# 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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# Table of Contents

# 1. Accomplishments

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

CSCRS's Strategic Roadmap provides context for our accomplishments in this document.

## 1.2 What was accomplished under these goals?

Selected highlights for this performance period include:

- Held the first CSCRS Safe Systems Summer Learning Series featuring 6 virtual sessions exploring what's needed for Safe System approaches to satisfy community safety, health, and equity needs.
- Continued planning for and hosted the virtual National Travel Monitoring Exposition and Conference (NaTMEC), bringing in a record audience of approximately 400 attendees.
- Began work on 12 new research projects and concluded several other projects.
- Continued the CSCRS webinar series with 2 new sessions.
- Added two new members to the Advisory Board: Charles T. Brown, Founder and CEO, Equitable Cities, and Dana Magliola, Statewide Program Manager, Freight + Logistics, North Carolina Department of Transportation.
- Generated almost 30 CSCRS research-related peer-reviewed publications, multiple presentations.
- Taught 22 transportation safety-related university courses and engaged hundreds of undergraduate, graduate, and doctoral students in CSCRS research, education, and professional development projects.

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.

Work began on these new projects:

- R35: Using Safe Systems approach to assess traffic impact and land development
  - PI: Tab Combs, UNC Department of City and Regional Planning (DCRP)
  - Interview and focus group analysis underway.
- R39: Integrating systems thinking tools into Vision Zero and Safe Systems approaches
  - PI: Becky Naumann, UNC Injury Prevention Research Center (IPRC)
  - IRBs complete and initial content development and testing of materials with Philadelphia Vision Zero program and NC Safe Routes to School programs complete.
- R40: A Safe Systems approach to motorcycle safety
  - PI: Eric Dumbaugh, Florida Atlantic University (FAU)
  - Literature review nearing completion; data analysis underway.

The following projects are either complete or near completion:

- R21: A systems approach to pedestrian safety, Phase II: Examining congestion pricing policies
  - PI: Becky Naumann, IPRC / Co-PIs: Kristen Hassmiller Lich, UNC Gillings School of Global Public Health; Laura Sandt, UNC HSRC; and Steve Marshall, UNC IPRC

- R24: Developing a framework to combine the different protective features of a Safe System
    - PI: Offer Grembek, University of California, Berkeley (UCB)

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

- CSCRS launched the 2021 Safe Systems Summer Learning Series, bringing together panelists with diverse perspectives to reflect on core Safe System concepts and the broader system in which our transportation work unfolds. The free series featured 6 virtual sessions:
    - Redefining Safety, Jul. 16 (102 participants; 63 recording views)
    - What Lies Beneath "Human Error?", Jul. 23 (94 participants; 126 recording views)
    - Redesigning the System to Support Safety, Jul. 30 (83 participants; 40 recording views)
    - Broadening the Toolbox for Kinetic Energy Management, Aug. 6 (59 participants; 20 recording views)
    - Redistributing Responsibility for Safety, Aug. 13 (91 participants; 28 recording views)
    - Change Management Tools for Safe System Implementation, Aug. 27 (70 participants; 15 recording views)
- CSCRS staff planned and managed NaTMEC with the theme "Connecting Travel Monitoring to Transportation System Safety and Mobility." Approximately 400 attendees – a record for NaTMEC – participated in the virtual conference. Hosting NaTMEC provided CSCRS the opportunity to link the concepts of Safe Systems with travel monitoring. Select highlights:
    - 43 sessions including interactive online poster discussions, sponsor showcases, a virtual exhibit hall, and a social travel trivia game
    - Welcoming keynote speaker Jamila Porter, DrPH, MPH, de Beaumont Foundation, who challenged attendees to consider how redlining in the U.S. was tied to interstate construction, which is directly related to the connections we still see between traffic, congestion, and segregation.
    - Opening plenary speaker Robert Hampshire, Deputy Assistant Secretary for Research and Technology, U.S. Department of Transportation (USDOT), urged attendees to address racial equity and justice, climate, and resilience through a holistic systems approach,
    - CSCRS researchers presented multiple presentations during NaTMEC covering pedestrian safety data and data quality.
- CSCRS continued its webinar series through this reporting period with 2 new webinars:
    - Exploring the National Pedestrian and Bicycle Safety Data Clearinghouse, Apr. 28 (99 participants; 39 recording views)
    - Traffic Crashes As Seen On TV: An Opportunity to Reshape the Dialogue Around Road User Injury, Jul. 1 (72 participants; 45 recording views)
- CSCRS staff continued planning for the third annual NCDOT Research & Innovation Summit, to be held Oct. 5-6, 2021. The event will feature a plenary address exploring key themes of CSCRS's Summer Learning Series, as well as presentations from several CSCRS researchers.
- CSCRS also continued the joint webinar program between NaTMEC and the Institute of Transportation Engineers (ITE) with 1 new webinar:
    - Emerging Equipment, Technologies, and Capabilities to Address Travel Monitoring Basics and Beyond, May 17 (83 participants)
- UNC IPRC hosted the NC Vision Zero Leadership Training Institute in Jun. Attended by multidisciplinary teams from 8 NC Vision Zero cities, the workshop helped each community advance efforts in coalition building and common goal setting across agencies/organizations drawing on CSCRS research and work.

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

- CSCRS members of the Road to Zero Coalition leadership committee continued their work with that group. Plus, CSCRS researcher Wes Kumfer continued leading the Road to Zero working group *Connecting Prioritizing Safety with Transportation Equity*, which met regularly during this period to compile information to be disseminated on the organization's website.
- CSCRS continued to participate in the Safe Systems Consortium, a working group convened by the Johns Hopkins Center for Injury Research & Policy and ITE that includes CSCRS researchers and Advisory Board members that discussed principles of a systems approach to road safety. The group released its Recommendations of the Safe System Consortium report in Jun. 2021 (also outlined in this video).

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

- CSCRS continues to engage with multiple agencies, particularly in consortium member states and cities, to determine the needs of state and local governments in implementing Safe Systems. For specific projects bridging research to local practice, see Objective 2-3.

## 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.

Work began on these new projects:

- R34: COVID-19 streets: Mobility justice and the rapid rollout of pedestrian and bicyclist improvements
  - PI: Tab Combs, UNC DCRP
  - Literature review and site selection complete; data analysis beginning.
- R36: Laying the Groundwork for a National Pedestrian Injury Surveillance System
  - PI: Katherine Harmon, UNC HSRC
  - Pedestrian data collection underway; indicators under development, and key informant interviews awaiting IRB approval.
- R42: Advancing crash investigation with connected and automated vehicle data – Phase 2
  - PI: Michael Clamann, UNC HSRC
- R43: Applying AI to data sources to improve driver-pedestrian interactions at intersections
  - PI: Subhadeep Chakraborty, University of Tennessee, Knoxville (UTK)

The following projects are either complete or near completion:

- R25: Advancing crash investigation with connected and automated vehicle data
  - PI: Michael Clamann, UNC HSRC / Co-Investigator: Asad Khattak, UTK
- R26: Understanding micromobility safety behavior and standardizing safety metrics for transportation system integration
  - PI: Chris Cherry, UTK /Steve Marshall, Becky Naumann, UNC IPRC, and Susan Shaheen, UCB
- R30: Urban freight and road safety: Trends and innovative strategies
  - PI: Noreen McDonald, UNC DCRP
- R31: Crash risk for low-income and minority populations: An examination of at-risk population segments and underlying risk factors

    - PI: Diana Mitsova, FAU / Co-Investigator: Eric Dumbaugh, FAU
- R32: Applying civic innovation methods to advance safety education: A pilot program
    - PI: Eric Dumbaugh, FAU

Work continued on the following projects:

    - A survey research tool was being developed.
- R27: Safety testing for connected and automated vehicles through physical and digital iterative deployment
    - PI: Subhadeep Chakraborty, UTK / Co-Investigator: Asad J. Khattak, UTK, Co-Investigator: Mary (Missy) Cummings, Duke University
    - The second round of track testing was completed, and data analyses is underway.
- R28: Reducing motorcyclist injuries: Engaging stakeholders to apply evidence-based countermeasures
    - Jerry Everett, UTK / Co-PI: Asad Khattak, UTK
    - Met with the Tennessee Highway Safety Office staff regarding using Tennessee as a case study for shortening the implementation cycle by investigating motorcycle rider injury severity and exploring hotspot locations. Descriptive analysis is on-going.

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

Work began on these new projects:

- R38: Assessing how private beliefs conflict with public action on Safe Systems
    - PI: Seth LaJeunesse, UNC HSRC
    - Began review of literature for literature synthesis.
    - Devised a set of constructs to measure and created an outline for the survey.
- R44: Safety enhancement by detecting driver impairment through analysis of real-time volatilities
    - PI: Asad Khattak, UTK

In addition, an extension of the R29 project on media framing was launched. For this effort, IRB review was completed and research participant recruitment is underway. The team is finalizing interview guides and a code book for coding crash reports.

**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.

Work began on these new projects:

- R33: US Regional Vision Zero Implementation
    - PI: Kelly Evenson, UNC IPRC
    - MPO interviews happening this fall.
- R37: Applying AcciMap to e-Scooter Crashes: A Safe Systems approach to analyzing micromobility
    - PI: Michael Clamann, UNC HSRC
- R41: Bike-sharing as a safety intervention: Evidence from nine large US cities
    - Eric Dumbaugh, FAU
    - Preliminary data analysis complete. Article submitted to the Transportation Research Board (TRB).

Work continued on the following project:

- RR2: US Vision Zero implementation

- PI: Kelly Evenson, UNC Gillings School of Public Health / Co-I's: Seth LaJeunesse, UNC HSRC, and Becky Naumann, UNC IPRC
- 10 interviews completed, transcription and coding of themes completed, analysis ongoing.

**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. In addition to CSCRS's new Summer Learning Series, another key example was virtual speed safety workshops Offer Grembek and Lisa Peterson of UCB conducted in partnership with ITE and Vision Zero Network for 3 California communities: Kern County, Oakland, and Palmdale. UCB also drafted summary reports for each site after the workshops.

CSCRS and its partners also took part in several presentations and panel discussions surrounding road safety, including two Safe System webinars hosted by the National Transportation Safety Board (NTSB):

- May 20, CSCRS board members and researchers contributed to the roundtable "A Safe System Approach to Traffic Safety."
- Jul. 7, CSCRS Director Laura Sandt was a panelist during the discussion "A Safe System."

Table 1 highlights additional presentations made in this reporting period to disseminate research findings to diverse groups.

*Table 1: Select CSCRS outreach highlights*

| | |
|---|---|
| Duke | Cummings, Apr. 2021, University of Cincinnati Analytics Summit," Future Pitfalls & Promises of Safety in Autonomous Systems.", ~80 |
| | Cummings, Apr. 2021, Institute for Defense Analysis DATAWorks 2021 keynote speaker (virtual), "Assessing Human-Autonomy Interaction in Driving-Assist Settings." |
| | Cummings, Jul. 2021, The Smoking Tire Podcast, "Mary "Missy" Cummings - Prof., Autonomy Lab and Duke Robotics." |
| | Cummings, Jul. 2021, Scientific Sense podcast, "Rethinking the maturity of artificial intelligence in safety-critical settings" |
| | Cummings, Apr. 2021, panelist for Arizona State University's panel on "Women Leading Digital Transformation, ~70 |
| | Cummings, May 2021, Marketplace podcast, "Self-driving cars might never be able to drive themselves." |
| | Cummings, Apr. 2021, Naturalistic Decision-Making podcast, "Missy Cummings from Duke's Pratt School of Engineering." |
| | Cummings, Jul. 2021, panelist for Collaborative Sciences Center for Road Safety Safe Systems Summer Learning Series, "What Lies Beneath Human Error" |
| | Cummings, Jun. 2021, Factually podcast, "Why Self-Driving Cars Aren't Coming Any Time Soon with Dr. Missy Cummings." |
| | Cummings, May 2021, Progress, Potential and Possibilities podcast, "Engineering A Safer World For Humans With Self Driving Cars, Drones, and Robots". |
| | Bauchwitz, Sep. 2021, CMU presentation "Evaluating Reliability of Driver Assist Functions in the Tesla Model 3", ~80 |
| | Bauchwitz, Sep. 2021, presentation to Lockheed Martin: "Modeling Risk for Autonomous Systems with Shared Authority". ~5 |
| FAU | Dumbaugh, E. "A Safe Systems Approach to Pedestrian and Bicycle Safety." Broward County Complete Streets Task Force. Apr. 22, 2021. |
| UCB | Apr. 14, Grembek presented in the "Roadway Safety Townhall: Equitable Solutions for Traffic Safety". (428 views of the Facebook live video) |
| | Aug. 8, Grembek and Vayalamkuzhi presented "Development of California-specific Safety Performance Functions" at the ITS CA Conference. |
| | Aug. 17, Grembek presented, "The Advantages of Developing and Using California-Specific Safety Performance Functions for Safety Analysis") at the virtual ATSIP Traffic Records Forum 2021. |
| | Aug. 19, Grembek presented: "Highway Crashes in California During the COVID-19 Pandemic: Insights and Considerations") at the virtual ATSIP Traffic Records Forum 2021. |
| | Aug. 20, Ragland, presented: " Crash Data Tools for Tribal Areas in California" at the virtual ATSIP Traffic Records Forum 2021 https://www.atsip.org/traffic-records-forum/). David received the ATSIP Traffic Records Forum Best Practices Award. |
| | May 20, Grembek presented to the CA SHSP Steering Committee about ""The Safe System Approach: Considerations for Strategic Safety." |
| | Jun. 17, Grembek presented to the CA SHSP Steering Committee about "The Safe System Approach: Case Studies and Implementation |
| | On Jul. 7 and Aug. 5, Ragland presented at the North Coast Tribal Transportation Commission (NCTTC). The presentation provided the data to prepare for a partnership between NCTTC tribes and Humboldt County for reducing road departure crashes within and in the vicinity of tribes. In this project we worked with representatives with Caltrans, FHWA, and Humboldt County. The project has evolved based on the observation that patterns of road departure crashes are similar are roads within and between tribes, suggesting that state/county governments and tribes can benefit through working partnerships. |
| | Clamann presented on R25 to the North Carolina Fully Autonomous Vehicle Committee. |

| | |
|---|---|
| UNC | Combs (Jul. 8). "COVID-19 Mobility Adaptations: Building a knowledge base for new practices." Webinar, Eno Transportation Center. |
| | Combs, Ainsley, Logan, Cantor (Jun. 9). "Open Streets – what happened, what did we learn and what's next?" Webinar, America Walks. |
| | Combs (Apr. 1). Bike Here Podcast. Shifting streets during COVID-19. (Apr. 1, 2021. Episode 17). Retrieved Apr 5, 2021. Host: Greenwald, A. |
| | LaJeunesse was a panelist during the Sep. 9 webinar "The Many Faces of Environmental (In)Justice: Scholarship Addressing Racism, Infrastructure and Climate Action," hosted by the UNC Office for Diversity and Inclusion. |
| | McDonald, UNC DCRP, presented in an ITE Annual Meeting Power Plenary Session on Jul. 22, 2021, exploring a post COVID-19 society through a transportation lens. |
| | Naumann (Aug. 3). Systems analysis of NYC congestion pricing policy and pedestrian safety. Centers for Disease Control and Prevention Reverse Site Visit to UNC-Chapel Hill. |
| | Naumann, Hassmiller Lich , Scott (Jun. 8 -9). Goal and action alignment mapping and synthesis. Southeastern and Southwestern Injury Prevention Network and Systems Thinking National Peer Learning Team Joint Annual Meeting. Two virtual workshops on map creation and synthesis. |
| | Keefe (Jul. 22). Assessing Community Readiness for Vision Zero in North Carolina. Presentation as a part of the NC Traffic Safety Conference & Expo. |
| | Sandt (Sep. 24). The Role of Behavioral Highway Safety in the Safe Systems Approach. Virtual Expert Panel Meeting. Governor's Highway Safety Association. |
| | Sandt (Sept. 22). Integration of Equity into Safe Systems Policy, Programming, and Design. Panel meeting at the ACS10 Mid-Year Meeting. |
| | Sandt (July 7). A Safe System. NTSB panel. |

## 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. (Note: Many of these continued to be virtual classes.) Highlights:

- UCB Spring – Fall 2021 graduate courses:
  - Injury Prevention and Control. Instructors: David Ragland & Glenn Shor. (5 students)
  - Traffic Safety and Injury Control. Instructors: David Ragland & Offer Grembek. (5 students)
  - Transportation Sustainability. Instructor: Susan Shaheen. (38 students)
  - Quantitative Reasoning for Planners. Instructor: Daniel Rodriguez. (37 students)
- UNC DCRP Spring – Fall 2021 graduate courses:
  - Complete, Safe, Equitable Streets. Instructor: Instructor: Tab Combs. (24 students)
  - Field skills for road safety professionals: new course presented with Town of Chapel Hill to introduce students to identifying, evaluating, and addressing road safety disparities. Instructor: Tab Combs, with CSCRS guest lecturers Seth LaJeunesse, Wes Kumfer. (12 students)
- UNC IPRC Fall 2021 graduate course: Injury as a Public Health Problem. Instructor: Becky Naumann, with CSCRS guest lecturer Katie Harmon. (12 students)
- UTK's Civil and Environmental Engineering faculty offered 11 transportation engineering courses during Spring – Fall 2021 covering transportation engineering I, transportation engineering II, transportation engineering lab, transportation seminar, traffic engineering: characteristics, intelligent transportation systems, analysis techniques for transportation systems i, transportation engineering i, transportation policy and economics, transportation safety, analysis techniques for transportation systems II. (Enrollment varies)
- Duke introduced a new course on cybersecurity with autonomous vehicle elements.

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

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

*Table 2: Select CSCRS student engagement activities*

| | |
|---|---|
| UCB | 5 students enrolled in an independent research component during which they prepare a paper for publication. |
| | 1 graduate student worked on R38. |
| Duke | 1 research assistantship, 2 graduate students, 3 undergraduate students and 1 high school student worked on R27. |
| FAU | 1 research assistantship worked on R30 / R40. |
| UNC | 1 master's student worked on R36. |
| | 1 research assistantship for R34. |
| | 1 research assistantship for R35. |
| | 1 PhD research assistantship for R21. |
| | 1 PhD student and 4 master's students worked on data linkage and Vision Zero projects. |
| | 1 master's student practicum in Health Behavior (School of Public Health) completed (200-hour requirement). |
| | 2 master's students worked on R33. |
| UTK | 1 postdoc worked with Dr. Khattak on CSCRS research. |
| | 1 undergraduate student worked on crashes involving Tesla vehicles & created a unique database. |
| | 4 UTK-ITE meetings were held to discuss student activities accompanied with presentation by practicing engineers. Those activities included:<br>• 13 graduate students worked with faculty on CSCRS research projects and prepared papers for the TRB Annual Meeting.<br>• Iman Mahdinia, graduate student at UTK, won the TSITE Billy Hart Scholarship.<br>• Amin Mohammadnazar and Iman Mahdinia represented the Civil and Environmental Engineering Department in the Graduate Student Senate.<br>• 2 joint ITE meetings were held with University of Maryland, College Park and Texas A&M University.<br>• UTK ITE participated in the 2021 Southern District ITE Traffic Bowl competition. |

**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.

- UCB researchers mentored 4 graduate students as part of CSCRS Road Safety Graduate Student Fellowships, to generate high quality CSCRS research pertaining to road safety topics.
- UCB also held weekly graduate student researcher group meetings that 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. These meetings included 5 graduate students from City and Regional Planning, Transportation Engineering, and Engineering and Project Management.
- UCB's SafeTREC held Friday traffic safety seminars including the Apr. 30, 2021, presentation by Laura Sandt, "Micromobility: A Dynamic Safety Research Landscape." (18 participants)
- UTK held 2 transportation engineering seminar series in the Spring 2021 and Fall 2021 semesters.
- CSCRS continued to update its Jobs Board of student and post-graduation opportunities.

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

- While the continuing impacts of the COVID-19 pandemic made it difficult to engage in K-12 education activities during this period, CSCRS continued to explore new opportunities, with plans to get involved more in the next reporting period. In particular, UTK's teen safety program has been successful in impacting young driver safety, particularly the use of the Seat Belt Convincer.

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

Myriad teaching, training, and learning opportunities have been showcased in this report (see Table 1 and 2).

## 1.4 How have the results been disseminated?

Results are being disseminated in accordance with the CSCRS Technology Transfer Plan. 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 666 followers. A recent month's analytics showed 21,300 impressions. Staff also maintained the CSCRS Facebook page. CSCRS staff updated project descriptions, titles, and end dates on the CSCRS website and in the TRB Research in Progress (RiP) Database, tagged as UTC research. CSCRS researchers engaged with the Advisory Board. 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?

CSCRS is evaluating research opportunities and needs and will continue implementation of its strategic research agenda. The following section provides additional examples of what CSCRS plans to complete during the next reporting period (10/1/2021-3/31/21) to accomplish its goals:

- **Research activities planned**:
  - Completion, posting, and reporting of several current CSCRS research projects will continue.
- **Professional development activities planned**:
  - Continue planning and hold the third annual NCDOT Research & Innovation Summit, Oct. 5-6, 2021.
  - Continuation of the CSCRS Webinar series; the next webinar is expected to be held in Dec. 2021.
  - Plan for significant participation by way of presentations, workshops, and committee meetings in the TRB 101st Annual Meeting, Jan. 2022.
  - FAU will present on Safe Systems to the Florida Department of Transportation through its Transplex training series.
  - FAU will work with the agency to integrate results of R31 into its Context Classification Guide.
  - Tab Combs, UNC DCRP, will present findings from COVID-induced street changes to representatives from the Virginia Department of Transportation and legislature.
  - UNC DCRP will host communications and marketing expert Tom Flood for a Nov. 2021 virtual public lecture on effective messaging for local ped/bike safety campaigns.
  - Results of R21 will be presented to New York City stakeholders (including public health leaders) and at the Society for Advancement of Injury and Research.
  - Seth LaJeunesse, UNC HSRC, will work on developing the web resource "Safe Systems Measurement Lab."
  - UTK will continue training and connections with practice through TN Local Technical Assistance Program, housed at UTK Center for Transportation Research.
  - UTK will continue working on transportation issues with the TennSMART consortium board, which has members from the private sector, public sector, and academia.
- **Teaching and student enrichment activities planned**:
  - Nominate a student to be CSCRS's 2021 Student of the Year.
  - Continue planning and hold the third annual NCDOT Research & Innovation Summit, Oct. 5-6, 2021.
  - Present the webinar Public Health, Economic Growth, Leisure: How transportation research impacts all our lives, every day, targeted to budding researchers, on Nov. 10 as part of UNC Research Week.
  - UCB will introduce round 7 of the UCB CSCRS Graduate Student fellowship program.
  - Plan for significant student participation in the TRB 101st Annual Meeting.
  - Teach several college courses, as well as incorporate CSCRS research findings and opportunities into other/existing courses and seminars.
  - Plan for participating in the 2022 North Carolina Science Festival.

In addition to activities specific to the 3 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, and developing efficient project management systems.

Some staffing changes, including the departure of UNC HSRC's director Dr. Radwan and senior research associate Dr. Clamann and the appointment of Dr. Cummings to a senior NHTSA adviser role, will lead to new responsibilities for other CSCRS researchers and the opportunity to add new researchers to the team.

# 2. Participants and Collaborating Organizations

## 2.1 What organizations have been involved as partners?

The following organizations have been involved as CSCRS partners:

*Table 3: Select CSCRS Collaborator and Sponsor Organizations*

| |
|---|
| **Business** |
| AT&T Fleet Complete, Atlanta, GA (Financial Support) |
| SoftServe, Inc., Austin, TX (Collaborative Support) |
| PhD Posters, Durham, NC (Financial Support) |
| Toyota Motor North America, Saline, MI (Financial Support) |
| Uber, San Francisco, CA (Financial Support) |
| VHB, Watertown, MA (Financial Support) |
| Volkswagen Group of America, Herndon, VA (Collaborative Support) |
| **Foundation** |
| *New this period: AAA Foundation for Traffic Safety, Washington, DC (Collaborative Support) |
| *New this period: de Beaumont Foundation, Bethesda, MD (Collaborative Support) |
| 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** |
| 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) |
| 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 (Collaborative Support) |
| 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) |
| 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) |
| Safe States, Atlanta, GA (Collaborative Support) |
| Transportation Research Board Standing Committee on Transportation Safety Management, Washington, DC (Collaborative Support) |

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|---|
| 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 Center for Medical Outcomes, California Department of Public Health, Sacramento, CA (Collaborative Support, Data Request) |
| Florida Department of Transportation (Collaborative Support) |
| North Carolina Division of Public Health, Raleigh, NC (Collaborative Support) |
| North Carolina Department of Transportation, Raleigh, NC (Financial Support) |
| North Carolina Governor's Highway Safety Program, Raleigh, NC (Collaborative and Financial Support) |
| North Carolina Turnpike Authority, Raleigh, NC (Collaborative 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 Aveiro |
| University of Miami |
| University of Tennessee, Chattanooga, TN (Collaborative Support) |
| Various Jiaotong Universities in China (Collaborative Support) |
| North Carolina Central University, Durham, NC (Collaborative Support) |
| Tennessee Technological University, Cookville, TN |

## 2.2 Have other collaborators or contacts been involved?

Nothing to report beyond the table above.

# 3. Outputs

CSCRS included 2 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.

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

Presentations given during this reporting period are summarized in Table 1 of this report. Following are select highlights of publications produced by CSCRS team members:

*Table 4: Select CSCRS publications*

| Peer-Reviewed Publications |
|---|
| Fu X., Q. Nie, J. Liu, A. Khattak, A. Hainen, & S. Nambisan, Constructing spatiotemporal driving volatility profiles for connected and automated vehicles in existing highway networks, Journal of Intelligent Transportation Systems, 1-14. |
| Jerome, Z., Arvin, R., & Khattak, A. J. (2021). Analyzing drivers' hazard recognition: Precursors to single-vehicle collisions. Accident Analysis & Prevention, 160, 106304. |
| Mohammadi S., R. Arvin, A. Khattak, & S. Chakraborty, The role of drivers' social interactions in their driving behavior: Empirical evidence and implications for car-following and traffic flow, Transportation Research Part F: Traffic Psychology and Behaviour 80, 2021, pp. 203-217. |
| Wei C., Fei Hui, & A. Khattak, "Driver Lane-Changing Behavior Prediction Based on Deep Learning", Journal of Advanced Transportation, Vol. 2021, Article ID 6676092, 2021. |
| Ahmad, N., Arvin, R., & Khattak, A. Exploring non-linear Effects of Distraction Duration on Driving Instability and Safety Critical Events. In Review. Journal of Accident Analysis and Prevention. |
| Ahmad, N., Arvin, R., & Khattak, A. Exploring Pathways from Driving Errors and Violations to Crashes: The Role of Speed Volatility. In Review. Journal of Accident Analysis and Prevention |
| Ahmad, N., King, M., & Khattak, A. Understanding the Survivability of Tesla Driver in Fatal Crashes: The role of Autopilot and Driver Errors. In preparation. |
| Ahmad, N., Wali, B., Khattak, A. J., & Dumbaugh, E. (2021). Built environment, driving errors and violations, and crashes in naturalistic driving environment. Accident Analysis & Prevention, 157, 106158. |
| Arvin R., A. Khattak, & H. Qi, Safety critical event prediction through unified analysis of driver & vehicle volatilities: Application of deep learning methods, Accident Analysis & Prevention, 151, 2021, 105949. " |
| Bardaka, E., Frey, C., Hajbabaie , A., List, G., Rouphail, N., Williams, B., Cummings, M., Hasnat, M., Samandar, S., Sharma, S, Das, T., Tajalli, M., & W. Yuan, "Impacts of Autonomous Vehicle Technology on Transportation Systems," North Carolina Department of Transportation, Report # 2019-11. |
| Bauchwitz, B. and M.L.Cummings, "Individual Vehicle Differences Dominate Variation in ADAS Takeover Alert Behavior" TRB, in review. |
| Carvajal, G. A., Sarmiento, O. L., Medaglia, A. L., Cabrales, S., Rodriguez, D. A., Quistberg, D. A., & Lopez, S. (2020). Bicycle safety in Bogota: A seven-year analysis of bicyclists' collisions and fatalities. Accident Analysis and Prevention, 144. doi:10.1016/j.aap.2020.105596 |
| Cummings, M.L. & B. Bauchwitz, "Safety Implications of Variability in Autonomous Driving Assist Alerting", IEEE Transactions on Intelligent Transportation Systems, in press. |
| Dannenberg, A. L., Rodriguez, D. A., & Sandt, L. S. (2021). Advancing research in transportation and public health: A selection of twenty project ideas from a U.S. research roadmap. Journal of Transport & Health, 21, 101021. doi:https://doi.org/10.1016/j.jth.2021.101021 |
| Dumbaugh, E. and D. Saha. (2021). The Traffic Safety Impacts of Transit Service on Freight Corridors: A Comparative Examination of Orlando SunRail and Charlotte Lynx. Case Studies in Transport Policy. |
| Jing S. X. Zhao, Fei Hui, A. Khattak & L. Yang, Cooperative CAVs optimal trajectory planning for collision avoidance and merging in the weaving section, Transportmetrica B: Transport Dynamics, Volume 9, Issue 1, 2021, pp. 219-236. |
| Kephart, J. L., Delclòs-Alió, X., Rodríguez, D. A., Sarmiento, O. L., Barrientos-Gutiérrez, T., Ramirez-Zea, M., . . . Diez Roux, A. V. (2021). The effect of population mobility on COVID-19 incidence in 314 Latin American cities: a longitudinal ecological study with mobile phone location data. The Lancet Digital Health. doi:https://doi.org/10.1016/S2589-7500(21)00174-6 |
| Khattak Z., M. Fontaine, W. Li, A. Khattak, & T Karnowski, Investigating the relation between instantaneous driving decisions and safety critical events in naturalistic driving environment, Accident Analysis & Prevention 156, 106086, 2021 " |
| Lee, S., Ahmad, N., Everett, J., & Khattak, A. Strategies for Reducing Motorcyclist Injuries in Tennessee: Relevance of Evidence-Based Countermeasures that work. In preparation. |
| Mohammadnazar, A., Mahdinia, I., Ahmad, N., Khattak, A. J., & Liu, J. (2021). Understanding how relationships between crash frequency and correlates vary for multilane rural highways: Estimating geographically and temporally weighted regression models. Accident Analysis & Prevention, 157, 106146. |
| Pardo, C. & Combs, T. (2021, April 12). What we learned after analyzing 5 months of Active Mobility Responses to COVID-19. TheCityFix. https://thecityfix.com/blog/what-we-learned-after-analyzing-5-months-of-active-mobility-responses-to-covid-19/?utm_source=twitter&utm_medium=numoalliance&utm_campaign=socialmedia&utm_term=e5877aaf-2948-4019-8601-4d8939e066dc |
| Parker, M. E. G., Li, M., Bouzaghrane, M. A., Obeid, H., Hayes, D., Frick, K. T., . . . Chatman, D. G. (2021). Public transit use in the United States in the era of COVID-19: Transit riders' travel behavior in the COVID-19 impact and recovery period. Transport Policy, 111, 53-62. doi:https://doi.org/10.1016/j.tranpol.2021.07.005 |
| Saha, D. and E. Dumbaugh. (2021) "Use of a Model-based Gradient Boosting Framework to Assess Spatial and Non-Linear Effects of Variables on Pedestrian Crash Frequency as Macro-Level. Journal of Transportation Safety and Security. |
| Shah, N. R., Aryal, S., Wen, Y., & Cherry, C. R. (2021). Comparison of motor vehicle-involved e-scooter and bicycle crashes using standardized crash typology. Journal of safety research. |
| Singichetti B, Conklin JL, Hassmiller Lich K, Sabounchi N, Naumann RB. Congestion pricing policies and safety implications: a scoping review. Journal of Urban Health. 2021. In press. |
| Wali B., A. Khattak, & J. Liu Heterogeneity assessment in incident duration modelling: Implications for development of practical strategies for small & large scale incidents, Journal of Intelligent Transportation Systems, 1-16. |
| Wali, B., Ahmad, N., & Khattak, A. Towards Better Measurement of Traffic Injuries – Comparison of Anatomical Injury Measures in Predicting Poor Clinical Outcomes in Motorcycle Crashes. Journal of Safety Research. |

## 3.2 Policy Papers

- None during this reporting period.

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

- Created A systems approach to pedestrian safety: Examining congestion pricing policies, a model interface that allows users to explore potential pedestrian safety impacts of a congestion pricing policy (developed as part of R21).
- The NC Transportation Safety & Public Health Data Dashboard was launched, taking a public health approach to examining motor vehicle crashes.
- Videos of the Duke research team evaluating the behavior of vehicles in various partially automated driving situations were showcased on the R27 site.
- An updated list of e-scooter fatalities (Apr. 2021) was posted (produced as part of R26).
- The Shifting Streets Dataset continues to be updated with new data; latest data release was Sep. 2021.
- Continued to update Vision Zero Plan Guide repository. The library is included on the Vision Zero Network website.
- Implemented updates and improvements to the National Pedestrian and Bicycle Safety Data Clearinghouse.

## 3.4 New methodologies, technologies, or techniques

Duke developed a device for measuring vehicle heading, acceleration, steering wheel position, temperature, and ambient light.

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 2 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 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 (see Section 4.6).

## 4.1 Increased understanding and awareness of transportation issues

CSCRS staff engaged with high-profile and local media outlets. Key examples:

- Missy Cummings, Duke was interviewed by and featured in numerous media outlets regarding the safety of automated driving systems.
- The history of UNC IPRC's work dedicated to traffic safety was outlined in Stopping Harm Before It Starts, an article published in UNC's *Endeavors* magazine on Jul. 22, 2001.

- Noreen McDonald, UNC DCRP, was interviewed by WCNC Charlotte for a Jun. 8, 2021, article on Charlotte, NC's transportation system.
- Michael Clamann, UNC HSRC, was interviewed for the Sep. 10, 2021 piece Are Robots Coming to a Sidewalk Near You? for *Next City*.
- Offer Grembek, UCB, was interviewed for the following:
    - Apr. 20, 2021, "Speed safety cameras would make school zones safer" in Cal Matters.
    - May 24, 2021, "Should SUVs Get a Pedestrian Warning Label?" in Bloomberg CityLab.
    - Jun. 3, 2021, "A new proposed warning label for cars could protect pedestrians" for Scripps National News.
    - Sep. 21, 2021, "Oakland's roadways are among the deadliest in California. Help us investigate why." For Oaklandside.
- On Jun. 22, 2021, CSCRS Road Safety Fellow Alejo Alvarado, UCB, was interviewed for "Traffic deaths increased during the pandemic. The toll fell more heavily on Black residents, report shows." for The Washington Post. Alvarado's final graduate school project was "The Racial Equity Implications of Road Safety Enforcement in Oakland, CA."

In addition, CSCRS publications related to automated vehicles and pedestrian safety, as well as COVID mobility changes, received several academic citations. Beyond that, CSCRS continues to coordinate with other key stakeholder groups and national initiatives in order to share research and to increase understanding of key transportation issues.

## 4.2 Passage of new policies, regulation, rulemaking, or legislation

While the bipartisan Infrastructure Investment and Jobs Act ultimately passed after this reporting period, it contains many provisions CSCRS and its partners and advisory board members have been providing information and conducting research around for years and have been the focus of multiple CSCRS research projects as well as a Safe Systems Consortium recommendations report, which involved many CSCRS representatives. Key examples:

- Implementation of the Safe System approach in roadway design, acknowledging that people make mistakes, and the cost of those mistakes should not be death.
- Prioritizing safe mobility for all roadway users, including vulnerable road users like pedestrians and cyclists
- A Safe Streets and Roads for All grant program that will provide funding to states and localities to develop or implement Vision Zero and Toward Zero Deaths plans.

Also, on May 3, Congressman David Price (NC-04) gave a special talk during Tab Combs's Complete, Safe, Equitable Streets course for UNC DCRP. Rep. Price discussed Congressional transportation policies and priorities and growing recognition of Safe Systems in federal transportation policy.

## 4.3 Increases in the body of knowledge

CSCRS researchers supported the increase in transportation safety knowledge in a variety of ways, documented throughout this report. Beyond these, CSCRS's contributions to the body of scientific knowledge continue to build. Final reports (distilled down into easily digestible research briefs), numerous journal articles, regular presentations at professional conferences, webinars, and many more dissemination avenues are continually increasing CSCRS's reach.

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

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

## 4.5 Enlargement of the pool of trained transportation professionals

CSCRS's university programs and student activities continue to attract new students to each campus, even virtually, and enlarge the pool of future professionals that are invested in improving safety. The presentations and other tech transfer activities implemented are also anticipated to have expanded the number of trained professionals in the field.

## 4.6 Adoption of new technologies, techniques, or practices

As we have previously reported, we continue to see a deepening of Safe Systems and systems thinking principles, literature, and tools that emerged from CSCRS being integrated broadly into policies and practices observed at national, state, and local levels. CSCRS leadership through the Road to Zero Coalition has directly influenced Safe Systems literature developed and shared widely by ITE, and our research reports are integrated into their Safe Systems professional development resource hub as well as their Safe Systems Action Plan.

Some projects have resulted in specific actions taken in the states in which CSCRS consortium members are performing research in collaboration with state and local partners. For example, David Ragland and other staff at UCB SafeTREC participated in multiple meetings of the California Strategic Highway Safety Plan (SHSP). Meetings covered aging drivers, emergency medical systems, road departure, pedestrian safety, and equity. Through these meetings they were able to reach out and interact with partners from a large number of state agencies and various interest groups. Jill Cooper, Katherine Chen, Lisa Peterson, and David Ragland, all of UCB, participated in the Traffic Records Coordinating Committee (TRCC) in the past six months. In meeting in May and June, the committee dealt with issues such as improving data collection and access, developing coordinating data systems, and using data to develop effective programs for improving road safety. Additionally, Eric Dumbaugh, FAU, was invited to assist the Florida Department of Transportation in updating the Context Classification Guide to better account for the safety of lower-income, minority, and vulnerable populations.

# 5. Impacts

CSCRS included 2 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

Findings from CSCRS research projects provided insights into Safe Systems practices and evidence of effectiveness around the world. CSCRS continues seeing engagement with decision-makers in the transportation safety realm and adoption of Safe Systems methods and tools developed by our consortium members (described in Section 4.6). The ability to estimate specific impacts of these policy changes will require time and additional resources, but we anticipate positive safety effects based on prior research findings and the experiences in other countries.

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

No start-up activities to report. CSCRS is still in the process of being able to measure the impact of the adoption of new practices described in Section 4.6. We continue working with communities to design and put into place evaluation frameworks and data collection efforts needed to estimate impacts in the future.

## 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.

One particularly notable development that was in the works during this reporting period was the appointment of CSCRS researcher Missy Cummings as a new senior adviser for safety at NHTSA. Cummings's CSCRS research on automated driving systems has been widely respected and acknowledged in the road safety field, and a NHTSA statement reported that the plan was to leverage "her experience and leadership in safety and autonomous technologies."

Evidence of our impact on the body of scientific knowledge can be found through other appointments that recognize our expertise and provide opportunities to influence scientific discourse. New appointments this reporting period, as well as other recognitions of our work, include:

- The Shifting Streets Dataset, created by Tab Combs, UNC DCRP, has been used to inform multiple studies, including several masters projects completed during the reporting period, and is the foundation for a National Institutes of Health proposal in preparation on the built environment and health.
- As mentioned, David Ragland and other staff at UCB SafeTREC participated in multiple meeting of the California Strategic Highway Safety Plan (SHSP).
- Becky Naumann, UNC IPRC, was invited back to guest lecture again on systems thinking and road safety practice at Clemson University.
- As mentioned, Eric Dumbaugh, FAU, was invited to assist the Florida Department of Transportation in updating the Context Classification Guide to better account for the safety of lower-income, minority, and vulnerable populations.
- Wes Kumfer, UNC HSRC, was invited to be the Transport Safety Section Editor for the upcoming article collection "Vision Zero: The safe system approach and traffic safety culture" for the journal Frontiers in Future Transportation.
- Offer Grembek, UCB, served as a member of the following organizations:
    - Steering Committee, California Strategic Highway Safety Plan
    - Bay Area Vision Zero Working Group
    - Metropolitan Transportation Commission (MTC)
    - Road to Zero Safe System Implementation Working Group
    - ITE
    - TRB Standing Committee on Transportation Safety Management Systems
- Asad Khattak, UTK, continued serving as a Board Member of TennSMART, a consortium of transportation CEOs, research institutions, and government officials. Dr. Khattak's leadership activities also include:
    - Matching projects that involve working with the Tennessee Department of Transportation (TDOT) on implementing Highway Safety Manual procedures in Tennessee.

    - Working with TDOT on connected and automated vehicle technologies; project also involves working collaboratively with faculty from UTK Mechanical Engineering Department, Electrical Engineering Department at University of Tennessee, Chattanooga.
    - Serving as a member of TRB's Standing Committee on User Information Systems and the Standing Committee on Traveler Behavior and Values.
    - Serving as editor-in-chief of the Journal of Intelligent Transportation Systems and associate editor of the International Journal of Sustainable Transportation. In this reporting period, a special issue of the journal was published featuring an article with Dr. David Yang and Dr. Donald Fisher on "Safety impacts and benefits of connected and automated vehicles: How real are they?"
    - Serving as special adviser to the Journal of Transportation Safety & Security & Advisory Board Member of Analytic Methods in Accident Research.
    - Serving on the advisory board of TEMA, the Centre for Mechanical Technology and Automation at University of Aveiro in Portugal.
- Chris Cherry, UTK, has chaired or is a member of the following committees:
    - SAE's Powered Micromobility Committee
    - Bird's Global Safety Advisory Board
    - TRB's Emerging Vehicles for Low Speed Transportation joint subcommittee
- Jerry Everett, UTK, served as the coordinator of the Tennessee Travel Demand User's Group, which aims to improve modeling and forecasting capabilities within the state. The group is a collaboration between the universities, TDOT, FHWA, MPOs, consultants, and other organizations.
- Subhadeep Chakraborty, UTK, served as a Member of IEEE.

### 5.4 Impact on transportation workforce development

CSCRS's continuing 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. With the Summer Learning Series, CSCRS continued expanding its connections with new audiences to help explore what road safety means for transportation access and mobility justice.

In addition, CSCRS's continuing work with the NC Transportation Center of Excellence in Advanced Technology Safety and Policy, in collaboration with other NC UTCs and state universities, leverages multi-disciplinary skills and knowledge towards a long-term view and cutting-edge approaches in transportation research and implementation. Developments during this period including more work exploring advanced technologies and data readiness.

In a related effort, planning for the 2021 NCDOT Research & Innovation Summit involved workforce development and brought together different stakeholders to discuss innovative research, technologies, and other issues. We will continue our outreach via webinars, virtual events, and other campus-specific seminars.

## 6. Changes/Problems

### 6.1 Changes in approach and reasons for change

While the COVID-19 pandemic continued to impact CSCRS transportation research and engagement activities, CSCRS continued adapting to these changes throughout this reporting period. Planning continued for CSCRS-managed virtual events, such as NaTMEC. Plus, CSCRS researchers and staff continued to participate and present in several virtual meetings and events.

Some CSCRS staff changes that took shape during this reporting period will provide the opportunity to bring in new voices and deepen connections.

## 6.2 Actual or anticipated problems or delays

Key examples of COVID-19 related disruptions that occurred during this reporting period (though to a lesser degree than in previous reporting periods) include:

- Cancellation or postponement of in-person training, conferences, and workshops.
- Issues related to in-person data collection (see section 6.4).
- International student recruitments have been affected partly due to the closure of U.S. missions abroad. This is envisioned to be offset by greater efforts for recruitment of domestic students.
- Delays in CSCRS communications and processing of final reports due to staff limitations or reduced staff/student hours.
- Opportunities for engagement with K-12 continued to be sparse due to cancellation or postponement of STEM projects due to school closures.
- Delay or cancellation of state or local match-funded projects.

The departure of UNC HSRC's director in October 2021 temporarily caused delays including those related to CSCRS reporting requirements. Moving forward, new leadership and administrative staff are in place and this change is not expected to cause additional delays.

## 6.3 Changes that have a significant impact on expenditures

Costs associated with rescheduling and reformatting the NaTMEC conference to a virtual event in June 2021.

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

The pandemic caused temporary freezes on data collection requiring close contact with human subjects, such as simulator-based research and intercept-survey studies, and university requirements for IRB application resubmission/reapproval. In addition, there have been temporary freezes on data collection requiring close contact with research team members, such as in-vehicle experiments and automated vehicle testing. School-based STEM activities and other community-based events have been rescheduled or put on hold as schools were closed or operate virtually and communities continue social distancing efforts.

# 7. Special Reporting Requirements

Nothing to report. This entire report is available on the CSCRS website.