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HIGHWAY SAFETY
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Strategies for Improving Road Safety: A Public Health Resource

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Introduction: How Public Health Partners Benefit Road Safety Efforts

Serious road traffic injuries and fatalities remain a persistent and preventable cause of death and disability in the United States. In 2022, more than 42,000 people died in motor vehicles in the United States, a 29 percent increase compared to a decade earlier. Many more sustained disabling injuries and psychological trauma requiring long-term care and recovery.

The societal burden of road trauma extends beyond individual crashes. Road trauma imposes societal costs, including strained emergency response systems, rising medical costs, reduced productivity, and lasting impacts on the health and well-being of families and communities. Moreover, unsafe roads discourage walking and cycling, often leading to physical inactivity which can increase people's risk of obesity, diabetes, and heart disease.

Addressing this growing public health burden requires the involvement of professionals from beyond the traditional boundaries of transportation. In recent years, public health professionals have become increasingly engaged in traffic safety efforts. Their roles have included supporting injury surveillance systems, contributing to behavioral and policy research, shaping communication strategies, and participating in local and statewide safety coalitions.

The integration of these professionals builds on earlier work by researchers and agencies seeking to bridge public health and transportation, highlighting areas of shared interest such as injury prevention, physical activity promotion, emergency preparedness, and access to essential services. Public health professionals offer tools that help transportation partners interpret complex trends, assess interventions, and bring attention to underlying contributors to injury. These capabilities make them valuable partners in improving road safety outcomes.

This *Strategies for Improving Road Safety: A Public Health Reference* document responds to the growing interest in identifying practical, prevention-focused strategies public health professionals can leverage to support road safety improvements. This resource draws upon and synthesizes critical information from three complementary sources:

- International examples of road safety policy and system design;
- Insights from public health and transportation professionals working in the field; and
- A review of general safety approaches and specific interventions that public health agencies can support or implement.

This resource is organized as follows:

- It begins with a description of how leading experts in transportation, road safety, public health, and injury prevention articulate public health's present role in road safety.
- This resource then presents four strategic opportunities for public health professionals to integrate their unique perspectives and skillsets into road safety programs and policies.

- Following the strategic opportunities are five methodological and practice-supporting appendices:
    - **Appendix A** describes the nature of our team's conversations with the experts.
    - **Appendix B** lists the experts consulted in developing this resource.
    - **Appendix C** offers detail on the road safety management frameworks employed by peer countries.
    - **Appendix D** provides information about a compendium of 50 effective safety countermeasures along with potential role(s) for public health partners to implement and evaluate each countermeasure.
    - **Appendix E** lists the academic and trade references used to develop this resource.

The Many Roles of Public Health in Road Safety

Public health professionals are playing increasingly visible and varied roles in traffic safety in the U.S. While national conversations tend to emphasize engineering, enforcement, and education measures, much of the everyday work happens at the local, regional, and State levels, where public health agencies bring essential expertise and community insight. These professionals contribute to traffic safety through data collection, injury prevention programming, and by reframing safety as an issue of health, community wellbeing, and systems change. Their perspective and expertise make them critical partners in efforts to create safer, healthier transportation systems.

To better understand how public health professionals are engaging in road safety work, and where there may be opportunities to expand their role, the project team conducted a series of conversations with 14 professionals working across the public health, transportation, and injury prevention. These conversations offered real-world insights into how public health tools, methods, and systems thinking are being applied to road safety challenges, as well as the structural and cultural barriers that can limit sustained collaboration.

Findings gleaned from these conversations illustrate how public health agencies support injury prevention in road safety, and where strategic alignment with transportation partners could enable more proactive, prevention-focused safety efforts. We begin with descriptions of ways public health professionals have been supporting and leading various aspects of road safety policymaking and programming. This is followed by a discussion of strategic opportunities for public health professionals to become more involved in road safety efforts.

> *"We think about crashes as a disease…the agent causing the disease is kinetic energy transfer."*

Broadening the Definition of Safety

Road safety is increasingly recognized as a population health issue, expanding beyond a series of isolated incidents. Moreover, rather than focusing solely on infrastructure or individual behavior, public health perspectives emphasize root causes, cumulative risk, and the human consequences of serious crashes. One colleague emphasized the importance of connecting road safety with other public health concerns, such as chronic disease, reflecting, "We think about crashes as a disease…the agent causing the disease is kinetic energy transfer." Another colleague added insight into how public health have helped reframe crashes as leading causes of fatalities or life-altering injuries and to "shift the conversation away from individual blame to broader system performance."

Integrating Data Beyond Crashes

Traditional traffic crash data misses the full scope of the road injury burden. Public health partners bring tools like trauma registries, emergency response data, and social vulnerability indicators to fill gaps in our collective understanding of road injury. For example, crash reports only tell us about who was involved in a crash, the movements crash-involved parties made just prior to colliding, where and when the crash occurred, and which party was at fault for the collision. However, as one colleague noted, "data from trauma centers helps paint the whole story: before, during, and after crashes." Others recognized the importance of incorporating qualitative and lived-experience data, such as near-misses, or barriers to transportation via transit, walking, or biking that community members experience into safety analyses.

Strengthening Evaluation and Learning

In addition to broadening our understanding of the social burden of road injury, public health partners emphasize evaluation, often drawing on methods such as logic models, systems thinking, and quasi-experimental designs. One colleague noted, "public health professionals have strong skills in designing, collecting, and analyzing qualitative data," which can support safety planning and accountability.

Other colleagues described how certain lives are left out of data decisions, such as unhoused pedestrians who "are often omitted from data and their stories rarely inform policy." This omission can lead to a kind of "double erasure", wherein unhoused crash victims' information is found in neither public records nor in community discourse. These insights illustrate how public health can help uncover risks and promote safety planning for all.

Findings from these conversations highlight the many ways public health professionals are contributing to road safety today and reveal opportunities to deepen and expand their role. These

perspectives inform a set of strategies that public health professionals can use to guide their involvement in traffic injury prevention efforts.

Strategic Opportunities for Public Health in Road Safety

Our team's conversations with transportation and public health experts illustrate a shift in how road safety can be approached, moving from interventions that focus on individual behaviors and toward ones that address systemic safety issues.

Moreover, leveraging knowledge of international best practices and proven safety countermeasures can inform a set of strategies that public health professionals can use to guide their involvement in traffic safety injury prevention. These strategies support a long-term shift from fragmented, reactive approaches to road safety to coordinated, prevention-first systems that prioritize human life and well-being.

Embed Safety into Planning and Policy

Public health professionals have traditionally focused on individual behavior change (e.g., promoting universal motorcycle helmet laws) rather than systemic redesign (e.g., safer road engineering, automated enforcement). However, as several colleagues recognized during our conversations with them, public health professionals are well-positioned to influence road safety by integrating safety priorities into domains where they already play a role, such as land use, housing, and community health. *Recommendations:*

- Collaborate with planning commissions and local zoning officials to influence transportation decisions impacted by local land use (e.g., approving the siting of affordable housing in proximity to jobs and commercial land uses thereby reducing the need to drive for all purposes).
- Promote the integration of health indicators and safety metrics in transportation project prioritization using CDC's Social Vulnerability Index or other public health indicator systems.
- Leverage existing domains of public health authority, such as community health assessments or environmental reviews, and incorporate assessments of injury risk associated with land development or road building proposals.

Reframe the Narrative to Support Systems Change

Several colleagues described how public health frames can elevate the urgency of road safety, such as using terms "like 'trauma' and 'life-altering crashes' instead of 'severity.'" Public health professionals were also described as trusted messengers who can connect safety goals to broader values like family, well-being, and community, as well as translate complex information into plain language. As one colleague shared, "health professionals should target decision-makers and public platforms with sticky messaging." *Recommendations:*

- Lead efforts to employ language that humanizes the victims of road trauma, placing road injuries into broader contexts (e.g., "this is the 5th crash resulting in injury on this road in just the last 2 years") and avoiding blaming individuals involved in serious or fatal crashes.

  Frame road injuries as "trauma" and with the same urgency as infectious diseases, as both devastate people and communities and are entirely preventable.

> *"We educate kids on seat belts, mandate airbags, and enforce laws—why don't we layer road safety the same way?"*

Promote Systemic Safety Approaches

Roadway design in the U.S. often prioritizes convenience for motor vehicle travel over the safety of road users. Several colleagues highlighted the disconnect between health-informed safety goals and the realities of roadway design practices, especially those related to speed management or car-centric planning. "Stroads are unsafe," one colleague explained, referencing the hybrid street-road designs that dominate many U.S. corridors and which simultaneously aim to provide direct access to destinations while inviting swift mobility. "We need flexible infrastructure policies to stop building them." *Recommendations:*

- Make clear connections between transportation system design and broader social goals such as mental health, social connection, and community well-being. As one colleague observed, transit provides more than just mobility but also "social infrastructure" to help reduce social isolation.
- Advocate for policies and built environment interventions that reduce isolation and injury risk rather than relying solely on individual behavior change or enforcement. To this point, one colleague asked, "We educate kids on seat belts, mandate airbags, and enforce laws—why don't we layer road safety the same way?"
- Draw inspiration from the Safe Systems Pyramid, modeled after the Health Impact Pyramid (Figure 1). As seen from Figure 1, the factors that impart the largest public health impacts and require the least amount of individual effort are socioeconomic and directly within the purview of public health (e.g., affordable housing located near transit, zoning reforms which allow for homes, jobs, and retail to be closer in space and thus more accessible to one another).

Figure 1. Safe Systems Pyramid (Vision Zero Network, 2024 adapting Ederer et al., 2023)

Bridge Sectors and Build Coalitions

In many communities, public health professionals serve as connectors, bringing together partners from across disciplines to address road safety as a shared priority. Their involvement in Vision Zero planning, Strategic Highway Safety Plan development, and community engagement have helped fill gaps where transportation agencies have struggled to establish community trust. Despite these strengths in convening and collaboration, structural barriers persist. "Structurally, transportation and public health aren't designed to work together…there are no shared funding streams", noted one colleague.

Several colleagues emphasized the need for defined roles to support collaborative work. One State program was cited as an example of a proactive, embedded model, where 'utility players' are embedded in transportation or public health departments to focus on safety policy and practice, and to align public health and transportation goals. Other colleagues shared how local-level public health departments can fill gaps in public outreach and cross-sectoral coordination by serving as "umbrella" organizations. *Recommendations:*

- Create roles that bridge agencies and share staffing models. Consider stationing these professionals across the State and tasking them with facilitating cross-sector partnerships and advocating for healthy infrastructure projects within their respective regions.
- Crosstrain transportation, public health, and mission-aligned professionals in the application of Safe System principles and practices. One colleague shared how State Highway Safety Offices (SHSOs) are never housed in Health Departments, cutting off natural collaboration. There should be cross-training to bridge enforcement, transportation, and public health silos.
- Explore pooled funding models that support ongoing collaboration with transportation partners and that extend beyond traditional funding cycles.

Conclusion

Public health professionals bring essential tools, frameworks, and values that complement and strengthen traditional road safety efforts. Their involvement in road safety helps shift the focus from individual behavior toward broader system-level changes that prioritize prevention, population well-being, and long-term impact. As illustrated by the insights and recommended strategies colleagues shared with the research team, public health professionals can help reframe safety challenges, integrate new sources of data and evaluation, and foster stronger partnerships across disciplines.

To support these strategies, the **Appendix** provides additional context about how this resource was developed, including the methods used to gather practitioner insights and the organizational structure of the strategies presented. These materials are intended to help public health professionals and their partners understand the foundation of the work and explore further opportunities for action.

Appendix

Organization of the Appendix

Thus far, we have explored the various roles public health partners play in advancing road safety in the United States, as well as strategic opportunities for these professionals to apply their far-reaching skills toward improving road safety policies and practices. Complementing the roles and strategic opportunities for public health professionals to become more involved in road safety efforts is a series of five Appendices organized as follows:

- **Appendix A. Conversation Procedures:** includes the questions—as well as the theory underlying the selection of specific questions—the research team posed to colleagues in public health, transportation, and injury prevention about their experiences and perspectives of integrating public health partners, data, and strategies into road safety work.
- **Appendix B. Strategy Contributors:** lists the colleagues who contributed their keen insights and expertise to discerning the multifaceted roles of public health in road safety.
- **Appendix C. Road Safety Management Frameworks of High-Income Countries:** presents the road safety management frameworks used by other high-income countries, including the countries' national speed limits on their urban and rural road networks; their general and differentiated blood alcohol content (BAC) laws; seat belt and helmet laws; as well as the systems of liability they have established to address accountability in the event of crashes.

- **Appendix D. A Compendium of Effective Safety Countermeasures**: provides a list of 50 behavioral, policy, and engineering countermeasures along with brief descriptions of each countermeasure; a listing of the agencies typically tasked with implementing the countermeasure; potential roles for public health partners in supporting the implementation, evaluation of, and communication about each countermeasure; the research evidence justifying inclusion of each countermeasure; and notes about effectively implementing each countermeasure.
- **Appendix E. References**: displays all the academic and trade references used to develop this resource.

Appendix A. Conversation Procedures

Informal Conversation Guide

Questions

1. What do you see as the single most impactful policy or intervention we could implement to improve road users' safety?
2. What experiences have you had working with people in road safety / public health?
    a. What did you work on together?
3. How, in your mind, do public health / road safety professionals contribute to improving safety on our roads?
    a. How could public health / road safety professionals contribute to improving safety on our roads?
4. What are you seeing or hearing about public health-road safety partnerships these days?
5. What resources and skills do you see public health / road safety partners bringing to your work?
6. What type of data is most useful for you to have when prioritizing road safety strategies for your state?
7. What kinds of tools or resources do you think would help you make good decisions in deciding how best to improve road safety?
8. Where do you see opportunities to build or strengthen relationships between public health and road safety professions?

Table 1. Theoretical Structure of Questions.

Question Purpose	Question
Mindset solicitation	What do you see as the single most impactful policy or intervention we could implement to improve road users' safety?
Personal partnership experience	What experiences have you had working with people in road safety / public health? What did you work on together?
Professional role reflection	How, in your mind, **do** public health / road safety professionals contribute to improving safety on our roads? How **could** public health / road safety professionals contribute to improving safety on our roads?
State of partnership	What are you seeing or hearing about public health-road safety partnerships these days?
Partnership synergies	What resources and skills do you see public health / road safety partners bringing to your work?
Useful data and resources	What type of data is most useful for you to have when prioritizing road safety strategies for your state? What kinds of tools or resources would help you make good decisions in deciding how best to improve road safety?

Question Purpose	Question
Potential partnership	Where do you see opportunities to build or strengthen relationships between public health and road safety professions?

Appendix B. Strategy Contributors

The strategies developed through this resource were shaped through collaboration with professionals in public health and transportation who brought a range of experience in road safety, injury prevention, systems planning, data analysis, program implementation, and other applied topics. Contributors included colleagues from Federal, State, and local agencies, and nonprofit professional organizations. Their insights informed the structure and examples in this resource. While all contributions were reviewed and considered, the research team made final decisions about strategy organization and content.

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Appendix C. Road Safety Management Frameworks of High-Income Countries

Country	Road Safety Strategy	Time Period	National Speed Limits on Urban Roads (in Km/h)	On Rural Roads	On Motorways	General BAC level (g/l)	Differentiated BAC level (g/l)	Seat-belt laws - Front seats	Seat-belt laws - Rear seats	Helmet laws - Powered two-wheelers	Helmet laws - Cyclists	Liability System
Australia	Australian National Road Safety Strategy	2021-2030	50 default. 60-80 (arterial roads increasing use of 40 km/h or lower limits in urban areas with high pedestrian activities)	100, 110	100 km/h default although often set to 110 km/h (130 km/h in the Northern Territory)	0.5	0.0 for novice drivers 0.2 for professional drivers	1970s	1970s	Yes	Yes	No-Fault Liability (injured parties claim from public fund, regardless of fault)
Canada	Canada's Road Safety Strategy 2025	2016-2025	40-70	80-90	100-110	0.8	administrative max of 0.5 or 0.4 in most provinces, 0.0 for drivers under 21 and novice drivers	1976-1988	1976-1988	Yes	In some jurisdictions	At-Fault Driver Liability, expect Quebec which has a No-Fault system for injuries (injured parties public fund claim from public fund) and At-Fault Driver Liability for property damage.
Denmark	2021-2030 Action Plan	2021-2030	50 (sections with 30, 40 or 60)	80 (sections with 60, 70 or 90)	130 (110 for a large part of the motorway network)	0.5	--	1970s	1980s	Yes	No. Yes for e-scooters	Strict Liability (driver usually pays for vulnerable road user injuries)
Finland	Traffic Safety Strategy for 2022-2026	2022-2026	30-60	80, 100	100, 120	0.5	--	1975	1987	Yes	No	Strict Liability (driver usually pays for vulnerable

Country	Road Safety Strategy	Time Period	National Speed Limits on Urban Roads (in Km/h)	On Rural Roads	On Motorways	General BAC level (g/l)	Differentiated BAC level (g/l)	Seat-belt laws - Front seats	Seat-belt laws - Rear seats	Helmet laws - Powered two-wheelers	Helmet laws - Cyclists	Liability System
												road user injuries)
Germany	The Road Safety Pact	2021-2030	50	100	None (130 recommended)	0.5	0.0 for drivers under 21 and novice drivers, for professional drivers who transport passengers or hazardous goods Drivers with a BAC between 0.3-0.5 g/l can have their licenses suspended if their driving ability is impaired	1976	1984	Yes	No	Strict Liability (driver usually pays for vulnerable road user injuries)
Iceland	Traffic Safety Plan	2024-2038	50	90 (paved roads) 80 (gravel roads)	n.a.	0.2	Sanction starts from above 0.5	Not documented	Not documented	Yes	Yes, for children to age 15	Strict Liability (driver usually pays for vulnerable road user injuries)
Ireland	Our Journey Towards Vision Zero	2021-2030	<=60 (can be 60 on arterial roads, 30 in built up areas)	80, 100	120	0.5	0.0 for young (under 24), novice and professional drivers	1979	1992	Yes	No	At-Fault Driver Liability
Japan	11th Traffic Safety Program	2021-2025	40, 50, 60	50, 60	100	0.3	--	1985	2008	Yes	Yes	At-Fault Driver Liability, with strict liability for pedestrian injuries.

Country	Road Safety Strategy	Time Period	National Speed Limits on Urban Roads (in Km/h)	On Rural Roads	On Motorways	General BAC level (g/l)	Differentiated BAC level (g/l)	Seat-belt laws - Front seats	Seat-belt laws - Rear seats	Helmet laws - Powered two-wheelers	Helmet laws - Cyclists	Liability System
Netherlands	Door to Door Safety	2018-2030	30-50	60-80	100 between 6:00 and 19:00 100, 120, or 130 between 19:00 and 06:00	0.5 (including cyclists)	0.2 for novice drivers (first five years) and professional drivers	2005 – urban areas	1992	Yes, motorcycles since 1972; mopeds since 1975. Not compulsory on slow mopeds (max. 25 km/h) until 2022. As of 1 Jan 2023, all riders of slow-mopeds (speed max 25 km./h) must wear a helmet	No	Strict Liability (driver usually pays for vulnerable road user injuries)
New Zealand	New Zealand's Road Safety Objectives	2024-2026	50 (sections may have higher or lower limits)	100 (sections may have lower limits)	100 (sections may have limits of 110 or 120)	0.5	0.0 for drivers under 20 years	1975	1979	Yes, since 1956 when travelling above 50 km/h. Since 1973 at all speeds	Yes, since 1994	No-Fault Liability (injured parties claim from public fund, regardless of fault)
Norway	National Plan of Action for Road Safety	2022-2025	50 (20 on residential streets)	80 (70 on roads with high risk and 90 on roads with very low traffic volumes)	90, 100, 110	0.2	--	1972	1985	Yes	No	Strict Liability (driver usually pays for vulnerable road user injuries)
Sweden	2022-30 Road Safety Strategy	2022-2030	50 (sections with 30, 40)	60, 70 ,80, 90, 100	110, 120	0.2	--	1975	1986; child restraint since 1988	Yes	Yes, for children to age 15	Strict Liability (driver usually pays for vulnerable road user injuries)

Country	Road Safety Strategy	Time Period	National Speed Limits on Urban Roads (in Km/h)	On Rural Roads	On Motorways	General BAC level (g/l)	Differentiated BAC level (g/l)	Seat-belt laws - Front seats	Seat-belt laws - Rear seats	Helmet laws - Powered two-wheelers	Helmet laws - Cyclists	Liability System
Switzerland	Sub-Strategy on Road Safety	2020-2030	50 (sections with 30)	80	120 (100 on expressways)	0.5	0.0 for novice (first three years) and professional drivers	1981	1994	Yes, motorcycles and mopeds	No for regular bicycles. Yes for e-bikes ≥ 25km/h	Strict Liability (driver usually pays for vulnerable road user injuries)
United Kingdom	Road Safety Strategic Framework	2011-2030	48 (30 mph) (20 mph in Wales)	96, 113 (60, 70 mph)	113 (70 mph)	0.8 (England, Wales, Northern Ireland) 0.5 (Scotland)	--	1983	1989 (children); 1991 (adults)	Yes, motorcycles and mopeds	No	At-Fault Driver Liability
United States	National Roadway Safety Strategy (NRSS)	2022-?	Set by each state	Set by each state	88-129 (55-80 mph, set by each state)	0.8 (0.5 in Utah)	0.4 for professional drivers 0.0 to 0.2 for drivers < 21	Primary law in 34 states and D.C., secondary law in 15 states. Not mandatory for adults in one state. Established first in NY state in 1974.	Varies by state	No national law. 18 states, D.C. and PR require helmet use by all, 29 by specific users, 3 have no helmet law	Age-specific helmet laws in 21 states and D.C.	At-Fault Driver Liability, expect for No-Fault states (FL, HI, KS, KY, MA, MI, MN, NJ, NY, ND, PA, UT) wherein injured parties claim from their own insurer regardless of who was at fault.

Road Safety Management Frameworks of High-Income Countries

While road safety is a global issue, the U.S. continues to experience higher rates of death and serious injury than many peer countries. High-performing nations have adopted coordinated strategies grounded in national policy frameworks, legal structures, and systems-level practices that emphasize prevention and long-term commitment. This section provides a brief review of road safety laws and frameworks from other high-income countries, highlighting how national standards related to speed limits, impaired driving, protective equipment, and legal liability contribute to safe conditions. These examples offer useful context for public health professionals seeking strategies to improve road safety outcomes.

To better understand how national policies shape safety outcomes, the research team conducted a review of road safety frameworks across 15 high-performing countries. This review focused on countries with established safety strategies in reducing traffic-related injuries and fatalities. Using publicly available data from the International Transport Forum (2024), the team compiled information on each country's:

- published road safety strategies;
- national speed limits on urban and rural roads, as well as motorways;
- general and differentiated legal blood alcohol content (BAC) levels measured in grams per liter (g/l);
- national front and rear seatbelt laws;
- national powered two-wheeler and cyclist helmet laws; and
- liability systems in the event of crashes resulting in one or more crash-involved parties' injuries.

The international scan offers a comparative perspective on the policy levers that contribute to safer transportation systems and provides context for identifying opportunities for public health involvement in road safety policy in the U.S. Across the countries reviewed, differences in speed limits, substance-impaired policies, protective equipment laws, and liability structures reveal how safety is prioritized and enforced at different levels within the system. These variations reflect policy choices that shape road user behaviors, infrastructure design, and legal accountability. The table above provides a detailed side-by-side comparison of road safety elements across 15 countries. The key themes that follow highlight common policy approaches and offer insights that can help inform public health approaches.

Speed Management

Many high-performing countries enforce lower default speed limits in urban areas, often at or below 31 mph (50 km/h), with increasing use of reduced limits in residential areas and areas with high pedestrian activity. In contrast, speed limits in the U.S. are set by individual States and municipalities, resulting in wide variation across regions. This fragmented approach often leads to higher speed limits on roads that serve both motor vehicles and other modes. In many cases,

posted speed limits do not reflect the context or function of the roadways, contributing to greater risks for pedestrians, bicyclists, and other nonmotorized users.

National Strategy and Policy Alignment

Most countries included in the scan have a clearly defined, time-limited national road safety strategy, often informed by Vision Zero or Safe System principles—whereas Vision Zero reflects a goal of eliminating serious and fatal road injury, the creation of a Safe System involves organizing multi-disciplinary safety policies and practices to realize the goal (Vision Zero Network, 2023). These strategies typically include national coordination, safety targets, and implementation timelines. In the U.S., the National Roadway Safety Strategy was introduced in 2022 but lacks a defined end and its implementation varies widely by State. This decentralized approach can limit consistency and coordination across the country.

Impairment Standards

Compared to global peers, the U.S. maintains relatively high legal blood alcohol concentration (BAC) limits. While many countries have adopted general limits between 0.2-0.5 grams of alcohol per liter of blood (g/l), the U.S. allows for 0.8 g/l in most states. Lower thresholds apply to commercial drivers and drivers under age 21, which aligns with the national minimum legal drinking age. In contrast, stricter BAC limits and more consistent application are commonly used in other countries as part of broader efforts to reduce alcohol-related road injuries and deaths.

Protective Equipment Requirements

Helmet use laws for powered two-wheeled devices, such as e-bikes or e-scooters, are widely implemented across peer countries, often as a national requirement. In the U.S., however, there is no Federal helmet law. Instead, a patchwork of State-level policies govern helmet use. Eighteen States and the District of Columbia require helmets for all riders, while others have age-specific requirements or no mandate at all. Traditional bicycle helmet laws also vary internationally, with some countries applying them only to children and others prioritizing infrastructure investments over personal protective regulations.

Liability Systems

Liability structures differ significantly across countries. Many Northern European nations operate under strict liability systems, which place a greater legal responsibility on drivers to protect road users using other modes besides motor vehicles. Others, such as Australia and New Zealand, use no-fault systems that enable injured parties to access compensation regardless of which party may be at fault for a collision. In contrast, the U.S. primarily relies on an at-fault model, like systems in Canada (except Quebec), Ireland, Japan (with some exceptions), and the United Kingdom. Twelve U.S. States operate under no-fault insurance systems for injury compensation, where injured parties claim from their own insurer regardless of fault. These legal differences influence how responsibility is assigned, and health care and support are provided to those impacted by a crash.

This international scan highlights how national policy and legal structure can influence safety outcomes. For public health professionals, these examples offer a broader view of the policy levers that influence injury risk and suggest areas where public health expertise can support or advocate for stronger safety policies.

Appendix D. A Compendium of Effective Safety Countermeasures

The tables in **Appendix D** present policy, behavioral, and engineering countermeasures designed to significantly improve road user safety. The research team curated these countermeasures so that each would impart either an increase in desirable agency actions or road user behaviors or a reduction in less desirable actions and behaviors, as illustrated below. Further, the selected countermeasures have been shown to impart meaningful (i.e., at least 15%) reductions in serious and fatal road injuries or their direct antecedents. The 50 countermeasures featured on the following pages are designed to:

- Reduce Alcohol-Impaired Driving
- Reduce Distracted Driving
- Increase Safe Driving Practice
- Reduce Exposure to Drivers with Declining Driving Abilities
- Increase Motorcycle Helmet Use
- Increase Pedestrian Safety
- Increase Seatbelt / Restraint Use
- Reduce Speeding
- Increase Staying in Travel Lane / On Roadway
- Reduce Exposure to Motor Vehicle Traffic

Reduce Alcohol-Impaired Driving

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
Administrative License Revocation or Suspension (ALR/ALS)	Suspending drivers' licenses (ALS) if they fail or refuse to take a blood alcohol content (BAC) test. License revocation (ALR) requires offenders to re-apply for a driver's license once their suspension period ends.	Law enforcement, Driver licensing authorities	Support monitoring of crash trends Educate public on the effectiveness of swift sanctions Advise on optimal suspension lengths	Reduced recidivism and DUI crashes often follow administrative suspensions (DeYoung, 2013). Fell & Scherer (2017) linked longer suspension periods to significantly fewer alcohol-related crashes.	NHTSA recommends that ALR/S laws include a minimum license suspension of 90 days.
Alcohol Ignition Interlocks	Prevent vehicles from starting or being operated unless their drivers provide a breath sample with a BAC lower than a pre-set level, which is typically .02.	Court officials order, offending drivers install	Promote universal or repeat-offender interlock laws Integrate programs with treatment Track recidivism trends	States with interlock laws tend to experience declines in fatal crashes (Teoh et al., 2021). Ignition interlock laws are associated with reductions in alcohol-involved crash deaths (Kaufman & Wiebe, 2016)	Indigent funds can reduce the costs of installing interlocks for low-income offenders.

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
Alcohol Measurement Devices	These are stationary or portable alcohol sensors used to measure a driver's BAC.	Law enforcement	Advocate for continuous/transdermal monitoring Support integration into 24/7 sobriety programs	Jones (2014) detailed how device accuracy enhances safety monitoring. Wright & Lee (2021) linked mandatory measurement devices to declines in fatal accidents.	Breath alcohol devices—inclusive of evidential breath test devices (EBTs), preliminary breath test devices (PBTs), and passive alcohol sensors (PASs)—require frequent recalibration to function properly and are required to have quality assurance plans that specify the inspection, maintenance, calibration requirements, and intervals of recalibration.
Alcohol Screening and Brief Intervention (SBIRT)	Alcohol screening involves posing a few questions to estimate the severity of alcohol use and to determine whether a person may be at risk of alcohol misuse or dependence. Brief interventions are short, one-time encounters with people who may be at risk of alcohol-related injuries or other health problems and focus on awareness of the problem and improving motivation to change people's behavior.	Professionals with specialize training to screen and administer the brief intervention	Train providers Coordinate SBIRT programs in primary care and emergency departments Connect SBIRT to treatment services	SBIRT in emergency settings can effectively reduce repeat DUI offenses and alcohol misuse (Dill et al., 2004), especially high-risk alcohol use (D'Onofrio & Degutis, 2002).	The Uniform Accident and Sickness Policy Provision Law or UPPL permits insurance companies to deny payment to hospitals for treating patients who are injured while impaired by alcohol or a non-prescription drug, which may cause hospitals to limit their use of alcohol screening.

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
DWI Courts	Specialized courts provide systematic and coordinated approaches to prosecuting, sentencing, monitoring, and treating DWI offenders.	State and local judicial systems (e.g., state courts, prosecutors), probation services, treatment providers	Assist in evaluation of recidivism and health outcomes Serve on multi-disciplinary teams	Fell et al. (2011) reported DWI court participants had significant reductions in repeat offenses. Another study found lower probabilities of arrest for DWI court participants versus traditional adjudication (Sloan et al., 2016).	Requires inter-agency coordination, steady funding, trained personnel. There is typically low uptake—only ~1% of DWI offenders referred, though those referred show high completion and recidivism reduction rates.
DWI Offender Monitoring	Intensive supervision using devices like Secure Continuous Remote Alcohol Monitoring (SCRAM) or 24/7 sobriety testing to reduce recidivism.	State DMV, probation/parole departments, county courts	Oversee use of SCRAM bracelets and phone reporting Collect data for evaluation studies and research	Beirness & Beasley (2014) showed immediate roadside prohibitions reduced the concentration of impaired drivers on roadways. Campos et al. (2013) documented Brazil's monitoring systems led to reduced recidivism.	Requires a robust legal framework, funding, and equipment.
High-Visibility Saturation Patrols	Focused patrol operations in high-risk areas at peak times to deter impaired driving.	Law enforcement	Help publicize patrol campaigns Evaluate enforcement campaigns' safety impacts Help disseminate results to communities	Higher enforcement intensity often correlates with fewer serious crashes (Fell et al., 2014). Wright & Lee (2021) found drunk-driving fatalities fell with visible patrol campaigns.	Publicity is critical for effective patrols, which often require coordinated media campaigns and officer training.
Lower BAC Limits	Legislation reducing legal blood alcohol content (BAC) thresholds (e.g., from .08 to .05 BAC).	State legislatures, Law enforcement	Advise on health implications of lower BAC limits Model crash reduction predictions Advocate for lower BAC legislation	Fatal car crashes have declined in the wake of BAC limit reductions (Wright and Lee, 2021). Teoh et al. (2021) also found lower BAC limits were associated with reduced fatalities.	Resistance from alcohol industry is possible and countermeasure effectiveness depends on reliable enforcement of the limit, training, and public outreach.

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
Minimum Legal Drinking Age Laws	Minimum legal drinking age set to 21 to reduce underage alcohol-related crashes.	Congress, state legislatures, alcohol regulatory bodies	Support research/public education on age limits Track youth crash data Advocate for law consistency	McCartt et al. (2010) found MLDA 21 laws reduced alcohol-related driving in youth. MLDA laws have proven to be among the most effective laws in reducing underage drinking and crashes (Fell et al., 2016).	Supported by federal highway fund incentives and these laws often require consistent community enforcement.
Open Container Laws	Prohibit open alcohol containers in vehicles to deter consumption while driving.	State legislatures, DOTs, law enforcement	Map open container law zones Educate hospitality industries on the law Collect passenger data to evaluate compliance	Stricter open-container laws associated with lower self-reported drunk-driving (Lenk et al., 2016) lower risk of fatal crashes Wright & Lee, 2021).	Must align with vehicle search/seizure laws, and signage enforcement is often necessary.
Publicized Sobriety Checkpoints	Pre-planned, advertised traffic stops to deter drunk driving via perceived risk of getting caught.	State patrol, local police, SHSOs	Help plan checkpoint frequency Foster community buy-in Publicize checkpoint results	Fell & Scherer (2004) reported strong evidence that checkpoints reduce alcohol-related crashes. Indeed, Erke et al. (2009) carried out a meta-analysis and found a 17% decline in fatal crashes where checkpoints were deployed.	Requires legal authority (legal in 37 states), publicity/media outreach is essential, and low-staff models can prove viable.

Reduce Distracted Driving

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
GDL Passenger Limits for Young Drivers	Restrictions on the number and age of passengers novice drivers may carry, typically allowing zero or only one non-family passenger during the intermediate stage.	State legislatures, Departments of Motor Vehicles, State Highway Safety Offices (SHSOs)	Promote strong GDL laws Educate families and schools about the need for robust GDL laws Evaluate crash and distraction rates in response to GDL policy changes	Stricter GDL passenger limits were associated with a significant reduction in fatal crashes among teen drivers Masten et al., 2013). Foss & Goodwin (2014) showed adolescent drivers were less likely to engage in distracting behavior when driving alone.	An approach combining GDL with public-health based campaigns and targeted enforcement may be needed to maintain GDL's effectiveness.
High-Visibility Cell Phone Enforcement	Focused enforcement waves—roving/spotter patrols supported by earned and paid media—designed to increase perceived and actual risk of detection for handheld cell phone use while driving.	State Highway Safety Offices (SHSOs), State/Local police	Coordinate awareness campaigns Support evaluation of behavior change Share crash trends with media and public officials	High-visibility enforcement campaigns in California and Delaware have led to short-term reductions in handheld phone use while driving (Schick et al., 2014; Chaudhary et al., 2015). Bonne et al. (2018) emphasized the added effectiveness of combining enforcement with education.	Requires coordination between enforcement and communications teams, substantial funding (e.g., ~$300K+), officer training in spotting cell phone use, multi-jurisdiction planning, and periodic campaigns (e.g., “Phone in One Hand, Ticket in the Other”).

Increase Safe Driving Practice

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Graduated Driver Licensing (GDL) Policy	Helps young drivers build experience gradually by starting with supervised driving, then allowing limited independent driving before full licensure.	State licensing agencies	Lead public education efforts, including outreach to parents/caregivers for engagement Lead or assist with program evaluation including health and safety outcomes	GDL programs have been associated with a significant decrease in fatal crashes among 16-year-old drivers with an overall reduction of 11%, and more substantial reductions, of about 18% to 21% with more comprehensive programs (Chen et al., 2006). A similar study estimated 16% reduction in fatal crashes involving for 16-year-old drivers (Masten et al., 2015).	Coordination of multiple components includes aligning policies that govern permit duration, night driving limits, and passenger restrictions. Challenges include enforcement limitations and the need for clear communication with parents/caregivers to ensure understanding and compliance.
GDL with Learner's Permit	Allows beginning drivers to practice driving under the supervision of a licensed adult, typically requiring a minimum holding period and a set number of supervised driving hours.	States set the policy framework for permit duration and requirements, State agencies administer and enforce the licensing process	Conduct outreach and engagement Develop model policy Lead evaluation of program effectiveness	States that implemented a minimum learner license duration of at least six months, saw significant declines in 16- and 17-year-old drivers' fatal crash rates. This suggests that a sufficiently long learner's permit period, requiring supervised driving, contributes to lower fatal crash rates among young novice drivers (Masten et al., 2013).	Relies on parental supervision, making public education about the purpose and quality of supervised driving essential. Programs that engage and support parents in guiding practice can increase the variety of their teen's driving experiences and may contribute to improved novice driver performance.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
GDL with Intermediate License Nighttime Restrictions	GDL nighttime restrictions restrict newly licensed teens from driving during certain hours to reduce their exposure to this dangerous period.	Implemented by law, enforced by law enforcement (and parents)	Advocate to maintain or strengthen current requirements	Prior work has demonstrated an average 43% crash reduction during restricted hours when curfew starts at 9 p.m. (Foss et al., 2001; Shope et al., 2001) National analyses find strong nighttime restrictions are associated with teen fatal crash rate reductions of 16–21% (McCartt et al., 2010; Foss et al., 2001; Tutsi et al., 2025).	Legislative changes can take many years to implement. All but one State (Vermont) have some nighttime restriction. The Insurance Institute for Highway Safety states that best practice is for the night driving restriction to start at 8pm which only one State currently meets (South Carolina).
GDL with Intermediate License Passenger Restrictions	Passenger restrictions under GDL limit the number of young passengers novice drivers can carry to reduce distraction and risk-taking behavior. These policies are widely supported and have been shown to reduce serious and fatal crashes, especially when limits are set at one or zero young passengers.	States set the legal framework for GDL nighttime restrictions. State agencies administer the licensing process and enforce the restrictions through license conditions and education materials.	Conduct outreach and engagement Develop model GDL policy Lead evaluation of program effectiveness	Research indicates that intermediate license passenger restrictions are associated with a significant reduction of about 9% in fatal crashes for 16- and 17-year-old drivers when accompanied by teen passengers (Fell et al., 2011). Other researchers estimated 21% reductions in fatal crashes among 15- to 17-year-olds when no passengers were permitted (McCartt et al., 2010)	Depends on coordination between State-level policy (setting restriction hours and exemptions) and family-level enforcement, as compliance often falls to parents.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Formal Courses for Older Drivers (classroom + on-road feedback)	Formal training programs for older drivers that combine classroom instruction on safe driving practices and age-related adjustments with individualized on-road feedback.	AAA, AARP (Smart DriverTEK), National Safety Council sometimes offer programs independently or under State accreditation For on-road components, additional implementation partners (e.g., driver educators w/ specialized training) would be needed	Assist with program development and/or evaluation, and research translation Conduct outreach and engagement of intended audiences Integrate training into broader healthy aging initiatives	Effective transition strategies include starting early discussions, involving stakeholders, focusing on proactive planning (not just assessment), supporting ownership of the decision, and planning for alternative transport (Dickerson et al., 2024). Vision tests, on-road training, cognitive exercises, and vehicle technologies are recommended for older drivers (Freed et al., 2024). Online road-rules refresher workshops, tailored feedback based on driving performance, and personalized driving lessons can greatly improve older driver performance (Hanson et al., 2024; Wotring et al., 2024).	Requires dedicated resources, especially for the on-road component, which requires specialized instructors trained to work with older adults.

Reduce Exposure to Drivers with Declining Driving Abilities

Countermeasure	Description	Implementing Agency(ies)	Potential Role(s) for Public Health Partners	Evidence	Notes on Implementation
License Restrictions	License restrictions allow medically at-risk drivers to retain limited driving privileges by placing conditions on when, where, or how they can drive.	State driver licensing agencies, Medical professionals/physicians may provide input	Lead policy evaluation studies Develop education and communication campaigns Provide training support for staff or physicians on how to determine at-risk drivers	In-person driver license renewal has been linked to lower driving mileage, and thus reduced exposure to crash risk (Freed et al., 2023; Freed et al., 2024)	States may need to review restriction policies regularly, ensure drivers understand the limits placed on their licenses, and establish clear enforcement practices.
License Screening and Testing	License screening for functional impairment is a process used by State licensing agencies to assess whether a driver's physical or cognitive abilities may affect safe driving.	State driver licensing agencies with support from partners who provide guidance, data, and tools.	Lead program evaluation studies Develop license screening and testing policy Provide referral system support (e.g., like driver rehab specialists)	Regularly cognitive screening can reduce driver-caused crashes (Inada et al., 2023), and loosening restrictions, e.g., via extending renewal intervals and reducing in-person renewals is correlated with increased crash and injury rates among drivers aged ≥ 75 (Hamann et al., 2025; Joyce et al., 2024).	Licensing agency staff might require training to administer screening tools and refer drivers for further evaluation. There are costs related to equipment, staff training, and external referrals. Additionally, States may need to navigate legal, policy, and administrative requirements before adopting screening programs.

Increase Motorcycle Helmet Use

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Universal Motorcycle Helmet Use Laws	Universal coverage motorcycle helmet use laws require all motorcycle riders and passengers to wear a helmet.	Implemented by law, enforced by law enforcement	Advocate to upgrade law from partial/no coverage to universal coverage Advocate to maintain universal coverage law	If all States had universal helmet laws from the period inclusive of 1976-2022, 22,000 lives would have been saved; and if all States required helmet use the current annual motorcycle fatality rate could be reduced by 10% (Teoh, 2025). States with stronger motorcycle helmet law ratings (e.g., presence of any law, whether all riders were covered or if there were exemptions for certain people, penalties for violation, etc.) tended to have lower rates of unhelmeted motorcycle	Legislative changes can take many years to implement. Opposition to helmet use laws are not uncommon.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
				fatalities (Ganga et al., 2023).	

Increase Pedestrian Safety

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Lower speed limits	Lowering speed limits leads to lower overall vehicle speeds reducing the severity of crashes.	State DOTs, local transportation agencies	Support speed limit reductions Communicate the purpose of these changes to encourage awareness and compliance	Reducing speed limits often leads to 1–2 mph average speed decreases per 5 mph posted reduction, reducing fatal crash risk by up to 50% (Blomberg and Cleven, 1998; Rosen and Sander, 2009). Toronto's speed limit reduction from 40 to 30 km/h efforts documented a 28% decrease in pedestrian crashes and a 67% reduction in serious/fatal injuries (Fridman et al., 2020).	It might prove worthwhile to coordinate with engineering (traffic calming) and high-visibility enforcement to publicize speed reductions and prioritize high pedestrian activity zones.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Pedestrian safety zones	A designated area—often in locations with high foot traffic, e.g., near schools, senior centers, parks, transit stops, or downtowns—where a coordinated set of measures is applied to reduce vehicle speeds, increase driver awareness, and minimize conflicts between vehicles and pedestrians.	Local transportation or public works departments, municipal traffic engineering divisions, police or public safety departments, public health departments, planning departments, school boards, State DOTs, community-based organizations	Help define zones through data analysis Support package evaluations (i.e., those evaluating the combined effects of engineering, enforcement, and education) Promote pedestrian safety zones through social media	NHTSA and FHWA-sponsored programs have documented 8–13% lower pedestrian crash rates in defined safety zones (e.g., in Phoenix, AZ (Blomberg and Cleven, 1998) and Miami-Dade, FL (Zegeer et al., 2008)). Taipei's Neighborhood Traffic Environment Improvement Program (Huang and Huang, 2024) was associated with decreased daytime traffic crashes by 5% and injuries by 8%.	Zone identification requires comprehensive crash data mapping, interventions should include engineering (e.g., sidewalk installation, crosswalk upgrades, signage), enforcement plans, and education and outreach plans. Evaluation should include at least analysis of rates of drivers yielding to crossing pedestrians and pedestrian crashes and injuries pre and post the pedestrian safety zone and at least one similar area that had not received safety interventions at the time of the study.

Increase Seatbelt / Restraint Use

Countermeasure	Description of Countermeasure	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Primary Enforcement Seat Belt Use Laws	Laws that allow law enforcement officers to stop and cite a driver or passenger solely for failing to wear a seat belt, without needing another traffic violation.	State legislatures, State Highway Safety Offices, law enforcement	Champion the need for primary enforcement laws Develop and disseminate educational campaigns Support data collection and evaluation Foster collaborations with community groups	A change from secondary to primary enforcement has been found to reduce annual passenger vehicle driver death rates by an estimated 7% (Farmer and Williams, 2005).	Requires political will and legislative action to upgrade from secondary to primary laws. Public outreach and education are important to build understanding and compliance. Can face opposition from those concerned about potential profiling, which needs to be addressed through community engagement and transparent enforcement policies.
Strong Child Passenger Safety Laws	Comprehensive laws requiring the use of age-, weight-, and size-appropriate child restraint systems (rear-facing car seats, forward-facing car seats, booster seats) for children up to a certain age or height.	State legislatures, State Highway Safety Offices, law enforcement , DMVs	Advocate for comprehensive laws that reflect best practices for child occupant protection Provide information to parents and caregivers on selecting, installing, and correctly using child restraints Train and certify Child Passenger Safety (CPS) technicians to assist families Monitor child restraint use rates and track injury/fatality trends to assess effectiveness	Booster seat use reduces the risk of serious injury for children aged 4–8 when compared with seat belt use alone (Arbogast et al., 2009).	Laws vary significantly by state regarding age/weight/height requirements, making consistency a challenge. Requires ongoing education and enforcement to combat misuse and encourage proper use. May require addressing barriers to access for low-income families (e.g., providing affordable or free child restraints).
Short-Term, High-Visibility Seat Belt Law Enforcement	Focused, short-duration law enforcement campaigns with high public visibility and extensive media coverage, such as "Click It or Ticket," designed to increase seat belt use.	Law enforcement, State Highway Safety Offices	Disseminate messages about the importance of seat belt use and the enforcement campaign Partner with community organizations to raise awareness and provide resources during the campaign	Enhanced enforcement programs have been found to be effective in increasing safety belt use and reducing	Campaigns require significant resources for enforcement, visibility elements (e.g., signage, marked vehicles), and publicity. Effective planning and coordination between law enforcement and highway safety

Countermeasure	Description of Countermeasure	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
			Evaluate campaigns' impact Advocate for sustained enforcement efforts and policies	injury rates (Farmer and Williams, 2005).	offices are crucial. Publicity efforts, including paid media, enhance effectiveness but add to costs.
Short-Term, High-Visibility Child Passenger Safety Law Enforcement	Targeted law enforcement campaigns, often conducted in conjunction with seat belt enforcement, specifically focused on ensuring correct child restraint use, combined with public awareness initiatives.	Law enforcement, State Highway Safety Offices	Provide training and education to law enforcement officers on child restraint laws and proper child restraint use Collaborate with schools, healthcare providers, and community organizations to educate parents and caregivers about child passenger safety Support programs that provide access to child safety seats for families in need Evaluate the effectiveness of enforcement efforts	High-visibility enforcement and publicity have been shown to increase child restraint use and correct use of safety seats (Shults et al., 2004).	Law enforcement reluctance to enforce child restraint laws due to lack of knowledge or competing priorities can be a barrier. Requires dedicated enforcement efforts and training for officers on child restraints. Publicity and communication strategies should emphasize the importance of child passenger safety to parents and caregivers.

Reduce Speeding

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Policies					
Setting appropriate speed limits	Speed limits (statutory or speed zone) should be set to appropriately match the function of the roadway and to reduce kinetic energy where traffic is mixed.	State departments of transportation, city departments of transportation, city public works	Assist with identifying corridors of high injury that would be suited for speed limit reductions Evaluate effectiveness of lowering posted speed limits	Kumfer et al. (2023) documented several international studies that showed decreases in specific crash types (and decreases in mean speeds, in some cases) when speed limits were reduced. Conversely, the research shows that increases in speed limits tend to be associated with crash increases (Savolainen et al., 2022). Farmer (2019) has shown this relationship between speed limit and safety in the United States.	Posted speed limits should align with the road context.
Penalties, demerits, or sanctions	Enforcement-based strategies that impose fines, driver license points, suspensions, or conditional driving limits in response to speeding violations.	Law enforcement, courts, driver licensing agencies (e.g., DMV)	Analyze traffic injury data, assessing the fairness and effectiveness of penalties Support education campaigns about consequences of speeding violations Evaluate behavior change outcomes	Introduction of a penalty point system in Spain led to a 13.5% reduction in fatalities and 15% in serious injuries (Tomas et al., 2010). In Norway, drivers accumulating points saw a 25–30% lower likelihood of reoffending following interventions (Høye and Sagberg, 2017).	Requires timely administrative processing of violations. Effectiveness increases when paired with visible enforcement. Sanctions should escalate for repeat offenses. Clear public messaging is key for deterrence and fairness perceptions.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Variable Speed Limits (VSL)	Real-time adjustment of posted speed based on conditions (weather, congestion).	State DOTs, highway operators	Advocate for VSL in higher risk environments Support evaluation of VSL's safety effectiveness	VSL reduced crash severity by 15–29% on Wyoming's I-80 interstate (Gaweesh & Ahmed, 2019).	Requires sensors, dynamic signage, and high degrees of driver compliance. Calibration is key, such as through gradual changes, and upstream/downstream speed differentiation.
Engineering Measures					
Convert intersection to a roundabout	Replace stop/signal with circular intersection controlling entry speed/direction.	Municipal traffic engineering, state and local DOTs	Advocate for accessible design for all users Evaluate injury reductions as result of roundabout conversions	Roundabout conversions have been associated with a 65% reduction in fatalities and a 40% reduction in injuries (Elvik, 2017); A study conducted in Carmel, IN documented 47% fewer injury crashes after roundabout conversions (Daniels et al., 2022).	It is critical to design for context, such as whether and to what extent the facility should provide cycling safety features. Often requires community outreach and education on how to navigate through roundabouts.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Install raised median with or without marked crosswalk (uncontrolled)	Center refuge to shorten pedestrians crossing distance and regulate traffic flow.	City engineering, public works	Promote use of raised medians Assist with collecting crossing data Lead safety effectiveness studies	Medians can reduce pedestrian crashes by about 46% (Zegeer et al., 2013; Ewing & Dumbaugh, 2009).	Ensure ramps adhere to ADS requirements, the medians should be highly visibility, and maintenance plans should be developed.
Decrease lane width from 11 ft to 9 ft	Narrow vehicle travel lanes to slow speeds and allow room for multimodal users.	State and local DOTs, urban planners and engineers	Analyze speed/volume impacts on injury outcomes	Narrower lanes can reduce speeds by 2–5 mph as well as the likelihood of serious crashes (Ewing, 2015; Chen & Chen, 2014).	Must consider traffic composition, such as the need to move heavy vehicles on these facilities. Clear pavement markings and street lighting are needed to facilitate staying in narrowed lanes.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Implement mobile automated speed enforcement (ASE)	Use of mobile cameras to enforce speed via citations.	Elected officials, law enforcement, camera vendors	Advocate for fair placement of ASE Evaluate the safety effectiveness of ASE Market ASE's benefits	Mobile ASE cuts mean speeds by 5–10 mph and reduced injury crashes (~20–25%) (Pilkington & Kinra, 2005; Christie et al., 2010).	ASE programs require fair deployment, camera, and sign placement, public education, and timely citation processing.
Install automated speed camera (ASE) at signalized intersections	Stationary camera to enforce speeding laws near traffic signals.	Elected officials, law enforcement, camera vendors	Advocate for fair placement of ASE Monitor intersection safety and evaluate the safety effectiveness of ASE Market ASE's benefits	Automated speed enforcement programs can achieve site-specific injury crash reductions in the range of 20% to 25% (Wilson et al., 2010; Thomas et al., 2008).	Requires clear signage and benefits from data sharing arrangements with public officials and health departments.

Increase Staying in Travel Lane / On Roadway

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
W-beam guardrail	Steel guardrail along roadsides that absorbs crash energy and redirects vehicles running off road.	State DOTs, local highway departments, contractors	Promote inclusion in road safety plans Evaluate post-installation injury outcomes Support community awareness	Finite-element tests show W-beam posts absorb significant crash energy Tso-Liang et al., 2016); Park et al. (2016) estimate a 25% reduction in run off road crashes that result in serious or fatal injuries after the installation of w-beam guardrails.	Ensure use of correct end treatments (ET-Plus, Midwest system). Schedule regular inspection to assess damage.
Shoulder and centerline rumble strips	Grooves milled near shoulder to alert drifting drivers via noise and vibration (shoulder rumble strips); and grooves along centerline alerting drivers drifting into opposing lanes (centerline rumble strips).	State/local DOT, contractors	Advocate for installation on high-risk roads Educate the public about the benefits of these countermeasures	Scholars have estimated a > 40% crash reduction and a > 50% crash reduction after the installation of shoulder and centerline rumble strips at tangent (straight) and curved road segments (Persaud et al., 2022); Centerline rumble strips can reduce head-on and opposite-side swipe collisions by 28–48%, respectively on rural two-lane roads (Gil-Martin et al., 2025).	Shoulder rumble strips require paved shoulder ≥3 ft, whereas centerline rumble strips require centerlines. Consider using sinusoidal strips to reduce noise near homes and opt for milled over raised design.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
High friction surface treatment (HFST)	Application of epoxy binder and aggregates to improve vehicles' skid-resistance.	State/local DOTs, maintenance crews	Assist with mapping skid-prone locations Lead the establishment of pilot projects	HFST installation is associated with a 48% reduction in fatal and injury crashes on horizontal curves on two-lane rural roads (Gayah et al., 2024a; Merritt et al., 2020)	Most applicable in high-rate or -risk crash spots (curves, interchanges). Must plan for periodic reapplication.
Cable median barrier (high-tension)	Tensioned steel cables in the median that decelerate vehicles across opposite lanes.	State/local DOTs, public works	Advocate for installation on high-speed roadways Evaluate injury trends pre- and post-implementation	Gayah et al. (2024b) estimated an average decrease in serious and fatal crashes resulting from crossing the median of ~90%; Other studies have estimated a > 50% in serious and fatal crash reduction post high-tension cable median barrier installation (Russo et al., 2016).	Requires space for deflection and maintenance to sustain cable tension.

Reduce Exposure to Motor Vehicle Traffic

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Commuter/regional rail service	Provides a transit connection to more distant destinations and often replaces driving for work commutes and occasional work and non-work-related trips.	Transit authorities, metropolitan planning orgs, state DOTs	Advocate for equitable transit Assess health impacts Assist with community engagement	Regional rail can improve access to jobs and reduce car dependence (Deka and Marchwinski, 2014). Shantz et al. (2022) find that commuter rail investments can shift mode choices and reduce vehicle miles traveled (VMT).	Requires coordination with land use and transit agencies, funding from federal/state agencies, and ADA compliance.
Telecommuting	Permit employees to work at home or in a remote location instead of commuting to their regular workplaces on either full- or part-time bases.	Employers	Support employer outreach Monitor air quality improvements Evaluate public health and road safety implications	Remote work often reduces commute-related emissions (Asmussen et al., 2023), and an analysis of post-pandemic work trends, confirms sustained reductions in travel demand after the implementation of remote work policies (Obeid et al., 2024). Zheng et al. (2024) find that telecommuting leads to long-term changes in travel behavior.	Must address fair access to digital infrastructure (e.g., Wi-Fi, broadband, desktops, etc.). Telecommuting could be facilitated with employer-provided computer and communications technology, and IT infrastructure.
Transit pass subsidies	Tend to be in the form of transit passes or transit trip reimbursements.	Employers, transit agencies	Evaluate impact on ridership Promote subsidy programs Assess emissions, fairness, and safety effects	Subsidized transit passes increase ridership and reduce car use (Chen, 2023). Chen and Yang (2023) confirm these effects especially among low-income commuters.	Consider integrating pass provision with payroll. These programs require employer coordination and marketing.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Transit-Oriented Development (TOD)	Transit-oriented development (TOD), consisting of moderate- to high-density, mixed-use development near high-quality public transit (e.g., within 1,500 ft).	City planning departments, developers, transit agencies	Conduct health impact assessments Consult on planning for the integration of active modes Assist with community outreach	TODs encourage walking and transit use (Ewing et al, 2013), and are linked with reductions in auto dependency (Lee and Lee, 2020). Stevens (2017) found that TODs were associated with lower VMT and greater transit ridership.	Often requires land zoning changes, eliminating minimum parking requirements, and providing developer incentives.
Residential density	An increase in the density of dwelling units per unit of space (e.g., per acre).	City planning, zoning boards	Provide evidence of the health and safety benefits of density Promote access to green space and services	Higher density supports shorter trips, more sustainable travel mode use (Merlin, 2018), and lower vehicle usage (Nasri and Zhang, 2012).	May require significant infrastructure upgrades. Consider balancing residential density with direct access to essential services.
Land-use mix	Areas with a mix of land use types within a neighborhood or district.	Planning departments, developers	Advise on mixed-use schemes Assess active transport uptake and public health and safety effects associated with mixed development patterns	Lee and Lee (2020) find that mixed land uses increase the likelihood of non-auto travel, whereas Nasri and Zhang (2014) confirm that diverse land uses reduce driving by enabling walking and transit use.	Often requires rezoning, e.g., instituting flexible form-based codes, as well as long-term coordination with residential property owners and business industry.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Jobs/housing balance	Access to employment opportunities near residential locations.	City and regional planning agencies	Evaluate health and safety effects Support fair placement of jobs and housing for lower-income households	Balancing jobs and housing often reduces commute distances (Boarnet and Wang, 2019) supports alternative travel modes, which tend to lower area-level VMT (Stevens, 2017).	Requires regional collaboration, especially pertaining to the areas that should be developed and on what time scale, and employer incentives to locate their businesses in strategic locations.
Congestion pricing	Congestion pricing imposes a higher price on driving at congested times.	City/regional governments, toll authorities	Model air quality, health, and safety effects Support revenue-reinvestment in health and road safety programs	Börjesson and Kristoffersson (2018) provide evidence from Stockholm showing reduced congestion and emissions. Croci (2016) reviews multiple cases and finds congestion pricing to be effective in reducing traffic volumes.	Requires installation and operation of digital tolling systems. Should consider exemptions and develop a public communication plan.
Local network connectivity	Improving the connectivity of the local transportation network reduces travel distances.	City public works, DOTs	Promote the provision of safe infrastructure Lead active transport promotion campaigns Evaluate the health and safety effects of connected street networks	Ding et al. (2017) find that well-connected street networks encourage walking and biking. Ewing et al. (2016) support this by showing increased accessibility and transit use in more connected areas.	Often requires street redesign, right-of-way acquisition, traffic calming, and maintenance.

Countermeasure	Description	Implementing Agency(ies)	Potential role(s) for public health partners	Evidence	Notes on Implementation
Bike share and scooter share	These programs provide bicycles or scooters for short-term rental. Bike share can be docked (where the bike must be picked up from and returned to a docking station in the service area) or dockless (where bikes can be parked—and picked up—anywhere in the service area). They can provide either pedaled bikes or e-bikes. Scooter share programs are generally dockless and employ electric kick scooters.	Local governments in partnership with private operators	Promote fair distribution of bicycles, scooters, and docking stations Promote helmet use Advocate for integration with transit	Bike share is associated with increases non-auto mode share more generally (Fishman et al., 2014). Further, scooter share can replace shorter car trips in urban areas (Fitch, 2019; Fukushige et al., 2023).	Requires the establishment of dockless bike and scooter regulations, parking rules, and outreach to neighborhoods who stand to benefit the most from these systems.
Parking pricing	Pricing workplace parking (including employer-provided cash-out programs), pricing on-street parking, and adaptive parking pricing (i.e., charging now for parking during high times of demand).	City finance, public works departments	Conduct pricing-health/safety impact analyses Advocate for reinvestment of revenues in transit, bike lanes, and sidewalks	Higher parking costs tends to directly discourage driving (Krishnamurthy and Ngo, 2019), especially in variable pricing schemes (Miller and Wilson, 2015). Moreover, Yan et al. (2019) provide evidence that parking pricing shifts mode choices toward transit use.	Adaptive pricing requires use of pricing technology. Priced parking requires enforcement and public outreach to be effective. Consider providing exceptions for those with lower incomes, especially workers having to park at work for long periods.

Appendix E. References

Abdel-Aty, M., & Dhindsa, A. (2007). *Coordinated use of variable speed limits and ramp metering for freeway safety improvement*. Transportation Research Board 86th Annual Meeting.

Ahmed, S. K., Mohammed, M. G., Abdulqadir, S. O., Abd El-Kader, R. G., El-Shall, N. A., Chandran, D., Ur Rehman, M. E., & Dhama, K. (2023). *Road traffic accidental injuries and deaths: A neglected global health issue*. *Health Science Reports, 6*(5), e1240.

Aktaş, A., & Öztürk, İ. (2024). "You are the company you keep": A study of peer pressure on driving. Transportation Research Part F: Traffic Psychology and Behaviour, 106, 244-256.

American Planning Association Tennessee Chapter. (2025). Plan4health. About the plan4health program. https://tennessee.planning.org/knowledge-center/plan4health/.

Arbogast, K. B., Jermakian, J. S., Durbin, D. R., & Kallan, M. J. (2009). The effectiveness of booster seats for restraining children in frontal crashes. Pediatrics, 124(1), 127–134.

Asmussen, Katherine E. Aupal Mondal, Chandra R. Bhat. (2023). *The Interplay between teleworking choice and commute distance*. Technical Paper, Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin. https://www.caee.utexas.edu/prof/bhat/ABSTRACTS/WPLCOMM.pdf.

Beirness, D. J., & Beasley, E. E. (2014). An evaluation of immediate roadside prohibitions for drinking drivers in British Columbia: Findings from roadside surveys. *Traffic Injury Prevention, 15*(3), 228-233. https://doi.org/10.1080/15389588.2013.813628.

Blomberg, R. D., & Cleven, A. M. (1998). *Development, implementation, and evaluation of a pedestrian safety zone for elderly pedestrians* (Report No. DOT HS 808 692). National Highway Traffic Safety Administration.

Blomberg, R. D., & Cleven, G. (1998). *Pedestrian safety zone case studies in Phoenix and Miami-Dade*. NHTSA/FHWA Joint Report.

Boarnet, M. G., & Wang, X. (2019). Urban spatial structure and the potential for vehicle miles traveled reduction: The effects of accessibility to jobs within and beyond employment sub-centers. *The Annals of Regional Science*. https://doi.org/10.1007/s00168-019-00900-7.

Bonne, S., Suber, I., Anderson, A., & Livingston, D. H. (2018). Implementation is not enough: Graduated drivers licensing benefits from a comprehensive enforcement, education, and awareness campaigns. *The Journal of Trauma and Acute Care Surgery, 85*(4), 704-710. https://doi.org/10.1097/TA.0000000000002018.

Börjesson, M., & Kristoffersson, I. (2018). The Swedish congestion charges: Ten years on. *Transportation Research Part A: Policy and Practice, 107*, 35–51. https://doi.org/10.1016/j.tra.2017.11.001.

Campos, V. R., e Silva, R. D. S., Duailibi, S., dos Santos, J. F., Laranjeira, R., & Pinsky, I. (2013). The effect of the new traffic law on drinking and driving in São Paulo, Brazil. *Accident Analysis & Prevention, 50*, 622-627. https://doi.org/10.1016/j.aap.2012.06.011.

Centers for Disease Control and Prevention. (2015). *Vital signs: Health burden and medical costs of nonfatal injuries to motor vehicle occupants—United States, 2012* (MMWR). https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6340a4.htm.

Centers for Disease Control and Prevention. (2022). *Injury prevention through strategic alignment in transportation planning*. U.S. Department of Health and Human Services. https://www.cdc.gov/road-safety-report.

Chaudhary, N. K., Connolly, J., Tison, J., Solomon, M., Elliott, K. R., & Preusser Research Group. (2015). *Evaluation of NHTSA distracted driving high-visibility enforcement demonstration projects in California and Delaware* (No. DOT HS 812 108). Preusser Research Group, Inc..

Chen, L. H., Baker, S. P., & Li, G. (2006). Graduated driver licensing programs and fatal crashes of 16-year-old drivers: A national evaluation. *Pediatrics, 118*(1), 56-62.

Chen, L., & Chen, C. (2014). Influence of lane width on safety for urban arterials. *Accident Analysis & Prevention, 71*, 18–26. https://doi.org/10.1016/j.aap.2014.05.005.

Chen, P. (2023). Multimodality incentivized by employer-based travel demand management. Transportation Letters, 1–11. https://doi.org/10.1080/19427867.2023.2207275.

Chen, P., & Yang, X. (2023). Revisit employer-based travel demand management: A longitudinal analysis. Transport Policy, 131, 22–31. https://doi.org/10.1016/j.tranpol.2022.11.014.

Christie, R., Lyons, R. A., Dunstan, F., & Jones, S. J. (2010). Are mobile speed cameras effective? A controlled before and after study. Injury Prevention, 16(2), 112–115. https://doi.org/10.1136/ip.2009.022566.

Community Commons. (n.d.). *Transportation and health*. Health in All Policies Learning Series. https://hia.communitycommons.org/learn/health-in-all-policies/transportation-and-health/

Croci, E. (2016). Urban Road Pricing: A comparative study on the experiences of London, Stockholm and Milan. Transportation Research Procedia, 14, 253–262. https://doi.org/10.1016/j.trpro.2016.05.062.

Crundall, D., & van Loon, E. (2025). An investigation of barriers and facilitators to young drivers' engagement with post-licensure training. Transportation Research Part F: Traffic Psychology and Behaviour, 110, 104-117.

Daniels, S., Nuyts, E., & Wets, G. (2022). Safety effects of roundabouts: A review of international studies. Accident Analysis & Prevention, 173, 106726. https://doi.org/10.1016/j.aap.2022.106726.

Deka, D., & Marchwinski, T. (2014). The revenue and environmental benefits of new off-peak commuter rail service: The case of the Pascack Valley line in New Jersey. Transportation, 41(1), 157–172. https://doi.org/10.1007/s11116-013-9495-0.

DeYoung, D. J. (2013). Traffic safety impact of judicial and administrative driver license suspension. In Countermeasures to address impaired driving offenders: Toward an integrated model (Transportation Research Circular, Number E-C174, pp. 41-53). Transportation Research Board. http://onlinepubs.trb.org/onlinepubs/circulars/ec174.pdf

Dickerson, A. E., Stapleton, T., Bloss, J., Géinas, I., Harries, P., Choi, M., & Vrkljan, B. (2024). A systematic review of effective interventions and strategies to support the transition of older adults from driving to driving retirement/cessation. Innovation in Aging, 8(6). https://doi.org/10.1093/geroni/igae054.

Dill, P. L., Wells-Parker, E., & Soderstrom, C. A. (2004). The emergency care setting for screening and intervention for alcohol use problems among injured and high-risk drivers: A review. Traffic Injury Prevention, 5(3), 278-291. https://doi.org/10.1080/15389580490465364.

Ding, C., Liu, C., Zhang, Y., Yang, J., & Wang, Y. (2017). Investigating the impacts of built environment on vehicle miles traveled and energy consumption: Differences between commuting and non-commuting trips. Cities, 68, 25–36. https://doi.org/10.1016/j.cities.2017.05.005.

Dinh-Zarr, T. B., Sleet, D. A., Shults, R. A., Zaza, S., Elder, R. W., & Sosin, J. M. (2001). Reviews of evidence regarding interventions to increase the use of safety belts. American Journal of Preventive Medicine, 21(4), 48–65.

Dong, X., Wu, J. S., Walshe, E. A., Winston, F. K., & Ryerson, M. S. (2023). Residing in a driver training desert leads to delayed licensure: Investigating the relationship between accessibility to driver training and young driver's licensure residing in a driver training desert leads to delayed licensure: Investigating the relationship between accessibility to driver training and young driver's licensure. Findings (Network Design Lab.Online).

D'Onofrio, G., & Degutis, L. C. (2002). Preventive care in the emergency department: Screening and brief intervention for alcohol problems in the emergency department: A systematic review. Academic Emergency Medicine, 9(6), 627-638. https://doi.org/10.1197/aemj.9.6.627.

Dumbaugh, E. (2014). The design of safe urban roadsides: An empirical analysis. Journal of the American Planning Association, 71(1), 69–83. https://doi.org/10.1080/01944363.2005.10383167.

Ederer, D. J., Panik, R. T., Botchwey, N., & Watkins, K. (2023). The Safe Systems Pyramid: A new framework for traffic safety. Transportation Research Interdisciplinary Perspectives, 21, 100905. https://doi.org/10.1016/j.trip.2023.100905.

Elvik, R. (2001). Area-wide urban traffic calming schemes: A meta-analysis of safety effects. Accident Analysis & Prevention, 33(3), 327–336. https://doi.org/10.1016/S0001-4575(00)00039-X.

Elvik, R. (2017). A re-parameterization of the power model of the relationship between the speed of traffic and the number of accidents and accident victims. Accident Analysis & Prevention, 98, 111–118. https://doi.org/10.1016/j.aap.2016.10.019.

Erke, A., Goldenbeld, C., & Vaa, T. (2009). The effects of sobriety checkpoints on alcohol-involved crashes: A meta-analysis. Accident Analysis & Prevention, 41(5), 914–923. https://doi.org/10.1016/j.aap.2009.05.005.

Evenson, K. R., Kintigh, J. M., Neuroth, L. M., LaJeunesse, S., & Naumann, R. B. (2024). Public health involvement in United States' vision zero initiatives: A mixed-methods study. *Journal of Public Health Management and Practice, 30*(4), 567-577. https://doi.org/10.1097/PHH.0000000000001988.

Ewing, R. (2015). Does compact development make people drive less? Journal of the American Planning Association, 83(1), 19–28. https://doi.org/10.1080/01944363.2016.1240044.

Ewing, R., & Dumbaugh, E. (2009). The built environment and traffic safety: A review of empirical evidence. Journal of Planning Literature, 23(4), 347–367. https://doi.org/10.1177/0885412209335553.

Ewing, R., Hamidi, S., & Grace, J. B. (2016). Compact development and VMT—Environmental determinism, self-selection, or some of both? Environment and Planning B: Planning and Design, 43(4), 737–755. https://doi.org/10.1177/0265813515594811.

Ewing, R., Hamidi, S., Gallivan, F., Nelson, A. C., & Grace, J. B. (2013). Combined effects of compact development, transportation investments, and road user pricing on vehicle miles traveled in urbanized areas. Transportation Research Record: Journal of the Transportation Research Board, 2397(1), 117–124. https://doi.org/10.3141/2397-14.

Farmer, C. M. (2019). The effects of higher speed limits on traffic fatalities in the United States, 1993–2017. Insurance Institute for Highway Safety. https://www.iihs.org/api/datastoredocument/bibliography/2188.

Farmer, C. M., & Williams, A. F. (2005). The effect of primary enforcement seat belt laws on motor vehicle occupant death rates. Accident Analysis & Prevention, 37(6), 1145–1148.

Federal Highway Administration. (n.d.). *Crash modification factors clearinghouse*. U.S. Department of Transportation. https://cmfclearinghouse.fhwa.dot.gov/.

Federal Highway Administration. (n.d.). *Integrating road safety into NEPA analysis: A practitioner's primer*. U.S. Department of Transportation. https://www.environment.fhwa.dot.gov/NEPA/road_safety_NEPAanalysis.aspx

Federal Highway Administration. (2022). *Proven safety countermeasures*. U.S. Department of Transportation. https://highways.dot.gov/safety/proven-safety-countermeasures

Federal Highway Administration. (2024, July). *Strategic highway safety plan (SHSP)*. U.S. Department of Transportation. https://highways.dot.gov/safety/hsip/shsp.

Fell, J. C., & Scherer, M. (2017). Administrative license suspension: Does length of suspension matter? Traffic Injury Prevention, 18(6), 577-584. https://doi.org/10.1080/-15389588.2017.1293257.

Fell, J. C., Jewett, A., McDonald, E., & Chaudhary, N. K. (2011). A national evaluation of the nighttime and passenger restrictions in graduated driver licensing laws. Journal of Safety Research, 42(1), 5-14.

Fell, J. C., Lacey, J. H., & Voas, R. B. (2004). Sobriety checkpoints: Evidence of effectiveness is strong, but use is limited. Traffic Injury Prevention, 5(3), 220-227. https://doi.org/10.1080/15389580490465247.

Fell, J. C., Scherer, M., Thomas, S., & Voas, R. B. (2016). Assessing the impact of twenty underage drinking laws. Journal of Studies on Alcohol and Drugs, 77(2), 249-260. https://doi.org/10.15288/jsad.2016.77.249.

Fell, J. C., Tippetts, A. S., & Langston, E. A. (2011). An evaluation of three driving-under-the-influence courts in Georgia. Annals of Advances in Automotive Medicine, 55, 301–312.

Fell, J. C., Waehrer, G., Voas, R. B., Auld-Owens, A., Carr, K., & Pell, K. (2014). Effects of enforcement intensity on alcohol impaired driving crashes. Accident Analysis & Prevention, 73, 181-186. https://doi.org/10.1016/j.aap.2014.09.002.

Fishman, E., Washington, S., & Haworth, N. (2014). Bike share's impact on car use: Evidence from the United States, Great Britain, and Australia. Transportation Research Part D: Transport and Environment, 31, 13–20. https://doi.org/10.1016/j.trd.2014.05.013.

Fitch, D. (2019). Electric assisted bikes (e-bikes) show promise in getting people out of cars. University of California Institute of Transportation Studies. https://escholarship.org/uc/item/3mm040km.

Foss, R. D., & Goodwin, A. H. (2001). Effects of Michigan's graduated driver licensing program on the collisions of young drivers. Journal of Safety Research, 32(4), 445–451.

Foss, R. D., & Goodwin, A. H. (2014). Distracted driver behaviors and distracting conditions among adolescent drivers: Findings from a naturalistic study. Journal of Adolescent Health, 54(5), S50-S60. https://doi.org/10.1016/j.jadohealth.2014.01.005.

Foss, R. D., Goodwin, A. H., & Preusser, D. F. (2001). Effects of North Carolina's graduated licensing curve on the crash rates of young drivers. Journal of Safety Research, 32(4), 331–338.

Freed, S. A., Staplin, L., Sprague, B. N., Ross, L., & TransAnalytics, L. L. C. (2024). State of knowledge on older drivers. https://rosap.ntl.bts.gov/view/dot/73056.

Freed, S. A., Staplin, L., Sprague, B. N., Ross, L., & TransAnalytics, L. L. C. (2024). State of knowledge on older drivers. https://rosap.ntl.bts.gov/view/dot/73056.

Freed, S., Ross, L., Mogle, J., Gamaldo, A., & Zhang, Y. (2023). Driver license renewal requirements predict driving mobility among older drivers with health-related travel difficulties. Transportation Research Record, 2677(8), 185-195. https://doi.org/10.1177/03611981231155903.

Freed, S., Ross, L., Mogle, J., Gamaldo, A., & Zhang, Y. (2023). Driver license renewal requirements predict driving mobility among older drivers with health-related travel difficulties. Transportation Research Record, 2677(8), 185-195.

Fridman, L., Ling, R., Rothman, L., Cloutier, M. S., Macarthur, C., Hagel, B., & Howard, A. (2020). Effect of reducing the posted speed limit to 30 km per hour on pedestrian motor vehicle collisions in Toronto, Canada - a quasi experimental, pre-post study. BMC Public Health, 20(1), 56-8. https://doi.org/10.1186/s12889-019-8139-5.

Frieden, T. R. (2010). A framework for public health action: The health impact pyramid. *American Journal of Public Health, 100*(4), 590-595. https://doi.org/10.2105/AJPH.2009.185652.

Fukushige, T., Fitch, D. T., & Handy, S. (2023). Estimating vehicle-miles traveled reduced from dock-less E-bike-share: Evidence from Sacramento, California. Transportation Research Part D: Transport and Environment, 117, 103671. https://doi.org/10.1016/j.trd.2023.103671.

Ganga, A., Kim, E.J., Tang, O.Y., Feler, J.R., Sastry, R.A., Anderson, M.N., Keith, S.E., Fridley, J.S., Gokaslan, Z.L., Cielo, D.J., Toms, S.A., & Sullivan, P.Z. (2023). The burden of unhelmeted motorcycle injury: A nationwide scoring-based analysis of helmet safety legislation. Injury, 52(3), 848-856. 10.1016/j.injury.2023.01.013.

Gaweesh, S. M., & Ahmed, M. M. (2019). A full Bayesian approach to modeling the safety effectiveness of variable speed limit systems. Journal of Transportation Safety & Security, 11(6), 667–689. https://doi.org/10.1080/19439962.2018.1427641.

Gayah, V. V., Donnell, E. T., & Zhang, P. (2024). Crash modification factors for high friction surface treatment on horizontal curves of two-lane highways: A combined propensity scores matching and empirical bayes before-after approach. Accident Analysis and Prevention, 199, 107536. https://doi.org/10.1016/j.aap.2024.107536.

Gayah, V. V., Donnell, E. T., Liu, H., & Prajapati, A. (2024b). Crash modification factors for high-tension cable median barriers: An empirical bayes before–after study. Transportation Research Record, 03611981241250345.

Gil-Marin, J. K., Sawtelle, A., Garder, P. E., & Shirazi, M. (2025). Examining the impact of centerline rumble strips on reducing rural two-lane head-on collisions in maine. Accident Analysis and Prevention, 216, 108003. https://doi.org/10.1016/j.aap.2025.108003.

Hamann, C. J., Davis, J. A., Pae, G., Zhu, M., Shill, G. H., Tefft, B., & Cavanaugh, J. E. (2025). Impact of driver licensing renewal policies on older driver crash involvement and injury rates in 13 states, 2000–2019. Injury Epidemiology, 12(1), 3-9. https://doi.org/10.1186/s40621-024-00555-9.

Handy, S. L., Volker, J., & Hosseinzade, R. (2024). *Assessing the effectiveness of potential vehicle-miles-traveled (VMT) mitigation measures*. UC Davis. https://escholarship.org/uc/item/1pf307sp

Hansen, A., Eramudugolla, R., Kiely, K. M., Delbaere, K., Bédard, M., Brown, J., & Anstey, K. J. (2024). Evaluation of the effectiveness of three different interventions on older driver safety over a 12-month period: study protocol for a randomized controlled trial. British Medical Journal Open, 14(8). https://bmjopen.bmj.com/content/14/8/e087137.

Hossain, M. M., & Rahman, M. A. (2023). Understanding the potential key risk factors associated with teen driver crashes in the United States: a literature review. Digital Transportation and Safety, 2(4), 268-277. https://www.maxapress.com/article/doi/10.48130/DTS-2023-0022.

Høye, A., & Sagberg, F. (2017). Effects of penalty point systems on traffic violations and crashes: A review of international findings. Accident Analysis & Prevention, 98, 68–76. https://doi.org/10.1016/j.aap.2016.09.018.

Huang, F. Y., & Huang, P. C. (2024). Enhancing urban traffic safety: An evaluation on Taipei's neighborhood traffic environment improvement program. arXiv preprint arXiv:2401.16752.

Hyden, C., & Nilsson, A. (2017). Evaluation of 30 km/h speed zones in urban areas. Traffic Injury Prevention, 18(5), 453–460. https://doi.org/10.1080/15389588.2016.1225225.

Imprialou, M., & Quddus, M. (2019). Crash data quality for road safety research: Current state and future directions. *Accident Analysis and Prevention, 130*, 84-90. https://doi.org/10.1016/j.aap.2017.02.022.

Inada, H., Tomio, J., Nakahara, S., & Ichikawa, M. (2023). Association between mandatory cognitive testing for license renewal and motor vehicle collisions and road injuries. Journal of the American Geriatrics Society (JAGS), 71(4), 1145-1155. https://doi.org/10.1111/jgs.18157.

International Transport Forum. (2024). *Road safety annual report 2024*. OECD Publishing. https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2024.pdf.

International Transport Forum. (2025, May). *Policy recommendation on comprehensive road safety policy* [Policy document]. Organisation for Economic Co-operation and Development.

https://summit.itf-oecd.org/2025/wp-content/uploads/2025/05/ITF-Policy-Recommendation-on-Comprehensive-Road-Safety-Policy.pdf

Jones, A. W. (2014). Effects of alcohol on fitness to drive. In B. Madea (Ed.), Handbook of forensic medicine (pp. 1057-1073). John Wiley & Sons, Ltd. https://doi.org/10.1002/9781118570654.ch58.

Joyce, N. R., Lombardi, L. R., Pfeiffer, M. R., Curry, A. E., Margolis, S. A., Ott, B. R., & Zullo, A. R. (2024). Implications of using administrative healthcare data to identify risk of motor vehicle crash-related injury: The importance of distinguishing crash from crash-related injury. Injury Epidemiology, 11(1), 38-13. https://doi.org/10.1186/s40621-024-00523-3.

Kärmeniemi, M., Lankila, T., Ikäheimo, T. M., Korpelainen, R., & Taimela, S. (2018). Built environmental characteristics and diabetes: A systematic review and meta-analysis. *BMC Medicine, 16*(1), 12. https://doi.org/10.1186/s12916-017-0997-z.

Kaufman, E. J., & Wiebe, D. J. (2016). Impact of state ignition interlock laws on alcohol-involved crash deaths in the united states. American Journal of Public Health (1971), 106(5), 865-871. https://doi.org/10.2105/AJPH.2016.303058.

Keefe, E., LaJeunesse, S., & Heiny, S. (2022). *Shaping the narrative around traffic injury: A media framing guide for transportation and public health professionals*. Collaborative Sciences Center for Road Safety. https://www.roadsafety.unc.edu/wp-content/uploads/2022/10/CSCRS_FGuide_v2.pdf

Kim, S., & Sivangula, P. (2024). Toward safe and confident silver drivers: Interview study investigating older adults' driving practices. JMIR Aging, 7, e57402. https://doi.org/10.2196/57402.

Kirley, B. B., Robison, K. L., Goodwin, A. H., Harmon, K., O'Brien, N. P., West, A., Harrell, S. S., Thomas, L., & Brookshire, K. (2023, November). *Countermeasures that work: A highway safety countermeasure guide for State Highway Safety Offices* (11th ed., Report No. DOT HS 813 490). National Highway Traffic Safety Administration. https://www.nhtsa.gov/book/countermeasures/countermeasures-that-work.

Klauer, S., Hua, L., Han, S., Guo, F., Ehsani, J., Duren, M., & Mastromatto, T. (2025). Outcomes of variability in teen driving experience and exposure: Evidence from naturalistic driving studies (No. BTSCRP Project BTS-23).

Koo, J., Martin, A., & Walton, J. (2023). Graduated driver licensing program (No. KTC-23-14). Kentucky Transportation Cabinet.

Krishnamurthy, K., & Ngo, N. (2019). The effects of smart-parking on transit and traffic: Evidence from SFpark. The Centre for Environmental and Resource Economics, Ume˚a University. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3245146.

Kroll, K. (2025, May 13). *They're not streets. They're not roads. 'Stroads' present challenges for cities. Smart Cities Dive.* TechTarget. https://www.smartcitiesdive.com/news/stroads-mashup-streets-and-roads-challenges-safety-traffic/.

Kumfer, W., Martin, L., Turner, S., & Broshears, L. (2023). Safe System Approach for speed management (Report No. FHWA-SA-23-002). Federal Highway Administration.

https://highways.dot.gov/sites/fhwa.dot.gov/files/Safe_System_Approach_for_Speed_Management.pdf.

Lane, L. B., Steedly, A., Townsend, T., Huston, B., Danly, C. (2019). *Connecting transportation & health: A guide to communication and collaboration*. NCHRP 25-25 Task 105. https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP25-25Task105/NCHRP25-25Task105Guidebook.pdf.

Lee, S., & Lee, B. (2020). Comparing the impacts of local land use and urban spatial structure on household VMT and GHG emissions. Journal of Transport Geography, 84, 102694. https://doi.org/10.1016/j.jtrangeo.2020.102694.

Lenk, K. M., Nelson, T. F., Toomey, T. L., Jones-Webb, R., & Erickson, D. J. (2016). Sobriety checkpoint and open container laws in U.S.: Associations with reported drinking-driving. Traffic Injury Prevention, 17(8), 782-787. https://doi.org/10.1080/15389588.2016.1161759.

Marshall, W. E., Piatkowski, D. P., & Garrick, N. W. (2014). Community design, street networks, and public health. *Journal of Transport & Health*, *1*(4), 326-340. https://www.sciencedirect.com/science/article/abs/pii/S2214140514000486?via%3Dihub.

Masten, S. V., Foss, R. D., & Marshall, S. W. (2013). Graduated driver licensing program component calibrations and their association with fatal crash involvement. Accident Analysis & Prevention, 57, 105-113. https://doi.org/10.1016/j.aap.2013.04.013.

Masten, S. V., Foss, R. D., & Marshall, S. W. (2013). The effect of the learner license duration in graduated driver licensing laws on 16- and 17-year-old drivers' fatal crashes. Accident Analysis and Prevention, 59, 239-245.

Masten, S. V., Thomas, F. D., Korbelak, K. T., Peck, R. C., & Blomberg, R. D. (2015, November). Meta-analysis of graduated driver licensing laws. (Report No. DOT HS 812 211). National Highway Traffic Safety Administration.

Mastromatto, T., Quiñones, T. & Staplin, L. (2023, June). Research on older adults' mobility: 2023 meeting summary report (Report No. DOT HS 813 457). National Highway Traffic Safety Administration.

Mayhew, D. R., Vanlaar, G. M., & Robertson, R. D. (2024). Driver education and training promising practices: A sytemic literature review (Report No. DOT HS 813 566). National Highway Traffic Safety Administration.

McCartt, A. T., Hellinga, L. A., & Kirley, B. B. (2010). The effects of minimum legal drinking age 21 laws on alcohol-related driving in the United States. Journal of Safety Research, 41(2), 173-181. https://doi.org/10.1016/j.jsr.2010.01.002.

McCartt, A. T., Teoh, E. R., Fields, M., Braitman, K. A., & Hellinga, L. A. (2010). Graduated licensing laws and fatal crashes of teenage drivers: A national study. Traffic Injury Prevention, 11(3), 240–248. https://doi.org/10.1080/15389580903578854.

McIff, B., Ralls, B., Van Wagenen, H., Waters, M., Fletcher, L., & Fronberg, R. (2023). Street smart: developing relationships to support walkable communities for all. *Health Promotion Practice*, *24*(1_suppl), 23S-27S.

Merlin, L. A. (2018). The influence of infill development on travel behavior. Research in Transportation Economics, 67, 54–67. https://doi.org/10.1016/j.retrec.2017.06.003.

Merritt, D. K., Lyon, C., Persaud, B., & Torres, H. N. (2020). Developing crash-modification factors for high-friction surface treatments (No. FHWA-HRT-20-061). United States. Federal Highway Administration.

Miller, S., & Wilson, R. (2015). Parking taxes as a second best congestion pricing mechanism. Inter-American Development Bank. https://www.econstor.eu/bitstream/10419/146427/1/IDB-WP-614.pdf.

Mirshahi, M., Obenberger, J., Fuhs, C., Howard, C., Mayhew, R., Moore, M., & Kuhn, B. (2007). Active traffic management: The next step in congestion management. FHWA-PL-07-012. U.S. Department of Transportation.

Moore, T. J., & Morris, T. (2024). Shaping the habits of teen drivers. American Economic Journal: Economic Policy, 16(3), 367-393.

Mueller, N., Rojas-Rueda, D., Salmon, M., Martinez, D., Ambros, A., Brand, C., & Nieuwenhuijsen, M. (2020). Health impact assessment of active transportation: A systematic review. Preventive Medicine, 76, 103–114. https://doi.org/10.1016/j.ypmed.2015.04.010.

Nasri, A., & Zhang, L. (2012). Impact of metropolitan-level built environment on travel behavior. Transportation Research Record: Journal of the Transportation Research Board, 2323(1), 75–79. https://doi.org/10.3141/2323-09.

Nasri, A., & Zhang, L. (2014). The analysis of transit-oriented development (TOD) in Washington, D.C. and Baltimore metropolitan areas. Transport Policy, 32, 172–179. https://doi.org/10.1016/j.tranpol.2013.12.009.

National Center for Statistics and Analysis. (2024, September). *Summary of motor vehicle traffic crashes: 2022 data* (Traffic Safety Facts. Report No. DOT HS 813 643). National Highway Traffic Safety Administration. https://crashstats.nhtsa.dot.gov/Api/Public/Publication/813643.

National Highway Traffic Safety Administration. (2023). *Countermeasures that work*. https://www.nhtsa.gov/book/countermeasures/countermeasures-that-work.

Naumann, R., Sandt, L., Booker, N., Keefe, E., Travitz, G., Taylor, N., & Harmon, K. (2023, November). *Insights and opportunities for transportation and public health agency collaboration to improve road safety across the U.S.* University of North Carolina at Chapel Hill, Highway Safety Research Center.

Obeid, H., Anderson, M. L., Bouzaghrane, M. A., & Walker, J. (2024). Does telecommuting reduce trip-making? Evidence from a U.S. panel during the COVID-19 impact and recovery periods. Transportation research part A: policy and practice, 180, 103972. https://doi.org/10.1016/j.tra.2024.103972.

Panis, L. I. (2010). Simulating the air quality impacts of speed reduction measures. Transportation Research Part D: Transport and Environment, 15(8), 431–436. https://doi.org/10.1016/j.trd.2010.04.004.

Park, J., Abdel-Aty, M., & Lee, J. (2016). Use of empirical and full bayes before-after approaches to estimate the safety effects of roadside barriers with different crash conditions. Journal of Safety Research, 58, 31. https://doi.org/10.1016/j.jsr.2016.06.002.

Persaud, B., Lindley, I., Eskandar, M., & Rajeswaran, T. (2022). Safety evaluation of centre line, edge line, and dual application rumble strips on Ontario two-lane rural roads. Canadian Journal of Civil Engineering, 49(11), 1696-1702. https://doi.org/10.1139/cjce-2022-0232.

Persaud, B., Lyon, C., Nguyen, T., & Lefler, N. (2011). Evaluation of safety effects of converting two-lane to four-lane divided highways. Transportation Research Record, 2265(1), 41–47. https://doi.org/10.3141/2265-06.

Pilkington, P., & Kinra, S. (2005). Effectiveness of speed cameras in preventing road traffic collisions and related casualties: Systematic review. British Medical Journal, 330(7487), 331–334. https://doi.org/10.1136/bmj.38324.646574.AE.

Retting, R. A., & Kyrychenko, S. Y. (2008). Reductions in injury crashes associated with red light camera enforcement in large U.S. cities. Journal of Safety Research, 39(1), 1–6. https://doi.org/10.1016/j.jsr.2007.10.010.

Robinson, M. (2000). Examples of variable speed limit applications. Transportation Research Board Speed Management Workshop Proceedings.

Rosen, E., & Sander, U. (2009). Pedestrian fatality risk as a function of driver impact speed. Accident Analysis & Prevention, 41(6), 1484–1495. https://doi.org/10.1016/j.aap.2009.06.011.

Russo, B. J., Savolainen, P. T., & Gates, T. J. (2016). Development of crash modification factors for installation of high-tension cable median barriers. Transportation Research Record, 2588(1), 116-125.

Savoie, C., Voyer, P., Lavallière, M., & Bouchard, S. (2024). Transition from driving to driving-cessation: Experience of older persons and caregivers: A descriptive qualitative design. BMC Geriatrics, 24(1), 219-10. https://doi.org/10.1186/s12877-024-04835-3.

Savolainen, P. T., Gates, T. J., Kassens-Noor, E., Gupta, N., Mahmud, M. S., Kay, J., Megat-Johari, M., Jashami, H., Lord, D., & Geedipally, S. (2022). Evaluating the Impacts of the 2017 legislative mandated speed limit increases (Report No. SPR-1714). Michigan Department of Transportation. https://rosap.ntl.bts.gov/view/dot/66076.

Schick, A., Vegega, M., & Chaudhary, N. (2014). Distracted driving high-visibility enforcement demonstrations in California and Delaware (No. DOT HS 811 993).

Shafi, S., Parks, J., & Gentilello, L. M. (2008). Cost-benefit analysis of a statewide 65 mph speed limit compared to a 75 mph speed limit on rural interstate highways. Journal of Trauma and Acute Care Surgery, 65(2), 314–321. https://doi.org/10.1097/TA.0b013e3181809c4c.

Shantz, A., Casello, J., Woudsma, C., & Guerra, E. (2022). Understanding Factors Associated with Commuter Rail Ridership: A Demand Elasticity Study of the GO Transit Rail Network. Transportation Research Record: Journal of the Transportation Research Board, 2676(8), 131–143. https://doi.org/10.1177/03611981221082573.

Shope, J. T., Molnar, L. J., Thompson, R., & Zakrajsek, J. S. (2001). Graduated driver licensing in Michigan: Evaluation of the nighttime driving restriction. Journal of Safety Research, 32(4), 423–430.

Shults, R. A., Elder, R. W., Sleet, D. A., Thompson, R. S., Sosin, D. M., & Task Force on Community Preventive Services. (2004). Reviews of evidence regarding interventions to increase the use of child passenger safety seats. American Journal of Preventive Medicine, 21(4), 66–75.

Sloan, F. A., Eldred, L. E., & Gifford, E. J. (2016). Does the probability of DWI arrest fall following participation in DWI and hybrid drug treatment court programs? Accident Analysis & Prevention, 93, 26–34. https://doi.org/10.1016/j.aap.2016.08.029.

Stefanidis, K. B., Mieran, T., & Summers, M. J. (2025). Older adults' perspectives on annual medical assessments for driving: A qualitative investigation. Journal of Transport & Health, 42, 102047.

Stevens, M. R. (2017). Does compact development make people drive less? Journal of the American Planning Association, 83(1), 7–18. https://doi.org/10.1080/01944363.2016.1240044.

Teng, T. L., Liang, C. C., Hsu, C. Y., Shih, C. J., & Tran, T. T. (2016). Impact performance of W-beam guardrail supported by different shaped posts. International Journal of Mechanical Engineering and Applications, 4(2), 59-64. https://doi.org/10.11648/j.ijmea.20160402.14.

Teoh, E. R. (2025). The human cost of allowing unhelmeted motorcycling in the United States. Journal of Safety Research 93, 292-297. https://doi.org/10.1016/j.jsr.2025.03.002.

Teoh, E. R., Fell, J. C., Scherer, M., & Wolfe, D. E. (2021). State alcohol ignition interlock laws and fatal crashes. Traffic Injury Prevention, 22(8), 589-592. https://doi.org/10.1080/15389588.2021.1984439.

Thompson, M. (2018). *Planning a healthy Tennessee: Health-promoting community design for the volunteer state.* https://www.tn.gov/content/dam/tn/health/program-areas/primary-prevention/Planning%20a%20Healthy%20Tennessee.pdf.

TN.gov. (n.d.). Healthy development coordinators. https://www.tn.gov/health/health-program-areas/office-of-primary-prevention/redirect-opp/built-environment-and-health/healthy-development-coordinators.html.

Tomas, J., De la Fuente, L., & Ledesma, R. (2010). Effects of the penalty-points system on traffic fatalities in Spain. Journal of Safety Research, 41(3), 211–216. https://doi.org/10.1016/j.jsr.2010.01.007.

Tusti, A. G., Dutta, A. K., Javed, S. A., & Das, S. (2025). Driving education advancements of novice drivers: A systematic literature review. arXiv preprint arXiv:2503.05762.

Tusti, A. G., Dutta, A. K., Javed, S. A., & Das, S. (2025). Driving education advancements of novice drivers: A systematic literature review. https://doi.org/10.48550/arxiv.2503.05762.

Vision Zero Network (2023, March). *Fundamentals of the Safe System Approach*. https://visionzeronetwork.org/fundamentals-of-the-safe-system-approach/.

Vision Zero Network. (2024, January). Thinking & acting differently for Vision Zero: Applying the health impact pyramid to roadway safety. https://visionzeronetwork.org/applying-the-health-impact-pyramid-to-roadway-safety/.

Watson-Brown, N., Scott-Parker, B., & Senserrick, T. (2025). Unspoken trepidations progressing through the licensing system: A qualitative study of teen novice drivers. Safety Science, 190, 106910.

Wilson, C., Willis, C., Hendrikz, J. K., Le Brocque, R., & Bellamy, N. (2010). Speed enforcement detection devices for preventing road traffic injuries. *Cochrane Database of Systematic Reviews*, 2010(10). https://doi.org/10.1002/14651858.CD004607.pub3.

World Health Organization. (2018). *Global status report on road safety 2018*. https://www.who.int/publications/i/item/9789241565684.

World Health Organization. (2023a), December 13). *Road traffic injuries* [Fact sheet]. WHO. https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries.

World Health Organization. (2023b). *Global status report on road safety 2023*. https://www.who.int/publications/i/item/9789240060881

Wotring, B. M., Antin, J., & Hankey, J. (2024). *Rural older adult driver tailored research-integrated plan (ROAD TRIP)* (Report No. CATM-2024-R4-VTTI). Center for Advanced Transportation Mobility, North Carolina A&T State University.

Wright, N. A., & Lee, L. T. (2021). Alcohol-related traffic laws and drunk-driving fatal accidents. Accident Analysis & Prevention, 161, 106358. https://doi.org/10.1016/j.aap.2021.106358.

Yan, X., Levine, J., & Marans, R. (2019). The effectiveness of parking policies to reduce parking demand pressure and car use. *Transport Policy, 73*, 41–50. https://doi.org/10.1016/j.tranpol.2018.10.009.

Zegeer, C. V., Blomberg, R., Henderson, D., Masten, S., Marchetti, L., Levy, M. M., & Thomas, L. (2008). Evaluation of Miami–Dade pedestrian safety demonstration project. *Transportation Research Record, 2073*(1), 1-10.

Zegeer, C. V., Nabors, D., Lagerwey, P., & Bushell, M. (2013). *Pedestrian safety strategic plan: Recommendations for research and product development*. FHWA-SA-14-001.

Zheng, Y., Wang, S., Liu, L., Aloisi, J., & Zhao, J. (2024). Impacts of remote work on vehicle miles traveled and transit ridership in the USA. *Nature Cities*, 1-13. https://doi.org/10.1038/s44284-024-00057-1.