



SAPR Report for University Transportation Centers

This is a semi-annual report of program progress and performance for the Collaborative Sciences Center for Road Safety, a national UTC focused on safety.

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1. Accomplishments

1.1 What are the major goals and objectives of the program?

The goals and objectives from our [Strategic Roadmap](#) provide context for our accomplishments in this document.

1.2 What was accomplished under these goals?

Selected highlights for this performance period include:

- Held the Safe Systems Summit, the most significant CSCRS training/professional development activity during this period. Specific details about the Summit are emphasized throughout this report.
- Concluded several CSCRS research projects, with several more nearing completion.
- Generated more than 80 CSCRS research-related publications, presentations, websites, videos, and other information resources.
- Engaged hundreds of undergraduate, graduate and doctoral students in CSCRS research, education, and professional development projects.
- Taught approximately 21 transportation safety-related university courses.

The bulleted sections below describe the accomplishments according to specific goals and objectives of CSCRS.

Goal 1:

To support Goal 1—ensuring that Safe Systems and systems science principles and approaches are shared, understood, and adopted by traffic safety professionals—we performed activities related to the following objectives:

Objective 1-1: Conduct research to generate a model(s) for what a Safe Systems approach, enhanced with systems science tools, can look like now and in the future and identify promising policies/practices that can be adopted to reduce fatalities and serious injuries.

- Completed research [Project R2](#) developed a prototype tool for conducting a systemic safety analysis for a scalable area. The project team coordinated research to practice delivery via a matching project funded by CALTRANS to implement systemic analysis in California.
 - PI: Offer Grembek, UCB / Co-Investigator: Libby Thomas, UNC HSRC
- Completed research [Project R3](#) to conduct a literature review to define Safe Systems application in the US, which culminated in part with information shared at the Safe Systems Summit.
 - PI: Eric Dumbaugh, Florida Atlantic University (FAU) / Co-Investigator: Wes Kumfer, UNC HSRC
- Research staff from [Project RR1](#) convened two workshops with diverse sets of safety professionals and stakeholders at the Safe Systems Summit (in April) and at the NC Traffic Safety Expo and Conference (in August) to expand the discussion around the system maps and models developed under the RR1 project and illustrate how systems science tools can facilitate stakeholder engagement regarding Vision Zero plans and other complex safety issues.
 - Co-PIs: Laura Sandt, UNC HSRC; Becky Naumann; UNC IPRC/ Co-Investigators: Kristen Hassmiller Lich, UNC; Jill Kuhlberg, UNC; Steve Marshall, UNC IPRC; Stephen Heiny, UNC HSRC
 - Project completed. Final deliverables under embargo until second of two-part journal series is published. [First article \(open source\) available now](#). Findings were used to inform Phase 2 system dynamics work (i.e., CSCRS Project 21).

Objective 1-2: Lead training, outreach, and professional development related to Safe Systems approach and related policies and practices.

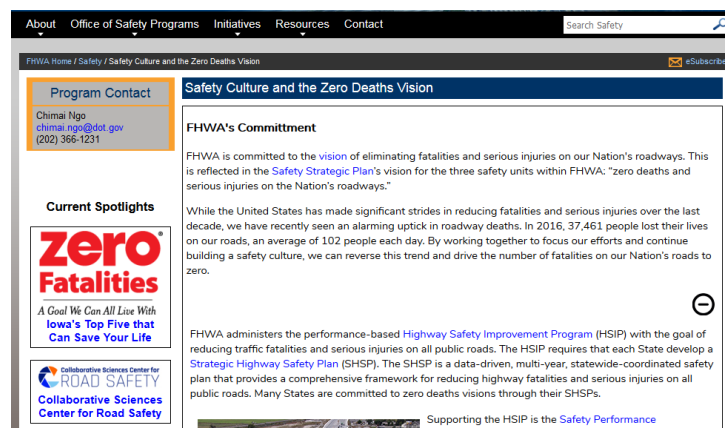
- The Safe Systems Summit, held in April 2019, represents a signature accomplishment for CSCRS. More than 340 participants—representing 29 different states, 33 universities, and 19 UTCs—attended the meeting in Durham, NC, to share and develop a stronger understanding of principles of Safe Systems and systems science to frame efforts to reduce traffic injuries and fatalities. A [recap](#) is available; [select presentations](#) are archived on the CSCRS website. (Conference proceedings are available by request.) Highlights:
 - 342 total attendees, with 95 student attendees
 - 51 speakers presented diverse perspectives in 19 different sessions
 - A poster showcase featured 43 research posters by students and researchers
 - Students and faculty from NC Central University, a local HBCU with ties to CSCRS, provided a walking tour of downtown Durham, highlighting transportation features and opportunities
 - The conference had 11 sponsors including safety and health organizations and private companies
 - The event featured a “Reading Room” with a variety of CSCRS research products on hand
 - We hosted adjacent meetings, including the CSCRS Advisory Board meeting and the mid-year meeting for the TRB [Transportation Safety Management \(ANB10\) Committee](#), each of which discussed how to integrate Safe Systems approaches into member activities and research.
- In June 2019, Wes Kumfer (UNC HSRC) co-presented on the ITE Learning Hub webinar “[The Safe Systems Approach to Speed Management: An emerging safety trend in the US](#)” (75 participants).
- Wes Kumfer and Seth LaJeunesse (UNC HSRC) co-presented the National Center for Rural Road Safety webinar “[Safe Systems for Rural Areas Webinar](#)” in July 2019 (100 participants).
- Eric Dumbaugh, FAU, presented the session "Safe System Approach and Impact on Road Safety Policy, Management and Mobility Systems" in July and August 2019 as part of the Road Safety Training Programme in Sao Paulo and Fortaleza, Brazil (25 participants).
- The third iteration of UNC HSRC’s Coffee & Conversation discussion series, [Coffee & Conversation III: Building Resilience into a Transportation System for All](#), continued into Spring 2019, with a total estimated attendance of 220.
- CSCRS began planning in preparation for hosting the biennial National Travel Monitoring Exposition and Conference ([NaTMEC](#)) in June 2020, Raleigh, NC. During this period CSCRS conducted the call for abstracts and helped coordinate the choosing of the meeting theme “Connecting Travel Monitoring to Transportation System Safety and Mobility.” A meeting topic area will focus on Safe Systems assessments.

Objective 1-3: Integrate Safe Systems principles into other road safety/public health/planning initiatives.

- CSCRS researchers continued to take part in the Core Learning Community Systems National Peer Learning Team, a working group that meets regularly to explore defining a systems approach to road safety. The team concluded its most recent efforts in July 2019.

Objective 1-4: Facilitate states and cities in implementing a Safe Systems approach in different contexts, utilizing the tools and research from CSCRS.

- CSCRS staff are engaged with multiple agencies, particularly in consortium member states and cities, to determine the needs of state and local governments in implementing Safe Systems. In July, CSCRS resources were featured on FHWA’s website amongst other tools intended to support city and state adoption of Safe Systems approaches.



Goal 2:

To support Goal 2—ensuring that cutting-edge research, tools, data, and resources compatible with a Safe Systems approach are developed and utilized—we performed activities related to the following objectives:

Objective 2-1: Perform road safety research that explores core safety issues and transformational changes (i.e., from technology, ride-sharing services, etc.) and integrates public health concepts and methods.

- Completed [Project R5](#), which sought to understand the transportation safety needs of major cities in the U.S.
 - PI: Eric Dumbaugh, FAU / Co-Investigator: Dan Gelinne, UNC HSRC
- Completed [Project R6](#), which explored bicyclist and pedestrian behavioral and safety issues related to connected and automated vehicles (CAVs).
 - PI: Noreen McDonald, UNC-CH Department of City and Regional Planning (DCRP) / Co-Investigator: Asad Khattak, UTK
- Continued [Project R9](#) to explore the operational needs and characteristics for an autonomous vehicles dispatch center.
 - PI: Missy Cummings, Duke
 - This project is still ongoing. A simulation environment for testing mixed traffic of autonomous vehicles and human-driven vehicles has been developed and demonstrated. Function analysis is underway for the dispatch center of autonomous vehicles.
- Continued [Project R10](#) to investigate how machine learning techniques can be used to design countermeasures that improve system safety.
 - PI: Missy Cummings, Duke / Co-Investigator: Michael Clamann, UNC HSRC
 - This project is near completion. Two datasets that include driver and pedestrian traffic fatality predictions have been analyzed using different machine learning models. A report that summarizes the project findings is in revision.
- Continued [Project R11](#) to examine the moderating role of the built environment on the relationship between crash incidence and socio-economic status.
 - PI: Yanmei Li, FAU / Co-Investigator: Eric Dumbaugh, FAU
 - The literature review is complete, and the data analysis is being refined for the draft final report.
- Continued [Project R12](#), which aims to provide a more accurate picture of California traffic injuries by utilizing medical data to fill in where police crash reports may have limited information, and to get a more accurate picture of California emergency medical services response times.
 - PI: David Ragland, UCB / Co-Investigator: Chris Cherry, UTK
 - Presented findings to the California Medical Outcomes Data (CMOD) staff at the California Department of Public Health. Began a collaboration with CMOD to extend that work. Will develop a ZIP code level map of California showing EMS deficient areas and provide recommendations for mitigating deficiencies. CMOD is also conducting a project matching crash, EMS and ED data for which we have been invited to participate.
- Continued [Project R13](#), which assesses how technological change embodied by shared mobility services impacts road safety.
 - PI: Noreen McDonald, UNC DCRP / Co-Investigator: Tabitha Combs, UNC DCRP
 - Work completed, manuscript under review, final deliverables being developed.
- Continued [Project R15](#), which aims to help policymakers and transportation safety professionals evaluate safety impacts of the transportation system and identify neighborhoods with a higher risk of traffic crash involvement.

- PI: Chris Cherry, UTK / Co-Investigator: Louis Merlin, FAU
- Developed several important approaches toward understanding how land use and travel demand modeling approaches can formally integrate safety prediction models into other transportation objectives. An application was developed for Nashville's transit-oriented development scenario, compared to its business-as-usual scenario.
- Continued [Project R16](#), which aims to provide evidence to provide insight into the impact of prescribing opioids for acute pain relief after a traffic crash, and for transportation professionals to help understand the systems impact of opioid use on traffic safety.
 - PI: Chris Cherry, UTK / Co-Investigators: Steve Marshall and Becky Naumann, UNC IPRC
 - Developed system maps to identify where opioid use can influence transportation safety. Conducted a dataset and data element inventory of police crash records across all 50 states and identified linkage potential with state Prescription Drug Monitoring Program databases.
- Continued [Project R18](#), which entails an examination of national trends in light rail safety performance and an investigation of the factors related to light rail-related crash risks.
 - PI: Eric Dumbaugh, FAU / Co-Investigator: Candace Brakewood, UTK
 - The effort is nearing completion. All preliminary analyses are complete, and a draft of the final report is in progress.
- Continued [Project R20](#), which explores the impacts of various treatments that can be explored using the Motorcycle Crash Causation Study data, collected by the US Department of Transportation.
 - PI: Asad J. Khattak, UTK / Co-Investigator: Arthur Goodwin, UNC HSRC
 - The project has quantified risk factors associated with injury severity in motorcycle crashes and identified relevant countermeasures. A federal database called Motorcycle Crash Causation Study (MCCS) was analyzed using rigorous statistical methods.

Objective 2-2: Develop research-driven tools, resources, and data sets to support problem identification and understanding.

- Completed [Project R7](#), which developed and evaluated a prototype Android mobile app that will alert pedestrians when they are near areas of high traffic density.
 - PI: Missy Cummings, Duke University
- Completed [Project R14](#), which created an online, searchable, [centralized data clearinghouse](#) of more than 3,000 existing bicycle and pedestrian safety-related datasets as a national resource for safety researchers.
 - PI: Krista Nordback, UNC HSRC / Co-Investigators: Seth LaJeunesse, UNC HSRC, and Julia Griswold, UCB
- Continued [Project R19](#), which is developing a deeper understanding of human errors that lead to crashes.
 - PI: Asad J. Khattak, UTK / Co-Investigator: Eric Dumbaugh, FAU
 - Developed detailed taxonomy of human errors and violations that provides a fundamental understanding of human factors and highlight opportunities to design successful interventions. Analyzed the SHRP2 naturalistic driving study dataset based on instrumented vehicles to understand pre-crash, near-miss and non-event driving.

Objective 2-3: Translate research knowledge to support the development of comprehensive programs, policies, and practices that are proven to reduce fatalities and severe injuries.

- Continued [Project R8](#), a two-year effort developing tools to assist parents of new drivers.
 - PI: Arthur Goodwin, UNC HSRC
 - This project is nearing completion and resources will be available in the next reporting period.
- Continued [Project R17](#), which aims to strengthen existing and facilitating new Vision Zero plans.

- PI: Kelly Evenson, UNC Gillings School of Public Health / Co-I's: Seth LaJeunesse, UNC HSRC, and Steve Marshall and Becky Naumann, both with UNC IPRC
- Finalized [Vision Zero Plan repository](#), which currently includes 30 Vision Zero plans and is publicly available on Dataverse. Sought multiple rounds of feedback on draft Guide for Vision Zero Plans, including experts internal and external to CSCRS. Final guide to be completed by February 2020.
- As part of the newly funded [Project R26](#), HSRC staff convened several injury stakeholder groups, identified recommended practices for coding e-scooter injuries using existing *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) codes, and developed and widely distributed a [poster](#) to help train healthcare workers on how to standardize e-scooter injury coding. The research team also coordinated with a group of researchers and hospital professionals to propose a series of new ICD-10-CM codes for categorizing injuries related to e-scooters and other micromobility devices, which was reviewed in September by the National Center for Health Statistics, the Federal agency responsible for use of ICD-10.
 - PI: Chris Cherry, UTK / Co-PI's: Laura Sandt, UNC HSRC and Susan Shaheen, UC-Berkeley

Objective 2-4: Broadly disseminate research products and findings, with emphasis on reaching new and non-traditional audiences:

Objective 1.2 covered many efforts to disseminate research, specifically relating to systems-oriented projects and work that CSCRS is producing. Table 1 features additional outreach methods, beyond the Safe Systems Summit.

Table 1: Select CSCRS outreach highlights

Duke	Missy Cummings presented on driverless cars at the Rethink Regulation meeting in Washington, DC in May 2019.
	Missy Cummings presented to Pfizer representatives in August 2019.
	In September, Missy Cummings presented elements of CSCRS research at the Carolina Cafe Sigma Xi outreach series, Chapel Hill, NC.
	Missy Cummings presented research to staff of federal legislators in September 2019.
	CSCRS research featured at the IEEE Holm conference for the Morton Antler Lecture series in Milwaukee in September 2019.
	Missy Cummings presented elements at the Global Order Colloquium, University of Pennsylvania, September 2019.
UCB	Praveen Vayalamkuzhi attended the Highway Safety Performance (ANB25) Committee Midyear Meeting in Irvine, CA, June 2019.
	Offer Grembek presented <i>Safer Speeds: Considerations for Speed Limits and Management</i> as part of Workshop 1 for the California AB 2363 Zero Traffic Fatalities Task Force in Sacramento, CA in June 2019.
	Offer Grembek presented <i>Research Synthesis by UC Institute of Transportation Studies</i> as part of Workshop 2 for the California AB 2363 Zero Traffic Fatalities Task Force in Sacramento, CA in August 2019.
	David Ragland presented findings from our CSCRS funded EMS work to the California Medical Outcomes Data (CMOD) staff at the California Department of Public Health in August 2019.
	Offer Grembek presented <i>Introducing an Intelligent Intersection</i> at the 52nd Annual Traffic Safety Leadership Conference for the National Association of Women Highway Safety Leaders in Anaheim, CA, in August 2019.
UNC HSRC	LaJeunesse, S. (2019). <i>Roles, relationships, and resources: A safe systems framework</i> . Presentation at the NC Traffic Safety Conference & Expo. Raleigh, NC, August 2019.
	Sandt, L. <i>Emerging Technologies for Micromobility: What do we know, what do we not know, and what do we do?</i> Presentation at the NC Traffic Safety Conference & Expo. Raleigh, NC, August 2019.
	Harmon, K. <i>North Carolina Motor Vehicle Crash Injury Data Linkage & Integration</i> . Presentation at the NC Traffic Safety Conference & Expo. Raleigh, NC, August 2019.
	Kumfer, W. <i>The Goal of Zero Traffic Deaths: What It Will Take to Achieve Our Statewide Vision</i> . Presentation at the NC Traffic Safety Conference & Expo. Raleigh, NC, August 2019.
	Sandt, L. CSCRS Research and Workforce Development Activities. Presented to NCDOT at the UTC Roundtable Meeting, August 2019.
UNC IPRC	Singichetti, B., Naumann, R., Marshall, S., Proescholdbell, S. <i>Deaths averted, injuries prevented, and costs saved by increased use of evidence-based behavioral road safety policies in North Carolina</i> . 2019 Council of State and Territorial Epidemiologists Annual Conference. Raleigh, NC. June 2-6, 2019.
	Singichetti, B., Naumann, R., Marshall, S., Proescholdbell, S. <i>Lives and costs saved by increased use of evidence-based road safety policy in North Carolina</i> . 2019 Society for Advancement of Violence and Injury Research Conference. Cincinnati, OH. April 1-3, 2019.
	Naumann, R.B., Sandt, L., Kuhlberg, J., Heiny, S., Lich, K.H. <i>Examining the rise in pedestrian fatalities: understanding the underlying system to inform more effective action</i> . 2019 Society for Advancement of Violence and Injury Research Conference. Cincinnati, OH. Apr. 1-3, 2019.
	Naumann, R.B., Sandt, L., Kuhlberg, J. <i>Systems Mapping to Inform Vision Zero Plans</i> . Workshop at the NC Traffic Safety Conference & Expo. Raleigh, NC, August 2019.
UNC DCRP	Noreen McDonald, UNC DCRP, co-presented the STRIDE UTC webinar "Innovation in Access to Healthcare: Understanding Transport Barriers" in September 2019.

	DCRP research associate Tabitha Combs was a keynote panelist on the role of CAVs in road safety at Virginia Tech’s Choices and Challenges forum, April 2019.
	DCRP research associate Tabitha Combs participated in the panel discussion <i>Emerging trends in transportation safety and the need for systemic resilience</i> . At the North Carolina Traffic Safety Conference & Expo, Raleigh, NC, 2019.
UTK	Wen, Y., He, K., Azad, M., Cherry, C. (2019). <i>Use-phase Sustainability Impacts of Dockless Bike Share and Other Shared Mobilities</i> . <i>Tennessee Sustainable Transportation Forum and Expo</i> . September 30, 2019. Knoxville, Tennessee.
	Workshop: <i>Emerging Technologies for Micro-mobility: What do we know, what do we not know, and what do we do?</i> Workshop organized at the ITE International Meeting, Austin TX. July 24, 2019
	<i>E-bikes: The future of urban mobility</i> . Keynote Go Bike MTL Festival. Montreal Quebec. May 30, 2019.

Goal 3:

To support Goal 3—to ensure that a growing body of students and future leaders are engaged and well-trained in road safety principles, Safe Systems approaches, and systems science methods—we performed activities related to the following objectives:

Objective 3-1: Develop and deliver courses at consortium member universities that integrate CSCRS concepts.

Highlights:

- Duke Spring 2019 undergraduate/graduate course, Human-Robot Interaction. Instructor: Missy Cummings (20 students).
- FAU undergraduate course, Introduction to Transportation. Instructor: Louis Merlin (8 students).
- UCB Fall 2019 graduate course, Injury Prevention and Control. Instructors: David Ragland, Glenn Shor (8 students).
- UCB Fall 2019 graduate course, Sustainable Mobility. Instructor: Daniel A. Rodriguez (35 students).
- UCB Spring 2019 graduate course, Traffic Safety and Injury Control. Instructors: Instructors: David Ragland, Offer Grembek (10 students).
- UCB Spring 2019 graduate course, Transportation and Land Use Planning. Instructor: Daniel A. Rodriguez (20 students).
- UNC Fall 2019 course, Transportation planning methods. Instructor: Noreen McDonald (40 students).
- UNC Fall 2019 graduate course, Injury as a Public Health Problem. Instructor: Steve Marshall (18 students).
- UNC Fall 2019 undergraduate/graduate course, Roadways for a safer future. Instructor: Tabitha Combs (15 students).
- UNC Spring 2019 graduate course, Complete, Safe, Equitable Streets. Instructor: Tabitha Combs (32 students).
- UTK’s Civil and Environmental Engineering faculty offered 11 transportation courses during Spring, Summer, and Fall 2019 covering transportation engineering, traffic, road design, planning, safety, accident reconstruction, public transportation, and intelligent transportation systems.

Objective 3-2: Engage students through student-directed activities and professional opportunities:

The Safe Systems Summit was a key student engagement activity during this period; 95 students attended. Of particular note was the Student Poster Showcase, offering students the opportunity to display and discuss their transportation-related research, capstone and community projects as poster presentations. The posters were reviewed by a panel of judges and prizes awarded to the top three posters, including to Duke and UNC students working on CSCRS research projects [R9](#) and [R17](#) project, respectively.

Table 2 describes additional key student engagement and awards offered during this reporting period.

Table 2: Select CSCRS student engagement activities

UCB	UCB awarded 8 graduate students CSCRS Road Safety Graduate Student Fellowships to generate CSCRS research pertaining to various topics.
	Conducted a series of meetings in which David Ragland advised three students doing master's thesis/capstone papers in the Data Science Division at Berkeley. The students prepared a website for generating cluster analyses of FARS data, which was then presented to SafeTREC staff in August 2109. The aim was to contribute to the goals in Vision Zero by creating a tool for focus of traffic efforts at different scales of analysis.
	Marta Polovin, UCB CSCRS Graduate Student Fellow, was the recipient of the 2019 Outstanding Student Award from the California Planning Foundation in July 2019.
	Faculty oversaw thesis and dissertation supervision: for three engineering students and two students in City Planning.
Duke	One postdoctoral associate and one master's student at Duke worked on Project R9.
	Graduate and undergraduate students are working on the manning model, re-routing algorithm development and simulation environment to demonstrate the problem and the re-routing algorithm.
FAU	One graduate student was provided with a research assistantship.
UNC	DCRP Master's student William Leimenstoll was awarded a Road Safety Graduate Student Fellowship through June 2019 to support research into how municipalities incorporate road safety concerns into traffic impact analyses.
	DCRP sponsored the Road Safety Scholars program, which brings together students and research fellows from across the UNC campus to participate in activities focusing on interdisciplinary research on road safety. These Road Safety Scholars participate in seminars and have opportunities for research mentoring and networking with road safety professionals. 32 students and fellows participated in the spring 2019 term, running through May 2019.
	DCRP Doctoral student Lindsay Oluyede was awarded a teaching assistantship to assist with Plan 590, Complete, safe, equitable streets (through May 2019).
	DCRP Doctoral students Mary Wolfe & Lindsay Oluyede have been awarded Eisenhower Fellowships to support their on-going research incorporating transportation and roadway safety concepts; DCRP Doctoral student Mary Wolfe & Masters student Tory won WTS fellowships
	DCRP Doctoral student Lindsay Oluyede and master's student Tory Gibler were awarded summer professional development awards to support safety-relevant professional development activities during Summer 2019.
	One post-doctoral research associate with training in systems science worked on systems-informed pedestrian safety research and congestion pricing policy research.
	One PhD graduate student engaged in CSCRS-funded research projects on effective public health policy for road traffic injury prevention, as well as systems science applications to road safety.
	Two PhD students and one master's student worked on CSCRS project R17, including helping to code Vision Zero plans from across the country and assisting with the development of a Vision Zero Guide.
	One PhD graduate student engaged in documenting key elements that could facilitate linkage potential of crash records and prescription drug monitoring program data (i.e., CSCRS R16).
One undergraduate student worked on CSCRS project R17 and gained experience and exposure to road safety research.	
UTK	Twelve (12) graduate students worked with faculty on CSCRS research projects and prepared research papers submitted them to the Transportation Research Board (TRB) for presentation and publication review at the 2020 TRB annual meeting.
	UTK WTS-Advancing Women in Transportation Student Chapter was officially recognized. Two meetings were held in Spring, Summer, and Fall 2019 semesters.
	Ali Boggs, graduate student at UTK, was named an ENO Center for Transportation Leadership Development Conference Fellow and was the winner of Lillian Borrone Alumni Award.
	4 UTK Institute of Transportation Engineers-ITE Student Chapter meetings were held in Spring, Summer, and Fall 2019 semesters. The meetings promoted student learning and career development in transportation engineering.
	4 UTK ITE Student Chapter members competed and won the TSITE (Tennessee Section of the Institute of Transportation Engineers) Traffic Bowl Competition and traveled to Arlington, Virginia to compete against other schools in the Southern District.
	UTK ITE Student Chapter won the Best Student Chapter award in Tennessee and the 2nd Best Student Chapter in Southern District.
	Supported 5 students from UTK ITE Student Chapter to attend and present at the Tennessee Section of the Institute of Transportation Summer Meetings.
	Two students, Ramin Arvin and Ali Boggs, represented the Civil and Environmental Engineering Department in the Graduate Student Senate.
	Six UTK graduate students won the Lifesavers Traffic Safety Scholarship to attend the National Lifesavers Traffic Safety Conference in Louisville, Kentucky.
	Ramin Arvin, graduate student at UTK, won the Drs. Greg and Kay Reed Scholarship for student engagement and leadership.
	Ali Boggs, graduate student at UTK, was awarded the University of Tennessee Chancellor's Extraordinary Professional Promise
	UTK Civil & Environmental Engineering Department held Weekly Graduate Student Researcher meetings with eight graduate students that provided various opportunities for professional development, such as best practices for effectively communicating research, research presentations, observation visits with practitioner organizations, and utilizing social media.

Objective 3-3: Develop mentorship and internship opportunities for students to engage in critical thinking about road safety issues from a variety of perspectives and connect with traditional and non-traditional partners.

- UTK Civil & Environmental Engineering Department held Weekly Graduate Student Researcher meetings with eight graduate students that provided various opportunities for professional development, such as

best practices for effectively communicating research, research presentations, observation visits with practitioner organizations, and utilizing social media.

- UCB continued holding weekly graduate student researcher group meetings including ten graduate students are from City and Regional Planning, Transportation Engineering, and Engineering and Project Management. The meetings provided opportunities for professional development, including best practices for effectively communicating research, research presentations, observation visits with practitioner organizations, and utilizing social media to support professional activities.
- HSRC's CSCRS intern, Clay Barnes, was awarded a NHTSA summer internship in the Region 6 Office.

Objective 3-4: Provide exposure to road safety principles in K-12 settings, to enhance early interest in traffic safety.

- CSCRS researchers Wesley Kumfer and Seth LaJeunesse gave a hands-on roadway design demo using a prop city intersection at North Carolina A&T's first ever Transportation Awareness Day in April 2019.
- Duke Humans and Autonomy Lab (HAL) brought their mobile command center van to the [Chapel Hill High School TigerFest](#) event in May 2019. The school's robotics club students got a first-hand look at computational modeling for a dispatch center showing autonomous vehicles. The annual TigerFest is an alternative educational day where students can take classes on a variety of subjects that aren't traditionally offered during the school year.
- Students from NC A&T's Summer High School Transportation Institute visited the HAL lab at Duke in July 2019 to learn about the facility's robotics programs and to practice traffic safety activities led by CSCRS researchers. This was the second year students from this program have participated in these activities.
- UCB SafeTREC held discussions with Deborah McCoy, Executive Director of Center for Cities + Schools at UCB May 2019, to explore opportunities to feature UCB's traffic safety videos and other safe systems/vision zero content as part of the curriculum for a local high school Y-PLAN project on transportation.

1.3 What opportunities for training and professional development has the program provided?

Myriad teaching, training, and learning opportunities have already been showcased in this report. Additionally:

- Weekly traffic safety seminars were held at SafeTREC on Fridays to provide platforms to discuss research happening at the center and beyond. Select topics:
 - "Adaptive Speed Limit Model" (13 participants).
 - "A Pedestrian Exposure Model for the California State Highway System" (12 participants).
 - "Safety Performance Functions for the California State Highway System" (15 participants).
 - "Pedestrian Crossing Behavior Modeling and Simulation" (12 participants).

1.4 How have the results been disseminated?

Results are being disseminated in accordance with the CSCRS [Technology Transfer Plan](#). In addition to the goal-specific activities described above, staff developed and disseminated one issue of *CSCRS Crossroads* newsletter in August 2019 (archives are available [here](#)). The Consortium coordinated to co-promote CSCRS news/updates on their websites, in newsletters, and on social media.

Communications staff continuously maintained the CSCRS Twitter feed, which now has 447 followers. A recent month's analytics showed 11,200 impressions, an increase of almost 60% over the previous month. Staff also maintained the CSCRS Facebook page.

CSCRS staff updated project descriptions, titles, and end dates on the [CSCRS website](#) and in the Transportation Research Board Research in Progress (RiP) Database, tagged as UTC research. Project-related publications and presentations from this reporting period are listed in the Products section.

1.5 What do you plan to do during the next reporting period?

The following section provides a sampling of activities CSCRS plans to complete during the next reporting period (10/1/2019-3/31/20) to accomplish the previously described goals and objectives.

- **Engagement:** In October 2019, CSCRS team members are planning the UNC-Chapel Hill Safe Systems Transportation Research Forum, a day devoted to meeting with Congressional staffers about important transportation safety research at UNC. CSCRS staff helped coordinate the event, and the staffers will meet with a variety of CSCRS researchers.

- **Research:** CSCRS will soon announce the funded 2019-2020 research projects. Some of these projects have held kickoffs and are already well underway:
 - [R21: A systems approach to pedestrian safety, Phase II: Examining congestion pricing policies](#) (led by Becky Naumann, UNC IPRC)
 - [R22: Using integrated data to examine characteristics related to pedestrian and bicyclist injuries](#) (led by Katie Harmon, UNC HSRC)
 - [R23: Driver impairment detection and safety enhancement through comprehensive volatility analysis](#) (led by Asad Khattak, UTK)
 - [R24: Developing a framework to combine the different protective features of a Safe System](#) (led by Offer Grembek, UCB)
 - [R25: Advancing accident investigation with connected and automated vehicle data](#) (led by Michael Clamann, UNC HSRC)
 - [R26: Understanding micromobility safety behavior and standardizing safety metrics for transportation system integration](#) (led by Chris Cherry, UTK)
 - [R27: Safety testing for connected and automated vehicles through physical and digital iterative deployment](#) (led by Subhadeep Chakraborty, UTK)
 - [R28: Reducing motorcyclist injuries: Engaging stakeholders to apply evidence-based countermeasures](#) (led by Jerry Everett, UTK)
 - [R29: Factors and frames that shape public discourse around road user safety](#) (led by Seth LaJeunesse, UNC HSRC)
 - [R30: Urban freight and road safety: Trends and innovative strategies](#) (led by Noreen McDonald, UNC DCRP)
 - [R31: Crash Risk for Low-Income and Minority Populations: An Examination of At-risk Population Segments and Underlying Risk Factors](#) (led by Diana Mitsova, FAU)
 - [R32: Applying Civic Innovation Methods to Advance Safety Education: A Pilot Program](#) (led by Eric Dumbaugh, FAU)

- **Professional development:** Key activities planned include:
 - In addition to individual research presentations, CSCRS is planning several sessions at TRB that highlight the principles of systems-oriented approaches. For example, the workshop [“The Nexus of Speed Management and Human Factors as a Focal Point of Safe Systems”](#) will be moderated and presented by various CSCRS team members and partners.
 - CSCRS will hold its popular [Safety Sunday @ TRB](#) event again, scheduled for Jan. 12, 2020.
 - Work will continue on planning the NaTMEC 2020 event. In the next reporting period, CSCRS will work with the planning committee on finalizing the program, as well as other logistics coordination.

- In its role on the Leadership Council for the Road to Zero Coalition, CSCRS researchers attend regular meetings and are providing support to develop a [Fall webinar series](#), hosted by CSCRS advisory board members from the Vision Zero Network, ITE, and the National Safety Council. The series will lay out principles of Safe Systems based on research and practices identified by CSCRS research and other sources.
 - In Fall 2019, UNC-HSRC staff will teach the CSCRS-funded Road Safety Academy “Road Safety 101” web-based course to a group of 25 professionals from engineering, enforcement, planning, public health, and other backgrounds. This course provides a broad safety background, integrates systems principles, and is designed to prepare students to sit for the ITE-administered Road Safety Professionals Certification exam. We also plan the development of a Road Safety Academy 201-level course, which will be taught in the Spring of 2020.
- **Teaching and student enrichment:** Key activities:
 - FAU is coordinating with the Urban Impact Lab, Dream in Green, AIA Miami, Miami Center for Architecture & Design, Inc., and the Health Foundation of South Florida to hold the Cardboard Challenge, October 2019 in Miami, FL. The event is targeted toward K-5 schools in the area and will be focused around creative play, street safety and environmental stewardship.
 - Our consortia will teach several college courses, as well as incorporate CSCRS research findings and opportunities into other/existing courses and seminars.
 - NaTMEC 2020 will incorporate activities for students, including opportunities to present and a poster event.

In addition to activities specific to the three goals, we will continue conducting administrative functions that support all Center activities, including managing the Center’s website, communications platforms, engaging with the Advisory Board, responding to USDOT or other requests, holding an annual Executive Committee retreat, and developing efficient project management systems.

2. Participants and Collaborating Organizations

2.1 What organizations have been involved as partners?

The following organizations, including seven that are *new, have been involved as CSCRS partners:

Table 3: Select CSCRS Collaborator and Sponsor Organizations

Business
*New this period: AT&T Fleet Complete, Atlanta, GA (Financial Support)
SoftServe, Inc., Austin, TX (Financial and Collaborative Support)
*New this period: PhD Posters, Durham, NC (Financial Support)
*New this period: Toyota Motor North America, Saline, MI (Financial Support)
*New this period: Uber, San Francisco, CA (Financial Support)
*New this period: VHB, Watertown, MA (Financial Support)
*New this period: Volkswagen Group of America, Herndon, VA (Collaborative Support)
Foundation
*New this period: Health Foundation of South Florida, Miami, FL (Collaborative Support)
John D. and Catherine T. MacArthur Foundation, Chicago, IL (Financial Support)
Local Government
Town of Chapel Hill Staff, Chapel Hill, NC (Collaborative Support)
Other Non-Profits
*New this period: American Institute of Architects, Miami, FL (Collaborative Support)

America Walks, Portland, OR (Collaborative Support)
American Planning Association, Chicago, IL, and Washington, DC (Collaborative Support)
American Public Health Association, Washington, DC (Collaborative Support)
Association of Pedestrian and Bicycle Professionals, Lexington, KY (Collaborative Support)
Broward Metropolitan Planning Organization, Fort Lauderdale, FL (Collaborative Support)
*New this period: Dream in Green, Miami, FL (Collaborative Support)
Institute of Transportation Engineers, Washington, DC (Collaborative Support)
Insurance Institute for Highway Safety, Vehicle Research Center, Ruckersville, VA
*New this period: The Miami Center for Architecture and Design, Miami, FL (Collaborative Support)
Miami-Dade Transportation Planning Organization, Miami, FL (Collaborative Support)
Mobility Lab, Arlington, VA (Collaborative Support)
National Association of City Transportation Officials, New York, NY (Collaborative Support)
National Cooperative Highway Research Program, Washington, DC (Financial Support)
National Indian Justice Center, Santa Rosa, CA (Collaborative Support)
National Local Technical Assistance Program Association, US (Collaborative Support)
North Carolina Center for Automotive Research, Garysburg, NC (Collaborative Support)
Palm Beach Transportation Planning Agency, West Palm Beach, FL (Collaborative Support)
Palm Beach Planning Congress, Palm Beach, FL (Collaborative Support)
*New this period: The Road to Zero Coalition/The National Safety Council, Itasca, IL (Financial and Collaborative Support)
Transportation Research Board Standing Committee on Pedestrians, Washington, DC (Collaborative Support)
Transportation Research Board Standing Committee on Transportation Safety Management, Washington, DC (Collaborative Support)
Vision Zero Network, San Francisco, CA (Collaborative Support)
WTS International, Washington, DC (Collaborative Support)
School District
Knox County School District, Knoxville, TN (Collaborative Support)
State Government
California Emergency Medical Systems Authority (Collaborative Support, Data Request)
California Medical Outcomes Data, California Department of Public Health, Sacramento, CA (Collaborative Support, Data Request)
North Carolina Department of Transportation, Raleigh, NC (Financial Support)
North Carolina Governor's Highway Safety Program, Raleigh, NC (Collaborative and Financial Support)
Tennessee Department of Transportation, Nashville, TN (Matching Request & Data)
Tennessee Dept. of Safety & Homeland Security, Nashville, TN (Data Request)
Tennessee Department of Health, Nashville, TN (Data Request)
Tennessee Technology Access Program, Nashville, TN (Collaborative Support)
U.S. Agency
National Science Foundation, Washington, DC (Sponsor of Projects)
Centers for Disease Control and Prevention, Atlanta, GA (Collaborative Support)
U.S. Facility
Oak Ridge National Laboratory, Oak Ridge, TN (Collaborative Support)
U.S. Government
U.S. Dept. of Energy, Washington, DC (Collaborative Support)
U.S. Dept. of Transportation, Washington, DC (Sponsor of Projects & Collaborative Support)
University
Duke Initiative for Science & Society Science Policy Tracking Program, Durham, NC (Financial Support)
East Tennessee State University, Johnson City, TN (Collaborative Support)
North Carolina State University Institute for Transportation Research and Education, Raleigh, NC (Collaborative Support)
Planning Society @ FAU, Boca Raton, FL (Collaborative Support)
Renaissance Computing Institute, Chapel Hill, NC (Collaborative Support)
University of Tennessee Chattanooga, TN (Collaborative Support)
Various Jiaotong Universities in China (Collaborative Support)
*New this period: North Carolina Central University, Durham, NC (Collaborative Support)

2.2 Have other collaborators or contacts been involved?

Nothing to report beyond the table above.

3. Outputs

CSCRS included two performance measures related to outputs in its Technology Transfer Plan:

- Organize and hold conferences through 2021.
- Annual journal manuscripts, publications, articles, posts, media stories, etc.

In addition to hosting the Safe Systems Summit in April 2019, CSCRS is working with FHWA and other partners on planning NaTMEC 2020, in Raleigh, NC, June 2020. The goal of this event will be to apply a Safe Systems lens to increasing the effectiveness of multimodal traffic monitoring programs to enhance data-driven decisions in areas of performance management, planning and design, asset management, safety and program administration.

Sections 3.1-3.3 present the significant number of outputs related to CSCRS research and tech transfer.

3.1 Publications, conference papers, and presentations

Following are select highlights of publications and presentations produced by CSCRS team members:

Table 4: Select CSCRS publications, conference papers, and presentations

Peer-Reviewed Publications
Ahmad, N., Ahmed, A., Wali, B., & Saeed, T. U. (2019). Exploring factors associated with crash severity on motorways in Pakistan. <i>Proceedings of the Institution of Civil Engineers - Transport</i> , 1–10. https://doi.org/10.1680/jtran.18.00032
Arvin, R., Kamrani, M., & Khattak, A. J. (2019). How instantaneous driving behavior contributes to crashes at intersections: Extracting useful information from connected vehicle message data. <i>Accident; Analysis and Prevention</i> , 127, 118–133. https://doi.org/10.1016/j.aap.2019.01.014
Arvin, R., Kamrani, M., & Khattak, A. J. (2019). The role of pre-crash driving instability in contributing to crash intensity using naturalistic driving data. <i>Accident; Analysis and Prevention</i> , 132, 105226. https://doi.org/10.1016/j.aap.2019.07.002
Azad, M., Hoseinzadeh, N., Brakewood, C., Cherry, C. R., & Han, L. D. (2019). Fully autonomous buses: A literature review and future research directions. <i>Journal of Advanced Transportation</i> (In press).
Dong, C., Khattak, A. J., Shao, C., & Xie, K. (2019). Exploring the factors contribute to the injury severities of vulnerable roadway user involved crashes. <i>International Journal of Injury Control and Safety Promotion</i> , 26(3), 302–314. https://doi.org/10.1080/17457300.2019.1595665
Griswold, J. B., Medury, A., Schneider, R. J., Amos, D., Li, A., & Grembek, O. (2019). A pedestrian exposure model for the California state highway system. <i>Transportation Research Record: The Journal of the Transportation Research Board</i> , 036119811983723. https://doi.org/10.1177/0361198119837235
Hezaveh, A. M., Arvin, R., & Cherry, C. R. (2019). A geographically weighted regression to estimate the comprehensive cost of traffic crashes at a zonal level. <i>Accident; Analysis and Prevention</i> , 131, 15–24. https://doi.org/10.1016/j.aap.2019.05.028
McDonald, N., Yuan, Q., & Naumann, R. (2019). Urban freight and road safety in the era of e-commerce. <i>Traffic Injury Prevention</i> , 20(7), 764–770. https://doi.org/10.1080/15389588.2019.1651930
Medury, A., Griswold, J. B., Huang, L., & Grembek, O. (2019). Pedestrian count expansion methods: Bridging the gap between land use groups and empirical clusters. <i>Transportation Research Record: The Journal of the Transportation Research Board</i> , 036119811983826. https://doi.org/10.1177/0361198119838266
Naumann, R. B., Heiny, S., Evenson, K. R., LaJeunesse, S., Cooper, J. F., Doggett, S., & Marshall, S. W. (2019). Organizational networks in road safety: Case studies of U.S. Vision Zero cities. <i>Traffic Injury Prevention</i> , 20(4), 378–385. https://doi.org/10.1080/15389588.2019.1587752
Naumann, R. B., Kuhlberg, J., Sandt, L., Heiny, S., Apostolopoulos, Y., Marshall, S. W., & Lich, K. H. (2019). Integrating complex systems science into road safety research and practice, part 1: Review of formative concepts. <i>Injury Prevention</i> . https://doi.org/10.1136/injuryprev-2019-043315
Naumann, R. B., Kuhlberg, J., Sandt, L., Heiny, S., Kumfer, W., Marshall, S.W., & Lich, K. H. (2019). Integrating complex systems science into road safety research and practice, part 1: Applying systems tools to the problem of increasing pedestrian death rates. <i>Injury Prevention</i> . (in press).
Naumann, R.B., Shiue, K., Mohamadi Hezaveh, A., Marshall, S.W., & Cherry, C.R. (2019). <i>Connections between opioids and road injury: Linkage of prescription monitoring and crash databases</i> . American Journal of Preventive Medicine (under review).

Wali, B., Khattak, A. J., & Ahmad, N. (2019). Examining correlations between motorcyclist's conspicuity, apparel related factors and injury severity score: Evidence from new motorcycle crash causation study. <i>Accident; Analysis and Prevention</i> , 131, 45–62. https://doi.org/10.1016/j.aap.2019.04.009
Zhao, X., Jing, S., Hui, F., Liu, R., & Khattak, A. J. (2019). DSRC-based rear-end collision warning system – An error-component safety distance model and field test. <i>Transportation Research Part C: Emerging Technologies</i> , 107, 92–104. https://doi.org/10.1016/j.trc.2019.08.002
Presentations
Arvin, R., Kamrani, M., & Khattak, A. (2019). <i>The role of pre-crash driving instability in contributing to crash intensity using naturalistic driving data</i> . ITE summer meeting, Gatlinburg, TN
Azad, M., & Cherry, C. R. (2019). <i>How do e-bikes affect bikeshare systems?</i> Lifesavers National Conference on Highway Safety Priorities, Louisville, KY.
Clamann, M. & Harmon, K. (2019, August). <i>Modernizing Crash Investigation with Vehicle Automation</i> . NC Traffic Safety Conference & Expo. Raleigh, NC.
Combs, T. (2019, August). <i>Emerging trends in transportation safety and the need for systemic resilience</i> . North Carolina Traffic Safety Conference & Expo, Raleigh, NC.
Combs, T. (2019, May). <i>Pedestrians and AVs: A safer future?</i> NCDOT Research and Innovation Summit, North Carolina A&T, Greensboro, NC.
Evenson, K.R., Cuthbertson, C.C., Naumann, R.B., Schilsky, S., Spade, C., & LaJeunesse, S. (2019, May 28 – June 1). <i>U.S. Vision Zero plans: Opportunity to support safer walking and bicycling</i> . American College of Sports Medicine Annual Meeting. Orlando, FL.
Goodwin, A.H. (2019, April). <i>Young drivers today: Where do we go from here?</i> Lifesavers Conference on Highway Safety Priorities. Louisville, KY.
Goodwin, A.H. (2019, June). <i>Young driver trends and implications for policy</i> . TRB Young Driver Subcommittee midyear meeting. Woods Hole, MA.
Goodwin, A.H. (2019, July). <i>Parents of new drivers: Helpful or hopeless?</i> 63rd Annual ADTSEA Conference. Burlington, VT).
Goodwin, A.H. & Robison, K. (2019, August). <i>Time to drive: A new program to help parents of teenage drivers in North Carolina</i> . NC Traffic Safety Conference & Expo. Raleigh, NC.
Hoseinzadeh, N., Liu, Y., & Zhang, Z. (2019). <i>A new tool for signalized intersection performance assessment</i> . ITE International Annual Meeting, Austin, TX.
Khattak, A., (2019, April). <i>The era of automated, connected, electric, shared vehicles</i> . Invited talk at the University of Alabama, Tuscaloosa, Alabama.
Khattak, A. (2019). <i>Social influence on driver decisions using modeling and gossip algorithms</i> . Invited talk at the plenary session, 19th COTA International Conference of Transportation Professionals, CICTP, Southeast University, Nanjing, China.
Kontou, E. (2019, September). <i>Associating ridesourcing with road safety outcomes: Insights from Austin, Texas</i> . Presentation at Bloomberg Data for Good Exchange, New York, NY.
Kumfer, W., Combs, T., Lajeunesse, S., & Clamann, M. (2019). <i>Emerging trends in transportation safety and the need for systemic resilience</i> . 2019 NC Traffic Safety Conference & Expo, Raleigh, NC.
Kumfer, W., Lajeunesse, S., Sadowsky, R., & Marek, J. (2019, July). <i>Safe systems for rural areas</i> . Webinar. National Center for Rural Road Safety.
Lajeunesse, S. (2019, August). <i>Shifting the paradigm: Safe systems principles</i> . Association of Pedestrian and Bicycle Professionals Conference. Portland, OR.
McDonald, N. (2019, September). <i>Associating ridesourcing with road safety outcomes: Insights from Austin, Texas</i> . Presentation at Cornell University Department of City & Regional Planning, Ithaca, NY.
Naumann, R. (2019, September). <i>Exploring and using systems approaches to inform transportation safety</i> . Guest lecture, UNC PLAN 590: Roadways for a Safer Future. UNC Department of City & Regional Planning, Chapel Hill, NC.
Nneji, V. (2019, April). <i>A workload model for designing & staffing future transportation network operations</i> . Duke University, Durham, NC.
Seth, D. (2019, July). <i>AI, aggression, and daily commutes – How aggressive driving in autonomous vehicles impacts safety and efficiency of highway traffic</i> . Duke University, Durham, NC.
Shah, N. R., & Cherry, C. R. (2019). <i>Evaluating safety using bicycle route choice: A new approach to model perceived safety of bicyclists using GPS data</i> . Lifesavers National Conference on Highway Safety Priorities, Louisville, KY.
Shiue, K., Naumann, R., Mohamadi Hezaveh, A., & Cherry, C. (2019, June 11-12). <i>Understanding the related issues of opioid use and motor vehicle crash injury: Evaluating the current landscape and linkage potential of prescription drug monitoring programs and crash databases</i> . North Carolina Opioid Summit. Raleigh, NC.
St. Clair, J. (2019, July). <i>Building a system to evaluate driver attention monitors in semi-autonomous vehicles</i> . Duke University, Durham, NC.
Wen, Y., & Cherry, C. (2019). <i>Designing an effective and uniform survey to understand the impacts of shared mobility in your city</i> . 10th Annual Georgia Bike Summit. Atlanta, Georgia.
Wen, Y., Cherry, C. (2019, September). <i>The Future of E-bikes and E-scooters</i> . 8th Annual Tennessee Bike Walk Summit. Knoxville, Tennessee, United States of America.
Wen, Y., Cherry, C., Darling, W., & Shah, N. (2019). <i>Material inventory of commercially used shared electric kick scooters: A key step towards the understanding of the overall environmental footprint of shared micromobility devices</i> . LCA XIX Conference. Tucson, AZ.
Yuan, Q. (2019, May). <i>Urban freight delivery and loading spaces</i> . NCDOT Research and Innovation Summit, North Carolina A&T, Greensboro, NC.
Books or other non-periodical, one-time publications
None to report for this period.

3.2 Policy Papers

- Nachman E., Rodriguez D. (2019). [Adult Bicycle Education Classes Increase Confidence, Feelings of Safety, and Knowledge of Bicycling Rules](#). A Policy Brief for the University of California Institute of Transportation Studies.
- Nachman E., Rodriguez D. (2019). [Evaluating the Effects of a Classroom-Based Bicycle Education Intervention on Bicycle Activity, Self-Efficacy, Personal Safety, Knowledge, and Mode Choice](#). A Research Report of the California Institute of Transportation Studies.
- Nachman E., Rodriguez D. (2019). [Research on the Effects of Bicycle Education is Limited but Does Point to Higher Rates of Bicycling and Increased Safety](#). A Research Brief for the University of California Institute of Transportation Studies.

3.3 Website(s) or other Internet site(s)

- The [National Pedestrian and Bicycle Safety Data Clearinghouse](#) (a product of [R14](#)) was visited by 1,281 unique visitors during this period. The searchable database of 3,000+ open source data sets continues to receive positive feedback from multiple users representing a variety of road safety professions.
- A UCB student created the video channel [City Beautiful](#); several of the videos focus on transportation planning.
- A special “[CSCRS on the Streets](#)” video project with interviews about autonomous vehicles with students, children, retirees, law enforcement, college professors and others debuted at the Safe Systems Summit.
- The CSCRS website, www.roadsafety.unc.edu, was regularly updated with new information regarding research, educational and professional development research, resources, and opportunities. The site had 2,756 unique visitors from all over the U.S. and the world during this period.

3.4 New methodologies, technologies or techniques

- UTK helped develop the new proposed standard, J3194, Taxonomy and Classification of Powered Micromobility Vehicles. It is a draft final standard that is being voted on by the committee.
- UNC-HSRC developed a new proposed e-scooter injury reporting code system, and stakeholders involved in the effort presented in September in favor of the proposed recommendations. Final changes to the ICD-10-CM are under review and the new codes, if accepted, will be available for international use in Summer 2020.

Other new technologies or techniques are documented in the final reports published by each completed project and highlighted in a “Research Brief” that is posted next to the final report on the CSCRS website.

3.5 Inventions, patent applications, and/or licenses

None to report for this period.

3.6 Other products

None to report for this period.

4. Outcomes

CSCRS included two performance measures related to outcomes in its Technology Transfer Plan:

- Average annual number of opportunities/instances to share transportation safety expertise at conferences, professional meetings and through media. (Please see conference presentations listed in Section 3.1 and media described in Section 4.1.)

- Annual number of adoptions, use or reference to CSCRS products, or influence on national or state research agendas.

4.1 Increased understanding and awareness of transportation issues

CSCRS staff engaged with several high-profile media outlets, as well as student university papers. Examples:

- Noreen McDonald, UNC DCRP, was featured in the article "[No keys to this future: Millennials ditch cars for transit](#)," *Mirage News*, August 9, 2019.
- Missy Cummings, Duke, was featured in the article "[Before driverless cars come driverless office park shuttles?](#)" *Marketplace*, August 20, 2019.
- Missy Cummings was also featured in the podcast "[The Truth about Autonomy](#)," *Harvard Business Review*, May 15, 2019.
- Offer Grembek, UCB, was interviewed for "[San Francisco's bike lanes lead to fewer fatalities for motorists, too](#)," *San Francisco Business Times*, June 2019.
- Julia Griswold, UCB, was interviewed for "[As deaths mount on Santa Rosa's Stony Point Road, city is pressed to do more for safety](#)," *Santa Rosa Press Democrat* on June 2019.
- Offer Grembek, UCB, was interviewed for KQED News about SMART train safety, July 2019.
- Laura Sandt was interviewed by ABC11 EyewitnessNews regarding the e-scooter injury codes rollout, August 2019.

In addition, CSCRS has been coordinating with other key stakeholder groups and national initiatives in order to share research and to increase understanding of key transportation issues. For example, in May CSCRS staff Sandt, LaJeunesse, and Kumfer joined the Road to Zero Leadership Council (to begin meeting in May), which has since planned a number of meetings and webinars to discuss the implementation of Safe Systems into policy and practice.

4.2 Passage of new policies, regulation, rulemaking or legislation

Nothing to report.

4.3 Increases in the body of knowledge

CSCRS team members with UNC IPRC and UNC HSRC were invited to share transportation and systems expertise with North Carolina's Vision Zero Task Force in their May 2019 quarterly peer exchange meetings and in an August 2019 workshop at the North Carolina Traffic Safety Conference and Expo. In follow-up to this workshop, we provided specific guidance to Transportation Planning Engineers with the Greensboro (NC) DOT, who sought to use the tools in team meetings moving forward.

4.4 Improved processes, technologies, techniques and skills in addressing transportation issues

Time to Drive (part of the [R8](#) project) continues to emphasize what parents can do to help their teen develop more quickly into an experienced, safe driver. During two-hour in-person sessions, parents view and discuss actual video clips of parents and teens during supervised driving. This helps parents understand the situations and challenges that are likely to occur during practice driving, and how they can best handle those situations.

Other developments in this area are documented in the Final Reports published by each completed project and highlighted in an "Info Brief" that is posted next to the Final Report on the CSCRS website.

4.5 Enlargement of the pool of trained transportation professionals

The Safe Systems Summit provided a huge boost in CSCRS's ability to reach out to emerging professionals; the number of student attendees is just one indication of the opportunity provided to increase this pool. Plus, CSCRS has ramped up engagement with both university and K-12 students during this period. While still difficult to measure, these student enrichment activities are anticipated to have expanded the number of interested and trained professionals in the field.

4.6 Adoption of new technologies, techniques or practices

Safe Systems and systems thinking principles, literature, and tools that emerged from CSCRS work were integrated into a [national curriculum \(module 19\) related to pedestrian and bicycle planning and design](#), funded by the FHWA Office of Safety. This course has been shared with hundreds of course instructors in planning and engineering programs across the US. The course modules are also designed to be used in other programs, such as public health, landscape architecture, and others.

David Ragland, UCB, participated in two meetings September 2019 for planning for the Governor mandated development of a California Master Plan for Aging. SafeTREC will provide input to assure that transportation mobility and safety is an integral part of the Master Plan, and, more specifically, to assure that the Master Plan is consistent with, and supports, and is supported by, the State's Vision Zero goals. Also, Ragland presented results of a project on tribal safety, including EMS response in rural areas, at the yearly Executive meeting of the California Transportation Records Coordinating Committee, August 2019. About 20-30 high ranking officials from California transportation agencies (Caltrans, Highway Patrol, Division of Motor Vehicles, California Dept of Public Health, etc.) attended.

5. Impacts

CSCRS included two performance measures related to impacts in its Technology Transfer Plan:

- Annual instances integrating CSCRS research results into agency or stakeholder practices that demonstrate use of research results in practice (see Section 5.1).
- Annual instances integrating CSCRS research results into organizational/workforce capacity building that demonstrate use of research results in capacity building activities conducted by local, regional, state or national level agencies (see Section 5.2).

5.1 Impact on the effectiveness of the transportation system

CSCRS continues seeing engagement with decision-makers in the transportation safety realm. Safe Systems concepts articulated by CSCRS are now firmly embedded in one State Highway Safety Plan, the Washington State Strategic Highway Safety Plan 2019 (in a draft reviewed by CSCRS researchers) and are being incorporated into the draft of the North Carolina Strategic Highway Safety Plan, with the assistance of CSCRS staff involved in the stakeholder committee. CSCRS Director, Laura Sandt, in November will provide a keynote address at the Louisiana State Traffic Safety Conference (at the invitation of CSCRS advisory member Dan Magri, the Louisiana DOT Lead Safety Engineer) and speak to the ways in which Safe Systems fundamentals, and CSCRS research, are being adopted in Louisiana and other states and cities.

Safe Systems principles and CSCRS research are also being adopted by for-profit transportation industry leaders, such as Bird, a micromobility service provider that referenced CSCRS work in a [Safety Self-Assessment Report](#) in April 2019.

Findings from research projects (such as R3) provided insights into Safe Systems practices and evidence of effectiveness around the world. The Safe Systems Summit provided a unique opportunity to engage various professions in the process of developing a program that would highlight both Safe Systems and systems science principles and showcase CSCRS research along with real-world practices.

5.2 Impact on the adoption of new practices, or instances where research outcomes have led to the initiation of a start-up company

CSCRS continues to build relationships with agency stakeholders around the country, creating the channels needed for implementation. Holding the Safe Systems Summit provided an opportunity to engage professionals from a wide variety of traffic safety fields.

As mentioned, because e-scooters and other micromobility devices are so new, there were no *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) codes for categorizing injuries related to these devices. Laura Sandt and Postdoctoral Research Associate Katie Harmon, in collaboration with a broad stakeholder group, proposed in June 2019 a series of new ICD-10-CM codes to be included in an updated version of ICD-10-CM, to be released in October 2020. The [poster](#) outlining the new codes was distributed to more than 1,500 individuals across the U.S. and abroad.

For the next reporting period, the planned CSCRS legislative day in October 2019 will provide an example of CSCRS efforts to provide research directly to several Congressional staffers about important transportation safety topics.

Other examples:

- Michael Clamann continues to communicate with the British company Humanising Autonomy, a start-up developing technology to predict human movement around traffic infrastructure, to create a partnership.
- The findings from the [R9](#) project have the potential to inform transportation policy based on machine learning analyses, as well as to impact the larger artificial intelligence community.
- The [R10](#) work could provide foundational information for companies and governments intending to develop autonomous vehicle dispatch centers.

5.3 Impact on the body of scientific knowledge

Using the numerous and varied methods listed previously, CSCRS is continuing efforts to contribute to the body of knowledge surrounding Safe Systems and systems-science approaches to road safety.

5.4 Impact on transportation workforce development

CSCRS's workforce development activities have been bringing people together who have not traditionally worked together, breaking down siloes and recognizing roles that technology, land-use planning and other disciplines play in safe transportation.

For example, during this reporting period, CSCRS's team coordinated a proposal for a new NCDOT Center of Excellence in Advanced Transportation Technologies, in collaboration with other NC UTCs and state universities. The proposed Center aims to leverage multi-disciplinary skills and knowledge across multiple universities towards a long-term view and cutting-edge approaches in transportation research and implementation. It would create opportunities for new projects, partnerships and work within the state and beyond focused on Safe Systems approaches to transportation safety.

Another high point of this period: Missy Cummings, Duke, was awarded the "Highway Safety Hero" award in April 2019 by Advocates for Highway Safety.

We will continue our outreach at events like the TRB Annual Meeting, national and regional conferences, webinars and other campus-specific seminars.

6. Changes/Problems

6.1 Changes in approach and reasons for change

Nothing to report.

6.2 Actual or anticipated problems or delays

Nothing to report.

6.3 Changes that have a significant impact on expenditures

Nothing to report.

6.4 Significant changes in use or care of animals, human subjects, and/or biohazards

Nothing to report.

7. Special Reporting Requirements

Nothing to report. This entire report is available on the [CSCRS website](#).