United States Senate Subcommittee on
Surface Transportation, Maritime, Freight, and Ports

Hearing: Examining the Roadway Safety Crisis and Highlighting Community Solutions

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Written Testimony

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Biography

Dr. Laura Sandt was appointed co-director of the University of North Carolina (UNC) Highway Safety Research Center (HSRC), focused on research strategy and implementation, in November 2023. She has been with HSRC since 2004 and is active in a variety of research areas, including the development and evaluation of community-involved health and injury prevention programs and studies focusing on pedestrian and bicycle safety, mobility, and access.

Dr. Sandt serves as co-director for the Pedestrian and Bicycle Information Center, a federal clearinghouse that provides leadership and technical guidance to communities across the U.S.. She also serves as director for the Collaborative Sciences Center for Road Safety, a National University Transportation Center funded in 2016 by the U.S. Department of Transportation (USDOT). In this role, she has oversight responsibilities for the Center, whose mission is to advance transportation safety through a multidisciplinary, systems-based approach.

She has been involved in the development of several seminal Federal Highway Administration (FHWA) and National Highway Traffic Safety Administration (NHTSA) resources, including the *Pedestrian Road Safety Audit Guidelines and Prompt Lists*, the guide *How to Develop a Pedestrian Safety Action Plan*, *Countermeasures that Work: 7th Edition*, and a toolkit for community members, *A Resident's Guide for Creating Safer Communities for Walking and Biking*. She has also led projects working directly with states and local communities to develop, implement, and evaluate programs aimed at improving pedestrian and bicycle safety and access to affordable travel options and health opportunities. Most recently, she participated in FHWA's Office of International Programs study team examining Safe System innovations to improve pedestrian safety on urban arterial roads.

Dr. Sandt has led or supported numerous projects related to transportation safety data improvement and systemic safety analysis. She served as Principal Investigator on NCHRP projects 17-73 (Report 893), and BTSCRP project 10 (Research Report 9), and has conducted several studies utilizing both healthcare and police data records to examine the quality and potential application of various data sources.

Dr. Sandt has a Ph.D. in epidemiology from the UNC-Chapel Hill Gillings School of Global Public Health, with a concentration in injury prevention. She also holds a Masters in Regional Planning (M.R.P.) from UNC-Chapel Hill with a concentration in transportation and land use. Her undergraduate degree is from Texas A&M University. Dr. Sandt is an active member of the Association of Pedestrian and Bicycle Professionals, the Institute of Transportation Engineers, the Road to Zero Coalition, and the Transportation Research Board, serving as former Chair of the Pedestrians Committee (ACH10), and co-chair of the Subcommittee on Automated Vehicles, Pedestrian, and Bicycle Interaction.

Chairman Peters, Ranking Member Young, and distinguished members of the Committee:

Thank you for the opportunity to speak today on the critical issues surrounding our roadway safety crisis. My name is Laura Sandt, and I am a Senior Research Associate and Co-Director of the Highway Safety Research Center at the University of North Carolina at Chapel Hill. The UNC Highway Safety Research Center was established in 1965 at the directive of the then Governor of North Carolina to provide policy makers with research needed to improve road safety – a very big concern in the 1960s. You may not be familiar with my Center in name, but I am confident that you are familiar with the impactful work of my HSRC colleagues, which has informed the creation of nationally adopted safety efforts such as Graduated Driver Licensing systems for novice drivers that have helped countless teens become safer drivers, and public engagement programs like *Click It or Ticket* that have helped to drive seat belt use to record high levels.

My work at UNC over the last 20 years has been to further advance this mission of saving lives on our roadways. My work is focused on better understanding the patterns and causes of roadway injuries and estimating the effectiveness of various approaches designed to prevent severe and fatal injuries. Further, as an epidemiologist and transportation planning and safety researcher, my guiding light is to improve the quality of life and wellbeing of our communities. I am just one out of a large community of safety researchers, so I will focus my comments today on topics related to my own research priorities rather than try and address the full set of existing and emerging road safety issues. My focus will be on:

- **The Growing Crisis of Roadway Fatalities**
- **The Value of the Safe System Approach**
- **Policy Opportunities to Further Strengthen Injury Prevention Efforts**

The Growing Crisis of Roadway Fatalities

The roadway fatality rate in the U.S. has been steadily increasing since 2010. In sharp contrast, over the same time period we have seen the fatality rate per capita consistently declining in countries adopting rigorous road safety programs, such as the Safe System Approach. For example, the U.S. fatality rate is three to five times that of the Netherlands, United Kingdom, Sweden, Norway, Australia, and New Zealand.[1, 2] According to the National Safety Council,[3] the "U.S. ranks 41st in worst traffic fatality rate among 49 high-income nations."

The consequences of this epidemic are dire. Traffic deaths are a leading cause of death in the U.S., and the top cause of death among youth. According to the Centers for Disease Control and Prevention,[4] each year there are over 2.1 million emergency department visits for injuries, and more than 41,000 people

[1] Collaborative Sciences Center for Road Safety. 2023. "Vision for a Safer Road System." Chapel Hill, NC: CSCRS. https://www.roadsafety.unc.edu/wp-content/uploads/2022/09/CSCRS_6YR.pdf.

[2] Chiarenza, J., Borah, A., Geschwindt, M., Ireland, L., Kim, Y.J., Levine, N., and Tran, H. 2023. "Global Benchmarking Program: Improving Pedestrian Safety on Urban Arterials." FHWA-PL-23-006. Washington, DC: Federal Highway Administration. https://international.fhwa.dot.gov/programs/mrp/docs/FHWA-PL-23-006.pdf.

[3] National Safety Council. 2021. "Zero Traffic Deaths: A Roadmap to Get There." ArcGIS StoryMaps. March 31, 2021. https://storymaps.arcgis.com/stories/b30d2c5754a3474bbecf7d46b6586469.

[4] U.S. Centers for Disease Control and Prevention. 2024. "About Transportation Safety." CDC: Transportation Safety. https://www.cdc.gov/transportation-safety/about/index.html.

killed, from motor vehicle crashes. Notably, vehicle-related fatalities and injuries significantly impact the hardworking people building our infrastructure. There were 891 people killed and 37,701 people injured in work zone crashes in 2022, representing a 52 percent increase in work zone fatalities since 2010.[5]

It is not just the loss of life that is concerning, but treating and recovering from injuries creates significant burdens for families, health care providers, employers, and the broader community. For crash survivors, transportation injuries have been associated with longer-term health concerns including arthritis, chronic pain, depression, anxiety, and the rise in opioid use. **Our economy and our public health depend on people and families arriving safely at their jobs and schools and returning safely to their homes and communities each day.**

As a nation, we are aging. More Americans are experiencing physical, medical, or mental conditions that limit their ability to drive, or make them uncomfortable driving in all conditions, such as at night. Having choices for safe and affordable forms of transportation is critical for community members to access employment, healthcare, education, and other opportunities. Given this need, the 58 percent increase in pedestrian deaths we have seen over the last decade has been particularly alarming.[6] **There is much work to be done to provide safe transportation options for all road users, of all ages and abilities.**

In the roadway safety and public health research community that I represent, we feel that it is important to acknowledge that this is a public health crisis affecting community members' lives, mobility, and access to the places they need to travel to safely. We also want to acknowledge that **roadway crashes are preventable, and we have many available tools** and practices that can be applied to reduce the rate of severe and fatal injuries and the trends we're seeing.

The Value of the Safe System Approach

The USDOT, in its *National Roadway Safety Strategy*, promotes the Safe System Approach, which focuses on five key objectives: safer people, safer roads, safer vehicles, safer speeds, and post-crash care. The Safe System Approach is an evidence-based strategy that specifically acknowledges the primary mechanism of injury in roadway related crashes: kinetic energy above human tolerance levels.[7] **Fundamentally, the Safe System Approach is a public health approach, focusing on population-level ways to prevent and manage exposure to injury risks.**

In contrast to commonly used traffic safety frameworks, the **Safe System Approach places a strong emphasis on the importance of managing speeds across the network to increase the chances of survival of all types of crashes.** This is a shift from many past safety initiatives, which have largely focused on the issue of *individual driver speeding* (i.e., driving too fast for conditions or exceeding the posted speed limit), rather than the injury mechanism of kinetic energy transfer that is driven by the mass and velocity of the parties involved in a crash.

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[5] National Safety Council. 2024. "Motor Vehicle Safety Issues: Work Zones." NSC: Injury Facts. 2024. https://injuryfacts.nsc.org/motor-vehicle/motor-vehicle-safety-issues/work-zones/.

[6] Governors Highway Safety Association. 2024. "U.S. Pedestrian Deaths Fall Slightly in First Half of 2023, but Remain Above Pre-Pandemic Levels." GHSA. https://www.ghsa.org/resources/news-releases/pedestrians-preliminary24.

[7] Ederer, D.J., Panik, R.T., Botchwey, N., and Watkins, K. 2023. "The Safe Systems Pyramid: A New Framework for Traffic Safety." Transportation Research Interdisciplinary Perspectives 21 (September): 100905. https://doi.org/10.1016/j.trip.2023.100905.

A large body of evidence has documented vehicle speed, and not necessarily speeding, as a root cause of traffic-related injuries and deaths. This is because speed affects:

1) the driver's ability to detect potential hazards on the road and avoid making driving errors;
2) road user reaction time and stopping distance needed to avoid a crash;
3) the performance of vehicle crash avoidance systems and safety equipment; and
4) the severity of injuries resulting from a crash and likelihood of survival.[8,9]

Traveling at higher speeds has been associated with driver errors and poor judgment. For example, research has found that high-speed operations led to stop sign and traffic signal violations amongst motorcycle riders.[10] My own research has shown that drivers on higher speed roads are less likely to comply with laws requiring them to yield to pedestrians at crosswalks, compared to drivers on lower speed roads.[11]

Many of our current safety interventions, equipment, and vehicle technologies are insufficient in mitigating injuries when speeds (and kinetic energy transfer) are high. For example, "Shibata 1994 found that when motorcyclists crashed at lower speeds, helmets significantly decreased the risk of death, but at speeds greater than 50 kilometers per hour (kph), there was no significant benefit from wearing a helmet."[12] Similarly, a study of automatic emergency braking (AEB) systems with pedestrian detection found that while AEB was associated with a 32 to 34 percent reduction in the odds of a pedestrian crash on roads with speed limits below 35 miles per hour (mph), there was no reduction in the pedestrian crash odds on roads where the speed limit was 50 mph or higher.[13]

High vehicle operating speed is a particular concern for people outside of the vehicle, including adults and children walking or using assistive devices, bicyclists and motorcyclists, and workers in construction zones. For example, research has shown that most pedestrians can survive a crash at an impact speed of 19 mph, but survivability plumets as speeds increase beyond that.[14,15] As our population ages, our

[8] World Health Organization. 2017. "Managing speed." No. WHO/NMH/NVI/17.7. World Health Organization. file:///C:/Users/lssandt/Downloads/WHO-NMH-NVI-17.7-eng.pdf.

[9] National Association of City Transportation Officials. 2020. "City Limits: Setting Safe Limits on Urban Streets." NACTO. https://nacto.org/safespeeds/.

[10] Lee, C., Karimi, B., Jang, S., Salow, V. 2018. "Understanding emerging motorcyclist segments in crashes using Florida crash data and statewide survey." Transportation Research Record 2672(34), 106–121. https://doi.org/10.1177/0361198118798177.

[11] Sandt, L.S., Marshall, S.W., Rodríguez, D.A., Evenson, K.R., Ennett, S.T., and Robinson, W.R. 2016. "Effect of a Community-Based Pedestrian Injury Prevention Program on Driver Yielding Behavior at Marked Crosswalks." Accident Analysis and Prevention 93 (August): 169–78. https://doi.org/10.1016/j.aap.2016.05.004.

[12] Liu, B., Ivers, R., Norton, R., Blows, S., and Lo, S.K. 2004. "Helmets for Preventing Injury in Motorcycle Riders." Cochrane Database of Systematic Reviews, no. 2: CD004333. https://doi.org/10.1002/14651858.CD004333.pub2.

[13] Cicchino, J.B. May 2022. "Effects of automatic emergency braking systems on pedestrian crash risk." Accident Analysis & Prevention (AAP). https://doi.org/10.1016/j.aap.2022.106686.

[14] Johansson, R. 2009. "Vision Zero - Implementing a policy for traffic safety," Safety Science, 47: 826-831. https://doi.org/10.1016/j.ssci.2008.10.023.

[15] Dumbaugh, E., Merlin, L.A., Signor, K., Kumfer, W., LaJeunesse, S., and Carter, D.L. 2019. "Implementing Safe Systems in the United States: Guiding Principles and Lessons from International Practice." Final report CSCRS-R3. Chapel Hill, NC: Collaborative Sciences Center for Road Safety. https://www.roadsafety.unc.edu/wp-content/uploads/2019/07/CSCRS_R3_Final-Report.pdf.

tolerance for kinetic energy also decreases. One study found that older people (age 70+) are roughly five times more likely to die when struck by an impact speed of 20 mph than are 20-year-olds.[16]

Fortunately, research indicates that **even relatively small changes in speed can significantly improve safety for all road users.**[17] The World Health Organization estimates that just a 5 percent reduction in average speed can cut the number of fatal crashes by 30 percent, making a significant step toward our goal of zero roadway deaths.[8] The Safe System Approach therefore holds great promise in reducing exposure to injury risks by managing vehicle operating speeds so that impact forces experienced in the event of a crash are within physical tolerance levels[18] and the likelihood of severe and fatal injuries is minimized.

Policy Opportunities to Further Strengthen Injury Prevention Efforts

Due to the role of speed in traffic-related injuries and deaths, the USDOT's *National Road Safety Strategy* has placed a strong emphasis on speed management and adoption of the Safe System Approach. Specifically, it calls out the need for a "multi-faceted approach that leverages road design and other infrastructure interventions, speed limit setting, education, and enforcement."[19]

Speed management requires a broad spectrum of agencies working in coordination across jurisdictional levels. In a 2017 study, the National Traffic Safety Board (NTSB) stated that "Current federal-aid programs do not ensure that states fund speed management activities at a level commensurate with the national impact of speeding on fatalities and injuries."[20] The discretionary grants under the Infrastructure Investment and Jobs Act (IIJA) and the formula programs offer opportunities to further invest in speed management efforts that could significantly reduce fatal and severe crashes. **Importantly, there is a need to enhance cross-sector coordination, address jurisdictional barriers to speed management, and incentivize implementation of speed management tools.**

Update Speed Limit Setting Processes and Speed Targets

In contrast to other countries adopting a Safe System Approach, there is no national maximum speed limit law in the U.S., with states instead having speed-limit setting authority. In most states, maximum operating speed limits have increased since 1995, and roadway design guidance has been modified over time to accommodate higher speed traffic, to disastrous effect on roadway safety.

Many state strategic highway safety plans include ambitious goals to reduce speed-related fatalities and lay out numerous strategies and supporting actions, including evaluating speed limits, identifying needed

[16] Tefft, B.C. 2013. "Impact Speed and a Pedestrian's Risk of Severe Injury or Death." Accident Analysis and Prevention 50 (January): 871–78. https://doi.org/10.1016/j.aap.2012.07.022.

[17] Kumfer, W., Martin, L., Turner, S., and Broshears, L. 2023. "Safe System Approach for Speed Management." FHWA SA 23 002. Washington, DC: Federal Highway Administration. https://highways.dot.gov/sites/fhwa.dot.gov/files/Safe_System_Approach_for_Speed_Management.pdf.

[18] Doecke, S.D., Kloeden, C.N., Dutschke, J.K., and Baldock, M.R. 2018. "Safe Speed Limits for a Safe System: The Relationship between Speed Limit and Fatal Crash Rate for Different Crash Types." Traffic Injury Prevention 19 (4): 404–8. https://doi.org/10.1080/15389588.2017.1422601.

[19] U.S. Department of Transportation. 2022. "National Roadway Safety Strategy." Washington, DC: USDOT. https://www.transportation.gov/sites/dot.gov/files/2022-02/USDOT-National-Roadway-Safety-Strategy.pdf.

[20] National Transportation Safety Board. 2017. "Safety Study: Reducing Speeding-Related Crashes Involving Passenger Vehicles." Public Information Meeting. https://www.ntsb.gov/news/events/Documents/2017-DCA15SS002-BMG-Abstract.pdf.

low speed zones, and developing a statewide speed management plan. While progress is being made, few of these plans have been funded, staffed, and implemented to the level necessary to address the magnitude of the issue. Cities, towns, and rural villages are also increasingly seeking ways to manage speeds but may be limited in their power to effect change, particularly in cases where state-owned roads run through local communities.

States need federal leadership and support to help overhaul speed limit setting practices. Many states have legislation mandating certain speed percentiles be used as a criterion for setting speed limits. Others have entrenched practices relying on driver operating speeds at free-flow conditions to inform speed limit setting. Still others have requirements for engineering studies to be performed prior to changing speed limits, but no capacity at the state or local levels to perform such studies. These challenges impede both state and local efforts to create speed limits and set target speeds designed for human tolerance levels.

There are several recently developed resources, guidance documents, and training resources available for context-sensitive speed limit setting aligned with the Safe System Approach. These tools describe the importance of developing target speeds (i.e., the maximum speed considered safe and appropriate for a specific roadway condition) for different contexts, and ways to align the posted speed and operating speed with those targets. **Critically, there is a need to support local efforts to build the capacity and resources available to identify speed management needs and effectively coordinate efforts with regional and state authorities.**

Accelerate Delivery of Self-Enforcing Roads and Speed-Managing Infrastructure

Posted speed limits send an important message to drivers about what speed is appropriate and safe. Beyond speed limit signs, there are many well-established safety treatments that can create "self-enforcing" roads that naturally cue drivers to adopt context-appropriate speeds. For example:

- Roundabouts to manage speeds at intersections
- Gateway treatments at speed transition zones
- Vertical and horizontal deflections
- Treatments designed to separate vulnerable road users from higher speed traffic (such as raised medians, separated bike lanes, separated paths, etc.)

In addition to documented safety benefits, many of these roadway treatments can also address goals related to improving mobility, accessibility, stormwater management, and other human and environmental health interests. As the usage of these treatments gains popularity in the U.S., we are seeing more public acceptance and demand for this infrastructure. **To further accelerate adoption of lifesaving infrastructure, there is a need to streamline delivery of these projects on existing roads, and to develop processes to ensure that future roadway design, operation, and maintenance practices incorporate these safety features where needed.**

Adopt Lifesaving Vehicle Technologies to Curb Kinetic Energy Transfer

In the U.S., vehicles are getting larger, heavier, and capable of reaching higher operating speeds more quickly. The increasing weight and height of vehicles has been linked to the increasing rate of pedestrian

fatalities that we have seen in the past decade.[21] The weight and acceleration capacity of motorcycles has also been linked to an increase in roadway fatalities.[22,23]

Opportunities exist for vehicle designs and technologies, as well as vehicle fleet management practices, to reduce kinetic energy, manage speeds, and provide feedback on speed to the driver that can reduce the risks of severe and fatal injuries.

Features like Intelligent Speed Assistance and Intelligent Speed Adaptation (ISA) are designed to help drivers stay within the speed limit.[24] ISA is now required on new vehicles in other countries, such as in countries within the European Union and in the United Kingdom, and is increasingly being incorporated into Safe System initiatives in other localities, such as New South Wales in Australia. Many Vision Zero cities are adopting fleet management practices that leverage opportunities to incorporate lifesaving technologies. For example, New York City has seen success in its fleet safety pilot program, reporting a 99 percent compliance rate with the speed parameters set.[25] States, too, are finding value in fleet vehicle technologies aimed at improving driver safety and traffic safety culture.

Enhance Safety Data and Safety Performance Metrics

We can't manage what we don't measure. Practitioners, the private sector, and safety researchers alike rely on data to investigate crashes, identify system failures, develop goals and plan for safety, evaluate the effectiveness of safety measures, and communicate risks to the public. These data need to be timely, accurate, consistent, accessible, and complete. Unfortunately, **our current transportation and health data systems are often siloed, under-funded, and in desperate need of modernization to help them meet these goals.** The distributed system of data ownership and funding for data improvements across transportation agencies, divisions of motor vehicles, healthcare providers, and federal entities means that data improvement efforts are often piecemeal, disconnected, inconsistent, and slow.

Several studies have documented data improvements that could greatly enhance our collective capacity to improve safety planning, deployment of projects and programs, and research and evaluation. For example, we need:

- **Enhanced requirements, definitions, and standards** for non-fatal injury reporting and geocoding (i.e., spatially referencing), including roadway and trail-related injuries involving pedestrians, bicyclists, and micromobility users that may or may not involve motor vehicles.
- **More routine collection of National Household Travel Survey data**, including more state-level sampling to support more localized and granular analysis.

[21] Hu, W., Monfort, S.S., Cicchino, J.B. 2023. "The association between passenger-vehicle front-end profiles and pedestrian injury severity in motor vehicle crashes." Insurance Institute for Highway Safety. https://www.iihs.org/topics/bibliography/ref/2294.

[22] Teoh, E.R., Campbell, M., 2010. "Role of motorcycle type in fatal motorcycle crashes." Journal of Safety Research 41(6), 507–512. https://doi.org/10.1016/j.jsr.2010.10.005.

[23] Jou, R.C., Yeh, T.H., Chen, R.S., 2012. "Risk factors in motorcyclist fatalities in Taiwan." Traffic Injury Prevention 13(2), 155–162. https://doi.org/10.1080/15389588.2011.641166.

[24] European Commission. 2018. "Speed and Speed Management." European Commission, Directorate General for Transport. https://road-safety.transport.ec.europa.eu/system/files/2021-07/ersosynthesis2018-speedspeedmanagement-summary.pdf.

[25] Automotive Fleet. 2022. "NYC Fleet Presents Preliminary Data on Speed Limiter Pilot." https://www.automotive-fleet.com/.

- **Comprehensive training for all primary collectors** of injury data, including state and local enforcement agencies and university/campus police, to include training on coding incidents involving emerging vehicle technologies and devices.
- **Technical resources and model practices** detailing how to obtain, document, process, securely store, and link or integrate data sources needed for safety assessment while protecting data privacy.
- **Sustained, long-term funding and dedicated coordinating units** for safety data collection, management, and usage across multiple data sources, as well as support to create data dashboards and accountability tools.

As more communities create Safe Streets for All and Vision Zero plans and embrace Safe System approaches to reduce roadway injuries, there is an urgent need to enhance our safety data and performance measurement efforts and integrate them with these activities. We currently lack standards and routine collection and reporting tools related to crash impact speed, facility or system design and operating speed, and indicators of how often and where repeat speeding offenders are traveling. As we increasingly look to in-vehicle safety technologies, we will need more data related to system usage, compliance, and failures to help us understand and improve their performance and public acceptance.

Many Safe System adopting countries have made great strides in developing data standards and safety performance measures related to speed and other safety outcomes. They are taking steps to systematically track safety metrics, such as the proportion of speed-compliant vehicles, roads/intersections in the network where the design speed matches the target speed, the proportion of roads in the network where the posted speed matches the human tolerance, and the proportion of the network that has been modified to align with safe and appropriate speeds. These data practices are easily replicable in the U.S. and could significantly advance our ability to set benchmarks related to speed management, show accountability in the implementation of Safe System efforts, and identify successful practices that result in safer speeds and reduced risks.

University-based researchers are well positioned to offer support in this work. Universities often have the skills, infrastructure, and capacity that private firms and state and local agencies lack to serve as independent data stewards, to securely protect sensitive data, to develop tools and repositories for data management, and to support efforts that make data products available and accessible for research and planning.

Similarly, public health agencies are key partners that could be further engaged in this work. The field of public health holds great expertise in developing near real-time injury surveillance systems, engaging with communities on safety and health issues, and developing sound injury prevention programs.

Engaging universities with cross-sector partners and bringing public health agencies to the table to enhance our safety data and performance measures can serve to bridge research and education with the ongoing safety work within our communities.

In closing, I thank you again for your time and your consideration of our road safety challenges and the opportunities we have for strengthening our injury prevention efforts together, and I welcome your questions and thoughts on these issues.