

RESEARCH REVIEW

• UNIVERSITY OF MICHIGAN TRANSPORTATION RESEARCH INSTITUTE • OCTOBER-DECEMBER 2014 • VOLUME 45, NUMBER 4 •



Meeting the Transportation Needs of Michigan's Aging Population

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UMTRI RESEARCH REVIEW

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UMTRI's Strategic Intent

To be the leader in transportation systems research integrating vehicles, people, and infrastructure to achieve a highway transportation system where:

- Fatalities and injuries are eliminated
- People and goods flow efficiently
- Reliance on nonrenewable energy is reduced

Meeting the Transportation Needs of Michigan's Aging Population

As America's population ages, older residents face a host of transportation challenges, particularly in a state as large and geographically varied as Michigan. Traveling to medical appointments, grocery shopping, or for social purposes requires safe mobility options for Michigan's older residents, whether they live in populated urban regions or remote rural communities.

The aging of America's population is expected to continue at an accelerated pace for the next two decades making it critically important that state agencies understand the mobility needs of older adults and incorporate these needs into transportation-facility design and planning. In 2010, the Michigan Department of Transportation (MDOT) turned to UMTRI's Behavioral Sciences Group for assistance through a competitively awarded project.

Led by research professor David W. Eby, the five-member research team began a comprehensive study of the demographics, travel patterns, and mobility needs of Michigan's aging population. The goal was to help MDOT and other agencies decide where to devote resources to have the biggest impact.

The UMTRI research team took a three-pronged approach to gathering data—conducting a literature review, demographic analysis, and statewide surveys of Michigan's older adult residents and family members/caregivers. In September 2011, the research project culminated in the development of a set of low-cost, high-impact recommendations on ways to improve mobility for the state's aging residents.

One of the recommendations advises taking into account the significant differences among older adults, some of whom need mobility assistance while others are independent.

"A large body of research, including our own, clearly shows that it is not age per se that leads to difficulties with safe driving," says UMTRI research professor David W. Eby. "Rather, it is the medical conditions that people have, and the medications that they use to treat those conditions, that can make safe driving more difficult. Many older adults enjoy good health and can drive safely."

Other recommendations from the report include such suggestions as implementing roadway design improvements, such as roundabouts, with an education-and-training

component tailored to older adults; investing in pedestrian infrastructure to improve travel routes from home to transit stations; reducing physical barriers to using public transit; and supporting travel training geared toward both older adults and their caregivers.

The research was conducted by David W. Eby, Lisa J. Molnar, Lidia P. Kostyniuk, Renée M. St. Louis, and Nicole Zanier. Read the full report: <http://deepblue.lib.umich.edu/handle/2027.42/90961>.



Older Adults in Rural Michigan

Based on the findings from the first research project, MDOT funded a second, competitively awarded UMTRI project to examine the mobility needs specific to older residents in rural areas of Michigan. The report also addresses the mobility needs of Indian tribes within the state.

To begin, the UMTRI research team conducted an analysis of demographic data in six rural Michigan counties (Iron, Marquette, Hillsdale, Mason, Huron, and Alpena) and a survey of Michigan's older adult residents in rural areas. The researchers also held group discussions with Indian tribal representatives.

In the six counties surveyed, the percentage of adults age seventy and older ranged from about 11-19 percent, which is higher than for Michigan overall. In some rural areas of the state, that's roughly one in five people over age seventy. In terms of travel patterns in rural Michigan, all interviewees agreed that older adults most often traveled for medical, shopping, and social or recreational purposes.

Continued on page 2

Continued from page 1

According to UMTRI associate research scientist Lisa Molnar, “mobility issues are magnified in rural areas because of greater distances between destinations and the relative lack of transportation alternatives.”

Although implementing transportation solutions is more challenging in rural areas, there are a number of steps that can be taken. The UMTRI research project, completed in 2012, resulted in sixteen recommendations to improve mobility for Michigan’s older residents in rural areas.

Among the findings, the report recommends that gender be considered when developing mobility solutions for rural older adults. Women in rural Michigan age seventy and older outnumber men and will continue to do so in the future. It has been estimated that older women will outlive their ability to drive safely by ten years, compared with six years for older men.

JOYCE DANIELS, UMTRI



Other recommendations also build on findings from the first report including emphasizing methods to extend safe driving; developing and disseminating educational information designed to help older adults transition to nondriving; working with public transportation providers and law enforcement to help them understand the mobility issues of aging residents; as well as pursuing opportunities to employ rural intelligent-transportation-system technologies designed to improve roadway safety.

The research was conducted by David W. Eby, Lisa J. Molnar, Lidia P. Kostyniuk, Renée M. St. Louis, Nicole Zanier, and Daniel Kellman. Read the full report:

<http://deepblue.lib.umich.edu/handle/2027.42/95709>.

A Statewide Strategy

Based on the findings of the two previous research projects, it became clear that the state needed an integrated strategy for aging and driving. In 2013, MDOT funded a third, competitively awarded UMTRI project, currently underway, to develop a comprehensive statewide older driver education and safe mobility planning strategy.

The overall objective of the project is to construct an optimal statewide strategy to support the safe mobility needs of an aging population. The strategy will be comprised of three components: public education, direct intervention, and administration/collaboration.

Stuart Lindsay is the MDOT project manager for the Older Driver Education and Safe Mobility Planning Project.

“We envision a statewide information and intervention strategy with two major objectives,” says Lindsay. “First, to help older drivers continue driving safely as long as possible. Second, when the time is right for each individual, assist drivers in making sound choices about mobility options, with help from family and support givers, healthcare providers, driver licensing experts, and others. The goal is that all older drivers will have the personal knowledge and community support they need to keep their independence, and to relinquish the keys at the best time for each driver, so everyone stays safe.”

The strategy will be developed over the next two years, including marketing and branding, and will be implemented and evaluated statewide.

See also www.umtri.umich.edu/wbo-we-are/research-groups/behavioral-sciences **RR**

Michigan's Older Residents: Who Drives and Where Do They Go?

In Michigan, with its long history of automotive manufacturing, mobility is frequently equated with being able to drive a personal automobile. That can create challenges in a state where the population was nearly 10 million in 2010, and approximately 10 percent of all residents were age seventy or older.

By 2030, the population of Michigan adults age seventy years and older is expected to comprise about 14 percent of the state's population, or about 1.5 million people. Women will account for 60 percent of this group. According to UMTRI research, about 80 percent of all adults age seventy and older and 63 percent of those eighty-five years and older are licensed to drive.

“The extent of driver licensure for the present generation of older adults is much higher than it was for older adults of the past, and older adults today drive more miles per year than older adults of the past,” says research scientist Lidia Kostyniuk, who conducted the demographic analyses. “We can expect to see older drivers making up larger and larger portions of the drivers on the road in the foreseeable future.”



UMTRI BEHAVIORAL SCIENCES GROUP

Further analysis of recent statewide travel survey data shows that about one-third of adults age seventy and older lived alone, and 12 percent did not have access to a car. Among adults age eighty-five and older, 43 percent lived alone, and 16 percent did not have access to a car. Project findings indicate that adults age seventy and older made, on average, 2.6 trips per day. The most frequent trip purposes were for personal business, everyday shopping, eating out, picking up or dropping off passengers, and accompanying another person. Most trips were made by car, either as a driver (73 percent) or passenger (23 percent).



UMTRI BEHAVIORAL SCIENCES GROUP

The UMTRI researchers also found that caregivers and family members play a critical role in maintaining safe mobility for older adults and will continue to play an important role in the coming decades. According to survey results, over 90 percent of people who provide care to an older adult reported providing transportation assistance, and of those, nearly all provided rides to the older adult.

“When an older adult is no longer able or chooses not to drive, the responsibility for providing transportation is overwhelmingly taken on by a caregiver,” says UMTRI researcher Renée St. Louis, who coordinated the caregiver survey. “While this is often the most efficient and cost-effective approach to meeting the transportation needs of older adults, it is important to consider the burden this places on caregivers and to support programs to assist caregivers with these responsibilities.”

RR

Self-Driving Vehicles Generate Enthusiasm, Concerns Worldwide

Despite safety concerns about equipment failure, a majority of drivers on three continents have high expectations for autonomous vehicles.

“Recent advances in autonomous vehicle technology have helped bring self-driving vehicles to the forefront of public interest,” said Brandon Schoettle, project manager in UMTRI’s Human Factors Group. “Self-driving vehicles are commonly envisioned to be the ultimate, full embodiment of connected-vehicle technology, an area that is currently the focus of several large research projects and government support.”

Building on an earlier study on public opinion regarding self-driving vehicles in the United States, United Kingdom, and Australia, Schoettle and UMTRI research professor Michael Sivak expanded their survey to include more than 1,700 respondents in India, China and Japan.

They found that about 87 percent of respondents in China and 84 percent in India have positive views regarding autonomous and self-driving vehicles, compared with 62 percent in Australia, 56 percent in the United States, 52 percent in the United Kingdom, and 43 percent in Japan. Half of the Japanese respondents were neutral, while the United States registered the highest percentage of negative views (16 percent) among the six countries.

According to the study, more than 80 percent of respondents in China, India and Japan believe that self-driving vehicles would reduce both the number and severity of crashes, compared with roughly 70 percent in the United States, United Kingdom, and Australia.

The Chinese and Indians are also more optimistic that autonomous technology would lead to less traffic congestion (72 percent of respondents in both countries agree) and shorter travel times (74 percent in India, 68 percent in China). On the other hand,

56 percent of Japanese respondents and less than 50 percent in the United States, United Kingdom, and Australia believe it would ease congestion. Likewise, less than 50 percent of respondents in those countries agree that it would shorten travel times.

Although more respondents in China and India expressed favorable views regarding the benefits of self-driving cars, the two countries differ when it comes to concerns about riding in a completely autonomous vehicle. About 79 percent of Indians said they would be very or moderately concerned, compared with 49 percent of Chinese. Among the other countries, the results were 67 percent for the United States, 57 percent for both Australia and the United Kingdom, and 52 percent for Japan.

Chinese and Indian respondents were more concerned about equipment failures, system and vehicle security (from hackers), data privacy (location and destination tracking), and interacting with pedestrians and bicycles than those in the study’s other countries. Nonetheless, much higher percentages of Chinese (96 percent) and Indians (95 percent) are at least slightly interested in owning a self-driving vehicle, compared with those in Japan (77 percent), Australia (68 percent), the United States (66 percent), and the United Kingdom (63 percent).

“Respondents in the six countries surveyed, while expressing high levels of concern about riding in vehicles equipped with this technology, mostly feel positive about self-driving vehicles, have optimistic expectations of the benefits, and generally desire self-driving vehicle technology,” Schoettle said.

—Bernie DeGroat
Michigan News



Experts Gather for Inside China Conference

Experts from the United States and China gathered at the University of Michigan on November 12 for an in-depth look at the Chinese automotive market. The seventh annual Inside China conference was the final event in the conference series hosted by UMTRI's Automotive Futures Group in 2014.

The Chinese automotive market continues to be the largest automotive market in the world. China's passenger-vehicle production and sales reached over 20 million units in 2013, which marked China's fifth consecutive year as the world's biggest auto market. At the same time, air quality is suffering, and studies indicate that transportation plays a significant role.

"Balancing rapid automotive industry growth with environmental concerns has led to some very complex challenges" said conference moderator Bruce Belzowski, managing director of UMTRI's Automotive Futures Group.

Among the pressing issues that China must face are energy security, air quality, and reduction of vehicle emissions.

In terms of energy security, China is heavily dependent on imported oil, and demand is steadily growing. China is on track to become the world's largest importer of oil. Conference speaker Weijian Han of Ford Motor Company projects that by 2025, imported oil will make up 70 to 80 percent of total oil consumption in China.

Feng An, executive director of the Innovation Center for Energy and Transportation (iCET), said the transport sector is responsible for the majority of the increase in oil demand, which has led to significant levels of carbon-dioxide emissions and deteriorating air quality. According to An, China's transport sector is responsible for about half of all city air pollution, and carbon-dioxide emissions are expected to increase.

Charles Chesbrough of IHS noted that 96 percent of major Chinese cities subject to National Air Quality Standards (NAQS) failed to meet their goal in 2013. Meanwhile, China's automotive industry continues to grow at a rapid pace, with China providing most of the global sales growth for light vehicles.

Meeting Fuel Economy Targets

One important factor influencing the automotive industry in China is its establishment of aggressive fuel economy targets. China's 2020 target of five liters per one-hundred kilometers translates to an overall reduction in corporate average fuel consumption of 30.7 percent in the coming seven years (2014-2020). For China to meet this target, according to iCET data, it must rely on the combined efforts of vehicle-efficiency technologies and commercialization of new-energy vehicles (pure electric, plug-in hybrids, CNG, and fuel-cell vehicles).

Technology research also plays a role. Don Siegel of the University of Michigan's U-S.-China Clean Energy Research Center (CERC) Clean Vehicles Consortium highlighted some of the ways the United States and China are working together. The objective of CERC-CVC is to contribute to dramatic improvements in technologies with the potential to reduce the dependence of vehicles on oil and to improve vehicle fuel efficiency through vehicle electrification, novel energy storage materials, next-generation biofuels, lightweight structures, and efficient energy conversion.

The China Automotive Technology and Research Center (CATARC) is another resource. Speaker Zhixin Wu gave a profile of CATARC, which was established in 1985 and now oversees many institutes and centers dealing with automotive standardization research, automotive testing, auto industry planning and design, quality system certification, and automotive engineering, much of which is related to research on safety and new-energy vehicles.

The Inside China conference is part of a series of automotive research conferences hosted by UMTRI Automotive Futures throughout the year. Upcoming conferences in 2015 include the following:

- February 18: New Business Models for New Mobility
- April 15: Inside Mexico: Understanding the Current and Future Mexican Automotive Industry
- July 22: Powertrain Strategies for the 21st Century

All conferences are held at the University of Michigan. For more information, visit <http://www.umtri.umich.edu/our-results/projects/focus-future-conferences> **RR**

UMTRI Researchers Participate in 58th Stapp Car Crash Conference

Several faculty, staff, postdoctoral fellows, and students from the UMTRI Biosciences Group participated in the 58th Stapp Car Crash Conference, held November 9-12, 2014, in San Diego, California.

UMTRI research professor Larry Schneider served as general chair of this year's Stapp Conference, filling in for John W. Melvin, who unexpectedly passed away in July 2014. UMTRI administrative specialist Leda Ricci served as executive director for the Stapp Conference. She directed the peer-review process for Stapp papers and managed and coordinated all aspects of the conference, as well as editing and production of the *Stapp Car Crash Journal*.

This year's Stapp Conference was dedicated to John Melvin, who was hired in 1968 as one of UMTRI's original research scientists. At that time, UMTRI was known as the Highway Safety Research Institute, and Melvin was head of the Biosciences Division. He transferred to General Motors in 1985, where he conducted injury biomechanics research until his retirement from GM in 1998. During and after his employment at GM, Melvin worked closely with the motorsports industry to improve crash safety for racecar drivers, using his unmatched knowl-

edge of human response, injury tolerance, and injury mechanisms under dynamic (i.e., crash) loading conditions.

At the 54th Stapp Conference in 2010, Melvin gave the Stapp Memorial Lecture, which was entitled "Injury Biomechanics at the University of Michigan—the Emergence of a New Engineering Discipline." In tribute to Melvin, this year's Stapp Conference included a one-day short course on injury biomechanics with presentations by members of the Stapp Advisory Committee who have authored chapters of the third edition of *Accidental Injury – Biomechanics and Prevention*. Melvin was a coeditor and author of the chapter on the biomechanics of brain injury for the first two editions and is also a coeditor of the newly released third edition.

As one of two newly elected members of the Stapp Advisory Committee, UMTRI research associate professor Jonathan Rupp gave a presentation in the short course on the biomechanics of knee, thigh, and hip injuries.

Several members of UMTRI's Biosciences Group were also recognized by Stephen Rouhana, general chair of last year's Stapp Conference, as the authors of the best paper of the 2013 Stapp Conference (published in the *Stapp Car Crash Journal*) as determined by a vote of members of the Stapp Advisory Committee. The paper is titled "PMHS Impact Response in 3 m/s and 8 m/s Nearside Impacts with Abdomen Offset" and is authored by UMTRI engineering in research lead Carl Miller, Nathaniel Madura, Larry Schneider, associate research scientist Kathleen Klinich, research professor Matthew Reed (current head of the UMTRI Biosciences Group), and Jonathan Rupp.

The final paper of the conference, entitled "Response and Tolerance of Female and/or Elderly PMHS to Lateral Impact," was presented by UMTRI postdoctoral fellow Lauren Wood. Other participants from UMTRI included Katelyn Klein, PhD student in Biosciences, and postdoctoral fellow Eunjoo Hwang, who both made presentations at the 42nd International Workshop on Human Subjects for Biomechanical Research, sponsored by the National Highway Traffic Safety Administration (NHTSA) immediately preceding the Stapp Conference.

Read more at www.stapp.org 



John Melvin gives the Stapp Memorial Lecture in 2010.

UMTRI Faculty Play Leadership Roles in HFES

The annual meeting of the Human Factors and Ergonomics Society (HFES) took place October 27-31 in Chicago, with several UMTRI faculty members participating.



UMTRI research professor Paul A. Green, head of UMTRI's Driver Interface Group, serves as a member of the HFES Executive Council and is faculty advisor of the University of Michigan

(U-M) student chapter of HFES. The U-M chapter received the Gold Award for outstanding student chapter at this year's meeting—the highest honor a chapter can receive.

Two additional UMTRI faculty members have been elected to leadership positions within HFES.



Anuj Pradhan, assistant research scientist in UMTRI's Young Driver Behavior and Injury Prevention Group, served as program chair for the Surface Transportation Technical Group for the 2014 HFES meeting.

He oversaw ten scientific sessions sponsored and cosponsored by the group and served as cochair of an invited symposium on Cognitive Training and Driving.

At this year's meeting, Pradhan was elected to the position of chair for the Surface Transportation Technical Group (STTG), a two-year elected position. The STTG fosters the exchange of information among members and promotes the development and application of human factors data and methods related to surface transportation. Transport modes

include passenger, commercial, and military vehicles, mass transit, highway and infrastructure systems, including Intelligent Transportation Systems (ITS), pedestrian and bicycle traffic, rail transit, and maritime transportation. The STTG consists of more than 350 members from around the world.



Shan Bao, assistant research scientist in UMTRI's Human Factors Group, has been chosen as the STTG program chair-elect for the 2015 HFES meeting in Los Angeles and the STTG program

chair for the 2016 HFES meeting in Washington, D.C.

The Human Factors and Ergonomics Society was founded in 1957. The mission of HFES is to promote the discovery and exchange of knowledge concerning the characteristics of human beings that are applicable to the design of systems and devices of all kinds. HFES has twenty-three technical groups and numerous local and student chapters.

Learn more at www.hfes.org 

UMTRI NAMES & FACES

RECENT UMTRI PUBLICATIONS

Most UMTRI reports are available in full text online. See the website address at the end of the citation. Please contact the UMTRI Library at 734-764-2171 or umtridocs@umich.edu to inquire about the availability of other publications listed here.

Journal Articles

Sullivan, J. M.; Bao, S.; Goudy, R.; Konet, H. 2015.
"Characteristics of Turn Signal Use at Intersections in Baseline Naturalistic Driving." *Accident Analysis & Prevention*, vol. 74, January 2015, pp. 1-7.
DOI: 10.1016/j.aap.2014.10.005

Technical Reports

Schoettle, B.; Sivak, Michael. 2014. A Comparison of CAFE Standards and Actual CAFE Performance of New Light-Duty Vehicles: An Update through Model year 2014. Report no. UMTRI-2014-29.

<http://hdl.handle.net/2027.42/109262>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.

Schoettle, B.; Sivak, Michael. 2014. A Survey of Public Opinion about Autonomous and Self-Driving Vehicles in the U.S., the U.K., and Australia. UMTRI-2014-21.

<http://hdl.handle.net/2027.42/108384>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.

Sivak, M.; Schoettle, B. 2014. Benefits of Recent Improvements in Vehicle Fuel Economy. Report no. UMTRI-2014-28.

<http://hdl.handle.net/2027.42/109199>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.

Sivak, M.; Schoettle, B. 2014. What Do Current Owners of Hybrids and Non-hybrids Think about Hybrids? Report no. UMTRI-2014-25.

<http://hdl.handle.net/2027.42/109078>

The research documented in this report was sponsored by UMTRI's Sustainable Worldwide Transportation program.



CONFERENCES & EVENTS

January 2015

94th Annual TRB Meeting
January 11-15; Washington, D.C.
[www.trb.org/AnnualMeeting2015/
AnnualMeeting2015.aspx](http://www.trb.org/AnnualMeeting2015/AnnualMeeting2015.aspx)

North American International Auto Show
January 17-25; Detroit, Michigan
www.naias.com

National Biodiesel Conference & Expo
January 19-22; Fort Worth; Texas
www.biodieselconference.org/2015/

Michigan Infrastructure & Transportation
Association
January 21-23; Mt. Pleasant, Michigan
www.mi-ita.com

NAPA Annual Meeting
January 25-28; Marco Island, Florida
www.asphaltpavement.org/

Crash Data Retrieval (CDR) User's Summit
January 26-28; Houston, Texas
www.cdrsummit.com/

New Partners for Smart Growth Conference
January 29-31; Baltimore, Maryland
www.newpartners.org/

February 2015

American Traffic Safety Services Association
February 6-10; Tampa, Florida
<http://expo.atssa.com/>

CERV—Conference on Electric Roads and
Vehicles
Feb. 9-10; Park City, Utah
www.cervconference.org/

SAE 2015 Hybrid & Electric Vehicles
Technologies Symposium
February 10-12; Los Angeles, California
www.sae.org/events/hybrid/

Technology & Maintenance Council (TMC)
annual meeting
February 16-19; Nashville, Tennessee
www.trucking.org

New Business Models for New Mobility
February 18; Ann Arbor, Michigan
[www.umtri.umich.edu/our-results/projects/
focus-future-conferences](http://www.umtri.umich.edu/our-results/projects/focus-future-conferences)

April 2015

SAE 2015 World Congress
April 21-23; Detroit, Michigan
www.sae.org/congress/

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Last Print Issue of *UMTRI Research Review*

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