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

CAMBRIDGE MOBILE TELEMATICS

2025 Research Report

A Data-Driven Action Plan for Safer Roads

Executive Summary

Since 2020, over 200,000 lives have been lost on U.S. roads. Roadway fatalities surged during the pandemic, reaching the highest levels in more than a decade. An increase in risky driving behaviors, including speeding, impairment, and distracted driving contributed to this rise. In 2021 alone, distracted driving caused an estimated 12,405 deaths, 28% of all traffic fatalities. This crisis is solvable and demands urgent action.

Telematics Risk Analysis (TRA) provides a modern framework for identifying and mitigating crash risk using physics and AI-based tools to measure patterns of risk on the road. Unlike traditional traffic safety systems that rely on historical trends, TRA analyzes roadway behaviors, such as phone handling, speeding, hard braking, and aggressive cornering as they happen. This information is then combined to form predictive safety indicators and assess risk. Insurance companies have used this process to predict risk for decades. The same opportunity is now available for the highway safety community — to better predict risk and make smarter choices on how to save lives.

TRA relies on anonymized, aggregate insights, safeguarding individual privacy while offering far greater precision than conventional measures. It enables traffic safety officials to spot dangerous conditions, such as repeated phone distraction on rural roads or high-speed driving through school zones before they result in injuries or fatalities. TRA shifts the foundation of roadway safety from reaction to prevention, giving traffic safety officials and their partners the tools to intervene earlier, smarter, and more effectively.

This report outlines how a modern approach to traffic safety can save lives and reduce injuries through targeted, evidence-based action. It describes how TRA can be used alongside other information to provide insight into road risk and how the methodologies used by the insurance industry have created a path forward that transportation officials, policy makers and industry leaders can follow to make significant progress in roadway safety.

Now is the time to act. While traffic deaths are once again moving in the right direction, we can accelerate this decline by adopting the approach outlined in this report. This means investing in predictive tools to identify risky driving behaviors and crash-prone locations earlier, planning infrastructure improvements, and enforcing proven safety laws on high-risk roads. By embracing these strategies, we can accelerate making our roads safer for everyone.

Key Findings:

- **We can predict and prevent crashes before they happen.**
  We no longer must wait for crashes to happen to identify risk. By using Telematics Risk Analysis (TRA), we can detect patterns of high-risk driving – phone distraction, hard braking or speeding – and act. This marks a fundamental shift in road safety strategy from reactive to proactive.

- **TRA is built on proven, regulator-approved models.**
  TRA is not experimental.It is built on the same validated and regulator-approved risk models used by thousands of companies in the insurance industry. These models accurately predict crash risk — drivers with the riskiest behaviors experience more crashes.

- **These risk insights can lead to fast, affordable safety wins.**
  TRA can already uncover solvable problems that crash data have yet to reveal, such as faded paint on the road, poor signage, and obstructed sightlines. These issues can be addressed quickly and provide measurable results.

- **This approach protects privacy and improves outcomes.**
  All insights come from aggregated, anonymized data that does not require monitoring individual drivers. TRA respects privacy, while giving public agencies greater insights to predict and prevent crashes, inform safety laws, and determine what is and is not working.

Introduction: Confronting A Preventable Crisis

Traffic crashes take a terrible toll on American communities each year. Distracted driving, speeding and impairment are leading contributors to this carnage. Until recently, safety authorities could only react after tragedies occurred due to their reliance on post-crash information, such as police crash reports and injury/fatality data. Today, we stand at a pivotal moment. Advanced data sources and analytics provide traffic safety officials with the means to spot danger before a crash happens and take preventive action. We have a chance to rethink how we approach roadway safety. Crashes don't have to be inevitable — they can be predicted and prevented.

The scale of the challenge is enormous and clear. Overall roadway fatalities jumped dramatically in 2020 and 2021, erasing years of progress. Risky behaviors are widespread. A national analysis conducted by Cambridge Mobile Telematics (CMT) found that between early 2020 and 2022, as drivers returned to the road post Covid, phone-related driver distraction increased by more than 20%. CMT's research also estimated that for every 10% increase in distracted driving, an additional 420 lives are lost at a societal cost of $4 billion per year. According to the National Safety Council, speeding-related fatalities during this period also increased by 22% compared to the previous decade's average annual rate.

These deaths and injuries do not occur randomly. They are the result of observable risky behaviors and choices, which can be addressed. Modern technology can capture these risks. It's incumbent on safety practitioners to use these tools to develop, implement, and evaluate prevention strategies that will save lives.

Fortunately, fundamental change is possible. Decades ago, impaired driving and low seat belt use seemed intractable, yet a sustained strategy of strong laws, education, enforcement, and technology has helped turn the tide. Impaired driving fatalities fell from more than 17,000 in 1990 to 12,000 in 2023, while the U.S. seat belt use rate climbed from 58% in the 1990s to 91% today, saving countless lives.

These successes provide a guide for the *Data-Driven Action Plan for Safer Roads* report. When we combine data and sound policy with national recognition and a will to act, major progress is possible. We must address modern threats such as distracted driving, which technology enables but can also help prevent. Data-driven tools, if harnessed correctly, can be the seatbelts of this era — protecting drivers and saving tens of thousands of lives in the decades to come.

The Case for Proactive Safety Strategies

Taking preventive action before injuries occur is the cornerstone of public health victories. In road safety, proactive approaches are now possible on a much greater scale due to the availability of more and better information. Rather than waiting for annual crash and fatality reports to reveal crash hotspots, traffic safety officials can monitor live or recent indicators of crash risk and respond swiftly.

Traditional crash reports show where harm has already occurred, but by their nature, they can miss the early warning signs of dangerous conditions. Predictive analytics can expose patterns as they occur, such as clusters of hard braking, erratic lane changes, or increased distraction at locations where the road environment may be confusing or incomplete. These insights reveal fixable problems that were previously invisible.

For example, repeated braking events at a school crosswalk could lead to the discovery of faded markings and a missing warning sign. Fresh paint and a repositioned sign can reduce the braking rate within days. In another location, a bus stop placed next to an intersection can be causing near misses when the bus blocks the stop sign. Simply relocating the bus stop can improve visibility and reduce risk. In another location, overgrown vegetation can prevent drivers from seeing a stop sign. The fix can often be simple. These are not capital projects, but quick, low-cost fixes that can be addressed by local crews using existing tools and budgets, guided by risk signals rather than complaints or collisions.

This same risk information can support the kinds of behavioral safety strategies that State Highway Safety Offices (SHSO) regularly fund and deploy. When TRA reveals elevated levels of distracted driving near schools or pedestrian corridors, SHSOs can launch hyperlocal public awareness campaigns timed to specific behavior patterns. Digital signs, targeted social media, parent outreach and school-based messaging can be focused on the areas and times where risk is increasing. Many states are also using these data to support safe routes to school, identifying corridors where students regularly walk alongside erratic traffic patterns or frequent lane departures. Agencies can act quickly with temporary curb markings, sidewalk reminders or visibility enhancements. Employers, delivery networks, and community leaders can also help by disseminating tailored messages that reinforce safe driving behaviors.

Together, behavioral and infrastructure countermeasures create a dynamic feedback loop. Maintenance teams can fix small hazards that cause crashes, while education programs are developed to reach the drivers and pedestrians who are experiencing them. With TRA, these behavior changes can be monitored and improved over time. Communities are no longer forced to wait for a tragedy to happen before taking action. They can proactively address issues road users are experiencing daily. These tools allow agencies to prioritize changes that are fast, affordable and effective. When cities combine modern telematics-based insights with behavioral strategies already in use by safety professionals across the country, it creates a safety system that is proactive, inclusive, and scalable. These immediate solutions deliver meaningful impact quickly and repeatedly on thousands of roads where no one can afford to wait.

The Governors Highway Safety Association (GHSA) and its partners recognize that cutting-edge insights can give safety officials a robust, up-to-date picture of what is happening on the road. Armed with this information, decision-makers can deploy countermeasures that will have the greatest safety impact and efficiently use limited resources. GHSA and industry innovators are actively funding state programs to harness these analytics, underlining the broad consensus that better insights will ultimately lead to better road safety outcomes. TRA significantly enhances roadway safety by empowering officials to make these data-driven adjustments, as noted in GHSA's 2023 distracted driving report.[1]

Another advantage of TRA is the ability to rapidly evaluate an intervention's effectiveness. TRA can show if the risk level changes in near real-time. This enables safety professionals to build programs based on risk, evaluate their effectiveness and continuously make improvements.

Telematics Risk Analysis can show the public and decision-makers that hands-free phone laws deliver measurable safety benefits. That's because telematics-based insights illuminate once-dark rooms. We can see problem behaviors clearly, address them systematically and verify the outcomes, creating a continuous cycle of safety improvement.

[1] Governors Highway Safety Association. (2023). Directing drivers' attention: A state highway safety office roadmap for combating distracted driving. https://www.ghsa.org/sites/default/files/2024-12/directing _drivers_attention_2022.pdf

Proven Risk Indicators:
Actuarially Validated Telematics Risk Analysis

Telematics is transforming the auto insurance industry, giving companies the power to understand real risk based on how people drive. An aggressive driver who frequently speeds, tailgates or uses their phone while driving is statistically more likely to be involved in a crash than a cautious driver who obeys speed limits and stows their phone. While this may seem obvious, understanding the magnitude and likelihood of risk for each behavior is important. For example, how much does phone distraction at 60 mph increase crash risk? How does frequent hard braking affect crash odds? Today, telematics leaders have matched billions of miles of risks to insurance claims to quantify the impact.[2]

TRA plays a crucial role in the data-driven safety revolution. It provides predictive analysis about how risk is evolving on the road. Studies conducted over the past decade have confirmed that TRA risk strongly predicts crashes.

A frequent question with TRA is whether these analytics reflect behavior in the broader driving population. A 2024 study by the Insurance Institute for Highway Safety (IIHS) addressed this by comparing TRA distraction analysis from CMT to direct observational data from the National Occupant Protection Use Survey (NOPUS), the federal gold standard for assessing distracted driving. The findings demonstrated strong alignment. One-third of trips (33.3%) included some form of phone manipulation, and 3.5% involved at least one handheld call. More importantly, active phone use accounted for 2.4% of total driving time, closely mirroring trends seen in roadside observations. This correlation confirms that smartphone-based telematics reliably captures population-level risk and can serve as a trusted proxy for distracted driving prevalence. The study affirms that aggregated, anonymized TRA offers both statistical rigor and practical utility for targeting behavioral interventions, evaluating laws and tracking progress as it evolves.[3]

[2] Verbelen, R., Antonio, K., & Claeskens, G. (2018). Unravelling the predictive power of telematics data in car insurance pricing. *Journal of the Royal Statistical Society: Series C (Applied Statistics), 67*(5), 1275-1304. https://doi.org/10.1111 /rssc.12283.

[3] Reagan, I., Cicchino, J., &Teoh, E (2024). The utility of telematics data for estimating the prevalence of driver handheld cellphone use, 2019–2022. *Journal of Safety Research, 89, 299-305.* https://doi.org/10.1016/j.jsr.2024.04.003

Understanding Telematics-Derived Crash Factors

Actuarial analysts at insurance companies rigorously validate telematics-based risk models using historical crash and loss data, and state regulators scrutinize these models before they approve them for use in pricing. The insurance industry has already proven that telematics insights are credible and predictive. As one study noted, incorporating driving behavior insights allowed far more accurate risk predictions than before.[4] For safety policymakers, the takeaway is powerful: We can trust these risk indicators. They are not speculative or untested metrics — they're the same insights that private industries rely on to make financial decisions worth billions of dollars.

> *When an insurance company offers a safe driver a **30%** discount or charges a risky driver **30%** more based on telematics analysis, they do so because their actuarial models and years of loss experience tell them that data reliably predicts crash risk.*

Before an insurance company uses a telematics-derived factor, such as a distracted driving score or hard braking incidents per 100 miles, analysts conduct extensive statistical testing. They confirm the factor has a strong correlation with crash involvement or claims filed, and that this relationship persists across different populations and periods. Analysts only integrate a risk factor into their model if it improves the ability to predict crashes. Insurers operate under strict regulatory oversight — they must file detailed supporting data with state insurance departments to justify any new rating factor or surcharge.

This means an insurer attempting to use telematics data in pricing has likely presented regulators with evidence, such as "drivers who exhibit the highest levels of phone distraction are 240% more likely to crash than those who do not," or "drivers with top safety scores experience up to 57% fewer losses than average." When regulators approve these filings, they are affirming the predictive validity of TRA. These models undergo rigorous review and actuarial validation, and their credibility is tested daily in the competitive insurance marketplace. A recent regulatory filing reinforces this point by demonstrating that distraction risk alone can be tied to

[4] Usman, F., Chan, J. S. K., Makov, U. E., Wang, Y., & Dong. D. (2024, August). Claim prediction and premium pricing for telematics auto insurance data using Poisson regression with lasso regularisation, *Risks*, MDPI, 12(9), 1-33. https://ideas.repec.org/a/gam/jrisks/ v12y2024i9p137-d1466155.html

sharp differences in crash frequency, providing clear evidence that telematics-derived risk scores have both statistical and practical significance.

Beyond distraction, other behavioral indicators (such as hard braking, rapid acceleration and speeding) also show a strong statistical relationship with crash risk. In regulatory filings, drivers with the highest rates of hard braking experienced expected losses 103% higher than those with the lowest rates. Excessive speeding, particularly on highways and rural roads where speed limits are higher, was associated with a 71% increase in predicted losses. These risk differentials are derived from models tested across billions of miles of driving and reviewed by insurance regulators. Together, these metrics demonstrate that telematics-based insights can reliably isolate high-risk behaviors that are strongly predictive of crash outcomes. This proves that public safety officials can use the same approaches for analyzing risk.[5]

Validated Risk, Data-Driven Insights: A New Era in Traffic Safety

Telematics Risk Assessment can flag when and where risky behaviors frequently occur, such as a curve where drivers regularly brake hard or a work zone where speeding is rampant.

TRA helps to validate or augment additional road safety information. Crash reports may under or inconsistently report elements of risk. This is especially true for distractions that drivers may not admit to or that may go unnoticed by law enforcement. As a result, the overall crash record doesn't provide a complete picture of what is happening behind the wheel. TRA fills these gaps. Now, a sudden slowdown from 60 to 0 mph combined with phone use provides clear evidence of hard braking and distraction, even if no crash occurs. These richer, more nuanced insights allow safety professionals to understand not just where and how crashes happen, but the risky behaviors that lead up to them. That clarity helps SHSOs, and their partners measure the impact of safety interventions and design more effective ones.

TRA insights can better inform public policy and ensure that resources are allocated efficiently, both of which are vital for gaining public trust.

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[5] Meng, S., Wang, H., Shi, Y., & Gao, G. (2022, May). Improving automobile insurance claims frequency prediction with telematics car driving data. *ASTIN Bulletin*, 52(2), 363–391. https://ideas.repec.org/a/cup/astinb/v52y2022i2p363-391_1.html

Predictive analytics eliminate the need for guesswork, enabling safety efforts to target interventions proven to prevent crashes. Outcomes can be measured and validated in real time through analysis.[6]

Implementing Proactive Interventions: From Data to Action

Collecting insights and analyzing risk are only the first steps. The goal is to translate this information into effective, lifesaving action. Forward-thinking authorities and organizations are implementing proactive, data-driven safety programs, and their experiences offer valuable lessons and proof of concept. There are numerous examples of how leveraging TRA can lead directly to interventions that save lives. They range from policy changes to public engagement campaigns, all underpinned by risk-based analysis. The following examples demonstrate the power of aligning interventions with identified risks and using feedback to refine them.

Hands-free laws and behavioral measurement. One of the most compelling examples of data-driven policy success is the enactment of distracted driving laws. Telematics can offer new insights to gauge the impact of these laws. Before the enactment of what are commonly called hands-free laws, a common concern was whether outlawing handheld phone use would change behavior. TRA can answer this by measuring distraction rates before and after a law was implemented. A study by the Behavioral Traffic Safety Cooperative Research Program confirmed that clear, well-enforced laws correlate with reduced distracted driving rates, especially when accompanied by public awareness.[7]

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[6] Meng, S., Wang, H., Shi, Y., & Gao, G. (2022, May). Improving automobile insurance claims frequency prediction with telematics car driving data," *ASTIN Bulletin*, Cambridge University Press, 52(2), 363-391. https://ideas.repec.org/a/cup/astinb/v52y2022i2p363-391_1.html

[7] Benedick, A., Levi, S., Petraglia, E., & DeLeondaris, D. (2021). Using electronic devices while driving: Legislation and enforcement implications. Washington, DC: The National Academies Press. https://doi.org/10.17226/26082.

States that have not yet enacted or fully enforced distracted driving bans have a data-backed action plan to tackle distraction: Pass strong laws, publicize them, enforce them, and measure the outcomes.

Data-driven infrastructure improvements. TRA may also reveal that the best intervention should be directed at the road environment, not drivers. For instance, when TRA and crash data indicate a particular intersection is the site of frequent hard braking or near-misses, engineers can assess whether to make physical changes, like adding a left-turn lane, adjusting signal timing or improving sightlines. In another scenario, statewide telematics assessments could show that certain rural routes have unusually high instances of speeding and lane departures at night, suggesting a need for better lighting or rumble strips. By fusing behavior data with traditional roadway analytics, agencies can adopt a systemic safety approach that fixes problems before a crash cluster fully materializes. The key is identifying risk factors and implementing countermeasures proactively, not waiting for multiple fatal or serious injury crashes to trigger a response.

With tools like the Highway Safety Manual's predictive methods and the influx of TRA, state Departments of Transportation (DOT) can perform predictive safety assessments. For example, a state DOT might use TRA to flag 100 roadway segments with high-risk profiles, such as "sharp curves + heavy speeding + past near misses," and prioritize them for low-cost safety improvements. Over time, as engineers implement these fixes, TRA can confirm whether driver behavior improves. This can be done by determining if fewer sudden braking events are occurring on these roads. This way, the data-driven safety loop continues to drive improvement.

Each of these intervention areas benefit from the same core strategy: reliable insights guiding targeted actions. The thread running through it is that we are no longer in the dark when it comes to safety measures. Whether in lawmaking, education or engineering, directing our efforts where telematics-based insights reveal the highest risk is essential. By applying proven risk models, we can identify the solutions most likely to deliver the greatest impact. This strategy maximizes the value of every dollar and every hour invested in safety.

Policy Recommendations and Call to Action

There is compelling evidence that data-driven, proactive measures can significantly improve road safety. Safety leaders need to collaborate and implement these measures. The following recommendations outline a path forward for institutionalizing analytics-guided safety practices. These actions reflect core principles focusing on risk, using evidence to guide decisions and intervening early to prevent harm. If policymakers, safety professionals and industry partners adopt these recommendations, we can reduce crashes, use resources more efficiently and build greater public trust in road safety initiatives.

Embrace modern analytics in safety planning. Federal law and regulation should encourage SHSOs, DOTs, and local Vision Zero programs to integrate TRA and predictive analytics into their core strategy development and planning process. By providing the right tools and resources, every state can develop and deploy a data-driven safety dashboard that displays real-time risk indicators, such as this month's top speeding locations or the percentage of drivers using phones. These dashboards should complement traditional crash statistics and guide more timely, targeted interventions.

Enact and strengthen evidence-based traffic safety laws. Elected officials should prioritize passing proven safety laws. This includes enacting unambiguous hands-free laws that clearly state when a driver may and may not use a cellphone, and stronger seat belt laws that make it a primary offense for not buckling up.

> *Data show that clear laws change driver behavior. States with loopholes or weak penalties in their safety laws are urged to tighten them to send a consistent message that these behaviors are dangerous.*

At the same time, legislation should be coupled with robust public education campaigns to raise awareness and help drivers understand new traffic laws and how they help make the roads safer. Policymakers must also resist attempts to weaken effective laws. For example, if automated enforcement is politically contentious, leaders should rely on the data to explain how these tools save lives without bias. In short, build a legal framework that empowers modern safety approaches rather than hindering them.

Analyze effectiveness and adapt quickly. We can modernize highway safety planning by going beyond crash history and using real-time risk analysis from TRA. This can help guide action and measure whether new laws, engineering changes, enforcement efforts or education campaigns are reducing risky behaviors and improving safety outcomes.

By using TRA, SHSOs can respond faster, improve programs and focus public resources on interventions that save lives. Federal and state grant programs can prioritize funding for projects that use TRA to target risk and include clear methods to measure results.

> *In short, modern highway safety plans should not only answer "where is risk highest?", but also "did our actions reduce that risk faster?"*

Maintain focus on accuracy and privacy. By using externally validated, aggregate risk indicators based on anonymized data, SHSOs can deliver more precise and effective safety strategies while preserving public trust and protecting personal rights.

Conclusion: From Reactive to Predictive, A New Era of Road Safety

This action plan delivers a message of both urgency and optimism. The U.S. can no longer accept tens of thousands of road deaths each year as the cost of mobility. Tools are available today to help us predict and prevent these tragedies. Advanced analytics, actuarially validated TRA and risk modeling provide a level of foresight that past generations of safety leaders couldn't imagine.

It's time for funding and policy to support road safety leaders using TRA to identify and deploy predicted and proven safety strategies. Accelerating and expanding the adoption of these tools requires leadership at every level. Elected officials need to champion the necessary laws and investments, and agency administrators need the freedom and resources to integrate new data and techniques. Industry partners must continue to share knowledge and support public goals.

In moving from a reactive to a predictive paradigm, we are redefining what it means to do traffic safety work. It becomes data science, a continuous improvement cycle and a collaborative enterprise. This does not reduce the value of traditional safety measures — it strengthens it. Traffic enforcement, engineering, education and emergency response all remain essential. But with data-guided countermeasure selection, implementation and evaluation, each becomes smarter, more precise and more effective.

The nation stands at a crossroads. One path leads to business as usual, and the same heartbreak and loss we have endured for years. The other path uses data, innovation and foresight to predict and prevent the worst outcomes. The choice is clear.

By following this data-driven action plan, we can build a future where fewer families receive that devastating knock on the door from a law enforcement official delivering unthinkable news. We have information that can help save lives now. Everyone working in traffic safety has a moral responsibility to act. Let us move boldly into this new era of road safety and turn the promise of data and analytics into the reality of safer roads for everyone.

CMT and GHSA have a shared mission of making our roads and drivers safer.

Cambridge Mobile Telematics (CMT) is the world's largest telematics service provider. Its mission is to make the world's roads and drivers safer. The company's AI-driven platform, DriveWell Fusion®, proactively identifies and reduces driving risk, leading to fewer crashes and injuries, making mobility safer. To date, CMT's technology has helped prevent over 100,000 crashes worldwide. CMT partners with insurers, automakers, commercial mobility companies, and the public sector to measure risk, detect crashes, provide life-saving assistance, and streamline claims. Headquartered in Cambridge, MA, CMT operates globally with offices in Budapest, Chennai, Seattle, Tokyo, and Zagreb. Learn more at www.cmt.ai.

The Governors Highway Safety Association (GHSA) is a nonprofit association representing the highway safety offices of states, territories, the District of Columbia, and Puerto Rico. GHSA provides leadership and representation for the states and territories to improve traffic safety, influence national policy, enhance program management, and promote best practices. Its members are appointed by their Governors to administer federal and state highway safety funds and implement state highway safety plans. Visit ghsa.org for more information.

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