



 Center for
Transportation
Research

2018-19 CTR Annual Report





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Director's Message

I am proud to present this report of the Center for Transportation Research's accomplishments and achievements for 2017–2019. We have made great strides in continuing education, research, and technology transfer this year, as evidenced by the number of publications and presentations by faculty and staff and the continuing relationships with our research sponsors and partners. While all our accomplishments are worthy of note, I would like to highlight a few here.

CTR touches the lives of nearly every Tennessean. For example, through our Law Enforcement Liaison and Judicial Outreach Liaison programs in the Tennessee Highway Safety Office of the Tennessee Department of Safety and Homeland Security, we have reduced Tennessee traffic fatalities as part of the nation's vision Toward Zero Deaths. We credit the effectiveness of these programs for helping to keep the number of crash fatalities from rising significantly, in spite of population growth and increased travel.

Research

CTR was awarded 21 new research grants during this period. Grant sponsors include the Tennessee Commission on Aging and Disability, Federal Motor Carrier Safety Administration, Federal Highway Administration (FHWA), Tennessee Department of Transportation (TDOT), US Department of Transportation (USDOT), US Department of Agriculture, Society of Automotive Engineers, and the National Science Foundation. We have 13 continuing grants in progress that were awarded by Tennessee Highway Safety Office, FHWA, TDOT, and USDOT.

Education

CTR is committed to continuing education, workforce development, and professional improvement. Since July 1, 2017, we presented 47 unique courses and workshops for a total of 278 classes that were attended by more than 5,000 people. These workshops and courses are provided through our Tennessee Transportation Assistance Program, Traffic Signal Academy, and Railroad Continuing Education Program. CTR staff also teach university classes and participate in national education programs such as the Railroad Engineering Education Symposium. In addition, CTR supported the transportation related research of many graduate and undergraduate students during this period.

Outreach

CTR activities benefit communities throughout Tennessee. We work with law enforcement and the judiciary to improve highway safety enforcement. We collaborate with high schools, local law enforcement agencies, and service organizations to develop driving skills and safety habits in teenagers. CTR helps non-profit community and service groups purchase vans to transport people who are disabled or otherwise mobility impaired.

Collaborations

Transportation research is inherently a collaborative, multidisciplinary endeavor. However, the structure of a large university hinders collaborative activities. One of CTR's key objectives is to foster collaboration among faculty and students from departments across the university. In 2014, we established the CTR Fellows program to recognize UT faculty and staff with expertise useful in transportation research. This year's class introduced the first Student Fellow, Mr. Hunter Sinclair. Hunter's research interests are in transportation planning and modeling, land use impacts, and the livable city movement.

This highly productive year is the result of the combined visions and efforts of many, many people. Because of these tireless contributors and supporters, CTR is laying foundations for new growth and innovation, not just in Tennessee, but also the world.

CTR Leadership



*Dr. David B. Clarke
Director*



*Dr. Jerry Everett
Associate Director*



*Ms. DeAnna Flinchum
Chief of Staff*



*Ms. Carol Hatmaker
Business Manager*



*Dr. Mark Burton
Director, Transportation
Economics*



*Mr. Matt Cate
Director, Tennessee
Transportation
Assistance Program*



*Dr. Airtion Kohls
Director, Traffic Signal
Academy*



*Dr. Janet Hopson
Fuel Economy
Information
Project Lead*

CTR Staff & Affiliated Research Faculty

Ms. Andrea Barbour, TDOT Long Range Planning Division
Dr. Candace Brakewood, Civil & Environmental Engineering
Dr. Larry G. Bray, Research Professor
Dr. Mark Burton, Director of Transportation Economics
Mr. Matthew Cate, TTAP Director
Dr. Subhadeep Chakraborty, Mech, Aerospace & Biomedical Engr.
Dr. Christopher Cherry, Civil & Environmental Engineering
Dr. David Clarke, Director
Dr. Jerry Everett, Associate Director

Ms. DeAnna Flinchum, Research Director
Dr. Lee Han, Civil & Environmental Engineering
Dr. Baoshan Huang, Civil & Environmental Engineering
Dr. Janet Hopson, Fuel Economy Information Project
Dr. Asad Khattak, Civil & Environmental Engineering
Dr. Airtion Kohls, Traffic Signal Academy Director
Dr. John Ma, Civil & Environmental Engineering
Dr. Melany Noltenius, Research Associate I
Ms. Mareike Ortmann, Research Associate I

CTR Fellows

2019-20 Fellows

Dr. Melissa Bowers, Haslam College of Business
Dr. David Icove, Electrical Engineering and Computer Science
Dr. James Ostrowski, Industrial and Systems
Dr. Tim Rials, UT Institute of Agriculture
Mr. Hunter Sinclair, Geography

2018-19 Fellows

Dr. Candace Brakewood, Civil & Environmental Engineering
Ms. Linda Dougherty, Center for Applied Research & Evaluation
Dr. Hyun Kim, Geography
Dr. Xueping Li, Industrial and Systems Engineering
Mr. Edward Taylor, Construction Industry Research & Policy

2017-18 Fellows

Dr. Qing Cao (Charles), Electrical Engr. & Computer Science
Dr. Rachel JC Chen, Ctr. for Sustainable Business & Development
Dr. Lance Walter Saunders, Marketing & Supply Chain Mgmt.
Dr. David K. Irick, Mechanical, Aerospace & Biomedical Engr.
Dr. Bradford Paul Collett, Plant Sciences, Landscape Architecture

2016-17 Fellows

Dr. Richard Bennett, Civil & Environmental Engineering
Dr. Eugene Fitzhugh, Kinesiology, Recreation and Sport Studies
Dr. Anahita Khojandi, Industrial and Systems Engineering
Mr. Jonathan Overly, East Tennessee Clean Fuels Coalition
Dr. Georg Schaur, Economics

2015-16 Fellows

Dr. John Bell, Marketing & Supply Chain Management
Dr. Subhadeep Chakraborty, Mech, Aerospace & Biomedical Engr.
Dr. Mingzhou Jin, Industrial & Information Engineering
Dr. John Ma, Civil & Environmental Engineering
Dr. Charles Sims, Economics; Baker Center for Public Policy

2014-15 Fellows

Dr. Christopher Cherry, Civil & Environmental Engineering
Dr. Mary C. Holcomb, Marketing & Supply Chain Management
Dr. Jennifer Richards, Food Science & Technology
Dr. Rapinder Sawhney, Industrial & Systems Engineering
Dr. Shih-Lung Shaw, Geography

CTR Staff

Ms. Debbie Bower, Accounting Specialist I
Mr. Frank Brewer, TTAP Training Coordinator
Ms. Connie S. Brock, Accounting Specialist III
Mr. Tony Burnett, THSO Law Enforcement Liaison
Mr. Buck Campbell, THSO Law Enforcement Liaison,
Ms. Judy Carver, Accounting Assistant III
Ms. Sandra Chandler, Administrative Specialist I
Ms. Rhiannon Chambers, THSO Program Administrator
Ms. Valencia Cooper, Coordinator I
Mr. Steve Dillard, THSO Law Enforcement Liaison
Ms. Tammy Enix, Research Associate II
Ms. Lissa Gay, Communications Director; JTSS Managing Editor
Mr. Robert Gibson, Research Associate I
Mr. Bill Gilpin, Tennessee Vans Nashville Office
Mr. Kevin Hager, THSO Asst Program Management Admin
Mr. Jonathon Haynes, TDOT Long Range Planning Division
Ms. Carol Hatmaker, Business Manager
Mr. Daniel Herman, Research Technician III
Ms. Katie Henrichs, THSO Administrative Specialist II
Mr. Jason Ivey, Deputy Director, THSO
Ms. Beth Jirik, Program Administrator
Ms. Jenny Jones, Editor, Road Talk
Ms. Jia (Lisa) Li, IT Analyst II
Ms. Janet Lindsey, TN Vans Administrative Services Assistant
Ms. Karla Lipford, THSO Law Enforcement Liaison, West TN
Mr. Kevin Long, Research Technician III
Ms. Danielle Meyers, Senior Research Assistant
Mr. Spence Meyers, IT Analyst II
Mr. Hector Moctezuma, Research Technician III
Ms. Janice Osborne, TN Vans Sr. Admin. Services Assistant
Dr. Stephen H. Richards, STC Director; JTSS Editor-in-Chief
Ms. Jacquelyn Richardson, IT Analyst II
Mr. Fred Sherrill, THSO Law Enforcement Liaison
Ms. Shandi Smith, THSO Program Manager
Ms. Kimberly Van Atta, THSO Program Manager
Ms. Beth Vernon, THSO Coordinator I
Ms. Vanessa Washington, Accounting Assistant III
Ms. Diana Webb, Course Registrar
Mr. Warren Wilson, IT Analyst II

FUEL ECONOMY GUIDE MODEL YEAR 2020



Fuel Economy and Environment

City 35 MPG Highway 42 MPG Combined 39 MPG

SAVED \$1,750 in fuel costs over 5 years

Actual fuel cost \$1,150

fueleconomy.gov

GOVERNMENT'S STAR SAFETY RATINGS

DELIVERY

SALES

FINANCING

RENTAL

SALES TAX

REGISTRATION

SALES TAX

REGISTRATION

SALES TAX

REGISTRATION

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U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
U.S. Environmental Protection Agency
UPDATED: January 13, 2020



CTR Programs

Freight Related Analytics

Freight movement should cause minimal interruption to the communities it passes through. As population densities increase, the challenge is to move goods cleanly, cheaply, safely, and unobtrusively while still accommodating congested transportation networks and environmental standards. CTR has nationally recognized specialists in individual freight modes: freight railway engineering, inland waterborne commerce, and the economics of railroad and barge freight transportation. These experts are engaged in combining individual freight modes in ways that improve social, economic, and environmental outcomes.

Fuel Economy Guide (www.fueleconomy.gov)

CTR staff at the National Transportation Research Center, Inc. collaborates with colleagues at Oak Ridge National Laboratory to develop and run the official US government source for fuel economy information, www.fueleconomy.gov. This highly informative site allows users to find and compare car models, calculate their miles-per-gallon, get mileage tips, and find the cheapest gas in their zip code areas. The site has the latest Fuel Economy Guide, a yearly publication that can help people understand the differences between hybrid and electric cars, find car and fuel related apps for smart phones, and save money on car fuel. FuelEconomy.gov is widely recognized as one of the most useful and user-friendly in the .gov domain.

#GetConvinced

#GetConvinced is CTR's Teen Highway Safety program that started as an offshoot of community outreach activities conducted for a seatbelt use project that was funded by the Centers for Disease Control and Prevention. The program uses a Seat Belt Convincer, which is an inclined trailer equipped with a car seat and seatbelt that simulates a low-speed (5-10 mph) crash. CTR uses the Convincer to educate teen drivers in East Tennessee on the importance of using a seatbelt. The #GetConvinced program initially focused on encouraging the use of seat belts but now addresses other highway safety issues faced by teen and novice drivers. The program "Convinces" participants to buckle up when riding in an automobile and

also to NOT drive distracted. CTR recently obtained funding to expand the program to educate teens in how to drive around tractor trailers, using a portable simulator.

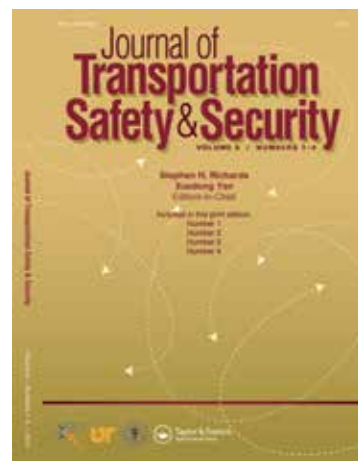
Inland Waterways

America's inland waterways are among our oldest and most reliable means of moving both people and freight. Today, the 10,000+ miles of navigable waterways safely and affordably accommodate roughly 560 million tons of freight annually. Because the waterways that support navigation also generate electricity, prevent flooding, supply water to municipal and commercial users, irrigate crops, and enhance recreation, the U.S. Army Corps of Engineers builds, maintains, and operates these systems. CTR faculty and staff are among the Corps' long-standing partners, and CTR provides a variety of analytical products to Corps districts and divisions along the Eastern Seaboard and the Gulf Coast.

Journal of Transportation Safety & Security

*An official journal of the
UT Center for Transportation Research in
partnership with Beijing
Jiaotong University*

Prior to the inception of the Journal of Transportation Safety & Security (JTSS), few journals published research related to comprehensive transportation safety and transportation security. JTSS fills that gap by emphasizing safety issues of multimodal transportation, including highway, transit, ride-sharing, pedestrian and bicycle modes as well as rail, water and aviation. The journal disseminates advanced research results to educators, researchers, practitioners, and policy makers to improve transportation safety with comprehensive and integrated solutions. JTSS is a forum for the exchange of academic ideas, data, and integrated transportation safety solutions developed through engineering research in multimodal transportation safety arenas. The journal is supported and directed by an international editorial board of renowned experts in all modes of transportation safety.



TTAP

The Tennessee Transportation Assistance Program is part of a nationwide Local Technical Assistance Program (LTAP), financed by the Federal Highway Administration (FHWA), Tennessee Department of Transportation (TDOT), and the University of Tennessee. TTAP moves innovative transportation technologies and practices into the hands of the men and women charged with maintaining Tennessee's local roads and bridges. TTAP assists city and county staff to solve transportation related problems. TTAP strives to be the prime resource in developing and transferring innovative technologies, proven solutions, and reliable services to resolve the transportation challenges facing Tennessee's local governments.

Tennessee Model Users' Group (TNMUG)

Tennessee Model Users' Group is a forum to exchange information about travel demand modeling and forecasting. TNMUG is a collaboration of Tennessee universities, TDOT, FHWA, MPOs, consultants, and other interested parties. They promote standard statewide guidelines and validation standards, help coordinate systematic data collection and processing, organize and promote staff member training, and conduct research on areas of interest to the group. TNMUG's goal is to improve modeling and forecasting capabilities within the state by supporting research and practices that advance the state of modeling applications in Tennessee. TNMUG's members gather quarterly for daylong meetings that feature an extensive technical program.

Traffic Signal Academy

The Traffic Signal Academy offers a comprehensive set of courses on standards, warrants, installation and maintenance guidelines, and strategies to minimize signal-related liability issues. Traffic signal operations are critical to the safe and efficient movement of people, goods, and vehicles through our roadway systems. According to the 2012 National Traffic Signal Report Card, current US traffic signal operations need routine signal timing updates to keep pace with changes in population growth and traffic patterns. The academy's program helps agencies with limited fiscal resources find ways to optimize available technology and apply innovative concepts to systems already in place.

Tennessee Vans

Tennessee Vans works in partnership with community agencies that provide services to persons with disabilities, workforce participants, youth, seniors, recovery program participants, and community outreach programs. TN Vans operates according to basic business principles to maintain financial sustainability and to ensure that resources are available to meet current as well as future transportation needs. It provides the opportunity for qualified community agencies to purchase vehicles through an affordable financing plan. Vehicle and operating expenses are recovered through fees charged to participating agencies for purchasing vehicles. After expenses, the remaining funds are recycled and used to purchase additional vehicles to meet the future demand for transportation resources.

Transportation Planning

CTR gives technical assistance and training in transportation planning for the TDOT Long Range Planning Division's Office of Community Transportation. Main areas of collaboration include major thoroughfare planning in Tennessee's counties, state-aid programs for locally maintained roads, revising urban and urbanized area boundaries, travel demand modeling and forecasting, and evaluating roadway efficiency software to determine the existing and future capacity of any roadway in the state.

Transportation Policy and Finance

Nearly every level of government must form, fund, and implement transportation policies. Whether it is a neighborhood's search for safe routes to school, obtaining federal funding for Interstate highways, or encouraging intermodal freight alternatives, CTR's transportation professionals provide formal and informal input to community and civic organizations. We work with regional and state-level planners to form state transportation policies, plan infrastructures, and assure adequate transportation funding. We regularly participate in national level transportation discussions through congressional testimony, federal level regulatory proceedings, and publicly funded national research activities.



Research: New Funding

<i>Sponsor</i>	<i>PI/Co-PI</i>	<i>Title</i>
TN Commission on Aging and Disability	J. Everett	Impact Evaluation of the Senior Volunteer Transportation Network (SVTN)
Federal Motor Carrier Safety Administration	J. Everett	Transferable Implementation Toolkit for Teens and Trucks Highway Safety Program
US DOT/CSCRS	A. Khattak S. Chakraborty M. Clamann	Driver impairment detection and safety enhancement through comprehensive volatility analysis
US DOT/CSCRS	C. Cherry S. Marshall B. Naumann	Understanding micromobility safety behavior and standardizing safety metrics for transportation systems integration
US DOT/CSCRS	S. Chakraborty A. Khattak M. Cummings	Safety testing for connected and automated vehicles through physical and digital iterative deployment
US DOT/CSCRS	N. McDonald C. Cherry O. Grembek	Urban freight and road safety: Trends and innovative strategies
TDOT	A. Kohls A. Khattak M. Cate	Autonomous Truck Mounted Attenuator (ATMA) Pilot
TDOT	A. Kohls	Traffic Signal Asset Management System
US DOT, FHWA	A. Kohls S. Ivey	Promoting Innovations Through Training To Improve Traffic Signal Operations In Tennessee
TDOT	A. Kohls M. Abkowitz	Integration of Resilience into TDOT Agency Practices
TDOT	C. Cherry C. Brakewood	Bicycle and Pedestrian Counting: Best Methodologies Assessment
TDOT	M. Cate	Americans with Disabilities Act (ADA) Sidewalk Inventory and Assessment (TTAP Special Task)
TDOT	M. Cate	Support for TDOT Annual Average Daily Traffic (AADT) Count Program
TDOT	C. Brakewood C. Cherry	Evaluating Transit Equity and Accessibility to Affordable Housing in Tennessee
TDOT	C. Cherry C. Brakewood	Addressing the Traffic Safety and Reducing Pedestrian Accidents and Fatalities in Tennessee Research
TDOT	A. Khojandi C. Brakewood M. Jin	Improvement of Park-and-Ride Facilities and Services in Metropolitan Areas of Tennessee
TDOT	C. Cherry C. Brakewood	Evaluating Performance and Benefits-Costs of Road Diets in Tennessee.
TDOT	C. Cherry	Truck Parking Needs in Tennessee
TDOT	C. Cherry C. Brakewood	Investigating the Service of App-Based Rideshare and Transportation Network Companies in Tennessee
Society of Automotive Engineers	C. Cherry	Micromobility Standards Development
NSF	C. Cherry D. Constinett W. Gao P. Frymier	GOAL!: Novel approaches to model travel behavior and sustainability impacts of e-bike use.

New Research Projects

Impact Evaluation of the Senior Volunteer Transportation Network; TN Commission on Aging and Disability; PI: Dr. Jerry Everett

The Southwest Tennessee Development District was awarded up to \$3.5 million dollars to implement the Senior Volunteer Transportation Network (SVTN). Based on the existing MyRide TN program, this new project will substantially expand the network of volunteer drivers providing transportation to approximately 7,500 seniors statewide between the years 2018 to 2020. MyRide is a volunteer senior transportation service for Senior Citizens age 60 plus. Eight of the nine Tennessee Area Agencies on Aging and Disability are expected to participate in the new network. The implementation plan calls for 10 new programs to be established each year for a total of 30 new locations within the eight service areas by the end of 2020. The network members have committed to provide a minimum of 15,000 trips to older adults, using about 1,500 volunteers over the grant period. The objective of this evaluation project is to measure the longitudinal change in transportation accessibility and overall quality of life of seniors served by the SVTN network and communities where new programs are established.

Transferable Implementation Toolkit for Teens and Trucks Highway Safety Program; Federal Motor Carrier Safety Administration; PI: Dr. Jerry Everett

The goal of this project is to repurpose the existing Teens and Trucks educational materials for a variety of new initiatives. The project will result in better informed teenage drivers, improved tools for driver education, and a comprehensive toolkit that will be the basis of a teen highway safety program focused on safe driving around large trucks. To achieve the greatest educational impact, the toolkit will include guidance for establishing innovative local partnerships, templates for outreach materials, and program and event checklists. It is possible the research will show that activities effective in urban schools with many resources and strong teacher and parental support are different from activities that work in a similarly sized rural school with very limited resources, weak teacher support, and poor support from parents. The toolkits

developed through this project will recommend the best mix of activities for each type of school.

Driver Impairment Detection and Safety Enhancement Through Comprehensive Volatility Analysis; US DOT; PIs: Drs. Asad Khattak, Subhadeep Chakraborty, University of Tennessee; Michael Clammann, University of North Carolina, Chapel Hill

As this project gets underway, the research team is creating simulations that will integrate data from drivers' biometrics, vehicle kinematics, and roadway environments to explore driving volatility and leading indicators of driver impairments. As part of this project, the team is analyzing data from the SHRP2 naturalistic driving study. The project has resulted in submission of a paper on driver impairment and distractions to the 2020 Transportation Research Board for review.



Understanding Micromobility Safety Behavior and Standardizing Safety Metrics for Transportation Systems Integration; US DOT; PIs: Drs. Chris Cherry, University of Tennessee; Steve Marshall, Becky Nauermann, University of North Carolina Chapel Hill

The research team is gathering datasets for this project and working with partners to develop standards for data and vehicle definitions. Along with match partners, the team has developed a model ICD-10 code and associated educational literature for hospital injury reporting. They have developed vehicle definitions in conjunction with FHWA and SAE and are currently developing model survey instruments for different sampling platforms that reference best practices from existing pilot tests. Also, they are gathering and analyzing publicly available datasets from operators such as MDS. To date, four presentations related to the findings have been given nationally and internationally.

Safety Testing for Connected and Automated Vehicles Through Physical and Digital Iterative Deployment; Sponsor: US DOT; PIs: Drs. Subhadeep Chakraborty, Asad Khattak, University of Tennessee; Missy Cummings, Duke University

The project is newly underway, and the team is conducting a thorough review of ongoing efforts in safety testing for connected and automated vehicles by standards organizations.

Urban Freight and Road Safety: Trends and Innovative Strategies; US DOT; PIs: Drs. Noreen McDonald, University of North Carolina, Chapel Hill; Christopher R. Cherry, University of Tennessee; Offer Grembek, University of California, Berkeley

This multi-university team is developing an alternative last mile freight vehicle performance profile for inclusion in future safety analysis. They are also developing an initial state-wide safety inventory of urban freight. One paper is under review in the Transportation Research Record.

Autonomous Truck Mounted Attenuator Pilot; TDOT PI: Dr. Airton Kohls, Co PIs: Dr. Asad Khattak and Mr. Matt Cate

The objective of this research is to evaluate the performance of autonomous truck mounted attenuator (ATMA) systems based on previous research

projects and on actual testing of the equipment during a demonstration pilot. The report will be provided to TDOT and should produce a supportive analysis to better understand how the autonomous system will improve safety in Tennessee work zones. The research will incorporate a multi-step process that, in coordination with TDOT, will determine which systems to test and the different test scenarios. The systems will be rated based on accuracy, ease of use, cost effectiveness, and additional applicability for TDOT such as the technology's potential to be adapted to sweeping, mowing, weed spraying, cone trucks, or when installing raised pavement markers.

Traffic Signal Asset Management System; TDOT; PI: Dr. Airton Kohls

This project will develop a standardized, web-based traffic signal asset management system (TSAMS) for the State of Tennessee. Initially, the focus will be on smaller (with fewer than 20 traffic signals) agencies creating a database structured for easy scalability. This tool will enable transportation agencies responsible for traffic signals to manage their infrastructure more effectively and minimize potential monetary losses in lawsuits. At the same time, agencies will be in a better position to prioritize needed infrastructure improvements. In addition, TSAMS will help facilitate US DOT's goal to improve the durability and extend the life of the transportation infrastructure, preserve the existing transportation system, and ensure that the US proactively maintains the critical transportation infrastructure in a state of good repair.

Integration of Resilience into TDOT Agency Practices; TDOT; PI: Dr. Airton Kohls

The Extreme Weather Vulnerability Assessment project gave TDOT extensive knowledge about the resiliency of the state's transportation system to extreme weather events. The next step is for TDOT to integrate such resilience into agency decision-making processes and operating procedures. Three activities should facilitate this integration:

1. form an Extreme Weather Resilience Task Force to encourage adoption and collaboration across TDOT's offices and divisions,
2. organize a series of transportation resilience webinars that are tailored to specific TDOT audiences, and

3. develop and maintain a web-based Resilience Clearinghouse for TDOT and its stakeholders; include links to other related information on FHWA, TRB, AASHTO, and other agency sites.

Promoting Innovations Through Training To Improve Traffic Signal Operations In Tennessee; US DOT, FHWA; PI: Dr. Airton Kohls, Co PI: Dr. Stephanie Ivey

This project will provide specialized training for agencies to incorporate innovations that will improve traffic signal operations in Tennessee. It will raise awareness of the benefits of emerging technology while identifying the resources necessary for successful implementation and developing a roadmap for agencies to build the necessary workforce skillsets.

Bicycle and Pedestrian Counting: Best Methodologies Assessment; TDOT; PIs: Dr. Chris Cherry and Dr. Candace Brakewood

Pedestrian and bicycle traffic is an important aspect of a multimodal transportation system. As TDOT expands its multimodal systems, it is vital to have a reliable and robust count program to direct strategies investments and to evaluate performance. TDOT currently does not have a centralized bicycle and pedestrian count program to monitor flows on and through

state and local infrastructure. The research in this project is supposed to assess different sets of methodologies and technologies of counting pedestrians and bicycles and recommend ways to integrate them into a statewide count program. The research provides an inventory and assessment of existing methods and technologies applied in Tennessee as well as best practices from other states; it compares traditional counting methods (e.g., manual counts) with new data sources and emerging technologies (e.g., smartphone apps, video) that can be used for pedestrian and bicycle planning.

Americans with Disabilities Act (ADA) Sidewalk Inventory and Assessment (TTAP Special Task); TDOT PIs: Mr. Matt Cate and Dr. Melany Noltenius

The Americans with Disabilities Act of 1990 (ADA) prohibits discrimination against individuals with disabilities in all areas of public life including jobs, schools, transportation, and all public and private places that are open to the general public. This task allows CTR to assist Tennessee cities and counties as they assess the accessibility of sidewalks, crosswalks, curb ramps, and other public infrastructure features. CTR has provided information on ADA requirements and procedures to 102 cities and all 95 counties.





Support for TDOT Annual Average Daily Traffic Count Program; TDOT; PI: Mr. Matt Cate

Each year, TDOT collects traffic data at more than 12,000 locations across the state. At most locations, a technician places pneumatic tubes across the roadway for a period of 24 hours. These counts allow the department to monitor travel on the state's roadway network and to effectively allocate resources. CTR provides up to four full-time traffic counting technicians to supplement TDOT's staff in this effort.

Newly Funded Proposals

Evaluating Transit Equity and Accessibility to Affordable Housing in Tennessee; TDOT; PI: Dr. Candace Brakewood, Co PI: Dr. Chris Cherry

Addressing the Traffic Safety and Reducing Pedestrian Accidents and Fatalities in Tennessee Research; TDOT; PIs: Dr. Chris Cherry and Dr. Candace Brakewood

Improvement of Park-and-Ride Facilities and Services in Metropolitan Areas of Tennessee; TDOT PI: Dr. Anahita Khojandi, Co-PIs: Dr. Candace Brakewood, Dr. Mingzhou Jin

Evaluating Performance and Benefits-Costs of Road Diets in Tennessee; TDOT; PIs: Dr. Chris Cherry and Dr. Candace Brakewood

Truck Parking Needs in Tennessee; TDOT; PI: Dr. Chris Cherry

Investigating the Service of App-Based Rideshare and Transportation Network Companies in Tennessee; TDOT; PI: Dr. Chris Cherry, Co-PI: Dr. Candace Brakewood.

Micromobility Standards Development; Society of Automotive Engineers; PI: Dr. Chris Cherry

GOALI: Novel Approaches to Model Travel Behavior and Sustainability Impacts of E-Bike Use; NSF; PIs: Drs. Chris Cherry, Dan Constinett, Wei Gao, and Paul Frymier; Collaborative Proposal with Portland State University and Bosch.

Research: Continued Funding

<i>Sponsor</i>	<i>PI/Co-PI</i>	<i>Title</i>
FHWA	A. Kohls	Improving Intersection Safety - Leading Pedestrian Interval And Yellow Change Interval - FHWA's Accelerating Safety Activities Program
THSO	J. Everett	Highway Safety Program Administration
THSO	J. Everett	Law Enforcement Liaison Program
THSO	J. Everett	Judicial Outreach Liaison Program
THSO/TDOSHS	M. Cate	Fiscal Year 2019 Statewide Observational Survey of Safety Belt Usage in Tennessee
TDOT	J. Everett	Tennessee Model Users Group
TDOT	A. Barbour M. Ortmann	Transportation Technical Assistance, Training, and Technology Transfer/Sub-project: Tennessee Rural Regional Transportation Plans
TDOT	D. Clarke	Tennessee Transportation Assistance Program
US DOT	A. Khattak C. Cherry	Comprehensive Sciences Center for Road Safety National University Transportation Center
US DOT/CSCRS	C. Cherry L. Merlin	Integrating spatial safety data into transportation planning processes
US DOT/CSCRS	C. Cherry S. Marshall B. Naumann	Opioids at the health and transportation safety nexus
US DOT/CSCRS	A. Khattak E. Dumbaugh	Developing a taxonomy of human errors and violations that lead to crashes
US DOT/CSCRS	A. Khattak A. Goodwin	Investigating the vulnerability of motorcyclists to crashes and injury



Continuing Projects

Improving Intersection Safety – Leading Pedestrian Interval and Yellow Change Interval

Sponsor: FHWA

PI: Dr. Airton Kohls

CTR presented five workshops in Chattanooga, Johnson City, Franklin, Memphis, and Knoxville where participants discussed the use of the Leading Pedestrian Interval (LPI) and the importance of Clearance Intervals at signalized intersections. This collaborative approach helped shorten the learning curve on the presented topics while providing relevant information aimed at standardizing traffic signal practices in Tennessee.

Highway Safety Program Administration

Project sponsor: THSO

PI: Dr. Jerry Everett

This project provides specialized staffing and resources to THSO, allowing them to operate more efficiently and effectively. Project staff create and submit Federal and state reports; assist with annual grant applications; review the award process; conduct annual monitoring; plan and lead a training course; and put on conferences and workshops. The majority of the project work is based in Nashville. All program positions assist THSO with coordination, facilitation, administration, and operational activities of the state's behavioral highway safety programs. This includes the development, management, and monitoring of THSO funded grants to law enforcement and other state and local agencies. Program administrators typically have specialized assignments such as overseeing the web-based grant management system.

Law Enforcement Liaison Program

Project sponsor: THSO

PI: Dr. Jerry Everett

The Law Enforcement Liaisons (LELs) program is a statewide initiative to promote education about and enforcement of laws that are designed to increase vehicle occupant protection and reduce the number of impaired driving crashes. LELs work in coordination with the Tennessee Highway Safety Office (THSO). LELs seek the endorsement and support of all law enforcement agencies in the state to conduct periodic, highly visible enforcement of seatbelt and impaired

driving laws. LELs encourage state and local organizations to work with law enforcement, the judiciary, advocates, health care providers, and the media to promote occupant protection and impaired driving enforcement.

Judicial Outreach Liaison Program (JOL)

Project sponsor: THSO

PI: Dr. Jerry Everett

This program is a point of contact between THSO and the Tennessee judiciary. JOL maintains mutually beneficial relationships between judicial entities and THSO and assists judges and their staffs to implement best practices in highway traffic safety. Such practices include instruction in the use of treatment courts, effective sentencing procedures, Fourth Amendment issues, new statutes, and case law reviews. The JOL program supports the judiciary in their efforts to reduce the number of drug and alcohol crashes, distracted driving crashes, and speed related crashes on Tennessee's roadways.

Fiscal Year 2019 Statewide Observational Survey of Safety Belt Usage in Tennessee

Sponsor: THSO and TDOSH

PI: Mr. Matt Cate

Each state must administer a highway safety program that is designed to reduce deaths, injuries, and property damage resulting from traffic accidents. As a part of this program, each state must conduct an annual observational survey of seatbelt use that complies with uniform criteria established by the National Highway Traffic Safety Administration (NHTSA). CTR has conducted Tennessee's annual observational survey of seatbelt use since 1986. In its current form, the survey incorporates data from 190 observation points in 16 counties across Tennessee. CTR conducted the latest observational survey in March, April, and May of 2019. Analysis of these data indicates that Tennessee's 2019 average seatbelt use rate is 91.75%, up from 90.90% in 2018.

Tennessee Model User Group (TNMUG)

Project sponsor: TDOT

PI: Dr. Jerry Everett

TNMUG was established in 2004 through a partnership between TDOT and CTR. The organization's goal is to improve travel demand forecasting capa-

bilities within the state. The group is a cooperative effort between Tennessee universities, TDOT, FHWA, MPOs, consultants, and other interested parties. TNMUG's objective is to support modeling research that can be undertaken in a comprehensive and coordinated fashion to advance the practice of modeling application in Tennessee. CTR staff members assist local and regional planning agencies and the TDOT Long Range Planning Division by sharing information, assessing the current state of travel demand modeling within Tennessee, identifying useful data and analytical tools, coordinating the transfer of knowledge between Tennessee's statewide model and MPO's regional models, and coordinating regular TNMUG meetings.

Transportation Technical Assistance, Training, and Technology Transfer/Tennessee Rural Regional Transportation Plans

Sponsor: TDOT

PI: Ms. Andrea Barbour, Co PI: Ms. Mareike Ortman

This project develops Rural Regional Transportation Plans for the 12 Rural Planning Organizations (RPOs) in Tennessee. TDOT's Office of Community Transportation collaborates with the RPOs and their stakeholders to create a set of concise and readable planning documents that outline the issues and opportunities facing rural Tennessee. These plans are uniformly formatted and incorporate local stakeholder input. To create these documents, CTR organizes workshops with local stakeholders, researches demographic and land use trends, inventories and analyzes existing transportation networks, and develops investment recommendations. The final Rural Regional Plan documents are presented to each RPO for formal adoption. These plans are the ensuing steps from the TDOT 25-Year Long Range Transportation Policy Plan recommendations.

Tennessee Transportation Assistance Program (TTAP)

Sponsor: TDOT

PI: Dr. David Clarke

TTAP provides training and technical assistance to those responsible for planning, designing, building, operating, and maintaining Tennessee's roadways. Tennessee's 95 counties and 346 municipalities are TTAP's primary audience, but the program also serves

state and federal government, engineering consultants, and contractors. TTAP offers workshops for state, local, and private transportation professionals; responds to technical assistance requests from state agencies and individuals relating to a broad range of transportation topics; publishes the RoadTalk newsletter; and is active in the National Local Technical Assistance Program Association (NLTAPA).



Comprehensive Sciences Center for Road Safety National University Transportation Center

Sponsor: US DOT

PIs: Drs. Chris Cherry and Asad Khattak

The first three years of this project are complete and the team has produced these reports:

Year 1: Completing the Picture of Traffic Injuries: Understanding Data Needs and Opportunities for Road Safety (2017-2018).

Year 2: Integrating Spatial Safety Data into Transportation Planning Processes, (2018-2019).

Year 2: Opioids at the Health and Transportation Safety Nexus, (2018-2019).

Year 2: Linking Crash and Post-Crash Data, (2018-2019).

Year 3: Urban Freight and Road Safety: Trends and Innovative Strategies, (2019-2020).

Year 3: Integrating Micromobility into Transportation Systems Phase 1, (2019-2020).

Integrating Spatial Safety Data into Transportation Planning Processes

Sponsor: US DOT/CSCRS

PIs: Dr. Chris Cherry; Dr. Louis Merlin, Florida Atlantic University

Through this project, researchers have developed approaches to understand how land use and travel demand modeling methods can integrate safety prediction models into other transportation objectives. The work includes extensions of the Home-Based Approach (HBA) to modeling crash risk where people live, with applications to seatbelt use, comprehensive crash costs, residential accessibility, and transit scenario planning. An application was developed for Nashville's transit-oriented development scenario

compared to its “business as usual” scenario. This project is 90% complete. Three journal papers related to the findings are under review, and one journal paper has been accepted. Project related findings are being prepared for review.

Opioids at the Health & Transportation Safety Nexus

Sponsor: US DOT/CSCRS

PIs: Drs. Chris Cherry; Steve Marshall, Becky Naumann, University of North Carolina Chapel Hill

The project team has developed system maps to identify where opioid use can influence transportation safety. They have conducted a dataset and data element inventory of police crash records across all 50 states and identified potential links with state Prescription Drug Monitoring Program databases. This project is 95% complete. One journal paper related to the findings is under review and one presentation was completed in North Carolina.

Developing a Taxonomy of Human Errors and Violations that Lead to Crashes

Sponsor: US DOT/CSCRS

PIs: Drs. Asad Khattak; Eric Dumbaugh, Florida Atlantic University

The team has developed a detailed taxonomy of human errors and violations that provides a fundamental understanding of human factors and highlights

opportunities to design successful interventions. They have analyzed the SHRP2 naturalistic driving study dataset based on instrumented vehicles to understand pre-crash, near-miss, and non-event driving. The project is 90% complete. The final report is in preparation and the project has resulted in a paper presentation at the Transportation Research Board Annual meeting and a presentation at the Safety Summit in Durham, North Carolina. Two papers are being prepared for submission to refereed journals.

Investigating the Vulnerability of Motorcyclists to Crashes and Injury

Sponsor: US DOT/CSCRS

PIs: Dr. Asad Khattak; Dr. Arthur Goodwin, University of North Carolina, Chapel Hill

The project quantifies risk factors associated with injury severity in motorcycle crashes and identifies possible countermeasures, such as rider conspicuity and proper helmet use. A federal database called Motorcycle Crash Causation Study (MCCS) was analyzed using rigorous statistical methods. The project is 95% complete. The final report is in preparation, and the project has resulted in two presentations at the Transportation Research Board and two publications in the journal Accident Analysis and Prevention.



Training & Education

CTR offers continuing education and training through its courses and workshops in rail training, all aspects of transportation and roadway maintenance, and traffic signal operations and best practices. CTR developed and administers the TATE Certificate Program for engineers, planners, designers, technicians, and other personnel working in the transportation field, designed to bring new professionals up to speed with current engineering practice and help seasoned professionals update their skills and knowledge.

Continuing Education Statistics

From July 1, 2017, through June 30, 2019, CTR's Continuing Education program numbers include:

Overall continuing education activity:

- 211 workshops
- 4,519 students
- 1,627 classroom hours
- 33,991 student hours
- 37 locations - 11 states, 1 international

Workshops by program area:

- TTAP: 146 workshops, 3,690 students, 20,763 student hours
- Railroad: 36 workshops, 607 students, 11,896 student hours
- Traffic Signal Academy: 29 workshops, 222 students, 1,332 student hours

Workshop participation by agency or business:

- 2,464 local government
- 1,431 private sector
- 558 state government
- 66 federal government

Tennessee Transportation Assistance Program (TTAP)

With sponsorship from TDOT, TTAP provides training and technical assistance to the men and women who are responsible for planning, designing, building, operating, and maintaining Tennessee's roadways. Tennessee's 95 counties and 346 municipalities are TTAP's primary audience, but the program also serves

state and federal government, engineering consultants, and contractors.

TTAP offered workshops for state, local, and private transportation professionals and responded to technical assistance requests from 27 agencies and individuals. These requests cover a broad range of transportation topics: traffic signal design and operations, pavement management and maintenance, access management, traffic data collection, intersection safety, traffic calming, and roadway functional classification. TTAP reached its constituents through quarterly issues of the RoadTalk newsletter.

Traffic Signal Academy - FHWA's Accelerating Safety Activities Program

In Tennessee, local agencies are responsible for the operation and maintenance of signalized intersections. Many of the estimated 80 local agencies in charge of signalized operations in the state are not staffed with a traffic engineer, yet they are challenged to provide the necessary operational safety for all road users. For example, pedestrian safety is an ongoing concern for transportation agencies. Commonly referred to as "vulnerable road users," pedestrians are often in conflict with vehicles turning permissively right or left at signalized intersections. This is caused by timing vehicle and pedestrian movements to happen concurrently and from drivers failing to yield to pedestrians. The Leading Pedestrian Interval (LPI) is one low-cost technique to allow pedestrians to establish their presence in the crosswalk, increasing their visibility to drivers and potentially reducing conflicts with turning vehicles. Similarly, drivers may be at risk at signalized intersections when clearance times (yellow change interval and red clearance interval) are not correctly timed for the geometry of the intersection and its approach speed. That may lead to increased red-light running occurrences and life threatening crashes.

CTR presented a series of five workshops in Tennessee where participants discussed the use of LPI and the importance of clearance intervals at signalized intersections. Sponsored with a grant from FHWA's *Accelerating Safety Activities Program*, the workshops were presented in Chattanooga, Johnson City, Franklin, Memphis and Knoxville. A total of 77 people from 33 different government agencies and 10 different consulting firms participated in a round table dis-



cussion on how to improve intersection safety using LPIs and appropriate traffic signal clearance intervals.

CTR Rail Training Program

According to the Bureau of Transportation Statistics, rail moved \$15.7 billion of freight between the U.S., Canada, and Mexico from June 2017 to June 2018. This was up 2% from the previous year. Given this statistic, it is no surprise that rail training is a much needed resource for the rail industry. CTR's rail training program is led by Center Director David Clarke. Dr. Clarke has identified topics and created rail related courses to meet this demand.

The audience for these classes ranges from rail workers to rail and transit agency managers. In the past year, CTR's rail program has taught 26 classes to a total of 435 participants. The most-demanded class is the Railroad Track Inspection & Safety Standards, which was taught 10 times in the previous year.

Custom courses are designed for groups with specific needs. Agencies such as Port of Tacoma, Bay Area Rapid Transit in the San Francisco Bay area, and Charlotte Area Transit have benefited from custom

courses as have a number of private rail companies. A custom course was also created and taught for a company in Santa Marta, Colombia, South America. Each participant receives Professional Development Hours after completing the course and passing a written exam.

While the Federal Rail Administration (FRA) does not require workers to be certified annually, credentialing is available to rail employees. CTR rail training is one of the steps these employees can use as part of the credentialing process. Our classes and training present new rules and guidelines as well as refresher courses that FRA recommends.

These rail courses are offered on a regular basis:

- Railroad Track Inspection and Safety Standards
- High-Speed Rail Track Inspection and Safety Standards
- Switch Inspection and Maintenance
- Railroad Track Design
- Railroad Track Maintenance
- Railcar Mechanical Inspection
- Advanced Track Geometry

- Railroad Roadway Worker Safety
- Railroad Bridge Inspection

Tennessee Academy for Transportation Engineering (TATE)

Since 1999, TATE has provided continuing education to engineers, planners, designers, technicians, and other personnel working in transportation. TATE offers a coordinated series of classes that addresses current topics in design, operation, and maintenance of transportation facilities. TATE workshop materials are an excellent source of current information for people with different levels of experience and participation in transportation; these materials are aimed at administrators, legislators, and others involved in policy- and decision-making.

TATE Certification is valuable for local and state government employees in engineering, planning, and public works, consulting personnel, and others involved in the evaluation and design of roadway and intersection improvements. To earn TATE Certification, candidates must successfully complete an examination following the Core and Elective classes.

All CTR Courses

- Advanced Track Geometry
- Advanced Work Zone, Design and Operation
- Asphalt Pavement Maintenance
- Basic Railroad Track Maintenance
- Confined Space Entry
- CWR Training
- Design of At-Grade Intersections
- Design of Modern Roundabouts
- Designing Pedestrian Facilities for Accessibility
- Flagger / Highway Safety
- Freight Car Inspection & Safety Standards for USA
- Fundamentals of Traffic Control
- Geometric Design for 2-Lane Roads & Streets
- Highway Safety Analysis
- Improving Intersection Safety
- Introduction To Highway Capacity Analysis
- Local Government Guidelines Manual Training
- Railroad 49 CFR § 213.7 Track Safety Training
- Railroad Bridge Inspection
- Railroad Track Design
- Railroad Track Inspection & Safety Standards
- Right of Way Training for Local Governments
- Road Safety 365

- Roadside Safety Standards
- RWP Training
- RWP Training for Contractors
- RWP Training for Track Crew
- RWP, Track Inspection & Safety Standards
- Traffic Flow Principles
- Traffic Impact Analysis
- Traffic Sign Retroreflectivity
- Traffic Signal Installation and Maintenance
- Traffic Signs & Pavement Markings
- Transportation Litigation
- Transportation Planning for Special Events
- Transportation Symposium: Innovation to Results
- Traffic Signal Academy
 - Day 1 - MUTCD and Signalized Intersections
 - Day 2 - Signal Timing
 - Day 3 - Detection and Advanced Operations
 - Day 4 - Signal Installation and Maintenance
 - Day 5 - Traffic Signal Controller Programming
 - Day 6 - Oversaturated Traffic Signal Systems
- Urban Street Design - Complete Streets
- Work Zone Traffic Control / Flagging
- Work Zone Traffic Control / Flagging On-site M TN



Outreach & Collaboration

CTR Fellows



Class of 2019-20 from left: Melissa Bowers, David Icové, Tim Rials, James Ostrowski, Hunter Sinclair



Class of 2018-19 from left: Candace Brakewood, Linda Daugherty, Hyun Kim, Xueping Li, Edward Taylor

The CTR Fellows Program was established in 2014 to foster a community of researchers and educators at the University of Tennessee, Knoxville who are committed to improving all aspects of transportation. With this fellowship, CTR recognizes both up-and-coming and established faculty who play leading roles in transportation education and research. In each class, CTR recognizes and encourages university faculty and staff whose activities make important contributions in transportation related research, education, or service.

Class of 2019-2020

Melissa Bowers

Dr. Bowers is an Associate Professor and Beaman Professor of Business in the Haslam College of Business, where she is Director of the Master's Program in Business Analytics. Her teaching and research interests include scheduling, operations, and discrete optimization models.

David Icove

Dr. Icove is the Underwriters Laboratories Professor of Practice in Electrical Engineering and Computer Science. He oversees one of the nation's few programs in Fire Protection Engineering. He is the co-author of three textbooks on fire and explosion investigations.

Tim Rials

Dr. Rials is the Associate Dean of AgResearch at the University of Tennessee Institute of Agriculture and former Director of the UT Center for Renewable Carbon. Dr. Rials researches renewable resources in advanced composite materials.

James Ostrowski

Dr. Ostrowski is an Associate Professor in Industrial and Systems Engineering and Director of Graduate Studies. His area of research is in developing theory and algorithms in mathematical optimization and applying that knowledge to applications. Dr. Ostrowski works in transportation applications that include train scheduling and snowplow routing.

Hunter Sinclair

We are proud to introduce our first Student Fellow, Hunter Sinclair, in this class. Mr. Sinclair is an MS candidate in the Department of Geography. His research includes GIS for transportation planning, 3D modeling and VR experiences, land-use impacts and urban morphology, and the livable city movement.

Class of 2018-2019

Candace Brakewood

Dr. Brakewood is assistant professor of Civil and Environmental Engineering. Her research group focuses on public transit and new shared mobility modes. Prior to UTK, she served on the Civil Engineering faculty at the City College of New York for three years. She holds a PhD in Civil Engineering from Georgia Tech.

Linda Daugherty

Ms. Daugherty is an Associate Director of the College of Social Work Office of Research and Public Service and directs the Center for Applied Research and Evaluation. She has collaborated with CTR researchers to conduct studies on safe routes to school, teen driving, attitudes about careers in transportation, and household travel studies.

Hyun Kim

Dr. Kim is an associate professor in the Department of Geography. His current research interests center on the reliable transportation network design and analysis, accessibility and equity of public transit systems, spatial optimization, and GIS for public health.

Xueping Li

Dr. Li is an Associate Professor of Industrial and Systems Engineering, Co-Director of the Health Innovation Technology and Simulation (HITS) Lab, and Director of UTK's Ideation Laboratory (iLab). His research includes complex system modeling, simulation, and optimization with broad application in supply chain logistics, healthcare, and transportation.

Edward Taylor

Mr. Taylor is director of the Construction Industry Research & Policy Center. In that role, he leads safety research under grants from agencies such as OSHA and the National Institute for Occupational Safety and Health (NIOSH). Previously, he spent two decades working as a structural engineer and later as a project manager in the highway industry. He is a registered engineer and holds advanced degrees in economics and business analytics.

The Tennessee Highway Safety Office



THSO works with law enforcement officials, judicial personnel, and community advocates to coordinate activities and initiatives relating to the human behavioral aspects of highway safety. Its mission is to develop, execute, and evaluate programs designed to reduce the number of fatalities, injuries, and economic losses resulting from traffic crashes on our roadways. THSO works closely with the National Highway Traffic Safety Administration to implement programs on occupant protection, impaired driving, speed enforcement, pedestrian, bicycle, motorcycle, teen driver, senior driver safety, and crash data collection and analysis. Programs administered by this office are entirely federally funded. Clyde “Buddy” D. Lewis is the director.

Perhaps the most significant result of THSO’s outreach is the **increase in Tennessee’s seatbelt use rate during this period, from 90.90% to 91.75%**, according to CTR’s Annual Seatbelt Survey.

Grants

- THSO awarded 363 federal grants to 319 different partners.
- THSO implemented a data-driven motorcycle safety pilot project in eight identified high crash counties. Each county received a \$12,000.00 migrant to conduct enforcement waves to address motorcycle crashes and fatalities.
- THSO reevaluated and redirected its Child Passenger Safety (CPS) grant funds, saving approximately \$100,000.

Certifications

During this reporting period, THSO certified

- 219 Child Passenger Safety Technicians
- 480 officers in Standardized Field Sobriety Testing
- 341 officers in Advanced Roadside Impairment Driving Enforcement, and
- trained 51 officers as Drug Recognition Experts.

Training

THSO offered 99 training courses, up from 73 the year before, to a total of 1,959 participants. In the previous year, there were 1,424 participants. This total represents 154 Tennessee Highway Patrol personnel, 424 sheriff departments’ personnel, 631 city police officers, and 225 other persons. On average, 20 students attended each course. The percentage of no-shows has fallen from 15.85% in 2019, to 19.1% in 2018, and 29.4% in 2017. Also this year, THSO developed a new statewide training initiative for law enforcement named LEADS (Law Enforcement Aging Driver Specialist). This training helps build community partnerships and recommends programs that can be used at the local level to maximize safety and reduce fatalities and serious crashes involving senior drivers.



Conferences

THSO hosted the 31st Annual Lifesavers Conference with over 681 individual registrations, representing more than 250 agencies for the three-day event. In addition, THSO hosted the 14th Annual Law Enforcement Challenge and recognized over 31 law enforcement agencies for their traffic safety efforts.

CTR Child passenger safety initiatives

Since Feb. 2019, CTR staff has assisted the THSO Law Enforcement Liaison program with their child passenger safety initiatives. CTR staff has overseen this process and has ordered 549 car seats which were distributed to 45 different agencies designed to serve, educate and assist families in need of new car seats. This nearly \$34,000 investment is part of the THSO Law Enforcement Liaison program's mission, which also trains law enforcement and other child passenger safety advocates across the state on the proper way to install child passenger seats.



#GetConvinced

Motor vehicle fatalities are the leading cause of teen deaths with 2,820 teens perishing in traffic crashes in 2016. Data

from the National Highway Traffic Safety Administration indicate that seat belt use is lowest among teen drivers. In fact, the majority of teenagers involved in fatal crashes are unbuckled. #GetConvinced, CTR's Teen Highway Safety program, strives to decrease the number of crashes, injuries, and deaths among teen drivers in East Tennessee.

#GetConvinced uses the Seat Belt Convincer, a 20 foot long inclined trailer equipped with a car seat and seat belt, to simulate a 5-10 mph crash. The Convincer "convinces" participants to buckle up and NOT drive distracted.

We reach our target audience by working with local law enforcement agencies, school systems, service organizations & others interested in Teen Highway Safety. Law enforcement officers can also borrow the Seat Belt Convincer for use in their communities. This program has connected with nearly 2500 high schools students since its inception.

TTAP Committee Memberships:

Much of TTAP's outreach comes through its staffs' committee memberships and taskforces:

- *Tennessee Strategic Highway Safety Steering Committee.* The Tennessee Strategic Highway Safety Steering Committee develops and implements the Tennessee Strategic Highway Safety Plan to reduce fatalities and serious injuries in Tennessee. The team comprises state agencies responsible for transportation and safety as well as other safety partners.
- *Tennessee Occupant Protection Task Force.* THSO formed the Occupant Protection Task Force in 2017 to generate broad support for programs that emphasize occupant protection. The task force includes organizations that are critical to implementing programs for child passenger safety, teen driver safety, and senior driver programs.
- *Tennessee State Transportation Innovation Council (STIC).* As a representative body of transportation stakeholders in Tennessee, STIC is a shared experience forum for initiating and overseeing that innovative strategies are deployed quickly to accelerate transportation project delivery and technologies proven to strengthen project quality and effectiveness.
- *NLTAPA Executive Committee* (Southeast Region Representative). The National Local Technical Assistance Program Association (NLTAPA) is a not-for-profit organization representing and serving the 52 Local Technical Assistance Program and Tribal Technical Assistance Program Member-Centers in the US and Puerto Rico. NLTAPA assists FHWA to develop program strategies that help each center meet the needs of its customers.
- *NLTAPA Innovation and Implementation Work Group* (Chair). The Innovation and Implementation Work Group supports NLTAPA and its member centers by identifying and sharing innovative practices, technologies, and implementation strategies that allow them to meet the needs of their local road practitioners.

Tennessee Vans

In 2020, TN Vans will celebrate 30 years of helping organizations meet their mobility needs. This program serves non-profits across the state through its Vehicle Purchase Program. Since 1990, TN Vans has placed 1,063 vehicles with more than 230 nonprofit groups in Tennessee via the purchase program. These organizations work in disability services, recovery services, and community outreach. TN Vans has a longstanding relationship with Rhea of Sunshine in Dayton, Tennessee. Rhea of Sunshine is an adult activity center and residential habitation training and living program for developmentally disabled people. Since 1991, they have purchased seven vehicles through our program. Data collected by TN Vans is used by public transportation researchers to support research studies and journal publications.

Visiting Scholars

In 2011, CTR established its Visiting Scholars program to connect with researchers and students from other countries. Since the program's inception, CTR has hosted 35 scholars from ten different universities and one research institute; they study aspects of transportation relating to railways, highway traffic, and transportation economics.

For the past year, CTR has hosted seven scholars from China and one from Japan. Their research examines traffic flow engineering, economic effects of the Belt and Road Initiative, transportation planning and traffic behavior, high speed railway and agglomeration economy, highway engineering and traffic safety, and urban expressway networks. They study at CTR for six months to one year, and they collaborate with UTK research faculty and staff.

CTR staffers Spence and Danielle Meyers host Visiting Scholars and their families on Memorial Day.



CTR Collaborators

National Partners

American Short Line and Regional Railroad Association
Appalachian Regional Commission
Centers for Disease Control and Prevention
Collaborative Sciences Center for Road Safety
Council of University Transportation Centers
ECS-GEC JV
Federal Highway Administration
Federal Motor Carrier Safety Administration
Federal Transit Administration
National Highway Institute
National Highway Transportation Safety Administration
National University Rail Center
Oak Ridge National Laboratory
Pipeline and Hazardous Materials Safety Administration
Tennessee Valley Authority
US Department of Agriculture
US Department of Defense
US Department of Energy
US Department of Transportation
US DOT Research and Innovative Technology
USDA - Agricultural Marketing Service
UT-Battelle - ORNL

State & Local Agencies

American Public Works Association, TN Chapter
City of Knoxville
Cocke County Schools
Fayette County Commission on Aging
Institute of Transportation Engineers, TN Section
Knox Area Transit
Knox County Engineering
Knox County Recovery Court
Knox County Schools
Knoxville Transportation Planning Organization
McGhee Tyson Airport
Metropolitan Nashville Health Department
Metropolitan Nashville Transportation Planning Organization
Tennessee Commission on Aging
Tennessee County Highway Officials Association
Tennessee County Services Association
Tennessee Department of Environment and Conservation
Tennessee Department of Safety and Homeland Security
Tennessee Department of Transportation
Tennessee Department of Transportation-Division of Planning
Tennessee Highway Safety Office

University Partners

Clemson University
Massachusetts Institute of Technology
Michigan Technological University
National University Rail Center (NURail)
North Carolina A&T State University
Rose-Hulman Institute of Technology
Southeastern Transportation Center
University of Alabama
University of Alabama at Birmingham
University of Central Florida
University of Illinois at Chicago
University of Illinois at Urbana-Champaign
University of Kentucky
University of Memphis
University of North Carolina, Chapel Hill
University of South Florida

International Partners

Beijing Jiaotong University
Chang'an University
China Academy of Railway Sciences
Nanchang Hangkong University
Shijiazhuang Tiedao University
Southwest Jiaotong University
Tongji University
Yanshan University
Zhejiang Institute of Communications

Private & Nonprofit Organizations

CDM Smith, Knoxville
Cambridge Systematics
Canon & Canon
Galveston Railroad Museum
National Waterways Foundation
Nisus Corporation
Norfolk Southern Railroad
Parham Engineering Consultants
Tennessee Municipal League
Tennessee Valley Railroad

Community Partners

Africa in April Cultural Awareness
Biblical Concepts Group Home
Blue Knights International
BMW Riders Association

Boys and Girls Club of the Hatchie River
 Centerstone of TN
 Cocaine and Alcohol Awareness (CAAP, Inc.)
 Community Health of East TN
 Continuum Courtyards
 Easter Seals
 Emmanuel Center
 Goodwill Homes Community Services
 Honda Goldwing Association
 Knoxville Anti-Drug Coalition
 Lakeway Achievement Center
 Manchester Anti-Drug Coalition
 Memphis Leadership Foundation
 Motor Cycle Riders Education Program
 Pacesetters
 Red Zone Memphis, Inc.
 Rhea of Sunshine
 Sertoma Center
 Shora Foundation
 Skills Development Services
 Synergy Foundation
 Tennessee Personal Assistance, Inc.
 United Methodist Neighborhood Centers
 West TN Cultural Heritage Association
 Youth Encouragement Center

University of Tennessee

Colleges

College of Art and Architecture
 College of Education, Health, and Human Sciences
 Haslam College of Business
 School of Communication Studies
 Tickle College of Engineering

Offices & Departments

Civil & Environmental Engineering
 Earth and Planetary Sciences
 Food Science & Technology
 Forestry, Wildlife & Fisheries
 Geography
 Industrial & Systems Engineering
 Kinesiology, Recreation and Sport Studies
 Marketing & Supply Chain Management
 Materials Sciences & Engineering
 Mechanical, Aerospace & Biomedical Engineering
 Office of Communications and Marketing
 Office of the Provost
 Parking and Transit Services
 Social Work Office of Research & Public Service
 Tennessee Hospitality and Tourism Association
 UT Athletics
 UT Libraries
 UT Transportation Services
 UT-Battelle

Centers & Institutes

Center for Business and Economic Research
 Center for Sustainable Business and Tourism
 County Technical Assistance Service
 Howard Baker Center for Public Policy
 Institute for a Secure and Sustainable Environment
 Institute for Assessment and Evaluation
 Institute for Public Service
 Institute of Agriculture
 Municipal Technical Advisory Service
 Pat Summitt Clinic, UT Medical Center Brain & Spine Institute

Student Organizations

Office of Sorority and Fraternity Life
 Student Chapter, Institute of Transportation Engineers
 Society of Women Engineers
 UT Outdoor Program Training & Education





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M. Kamrani, Integrating and analyzing driver, vehicle and road infrastructure volatilities using connected and instrumented vehicles technology, Ph.D. Dissertation, University of Tennessee, Knoxville, USA.



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- Clarke, D.B., “Railway Industry: Overview,” Invited Lecture, CE 355, Department of Civil and Environmental Engineering, University of Tennessee, Knoxville, TN, November 13, 2018.
- Workshop: Emerging Technologies for Micro-mobility: What do we know, what do we not know, and what do we do? Workshop organized at the ITE International Meeting, Austin TX. July 24, 2019 (co-organized with Laura Sandt).
- E-bikes: The future of urban mobility. Keynote Go Bike MTL Festival. Montreal Quebec. May 30, 2019.
- Infrastructure needs fixing and now: How can Knoxville work toward some fast fixes. Active Knox Seminar Series. Knoxville TN. May 23, 2019.
- Electric Scooters: Making Friends, Not Foes. 20th Annual League of American Bicyclists National Bike Summit. Arlington, Virginia, United States of America. Mar 11, 2019.
- Rideables and the Inexperienced Traveler. Coffee and Conversation Seminar Series. University of North Carolina, Chapel Hill. Chapel Hill, North Carolina, United States of America. April 2, 2019.
- Micromobility is the Future? University of Tennessee Freshmen Honors Program April 17, 2019, Knoxville TN.
- Workshop: What’s That on the Sidewalk?: Safety Issues, Mobility Benefits, and Policy Issues of Emerging Transportation Devices. Workshop organized at the Transportation Research Board Annual Meeting (With John MacArthur), Washington DC. January 13, 2019.
- Knoxville’s early experiments with tactical urbanism. Active Knox Seminar Series, Knoxville, TN. November 27, 2018.
- What We Know and Don’t Know About E-scooters and other Emerging Transportation Modes. Coffee and Conversation Seminar Series. University of North Carolina, Chapel Hill. Chapel Hill, North Carolina, United States of America. Nov 5, 2018.
- Do e-bikes belong in a city? Evidence-base for answers to FAQs. Interbike Bosch Electric Theater. Reno NV. Sept 20, 2019.
- New Probe Data Sources to Measure Cycling Behavior and Safety. University of Queensland. May 15, 2018.
- New Probe Data Sources to Measure Cycling Behavior and Safety. Monash University, Institute of Transport Studies. April 18, 2018.
- Light Electric Vehicles: Asian and North American experiences. Africa Clean Mobility Week, UNEP. Nairobi Kenya. March 12-16, 2018. (invited)
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