, the use of technology to implement behavioral principles, and community/organizational psychology. Many of the tools he has developed are in the Federal Highway Administration's Manual on Uniform Traffic Control Devices.

Specific projects have included conducting research on bicycle lanes, participating in the development of shared-use bicycle marking, and completing a number of large-scale studies on reducing nighttime pedestrian crashes. Many of these projects included social norming elements to target shifts in the safety culture.

In the fall of 2015, Van Houten presented at three pedestrian safety workshops offered by the Roadway Safety Institute. He discussed both pedestrian-focused and driver-focused countermeasures, with an emphasis on innovative techniques supported by recent research. He also emphasized human factors, noting that changing the safety culture in a community is as important as installing countermeasures. [See related article in this issue]

Van Houten says the most gratifying aspect of his work is developing tools that can reduce traffic fatalities and injuries. "I also enjoy examining ways to increase options of healthy transportation choices."

Increasing walking and bicycling as well as increasing the safety of both modes is critical, he says. "When I was growing up most children walked or bicycled to school. Today this is relatively rare," he says. "We are seeing the consequences of these changes in the increase in the incidence of childhood obesity."

Van Houten received the Patricia Waller Award at TRB in 2014 for changing driver behavior in yielding the right-of-way to pedestrians on a citywide basis. He holds an M.A. and Ph.D. from Dalhousie University and a B.A. from the State University of New York at Stony Brook.



Ron Van Houten

Pedestrian workshop summary now available

In late 2015, the Roadway Safety Institute held three workshops designed to inform transportation practitioners about innovative treatment options for improving pedestrian safety. A summary report of the workshops' content, including participant discussions at each event, is available at roadwaysafety.umn.edu.

Each workshop featured a presentation by Institute researcher Ron Van Houten of Western Michigan University. Nearly 90 individuals from nonprofit organizations, private firms, and state and



local agencies attended the workshops, held in Wisconsin, Indiana, and Ohio.

RSI travel-award recipients participate at TRB

The Roadway Safety Institute provided 15 graduate students from its partner institutions travel awards to attend the Transportation Research Board's 95th annual meeting in Washington, DC, January 10–14. As a result, students from the University of Minnesota Twin Cities, University of Minnesota Duluth, Auburn University, University of Akron, and University of Illinois at Urbana-Champaign had the opportunity to present research and network with other participants from across the country.



Exhibit teaches kids to be seen and be safe with reflectivity

Roadway Safety Institute staff taught more than 450 kids about reflectivity, pedestrian visibility, and safety at TechFest on February 27. The event, hosted annually by The Works Museum in Bloomington, is designed to introduce kids to engineering and technology concepts through hands-on activities and demos.

At the Institute exhibit, kids and their families viewed the “No White at Night” video as an introduction to reflectivity and safety. Then, they experimented with flashlights, a black box, road signs, and other materials to learn about the principles of light and reflectivity.

Visitors also struck a pose in the reflectivity photo booth, where they could try on reflective costumes (including vests and headlamps) to help them understand what types of clothing they can wear to help them be seen and be safe.

The Institute’s exhibit piloted a concept that will be used in a permanent exhibit to be installed at The Works later this year.



Visit highlights crash record research

In February, NHTSA administrators Mark Rosekind and Darin Jones, along with Kathleen Haney, traffic records coordinator with the Minnesota Department of Public Safety (DPS), toured the HumanFIRST Lab on the University of Minnesota campus and discussed results of a project led by RSI researcher Nichole Morris.

The research project redesigned the electronic crash report interface used by Minnesota law enforcement officers to improve the accuracy, speed, reliability, and meaningfulness of data collected from the scene of a crash. Although at first glance this data appears to serve simply drivers and insurance companies, this information is highly valued because it is used by state and federal agencies, as well as researchers, to analyze and evaluate crashes, trends, and potential countermeasures.

The project was a component of a larger project redesigning Minnesota’s crash records database and was sponsored by the Traffic Records Coordinating Committee at the Minnesota DPS and by the Minnesota Department of Transportation.



RSI director Max Donath, Darin Jones (NHTSA), Nichole Morris (RSI/HumanFIRST), Mark Rosekind (NHTSA), Kathleen Haney (DPS), and HumanFIRST staff Jennifer Cooper, Jake Achtemeier, and Disi Tian

Results of the HumanFIRST research prototypes were combined with the state vendor’s prior experience for a “best-of-breed approach,” Haney said.

The new interface launched in January 2016. The report has logged well over 20,000 crashes since its launch and the feedback from users has been highly positive, Morris reports.

Editor’s note: “Computerized Crash Reports Usability and Design Investigation” will be featured on May 10 as part of the Transportation Safety Webinar Series: Moving Research into Practice.

This series is jointly hosted by the Roadway Safety Institute and the Midwest Transportation Center at Iowa State University. Visit roadwaysafety.umn.edu/ events for more details.

Regional UTCs join forces on research webinars

The Roadways Safety Institute and the Midwest Transportation Center at Iowa State University are jointly hosting the Transportation Safety Webinar Series: Moving Research into Practice—a series that shares the impacts of research conducted through these Regional University Transportation Centers. Both researchers leading the work and practitioners implementing results in the field share the spotlight during the webinars, which are streamed live and recorded for later viewing.



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The first webinar, held February 16, featured Shauna Hallmark, director of InTrans at Iowa State University, and Bill Rosener, executive vice president of the Asphalt Paving Association of Iowa, presenting an evaluation of safety edge benefits. During the March 22 seminar, John Hourdos, director of the Minnesota Traffic Observatory at the University of Minnesota (U of M), and traffic engineer Joe Gustafson with Washington County, MN, discussed the safety and mobility of two-lane roundabouts.

The series is sponsored by the Roadway Safety Institute and Midwest Transportation Center, and featured projects in this series were funded by the Iowa Highway Research Board, the Iowa DOT, the Minnesota DOT, the Minnesota Local Road Research Board, the Minnesota Department of Public Safety, and the National Highway Traffic Safety Administration.

Upcoming webinars will feature Hallmark presenting on low-cost traffic calming for rural communities (April 19) and Nichole Morris of the U of M presenting on a computerized crash reports usability and design investigation (May 10). To watch past or upcoming seminars, visit roadwaysafety.umn.edu/events.

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