



Program Progress Performance 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.

PPPR #3 reporting period: 4/1/18 - 9/30/18

Grant No. 69A3551747113

DUNS: 608195277

EIN: 56-600-1393

Project/grant period: 11/30/16 - 9/30/22

Submitted to:

Robin Kline, Grant Manager

University Transportation Centers Program (RDT-30)

Office of the Assistant Secretary for Research and Technology

U.S. Department of Transportation

1200 New Jersey Avenue, SE, Work Station E33-466

Washington, DC 20590-0001

Submitted by:

Collaborative Sciences Center for Road Safety

Laura Sandt Ph.D., Center Director



sandt@hsrc.unc.edu

919-962-2358

Submission date: October 30, 2018

Table of Contents

1. Accomplishments	3
1.1 What are the major goals and objectives of the program?	3
1.2 What was accomplished under these goals?	4
1.3 What opportunities for training and professional development has the program provided?	10
1.4 How have the results been disseminated?	10
1.5 What do you plan to do during the next reporting period?	11
2. Products	13
2.1 Publications, conference papers, and presentations	13
2.2 Website(s) or other Internet site(s)	15
2.3 Technologies or techniques	15
2.4 Inventions, patent applications, and/or licenses	15
2.5 Other products	15
3. Participants and Collaborating Organizations	16
3.1 What organizations have been involved as partners?	16
3.2 Have other collaborators or contacts been involved?	17
4. Impact	17
4.1 Impact on the development of the principle discipline(s) of the program	17
4.2 Impact on other disciplines	18
4.3 Impact on the development of transportation workforce development	18
4.4 Impact on physical, institutional, and information resources	19
4.5 Impact on technology transfer	19
4.6 Impact on society beyond science and technology	19
5. Changes/Problems	19
5.1 Changes in approach and reasons for change	19
5.2 Actual or anticipated problems or delays	20
5.3 Changes that have a significant impact on expenditures	20
5.4 Significant changes in use or care of animals, human subjects, and/or biohazards	20
6. Special Reporting Requirements	20

1. Accomplishments

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

Per our Strategic Roadmap, established in 2018 with the input from executive leadership and the Advisory Board, CSCRS activities are aligned with three major goals, each of which has a number of strategic objectives aimed at advancing transportation safety.

- **Goal 1:** Safe Systems and systems science principles and approaches are shared, understood, and adopted by traffic safety professionals (traditional and nontraditional) and stakeholders.
 - **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.
 - **Objective 1-2:** Lead training, outreach, and professional development related to Safe Systems approach and related policies and practices.
 - **Objective 1-3:** Integrate Safe Systems principles into other road safety/public health/planning initiatives.
 - **Objective 1-4:** Facilitate states and cities in implementing a Safe Systems approach in different contexts, utilizing the tools and research from CSCRS.

- **Goal 2:** Cutting-edge research, tools, data, and resources—compatible with a Safe Systems approach—are developed and utilized by professionals and the public at large to better understand and address existing and emerging road safety issues.
 - **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.
 - **Objective 2-2:** Develop research-driven tools, resources, and data sets to support problem identification and understanding.
 - **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.
 - **Objective 2-4:** Broadly disseminate research products and findings, with emphasis on reaching new and non-traditional audiences.

- **Goal 3:** A growing body of students and future leaders are engaged and well-trained in road safety principles, Safe Systems approaches, and systems science methods.
 - **Objective 3-1:** Develop and deliver courses at consortium member universities that integrate CSCRS concepts to help students analyze and evaluate road safety issues, principles, processes/procedures; understand their role in a multidisciplinary, Safe Systems approach; and apply innovative tools, methods, and solutions.
 - **Objective 3-2:** Engage students at all consortium member campuses through student-directed activities and professional opportunities.
 - **Objective 3-3:** Develop mentorship and internship opportunities for students to engage in critical thinking about road safety issues from a variety of disciplinary perspectives and connect with traditional and non-traditional partners.
 - **Objective 3-4:** Provide exposure to road safety principles in K-12 settings, to enhance early interest in traffic safety work.

1.2 What was accomplished under these goals?

Selected highlights for this performance period include:

- Selected 13 new research projects in April 2018 that explore a range of transportation safety topics; these represent \$1,046,462 in research funding.
- Selected 19 new education and professional development projects in April 2018.
- Completed 5 research projects and published, or submitted for publication, more than 50 journal articles and other publications related to CSCRS-funded research.
- Engaged 95 undergraduate, graduate, and doctoral students in CSCRS research, education, and professional development projects.
- Taught 17 transportation safety-related university courses.
- Presented a webinar on the connection between Safe Systems and Vision Zero, with 75+ participants.
- Hosted 16 middle school students at UTK’s first *CSI: Crash Scene Investigation Summer Camp* in July 2018.

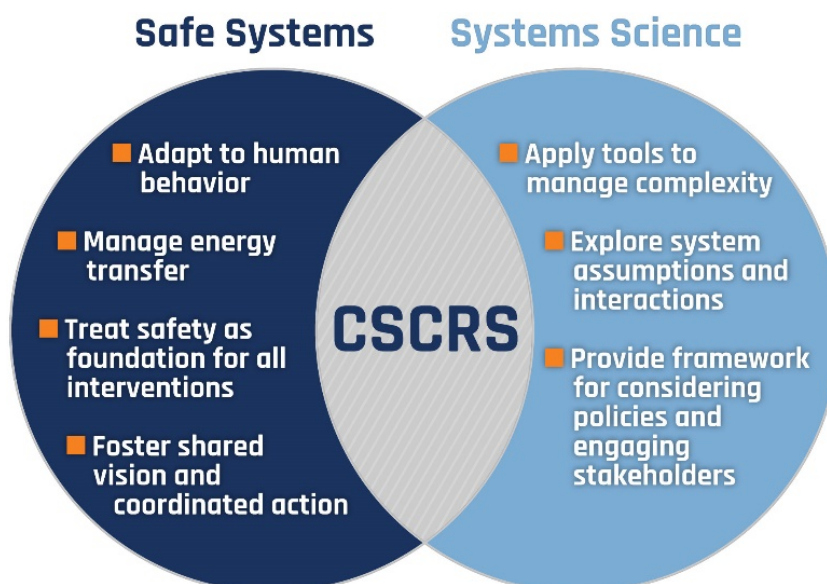
The bulleted sections below describe the accomplishments according to specific goals and objectives of the CSCRS.

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.

- A major goal of CSCRS is to share and develop a stronger understanding of principles of Safe Systems and systems science that can be applied to our collective work in reducing traffic injuries and fatalities. In this period, we made progress in defining and articulating core features of Safe Systems and systems science, as shown below, which is foundational to achieving Goal 1, Objective 1.1.



- Research [Project R1](#) revealed potential new influential U.S. partners for engagement in transportation safety and explored the structure and function of organizational networks among Vision Zero cities.

- PIs: Seth LaJeunesse, UNC Highway Safety Research Center (UNC HSRC); Steve Marshall, UNC Gillings School of Public Health and UNC Injury Prevention Research Center (IPRC); Co-Investigator: Jill Cooper, University of California, Berkeley (UCB)
- Project completed; final deliverables to be posted online. The project identified opinion-leading and boundary-spanning U.S. cities with Vision Zero programs and elucidated the structure and function of two cities' Vision Zero coalitions. Findings from this project provide direction for future research and road safety intervention work.
- [Project R2](#) developed a prototype tool for conducting a systemic safety analysis for a scalable area.
 - PI: Offer Grembek, UCB / Co-Investigator: Libby Thomas, UNC HSRC
 - Project completed; final deliverables to be posted online. A journal paper about the findings is being developed.
- [Project R3](#) entails a two-part review of Safe Systems literature to develop a single, working definition of the concept.
 - PI: Eric Dumbaugh, Florida Atlantic University (FAU) / Co-Investigator: Wes Kumfer, HSRC
 - To be completed Oct. 31, 2018. Findings to date include details of U.S. applications of the Safe Systems concept, a model for integrating Safe Systems into practice, and a review of how Safe Systems has been developed by other countries.
- [Project RR1](#), CSCRS's first Rapid Response project, convened a diverse group of cross-sector experts and stakeholders and applied systems methods to explore factors driving the national rise in pedestrian deaths and share and develop insights into strategies to prevent pedestrian injuries and deaths.
 - PIs: Laura Sandt, UNC HSRC, and Becky Naumann, UNC IPRC
 - Project completed; final deliverables to be posted online. Two journal papers about the findings are being developed and we will present findings at two separate sessions at TRB in 2019.

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

- Related in part to [Project R3](#), CSCRS staff completed extensive planning for the [Safe Systems Summit](#), designed to provide an interactive, multidisciplinary venue for exploring Safe Systems and systems science and what they mean for transportation safety in the U.S. The Summit, postponed due to Hurricane Florence in September, was rescheduled for Apr. 23-24, 2019, in Durham, NC.
- Maintained CSCRS communications including the website, social media, and newsletters.
- Created the CSCRS Tech Transfer Plan, outlining how CSCRS will facilitate the adoption and integration of its research into practice.
- Continued the first iteration of UNC HSRC's [Coffee & Conversation: A Safe Systems Exploration of Transportation](#) discussion series, with a total attendance of 210. Launched the second iteration, [Coffee & Conversation 2.0: Autonomous Vehicles and Road Safety](#), in fall 2018.

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

- Held a May 2018 Advisory Board meeting, which included a focused discussion on Safe Systems principles and how to integrate approaches into practice. This led to the development of a Safe Systems webinar series with board member Leah Shahum, Founder & Executive Director of the influential Vision Zero Network. The [first webinar](#) was held on August 20 and featured CSCRS researchers and 75+ attendees; it led to a recap blog post shared by the Vision Zero Network. The next webinar in the series is currently being planned.
- 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 what a systems approach to road safety will

look like and how best to convey the concepts and practices to a broad audience. This group is also planning a webinar series to help integrate systems thinking and tools into current public health practices.

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

- CSCRS coordinated with the City of Durham to submit a grant proposal to the Robert Wood Johnson foundation that would support implementation of a Safe Systems approach in the Durham, NC region in coordination with the City's Vision Zero Plan.

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.

- [Project R4](#) identified safety data linkage and integration opportunities not formalized in the past.
 - PI: Chris Cherry, University of Tennessee, Knoxville (UTK) / Co-Investigators: Eric Dumbaugh, FAU; David Ragland, UCB; and Laura Sandt, HSRC
 - Project completed; final deliverables to be posted online. The project demonstrated many opportunities for linking data with five applications that are illustrative of possible types of analysis.
- [Project R5](#) seeks to understand the transportation safety needs of major cities in the U.S.
 - PI: Eric Dumbaugh, FAU / Co-Investigator: Dan Gelinne, HSRC
 - Due to be completed Nov. 15, 2018. The focus group component of the effort is complete, and the survey effort is nearing completion.
- [Project R6](#) 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
 - Project completed; final deliverables to be posted online. The project concluded that crosscutting safety and technology-oriented research, development and deployment efforts should encompass CAVs and infrastructure, and safety technologies and strategies to promote safe and smart communities. Research outputs included journal articles and presentations listed in Products section (some under review).
- [Project R9](#) explores the operational needs and characteristics for an autonomous vehicles dispatch center.
 - PI: Missy Cummings, Duke
 - Researchers conducted a literature review and group discussions to define the problem, and to find potential algorithms to model the problem. A simulator of a general dispatch center was developed to model human-system performance with key indicators.
- [Project R10](#) investigates how machine learning techniques can be used to design countermeasures that improve system safety.
 - PI: Missy Cummings, Duke / Co-Investigator: Michael Clamann, HSRC
 - A subset of data was selected from the original HSIS database. Neural Networks, Principal Component Analysis (PCA), and Naive Bayes methods have been used to gain a preliminary understanding of how various factors relate to fatal crashes.
- [Project R11](#) examines 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
- All relevant datasets in socioeconomic characteristics, road conditions, land use, public transportation, and other variables were gathered. The team also processed part of the data and conducted descriptive and inferential statistical analyses, and gathered all relevant literature to start drafting a literature review.
- [Project R12](#) aims to provide an accurate picture of California traffic injuries by utilizing medical data to fill in police crash reports, and to get an accurate picture of emergency medical services response times.
 - PI: David Ragland, UCB / Co-Investigator: Chris Cherry, UTK
 - Researchers obtained data for California EMS Information System that includes data needed for evaluating EMS response times; began analyses comparing injury data from the Statewide Integrated Traffic Records System to injury data from hospital data.
- [Project R13](#) assesses how technological change embodied by shared mobility services has and will impact road safety.
 - PI: Noreen McDonald, UNC / Co-Investigator: Tabitha Combs, UNC
 - The project team is currently working on a data use agreement.
- [Project R15](#) will use the location of individuals' households involved in crashes instead of the location of the crashes to evaluate the associations between sociodemographic variables, accessibility, individual exposure, and road safety.
 - PI: Chris Cherry, UTK / Co-Investigator: Louis Merlin, FAU
 - Work on this project began in late spring 2018. Manuscripts generated from this project are under review; there is also one accepted presentation from this project.
- [Project R16](#) 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
 - Researchers have engaged in the IRB approval process, and one paper related to pedestrian impairment has been published.
- [Project R18](#) 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 project team reviewed the available literature on light rail transit and crash incidence and collected data for the Charlotte Lynx and Orlando Sunrail systems; data analysis has begun.

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

- [Project R7](#) is developing and evaluating a prototype Android mobile app that will alert pedestrians when they are near areas of high traffic density.
 - PI: Missy Cummings, Duke University
 - Due to be completed Dec. 31, 2018. In Summer 2018, experiments involving 30 subjects and consisting of 900 experiment trials were performed at the North Carolina Center for Automotive Research in Garysburg, NC. The experiment data has been summarized, and first-round analysis has been performed to characterize the subjects and their behaviors. Further analysis and a journal paper are undergoing.
- [Project R14](#) aims to create an online CSCRS centralized data clearinghouse for bicycle and pedestrian safety-related data as a national resource for safety researchers.
 - PI: Krista Nordback, UNC / Co-Investigators: Seth LaJeunesse, UNC, and Julia Griswold, UCB

- The project team has so far compiled a list of over 3,500 online safety-related datasets, interviewed eight bicycle and pedestrian safety researchers to understand their data needs, and conducted a literature review.

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.

- [Project R8](#) is a two-year project developing tools to assist parents of new drivers in North Carolina and beyond.
 - PI: Arthur Goodwin, UNC HSRC
 - A debriefing form was developed for driver education instructors to inform parents of the progress and proficiency of their teen driver, and a guidance document for parents was created called "Choosing a Safe Vehicle for Your Teen." Also, the project team held two meetings with the NC DMV Commissioner to discuss the program for parents.
- [Project R17](#) aims to strengthen existing and facilitating new Vision Zero plans.
 - PI: Kelly Evenson, UNC / Co-Investigators: Seth LaJeunesse, Steve Marshall and Becky Naumann, UNC IPRC
 - The team created a document that describe elements of a high-quality Vision Zero plan; developed a coding tool from the elements; pilot tested and implemented coding of 14 U.S. Vision Zero plans; and developed a protocol to obtain permission from U.S. Vision Zero locations to host the plan permanently using Dataverse to create a library of easily accessed plans.

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

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

Table 1: Select CSCRS outreach highlights

UCB	Offer Grembek co-presented "Driving in Intersections is Risky" at the Berkeley Deep Drive Spring 2018 Workshop.
	Julia Griswold presented the poster "Comparison of Pedestrian Count Expansion Methods: Land Use Groups versus Empirical Clusters" at the National Travel Monitoring Exposition and Conference (NaTMEC) in June 2018 in Irvine, CA.
	Praveen Vayalamkuzhi attended the Highway Safety Performance (ANB25) Committee Midyear Meeting in June 2018 in Irvine, CA.
	Pravin Varaiya presented about an intelligent intersection in the breakout session "AVs and Vulnerable Road Users: Envisioning a Healthy, Safe, and Equitable Future" at the Automated Vehicles Symposium 2018 in July 2018 in San Francisco, CA.
	Offer Grembek presented "Safe Systems: An emphasis on Safe Speeds" at the TRB Standing Committee on Transportation Safety Management (ANB10) mid-year meeting in July 2018.
	Offer Grembek, Daniel Rodriguez, Jill Cooper and David Ragland attend UC Institute of Transportation Studies (ITS) Executive Committee meetings in August 2018 as UC ITS co-directors.
	Offer Grembek was appointed to serve as a lead of a new UC ITS Innovation Mobility research initiative to develop a California statewide Innovative Mobility Applied Research Program in August 2018.
UNC DCRP	Tabitha Combs presented on challenges for ensuring safety and mobility for vulnerable road users in a CAV-dominant transportation system at the Automated Vehicles Symposium.
UNC IPRC	Becky Naumann was interviewed by the San Francisco Municipal Transportation Agency regarding public health and systems approaches to considering transportation injury problems.
UNC HSRC	Laura Sandt presented preliminary findings on the Rapid Response project to USDOT stakeholders involved with the pedestrian safety committee.
UTK	Asad Khattak served as: 1) editor-in-chief of Science Citation Indexed Journal of Intelligent Transportation Systems; 2) associate editor of SCI-indexed International Journal of Sustainable Transportation; 3) special adviser to the Journal of Transportation Safety and Security; and 4) advisory board member of Analytic Methods in Accident Research.

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:

- UCB Spring 2018 graduate course [Traffic Safety and Injury Control](#) (cross-listed with Public Health C285). Instructors: Offer Grembek, Prof. David Ragland. 11 students participated.
- UCB Fall 2018 graduate course [Injury Prevention and Control](#). Instructors: Prof. David Ragland, and Dr. Glenn Shor. 6 students participated.
- UNC IPRC Spring 2018 graduate course [Injury as a Public Health Problem](#). Instructor: Steve Marshall.
- UNC DCRP Spring 2018 graduate course [Complete, Safe, Equitable Streets](#). Instructor: Tabitha Combs. Students presented neighborhood complete streets plan to Town of Chapel Hill representatives in April 2018.
- UTK’s Civil & Environmental Engineering faculty offered 10 transportation courses during Spring and Fall 2018 covering engineering, geometric design, planning, safety, ITS, and systems analysis.

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

Table 2 describes 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, providing the opportunity to generate high quality CSCRS research pertaining to road safety topics.
	Two UCB master’s student research assistants worked on CSCRS-related projects. <ul style="list-style-type: none"> • Sarah Doggett worked on the “Linking Crash and Post-Crash Data” research project and is studying how to merge crash and medical files for transportation safety research and how Emergency Medical Services response times vary throughout California. • Joy Pasquet worked on “Strategies for reducing pedestrian and bicyclist injury at the corridor level.” The objective of the project is to conduct a systemic safety analysis for the Caltrans network on bicycle-involved collisions.
Duke	12 students were involved in conducting the pedestrian experiment and summarizing and performing preliminary analysis on data.
	One doctoral student is doing a literature review to identify an autonomous vehicles dispatch center.
	Students designed a simulation of an autonomous vehicles dispatch operation center to model human-system performance with key indicators like operator utilization or delays.
UNC	One graduate student is establishing data-driven models to understand how various factors contribute to the crash fatality
	UNC DCRP chose 43 students across nine degree programs to take part in its Road Safety Scholars Program.
	The Coffee & Conversation seminar series was well attended by graduate students including the Road Safety Scholars.
UTK	One injury epidemiology doctoral student has received tuition and stipend support for Fall 2018 to examine the effects of implementing different combinations of evidence-based road safety interventions on lives and costs saved.
	15 students prepared papers submitted and submitted them to TRB for review.
	Three graduate students were recognized for their contributions in terms of publications in safety and academic excellence.
	Eight UTK ITE Student Chapter meetings were held in the Spring 2018 and Fall 2018 Semesters. The meetings were held to promote further learning and career development into the transportation engineering realm.
	Supported four students from UTK ITE Student Chapter to attend and present at the Tennessee Institute of Transportation Engineers (TSITE) Summer Meeting.
	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 disciplinary perspectives and connect with traditional and non-traditional partners.

- CSCRS staff attended the CUTC Summer meeting in Minneapolis and learned about additional student engagement opportunities and best practices that will support this goal/objective in the future.

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

- In July 2018, UTK launched the Crash Scene Investigation (CSI) Camp. The camp taught 16 rising 8th and 9th grade students how to investigate a large-scale crash with multiple vehicles. A key goal was to illustrate the statistics of motor vehicle crashes. Students considered potential contributing factors including environment conditions, vehicle condition, and human factors. The Southeastern Transportation Center Seatbelt Convincer was used to emphasize the importance of wearing a seatbelt when a motor vehicle is in motion. This camp will become an annual summer event with exportable lesson plans, supply lists, and other helpful information for use in other locations.
- In October 2018, UTK students participated in the Tickle College of Engineering Engineer's Day for high school students who are interested in pursuing a degree in an engineering discipline. This tradition brings in more than 1,500 students from various high schools in Tennessee, Florida, Georgia, and Kentucky.
- In July 2018, UNC and Duke co-hosted 15 high school students from North Carolina A&T State University's Center for Advanced Transportation Mobility Summer Transportation Institute for a tour of Duke's HAL Lab and a discussion about transportation safety with Duke's Missy Cummings.

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

Many student and practitioner educational opportunities are described in the accomplishments sections above. In addition, as part of [Project RR1](#), Kristen Hassmiller Lich of UNC Gillings School of Global Public Health led the first CSCRS Systems Workshop on "Exploring the Complexity of Pedestrian Fatalities to Inform Action" in April 2018. The session looked at pedestrian safety by considering consequences, interactions, influencers and feedback loops that impact the issue. This workshop provided participants with skill-building opportunities to apply group model building and system mapping techniques useful for developing deeper transportation safety and policy insights.

1.4 How have the results been disseminated?

In addition to the goal-specific activities described above to disseminate research findings, staff developed and disseminated two issues of CSCRS Crossroads newsletter in July 2018 and October 2018. Newsletter archives are available [here](#). The team coordinated with consortium member communications teams to co-promote CSCRS news/updates on their websites, in newsletters, and on social media.

Communications staff maintained the CSCRS Twitter feed, which has grown to 277 followers. A recent month's analytics showed 10,600 impressions. Staff also maintained the CSCRS Facebook page, reaching roughly 120 people in an average month. Social media engagement increased as a result of Safe Systems Summit promotions.

CSCRS staff updated project descriptions, titles, and end dates on the CSCRS website, www.roadsafety.unc.edu/research/projects, and in the Transportation Research Board (TRB) 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 sections provide a description of activities CSCRS plans to complete during the next reporting period (11/1/2018-3/31/19) to accomplish the goals and objectives previously described.

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 will perform 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.

- The projects R3, R5 and RR1 are complete or will be completed in the next cycle and will be providing final reports related to the Safe Systems approach and system science applications; these will be broadly circulated to integrate key findings into practice. Additional research needs, identified through these and other projects, will be identified and pursued in the next round of proposals.
- We are performing a literature scan in order to develop a comprehensive webpage, to be part of the CSCRS website, that includes systems thinking and systems science resources for road safety researchers and practitioners.

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

- In addition to individual research presentations, CSCRS is coordinating with TRB committee leadership to plan several sessions at TRB that highlight the principles of systems-oriented approaches and/or provide networking opportunities for diverse audiences:
 - Safety Sunday @ TRB, scheduled for January 13, 2019.
 - Sunday workshop entitled, “From Silos to Safe Systems: An Integrated Response to the Global Road Safety Crisis” (Led by UCB).
 - Sunday workshop entitled, “The Rapid Rise in Pedestrian Fatalities: Changing Driver and Pedestrian Behavior to Save Pedestrian Lives” (Led by UNC HSRC).
 - TRB Monday lectern session, entitled, “Building Systems into a Safe System: From Theory to Practice” (Led by UNC HSRC).
 - Thursday workshop entitled, “Exploring the Complexity of Pedestrian Fatality Trends: Understanding the Underlying ‘System’ to Inform More Effective Action” (Led by UNC IPRC).
- We continue to organize and prepare for the Safe Systems Summit, to be held April 23-24, 2019 and provide public health travel scholarships for select Summit attendees (Led by UNC HSRC and UNC IPRC).
- Complete and showcase a Traffic Safety YouTube video series (Led by UCB).

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

- Coordinate with the TRB committee, ANB10, to share updates on Safe Systems that will inform committee and sub-committee thinking and activities, and working with the chair to support their mid-year meeting at the Safe Systems Summit in April 2019. (Led by UNC, FAU, and UCB).
- Coordinate with the Vision Zero Network to plan a December webinar on Safe Systems and system science to integrate key principles into their constituent’s practices.

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

- Lead a Safe Systems education and outreach program (Led by FAU).

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 will perform 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.

- We will continue to complete research projects funded since the Center was initiated.
- We will open a call for new research and administer a peer-review process to evaluate proposals and work with consortium team members to refine and select Year 3 activities.

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

- Many of the research projects referenced in Objective 1-1 and 2-1 will lead to new resources and data sets to support safety problem identification and intervention development.

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.

- We will lead pilot workshops on road safety for planners in NC (Led by UNC DCRP).

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

- CSCRS researchers will present their research findings at TRB and other upcoming conferences.
- We will continue managing the CSCRS website and distributing findings through our social media and quarterly newsletter followers.
- We will incorporate research findings into courses and seminars described in Goal 3.
- We will engage the Advisory Board at TRB and utilize their influential networks to distribute research findings.

Goal 3:

To support Goal 3, we will perform activities related to the following objectives:

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

- Teach Complete, Safe, Equitable Systems UNC course (Led by UNC DCRP)
- Teach Injury Prevention and Control course (Led by UCB)
- Teach Traffic Safety and Injury Control course (Led by UCB)
- Begin Traffic Signal Academy course development (Led by UTK)
- Begin Road Safety Academy 201 course development (Led by UNC HSRC)
- Teach TTAP online traffic safety course (Led by UTK)

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

- Student fellowship and research grants (Led by UCB)
- UTK student scholar awards (Led by UTK)
- Continuation of CSCRS Scholars program (Led by UNC DCRP)

- CSCRS student-focused meeting/conference (Led by UTK)
- Safe Streets lecture series (Led by FAU)
- Weekly transportation seminar and webinar speaker series (Led by UTK)
- Coffee and Conversation seminar series (Led by UNC HSRC, DCRP, and SPH)

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

- CSCRS is in the initial development phase of identifying transportation-public health “bridge” internship opportunities in coordination with local and state transportation and health agencies.

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

- Community Planning Month engagement with Chapel Hill elementary students (Led by UNC DCRP).
- Host a second Crash Scene Investigation Camp for middle school students (Led by UTK).

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, meeting reporting requirements, and developing efficient project management systems.

2. Products

2.1 Publications, conference papers, and presentations

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

Table 3: Select CSCRS publications, conference papers, and presentations

Peer-Reviewed Publications
Boakye K., A. Khattak, S. Nambisan, & J. Everett, Correlates of front-seat passengers’ non-use of seatbelts at night, Forthcoming Accident Analysis and Prevention, 2018. https://doi.org/10.1016/j.aap.2018.04.006
Combs, T.S., Sandt, L., Clamann, M., & McDonald, N.C. (in press). Automated vehicles and pedestrian safety: exploring the promise and limits of pedestrian detection. American Journal of Preventive Medicine.
Combs, T.S., Sandt, L., Clamann, M., McDonald, N.C., forthcoming. Automated vehicles and pedestrian safety: exploring the promise and limits of pedestrian detection. American Journal of Preventive Medicine.
E. Dumbaugh, L. Merlin, and D. Saha. Towards Safe Systems: An Examination into the Nature of Traffic Crashes in Urban Environments. Journal of the American Planning Association. Submitted June 11, 2018.
Evenson, K. R., LaJeunesse, S., & Heiny, S. (2018). Awareness of vision zero among united states’ road safety professionals. Injury Epidemiology, 5, 1-6. doi:10.1186/s40621-018-0151-1.
Grembek, O., Kurzhanskiy, A. A, Medury, A., Varaiya, P., & Yu, M. (2018). Introducing an Intelligent Intersection. ITS Reports, 2018(13).
Hezaveh, A. M., & Cherry, C. R. (2018). Neighborhood-Level Factors Affecting Seat Belt Use. Accident Analysis and Prevention. Article in press
Hezaveh, A. M., Zavareh, M. F., Cherry, C. R., & Nordfjærn, T. (2017). Errors and violations in relation to bicyclists’ crash risks: Development of the Bicycle Rider Behavior Questionnaire (BRBQ). Journal of Transport & Health 8 (2018): 289-298.
Julia B. Griswold, Aditya Medury, Robert J. Schneider, Offer Grembek. 2018. Comparison of Pedestrian Count Expansion Methods: Land Use Groups versus Empirical Clusters. In: Transportation Research Record.
Julia Griswold, Mengqiao Yu, Victoria Filingeri, Offer Grembek, Joan L. Walker. 2018. A behavioral modeling approach to bicycle level of service. In: Transportation Research Part A: Policy and Practice, Volume 116, Oct. 2018, Pages 166-177.

Kamrani M., R. Arvin, & A. Khattak, What measures of driving volatilities best explain crash frequency at intersections? Forthcoming Transportation Research Record: Journal of the Transportation Research Board, https://doi.org/10.1177/0361198118773869 , 2018.
LaJeunesse, S., Heiny, S., Evenson, K. R., Fiedler, L. M., & Cooper, J. F. (In press). Diffusing innovative road safety practice: A social network approach to identifying opinion leading U.S. cities. <i>Traffic Injury Prevention</i> .
Liu J., & A. Khattak, Are gates at rail grade crossings always safe? Examining motorist gate-violation behaviors using path analysis, <i>Transportation Research Part F</i> 55, 2018, pp. 314–324.
Merlin, L., Dumbaugh, E., Cherry, C. R., Hezaveh, A. M., (2018). Residential Accessibility's Relationships with Crash Rates per Capita.
Naumann, R.B., Kuhlberg, J., Hassmiller Lich, K., Heiny, S., Sandt, L., & Marshall, S.W. (Manuscript in final preparation). Integrating complex systems science into road safety research and practice, Part 2.
Naumann, R.B., Sandt, L., Kuhlberg, J., Hassmiller Lich, K., Heiny, S., & Marshall, S.W. (Manuscript in final preparation). Integrating complex systems science into road safety research and practice, Part 1.
Offer Grembek, "A State-of-the-Art Review on Empirical Data Collection for External Governed Pedestrians Complex Movement," <i>Journal of Advanced Transportation</i> , vol. 2018, Article ID 1063043, 42 pages, 2018.
Robinson RM, A. Collins, C. Jordan, P Foytik, & A. Khattak, Modeling the Impact of traffic incidents during Hurricane Evacuations using a large scale microsimulation, Forthcoming, <i>International Journal of Disaster Risk Reduction</i> , 2018 https://doi.org/10.1016/j.ijdrr.2017.09.013 .
Saha, D. E. Dumbaugh, and L. Merlin. Macroscopic Crash Risk Factors on Urban Streets: An Examination of Environmental Correlates and Modelling Approaches. <i>Transportation Research Record: Journal of the Transportation Research Board</i> . Submitted July 25, 2018.
Shay E., A. Khattak, & B. Wali, Walkability in the connected and autonomous vehicle era: A U.S. perspective on research needs, Forthcoming <i>Transportation Research Record: Journal of the Transportation Research Board</i> , https://doi.org/10.1177/0361198118787630 , 2018.
Shay E., Khattak A., & Wali, B. Walkability in the connected and autonomous vehicle era: A U.S. perspective on research needs, Forthcoming <i>Transportation Research Record: Journal of the Transportation Research Board</i> , 2018.
Wali B., A. Khattak, H. Bozdogan, & M. Kamrani, How is Driving Volatility Related to Intersection Safety? A Bayesian Heterogeneity-Based Analysis of Instrumented Vehicles Data. <i>Transportation Research Part C: Emerging Technologies</i> , 92, 2018, pp. 504-524.
Wali B., Asad Khattak, & Aemal Khattak, A Heterogeneity Based Case-Control Analysis of Motorcyclist's Injury Crashes: Evidence from Motorcycle Crash Causation Study, <i>Accident Analysis and Prevention</i> , 119, 2018, pp. 202-214.
Wali, B., A. Khattak, D. Chimba, J. Waters, & X. Li, Development of Safety Performance Functions for Tennessee: Unobserved Heterogeneity & Functional Form Analysis, Forthcoming in <i>Transportation Research Record: Journal of the Transportation Research Board</i> , https://doi.org/10.1177/0361198118767409 , 2018.
Wali, B., A. Khattak, J. Xu, Contributory fault and level of personal injury to drivers involved in head-on collisions: Application of copula-based bivariate ordinal models, <i>Accident Analysis & Prevention</i> , 110, 2018, pp. 101-114.
Zhang, M., J. Liu, A. Khattak, and D. Clarke, A comparative study of rail-pedestrian and cyclist trespassing crash injury severity at highway-rail grade crossings and non-crossings. <i>Accident Analysis & Prevention</i> , 117, 2018, pp. 427-438.
Presentations
Cherry C. R., Hezaveh A. M., Grembek O., Sandt L., Merlin L. (2017). Better data integration to create a complete picture for cycling safety. 6th Annual International Cycling Safety Conference, Davis, California, USA.
Combs, T.S., Sandt, L., McDonald, N.C., Clamann, M., 2018. Limitations in Detection Technologies for Automated Driving Systems and Implications for Pedestrian Safety. Presented at the Transportation Research Board Annual Meeting, Washington D. C., United States.
Combs, T.S. 2018. "Hidden equity challenges of an AV-dominant transport system: tradeoffs between access to opportunity and safety for vulnerable pedestrians." Breakout session at the Automated Vehicles Symposium, San Francisco CA.
Combs, T.S., Sandt, L., McDonald, N.C., Clamann, M., 2018. Limitations in Detection Technologies for Automated Driving Systems and Implications for Pedestrian Safety. Presented at the Transportation Research Board Annual Meeting, Washington D. C., United States.
Goodwin, A.H., Harrell, S., O'Brien, N.P., Kirley, B.B., & Foss, R.D. (2018). Orientation sessions for parents of young novice drivers: An assessment of U.S. programs and recommendations. Washington, D.C.: AAA Foundation for Traffic Safety.
Goodwin, A.H. What works (and what doesn't) to improve teen driver safety. Presented at the Child Fatality Prevention System Summit. Raleigh, NC, 2018.
Goodwin, A.H. Enforcement with teenage drivers. Presented at the NC Traffic Safety Conference and Expo. Wilmington, NC, 2018.
Hezaveh, A. M., & Cherry, C. R. (2018). Likelihood of Involvement in Traffic Crashes: Introducing Home-Based Approach. <i>Transportation Research Board 98th Annual Meeting Transportation Research Board</i> , Washington D.C. USA.

Hezaveh, A. M., Fallah, M., Cherry, C. R., & Nordfjærn, T. (2017). Toward Developing Bicycle Rider Behavior Questionnaire (BRBQ). 6th Annual International Cycling Safety Conference, Davis, California, USA.
Lester, T.W.; Combs, T.S.; Zhang, W. 2018. "How can planning theory inform the challenges of planning for automated vehicles?" Roundtable discussion at the Association of Collegiate Schools of Planning (ACSP) Conference, Buffalo NY.
Lester, T.W.; Combs, T.S.; Zhang, W. 2018. "How can planning theory inform the challenges of planning for automated vehicles?" Roundtable discussion at the Association of Collegiate Schools of Planning (ACSP) Conference, Buffalo NY.
Zhang M., A. Khattak, & E. Shay, Analysis of Crashes Involving Pedestrians across the United States: Implications for Connected and Automated Vehicles, 18-04721, Presented at Transportation Research Board annual meeting, National Academies, Washington, D.C., 2018.
Under review in peer-reviewed journals
Hezaveh, A. M., & Cherry, C. R. (2018). Individuals' Likelihood of Involvement in Traffic Crashes: Introduction of Home-Based Approach –A Complementary Definition of Road Safety.
Merlin, L., Dumbaugh, E., Cherry, C. R., Hezaveh, A. M., (2018). Residential Accessibility's Relationships with Crash Rates per Capita.
Mussah, AR., Wali, B., Khattak, A., Using Driving Volatility As a Leading Predictor of Unsafe Events Involving Vulnerable Road Users - A Naturalistic Driving Environment Study, TRB Paper 19-02947, Under-Review (Presentation & Publication), 2019.
Naumann, R.B., Heiny, S., Evenson, K.R., LaJeunesse, S., Copper, J.F., Doggett, S., & Marshall, S.W. (Under review). Organizational networks in road safety: case studies of U.S. Vision Zero cities. Accident Analysis & Prevention.
Books or other non-periodical, one-time publications
Fortin G., McMillan T., Grembek O., Cooper J., Shared Responsibility for Road Safety in Safe Systems. The University of California at Berkeley, SafeTREC, Berkeley, 2018, Fact Sheet.
Fortin G., McMillan T., Grembek O., Cooper J., The Goal of Road Safety in the Safe Systems Context. The University of California at Berkeley, SafeTREC, Berkeley, 2018, Fact Sheet.
Kamrani M., A Framework to Process and Analyze Driver, Vehicle and Road Infrastructure Volatilities in Real-time, Unpublished Ph.D. Dissertation (in-preparation), The University of Tennessee, Knoxville, 2018.
Li X., Analysis of Large-Scale Traffic Incidents and En Route Diversions due to Congestion, Unpublished Ph.D. Dissertation (completed), The University of Tennessee, Knoxville, 2018.
Wali B., Harnessing Big Data for Characterizing Driving Volatility in Instantaneous Driving Decisions – Implications for Intelligent Transportation Systems (completed), The University of Tennessee, Knoxville, 2018.
Zhang M., Understanding Micro-Level Lane Change and Lane Keeping Driving Decisions: Harnessing Big Data Streams from Instrumented Vehicles, Unpublished Ph.D. Dissertation (completed), The University of Tennessee, Knoxville, 2018.

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

The CSCRS website, www.roadsafety.unc.edu was regularly updated with new information regarding research, educational and professional development research, resources, and opportunities.

2.3 Technologies or techniques

UTK received a new competitively-awarded project from Tennessee Department of Transportation, titled "Research on Connected and Automated Vehicles Investment and Smart Infrastructure in Tennessee." The project will facilitate field testing of various connected and automated vehicle technologies, on the UT Knoxville campus, TN, the East Tennessee State University campus in Johnson City, TN and UT Chattanooga, TN. Dedicated Short Range Communications (DSRC) technology is being used along with new algorithms and applications for passing signal phasing information to drivers and other users at traffic intersections and for testing the reliability of DSRC.

2.4 Inventions, patent applications, and/or licenses

None to report for this period.

2.5 Other products

- A video of the Duke pedestrian experiment has been uploaded to YouTube: <https://www.youtube.com/watch?v=Zl0bCDXS6VA>.
- UCB's Safe Transportation Research & Education Center produced two videos: [Safe System Principles](#) and [Bicycle Level of Service \(LOS\) Measures](#).

- The completed project, R4, resulted in five data sets (currently embargoed) that have been added to the CSCRS data archive.

3. Participants and Collaborating Organizations

3.1 What organizations have been involved as partners?

The following organizations have been involved as partners in CSCRS funded or match-funded projects:

Foundation

- John D. and Catherine T. MacArthur Foundation, Chicago, Ill. (Financial Support)

Local Government

- Town of Chapel Hill Staff, Chapel Hill, N.C. (Collaborative Support)

Other Non-Profits

- America Walks, Portland, Ore. (Collaborative Support)
- American Planning Association, Chicago, Ill, and Washington, D.C. (Collaborative Support)
- American Public Health Association, Washington, D.C. (Collaborative Support)
- Association of Pedestrian and Bicycle Professionals, Lexington, KY (Collaborative Support)
- Broward Metropolitan Planning Organization, Fort Lauderdale, Fla. (Collaborative Support)
- Institute of Transportation Engineers, Washington, DC (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 Local Technical Assistance Program Association, U.S. (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)
- Transportation Research Board Standing Committee on Pedestrians, 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

- 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 (Sponsor of Projects)
- 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 (Collaborative Support)
- Planning Society @ FAU, Boca Raton, FL (Collaborative Support)
- Renaissance Computing Institute, Chapel Hill, NC (Collaborative Support)
- University of Tennessee Chattanooga (Collaborative Support)
- Various Jiaotong Universities in China (Collaborative Support)

3.2 Have other collaborators or contacts been involved?

The City of Durham, Duke Hospital Trauma Registry staff, and faculty at the North Carolina Central University in Durham were all involved in coordinating activities and sessions related to the Safe System Summit and will be active partners in hosting the rescheduled conference in April 2019.

4. Impact

CSCRS has begun realizing the results of its work to create and exchange knowledge to advance transportation safety through a multidisciplinary approach.

4.1 Impact on the development of the principle discipline(s) of the program

CSCRS's research and outreach efforts to date have continued to provide an enhanced understanding of safer roadway systems (and approaches such as Safe Systems and Vision Zero) as well as opportunities for applying principles and methods from systems science. Research projects such as RR1 provided an opportunity to apply system science techniques, such as group model building and causal loop diagramming, in a transportation safety context. Participants in the workshop, including 27 state and local transportation planning, engineering, and transit agency staff, reported changes in thinking about pedestrian safety and took new, collaborative safety approaches following the workshop. For example, NCDOT coordinated with CSCRS and other RR1 workshop participants to plan a follow-up event, entitled "Shaping Better Transit Safety Outcomes Through a Systems Perspective" at their NCDOT sponsored conference, held on October 8, 2018 and attended by more than a hundred participants.

Findings from research projects such as R3 provided insights into Safe Systems practices and evidence of effectiveness around the world. Planning 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.

Through this work, as well as our presentations to the Vision Zero Network and other professional networks regarding the role of Safe Systems in Vision Zero programs, we are seeing increased recognition of and response to CSCRS research and collaborative scientific inquiry. For example, leadership from the TRB committee ANB10, Transportation Safety Management, reached out to CSCRS and offered our researchers a role in coordinating a lectern session as well as time on the committee agenda to provide CSCRS-related research updates. We are also planning to host the ANB10 mid-year meeting at the re-scheduled Safe Systems Summit in April 2019 to support and engage committee members in the Safe Systems conversations. Similarly, we have been actively coordinating

with the ANF10 committee, on Pedestrians, to incorporate CSCRS research findings and ongoing activities into ANF10-sponsored workshops and meetings at TRB.

As mentioned in the last PPPR, CSCRS research and inquiry into Safe Systems and systems thinking is changing the way transportation safety is being taught at our consortium universities, making stronger connections between transportation safety and other topic areas such as planning, computer science, public policy, media, and public health. In our most recent [Coffee and Conversation](#) series, for example, we see all of these disciplines represented in the student and faculty participants, leading to rich discussions around current and emerging transportation safety issues and research needs.

As we begin to share more research findings and implement our technology transfer plans, our team is well-positioned to connect with diverse stakeholders to generate interest in and understanding of its research around Safe Systems and systems science. We have and will continue participation in numerous conferences, engaging with key opinion leaders and influential organizations, and offering educational/professional development events at TRB, the Safe Systems Summit, and other stakeholder gatherings in the future.

4.2 Impact on other disciplines

Systems science is an interdisciplinary field with broad opportunities for application and collaborative problem-solving. CSCRS's vision involves uniting perspectives from planning, engineering, public health, systems science, robotics and other automotive-related fields to enhance the safety of transportation systems. This "working together" concept requires engaging practitioners from a wide variety of disciplines by convincing them of their stake in contributing to reducing roadway deaths. For example, the diversity of viewpoints on CSCRS's Advisory Board demonstrates a strong commitment to widening CSCRS's reach. In this reporting period, we continued to expand the diversity of our Advisory Board by adding several new members:

- Nadia Anderson, Manager, Public Policy, Road and Traffic Safety, Uber
- Jason Gainey, Manager, Passive Safety and Accident Research, Volkswagen Group of America
- King Gee, Director of Engineering and Technical Services, American Association of State Highway and Transportation Officials
- Jacqueline Gillan, President Emeritus, Advocates for Highway and Auto Safety
- Dan Magri, Deputy Assistant Secretary, Office of Planning, Louisiana Department of Transportation & Development

We anticipate that, with these individuals more actively involved in CSCRS-funded activities, we will strengthen connections with key decision makers within AASHTO and state DOTs, industry partners, and the wider safety community. We are engaging the AB at forthcoming TRB and Safe Systems Summit events, as well as our annual research review process, along with other stakeholders to identify additional needs and opportunities to implement CSCRS's strategic roadmap and tech transfer plans.

4.3 Impact on the development of transportation workforce development

The myriad education and workforce development activities described above—from lecture series, to university courses, to student-oriented events, awards, and research opportunities—provide evidence of strong delivery of workforce development opportunities and potential for impact. In particular, the seminar series that continue to be taught across three campuses (UNC, UCB, and UTK) are well-attended and are offering opportunities for hundreds of current and aspiring professionals to think differently about traffic safety issues and approaches, and to become familiar with the principles of Safe Systems and systems science in an intimate and engaging setting. Conference presentations made beyond consortium member campuses further the reach and impact of CSCRS work and ideas.

4.4 Impact on physical, institutional, and information resources

CSCRS team members continue to implement systems methods and Safe Systems principles into existing university courses. In this reporting period, CSCRS consortium campuses continued to host seminars that involve students, practitioners, and other researchers in engaging dialogue about current and emerging transportation safety issues, practices, technologies, and interventions. These series also provide opportunities to engage with local and state decision-makers and invited guests from other parts of the US as a means of relationship building and knowledge exchange.

Several research projects—including R4, R12, R14, R15, and elements of others—involve efforts to improve transportation safety data and move toward having more complete, centralized, linked/integrated, spatially-referenced, and accessible data sources to support safety applications. With these efforts, we are building physical resources (such as databases and web-platforms for data sharing) and institutional capacity to manage large and linked data sets. In September 2018, HSRC hired a full-time post doc researcher, Katie Harmon, a recent UNC epidemiology program graduate, to support several safety data linkage efforts underway. As CSCRS builds capacity to perform data linkage between crash and medical data sources, we are working hand-in-hand with regional trauma centers (including UNC and Duke Hospitals) and city and state-level leadership to coordinate the provision of linked data with ongoing safety programs. We're also coordinating with other transportation and public health partners in other states—including CA, UT, MD, and TX—to share best practices and identify transferrable models for transportation safety data improvements. Additionally, CSCRS researcher Krista Nordback participated in the USDOT Safety Data meeting held in summer 2018 to share recent findings, plans, and research needs to support national-level data coordination.

4.5 Impact on technology transfer

CSCRS continues to expand its universe of stakeholders, identifying individuals and organizations with the ability to put research into practice. A key objective (1.4) is to aid states and cities interested in implementing Safe Systems approach in various contexts. Through TRB sessions and other events, we are inviting state and local speakers to present on how they are implementing Safe Systems and are facilitating dialogue on this topic. Efforts to increase the involvement of state and local government officials are underway, including providing more than 10 travel scholarships to the upcoming Safe Systems Summit to state and local transportation or health department staff. Safe Systems Summit registrations (above 300 before the conference was postponed) were higher than originally anticipated, indicating strong demand, and plans are underway to expand the room capacity available for the rescheduled conference in 2019.

4.6 Impact on society beyond science and technology

CSCRS understands the significance of impacting how everyday road users understand their roles in a safe roadway system. Changing public perception is a key part of the CSCRS vision, which includes equipping the public at large with cutting-edge tools, data, and resources to address the systems that impact transportation safety. We continue to share findings and activities in a publicly-accessible way through our website, social media, and other communications channels. We have fielded media calls and invited the media to cover the Safe Systems Summit program, in hopes of engaging a wider audience beyond transportation professionals.

5. Changes/Problems

5.1 Changes in approach and reasons for change

Songpo Li of Duke University's Humans and Autonomy Lab joined the CSCRS Executive Team as an Associate Director in July 2018. He replaced Michael Clamann, who left Duke to join UNC's HSRC and remains active with CSCRS-funded projects.

5.2 Actual or anticipated problems or delays

As mentioned, CSCRS had to reschedule the Safe Systems Summit because of Hurricane Florence. The safety and well-being of Summit speakers, attendees and event staff is paramount. The event has been rescheduled for April 23-24, 2019 with full support from the NC Governor's Highway Safety Program, the conference co-sponsor. The rescheduled event will feature most of the original program speakers and offer new opportunities for engagement.

5.3 Changes that have a significant impact on expenditures

Nothing to report.

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

Nothing to report.

6. Special Reporting Requirements

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