Putting the Pieces Together:

Addressing the Role of Behavioral Safety in the Safe System Approach

A report by Cambridge Systematics, Inc. for the Governors Highway Safety Association

CAMBRIDGE SYSTEMATICS

GHSA
Governors Highway Safety Association
The States' Voice on Highway Safety

Contents

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Why This Report?

At the time of this publication, the nation's highway safety problem is getting worse, not better. The most recent federal estimates for U.S. traffic fatalities for 2021 are on track to exceed 40,000 for the first time in more than a decade.

The Safe System approach is exciting, promising and achievable. Behavioral highway safety and road users can and should be a part of it. State Highway Safety Offices and others involved in behavioral safety provide substantial value to pursue our shared safety goals.

The most important takeaway from this report and a fact the Safe System sustains is that it will take a comprehensive approach to highway safety to achieve zero. Clearly, efforts are needed to amplify focus on neglected areas of safety, such as increasing the responsibility of road designers to create safer infrastructure. After all, the best approach to a crash is to mitigate or prevent it in the first place.

However, emphasizing one approach does not mean we should discount others. We cannot only enforce, educate or build our way out of the problems plaguing our roadways. All the traffic safety E's — education, enforcement, engineering, emergency response and equity — are needed because they tackle different parts of the safety problem in sometimes exclusive ways. The Safe System is meant to be a systematic approach and it will be unachievable if we de-emphasize or willfully ignore parts of the system.

Whether you are working at the national, state or local level, data should drive the decision making. We must follow the data on which crash factors deserve the most focus in the areas of infrastructure, behavior, vehicle design and others. We should also doggedly continue to pursue a more robust understanding of what countermeasures are the most effective — given the specific safety problem — and do what works.

GHSA is calling on the highway safety community to work together on implementing those strategies we can all agree upon and not waste time and resources on the things that divide us. Highway safety has historically lived in stubborn silos that have frustrated safety efforts. Let's continue to break down silos, not create new, conceptual ones that will only prevent us from moving forward.

GHSA and our partners are committed to eliminating crashes, deaths and injuries on our nation's roadways. We ask you to join with us on the road to zero.

—Jonathan Adkins
GHSA Executive Director

Introduction

In October 2021, United States (U.S.) Transportation Secretary Pete Buttigieg announced National Highway Traffic Safety Administration (NHTSA) early fatality estimates for the first half of 2021. The news was troubling, as NHTSA estimated 20,160 people died in motor vehicle crashes during this period, up 18.4% compared to 2020 (National Center for Statistics and Analysis, 2021). These latest findings put the U.S. on track to exceed 40,000 annual fatalities for the first time since 2007. Prior to this announcement, the U.S. saw roadway fatalities steadily rise from 32,744 in 2014, to 38,680 in 2020 based on NHTSA's preliminary fatality data. Clearly, the U.S. needs to refocus and double down to address this alarming trend.

+18.4%

The estimated increase in fatalities due to motor vehicle crashes for the first half of 2021 compared to the same period in 2020.

Over the past decade, several national initiatives have sought to reverse this course of events. In 2014, the Toward Zero Deaths (TZD) steering committee, of which the Governors Highway Safety Association (GHSA) is a member, released *A National Strategy on Highway Safety* with the vision of a highway system free of fatalities through a sustained and even accelerated decline in transportation-related deaths and injuries. The National Strategy provided a platform for state agencies, private industry, national organizations and others to develop safety plans that prioritize traffic safety culture and promote the national TZD vision.

In January 2016, the Vision Zero Network, a nonprofit dedicated to helping communities eliminate all traffic fatalities and severe injuries through safe, healthy and equitable mobility, launched the Vision Zero Focus Cities program. Ten U.S. cities committed to stepping up efforts to eliminate traffic fatalities and severe injuries among all road users with a focus on pedestrian and bicycle related crashes. Today more than 40 communities participate.

The Road to Zero Coalition (RTZ) sought to unify TZD and Vision Zero efforts and in April 2018 produced *The Road to Zero: A Vision for Achieving Zero Roadway Deaths by 2050* report. One of three strategies in the plan prioritized safety by creating a safety culture and adopting the Safe System approach. The *Road to Zero Safe System Strategic Plan*, produced by the Institute of Transportation Engineers (ITE), funded by the Federal Highway Administration (FHWA), provides a roadmap for adopting the Safe System approach in the U.S. predominantly through an infrastructure lens.

This "infrastructure-centric" focus has led some national highway safety groups to question the role of behavioral safety in advancing the Safe System approach. However, some organizations, including GHSA, continue to promote the need to take a fully holistic approach to advancing safety — one that includes behavioral safety.

> *The fact is it will take time to create a system that accommodates human error and where crashes are within the tolerance of human injury when they occur. Sweden has been working on Safe System for 25 years and they are still doing behavioral programs.* **— Expert Panel Member**

The State Highway Safety Offices (SHSOs), GHSA's members, can and are playing a critical role in helping to advance the Safe System approach in partnership with engineers, planners, advocates, law enforcement agencies, educators and many others.

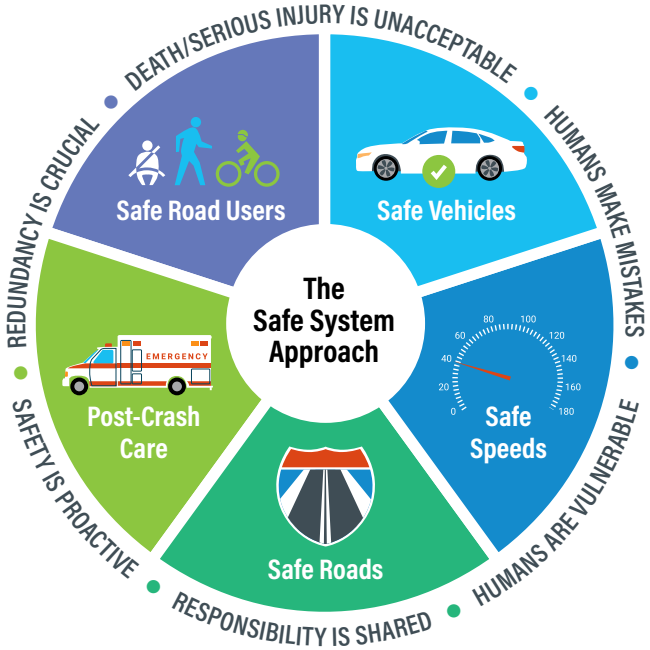
Project Approach

GHSA selected Cambridge Systematics, Inc. (CS) to produce a report providing guidance on how SHSOs and their partners can conduct highway safety planning and implement behavioral safety countermeasures and programs within the Safe System framework, while also supporting local Safe System and Vision Zero programs. In addition to a literature review of successful U.S. and international Safe System practices, CS met with 21 experts representing SHSOs, law enforcement, transportation safety organizations, universities, NHTSA and FHWA to better understand how they view behavioral safety programs through the Safe System lens (see Acknowledgments). This report reflects what was learned about the SHSOs' role in implementing the Safe System approach and what is needed to change the culture in a state, so that safety is factored into every transportation decision at the organizational and personal level. It also addresses implementing behavioral safety in an equitable manner in the context of a Safe System. Direct comments from expert panel members are included throughout the report, along with resources they identified as being helpful to SHSOs (see Appendix A).

Introduction to the Safe System Approach

The Safe System approach was first implemented abroad and has been linked to substantial reductions in traffic-related fatalities. Countries that have adopted the approach have experienced large decreases in deaths ranging from 47% in Australia to an 80% reduction in Spain (Johns Hopkins University, 2021). As a result, many countries and U.S. states have begun to apply a Safe System approach to their roadways. The approach can also be used as an equity tool in areas that have been disproportionately exposed to traffic-related hazards and historically overlooked. The Safe System approach to roadway safety envisions eliminating fatal and serious injuries for all road users by creating a transportation system that accommodates human mistakes and keeps impacts on the human body at tolerable levels (FHWA, 2021). The approach is based on six principles:

Figure 1: The Safe System Approach



Source: FHWA

- Death/serious injury is unacceptable
- Humans make mistakes
- Humans are vulnerable
- Responsibility is shared
- Safety is proactive
- Redundancy is crucial

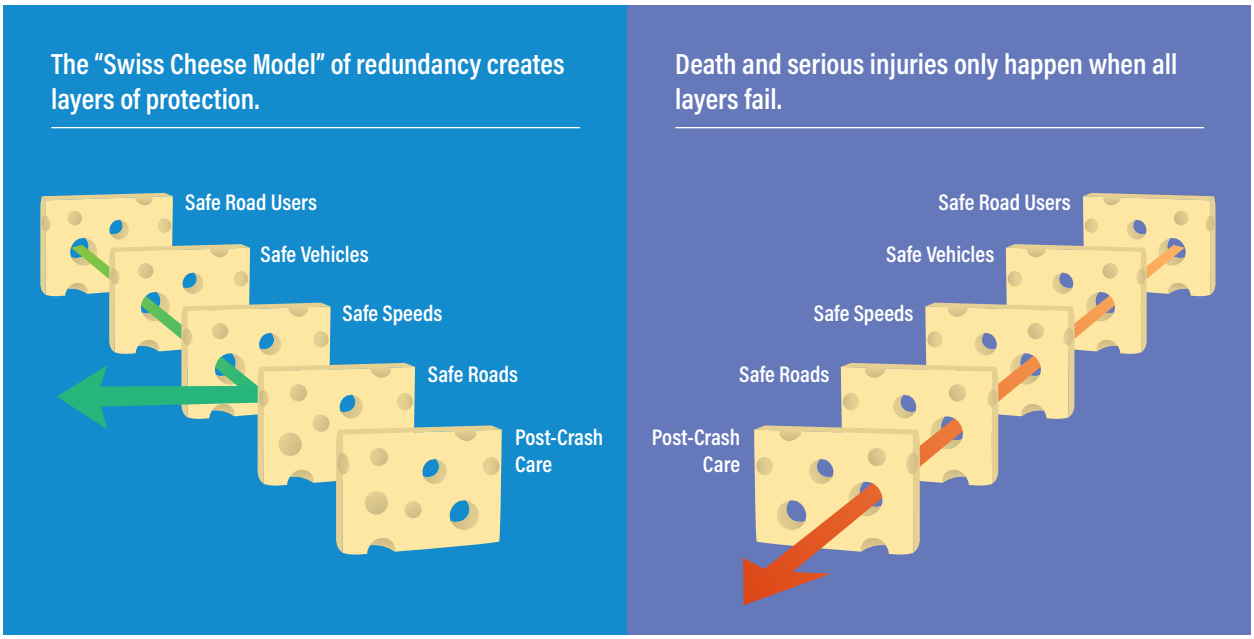
These principles may initially appear to suggest an approach that significantly differs from traditional behavioral safety programs. However, they align in many ways with long-standing behavioral safety strategies. A focus on these principles strongly supports a culture in which any death and serious injury is unacceptable. Behavioral safety professionals recognize that humans make mistakes and are vulnerable, and have developed programs to address those factors.

SHSO programs promoting the use of safety belts are a good example. A seat belt is a device designed to reduce human vulnerabilities in the event of a crash, so wearing one offers a measure of protection. Choosing to buckle up is proactive and recognizes that a traffic crash is possible for anyone who drives or is a passenger in a vehicle. Redundancy is also inherent in seat belt programs. For instance, seat belts are standard equipment in passenger vehicles. Occupant protection programs include state and local education and outreach to convince people to buckle up and encourage their family and others in their vehicle to do the same. These programs are combined with earned and paid media throughout the year. Law enforcement agencies back up these efforts with high visibility enforcement campaigns focused on both education and enforcement. If an educational message does not influence positive behavior change, enforcement with sanctions exists to reinforce the message.

So why the disconnect when it comes to behavioral safety being a part of the Safe System approach? The differentiation of the Safe System approach from other current highway safety strategic frameworks offers pros and cons. On one hand, it has reframed and revitalized interest in traffic safety, brought new voices to traffic safety discussions, identified infrastructure shortcomings and promoted the need for a stronger sense of shared safety responsibility in infrastructure planning. On the other hand, some Safe System discussions have prioritized infrastructure at the expense of other countermeasures proven to positively impact safety. It has also created divisions within the safety community that undermine the shared pursuit of safety goals. It is difficult enough creating a sustained sense of urgency about safety without professionals and advocates arguing with each other.

Improvement is needed to strengthen all aspects of the roadway system so if one fails, people are still protected. This requires all parts of the system to be managed as a whole, not separately. Achieving a Safe System that is forgiving of mistakes requires investment in Safe Roads, Safe Speeds, Safe Vehicles, Safe Road Users and Post-Crash Care. Known as the five Safe System elements, they create layers of protection to keep people safe from death and serious injury. All parts of the system must be strengthened collectively so that if one part fails, the others will continue to provide a protective effect. The Swiss Cheese Model, shown in Figure 2, incorporates the five Safe System elements and underscores the principle that redundancy is crucial. The more layers of protection against a roadway fatality or serious injury, the less likely it is to occur.

Figure 2: Swiss Cheese Model



Source: Washington Traffic Safety Commission, 2021

Instead of reacting to crashes, the Safe System approach encourages transportation agencies and other stakeholders to be proactive, identify the potential risks in advance and implement strategies to mitigate those risks. Behavioral safety is not just reactive; it can be proactive, for instance through public education

and the deterrent effect of enforcement. This would include programs or policies to mitigate risky driving behaviors, including getting behind the wheel after consuming alcohol and/or other impairing substances or speeding. The rise of designated driver programs, for example, illustrates a proactive approach to impaired driving prevention. Meanwhile, the presence of a marked police vehicle at the roadside, automated enforcement and other deterrents are shown to slow drivers down.

Application in the U.S.

Partners leading the adoption of the Safe System approach in the U.S. have identified the role of behavioral safety in its successful implementation. The first element, safe road users, highlights individual road user responsibility as a key element of a Safe System.

> *Each road user has a responsibility to use the road safely, whether they are driving, biking, walking, riding, or traveling by other modes and act within the limits of the road system's design. Four of the Safe System elements strongly align with the four E's of safety — enforcement, education, emergency response and engineering.* **— Expert Panel Member**

The Institute of Transportation Engineers (ITE), an international membership association of transportation professionals, stated that, "education and enforcement programs and policies, such as DUI checkpoints and media campaigns, help promote this individual responsibility by ensuring compliance with rules and limiting risky behaviors such as distracted or impaired driving" (2019).

The Safe System principles and elements make it clear the burden is not only on the designers of roads and vehicles. Behavioral interventions, including education and enforcement, are essential for encouraging more responsible road use and are an equally vital part of a safe transportation system. This is especially true for impaired driving, which is a leading factor in fatal crashes. While roadway design may or may not mitigate the severity of an impaired driving crash, it would not prevent the impairment from occurring in the first place. It would also not prevent recidivism, which is common among high-risk impaired driving offenders.

The Safe System approach emphasizes shared responsibility between many stakeholders working to make travel safe for all road users. While some might think only the Safe Road Users and Safe Speeds elements can be addressed by the SHSOs, state highway safety programs can have a positive impact on all five Safe System elements. For example, SHSOs already are or can contribute to each element of a Safe System in the following ways:

- **Safe Road Users —** Educating drivers about safe and unsafe driving behaviors, such as driving impaired, drowsy and/or distracted, as well as stopping the most dangerous driving when it occurs through equitable enforcement.

- **Safe Vehicles —** Educating drivers about occupant restraint use, vehicle recalls and the proper use of more sophisticated vehicle technology.

- **Safe Speeds —** Conducting speed enforcement, as well as providing analysis of where speed citations are written versus where speed related crashes occur, which helps with the development of speed management programs.

- **Safe Roads —** Providing support for joint enforcement and engineering training; encouraging involvement of SHSO grantees, such as local law enforcement, in road safety audits; and educating the public about newly installed innovative road safety features and how they work, such as roundabouts, Rapid Flashing Beacons/HAWK signals and bike boxes.

- **Post-Crash Care —** Investing in National Emergency Medical Services Information System (NEMSIS) reporting in underserved areas of the state.

Additional examples of how SHSOs can support Safe System implementation can be found in the Behavioral Safety Safe System Framework (Table 1).

The Role of Behavioral Safety in the Safe System Approach

Behavioral Safety Safe System Framework

To demonstrate how behavioral safety fits into the successful implementation of the Safe System approach, CS reimagined the Haddon Matrix, which uses a two-dimensional model to apply the principles of public health to motor-vehicle related injuries. The value of this method is each cell represents a different area in which interventions can be identified and implemented for transportation system safety improvement. Input from the experts interviewed for this report informed the structure of this strategic framework and the strategies that can lead to achieving zero fatalities and serious injuries.

The Behavioral Safety Safe System Framework (Table 1) is divided into two major components — SHSO operations cross-referenced with the Safe System principals and SHSO programs cross-referenced with Safe System elements. SHSO operations — leadership, communication, policy and collaboration — are fundamental components of successful highway safety program management. The SHSO programs are different countermeasure families in the context of the four E's of safety (education, enforcement, engineering, and emergency response), plus equity and evaluation, that are typically implemented in state highway safety programs.

The framework shows how behavioral safety and the Safe System approach can be effectively integrated programmatically. It can also help an SHSO identify where it may already be supporting the Safe System principles and elements, in addition to areas for potential strategic growth. The framework clearly illustrates why it would be insufficient to focus only on one approach; all need to be a part of the solution.

It should be noted that the Behavioral Safety Safe System Framework, as presented, is "fluid" rather than "static." As more states implement the Safe System approach, or expand their implementation efforts, additional strategies should be added to the framework.

While the framework contains "Engineering" and "EMS," the content is currently limited to highlighting how behavioral safety intersects with these elements. Clearly, an expansive set of infrastructure-specific countermeasures, addressed in many other resources, also strongly supports the Safe System principles and elements.

Table 1: Behavioral Safety Safe System Framework — SHSO Operations

SHSO Operations					
Death/Serious Injury is Unacceptable	**Humans Make Mistakes**	**Humans Are Vulnerable**	**Responsibility is Shared**	**Safety is Proactive**	**Redundancy is Crucial**
Leadership					
• Lead efforts to change (or keep) the state's goal of zero fatalities and serious injuries.	• Work with engineers to identify and remediate areas with behavioral driving issues.		• Establish and nurture a safety culture in the SHSO, its broader agency, within the safety community and statewide with the public.	• Reinforce that everyone has a role to play in ensuring safety programs and traffic enforcement are equitable.	• Seek consistent Safe System messaging from the Governor's office and all state agencies.
Communication					
• Explain to road users how to safely use the system.	• Educate the public on how they can avoid being involved in a crash (e.g., obey the speed limit because roads are designed to only handle certain speed thresholds).	• Educate drivers about what they can do to better tolerate crash impacts and avoid or minimize injury.	• Explain to road users their responsibilities when using the system for each mode of travel. • Leverage SHSO education and marketing expertise to help inform the public of technology and infrastructure solutions.	• Ensure everything the SHSO does aligns with the Safe System approach.	• Lead production of branded Safe System marketing and outreach materials.
Policy					
• Educate elected and government officials and the public about laws and policies that are proven effective in reducing deaths and serious injury.	• Encourage employers to adopt policies that reward good driving behavior.	• Support policies that equitably protect all road users.	• Educate local officials, employers and community leaders about how the policies they set can influence reductions in road user deaths and serious injury.	• Support driver licensing policies that improve equitable outcomes.	
Collaboration					
• Collaborate with communities impacted by a traffic crash by bringing in law enforcement, engineers, medical professionals and citizens to discuss how all traffic deaths and injuries are unacceptable and work together to develop and implement solutions.		• Work with medical professionals to help articulate how certain behaviors increase road user vulnerability.	• Engage with nontraditional partners who can influence and spread the safety message among their constituencies.	• Coordinate with other partners and leverage SHSO education and marketing expertise to help inform the public of technology and infrastructure solutions. • Collaborate with partners to develop comprehensive speed management programs and plans.	• Collaborate with partners to develop consistent messaging on Safe System goals, projects and outcomes.

Source: Cambridge Systematics, 2021

Table 1: Behavioral Safety Safe System Framework — SHSO Programs

SHSO Programs				
Safe Users	**Safe Speeds**	**Safe Roads**	**Safe Vehicles**	**Post-Crash Care**
Education				
• Deliver CPS tech and instructor training and car seat check events. • Conduct community outreach events. • Conduct public information and education campaigns (e.g., print and broadcast materials and ads, related events). • Provide social media posts. • Deliver driver education/ training material support. • Carry out teen driver safety programs (e.g., Ford Driving Skills for Life, peer-to-peer initiatives). • Conduct older driver programs such as CarFit. • Collaborate with employers and the Network of Employers for Traffic Safety (NETS). • Educate legislators, policy makers and partners on traffic safety laws and policies. • Collaborate with partners who can influence road user behaviors and stakeholder actions that impact traffic safety (safety culture). • Set normative standards with strong highway safety laws. • Deliver restaurant and bartender alcohol server training.	• Conduct pedestrian safety campaigns. • Conduct speed and aggressive driving communication campaigns (e.g., 100 days of summer). • Deliver educational messages and programs about the dangers of speeding and what we know about reductions in speed and survivability in the event of a crash.	• Educate on infrastructure improvements (e.g., roundabouts, bike lanes, HAWK signals) including how they improve safety and how to use them. • Offer LTAP training support.	• Educate on vehicle safety features (e.g., distracted driving warning, lane assist) through driver education and training. • Support education on connected and automated vehicles (CAV) and vehicle recalls.	• Deliver first responder training on incident management to clear the way for EMS and avoid secondary crashes. • Educate the public on their role when they come upon a crash scene. • Deliver educational messages and programs about how to provide post-crash care (bystander training).
Enforcement				
• Enforce traffic laws through high visibility enforcement campaigns, and impaired driving and seat belt enforcement checkpoints. • Conduct law enforcement officer training & activities (e.g., SFST, ARIDE, DRE). • Provide Traffic Safety Resource Prosecutor and Judicial Outreach Liaison support. • Offer court and supervision support for impaired driving (e.g., 24/7 Program, DUI and Drug Courts).	• Conduct speed enforcement.	• Conduct surveillance of crash locations.	• Promote increased use of ignition interlocks, seat belts, speed governors and event data recorders in vehicles.	• Support crash investigation and incident reporting training. • Support Traffic Incident Management (TIM) training.

Safe Users	Safe Speeds	Safe Roads	Safe Vehicles	Post-Crash Care
Engineering				
• Offer driver education/ training material that supports infrastructure improvements (e.g., what they are, pertinent laws, how to navigate them). • Work with the state licensing agency and driver education/ training providers to ensure roadway improvement information is consistent.		• Support joint enforcement and engineering training. • Provide input into state and local transportation safety plans. • Involve SHSO grantees in road safety audits.		• Conduct Traffic Incident Management.
Emergency Response				
• Educate motorists about Yellow Dot programs available in their area and provide by-stander care until EMS arrives on scene. • Partner with first responders and ER physicians to educate motorcyclists and elected officials about the importance of helmet use in the event of a crash.	• Partner with first responders and ER physicians to educate drivers, elected officials and the media about the impact of speeding on crash survivability.			• Conduct training for EMS personnel. • Provide funding and resources for EMS response. • Perform data collection and analysis. • Integrate crash and trauma datasets.
Equity				
• Conduct law enforcement training to refocus on risky driving behaviors. • Develop materials for Black, Indigenous and People of Color (BIPOC) audiences with their input. • Conduct outreach to BIPOC communities on grant opportunities. • Provide BIPOC representation in the highway safety planning process. • Collect and analyze citation data (Section 1906) to identify and address disparities.	• Promote use of automated enforcement as a proven countermeasure using the GHSA, National Safety Council, AAA, Insurance Institute for Highway Safety and Advocates for Auto and Highway Safety checklist.	• Promote the installation of protected bike lanes and sidewalks, which benefit all road users.	• Educate drivers on how a vehicle's front-end design affects pedestrian injuries in the event of a crash.	• Invest in EMS response reporting (NEMSIS) in underserved areas.
Evaluation				
• Conduct attitudinal awareness surveys. • Conduct seat belt and distracted driving observation surveys. • Conduct pre- and post-highway safety program surveys. • Analyze racial data for every traffic stop. • Provide HSP/SHSP/HSIP performance measures. • Promote collection and analysis of toxicology data that accounts for all impairing substances.	• Analyze where speed citations are written versus where speed related crashes occur. • Analyze automated enforcement data (e.g., decline in citations) to determine improvements in driver behavior.	• Identify high crash locations for use in program selection and implementation.	• Encourage Traffic Records Coordinating Committees (TRCC) to address the collection and analysis of CAV data.	• Review, analyze and use trauma and hospital data. • Promote data linkage.

Misconceptions About Behavioral Safety's Role in the Safe System Approach

Expert panel members expressed or have heard many challenges regarding the role of behavioral safety in the Safe System approach. Each challenge should be viewed as an opportunity for SHSOs to lead Safe System implementation in their state. It is important that SHSOs make it clear that behavioral safety is not only a vital component of ensuring crashes do not result in deaths and serious injury, but also that it is essential to achieving this goal.

Misconception: Behavioral Safety Has Little to No Role in Promoting Safety Culture

Safety culture is defined as the shared values, actions and behaviors that demonstrate a commitment to safety over competing goals and demands. A culture of safety is necessary to effectively implement the Safe System approach because it promotes the expectation that all users of the roadway system, regardless of mode, will be protected and that responsibility is shared. This is not a new concept to SHSOs. As one expert panel member noted, "behavioral safety is the glue that [holds] safety culture and a Safe System together."

> *Beyond looking at how you can support each Safe System element, make sure everything you do is in alignment with those elements. Focus on creating a safety culture because I firmly believe it's required for successful implementation.* **— Expert Panel Member**

One of the main responsibilities of every SHSO is to implement education and outreach programs. The SHSOs have the knowledge and expertise on public education that has established them as state and local leaders in promoting and nurturing safety culture. As a result, SHSO staff and grantees are well-positioned to be ambassadors in promoting Safe System principles.

SHSO leadership can ensure their staff and grantees know what the Safe System is (and is not) and their responsibilities in implementing the approach. Simultaneously, the SHSO leadership can also educate their agency leadership about the approach and identify how the agency can lead Safe System implementation statewide. Another important role of the SHSO is to advocate for changes to the agency's internal policies and provide education and messaging that conveys to all staff that getting to zero is everyone's responsibility at work and in their personal life.

SHSOs should also communicate with members of the public, the users of the roadway system, who need to know about the Safe System approach and their critical role in improving safety. The Safe System approach is not just a project for roadway designers.

> *If only the state professionals, partners and stakeholders [working in highway safety] know about the Safe System approach, then we've not done our job. ...the public needs to understand they share responsibility for this approach.* **— Expert Panel Member**

SHSOs have many resources to reach the public, including SHSO staff, grantees (e.g., Law Enforcement Liaisons, Judicial Outreach Liaisons, Child Passenger Safety Technicians and Instructors, grantee agency program coordinators), and program area coalition coordinators and members. The SHSOs' communication and education programs also help change public attitudes and behavior. It is imperative that all transportation system users recognize they are a part of the solution for getting to zero and have a responsibility for other people's safety in addition to their own. As one expert panel member pointed out, "educating the public on new vehicle technologies, roadway designs and laws to increase system performance through behaviors is absolutely critical to get their buy-in. If we want them to use this system safely, we need to explain how they do that."

SHSOs must also take a leadership role in educating their partners and stakeholders about the Safe System to ensure the narrative includes the importance of behavioral strategies. SHSOs can help reshape organizational safety culture among other state agencies, Metropolitan Planning Organizations, Tribes, counties, cities, health care providers, nonprofit stakeholders and private employers to integrate safety considerations into all responsibilities. This should include identifying non-traditional stakeholders and building or expanding community collaboration in areas previously overlooked.

All states are required to have a Strategic Highway Safety Plan (SHSP), which is a requirement to receive Section 148 Highway Safety Improvement Program (HSIP) funding from the FHWA. The SHSP is a five-year statewide-coordinated safety plan that provides a comprehensive framework for reducing highway fatalities and serious injuries on all public roads. Through the SHSP update process, participants identify a state's key safety needs and guide investment decisions regarding strategies and countermeasures that provide the most potential for preventing crashes and injuries and saving lives. FHWA encourages states to include the Safe System approach when they update their SHSP. Lack of SHSO engagement in the SHSP is a missed opportunity to collaborate on implementing behavioral safety programs within the Safe System framework as the SHSP evolves.

> *For SHSOs not in a DOT or intimately involved in their SHSP, the perception is Safe System prioritizes engineering and road design centered on infrastructure and safe speeds. This has been the challenge for some SHSOs as they began to tune into the Safe System approach.* **— Expert Panel Member**

Misconception: The Four E's Approach Is Outdated, Different from the Safe System Approach

One disconcerting challenge faced by SHSOs is that the traditional four E's approach to traffic safety — engineering, education, enforcement and emergency response — helped save lives, but is no longer

delivering the progress that is needed now. This is a false narrative which several expert panel members soundly rejected. One, in particular, stated that:

> *The notion that we've got to be in one camp about what works is wrong. It's not about eliminating but building on what we have.*

Table 1 clearly shows how the E's, which must also include equity and evaluation, are easily cross-referenced to Safe System elements. The distinction is deeply semantical and at best a re-branding or re-organization of existing highway safety activities that have been underway for decades and will continue to be deployed because they are proven to be effective. Some highway safety advocates have attempted to leverage this distinction in an effort to eliminate some safety programs. But this approach is divisive and undermines countermeasures proven to prevent crashes and the resulting injuries and fatalities.

Misconception: Safe System is an Engineering Approach

Expert panel members were steadfast in their belief that Safe System is not just an engineering approach, pointing out that:

> *Human behavior underpins everything.*

> *Behavioral safety is at the center of the Safe System approach and everything else around it is the safety net to protect us.*

> *There is nothing in the Safe System approach that says the U.S. must move away from behavioral safety. All five elements of the approach have their underpinnings in human behavior.*

In addition, an FHWA senior safety engineer stated, "as engineers we're not going to solve these issues by ourselves. Law enforcement isn't either. And it's the same for EMS. We can't do it by ourselves, but if we all come together and combine it with education, we may be able to get to zero [deaths]" (Bergal, 2021).

It is clear from studying successful Safe System efforts implemented in other countries that all members of the safety community must be involved. As another expert panel member observed, "we're never going to take human behavior out of Safe System until we take the human driver out of the picture completely. That's not going to happen for a long time."

Behavioral safety-related legislation (e.g., national .08 BAC, Graduated Drivers Licensing, seat belt and distracted driving laws) has reduced fatalities and serious injuries. According to FHWA, New Zealand has seen a 50% to 60% reduction in fatalities from 1994 to 2015. Yet the country's 2010-2020 Safe System plan (see Appendix A), "Safe Journeys," is primarily focused on behavioral interventions.

One expert panel member cautioned there is room for all the evidence-based behavioral programs, although some are going to be more aligned with Safe System than others:

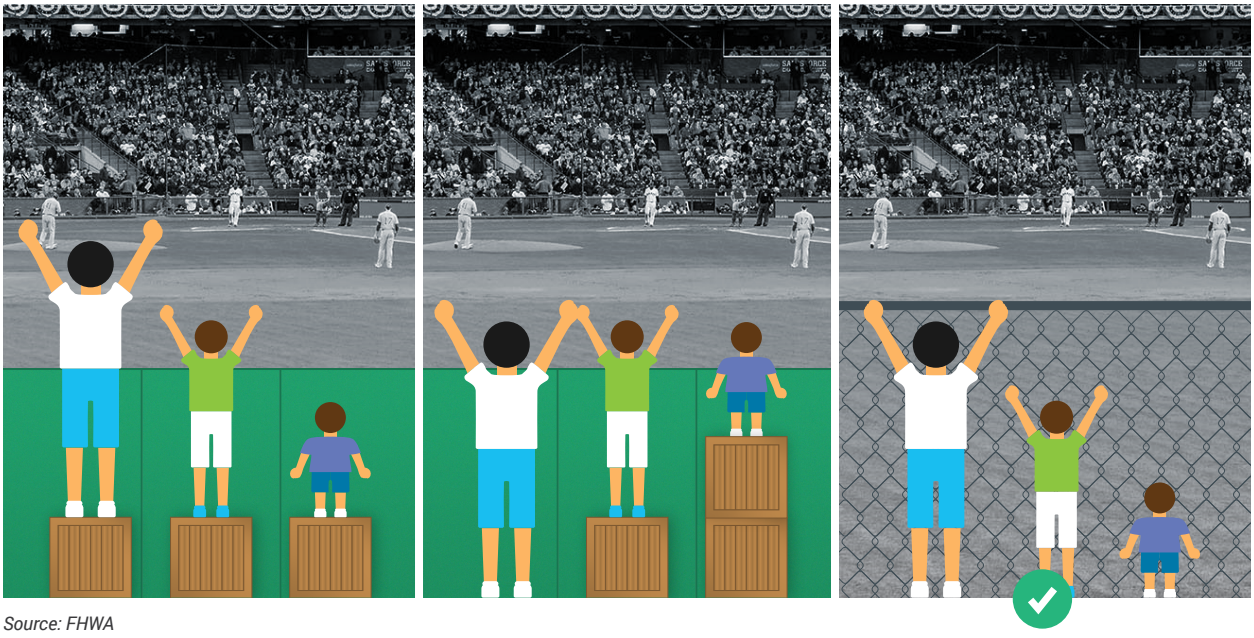
> *During this long transition period, the most important programs are aligned with Safe System principles or those that work upstream. For alcohol programs it might be responsible service or promoting impairment detection such as the Driver Alcohol Detection System for Safety (DADDS) program.*

It is not the intent to diminish the value and efficacy of engineering approaches. Safety infrastructure needs are very real. However, some approaches cannot be pursued at the expense of others because it will create systematic safety gaps. All countermeasures should be leveraged and many at the same time.

Misconception: Behavioral Safety Cannot be Implemented Equitably

Equity must be an essential element in any Safe System approach. But what does "equity" mean in practice? The figure below illustrates the meaning of equity.

Figure 3: Equity



Source: FHWA

In the first frame, it is assumed that everyone will benefit from the same countermeasure (boxes). In this case, they are being treated equally, but the result is not equal with some being denied a proper view of the field.

In the second frame, the individuals are being treated equitably by being given supports (boxes) according to their needs, but not all the supports are distributed equally.

But the third frame is the definition of equity, the systemic barrier has been removed and no supports or other accommodations are needed because the cause of the inequity has been addressed.

In the highway safety context, SHSOs have prioritized safety investments based on analysis of crash data to identify the state's traffic safety problems. The analysis typically leads to identifying jurisdictions where fatalities and serious injuries are the highest for a specific risky driving behavior such as impaired driving or speeding. The SHSO then works with their partners in those communities to provide enforcement and education/outreach grants, sometimes coupled with a statewide media campaign. In this case, all the jurisdictions and their communities are either treated equally or given, according to their needs, services and products to address these risky driving behaviors.

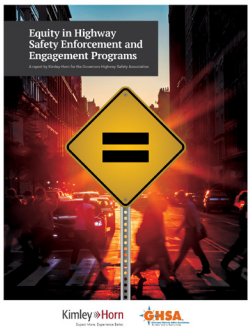
However, to achieve more equitable outcomes SHSOs are encouraged to develop highway safety programs, enforcement strategies and safety messages that address more deeply-seated systemic barriers in partnership with organizations working in and with BIPOC communities.

One of the most acute systemic barriers in highway safety has been racial inequity. Historically underserved communities experience inequitable treatment in the identification of and investment in their transportation needs, which exacerbates safety problems. As noted in the August 2021 GHSA report *An Analysis of Traffic Fatalities by Race and Ethnicity*, pedestrian crashes are more common in low-income neighborhoods and communities of color. In these areas it is critical to consider transportation safety as a primary criterion for project prioritization.

One of the most acute systemic barriers in highway safety has been racial inequity.

It is also well-documented that racial disparities exist in both the frequency of traffic stops and the outcome of those encounters. At the same time, traffic enforcement has been proven effective for successfully addressing important parts of the highway safety challenge in very specific ways. It reinforces social norms and general deterrence and stops dangerous driving when it occurs. The management of impaired driving in the wider criminal justice system also helps prevent impaired driving and impaired driving recidivism. Infrastructure and vehicle safety countermeasures fail to adequately address these problems, even in the long-term.

GHSA has provided thought leadership and extensive recommendations on how state highway safety programs can better address equity in traffic enforcement. Research shows clear trends of racial disparities in traffic enforcement, substantiating the anecdotal experience in many of the communities that highway safety programs serve. GHSA's August 2021 report written by Kimley-Horn, *Equity in Highway Safety Enforcement and Engagement Programs*, includes ten recommendations to support more equitable outcomes for BIPOC individuals based on national best practices, interviews with SHSO leaders to examine current practices and conversations with key GHSA safety partners.



The report included the following consultant-developed recommendations, which are directed to GHSA, SHSOs and their grant recipients, and other highway safety stakeholders to help broaden the reach of the nation's highway safety programs by eliminating racial disparities in traffic safety engagement and enforcement:

- **Promote the collection and analysis of racial data for every traffic stop** to better understand potential disparities and allocate funding toward more effective enforcement.
- **Support increased funding for racial profiling data collection** to allow more states to collect and analyze data that can be used to identify and implement solutions to address disparities.
- **Support increased use of automated enforcement,** which studies confirm can substantially reduce risky driving behaviors and be applied equitably with community engagement.
- **Establish a promising practices guide for SHSOs** that identifies opportunities to increase BIPOC participation in highway safety programs.
- **Encourage broader community involvement in the highway safety planning process** so diverse communities have a voice in shaping enforcement and other strategies that can help reduce racial inequities.
- **Develop a communications toolkit for SHSOs** that identifies key strategies for mitigating disparities and reinforces the message that everyone has a role to play in ensuring traffic enforcement and safety programs are equitable.
- **Refocus traffic enforcement efforts on traffic safety** and prioritize the most dangerous and unlawful driving behaviors, such as speeding and driving under the influence, that put all road users at risk. Pretextual traffic stops often do not advance safety and undermine trust in safety programs.
- **Encourage modernized police recruitment and training standards** to achieve more equitable enforcement outcomes so that law enforcement agency demographics more closely align with the communities they serve.
- **Continue to cultivate partnerships with Vision Zero, Road to Zero and Safe System communities** to promote a holistic and collaborative approach to highway safety that leverages all available safety tools.
- **Support driver licensing policies that improve equitable outcomes** such as ensuring that license sanctions are limited to moving violations and exploring more flexible fee and payment structures for traffic citations, driver license fees and vehicle registration.

SHSOs and partners across the U.S. recognize the need to operate the transportation system in a fair and unbiased way that improves every citizen's quality of life. Everyone deserves safe and accessible transportation, especially those that have been historically underserved. To develop and maintain a transportation system that works for everyone, programs must involve the people most impacted to align safety investments with their needs.

The challenge for SHSOs is to not just listen to the usual stakeholders, but also seek out other voices and ensure they have a say in the best Safe System practices in their communities.

The challenge for SHSOs is to not just listen to the usual stakeholders involved in the transportation planning processes (e.g., for the development of SHSPs, HSP and HSIPs), but to also seek out other voices and ensure they have a say in the best Safe System practices to improve transportation safety in their communities. One expert panel member suggested other avenues for input:

> *Program funding to do coalition-based road safety assessments, health impact assessments, racial impact assessments, and identify shared risk/protective factors have been successful in identifying behavioral issues and developing more integrated policy solutions. Individuals involved in these efforts can provide valuable insights.*

Expanding external outreach throughout the planning process will ensure diverse communities have a voice in shaping enforcement, programs, messages and other strategies that can help reduce racial disparities and systemic barriers. Another benefit of broadening outreach efforts is that it will further build community trust in the mission and work of the SHSO and their partners.

Misconception: Behavioral Safety Does Not Evolve

The panel agreed that another key challenge for SHSO leaders and their staff is not letting the continuation of present practices get in the way of new ones. SHSO leadership and staff must all be on board to aggressively promote and implement the Safe System approach. SHSOs should be proactive in developing innovative strategies and countermeasures and new partnerships necessary to achieve the ambitious long-term targets for zero deaths and serious injuries. In other words, do not be afraid to try new and innovative programs and fail. If a program is not producing the desired benefits and change, the SHSO should not hesitate to cease funding the program or modify it.

Do not be afraid to try new and innovative programs and fail. If a program is not producing the desired change, the SHSO should not hesitate to cease funding the program or modify it.

SHSO operations have changed over time from promoting innovation and the testing of promising practices to a focus on grants administration. Behavioral safety programs could be reinvigorated by allowing SHSOs to pilot and test new ideas. To assist states in moving forward, funding flexibility and changes in federal regulations are needed to enable SHSOs to fully contribute to advances in countermeasures and programs under a Safe System framework.

Recommendations

The following are recommendations for SHSOs, GHSA and NHTSA to further understanding of and promote implementation of the Safe System approach in the states.

State Highway Safety Offices

SHSOs and their staff are the obvious champions for safe road use through their collaboration and implementation of the programs and initiatives in the Highway Safety Plan. To implement the Safe System approach, SHSOs can:

Be a leader in Safe System adoption.

- Do not just sit at the table, take a leadership role in promoting and expanding the adoption of the Safe System approach. Abdicating a leadership role sends a signal that the SHSO does not believe behavioral safety has a role in the Safe System approach.
- Create a Safe System Coordinator position within the SHSO. This coordinator should be tasked with educating the administration, staff, agency employees, grantees and employers about Safe System and seeking more diverse safety partners and stakeholders to join the state's Safe System efforts and promote its principles. The coordinator could also expand collaboration opportunities to reach wider audiences and gain input into the development and delivery of SHSO safety messages and programs.
- Educate employers and the public about their shared responsibilities in ensuring that crashes do not lead to fatal or serious injuries.

Establish expectations for addressing equity in the SHSO's planning process and programs.

- Identify and establish metrics for tracking equity in SHSO internal operations and with grantees and grant programs.
- Develop and implement an SHSO equity plan.
- Encourage broader community involvement in the highway safety planning process.
- Identify and put into practice opportunities to increase BIPOC participation in highway safety programs.
- Reinforce the message that everyone has a role to play in ensuring traffic enforcement and safety programs are equitable.

- Refocus traffic enforcement efforts on traffic safety and prioritize the most dangerous and unlawful driving behaviors, such as speeding and driving under the influence, that put all road users at risk.

- Continue to cultivate partnerships with Vision Zero, Road to Zero and Safe System communities to promote a holistic and collaborative approach to highway safety that leverages all available safety tools.

Highlight how behavioral safety already supports a Safe System approach.

- Point out that four of the Safe System elements are the responsibility of NHTSA (Safe Road Users, Safe Speeds, Safe Vehicles, Post-Crash Care).

- Provide information on the number of lives that seat belts, .08 BAC laws, motorcycle helmets and Graduated Driver Licensing laws have saved.

- Remind everyone that behavioral safety has been tremendously successful by highlighting key data points such as a 90% nationwide safety belt use rate; reduction from 28,000 alcohol related deaths in 1980 to under 10,150 in 2019; and widespread use of child safety seats, which reduced fatal injury by more than 70% for infants and 50% for toddlers (Kahane, 2015).

Establish and nourish a safety culture in your State.

- Articulate and promote the values, attitudes, beliefs and behaviors that prioritize safety in an equitable manner on the state's transportation system.

- Establish expected behaviors for SHSO staff, so they routinely practice and educate others about safe driving, cycling and walking. Have all SHSO staff sign a pledge to drive phone-free.

- Establish protocols for addressing equity in the development, evaluation and selection of grant applications and implementation and evaluation of all safety programs.

- Invest safety resources — both money and people — equitably.

- Disincentivize undesirable behaviors by supporting equitable consequences (e.g., fines, remedial training, policies, laws).

- Incentivize desired behaviors through grant programs that teach and reward desired safe road user behaviors.

- Seek continuous improvements by doubling down on what works to reach zero fatalities.

Governors Highway Safety Association

- Provide Safe System training for new SHSO leaders at the GHSA Executive Seminar on Program Management and in the soon-to-be developed leadership training course for mid-level SHSO staff.
- Develop talking points, presentations, fact sheets and examples of contacts for SHSOs to reach more diverse audiences and present information to leadership, partners and the public.
- Provide the SHSOs with easy-to-use tools that include real examples of what behavioral safety applications look like in the Safe System approach using relevant case studies. Build out the Behavioral Safety Safe System Framework with additional examples implemented by SHSOs.
- Encourage SHSO leadership and staff to aggressively promote implementation of the Safe System approach.
- Seek changes in federal regulations regarding funding flexibility to allow SHSOs to promote and implement the Safe System approach and pilot new promising practices to reduce fatalities and serious injuries.
- Establish a promising practices guide for SHSOs that identifies opportunities to increase BIPOC participation in highway safety programs.

National Highway Traffic Safety Administration

- Affirm the role of behavioral safety in the Safe System approach.
- Provide guidance and resources to states on how to further integrate behavioral strategies and programs into Safe System implementation.
- Develop best practices and provide resources to states to equitably implement traffic enforcement programs.
- Provide flexibility to states to pilot new approaches based on Safe System principles.

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Appendix A

Safe System Behavioral Success Stories

U.S. Efforts

Several states have incorporated the Safe System approach in their SHSPs, some more comprehensively than others. What follows is a description of those efforts and how each state is addressing behavioral safety.

California Safe Roads and Implementation Plan

The SHSP includes four guiding principles, one of which is to implement a Safe System approach, with a goal of moving towards zero fatalities and serious injuries (Caltrans, 2021). The plan includes numerous behavioral strategies and actions including:

- Developing a statewide traffic safety monitoring program on the state highway system that identifies and addresses locations with speed-related crashes.
- Creating new messaging related to designating sober drivers or choosing another safe alternative.
- Developing an education toolkit for how speed plays into the likelihood of pedestrian injury/fatality.
- Developing an interactive young driver webpage on the DMV website.
- Utilizing teen influencers for messaging and providing positive community norming strategies in high schools to encourage good driving behaviors.
- Assessing effects of law enforcement training on aging road users for physical/mental condition referrals to the DMV.
- Implementing a training program for child passenger safety technicians to use behavioral approaches in teaching parents about child restraint installation and use.

Florida Strategic Highway Safety Plan

Florida's (2021) SHSP provides a framework for how the state's traffic safety partners will move toward the vision of a fatality-free transportation system. The SHSP introduces the Safe System approach and includes a call to action for public, private and civic partners to identify areas for collaboration, investment and innovation. Key SHSP strategies are focused on advancing systemic solutions by continuing emphasis on the four E's of traffic safety and adding four I's — Information Intelligence, Innovation, Insight into Communities, and Investments and Policies.

Behavioral-related emphasis areas in the plan include:

- **User behavior,** which includes impaired driving, occupant protection, speeding and aggressive driving and distraction.

- **Road users,** which includes pedestrians and bicyclists, teen drivers, aging road users, motorcyclists and motor scooter riders, and commercial motor vehicle operators.

Missouri: Show-Me Zero

Missouri's (2020) SHSP, "Show-Me Zero," is based on the Safe System approach and includes opportunities to strengthen traffic safety culture through enactment of a primary seat belt law, hands-free cellphone law and enhancements to the state's current child passenger safety and Graduated Driver Licensing laws. The Missouri Coalition for Roadway Safety, which is tasked with implementing the plan, asks all Missourians to "lead by example in fostering a culture that prioritizes safety for ourselves and our fellow citizens." The plan is intended as a resource for everyone to use to identify and implement simple strategies to make Missouri's roads safer.

The SHSP focuses on four key behaviors — occupant protection, distracted driving, speed and aggressive driving and impaired driving — plus three groups overrepresented in the data — teen drivers, older drivers and non-motorized users (which includes pedestrians, bicyclists and scooter riders). The plan identifies a broad range of strategies for individuals and their families as well as businesses, schools, state and local agencies and traffic safety partners. The message is simple, "No one can do it all, but everyone can do something."

Oregon Transportation Safety Action Plan

One long-term goal in Oregon's (2021) SHSP is to have healthy and livable communities through a Safe System approach in planning, design and program implementation. Another is to support enforcement and emergency medical services to improve the safety and livability of communities. The SHSP includes a policy to provide resources and tools which will allow localities to offer programs and education based on their needs and issues, that also considers issues of equity. The policy includes the following four strategies:

- Explore methods to distribute and implement safety programs and funding between urban and rural communities to eliminate fatalities and serious injury crashes.

- Provide transportation safety educational opportunities for people of all ages, ethnicities and income levels.

- Support adequate funding for EMS particularly in rural and remote areas, to the extent that this is the most efficient use of resources to eliminate fatalities and serious injuries.

- Encourage implementation of Safe Communities statewide.

Washington State: Target Zero

Washington's (2019) "Target Zero" plan is based on a Safe System approach and includes all stakeholders and road users. Elements in the plan that focus on behavioral safety include:

- Speed control strategies which include enforcement and education, such as conducting speed awareness courses, similar to those offered in London as an alternative to paying a speeding fine and receiving penalty points for drivers cited for traveling at inappropriate speeds.

- Addressing road user needs to assess their own capability to handle driving, walking and biking tasks and conducting riding skills courses for bicyclists, motorcyclists and users of micromobility.

- Policy change to increase the consequences of driving that endangers others and to driver education through required online training, more practice time and stricter license requirements.

- Use of automated traffic safety cameras.

- Education on the greater chances of a fatality for vulnerable users hit by an SUV or other large vehicle, the impact of speed on the possibility of a fatality and the importance of observing posted speed limits and reducing speeds based on conditions.

International Efforts

How the Safe System approach has been implemented in other countries can be instructive. The following information is sourced from the Highway Safety Research Center's report, *Safe Systems Synthesis: An International Scan for Domestic Application*. While each of these countries focus on the infrastructure aspects of a Safe System, behavioral safety and road user responsibility is an equally important element. These examples show how Safe System programs in the U.S. can successfully incorporate behavioral approaches.

Sweden

The Swedish legislation and concept, Vision Zero, emphasized that responsibility for road safety is shared:

- The designers of the system are always ultimately responsible for the design, operations and use of the road transport system and are thereby responsible for the level of safety within the entire system.

- Road users are responsible for following the rules for using the road transport system set by the system designers.

The Swedish government launched a short-term action plan with 11 priority areas including three that focus on behavioral traffic safety:

- The responsibility of road users to respect traffic laws particularly obeying speed limits, using seat belts and not driving impaired.

- Safe bicycling practices (e.g., a voluntary bicycle safety standard and campaigns promoting the use of bicycle helmets).

- Better use of Swedish technology (e.g., promoting the introduction of technology — available or to be developed — that can be applied relatively soon including seat belt reminders, in-car speed adaptation systems, alcohol ignition interlocks for preventing drinking and driving and electronic driver licenses).

Other aspects of the Swedish Safe System effort include:

- Lowering speeds by using road safety cameras to encourage drivers not to speed. (Speed limit adherence improved from 50% in the 1990s to more than 80% across Sweden. Speed adherence was 95% at camera sites in 2014.)

- Implementing mandatory requirements such as a helmet law for bicyclists under age 16 and that new cars be equipped with seat belt reminders (the latter increased usage from 92% to 99%).

- Monitoring metrics including drunk driving, speeding and seatbelt and bike helmet use.

New Zealand

New Zealand implemented the Safe System approach through a comprehensive safety plan. The first plan (2011-2012) included the following behavioral strategies:

- Improving speed management through public campaigns, safer speeds and expanding the use of safety cameras.

- Generating consumer demand for safe vehicles and improving child restraint use.

- Increasing the safety of motorcycling through training, road treatments and enforcement.

- Reducing alcohol/drug impaired driving and the safety of young drivers through regulations, education and enforcement.

- Reducing the impact of high-risk drivers through rehabilitation, regulation and enforcement.

- Improving pedestrian and cyclist safety through education and safer infrastructure.

- Reducing the impact of distraction and fatigue through education and road infrastructure.

The second action plan (2013-2015) included programs such as Behind the Wheel, which supported young drivers in the community of Mangere; and the Visiting Drivers Project, which was aimed at improving road safety for visiting tourists. The third action plan (2016-2020) was more narrowly focused and included:

- Enabling smart and safe choices on the road by using technology to provide real-time safety information to road users.

- Making motorcycling safer by increasing rider awareness and training, encouraging use of motorcycle technologies and increasing the use of protective clothing.

Actions in the "Safer Journeys 2010–2020" plan were primarily focused on behavioral interventions:

Young Drivers

- Raising the minimum driver age from 15 to 16.
- Implementing zero BAC for drivers <20 years old.
- Strengthening the restricted driver license test.
- Introducing a Community Driver Mentor Program.
- Launching an online interactive website for learner drivers.
- Producing road safety resources that support school curriculum.

Drunk/Drugged Driving

- Lowering the BAC to .05 for drivers >20 years old.
- Focusing on reducing alcohol impaired driving through the Legend Campaign.
- Implementing an alcohol interlock program.
- Raising awareness of the risks posed by drugged driving through television ads.

Restraint Use

- Increasing compulsory child restraint use to 7 years of age.

Australia

Australia's Safe System approach is detailed in a *National Road Safety Strategy (2001-2010)*. An improving road user behavior strategic objective called for:

- Educating young road users on responsible road safety behavior.
- Conducting driver training and licensing to improve competence and attitudes.
- Enhancing police enforcement using targeted campaigns.

The Australian Safe System Approach centers on four cornerstone areas that align with the U.S. Safe System approach: safe roads, safe speeds, safe vehicles and safe people. The latter, safe people, focuses on safer users of the road system. Programs include a graduated driver and motorcycle rider licensing program, road safety programs for indigenous communities and disadvantaged groups, lowering BAC limits, using alcohol interlocks, and increasing penalties for repeat drinking or drugged driving offenders.

In addition to these efforts, the Monash University Accident Research Centre in Victoria proposed two strategies that could easily be adopted independent of any political involvement:

- Improving vehicles to address driver behavior issues by incorporating seat belt interlocks, alcohol interlocks and intelligent speed limiters.

- Motivating the community to use the system in a safer way.

The Netherlands

The Netherlands' Sustainable Safety Program focused only on behavior modification, which was unsustainable. As a result, a more comprehensive Safe System approach was adopted that includes several guiding principles:

- Predictability of the roadway course and road user behavior by a recognizable road design that supports road user expectations through consistency and continuity.

- Awareness by the road user, so they can assess their capability to handle the driving task.

The program was updated in 2005 to include a greater focus on education, regulation and enforcement.

Appendix B

Resources Provided by Expert Panel Members

The University of North Carolina's Collaborative Sciences Center for Road Safety (CSCRS) hosted a Safe System Summit in 2021 to discuss Safe System concepts and followed that up with a summer learning series. These links provide recordings, slide decks and other Safe System resources:

- https://www.roadsafety.unc.edu/education/activities/summer-learning-series-2021/
- https://www.roadsafety.unc.edu/summit/

CSCRS has produced resources that focus on improving processes and evidence-based efforts that back Vision Zero plans and state SHSPs. The Center also has a library of Vision Zero plans:

- https://dataverse.unc.edu/dataverse/VZPlans

CSCRS also produced *Shaping the Narrative Around Traffic Injury*, a guide for effectively framing traffic safety issues when agencies are working with the media and responding to high-profile crash incidents.

The Centers for Disease Control and Prevention's (CDC) Health Equity Guiding Principles for Inclusive Communication website emphasizes the importance of addressing all people inclusively and respectfully.

Also see CDC's Resources & Style Guides for Framing Health Equity & Avoiding Stigmatizing Language website, which provides equity guidance by taking a similar "culture/health in all policies" approach.

The Australian report on the role of behavioral data as evidence of system failures, *Bad behaviour or societal failure? Perceptions of the factors contributing to driver's engagement in the fatal five driving behaviours*, describes a study designed to go beyond limited crash data. The study investigates the factors that influence drivers' engagement in the fatal five behaviors of drinking and drugged driving, distraction and inattention, speeding, fatigue, and failure to wear a seat belt.