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 #2 reporting period: 6/1/17 - 3/31/18

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1. Accomplishments

Major Goals and Objectives of CSCRS

In this reporting period, CSCRS has continued its work to advance the Center's research, education, workforce development, professional development and leadership efforts. To provide a framework for these efforts, CSCRS leadership jointly created a strategic roadmap, which summarized the mission/vision of CSCRS, defined strategic goals, objectives, and related performance measures, as well as documented the process for project selection. Following are key elements from the strategic roadmap:

Mission: To create and exchange knowledge to advance safer transportation systems through a multidisciplinary approach.

Vision: To unite perspectives from planning, engineering, public health, robotics, and systems science in ways that advance road safety research and equip professionals and the public with cutting-edge tools, data, and resources to address the systems that impact transportation safety.

Goals:

- **Goal 1:** Safe Systems principles and approaches are understood, enhanced, shared, and adopted by the agencies and stakeholders with a role in improving transportation safety.
- **Goal 2:** System science principles and analytic tools are increasingly understood and applied by multidisciplinary groups to develop a shared vision and/or shared solutions to complex traffic safety problems.
- **Goal 3:** Cutting-edge research, tools, data, and resources—guided by systems science and compatible with a Safe Systems approach—are developed and utilized by professionals and the public to better understand and address existing and emerging road safety issues.
- **Goal 4:** A growing body of students and future leaders are engaged and well-trained in road safety principles, Safe Systems approaches, and systems science principles and methods.

Moving forward, the strategic roadmap will be a tool to help guide CSCRS activities to produce high-impact results. It will be regularly revisited and updated to reflect advancements in thinking and practice.

Accomplishments Under These Goals

CSCRS worked towards advancing these goals through the following activities included in the PPPR 2 reporting period (6/1/17 - 3/31/18):

Administration and Management

Processes implemented during the first PPPR reporting period paved the way for smooth operations in the second reporting period. Many of these activities are continuing efforts, and others developed from the structure provided by the strategic roadmap.

- Facilitated CSCRS research:
  - Tracked and documented the progress of CSCRS Year 1 research projects.
  - Implemented processes for Year 2 research proposal reviews:
    - Conducted annual peer-review process, resulting in 9 new projects and one project continuation from Year 1; an additional 3 projects were recommended to be revised and resubmitted and are currently in the process of being finalized for selection.
    - Launched new Rapid Response submission process for short-term (e.g., 6-9 months) projects outside annual review cycle, generating one new project.

- Refined and implemented processes for Year 2 education and professional development activities. Nineteen initiatives are planned for 2018-2019, many building on Year 1 activities.
- Planned and held Safety Sunday @ TRB networking reception in conjunction with the 2018 TRB Annual Meeting in Washington, D.C., which drew 130 attendees.
- Planned for and coordinated multiple important team/project meetings:
  - First CSCRS Executive Committee Retreat August 10-11, 2017, in Chapel Hill, N.C. CSCRS associate directors and staff shared and planned strategic roadmap priorities.
  - First CSCRS Advisory Board meeting August 17, 2017, in Chapel Hill, N.C. Board members advised the Center on research and professional development priorities.
  - PI Kick-Off meeting on March 24, 2018, for Year 2 project PIs. Reviewed expectations, immediate needs, and available resources.
  - Periodic consortium member meetings the second Wednesday of every month to discuss and coordinate all CSCRS business.
  - Monthly research calls to review active CSCRS research projects, explore new research questions, and coordinate CSCRS research-specific activities.
- Coordinated resources and communications:
  - Maintained the CSCRS website with regular additions and updates including a new page with information on Safe Systems and systems science; research, education and professional development activity updates; events, news, and newsletters; and a resources page with information for team members and researchers.
  - Maintained the CSCRS Facebook and Twitter pages.
  - Coordinated with consortium members' communications teams to share news and content and co-promote updates on social media.
  - Continued work on creating an online CSCRS project management system.
  - Created a PI Handbook for researchers that includes details about CSCRS research rules and processes, project close-out procedures, templates, and information related to cost matching and communications.
- Completed other management obligations:
  - Satisfied USDOT reporting requirements for submitting SF 425, Performance Indicator and Recipient Share reports.
  - Guided CSCRS consortium members to join the Council of University Transportation Centers.
  - Chose the CSCRS Outstanding Student of the Year, Becky Naumann, Ph.D.
  - Attended CUTC administrative meetings, such as the Winter Business Meeting, in conjunction with the 2018 TRB Annual Meeting.

Research

Year 1 Research Project Progress

As needed, 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. Updates include:

R1: Structures of Stakeholder Relationships in Making Road Safety Decisions
PIs: Seth LaJeunesse, UNC Highway Safety Research Center (HSRC); Steve Marshall, UNC Gillings School of Public Health and UNC Injury Prevention Research Center
Co-Investigator: Jill Cooper, University of California, Berkeley (UCB)
The purpose of this project is to reveal potential new partners for engagement in transportation safety. Updates:

- Interviewed 10 San Francisco Vision Zero contacts; interviewees reported coordination/collaboration improved as part of efforts. Final data is being sent to project lead.

- Interviewed 8 of 11 New York City Vision Zero contacts. Participants generally agreed city's Vision Zero task force encouraged them to coordinate road safety efforts and improve safety-related operations.
- Interviewed 6 of 8 Seattle Vision Zero contacts. Analysis of the Seattle data is in process.
- Developed final list of Vision Zero contacts iteratively; circle of contacts widened until no new contacts were suggested during interviews. Analyses of the other city networks to follow.

R2: An Enhanced Systemic Approach to Safety
PI: Offer Grembek, UCB / Co-Investigator: Libby Thomas, HSRC; This study will develop a prototype tool for conducting a systemic safety analysis for a scalable area. Updates:

- Tested different matrix structures across modes with California collision data.
- Built several matrix structures across modes to test different structures and identify variables of interest in a qualitative way.
- Quantified performance of various matrix structures to divert from the initial approach of reviewing structures on a case-by-case base -- part of effort to create a systematic method for defining systemic matrix structure across modes.
- Chose relevant indicators to create ratings for matrices and testing them on various structures to keep the most meaningful ones.
- Next step: Apply the performance of our different matrix structures for California data.

R3: Defining Safe Systems: A Review of the State-of-the-Practice and Leadership Summit (updated title)
PI: Eric Dumbaugh, Florida Atlantic University (FAU) / Co-Investigator: Wes Kumfer, HSRC; This effort will entail a review of the literature on Safe Systems to develop a single, working definition of the concept. Updates:

- Conducted a comprehensive literature review, a preliminary version of which was presented at the STRIDE conference, held at the University of Florida, on November 20th, 2017.
- Created an initial list of potential Safe Systems Summit speakers.

R4: Completing the Picture of Traffic Injuries: Understanding Data Needs and Opportunities for Road Safety
PI: Chris Cherry, University of Tennessee, Knoxville (UTK) / Co-Investigators: Eric Dumbaugh, FAU; David Ragland, UCB; and Laura Sandt, HSRC; This project aims to identify safety data linkage and integration opportunities that have not been formalized in the past. Updates:

- Gathered information on data and analysis already done that provides a richer context to safety analysis, through a review of the safety literature.
- Described opportunities to link data across many domains and described the linkage methods and processes to do such integration.
- Research has been completed and producing final deliverables, which include a report on linked data systems, an appendix describing individual datasets and their linkage opportunities, and five case studies showcasing the importance of data integration.

R5: Identifying the Traffic Safety Information Needs of Major Cities in the U.S. (updated title)
PI: Eric Dumbaugh, FAU / Co-Investigator: Dan Gelinne, HSRC; This study seeks to understand the safety needs of major cities in the United States. Updates:

- Completed a draft of the survey instrument, which is currently being reviewed by peer groups before being deployed to the 150 largest cities in the U.S.
- Conducted an in-person focus group with 10 representatives from cities in the U.S. on October 30, 2017. Completed a final transcript that has reviewed all identifying information, and had the accuracy of the transcript reviewed and amended by focus group participants.
- Conducted a thematic analysis of the focus group results.

R6: Using Advanced Analytics to Frame Vulnerable Road User Scenarios with Autonomous Vehicles (updated title)
PI: Noreen McDonald, UNC-CH Department of City and Regional Planning (DCRP) / Co-Investigator: Asad Khattak, UTK; The project, close to completion, explores bicyclist and pedestrian behavioral and safety issues related to connected and automated vehicles (CAVs). Updates:

- Investigated pedestrian and bicyclist behaviors in vehicle collisions, crashes and near misses in naturalistic driving environments.
- Produced papers and presentations including three lectern presentations at TRB, one publication in TRR (Shay, Khattak, & Wali), and one paper currently at the revise-and-resubmit stage at *American Journal of Preventive Medicine* (McDonald).

R7: Development and Evaluation of Vehicle to Pedestrian (V2P) Safety Interventions
PIs: Missy Cummings and Michael Clamann, Duke University; Developing a prototype Android mobile app to alert pedestrians when they are near areas of high traffic density, including the presence of autonomous vehicles, and advise pedestrians when it is unsafe to cross a street. Updates:

- Developed the Vehicle Avoidance System for Pedestrians (VASP) prototype, Summer 2017. VASP is a low-cost ultrasound transmitter paired with a smartphone app used to detect an oncoming vehicle.
- Completed experiment protocols and gained IRB approval for a human-in-the-loop experiment to measure trust thresholds for an app that warns pedestrians of oncoming traffic. Experiment design presented at TRB in January and to CSCRS in March.
- First pilot test for experiment completed in March 2018. Additional pilot test to take place in April. Full experiment scheduled to take place at North Carolina Center for Automotive Research (NC CAR) in Garysburg, NC, June 2018. NC CAR is allowing the Duke research team to use a portion of their test track for the experiment.

R8: Development of Resources to Guide Parents in Helping Teens Learn to Drive (updated title)
PI: Arthur Goodwin, UNC HSRC; The objective of this two-year project is to develop tools to assist parents of new drivers in North Carolina. Updates:

- Created a two hour, in-person parent “orientation session” that has two main goals: 1) encourage parents to provide their teens with a substantial amount of driving practice in a wide variety of settings, and 2) help parents better communicate with their teen during supervised driving.
- Created a facilitator guide and PowerPoint presentation to accompany the session.
- Created several other tools for parents including a debriefing form for driver educators and an inventory for parents to assess their teen’s readiness to drive without supervision.
- Updated a smartphone app that assists and encourages diversified practice during supervised driving.
- During the second year of the project, will pilot test the guidance materials in one or more communities and work with key agencies in North Carolina toward the goal of providing these resources to all parents of new teen (<18) drivers.

Year 2 Research Projects

Following the success of the Year 1 research efforts, CSCRS employed a rigorous peer-review process, leading to selection of the following Year 2 research projects. Some of these projects continue the work of Year 1 projects, and others address research gaps identified in the CSCRS strategic roadmap. Detailed individual project information is available on the webpages hyperlinked from the project titles below.

R9: Concept of Operations for an Autonomous Vehicle Dispatch Center
PI: Missy Cummings, Duke; The purpose of the CONOPS will be to describe the operational needs and systems characteristics for the system.

R10: Machine Learning Tools for Informing Transportation Technology Design
PI: Missy Cummings, Duke / Co-Investigator: Michael Clamann, Duke; This project will investigate how machine learning techniques can be used to design countermeasures that improve system safety. Progress to date: Student Yaoyo Wang developed preliminary machine learning algorithms to analyze accident and roadway data obtained from the HSIS database.

R11: Understating Crash Risk Exposure of Low Income Neighborhoods and Households
PI: Yanmei Li, FAU / Co-Investigator: Eric Dumbaugh, FAU; This study will examine the moderating role of the built environment on the relationship between crash incidence and socio-economic status.

R12: Linking Crash and Post-Crash Data
PI: David Ragland, UCB / Co-Investigator: Chris Cherry, UTK; This project addresses two California issues; one is to provide a more accurate picture of traffic injuries in California by utilizing medical data to fill in police crash reports. The second is to get a more accurate picture of emergency medical services response times.

R13: Shared Mobility Services and Their Connection to Roadway Fatalities
PI: Noreen McDonald, UNC / Co-Investigator: Tabitha Combs, UNC; This project will assess how technological change embodied by shared mobility services has and will impact road safety. Progress to date:

- Identifying and summarizing trends in mode choice, traffic fatalities, and the rise of shared mobility services in U.S. urban areas.
- Identifying data sources on travel patterns, mode choice, transit supply, and safety outcomes; preparing data for analysis of associations between travel patterns and safety.
- Identifying and developing analytical frameworks for assessing trends in roadway fatalities over time and at varying levels of aggregation, and identifying associations with urban travel patterns, availability and prevalence of shared mobility options.

R14: Creating a CSCRS Clearinghouse for Bicyclist and Pedestrian Safety-Related Data, Phase I: Inventory & Framework
PI: Krista Nordback, UNC / Co-Investigators: Seth LaJeunesse, UNC, and Julia Griswold, UCB; The long-term goal of this project is to create an online CSCRS centralized data clearinghouse for bicycle and pedestrian safety-related data as a national resource for safety researchers.

R15: Integrating Spatial Safety Data into Transportation Planning Processes
PI: Chris Cherry, UTK / Co-Investigator: Louis Merlin, FAU; In this project, will use the addresses of individuals who were involved in traffic crashes instead of the location of the crashes to evaluate road safety.

R16: Opioids at the Health and Transportation Safety Nexus
PI: Chris Cherry, UTK / Co-Investigators: Steve Marshall and Becky Naumann, UNC; This project will identify a system map for the linkage of prescription opioid and traffic safety data, as well as the generation of research questions that will contribute to further investigation.

R17: Strengthening Existing and Facilitating New Vision Zero Plans

PI: Kelly Evenson, UNC / Co-Investigators: Seth LaJeunesse, Steve Marshall and Becky Naumann, UNC; This project will develop products to impact the creation of new Vision Zero plans and assist municipalities as they update current Vision Zero plans.

Additionally, three projects were reviewed, revised, and are currently being finalized for selection; these will be added to the website and to RiP in the next reporting cycle:

- R18: Examining the Safety Effects of the Introduction of Light Rail Transit on Arterial Thoroughfares
- R19: Developing a Taxonomy of Human Errors and Violations that Lead to Crashes
- R20: Exploring the Vulnerability of Motorcyclists to Crashes and Injury

Rapid Response Projects

In this reporting period, CSCRS chose to fund its first Rapid Response project (which is a short-term, high priority project that requests funding outside of the normal funding process due to the need for a quick response).

RR1: Explaining the Rise in Pedestrian Fatalities: A Systems Approach

PIs: Laura Sandt and Becky Naumann, UNC; The purpose of this project is to convene a diverse group of cross-sector experts and stakeholders to explore factors driving the national rise in pedestrian deaths and share and develop insights into strategies to prevent pedestrian injuries and deaths. Progress to date:

- Planned two systems mapping workshops to be held with a diverse range of researchers and practitioners that bring a unique perspective to the issue of pedestrian safety. The purpose of the workshops is to identify mental models of underlying systems driving the increase in pedestrian deaths. Workshops will be conducted on April 5 and 19.
- Next steps will involve qualitative analysis of the workshop data and quantitative analysis of existing data to test hypotheses generated from the mapping exercises in the workshop. Will also identify key data and research needs to help advance the science in this area.

Current Education/Professional Development Projects

All CSCRS consortium member campuses launched learning and training programs by leveraging existing networks and resources and developing new collaborations. Major center-wide activities and progress for this reporting period in these areas included:

- Implemented Year 1 education and professional development programs, many of which will continue into additional contract years.
- Coordinated activity selection and planning for Year 2 education and professional development activities from consortium members.
- Learn more about current CSCRS education and professional development activities and projects on the CSCRS website, www.roadsafety.unc.edu.

HIGHLIGHTS

Safe Systems Summit: Redefining Transportation Safety *(led by HSRC)*

A major component of CSCRS's education and professional development activities, this summit aims to connect individuals from engineering, public health, departments of transportation, planning, media, injury prevention, and more to leverage our shared interest in preserving lives and promoting health to change the conversation about road safety in the United States and in North Carolina. The event is co-hosted by the NC Governor's Highway Safety Program. Planning accomplishments for the Summit during this reporting period:

- Originally envisioned for Spring 2018, but postponed to allow more development of the Safe Systems approach and surrounding CSCRS research, the Summit will officially be held September 13-14, 2018, in Durham, N.C.

- Invited keynote speaker: Internationally renowned Dr. Rod McClure has a unique background in public health, years of experience at the CDC, and forward-thinking insights into the transportation safety system to galvanize and encourage Summit attendees to take action to improve roadway safety.
- NC's Secretary of Transportation, James Trogdon has been invited to welcome the expected 200+ participants to open the event on Thursday morning.
- Created a committee of consortium team members to develop Summit programming and list of invited speakers and organizations.
- Began initial promotion of the Summit: www.roadsafety.unc.edu/profdev/summit/

Safe Streets Lecture Series (l*ed by FAU)*
- 1-2 speakers are planned for this series, which is held every fall and spring.
- The first lecture in this series took place on March 22, 2018, and featured Peter Norton, Professor of History at the University of Virginia, on "The Invention of the Motor Age Street."

Core Learning Community for Systems Thinking *(led by UNC IPRC)*
Core CSCRS team members joined a collaborative planning group, called Core Learning Community for Systems Thinking (CLC ST), set up as part of a CDC-grant funded project designed to understand how to use systems science approaches to improve the practice of injury and violence prevention. Due to the partnership and support of the CSCRS, the team has designated highway safety as its first area of focus.

Engagement at Conferences *(all)*
See Leadership *section for details on conference-related presentations and other engagement.*

Coffee and Conversation *(led by UNC)*
This ten-part Safe Systems-focused lecture series, started in January 2018 on the UNC-CH campus, is a biweekly dialogue featuring experts in public health, transportation, planning, engineering, ethics, and systems science. UNC-CH students, faculty, and researchers discuss state of practice in developing, implementing, and diffusing Safe Systems approaches to transportation safety. The following Coffee and Conversation sessions have been held thus far (see website for archived presentation slides and proceedings):
- Jan. 23, 2018: *It's Time for a Fresh Approach: Intro to Systems Thinking and Engineering*, Richard Burgess, Research Associate, Murdough Center for Engineering Professionalism, Texas Tech
- Feb. 6, 2018: *Transportation Funding and Finance 101: Why Funding is Policy*, Nick Norboge, Texas A&M Transportation Institute
- Feb. 20, 2018: *There Will Be Lawyers: Legal and Political Considerations for Safe Systems*, Alan Dellapenna, Branch Head, Injury and Violence Prevention, NC DHHS
- March 6, 2018: *Systemic Change and Systematic Change: Using Systems Science Tools to Communicate Complex Concepts*, Steve Marshall, Director, UNC IPRC
- March 20, 2018: *Framing the Dialogue on Traffic Safety to Advance Safe Systems*, Lucinda Austin, Assistant Professor, School of Media and Journalism, UNC-CH

Weekly Transportation Safety Seminar Series *(Led by UTK)*
UTK holds a weekly transportation safety seminar series that is funded in part by CSCRS. The following sessions have been held/scheduled:
- Sept. 7, 2017: Dissertation Overview, Bumjoon Bae and Meng Zhang, UTK PhD Candidates
- Sept. 14, 2017: Studying the Impacts of Connected and Automated Vehicles, Dr. Jackie Rios-Torres, Oak Ridge National Laboratory Research Scientist
- Sept. 21, 2017: Monitoring Drivers' Vital Signs during Driving, Dr. Aly Fathy, UTK Electrical and Computer Engineering Professor

- Sept. 28, 2017: Predicting Traffic Flows in the North American Railway Network, Dr. David Clarke, UTK Civil and Environmental Engineering Professor
- Oct. 12, 2017: Big Data Approaches to Understanding the Intersection of Bikesharing and Public Transit, Dr. Candace Brakewood, UTK Civil and Environmental Engineering Assistant Professor
- Oct. 19, 2017: Automotive Vehicle Safety: Lessons Learned from Aerospace Systems, Dr. Mark Whorton, University of Tennessee Space Institute Director
- Nov. 2, 2017: Transportation Infrastructure Management: From Policy to Technology, Dr. Shuai Li, UTK Civil and Environmental Engineering Assistant Professor
- Nov. 9, 2017: The Buckle Up Tonight to See Tomorrow Campaign, Dr. Jerry Everett and Christine Waxstein, UTK Center for Transportation Research
- Nov. 16, 2017: Freight in Tennessee, Daniel Pallme, Tennessee Department of Transportation
- Feb. 1, 2018: 2018 Transportation Research Board Conference Experiences, UTK Graduate Students
- Feb. 8, 2018: Challenges of Roadway Construction in Area with Sulfur-Bearing Formations: Investigation and Mitigation Techniques, Jim Ozment
- Feb. 15, 2018: Social Media and Crowd-Sourced Data in Transportation, Dr. Christa Brelsford, Oak Ridge National Laboratory
- Feb. 22: Transportation Infrastructure: Data to Pave the Way Forward, Pat Hu, U.S. DOT Bureau of Transportation Statistics
- March 8: Some Creative Thinkings in Mobility Data Analytics, Dr. Ho-Ling Hwang, Oak Ridge National Laboratory

Weekly Transportation Safety Seminar *(Led by UCB)*
Provided a platform for both researchers and students to share ongoing and completed UCB work and get feedback. Seminars included:

- Oct. 27, 2017: A Vision for Road Safety Management, Offer Grembek, Co-Director, UC Berkeley SafeTREC (13 staff/students attended)
- Nov. 17, 2017: A Behavioral Modeling Approach to Bicycle Level of Service, Julia Griswold, Researcher, UC Berkeley SafeTREC (12 staff/students attended)
- Dec. 1, 2017: Identifying the Data Requirements for Determining High Collision Concentration Locations across the State Highway System, Aditya Medury, Postdoctoral Researcher, UC Berkeley SafeTREC (8 staff/students attended)
- Jan. 26, 2018: Vision Zero and Safe Systems, Offer Grembek, Co-Director, UC Berkeley SafeTREC (14 staff/students attended)
- Feb. 2, 2018: Developing and Implementing Safety Performance Functions for Safer Roads in California, Camille Salem, Graduate Student Researcher, and Praveen Yayalamkuzhi, Postdoctoral Researcher, UC Berkeley SafeTREC (12 staff/students attended)
- Feb. 9, 2018: Developing an Intersection I2V System for CV/AV, Mengqiao Lu, Graduate Student Researcher, UC Berkeley SafeTREC (11 staff/students attended)
- Feb. 16, 2018: SafeSpot, SafeCorridor, SafeSystemic: a set of tools for ped/bike safety, Aditya Medury, Postdoctoral Researcher, UC Berkeley SafeTREC (11 staff/students attended)
- March 16, 2018: Roundtable Discussion of World Bank Report: The High Toll of Traffic Injuries: Unacceptable and Preventable, Offer Grembek, Co-Director, UC Berkeley SafeTREC (11 staff/students attended)

Student Scholarships *(led by various consortium members)*
Following are examples of scholarship programs implemented during this reporting period:

- ***CSCRS Scholars*** *(led by UNC):* CSCRS Scholars program was set up at UNC to select students who should receive a $500 award per semester, plus mentorship and academic support from a team of experienced transportation and public health researchers. Scholars participate in student-led or CSCRS-related activities. 16 CSCRS Scholars were selected for the 2017-2018 academic year.
- ***2017 Outstanding Student of the Year:*** Dr. Becky Naumann, who received her Ph.D. in epidemiology from UNC, was chosen by CSCRS Associate Directors as CSCRS's first Outstanding Student of the Year and was honored at the CUTC 27th Annual Outstanding Student of the Year Awards ceremony in January 2018. Learn more here: www.roadsafety.unc.edu/education/activities/becky-naumann.

Support Course Development/Teaching *(led by various consortium members)*
CSCRS funds were used to support several related Fall 2017 and Spring 2018 courses across consortium member campuses:

- [UCB] Fall 2017 Graduate course, titled: Injury Prevention and Control (PH285a), a two-unit course (or three units with a paper) taught by Prof. David Ragland, and Dr. Glenn Shor. 3 students participated. Course link: https://safetrec.berkeley.edu/education/injury-prevention-and-control
- [UCB] Spring 2018 Graduate course, titled: Traffic Safety and Injury Control (CEE C265 / cross-Listed with Public Health C285), a three units course taught by Dr. Offer Grembek and Prof. David Ragland. 11 students participating. Course link: https://safetrec.berkeley.edu/education/traffic-safety-and-injury-control
- [DUKE] Spring 2018 Graduate course, titled: Governance and Adaptive Regulation of Transformational Technologies in Transportation. Course link: https://bassconnections.duke.edu/project-teams/governance-and-adaptive-regulation-transformational-technologies-transportation-2017
- [UNC] Spring 2018 Graduate course, titled: Complete Safe Equitable Streets (PLAN 590), taught by Dr. Tabitha Combs. Course link: https://planning.unc.edu/courses/590/
- In the Fall 2017 and Spring 2018 at UTK:
  - 18 graduate students were enrolled in the Transportation Engineering and Science Program.
  - 13 graduate students (including two doctoral students) completed their degree requirements.
  - 236 undergraduate students (sophomore –seniors) were enrolled in the Civil and Environmental Engineering program.
  - Offered students 10 transportation courses taught by Civil & Environmental Engineering faculty, including: CEE 355 - Transportation Engineering I; CE 455- Transportation Engineering II; CE 456/458 – Transportation Engineering II Lab; CE 550 – Transportation Seminar; CE 551 – Traffic Engineering: Characteristics; CE 553 – Geometric Design; CE 558 – Transportation Planning; CE 559 – Transportation Safety CE 652 – Analysis Techniques for Transportation Planning System II; and CEE 653 – Intelligent Transportation Systems.

Student Research Activities
All consortium members

- Duke students were involved in a variety of student research activities on behalf of CSCRS this reporting period, including:
  - Completing an independent study on NHTSA guidance for automated vehicles, which resulted in the development of two podcasts:
    - The Brief Breakdown, Episode 1: DOT Federal Automated Vehicle Policy (Part 1): https://soundcloud.com/duke-scipol/brief-breakdown-episode-1

        - The Brief Breakdown, Episode 2: DOT Federal Automated Vehicle Policy (Part 2): https://soundcloud.com/duke-scipol/brief-breakdown-episode-2
    - Completing a publication and co-authored/guided research paper on machine learning.
    - Presenting a poster at the Duke Research Experience Undergraduate conference summarizing elements from the Research Project R7, including a test of a mobile app for warning pedestrians of oncoming traffic.
    - Reviewing the existing North Carolina legislation regulating autonomous vehicles to develop a model to analyze policy factors affecting the amount of AV activity in each state (six-student team at Duke).
    - Synthesizing a science library independent study at Duke for AV technology and terminology with undergraduate students. That project is due May 2018, and results will be posted soon thereafter.
- Two FAU student research assistants are working on CSCRS-related projects:
    - Abraham Fogel is working on a data linkages project, related to Research Project R4.
    - Amanda Murray is working on the Safe Systems synthesis project and survey (Research Project R3).
- Two UCB Transportation Engineering master's student are working as research assistants on CSCRS-related projects:
    - Lin Yang's research focuses on the methods that can be applied to maximize the pre-crash kinetic energy dissipation so that the energy imposed on the road users can be minimized. Title: "Methods for Maximizing Pre-Crash Kinetic Energy Dissipation from a Safe System Perspective."
    - Ibrahim Itani's research, titled "Applied Principles in Safe Systems," examines how Safe Systems are being implemented in other fields (e.g., construction, health care) and what can be learned from their approach.
- Two UNC DCPR master's students were selected as CSCRS research fellows:
    - Sarah Johnson's research focuses on analysis of city-level pedestrian and bicycle crash data to identify dangerous roadway configurations, and considers context-sensitive design interventions to improve pedestrian and bicycle safety in North Carolina.
    - Alyson West's research focused on creating a public dashboard with survey responses to the ABPB 2016 Women's Cycling Survey, to provide practitioners insight on how to increase cycling mode shares in their communities. West presented her research at the National Bike Summit in Washington, DC, March 2018.

Other Student Education Activities

- UCB Weekly Graduate Student Researcher meetings held with eight graduate students that provide various opportunities for professional development, including best practices for effectively communicating your research, research presentations, observation visits with practitioner organizations, and utilizing social media to support professional activities. Students are from City and Regional Planning, Transportation Engineering, and Engineering and Project Management.
- UTK supported student attendance and participation in various professional meetings to promote further learning and career development into the transportation engineering realm, including: nearly 30 students to attend and present papers/posters the 2018 TRB Annual Meeting; eight students to attend and present at the Regional Southern District ITE Conference; seven students to attend and present the Tennessee Institute of Transportation Engineers Summer Meeting; nine UTK ITE Student Chapter meetings in the 2017 Fall and 2018 Spring Semester (which included presenters from Tennessee Department of Transportation (TDOT), City of Knoxville, Knoxville TPO, Federal Highway Administration, and local consulting firms).
- UTK students were involved in several Tickle College of Engineering events and activities including:

  - WomEngineers, a dinner in Neyland Stadium for incoming and transfer female engineering students to meet and network with UT faculty and students.
  - A 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 who participate in events around the college.
  - STEMpunk Reverse Science Fair, where high school seniors were able to learn about electric bikes and their impact on countries with congestion issues, such as China.
- UTK students created an event called "Using Transportation Technology to Improve Safety, Mobility, Efficiency, and Sustainability" which gave the high schoolers an introduction on transportation engineering and the career opportunities that transportation engineer holds. Attendees rode electric bikes, used real time license plate recognition devices and a driving simulator, and visited a traffic management center.
- UTK students volunteered in the OpenStreets Knoxville hosted by the Bike Walk Knoxville, Knoxville Regional Transportation Planning Organization (TPO), and City of Knoxville hold OpenStreets Knoxville. This event was an opportunity to bring the community groups and businesses to give residents the opportunity to walk, ride bikes, rollerblade, etc. in a safe and fun environment. This event encourages people to use active transportation instead of healthy living and to reconsider our streets as public space.
- UTK students assisted in hosting Transit Day at local elementary schools including Emerald Academy, Green Magnet Academy, and Bearden Elementary School to encourage ridership on Knoxville Area Transit (KAT). Students were able to hop on and learn about the trolley while also learning about the costs in respects to Uber/Lyft.
- UTK students assisted in the Seatbelt Convincer, which simulates a low speed crash of approximately 5 to 7 miles per hour and allows the public to experience the benefits of wearing their seatbelt even at a low speed, at events all over Tennessee including: Austin East High School, Knoxville Ice Bear Hockey Team games, Tickle College of Engineering Homecoming Barbeque, Teen Rodeo, LN Stem Academy, UT Welcome Week, and Knoxville Healthy Living Expo.
- UTK students established a Women's Transportation Seminar Student Chapter at the University of Tennessee in the Fall 2017 semester.
- UTK students showcased transportation engineering and technologies and assisted in the Tennessee Regional Future City Competition that was held at the University of Tennessee, Knoxville. Middle school students from nine schools across Tennessee competed in this competition, which challenged students to design a virtual city in SimCity, write a 1,500-word essay on the city, build a scale model using recycled materials and that included at least one moving part, present a 7-minute presentation, and develop a project plan.
- UTK students received the best paper award by TRB's Safety Data, Analysis and Evaluation Committee (ANB20) for the following paper: Kamrani, M., B. Wali, & A. Khattak, Can Data Generated by Connected Vehicles Enhance Safety? Proactive Approach to Intersection Safety Management. Transportation Research Record: Journal of the Transportation Research Board, 2017 (TRR 2659).

Leadership

CSCRS team members presented at numerous conferences. In particular, CSCRS researchers made substantial scientific contributions during the 2018 Transportation Research Board (TRB) Annual Meeting, presenting during approximately 139 sessions; a list of all CSCRS-related sessions is at: http://www.roadsafety.unc.edu/wp-content/uploads/2018/01/CSCRS_TRB_Schedule.pdf. Additional conference and journal/publication activities include:

HIGHLIGHTS

- Mohamadi Hezaveh, A., & Cherry, C.R. (2018). *New approach to aggregate crash prediction model: Home-based crash frequency modeling*. Presented at Southern District ITE, Mobile, AL, United States.
- Mohamadi Hezaveh, A., Fallah Zavareh, M., Cherry, C.R., & Nordfjærn, T. (2017). *Toward developing bicycle rider behavior questionnaire (BRBQ)*. Paper presented at International Cycling Safety Conference, Davis, CA, United States.
- Noreen McDonald arranged and moderated an academic panel at ITS Carolinas Annual Conference & Exposition, February 2018. Gave presentation, "The human factor for autonomous vehicles."
- Asad Khattak attended the 5th Annual UTC Conference for the Southeastern Region in Gainesville, FL., in November 2017. Four of his graduate students presented four posters at the conference.
- Cherry, C.R. (2017, September). *Better data integration to create a complete picture for cycling safety*. Poster presented at the International Cycling Safety Conference, UC Davis Conference Center in Davis, CA, United States.
- Cherry, C.R., Mohamadi Hezaveh, A., Grembek, O., Sandt, L. & Merlin, L. (2017). *Better data integration to create a complete picture for cycling safety*. Paper presented at the International Cycling Safety Conference, Davis, CA, United States.
- Caroline Mozingo attended the North Carolina A&T State University Center for Advanced Transportation Mobility Annual Symposium in Greensboro, N.C., October 2017.
- Rodriguez, D. (2018, February 27). *Cycling benefits for all*. Presented in the Cycling to Health: How to Improve Wellness, Decrease Injury, and Maximize Performance course, Osher Mini Medical School for the Public, UC San Francisco, CA, United States.
- Michael Clamann participated in the panel discussion *Disruption Ahead: Autonomous Vehicles and the Cities They Inhabit* on September 19, 2017, as part of the Duke in DC series: https://alumni.duke.edu/events/disruption-ahead-autonomous-vehicles-and-cities-they-inhabit-september-19-1200-130-pm.
- Dumbaugh, E. (2017, November). *Integrating "Safe Systems" into land use planning: Examining the role of land use codes & development regulations on the incidence & severity of traffic-related death & injury*. Presented at the 5th Annual UTC Conference for the Southeastern Region, Gainesville, FL, United States.
- Griswold, J. (2017, September). *A behavioral approach to bicycle level of service*. Presented at the International Cycling Safety Conference, Davis, CA, United States.
- Laura Sandt presented during the breakout session "Challenges and opportunities for the intersection of Vulnerable Road Users (VRUs) and AVs" at the Automated Vehicles Symposium, July 2017, San Francisco, CA. Sandt moderated the "Vulnerable Road User safety needs and concerns" panel and provided an overview of automated vehicle/ vulnerable road user research.
- Laura Sandt presented at a Human Factors Workshop at the TRB annual meeting, National Academies, on pedestrian and bicycle safety and connected and automated vehicles during the annual meeting in Washington, D.C., January 2018.
- Michael Clamann presented during the breakout session "Challenges and opportunities for the intersection of Vulnerable Road Users (VRUs) and AVs" at the Automated Vehicles Symposium, July 2017, San Francisco, CA. Clamann moderated the panel "Technology, infrastructure, and policy considerations."
- Michael Clamann guest lectured at the Duke University School of Law and in a Noreen McDonald UNC class on the topics of AV technology and current policy developments.
- Noreen McDonald attended the 5th Annual UTC Conference for the Southeastern Region in Gainesville, FL, November 2017. McDonald moderated a session about the planning perspective.

- Grembek, O. (2017, September). *A behavior modeling approach to bicycle performance measures.* A co-authored paper presented at the International Cycling Safety Conference at the UC Davis Conference Center, Davis, CA, United States.
- Grembek, O. (2017, November). *Moving the needle on Vision Zero*. Presented at the Vision Zero SF Workshop: Bold Ideas for Vision Zero, San Francisco, CA, United States.
- Grembek, O. (2017, November). Presented during the *Enabling technologies and methodologies for Automated Driving Systems* breakout session at the UC Berkeley "Berkeley DeepDrive", Berkeley, CA, United States.
- Asad Khattak served as: 1) Editor-in-Chief of Science Citation Indexed Journal of Intelligent Transportation Systems, with a 2-year impact factor of 1.769 in 2016. 2) Associate Editor of SCI-indexed International Journal of Sustainable Transportation, with a 2-year impact factor of 1.973 in 2016, 3) Special adviser to the Journal of Transportation Safety and Security, & Advisory Board Member of Analytic Methods in Accident Research
- Eric Dumbaugh served as Associate Editor of the Journal of the American Planning *Association.*

Dissemination of Results

- CSCRS staff authored the article, "New Safety UTC Envisions Safe Systems Approach for U.S. Roadways" for the October 2017 USDOT *Spotlight* newsletter. www.transportation.gov/sites/dot.gov/files/docs/utc/286546/utcnewsletter115october.pdf
- Staff developed and disseminated two issues of *CSCRS Crossroads* newsletter in December 2017 and March 2018. Newsletter archives are available here: www.roadsafety.unc.edu/newsletters/newsletter-archive. 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 167 followers since the account was created. A recent month's analytics showed 10,600 impressions. Staff also maintained the CSCRS Facebook page, reaching as many as 120 people in an average month.
- The UTK ITE Student Chapter updated its online presence to include: a more user-friendly website, a Facebook page, and a Twitter profile.

Activities During Next Reporting Period

The following sections provide a description of activities CSCRS plans to complete during the next reporting period (4/1/2018-9/30/18) to accomplish the goals and objectives.

Administration and Management

- Plan and facilitate a CSCRS Executive Committee meeting to be held on April 5-6, 2018, to refine and update the CSCRS strategic roadmap and internal processes.
- Plan and facilitate a CSCRS Advisory Board conference call on May 24, 2018, and an in-person meeting on September 12, 2018, in conjunction with the Safe Systems Summit.
- Attend the Council of the University Transportation Centers (CUTC) Annual Summer Meeting, June 4-6, 2018, in Minneapolis, and renew membership in the organization.
- Plan and hold the Safe Systems Summit, September 13-14, 2018, in Durham, N.C.
- Develop and issue a call for new projects. Administer a peer-review process to evaluate proposals and work with consortium team members to refine and select Year 3 activities.
- Continue exploring functionality needs for an online CSCRS project management system.
- Begin planning for the second Safety Sunday @ TRB to be held in conjunction the 2019 TRB annual meeting.

Research

Year 1 Research Projects

Continue work on Year 1 research projects (many of which are scheduled to be finished during the next reporting period).

Year 2 Research Projects

Begin and continue work on Year 2 research projects, and finalize the selection process for the three projects that were recommended for funding on April 4 (more information below):

R18: Examining Potential Safety Risks Associated with the Introduction of Light Rail Transit
PI: Eric Dumbaugh, FAU / Co-Investigator: Candace Brakewood, UTK; This study will entail a two-tiered analysis. The first analysis will entail a systematic examination of national trends in light rail safety performance. The second tier will investigate the design-level factors that may be responsible to the crash risk associated with light rail transit.

R19: Developing a Taxonomy of Human Errors & Violations that Lead to Crashes
PI: Asad Khattak, UTK / Co-Investigator: Eric Dumbaugh, FAU; This project will develop key elements of a Safe Systems framework by analyzing human errors and violations and their contributions to crashes; bringing together and analyzing behavioral, infrastructure/built environment, and vehicle, and data analytic features to find ways to reduce crashes and prevent injuries.

R20: Investigating the Vulnerability of Motorcyclists to Crashes and Injury
PI: Asad Khattak, UTK / Co-Investigator: Arthur Goodwin, UNC; This study will focus on analyzing a unique database of motorcycle crashes, exploring how key risk factors vary by demographics and from one context to another, i.e., the settings in which motorcycle travel takes place.

Education/Workforce Development and Professional Development

Continue work on Year 1 non-research activities, as well as Year 2 activities, including:

- *Safe Streets lecture series, Year 2 (Led by FAU)*
- *Student fellowship and research grants (Led by UCB)*
- *Pilot workshops on road safety for planners in NC (Led by UNC DCRP)*
- *CSCRS web-based repository of systems thinking resources (Led by UNC IPRC)*
- *Public Health travel scholarships for Safe Systems Summit (Led by UNC IPRC)*
- *Systems thinking workshop focused on pedestrian safety (Led by UNC IPRC)*
- *CSCRS student-focused meeting/conference (Led by UTK)*
- *Traffic Signal Academy course development (Led by UTK)*
- *TTAP online traffic safety course (Led by UTK)*
- *Weekly transportation seminar and webinar speaker series (Led by UTK)*
- *Safe Systems education and outreach program (Led by FAU)*
- *Injury Prevention and Control course (Led by UCB)*
- *Traffic Safety and Injury Control course (Led by UCB)*
- *Traffic Safety YouTube video series (Led by UCB)*
- *Community Planning Month engagement with Chapel Hill elementary students (Led by UNC DCRP)*
- *Continuation of CSCRS Scholars program (Led by UNC DCRP)*
- *Teach Complete, Safe, Equitable Systems UNC course (Led by UNC DCRP)*

- *Crash Scene Investigation Camp (Led by UTK)*
- *UTK student scholar awards (Led by UTK)*

2. Products

The following sections summarize the products that have resulted from CSCRS or companion projects during the reporting period.

Publications, Conference Papers and Presentations

Peer Reviewed Journal Publications

- Boakye K., Khattak, A., Nambisan, S., & Everett, J. (Forthcoming). Correlates of front-seat passengers' non-use of seatbelts at night. *Accident Analysis & Prevention.*
- Combs, T.S., Sandt, L., Clamann, M., & McDonald, N.C. (Under review). Automated vehicles and pedestrian safety: exploring the promise and limits of detection technology. *American Journal of Preventative Medicine*.
- Evenson, K.R., LaJeunesse, S., & Heiny, S. (In press). Awareness of vision zero among United States' road safety professionals. *Injury Epidemiology.*
- Kamrani M., Arvin, R., & Khattak, A. (Forthcoming). What measures of driving volatilities best explain crash frequency at intersections? *Transportation Research Record: Journal of the Transportation Research Board*.
- Liu J., & Khattak, A. (2017). Gate-violation behavior at highway-rail grade crossings and the consequences: Using geo-spatial modeling integrated with path analysis. *Accident Analysis & Prevention*, 109, 99-112.
- Liu, J., Khattak, A. & Wali, B. (2017). Do safety performance functions used for predicting crash frequency vary across space? Applying geographically weighted regressions to account for spatial heterogeneity. *Accident Analysis & Prevention*, 109, 132–142.
- Mohamadi Hezaveh, A., Fallah Zavareh, M., 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, 289-298.
- Shay E., Khattak, A., & Wali, B. (Forthcoming). Walkability in the connected and autonomous vehicle era: A U.S. perspective on research needs. *Transportation Research Record: Journal of the Transportation Research Board*.
- Wali, B., Khattak, A., Chimba, D., Waters, J., & Li, X. (Forthcoming). Development of safety performance functions for Tennessee: Unobserved heterogeneity & functional form analysis. *Transportation Research Record: Journal of the Transportation Research Board*.
- Wali, B., Khattak, A., & Xu, J. (2018). Contributory fault and level of personal injury to drivers involved in head-on collisions: Application of copula-based bivariate ordinal models, *Accident Analysis & Prevention*, 110, 101-114.
- Fallah Zavareh, M., Mohamadi Hezaveh, A., & Nordfjærn, T. (2018). Intention to use bicycle helmet as explained by the health belief model, comparative optimism and risk perception in an Iranian sample. *Transportation Research Part F: Traffic Psychology and Behaviour*, 54, 248-263.
- Zhang, M., Khattak, A., Liu, J., & Clarke, D. (Forthcoming). A comparative study of rail-pedestrian and cyclist trespassing crash injury severity at highway-rail grade crossings and non-crossings. *Accident Analysis & Prevention*.

Books or other non-periodical, one-time publications:

- Boakye K., (2017*). Evaluation of increased targeted enforcement and community-based outreach and education programs to increase nighttime seatbelt use in East Tennessee*. (Unpublished doctoral dissertation). The University of Tennessee, Knoxville.

- Clamann, M. (2017, August 17). Making driverless cars safe for people on foot. *The Conversation.* Retrieved April 10, 2018, from https://theconversation.com/making-driverless-cars-safe-for-people-on-foot-82411
- Cummings, M.L. (in press). Adaptation of licensing examinations to the certification of autonomous systems. In Li, X., Murray, R., Tomlin, C.J., & Yu, H. (Ed.), *Safe, Autonomous and Intelligent Vehicles, Unmanned System Technologies* series, New York, NY: Springer.
- Li, X., (In preparation). *Analysis of large-scale traffic incidents and en route diversions due to congestion.* (Unpublished doctoral dissertation). The University of Tennessee, Knoxville.
- Zhang M. (In preparation). *Understanding micro-level lane change and lane keeping driving decisions: Harnessing big data streams from instrumented vehicles*, (Unpublished doctoral dissertation). The University of Tennessee, Knoxville.

Websites, Social Media and Other Internet Resources

- DCRP master's student and CSCRS Scholar Will Leimenstoll is producing a weekly roundup of news articles that address or discuss the pedestrian and bicycle safety implications of CAVS. This roundup is published online in blog format at https://ctp.unc.edu/.

Technologies or Techniques

Vehicle Avoidance System for Pedestrians (VASP) prototype

Tested various connected and automated vehicle technologies in the field, on the UT Knoxville campus and the East Tennessee State University campus in Johnson City, TN. Dedicated Short Range Communications (DSRC) technology is being used along with new algorithms and applications for signal phasing at intersections, freeway merging systems at on-ramps, and for testing the reliability of DSRC on rural two-way two-lane roads. The work is reflected in the following papers (under submission to IEEE journals) and presentations at the 2018 Transportation Research Board annual meeting:

- A Cooperative Freeway Merge Assistance System using Connected Vehicles, Poster Session 392, Md Salman Ahmed, Mohammad Hoque, Jackeline Rios-Torres, Asad Khattak
- Intersection Approach Advisory Through V2X Technology Using Signal Phase and Timing (SPaT) Information at Fixed-Time Signalized Intersection, Poster Session 572, Md Salman Ahmed,Mohammad Hoque, Asad Khattak
- Impact of Vehicle-to-Vehicle Communication Reliability of Safety Applications: An Experimental Study, Lectern Session 755, Mohammad Hoque, Md Salman Ahmed, Jackeline Rios-Torres, Asad Khattak, Ramin Arvin

Inventions, Patent Applications and/or Licenses

Nothing to report.

Other Products

Nothing to report.

3. Participants & Collaborating Organizations

Partner Organizations

Below is a summary of organizations that have been involved as partners, organized by type:

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 Schools 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(ies)
- Duke Initiative for Science & Society Science Policy Tracking Program, Durham, NC (Financial Support)
- Planning Society @ FAU, Boca Raton, FL (Collaborative Support)
- Renaissance Computing Institute, Chapel Hill, NC (Collaborative Support)

Other Collaborators or Contacts
Nothing to report.

4. Impact

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

Impact on the Development of the Principle Discipline(s) of the Program

CSCRS's research and outreach efforts to date have provided 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. For example, participation in the Core Learning Community for Systems Thinking has helped to expand understanding of systems science approaches broadly, and how they may be applied to highway safety issues in a variety of contexts. The Rapid Response project, funded as a direct result from conversations with USDOT staff at the TRB conference, has also generated opportunities for applying systems science techniques and engaging stakeholders beyond traditional transportation agency staff. As part of this project, a workshop planned for April 2018 will involve participants from 20+ different areas of expertise (including auto-makers, transit agencies, state and local planners and engineers, homeless shelter volunteers, journalists, enforcement officers, injury researchers, lawyers, victim-advocates, community groups, and others) tasked with developing causal loop diagrams to map transportation-related systems (and underlying mental models) and generate sophisticated hypotheses about the complex issues underlying the recent rise in pedestrian fatalities. This effort is intended to inform and enhance the development of future research and policy initiatives as well as shed light on systems science techniques for developing shared understanding of issues and leverage points for future interventions.

These activities, plus the collaborations across the CSCRS projects, are resulted in a honing of how transportation safety is being taught at several universities. As a result of the development of the Rapid Response workshop, several CSCRS consortium members are augmenting the workshop format in order to integrate it into existing transportation courses as a way of introducing systems science principles and methods.

As we prepare to share the research findings from our first year, CSCRS's 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 already participated in numerous conferences, engaged with key opinion leaders and influential organizations, and are poised to offer our own educational/professional development events in the near future.

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. We're also leveraging individual research and non-research projects as a way to engage various disciplines. For instance, representatives from Volkswagen, the Alliance of Automobile Manufacturers, and Mercedes-Benz will be participating in the April Rapid Response workshop. CSCRS researchers are actively engaging representatives from various disciplines as we plan the Safe Systems Summit and identify additional needs and opportunities through the strategic roadmap and tech transfer plan development.

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—provide evidence of strong delivery of workforce development opportunities and potential for impact. In particular, the seminar series 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.

Impact on Physical, Institutional, and Information Resources at the University or Other Partner Institutions

CSCRS team members are implementing systems science mapping exercises into existing university courses to introduce students to systems thinking now. Also, all CSCRS consortium campuses have launched 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.

Impact on Technology Transfer

CSCRS continues to expand its universe of stakeholders, constantly reaching into areas where research can be put into practice. For example, a key objective is to aid states and cities interested in implementing Safe Systems approach in various contexts. Efforts to increase the involvement of state and local government officials are underway. Also, the invite list for the Safe Systems Summit includes people with the power and connections to bring safe roadway systems to fruition in the U.S.

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.

5. Changes/Problems

Starting on January 1, 2018, Dr. Laura Sandt began serving as director of CSCRS with the approval of USDOT, replacing previous director David Harkey, who left the position at the end of 2017. Dr. Sandt has been an integral part of the CSCRS team from the conception of the original proposal materials, to implementation and management of the grant since the HSRC was awarded the UTC grant in November 2016.

Additional Information Regarding Products and Impacts

Nothing to report.

6. Special Reporting Requirements

This entire report is available on the CSCRS website.