STATEMENT OF CATHERINE CHASE
PRESIDENT
ADVOCATES FOR HIGHWAY AND AUTO SAFETY

ON

"LEGISLATION TO MAKE CARS IN AMERICA SAFER"

SUBMITTED TO THE

UNITED STATES HOUSE OF REPRESENTATIVES
COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON CONSUMER PROTECTION AND COMMERCE

JULY 24, 2019

Introduction

Advocates for Highway and Auto Safety (Advocates) is a coalition of public health, safety, and consumer organizations, insurers and insurance agents that promotes highway and auto safety through the adoption of federal and state laws, policies and regulations. Advocates is unique both in its board composition and its mission of advancing safer vehicles, safer motorists and road users, and safer roads.

Deaths and Injuries on Our Nation's Roads Remain Unacceptably High

In 2017, more than 37,000 people were killed and 2.7 million were injured in motor vehicle crashes.[1] Estimates for 2018 show a slight projected decrease in crash fatalities of approximately one percent. These figures do not account for non-traffic motor vehicle crashes and incidents that happen off of public roads, which claim thousands of additional lives and result in tens of thousands more injuries each year. Moreover, crashes impose a financial toll of over $800 billion in total costs to society and $242 billion in direct economic costs, equivalent to a "crash tax" of $784 on every American. This incredibly high level of carnage and expense would not be tolerated in any other mode of transportation.

Available Commonsense and Cost-Effective Solutions

While far too many lives are lost and people are injured on our Nation's roads each year, proven solutions are currently available that can prevent or mitigate these senseless tragedies. The National Highway Traffic Safety Administration (NHTSA) currently values each life lost in a crash at $9.6 million. Each one of these preventable losses not only irreparably harms families and communities, but they also impose significant costs on society that can be avoided. While we are optimistic that in the future autonomous vehicles (AVs) may bring about meaningful and lasting reductions in motor vehicle crashes, that potential remains far from a near-term reality. Yet, we have actions that can be taken immediately on the path to fully driverless cars. We urge you to take swift action on the following recommendations for safety advances.

Pass the Hot Cars Act of 2019 (H.R. 3593) to Prevent Vehicular Heatstroke Deaths

Already this year, at least 21 children have died in hot cars. During the short period of time from when this Subcommittee held its May 23 hearing on this issue, which featured compelling testimony by Advocates' Consumer Co-Chair Janette Fennell, Founder and President of KidsAndCars.org, and the heart-wrenching account of Miles Harrison unknowingly leaving his son, Chase, in his car, 12 children have died. While a majority of the overall cases of vehicular heatstroke deaths involve a child being unknowingly left in a vehicle, over 25 percent result from children getting into a car on their own, on average. Last year a record number of annual vehicular heatstroke fatalities occurred, with at least 52 children being killed. Since 1990, approximately 900 children have been killed and many have been seriously and permanently injured in these tragic and preventable circumstances.[2] (See Attachment A.)

[1] Statistics are from the U.S. Department of Transportation unless otherwise noted.
[2] Statistics provided by KidsAndCars.org.

While it may be unthinkable that a child, especially an infant or toddler, could be left in a car, it is an all-too-frequent problem. Neuroscience experts and other scientific researchers have shown that common circumstances such as work demands, stress, fatigue or change in routine can all lead to this injurious and deadly outcome. According to Dr. David Diamond, Professor in the Departments of Psychology, Molecular Pharmacology and Physiology at the University of South Florida, "This phenomenon must be explained from a brain science perspective, not one that blames parents for being negligent."[3] (See Attachment B.) Even the most loving, caring and responsible parents and caregivers can succumb to these conditions and make this mistake. For example just two weeks ago on July 9th, the three-year-old son of a professor at the University of Southern Indiana (USI) died in a hot car on the USI campus after the professor forgot to drop him off at the USI Children's Learning Center.[4] People are not infallible; that's why vehicles already have reminder systems for headlights, keys, doors and regular maintenance. It is time to take action on requiring the most vital alert of them all, one that can save a life.

Fortunately, legislation has been introduced to solve this problem. Advocates thanks and commends Chairwoman Jan Schakowsky (D-IL), Congressman Tim Ryan (D-OH) and Congressman Peter King (R-NY) for sponsoring the bipartisan Hot Cars Act of 2019 (H.R. 3593) which requires all new cars to be equipped with a detection system to alert that a child is unattended inside the vehicle. The bill directs the United States Department of Transportation (U.S. DOT) to issue a final rule by two years after enactment to accomplish this lifesaving goal. A number of suppliers and manufacturers already have unattended occupant detection technology commercially available. I'd like to now show a brief video to highlight this remarkable feature.[5]

As you can see from that demonstration, lives can be saved using technology on the market today. While automakers continue to spend billions of dollars on developing driverless cars, which is speculative technology that may save lives in the future, this detection technology is available now for approximately $20-40, according to suppliers. Moreover, that figure will drop significantly once the technology becomes standard equipment, just as it did for rearview cameras and airbags.

Additionally, such detection systems may have other useful applications. For example, this type of technology could detect whether or not occupants are properly restrained and may satisfy requirements for occupant protection. Specifically, the Moving Ahead for Progress in the 21st Century (MAP-21) Act directed the U.S. DOT to issue a rule requiring rear seat belt reminders in all new cars by October 2015.[6] This regulation, which is long overdue, could be potentially met by an occupant detection sensor. In the future, as driverless cars are deployed, this type of technology could communicate to the AV system that the car is occupied and would support determining if those occupants are restrained properly.

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[3] David Diamond, Professor in the Departments of Psychology, Molecular Pharmacology and Physiology at the University of South Florida, "A Scientific Perspective on Why Parents Forget Children in Cars," Press Event (June 7, 2017).

[4] Tori Fater and Mark Wilson, Child dies after being left in hot car, Vanderburgh sheriff says; father was USI employee, Evansville Courier & Press (Jul. 9, 2019).

[5] https://www.youtube.com/watch?v=DqPRdmqLMS0&feature=youtu.be

[6] Pub. L 112-141, Sec. 31503 (2012).

We are coming off of a major heatwave that gripped much of the U.S. for the past week, and more hot days of summer are still ahead. Unfortunately, public education alone is inadequate to overcome this innately human problem. Offering the detection technology as optional equipment at an additional cost will similarly not solve the problem because no one thinks this tragedy will happen to them. Congress must swiftly enact this legislation. Children's lives are hanging in the balance.

Pass the PARK IT (Protecting Americans from the Risks of Keyless Ignition Technology) Act (H.R. 3145) to Curb Risks Associated with Carbon Monoxide and Vehicle Rollaway

Vehicles are increasingly being equipped with keyless ignition systems, also known as push-button starts, which offer consumers the convenience of not having to use keys to start the vehicle. In fact, according to Edmunds, in 2018 keyless ignitions were standard equipment on nearly two-thirds of vehicles sold – up from just 11 percent in 2008. While these systems have increased ease of use by allowing drivers to unlock, start and turn off their cars without keys, they have also introduced new safety risks that unfortunately can be deadly.

Just this month, at least two people have died of carbon monoxide poisoning after unknowingly leaving their car running in the garage. David Clifford, a 77-year-old man from Glenmont, NY was found dead in his home on July 6th, and Connie Dotson, a 54-year-old woman who was deaf died in her home in Lexington, KY on July 9th. These two recent deaths highlight dangers of carbon monoxide, a colorless, odorless and potentially fatal gas, which is emitted by a vehicle that has been left turned on and running. The PARK IT Act (H.R. 3145) would help address this problem by requiring that a vehicle equipped with a keyless ignition and an internal combustion engine automatically shut off after a set time of idling. This important safeguard would help assure that a vehicle stops running before deadly levels of carbon monoxide are accumulated.

Keyless ignitions have also contributed to crashes involving vehicle rollaway. This problem tragically made national headlines in 2016 when Anton Yelchin, an actor known most famously for his role as Pavel Chekov in three Star Trek films, was crushed in his driveway by his Jeep Grand Cherokee as it rolled backwards, pinning him between a mailbox and security fence. As vehicles with keyless ignitions do not require a key to turn off and can be nearly silent when still on, drivers can exit the vehicle while it is still in gear. This can lead to the driver being struck by her/his own vehicle or the vehicle continuing unabated, potentially striking objects or people in its path. The legislation would require that the U.S. DOT issue a final rule to require that manufacturers install technology to prevent movement of the vehicle under specified conditions.

We applaud the leadership of Chairwoman Schakowsky, together with Representatives Darren Soto (D-FL), Seth Moulton (D-MA), Joseph Kennedy (D-MA), Ted Deutch (D-FL) and Vicente Gonzalez (D-TX), for introducing this important bill and urge Congress to enact it.

Take Action Now to Combat the Persistently High Number of Impaired Driving Crashes

On average, an alcohol-impaired driving fatality occurs every 48 minutes on America's streets. In 2017, 10,874 people were killed in crashes involving a drunk driver, accounting for nearly a third of all traffic fatalities. The National Transportation Safety Board (NTSB) has consistently listed ending impaired driving on their Most Wanted List of Transportation Safety Improvements, including the

2019-2020 list released earlier this year.[7] Moreover, when drug and alcohol use are combined, known as "polyuse", the effects of impairment for a driver can be amplified.

A number of actions exist that Congress could take to curb alcohol impaired driving. Specifically, they should direct the U.S. DOT to issue a minimum standard requiring all new vehicles to be equipped with passive sensor technology that prevents a vehicle from moving if the blood alcohol content (BAC) of the driver is above a certain level. Additionally, states should be incentivized to lower the BAC while driving limit to 0.05 percent. Moreover, 17 states still do not have a lifesaving law requiring ignition interlock devices (IIDs) for all offenders. (See Attachment C.) States that do not yet have this vital law should be required to enact it by a date certain or face a sanction.

Relatedly, Congress could take action on drug impaired driving by providing additional resources to educate and train law enforcement officers such as through the Advanced Roadside Impairment Driving Enforcement Program (ARIDE), Drug Recognition Experts (DREs) and Standard Field Sobriety Testing (SFST) training programs. Funds should also be authorized to accelerate research and development for verified roadside testing technology, improve data collection and analysis, and determine a level of impairment for marijuana use and a causal link to drug involved crashes, fatalities and injuries.

Advocates looks forward to working with the Subcommittee on ways to reduce the scourge of impairment on our roads.

Countermeasures to Prevent Distracted Driving Must be Advanced

In 2017, crashes involving a distracted driver claimed 3,166 lives. Crashes in which at least one driver was identified as being distracted impose an annual economic cost of $40 billion, based on 2010 data. Issues with underreporting crashes involving cell phones remain because of differences in police crash reporting, database limitations, and other challenges. It is clear from an increasing body of safety research, studies and data that the use of wireless electronic devices for communications (such as mobile phones and text messaging), telematics and entertainment can readily distract drivers from the driving task.

Numerous devices and applications, which pose a substantial risk for distracted driving, are being built into motor vehicles. Yet, NHTSA has merely issued non-binding guidelines which recommend, but do not require, that clearly unsafe electronic devices should not be installed in vehicles. This approach does not prohibit manufacturers from installing electronic communications devices that have highly distracting features and will not prevent manufacturers from disregarding the agency guidelines. Advocates urges Congress to direct the U.S. DOT to issue regulations strictly limiting the use of electronic communication and information features that can be operated while driving and prohibiting the use of those features that cannot be conducted safely while driving.

Additionally, improvements to the National Priority Safety Incentive Grant Program are needed to encourage states to pass strong safety laws and qualify for money to undertake efforts to combat distracted driving. Congress should pass the SAFE TO DRIVE Act (H.R. 2416), which would add

[7] NTSB, 2019-2020 Most Wanted List of Transportation Safety Improvements.

opportunities for states to improve distracted driving laws and qualify for distracted driving incentive grant awards as well as improve transparency for states in determining grant eligibility.

Legislation Should be Enacted to Make Advanced Driver Assistance Systems Standard

Every day on average, over 100 people are killed and 7,500 people are injured in motor vehicle crashes. Advanced vehicle technologies, also known as advanced driver-assistance systems (ADAS), can prevent and lessen the severity of crashes and should be required as standard equipment on all new vehicles. In fact, the NTSB has included increasing implementation of collision avoidance technologies in all of its recent Most Wanted Lists of Transportation Safety Improvements since 2016.[8]

Collision avoidance systems include automatic emergency braking (AEB), lane departure warning (LDW), blind spot detection (BSD), rear AEB and rear cross-traffic alert. The Insurance Institute for Highway Safety (IIHS) has found that:

- AEB can decrease front-to-rear crashes with injuries by 56 percent;
- LDW can reduce single-vehicle, sideswipe and head-on injury crashes by over 20 percent;
- BSD can diminish injury crashes from lane change by nearly 25 percent;
- Rear AEB can reduce backing crashes by 78 percent when combined with rearview camera and parking sensors; and,
- Rear cross-traffic alert can reduce backing crashes by 22 percent. [9]

However, these safety systems are often sold as part of an additional, expensive trim package along with other non-safety features, or included only in high end models or vehicles. Moreover, there are currently no minimum performance standards to ensure they perform as expected. Additionally, the IIHS has found that while nighttime visibility is essential for safety, few vehicles are equipped with headlights that perform well. Federal Motor Vehicle Safety Standard (FMVSS) 108 should be upgraded to improve headlight performance.

We urge Congress to require that advanced technologies that have proven to be effective at preventing and mitigating crashes be standard equipment with minimum performance standards. In a similar vein, Congress should enact the Safe Roads Act of 2019 (H.R. 3773) which directs the U.S. DOT to issue a final rule for AEB to be installed in all new trucks. On the path to AVs, requiring minimum performance standards for these foundational technologies will ensure the safety of motorists in vehicles and all roads users sharing the driving environment with them, while also building consumer confidence in the capabilities of these technologies.

Commonsense Regulation of Experimental Driverless Car Technology is Essential

Autonomous vehicles (AVs), also known as driverless cars, are being developed and tested on public roads without sufficient safeguards to protect both those within the AVs and everyone sharing the roadways with them without express consent. Numerous public opinion polls show a high skepticism and fear about the technology, and for good reason. (See Attachment D.) At

[8] NTSB Most Wanted List Archives, https://ntsb.gov/safety/mwl/Pages/mwl_archive.aspx

[9] IIHS, Real world benefits of crash avoidance technologies, available at: https://www.iihs.org/media/259e5bbd-f859-42a7-bd54-3888f7a2d3ef/e9boUQ/Topics/ADVANCED%20DRIVER%20ASSISTANCE/IIHS-real-world-CA-benefits.pdf

least six crashes resulting in four fatalities have occurred in the U.S. involving cars equipped with autonomous technology that are being investigated by the NTSB.

While AVs have tremendous promise to meaningfully reduce traffic crashes, fatalities and injuries once they are proven to be safe, they must be subject to minimum performance standards set by the U.S. DOT. These standards should include, but not be limited to, cybersecurity, vehicle electronics, driver engagement for AVs that require a human driver to take over at any point, and a "vision test" for driverless cars to ensure they can properly detect and respond to their surroundings. Relatedly, Advocates is opposed to further expanding exemptions from existing regulations beyond the reasonable cap of 2,500 vehicles currently in place for most automakers. Section 24404 of the Fixing America's Surface Transportation (FAST) Act allows unlimited testing of vehicles that do not have to comply with the FMVSS.[10] Under this expansion, manufacturers have broad ability to test AVs. Minimum performance requirements and protections will be especially critical as autonomous systems are deployed in commercial motor vehicles. Furthermore, although AVs may increase access to mobility in the future, the varying needs of diverse disability communities, such as wheelchair users, must be addressed and safety must be ensured.

Along with sensible regulations for AVs, consumers and regulators must be given essential information, data and documentation about AVs, and not just descriptions which potentially could be accomplished with a glossy marketing brochure. Consumers must be made aware of the limitations and capabilities of the technology in the owner's manual and at the point of sale, as well as via a public website searchable by the vehicle identification number (VIN) that includes, at a minimum, vehicle information such as any exemptions from federal safety standards and the AV's operational design domain (ODD).

The recent crashes involving the Boeing 737 MAX airplane tragically highlight the catastrophic results that can occur when automated technology potentially malfunctions and is not subject to thorough oversight. Reports have indicated that many aspects of the plane's certification were delegated to Boeing. In addition, safety systems that could have assisted the pilots were not required as standard equipment but were offered as an option at an additional cost. Lastly, both planes were being operated by experienced pilots who had extensive training. In sharp contrast, there are no federal training requirements for individuals testing or operating automated vehicle technology or for the consumers who purchase these vehicles and are using them on public roads.

Congress should direct U.S. DOT to put these and other vital safeguards in place prior to the wide-scale deployment of unproven driverless cars onto public roads. (See Attachment E).

Crash Data Must be Collected and Available

At a minimum, data reflecting the performance of a vehicle including how the safety systems perform in a crash should be collected, recorded, accessible, and shared with appropriate federal agencies and researchers so that safety-critical problems can be identified. Currently, vehicles are not required to be equipped with an event data recorder (EDR). While there is a requirement for what data voluntarily-installed EDRs must capture, this information is insufficient to properly ascertain facts about crashes, especially as vehicles become more highly automated. EDRs must

[10] Pub. L. No. 114-94 (2015).

be mandated for all vehicles and required to collect sufficient, standardized information to aid investigators and regulators in assessing performance, including for AVs.

Connected Vehicle Technology with Potential to Offer Added Safety Benefits Should be Deployed

Connected vehicle technologies allow a vehicle to send and receive communications with other vehicles (vehicle-to-vehicle (V2V)) and the infrastructure (vehicle-to-infrastructure (V2I)). These messages can relay information ranging from the relative location and direction of motion of other vehicles to warning messages that traffic lights are about to change or weather conditions are soon to be encountered. These systems will likely help fill in gaps in the performance of AVs. In 2017, NHTSA issued a Notice of Proposed Rulemaking to require V2V technology.[11] However, despite the identified safety benefits of V2V technology, this rule is languishing at the U.S. DOT. Congress should direct U.S. DOT to complete this rulemaking by a date certain.

The Upward Trend of Fatalities among Vulnerable Road Users Must be Reversed

Deaths and injuries of pedestrians and bicyclists are unacceptably high. Recently released estimates for 2018 show that despite a slight decrease in overall crash deaths, fatalities of pedestrians increased by four percent and pedalcyclist fatalities increased a staggering 10 percent. These upticks follow fatalities of pedestrians and bicyclists hitting their highest levels in approximately 30 years in 2016.

Collisions involving vulnerable road users do not have to be a death sentence. Vehicles can be designed, specifically in the front end, to reduce the severity of impacts with pedestrians and/or bicyclists. Collision avoidance systems for pedestrians, like advanced AEB, also have promise to further reduce deaths and injuries. Advocates continues to monitor research on the effectiveness of these systems and will support data-driven solutions to crashes involving vulnerable road users.

Moreover, the New Car Assessment Program (NCAP) must be updated to include pedestrian crashworthiness and pedestrian crash avoidance, among other improvements. The United States was the leader in developing NCAP 40 years ago when Advocates' Board Member Joan Claybrook was at the helm of NHTSA, yet has fallen woefully behind our international counterparts in robust and comprehensive ratings of vehicle safety. Additionally, upgrades to infrastructure such as protected intersections, dedicated paths, use of automated enforcement systems to curb speed and red light running, leading intervals for signaling, and other improvements could also offer pedestrians and bicyclists better protection to reduce the occurrence and severity of crashes.

In September 2018, the NTSB issued a Special Investigation Report on Pedestrian Safety, which reinforced the need to implement a number of these safety improvements. We urge Congress to direct NHTSA to issue a standard for improved vehicle designs to reduce the severity of impacts with vulnerable road users and update NCAP to include pedestrian crashworthiness and pedestrian crash avoidance, among other essential improvements.

[11] 82 F.R. 3854 (Jan. 12, 2017).

Safety Improvements are Needed to Address the Aging Population

In 2017, over 6,500 people age 65 and older were killed in traffic crashes – representing 18 percent of all traffic fatalities. Advocates has developed federal legislative proposals addressing both human factors and vehicle design issues to improve the safety of older adults. These recommendations include development of a crash test dummy representative of older occupants, revising NCAP to include a "Silver Car Rating", and modifying the injury criteria used in crash tests to address the specific injury patterns suffered by older occupants. We encourage the Subcommittee to examine issues particular to older Americans and advance these measures.

NHTSA Must be Sufficiently Funded and Given Additional Authorities

Ensuring NHTSA has adequate resources, funds and staff is a crucial priority for the agency to successfully carry out its mission "to save lives, prevent injuries, and reduce economic costs due to road traffic crashes, through education, research, safety standards, and enforcement." However, the agency is chronically underfunded. Currently, 95 percent of transportation-related fatalities and 99 percent of transportation injuries, involve motor vehicles. Yet, NHTSA receives only one percent of the overall DOT budget.

In recent years, millions of motor vehicles have been recalled for serious and fatal safety defects including faulty General Motors (GM) ignition switches and exploding Takata airbags. Nonetheless, used cars can still be sold and leased with open recalls – a significant loophole that should be closed. Additionally, NHTSA should be given the ability to take immediate action, known as imminent hazard authority, when the agency determines that a defect substantially increases the likelihood of serious injury or death if not remedied promptly. Further, NHTSA should be given the authority to pursue criminal penalties in appropriate cases in which corporate officers who acquire actual knowledge of a product danger that could lead to serious injury or death and knowingly and willfully fail to inform NHTSA and warn the public. Considering the unacceptably high number of fatalities and injuries on our Nation's roads, the prevalence of recalls, and the new responsibilities incumbent upon the U.S. DOT as AVs are developed and deployed, NHTSA must have additional resources and authorities to effectively oversee vehicle safety.

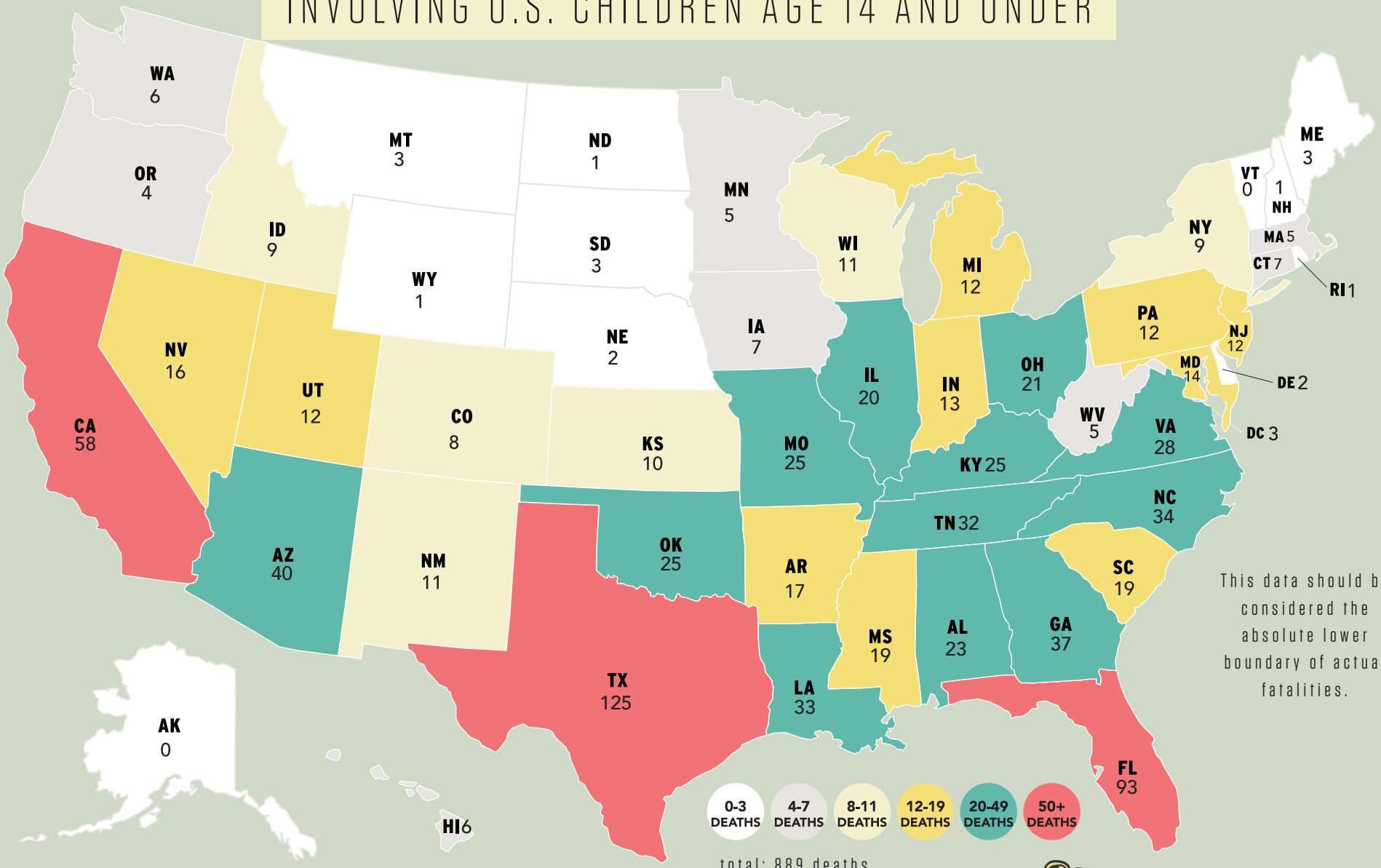
Conclusion

Advocates commends the Subcommittee for holding this vital hearing on "Legislation to Make Cars in America Safer." With crashes, deaths, injuries and costs needlessly high, the recommendations outlined above should be implemented with urgency. While fully driverless cars may have a future potential to reduce the carnage on our roads, commonsense, lifesaving solutions can and must be implemented now. Advocates looks forward to continuing to work with the Subcommittee to make our Nation's roads safer for all.

ATTACHMENT A

CHILD VEHICULAR HEATSTROKE FATALITIES (1990-2018)

INVOLVING U.S. CHILDREN AGE 14 AND UNDER



total: 889 deaths

This data should be considered the absolute lower boundary of actual fatalities.

Data Source: KidsAndCars.org as of April 2019
See back for details

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When a child dies of heatstroke after a parent or caretaker unknowingly leaves the child in a car: How does it happen and is it a crime?

David M Diamond

Abstract

It is commonly reported that in the course of a drive, a parent or caretaker loses awareness of the presence of a child in the back seat of the car. Upon arriving at the destination, the driver exits the car and unknowingly leaves the child in the car. This incomprehensible lapse of memory exposes forgotten children to hazards, including death from heatstroke. More than 400 children in the past 20 years have suffered from heatstroke after being unknowingly forgotten in cars. How can loving and attentive parents, with no evidence of substance abuse or an organic brain disorder, have a catastrophic lapse of memory that places a child's welfare in jeopardy? This article addresses this question at multiple levels of analysis. First, it is concluded that the loss of awareness of a child in a car is a failure of a type of memory referred to as prospective memory (PM), that is, failure to remember to execute a plan in the future. Second, factors that increase the likelihood that PM will fail are identified. Third, research on the neurobiology of PM and PM-related memory failures are reviewed, including a discussion of how competition between brain structures contributes to a failure of PM. Finally, the issue of whether a failure of PM that results in harm to a child qualifies as a criminal offence is discussed. Overall, this neuropsychological perspective on how catastrophic memory errors occur should be of value to the scientific community, the public and law-enforcement agencies.

Keywords

Forensic psychiatry, memory failure, neurobiology of memory, prospective memory, *mens rea*, neuropsychology of memory

Prologue: A case study

Lyn and Jarrett Balfour shared the responsibility of taking their nine-month-old son, Bryce, to day care; either Lyn or Jarrett would take Bryce to day care as a part of each one's drive to work. On the morning of 30 March 2007, Jarrett's car was unavailable, so Lyn modified her normal routine to work to include driving Jarrett to day care. Other aspects of the drive were different as well. First, Bryce had always been placed in a car seat behind the passenger's seat. However, on this day, Jarrett placed a new car seat in the regular location, and he moved Bryce's old car seat to a new position, behind the driver. Bryce was placed in the old car seat, which was positioned behind the driver for the first time. Second, Lyn routinely placed Bryce's change bag on the front passenger seat when she took Bryce to day care. However, because Jarrett sat in the front seat that morning, the change bag was placed on the rear floor, out of Lyn's view. Third, soon after Lyn dropped Jarrett at work, her drive was interrupted by two important phone calls: the first from a family member in need of her assistance, and the second involving an urgent problem at work that required her immediate attention. Once Lyn had successfully dealt with the family and work crises, she returned to what seemed to be the only task at hand: to continue her drive to work. At this stage, Lyn had lost awareness that Bryce, sleeping soundly behind her, was in the car.

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It is also important to note that the night before, Lyn had cared for a neighbour's baby until 1:00am, and then Bryce woken her at 3:00am. She spent hours caring for Bryce, which left her sleep deprived that day. Thus, without Bryce in the passenger-side car seat or the change bag in the front seat, and with Bryce sleeping quietly behind her, Lyn did not have the typical visual and auditory cues that could have alerted her to Bryce's presence in the car.

Lyn arrived at work, exited the car and prepared for the demands of her job, unaware Bryce was still in her car. During her day at work, Lyn frequently looked at a picture of Bryce on her desk and was confident she had taken him to the day-care provider that morning. This was, in fact, a false memory, as later that day Lyn was horrified to discover that Bryce was still in her car. Bryce was found unconscious, with a body temperature of at least 42°C (108°F). His cause of death was determined to be heatstroke from spending the entire day in a hot car.

In *Balfour* v. *Commonwealth of Virginia*, Lyn was initially charged with felony child neglect and second-degree murder. This charge was later reduced to involuntary manslaughter. A conviction in this case carried a maximum penalty of 10 years in prison. On 25 January 2008, at the conclusion of an emotionally charged trial, Lyn Balfour was found not guilty of all charges.

Introduction

The tragic loss of Bryce Balfour's life represents an epidemic of children who have died or suffered organ damage from heatstroke when parents or caretakers have left them in a car that has become intolerably hot in response to heat exposure. It has been estimated that more than 400 children in the USA and other countries[1,2] have been harmed after being forgotten in cars.[3–5] The high incidence of harm to children in hot cars has been linked to the installation of air bags in the front seat of vehicles in the 1990s, when drivers were first compelled to place small children in the back seat where they would not be harmed by air-bag deployment.

In this viewpoint, I address the issue of how loving and attentive parents and caretakers – with no evidence of neglect, substance abuse or an organic brain disorder – can have a catastrophic lapse of memory that results in harm to their children. First, I describe how the loss of awareness of a child in a car is a failure of a category of memory referred to as prospective memory (PM). Second, I identify factors that affect the likelihood that a PM failure will occur. Third, I provide a model that illustrates why the incidence of heatstroke-induced harm is relatively rare, despite the finding that a high percentage of parents report having lost awareness of children in cars. Fourth, I review the neurobiological basis of PM and how brain structures may interact to cause a PM failure. Finally, I formulate an opinion as to whether a memory failure that puts a child in harm's way qualifies as a criminal offence. In summary, the goal of this viewpoint is to provide a cognitive and neurobiological perspective on how catastrophic memory errors occur, which should be of value to the public and law-enforcement agencies.

Types of memory: Focus on retrospective and prospective memory

Memory may be categorised broadly into two types: retrospective memory (RM) and PM.[6] The essence of RM was described by William James who, in 1890, wrote that emotional experiences leave 'a scar upon the cerebral tissues'.[7] In a sense, all events from one's past – neutral as well as emotional – may leave the neural equivalent of a 'scar' upon the brain. RM therefore involves the processing, storage and retrieval of information from past experiences.

RM can be divided into explicit and implicit forms. Explicit RM involves conscious cognitive effort at the storage and retrieval phases of memory processing.[8,9] Remembering detailed information and events, such as a phone number, a spouse's birthday and what was served for breakfast today, are all examples of explicit RM. Implicit RM, by contrast, involves subconsciously processed information.[10] One form of implicit RM, which is relevant to this viewpoint, is habit memory.[11,12] Habit memories are formed slowly in response to acquired perceptual and motor skills that develop largely outside of one's awareness of the learning process. Examples of habit memory are maintaining one's balance while riding a bike, driving a car and refined skills in sports (e.g. how to hit a tennis ball properly).

PM is the second general category of memory. PM is an extension of RM in that it involves the use of stored information to plan and then execute an action which will take place in the future.[13–15] Successful performance of PM requires multiple cognitive operations, including: forming, organising and initiating the plan; retaining the memory of the intention over a delay period; performing the intention at the right time; and then remembering that the intended action took place.

PM takes place repeatedly on a daily basis. Examples of PM on a typical day may include plans to return a phone call to a colleague after lunch, to take medication prior to going to bed or to interrupt the routine drive home to stop at a pharmacy to pick up medication. As simple as the example of stopping at the

pharmacy may appear, successful completion of this task involves the coordination of multiple explicit and implicit RM components. To begin, the person needs to take into consideration past experiences to plan the modified route. The drive itself involves implicit RM, beginning with habitual (automated) actions involved in the mechanics of operating a car (unlock the door, attach the seat belt, push the ignition button, etc.). The act of driving along a well-travelled route can be an automated process, enabling the driver to drift into an 'autopilot' mode. The great benefit of the 'autopilot' mode is that it frees cognitive resources for the driver to multi-task, that is, listen to the radio, remember events of one's past and discuss future plans with the passengers, all with minimal conscious effort to drive on a well-travelled route.[16]

The critical juncture of the drive takes place as the driver approaches the pharmacy. At that moment, the memory to interrupt the routine drive to stop at the pharmacy may be active because the driver has maintained a persistent effort to keep the intention in mind throughout the drive to pick up the medication.[13–15] However, as is more often the case, when awareness of an intention is temporarily lost, the memory needs to be reactivated by a cue, such as time (e.g. go to the store at 5:00 pm),[17] a PM-specific sensory cue (e.g. receiving a phone call during the drive with a reminder to stop at the pharmacy)[18,19] or an activity (e.g. a sneeze may remind the driver to pick up cold medication). If, however, the task is not maintained constantly in the driver's awareness or the memory is not reactivated by an intention-specific cue, then PM is likely to fail.[20]

Characterisation and causes of memory failures

When people are queried about their memory, they commonly focus on RM-type forgetting of facts and details, such as a phone number or someone's name, but research indicates that the most common memory errors in everyday life are PM failures.[14,21–23] Although most memory failures are minor annoyances, memory failures involving PM can create potentially hazardous conditions, such as when a person leaves home and forgets to shut off the oven or to close the garage door. Confirmed PM-related memory errors have been shown to contribute to hazardous medical-care conditions, such as when surgeons forget to retrieve surgical tools in a body cavity[14,24,25] and when medication is dispensed incorrectly by pharmacists.[26]

PM errors have also been committed when pilots have failed to remember to interrupt their ongoing cockpit activity to begin their descent,[27] causing them to overshoot the airport destination. Far worse than missing the airport, serious incidents and even catastrophic outcomes with a loss of lives have been caused by attention and memory errors by air-traffic controllers,[27] airline mechanics and pilots.[14]

A surprising and potentially hazardous form of PM failure is the well-documented finding that security guards, police officers and detectives have left their loaded guns in public bathrooms.[28] To understand how this can happen, I conducted an interview with a Tampa detective that left his gun in a bathroom at a movie theatre.[29] He disclosed to me that just as he had completed his use of the toilet, he was distracted by his son calling to him to hurry because the movie was about to begin. At the moment in which his attention was diverted to his son, he lost awareness of his gun, which was directly in front of him on the toilet-roll dispenser; he then exited the bathroom, leaving his weapon behind. A child later picked up the gun and delivered it to his parent, averting a potential catastrophe had the child fired the gun. This example of a potentially catastrophic PM failure illustrates how rapidly, in a matter of seconds, a person's awareness of an intention can be lost in response to a distracting stimulus.

The most frequently reported occurrence of a catastrophic PM failure is the primary topic of this viewpoint. Just as a detective can forget his weapon in a public bathroom and a pilot can forget to set the wing flaps properly prior to take-off, a parent or caretaker can forget a child in a car, which puts the child at risk of harm from heatstroke.

Why does memory fail in general, and specifically, why does PM fail, especially when the consequences of a PM failure are so dire? Figure 1 illustrates six primary factors that contribute to the core feature of a PM failure, which is the loss of awareness of the plan to interrupt ongoing activity to perform the target action.

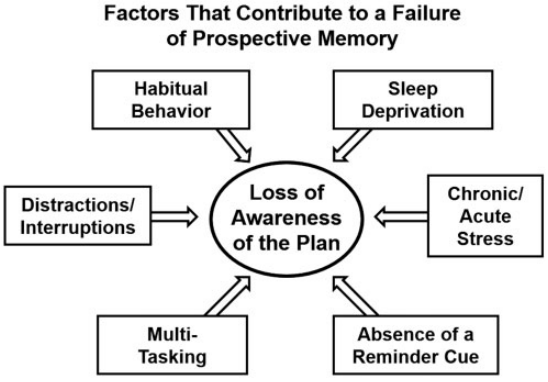

Figure 1. Factors that contribute to a failure of prospective memory (PM). The core feature common to all PM failures is the loss of awareness of an intended action.

That is, from the time of the formulation of the plan to its expected time of execution, these six factors contribute to an individual losing awareness of the intention to complete the plan. The essence of a PM failure therefore is the loss of awareness to 'remember to remember' at just the right time.[21,30]

Two of the six factors in Figure 1 – sleep deprivation and chronic stress – provide a global detrimental influence on PM.[31–33] The other factors represent acute conditions during the PM delay that influence its outcomes. In one study, investigators noted that PM failures were most likely to occur in times of transition, typically when a person leaves one environment to go to another (e.g. when leaving from home to go to work). This study reported that PM failures were at their highest rate of occurrence when people were in a state of 'high arousal' or were 'preoccupied' with another action.[34] These findings are consistent with the literature demonstrating that stress,[35] distractions and interruptions,[36] as well as simply processing ongoing intervening events,[37] are all potent detrimental influences on PM. Experimental research under controlled conditions has demonstrated that even mild distractions can impair PM rapidly in less than a minute.[38]

Two factors that often occur in conjunction with a PM failure are ongoing habitual activity ('autopilot' mode) and the absence of an explicit reminder cue. Habitual activity can trigger a form of inattentional blindness, such that the awareness of the intention is lost because a person's attention is focused on other features of the environment.[16] This phenomenon was first described in 1890 by William James, who noted that 'habit diminishes the conscious attention with which our acts are performed'.[7] Once inattentional blindness develops, the ongoing habit can dominate one's awareness,[39] which impairs attention to the task that deviates from the habit.[40] With one's awareness focused on the routine, awareness of the plan to interrupt the habit may occur only in response to a highly salient and unique reminder cue,[41] such as the child vocalising, seeing the child's change bag in the car or a phone call from the day-care provider asking about the child.

Relation of children forgotten in cars to false-memory research

There is a vexing component of children forgotten in cars that commonly provokes outrage from the public and may influence law-enforcement officers to charge parents and caretakers with crimes, ranging from child neglect to murder. Parents and caretakers who forget children in cars may go about their daily routine, for many hours at home or at work, as the child dies from heatstroke. The question that is commonly asked is that someone may forget a child for a brief period of time, but how does someone forget a child in a car all day or even overnight in some cases?

Parents and caretakers have universally reported being certain they had taken the child to the target location, typically home or day care. False memories such as this one have intrigued cognitive psychologists for nearly a century.[42] Researchers have studied different categories of false memories, including fabricating and implantation of memories of events that did not happen, such as childhood experiences, or distorting real experiences to reduce their accuracy.[42–45] The category of false memory most relevant to parents forgetting children in cars is when an event assumed to have taken place becomes stored as a very real – but false – memory. This phenomenon was first studied by Deese[46] and then extended by Roediger and McDermott,[47] in an approach which is referred to as the Deese–Roediger–McDermott (DRM) false-memory paradigm.[48] In this approach, people study a list of words that share a common theme such as medical care (e.g. nurse, hospital, surgery, medication, etc.). The list, however, lacks a word that is common and semantically related to the theme, such as 'doctor', which people assume had been included in the list. At some time later, when people are queried as to which words were on the list, a high percentage of people falsely 'recall' that the word 'doctor' was on the list. Hence, the assumption that 'doctor' was on the list becomes a false memory, in which people report with high confidence that 'doctor' was on the list when in fact it was not.

The authors of the original DRM study were so taken by the strength of the false memories formed that they stated '...the illusion of remembering events that never happened can occur quite readily' and further noted 'the fact that people may say they vividly remember details surrounding an event cannot, by itself, be taken as convincing evidence that the event actually occurred'. The DRM paradigm mimics the false memories of parents who forget children in cars because the driver's assumption that he or she took the child to day care becomes a false but seemingly very real memory.

It is notable that DRM false memories can be quite durable, lasting for many hours and even overnight.[49] Thus, once a false memory is formed, it is as durable as a real memory, a finding that may help us to understand how a person can leave a child in a car for many hours, all the while being certain that the child was at the intended location.

Relation of Reason's 'Swiss cheese' model to cases in which children have been forgotten in cars

Reason developed a 'Swiss cheese' model[50] based on protective barriers, such as alarms, physical barriers and automatic shutdowns, which reduce the likelihood that a hazardous workplace situation will develop into a tragedy. According to Reason, the barriers should be impenetrable to human error, but they have flaws, depicted as holes in slices of Swiss cheese, which are continually opening, shutting and shifting their location. The presence of holes in any one 'slice' (one flawed protective barrier) does not normally cause a hazardous outcome, but when the holes in many layers momentarily line up, an improbable trajectory from potential hazard to tragedy can pass through all of the protective barriers.

I have applied Reason's model to the conditions that influence whether a forgotten child is retrieved safely or is harmed by heatstroke based on experimental research and my service as an expert witness in civil and criminal cases. As illustrated in Figure 2, the trajectory from a potentially hazardous condition to heatstroke-induced harm begins with findings of a survey in which approximately 25% of parents of young children reported they had forgotten (lost awareness of) a child in their car at some time during a drive.[51] This loss of awareness may develop spontaneously, as a matter of a time-related PM failure,[52] or may be a more active process, triggered by a stimulus that directs the driver's attention away from the child, such as an emotional experience. The attentional narrowing that occurs with strong emotion, also referred to as 'tunnel vision', was described in a seminal paper by Easterbrook in 1959[53] and has been replicated in more contemporary research.[54–58] In a related cognitive process, referred to as 'inattentional blindness' and 'attentional capture',[59,60] a person's awareness of a salient cue – in this case, the child – may be lost as other salient cues in the environment attract a person's attention. Therefore, the 'Swiss cheese' model of forgotten children in cars typically begins with the driver's loss of awareness of the presence of the child in the car.

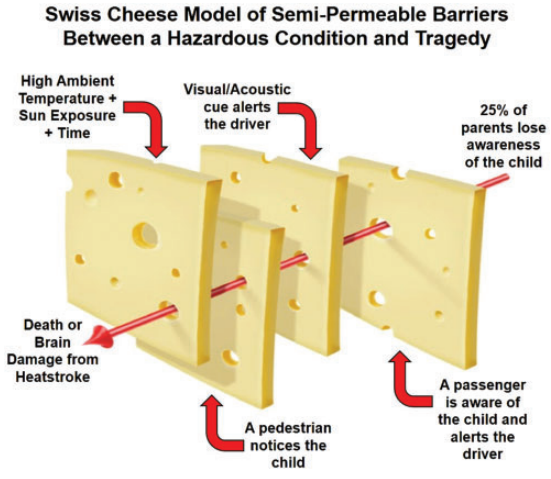

Figure 2. 'Swiss cheese' model of semi-permeable barriers that stand between a hazardous condition (loss of awareness of a child in the car) from developing into a tragedy (heatstroke). Only the trajectory that passes through a hole in each of the protective barriers results in tragedy.

The first protective barrier after a driver loses awareness of a child is that a passenger alerts the driver to the presence of the child in the car. This barrier is potentially a significant factor, as most reported cases involve drivers who were alone when children were forgotten in cars. However, even when the driver is not alone, the presence of a passenger in the car may not be a sufficient barrier to avoid a child from being forgotten because the driver and the passenger both lose awareness of the child in the car. For example, in three cases in which I have served as an expert witness (*Poole* v *Director of Public Prosecutions*, Victoria, Australia [2014]; *Ives* v *State of Texas* [2015] and *Lillie* v *State of Florida* [2017]), a child died of heatstroke after being forgotten in a car in which the driver, as well as a sole passenger, both lost awareness of the presence of the child in the car.

The second barrier is that a cue (typically visual or auditory) alerts the driver to the child's presence. I have received numerous reports from parents alerted to their child's presence when they heard the child make a sound or they happen to look in the back seat to 'discover' their child in the car. A person may also be alerted to the child in the car by a phone call from the day-care provider asking why the child hadn't arrived at day care as scheduled. This barrier fails when there is an absence of a sensory cue alerting the parent or caretaker to the child's presence in the car.

When the first two within-car barriers fail and a child is forgotten in a car, there is a third layer of protection. In cases in which I have served as an expert witness (e.g. *Gruen* v *State of New Jersey* [2017], *Steinhart* v *State of Iowa Child Protective Services* [2015]), as well as numerous other cases which have been reported in the media, pedestrians have noticed a child alone in a hot car. In these instances, the pedestrians may intervene by calling the police and/or breaking into the car to free the child. This barrier is most likely to be present when the car is parked in a high pedestrian traffic area such as a shopping centre. This condition often saves a child from harm but may result in the driver being charged with child neglect or abandonment.

Even when the trajectory from potential hazard to harm passes through the first three barriers, a forgotten

child in a car may remain unharmed if environmental conditions are not conducive towards producing heatstroke.[61,62] That is, under conditions in which the internal temperature of the car does not rise sufficiently to cause harm (e.g. in cool weather), the car is parked in covered parking or the duration of exposure is brief, the child may remain unharmed in the car for many hours. It is only when environmental conditions produce an intolerably hot (or cold) environment for a prolonged period of time that a child may be harmed by extreme ambient temperature.

In sum, Reason's 'Swiss cheese' model has value towards understanding why it is relatively common that drivers report having forgotten children in cars, but death or organ damage from heatstroke is quite rare. It is only in the extraordinarily rare circumstance in which a trajectory from a potentially hazardous condition passes unimpeded through all protective barriers that a child suffers from heatstroke.

Neurobiology of RM and PM failures

The expression of normal, healthy brain functioning involves the capacity to process and store information from one's past (RM) and to use that information in the present to make plans for the future (PM). A memory failure, in the absence of pharmacological influences or an organic disorder, also reflects the expression of a normal, healthy brain, even when that memory failure results in a tragic outcome. It is of value therefore to understand how normal brain functioning can result in catastrophic memory errors.

As noted previously, PM is a complex form of memory that involves multiple cognitive operations, beginning with forming and organising a plan based on past experiences (RM), determining when and how to execute the plan, performing the intention at just the right time in the future and then remembering that the intention has been accomplished. With such a complex, multi-component cognitive process, it is a challenge to model the different neural systems that enable PM to occur. It is therefore understandable that neural models of PM have been complex, involving numerous brain structures that cooperate as well as compete with each other. Recent reviews provide a reference source for research in this area.[63–68]

Although numerous brain structures are involved in PM, the neural systems that are of most value towards understanding PM and PM failures are the frontal and parietal cortices (F/PC) and the hippocampus (HC). A vast literature has demonstrated that F/PC functioning underlies strategising, planning for the future and maintaining a representation of an intention,[64,69–71] and that the HC is necessary for the formation of conscious memories.[72,73] A person without a functioning F/PC would have great difficulty in planning and strategising about the future and in multi-tasking.[74] Damage to the HC, by contrast, would result in a person who appears to be normal, in that intellect, communication and personality would be unaffected. However, without a HC, a person would be unable to form and retrieve all recently processed memories of explicit (conscious) experiences.

Although people with damage to the HC are incapable of forming explicit memories, they can acquire perceptual and motor skills at a normal rate, despite a complete lack of awareness that the learning has taken place.[12] This observation was first reported in a patient (H.M.) with surgical removal of his HC bilaterally.[75] Although the surgery rendered H.M. incapable of forming new conscious (i.e. declarative/explicit) memories, he subconsciously learned perceptual and motor skills at a normal rate, a finding that has been replicated repeatedly over the ensuing decades.[76] The research beginning with H.M. has been extended to animal studies[77,78] to demonstrate conclusively that there are separate and distinct brain memory systems for conscious (explicit) versus subconscious (habit) memory processing.[79] The neural structure that processes subconscious – particularly skill and habit – memories is a set of primitive nuclei, referred to as the basal ganglia (BG).[80,81]

The sequence and brain structures involved in successful and unsuccessful PM is in Figure 3 (adapted from McDaniel and Einstein[67]). PM begins as a plan, generated by the F/PC system, to accomplish an intention in the future. The F/PC works with the HC to use stored memories and to process new information in order to create a representation of the intention.[68] In the example of a drive that inconsistently includes a child, the F/PC would generate the plan to include a stopover at the day care, and the HC would store the information that the child is in the car today, perhaps unlike other days. The literature indicates therefore that the F/PC subserves the planning component of the drive and the maintenance of the intention in memory, and the HC provides the complementary function to store the memory of the child's presence in the car and to reactivate that memory at the appropriate time.[82]

During the delay between the formation and execution of the plan, there is a form of competition between the conscious (F/PC and HC) brain memory systems to process the PM and the subconscious (BG) brain memory system to enable someone to accomplish a routine action automatically as if in an 'autopilot' mode. Brain-imaging studies have demonstrated that this competitive process can involve the simultaneous activation of the BG and reduced activation of the HC,[83–85] which is enhanced by stress.[86] Mechanistic

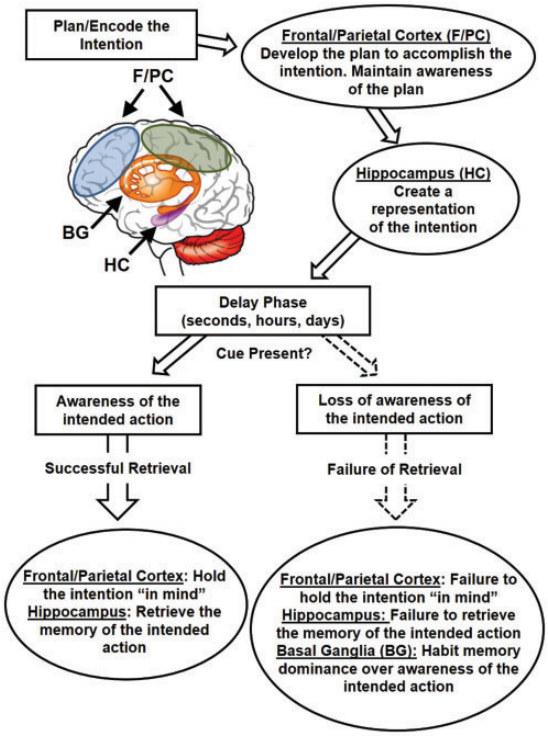

Figure 3. Neurobiological model of successful and unsuccessful PM. PM is initiated and maintained by the frontal cortex (shaded in blue) in conjunction with the parietal cortex (shaded in green). The conjoint action of the frontal and parietal cortices is indicated as the F/PC. The hippocampus (HC) works with the F/PC to generate a representation of the plan based on prior experience (retrospective memory). The HC needs to be reactivated at the right time, usually by a reminder cue or activity, for PM to be successful. If basal ganglia (BG) activation during habitual activity occurs, awareness of the intention may be lost. In this case, failure of PM retrieval is likely to occur unless a salient, PM-specific cue reactivates the F/PC and HC neural system.

studies in rodents have also identified competitive interactions between these two brain systems under conditions of habit versus novel learning conditions.[85,87,88] These findings support the hypothesis that under conditions of stress or habitual behaviour, the BG may interfere with one's awareness of an intended action, leading a driver to lose awareness of the child in the car and to follow a commonly driven route.

Research indicates that when the intended action should occur, a cue can reactivate the F/PC+HC system in the neural equivalent of 'booting' the conscious memory system. If that 'booting' of the F/PC+HC system occurs, then there is a reactivation of the target memory, with successful retrieval of the memory of the intention. If, however, there is a loss of awareness of the task in conjunction with an absence of an alerting cue, then there is a strong likelihood of a failure to retrieve the memory of the intention.

PM failure, and therefore the failure of the F/PC + HC system, is common because keeping an intention in mind, for even less than a minute,[38] is adversely affected by multiple competing factors. The passage of time, distraction, multi-tasking and stress all exert an adverse effect on F/FC[89] and HC functioning[90] while promoting subconscious, habit-based (BG) memory processing,[91] as well as an inherent competition between the BG and F/PC + HC memory systems.[85,87,88]

With the BG guiding behaviour, the driver can perform a habitual behaviour (i.e. to drive a well-established route) and the F/PC can perform its multi-tasking function (i.e. to enable the driver to listen to the radio, have a discussion with passengers and plan for the future), all with minimal cognitive effort. However, as the F/PC multi-tasks and the BG guides habitual behaviour, the driver may lose awareness of the presence of the child in the car. With this loss of awareness of the child in the car, the plan to stop at the day care is lost as well.

Therefore, when the driver arrives at the routine destination, he or she exits the car having lost awareness that the child remains in the car. The driver's assumption that the child has been taken to day care becomes a false memory, which provides the driver with the false sense of security that the child is in a safe location. The driver then conducts routine activity at the destination for as much as an entire day or an entire evening, completely unaware that the child remains in the car. This hypothesis explains how parents and caretakers may return to their car after being away for many hours and are horrified when they discover their child had died in the car during their absence.

Unknowingly and unintentionally leaving a child in a car: Is it a crime?

A subset of parents and caretakers who have unintentionally and unknowingly left a child in a car have been prosecuted for crimes which range from child neglect to murder. In this situation, the Latin dictum '*actus non facit reum nisi mens sit rea*' is relevant, meaning 'the act does not make a person guilty unless the mind is also guilty' or put more simply, a criminal act requires a knowing 'guilty mind' (*mens rea*). Components of the 'voluntary act requirement' in the USA Model Penal Code (MPC), Section 2.01, relevant to *mens rea* include: 'a person is not guilty of an offense unless he acted purposely, knowingly, recklessly or negligently'.

The *mens rea* requirement of criminal law negates prosecution of individuals if they are limited in their capacity to be aware that their actions could harm

another person. Neuroscience research has been of great value in this regard by expanding our understanding of conditions that influence the accountability of individuals who have committed violent acts. A vast literature has incorporated impaired or insufficient functioning of brain structures, such as the frontal cortex, amygdala and HC, produced by early life trauma,[92,93] brain dysfunction,[94] immature brain development[95] or intense emotion,[96] as mitigating factors in limiting offender accountability in violent acts.

Also relevant to the *mens rea* component of the law is that people have not been found to be legally responsible for committing harm to others when they are in an unconscious state. *Massachusetts* v *Tirrell* (1846) was the first case to determine that an individual cannot be criminally responsible for acts committed while unconscious, in this case killing a person while the defendant was in a somnambulism (sleep-walking) state. The *mens rea* defence has been used successfully in numerous contemporary cases when an individual in a somnambulism state caused harm to another (see Denno[97] for a review). Courts have also held that other forms of an unconscious state (also referred to as automaticism) constitute a defence to a criminal charge,[97] such as harm caused by an individual in the midst of an epileptic seizure[97] or harm caused by an individual who fell asleep while driving.[98]

The issue of offender accountability was summarised succinctly in California jury instructions, which described the defence of 'automatism' as: 'A person who commits what would be a criminal act, while unconscious, is not guilty of a crime'.[97] It is in this context that the neuroscience research I have reviewed is relevant. There is incontrovertible evidence that there are independent levels of conscious and non-conscious processing which occur simultaneously by different brain structures. Whereas the F/PC+HC system processes conscious, planned and strategic actions, other structures, such as the BG, function at a subconscious level, enabling well-established routines to occur automatically, with minimal conscious awareness. Moreover, it is a well-established finding that these brain systems appear to compete against each other for access to conscious awareness, which includes the BG habit-based subconscious system, which exerts a powerful influence on awareness and behaviour.

In cases I have reviewed when people unknowingly left children in a car, there is strong support for the hypothesis that they were guided by their BG, which was focused on accomplishing a habitual action. Brain-imaging research reveals that HC neural activity, which maintains the memory of the child's presence in the car, is reduced in a task in which BG activity is dominant. Thus, at the moment in which the driver exits the car, the HC cellular activity that had processed the memory of the presence of the child in the car would be reduced below the level of conscious awareness. Moreover, in a process which is not well understood, the brain creates a false memory that the child has been taken to the planned destination (home or day care). Therefore, upon exiting the car, the driver has not left the child (or children) in the car purposely, knowingly, recklessly, negligently and certainly not with malice. Rather, the person's actions reflect the dynamics and imperfection of human brain functioning in a complex multitasking situation, which underlies the failure of PM.

My opinion expressed in this viewpoint is that absence of *mens rea* directly applies to cases in which parents and caretakers, unknowingly and unintentionally, leave a child in a car. A similar opinion was expressed by the Court of Appeals of the State of Texas in their reversal of the conviction of Wakesha Ives of criminal negligence after she had forgotten her child in her car.[99] The court determined that 'Because the evidence does not rise to the level of some serious blameworthiness, we reverse the conviction…'. Therefore, when we take into account that a criminal act requires an individual to be fully aware that his or her action could cause harm, when a child dies of heatstroke in a hot car, it is a public-health issue and a tragedy, but it is not a crime.

Epilogue

The combination of detrimental factors which led Lyn Balfour to leave Bryce in her car that day were covered extensively in a *Washington Post* Pulitzer Prize–winning feature entitled 'Fatal Distraction'[100] and were also called the 'Perfect Storm' in a local news story.[101] Her case had many PM-impairing factors which coexisted, seemingly conspiring against her from maintaining awareness of Bryce's presence in her car: she was sleep-deprived, stressed by urgent phone calls during her drive and deprived of regular cues, for example the change bag which had always served as a reminder that Bryce was in the car. Her case serves as a template to understand the multitude of factors that contribute to why children can be forgotten in cars.

It is important to emphasise that with more than 400 children dying in hot cars as a result of a PM failure over the past 20 years, as well as other conditions in which children may die as a result of human error, each case is different; each case needs to be evaluated based on the unique circumstances that led to a loss of awareness by the caretaker of the child's presence in the car. A PM failure may occur with only a small subset of the perfect storm of events that Lyn Balfour experienced. Indeed, as little as a single factor in Figure 1, for example a habit-based drive that only intermittently includes

taking the child to day care, has sufficed for people to lose awareness of a child in a car.

Finally, human error involving an impairment of memory and attention with catastrophic outcomes can take on many different forms (e.g. airline pilot error, critical care setting, medication adherence, children and dogs[102] forgotten in hot cars). Therefore, while the primary purpose of this viewpoint is to address how and why children are forgotten in cars, this analysis of human errors can provide guidance as to how people may unknowingly make a catastrophic error which can unintentionally result in harm to others.

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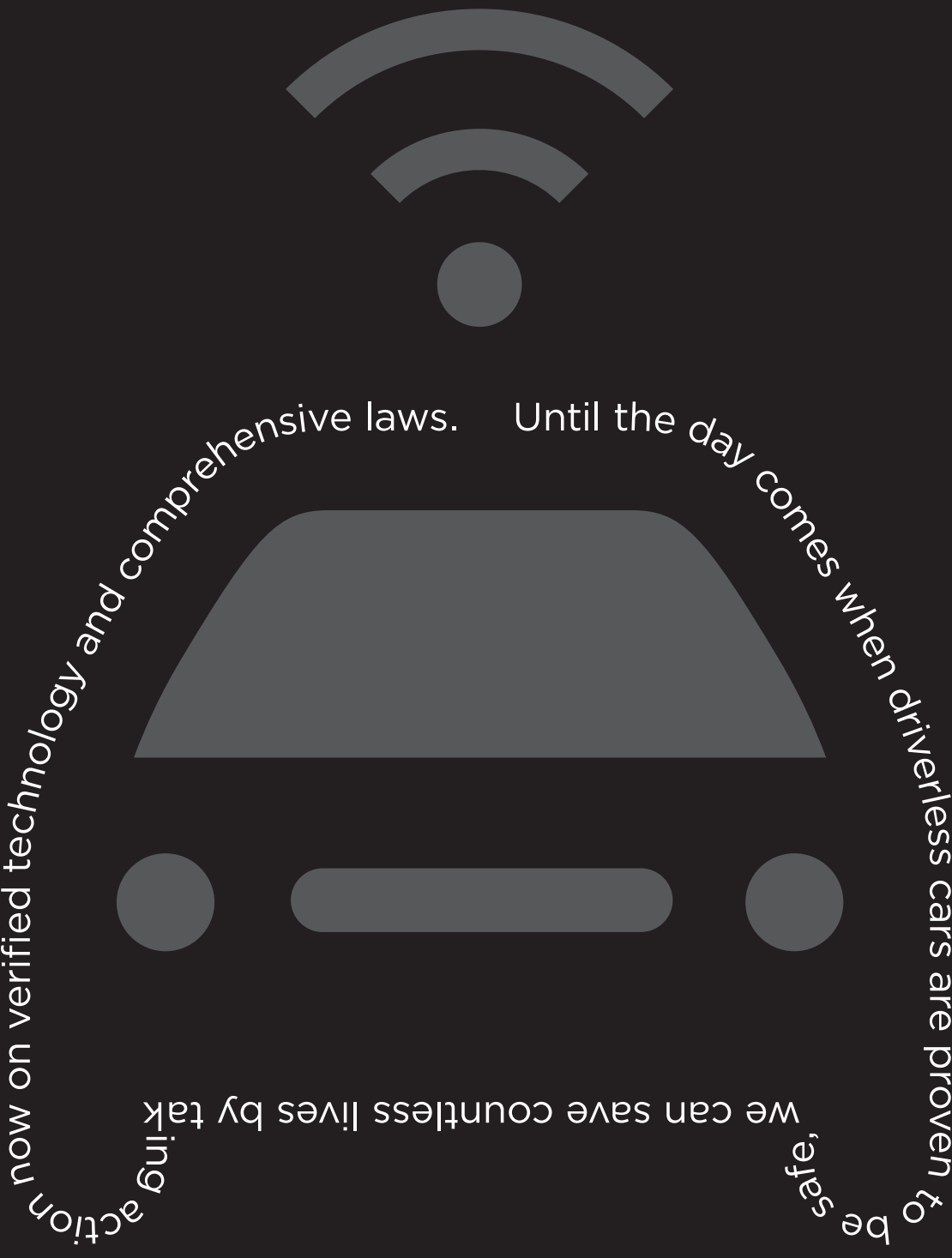

Until the day comes when driverless cars are proven to be safe, we can save countless lives by taking action now on verified technology and comprehensive laws.

16TH ANNUAL ROADMAP OF STATE HIGHWAY SAFETY LAWS

The future offers a promise of improving safety on our roads with autonomous vehicles, but thousands of lives can be saved with proven technology and strong safety laws now. Let's get to work.

Hardly a day goes by when there isn't a news story, article or editorial piece about driverless vehicles -- cars, trucks and buses with complex computer systems and automated functionality that assume the role of human drivers. In an ideal world where these systems perform reliably and safely, they hold tremendous promise to make significant reductions in preventable crashes, deaths and injuries as well as expanding safe mobility choices.

However, that utopic vision is still a while away, potentially decades, from becoming reality. Advocates for Highway and Auto Safety (Advocates) is optimistic about this possibility, but important steps must be taken to ensure that driverless vehicles are "rolled out" in a safe manner. The federal government needs to establish minimum performance requirements, exercise strong oversight and establish transparency so that if, or when, something goes wrong, problems can be remedied expeditiously.

As we drive toward that future, numerous readily-available solutions can be employed now to bring down the needless death, injury and economic toll from motor vehicle crashes. Proven safety technologies that can help avoid and mitigate crashes should be fully deployed in all new vehicles. Additionally, the 16 state traffic safety laws outlined in this report should be adopted in all 50 states and the District of Columbia. This year's report cover sums up our message: "Until the day comes when driverless cars are proven to be safe, we can save countless lives by taking action now on verified technology and comprehensive laws."

Crashes remain all too frequent and all too deadly. Each day on average over 100 people are killed and 8,500 more are injured on our Nation's roads. Yet, verified technologies like automatic emergency braking (AEB), lane departure warning (LDW) and blind spot detection (BSD) still are largely limited to luxury cars or high end models. Moreover, over 400 laws are still needed in states nationwide. These laws, as outlined in the Roadmap Report, are strong countermeasures targeted at deadly and persistent highway safety problems that contribute to the over 37,000 fatalities and millions of injuries from crashes annually.

Every single state still has gaps in their laws. If every state passed just one measure this year, substantial safety improvements for occupant protection, child passenger safety, teen drivers, impairment and distraction could be accomplished. While much focus is given to cars that can completely drive themselves, we continue to experience almost half of passenger vehicle occupants killed being unbuckled and nearly a third of crashes still being caused by an impaired driver. It is not acceptable to ignore these tragically enduring facts while we await a still uncertain future.

Advocates calls on state lawmakers to pass the recommended laws in the Roadmap Report and urges Congress and the U.S. Department of Transportation to require that advanced safety technologies, which are backed by research and data, be installed in all new cars. On the path to fully autonomous vehicles, too many lives are at stake in the meantime. We can and must act now.

Catherine Chase, President

Table of Contents

States at a Glance

Glossary of Acronyms

Advocates - Advocates for Highway and Auto Safety

AAA - American Automobile Association

AEB - Automatic Emergency Braking

AV - Autonomous Vehicle

BAC - Blood Alcohol Concentration

BSD - Blind Spot Detection

CDC - Centers for Disease Control and Prevention

CPS - Child Passenger Safety

DC - District of Columbia

DUI- Driving Under the Influence

DWI - Driving While Intoxicated

FARS - Fatality Analysis Reporting System

FHWA - Federal Highway Administration

FAST Act - Fixing America's Surface Transportation Act (Pub. L. 114-94)

GAO - Government Accountability Office

GDL - Graduated Driver Licensing

IID - Ignition Interlock Device

IIHS - Insurance Institute for Highway Safety

LDW - Lane Departure Warning

LATCH - Lower Anchors and Tethers for Children

MADD - Mothers Against Drunk Driving

MAP-21 - Moving Ahead for Progress in the 21st Century Act (Pub. L. 112-141)

NHTSA- National Highway Traffic Safety Administration

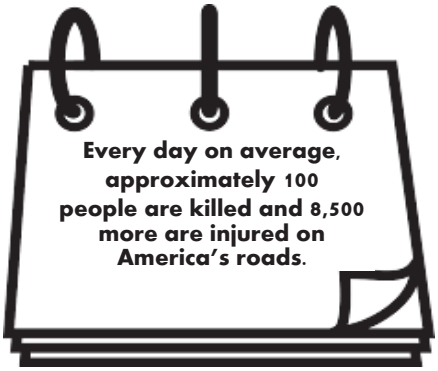
NTSB - National Transportation Safety Board

U.S. DOT - United States Department of Transportation

Urgent Action Needed to Improve Highway Safety

The Problem

All across the nation people greatly depend on the safety of our transportation system. Whether walking, biking, driving or riding, many Americans are afforded a significant degree of mobility. Yet this comes with an enormous social cost. In 2017, more than 37,000 people were killed in motor vehicle crashes. Further, there were nearly 7.27 million police-reported crashes and more than 3.14 million people injured in 2016, the latest year for which full data is available.
This is a major public health epidemic by any measure.



While federal action and safety requirements can address part of the problem, state laws have a direct impact on promoting safer behavior by drivers and occupants. Unfortunately, as demonstrated by this report, far too many highway safety laws are lacking across the nation.

In 2017:

- 37,133 people were killed in motor vehicle crashes – a 1.8% decrease from the previous year. This marginal decrease follows two years of increases.
- Automobile crashes remain a leading cause of death for Americans age five to 34.
- Almost half (47%) of passenger vehicle occupants killed were unrestrained.
- A total of 5,172 motorcyclists died, amounting to 14% of all crash fatalities.
- 1,147 children aged 14 and younger were killed in motor vehicle crashes, including 267 children age four through seven and 248 children age two and younger.
- Crashes involving young drivers (age 15 - 20) resulted in 4,750 fatalities, accounting for almost 13% of all crash deaths.
- There were 10,874 fatalities in crashes involving a drunk driver.
- In crashes involving a distracted driver, 3,166 people were killed.

An additional 406 laws need to be adopted in all states and DC to fully meet Advocates' recommended optimal safety laws in this report.

Near Term and Long Term Traffic Safety Solutions

With more than 37,000 people killed on our roads in 2017, the magnitude of this public health epidemic is clear. While the *Roadmap of State Highway Safety Laws* focuses on state laws as countermeasures to curb this needless death and injury toll, Advocates takes a comprehensive approach to ensure the safety of all road users.

Advocates has always enthusiastically championed the use of safety technology, and for good reason. NHTSA estimates that since 1960 over 600,000 lives have been saved by vehicle safety technologies.

In the long term, autonomous vehicles (AVs) have the potential to be the catalyst for meaningful and lasting reductions in fatalities and injuries.

However, in the near term, effective and proven solutions could be implemented to save lives now.

Driver Assistance Technology

Advanced technologies that have been proven to help avoid or mitigate crashes should be required as standard equipment on all vehicles. These include automatic emergency braking (AEB), lane departure warning (LDW) and blind spot detection (BSD) for cars, trucks and buses. These systems can help prevent crashes from occurring, as well as mitigate crashes that do occur, potentially lessening the severity. The Insurance Institute for Highway Safety (IIHS) has found that AEB can reduce front-to-rear crashes with injuries by 56%, LDW can reduce single-vehicle, sideswipe and head-on injury crashes by over 20%, and BSD can reduce injury crashes from lane change by nearly 25%. Additionally, the IIHS has found that while nighttime visibility is essential for safety, few vehicles are equipped with headlights that perform well. Unfortunately, these safety systems are often sold separately as part of an expensive trim package or on high end models.

Automated Enforcement

Automated enforcement can be used as an effective tool against two common crash contributors -- speeding and red light running. One of the most challenging issues contributing to traffic crashes is speeding, which is driving in excess of the posted legal limit. In 2017, over 25% of all fatal crashes involved speeding as a contributing factor according to NHTSA data. Moreover, the Federal Highway Administration (FHWA) reports that Americans are more likely to be injured in a red light running related event than any other crash. A study by IIHS found that red light cameras reduced the fatal red light running crash rate by 21% and the rate of all types of fatal crashes at signalized intersections by 14%. Similarly, speed cameras have been shown to reduce both vehicle speed and crashes.

Improving Large Truck Safety

Truck crashes continue to occur at an alarmingly high rate. In 2017, 4,761 people were killed in crashes involving large trucks. This is an increase of 9% from the previous year and a staggering 41% increase since 2009. Further, over 100,000 people are injured in large truck crashes each year. In fatal two-vehicle crashes between a large truck and a passenger vehicle, 97% of the fatalities are occupants of the passenger vehicle, according to IIHS. Several safety improvements would curb the needless carnage resulting from large truck crashes. Available safety technologies such as speed limiting devices and AEB could already be preventing crashes if they were required on the entire fleet. Further, trucks should be equipped with strong underride guards to mitigate horrific and violent crashes when a vehicle goes under the rear or side of a truck.

Rear Seat Safety

The majority of passengers in the rear seat are children, teens, and older adults. Congress directed a final rule requiring rear seat belt reminders in all new motor vehicles by October 2015 as part of MAP-21. NHTSA has failed to issue a Notice of Proposed Rulemaking, which is woefully overdue.

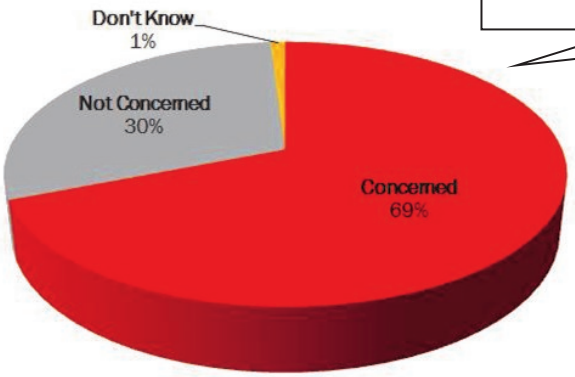
Adults unintentionally leaving infants and young children in child restraint systems in the rear seats of vehicles tragically leading to death has been, and continues to be, a well-known safety problem, but one with available technology solutions. Exposure of young children, particularly in extreme hot and cold weather, leads to hyperthermia and hypothermia that can result in death or severe injuries. Legislation was introduced in the last Congress and is expected to be reintroduced this year that would require the U.S. DOT to issue a final rule for a reminder system to alert the driver if a child is left unattended in a vehicle.

Building Trust that Technology Can Deliver Safety

The public has said time and again that they are skeptical about sharing the road with driverless cars. This mistrust is understandable. There is a lack of transparency and information about their capabilities and limitations, coupled with preventable crash fatalities that have already occurred. Proven technologies available now can serve a dual purpose of building public confidence in technology and saving lives.

Public acceptance will be crucial on the path to fully driverless vehicles.

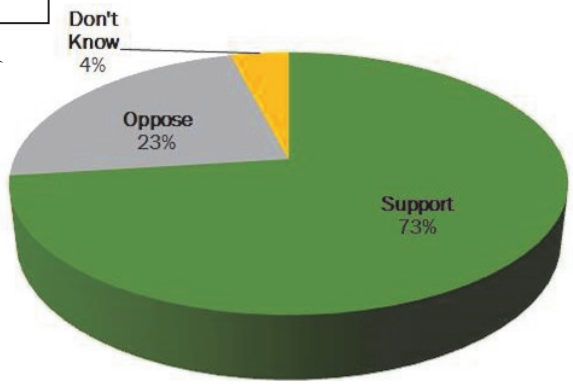
How concerned are you about being on the road with driverless cars?



The public is overwhelmingly (69%) concerned about sharing the road with driverless vehicles as motorists, bicyclists and pedestrians. This apprehension is widespread across demographics including gender, generations, region, education and political affiliation.
(ORC International, July 2018)

Do you support safety standards for driverless cars?

The vast majority (73%) supports safety standards for new features related to the operation of driverless cars. Responses were similarly strong across gender, political affiliation and region of residence.
(ORC International, January 2018)

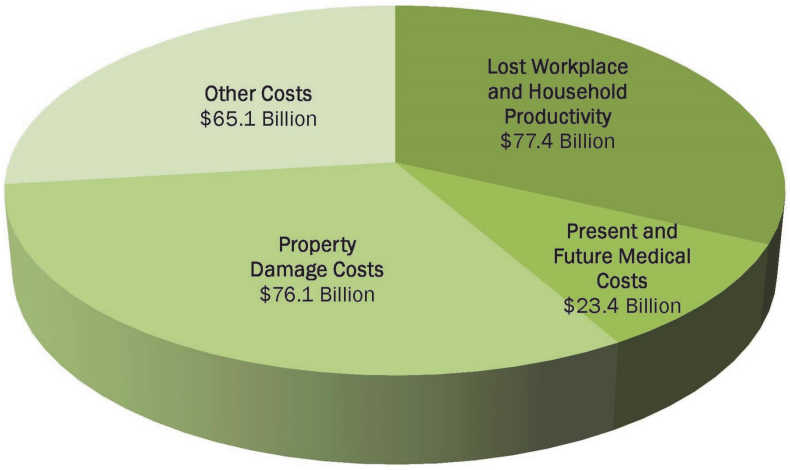


The public has indicated clearly that they want protections put in place for driverless cars that will be operating on public streets and highways. As driverless cars are developed and deployed, building and maintaining public confidence will be critical. This can be accomplished by subjecting these experimental vehicles to sufficient oversight and necessary federal standards.

Safety Laws Reduce Crash Costs

Motor vehicle crashes impose a significant financial burden on society.

Annual Economic Cost of Motor Vehicle Crashes: $242 Billion



STATE	(Millions $)	STATE	(Millions $)
AL	$4,473	MT	$898
AK	$592	NE	$1,295
AZ	$4,183	NV	$1,978
AR	$2,386	NH	$1,374
CA	$19,998	NJ	$12,813
CO	$4,173	NM	$1,769
CT	$4,880	NY	$15,246
DE	$684	NC	$7,909
DC	$859	ND	$706
FL	$10,750	OH	$10,125
GA	$10,787	OK	$2,910
HI	$577	OR	$1,768
ID	$886	PA	$5,851
IL	$10,885	RI	$1,599
IN	$6,375	SC	$4,045
IA	$2,188	SD	$720
KS	$2,445	TN	$5,667
KY	$4,363	TX	$17,044
LA	$5,691	UT	$1,725
ME	$1,303	VT	$538
MD	$4,476	VA	$4,998
MA	$5,835	WA	$4,469
MI	$9,599	WV	$1,482
MN	$3,057	WI	$4,546
MS	$2,718	WY	$788
MO	$5,560	Total	**$241,988**

Source: The Economic and Societal Impact of Motor Vehicle Crashes, 2010, NHTSA (2015).

Each person living in the U.S. essentially pays a **$784 annual "crash tax."**

When loss of life, pain and decreased quality of life are added to economic costs, the toll is $836 billion each year.

According to the Network of Employers for Traffic Safety (NETS), motor vehicle crashes cost employers $47.4 billion in direct crash-related expenses based on 2013 data.

Legislative Activity in 2018

In 2018, **5 laws were passed** that meet the criteria for the basic safety laws included in this report.

While other legislative activity occurred throughout the states, for purposes of this report only those laws that meet the optimal law criteria, as defined on pages 11 and 12 are considered.

Note: Laws that do not meet the optimal law criteria, including laws subject only to secondary enforcement, are not included in the legislative activity summary.

Idaho: Enacted ignition interlock device requirement for all offenders

Illinois: Enacted rear facing through age 2 law

Iowa: Enacted ignition interlock device requirement for all offenders

Nebraska: Enacted rear facing through age 2 law

Virginia: Enacted rear facing through age 2 law

States are failing to close important safety gaps because they have not adopted the lifesaving safety laws listed below. While a number of highway safety laws have been enacted during the last few years, many laws considered to be fundamental to highway safety are still missing in many states.

Based on Advocates' safety recommendations, states need to adopt 406 laws:

- 16 states need an optimal primary enforcement seat belt law for front seat passengers;
- 31 states need an optimal primary enforcement seat belt law for rear seat passengers;
- 31 states need an optimal all-rider motorcycle helmet law;
- 38 states and DC need a rear facing through age 2 law;
- 35 states and DC need an optimal booster seat law;
- 192 GDL laws need to be adopted to ensure the safety of novice drivers, no state meets all the criteria recommended in this report;
- 33 critical impaired driving laws are needed in 30 states;
- 7 states need an optimal all-driver text messaging restriction; and,
- 20 states and DC need a GDL cell phone restriction.

Key Things to Know About This Report

The Report is Divided into Five Issue Sections:

Occupant Protection:
Primary Enforcement Seat Belt Law
Front Seat Occupants
Rear Seat Occupants
All-Rider Motorcycle Helmet Law

Child Passenger Safety:
Rear Facing through Age 2 Law
Booster Seat Law

Teen Driving (GDL):
Minimum Age 16 for Learner's Permit
6-Month Holding Period Provision
50 Hours of Supervised Driving Provision
Nighttime Driving Restriction Provision
Passenger Restriction Provision
Age 18 for Unrestricted License

Impaired Driving:
Ignition Interlock Devices (IIDs) for All Offenders
Child Endangerment Law
Open Container Law

Distracted Driving:
All-Driver Text Messaging Restriction
GDL Cell Phone Restriction

Even with the future potential of driverless cars, a mixed fleet will be on the roads for many years to come. It is therefore imperative that the 16 state laws listed in the five sections be advanced to save lives, prevent injuries, and reduce health care and other costs. These 16 laws do not comprise the entire list of effective public policy interventions states should take to reduce motor vehicle deaths and injuries. Background information about each law is provided in the respective sections throughout the report. The statistical data on fatalities are based on 2017 Fatality Analysis Reporting System (FARS) data, except as otherwise indicated. *At the time of publication, injury data for 2017 was not available. Additionally, in 2016, NHTSA changed the crash and injury estimates to be based on the modernized data collection system. Due to that change, a direct comparison between injury and crash estimates from 2016 and newer data with older data cannot be made.*

States are rated only on whether they have adopted a specific law, not on other aspects or measures of an effective highway safety program. **A definition of each law as used by Advocates for purposes of this report can be found on pages 11-12.**

Each issue section has a state law chart, in alphabetical order, with each state's rating. The section ratings result in an overall rating, and overall state ratings on pages 39-50 fall into three groupings:

Green	Good—State is significantly advanced toward adopting all of Advocates' recommended optimal laws.
Yellow	Caution—State needs improvement because of gaps in Advocates' recommended optimal laws.
Red	Danger—State falls dangerously behind in adoption of Advocates' recommended optimal laws.

Note: *No state can receive the highest rating (Green) without having primary enforcement seat belt laws for both the front and rear seats. Additionally, no state that has repealed its all-rider motorcycle helmet law within the previous ten years can receive a green rating in this report.*

Definitions of the 16 Lifesaving Laws

Based on government and private research, crash data and state experience, Advocates has determined the traffic safety laws listed below are critical to reducing motor vehicle deaths and injuries. For the purposes of this report, states are only given credit if the state law meets the optimal safety provisions as defined below.
No credit is given for laws that fail to fully meet the criteria in this report. Also, no credit is given for laws that are subject to secondary enforcement or for GDL laws that permit an exemption based on driver education programs.

Occupant Protection

Primary Enforcement Front Seat Belt Law - Allows law enforcement officers to stop and ticket the driver for a violation of the seat belt law for front seat occupants. No other violation need occur first. (Ratings are based on front seat occupants only.) A state that does not have this law, in addition to a primary enforcement rear seat belt law, cannot receive a green overall rating.

Primary Enforcement Rear Seat Belt Law - Requires that all occupants in the rear seat of a vehicle wear seat belts and allows law enforcement officers to stop and ticket the driver for a violation of the seat belt law. No other violation need occur first. (Ratings are based on rear seat occupants only.) A state that does not have this law, in addition to a primary enforcement front seat belt law, cannot receive a green overall rating.

All-Rider Motorcycle Helmet Law - Requires all motorcycle riders, regardless of age, to use a helmet that meets U.S. DOT standards or face a violation. A state that has repealed an existing all-rider motorcycle helmet law in the previous 10 years cannot achieve a green overall rating.

Child Passenger Safety

Rear Facing Through Age 2 Law - Infants and toddlers should remain in a rear facing child restraint system in the rear seat from birth through age two at a minimum. After the child reaches the maximum weight and height limit for the rear facing safety seat, the child may be placed forward facing in a harness-equipped child restraint system. The child restraint system should be certified by the manufacturer to meet U.S. DOT safety standards.

Booster Seat Law - Requires that children who have outgrown the height and weight limit of a forward facing safety seat be placed in a booster seat that should be used until the child can properly use the vehicle's seat belt when the child reaches 57 inches in height and age eight. The booster seat should be certified by the manufacturer to meet U.S. DOT safety standards.

Teen Driving

GDL programs allow teen drivers to learn to drive under lower risk conditions, and consist of a learner's stage, then an intermediate stage, before being granted an unrestricted license. The learner's stage requires teen drivers to complete a minimum number of months of adult-supervised driving in order to move to the next phase and drive unsupervised. The intermediate stage restricts teens from driving in high-risk situations for a specified period of time before receiving an unrestricted license. Advocates recommends that the three-phase GDL program be no less than one year in duration, though this is not considered in the ratings. Advocates rates state GDL laws on six key safety components identified in research and data analysis:

Learner's Stage: Minimum Age 16 for Learner's Permit - A beginning teen driver is prohibited from obtaining a learner's permit until the age of 16. States have not been given credit if the law allows for a beginning driver to obtain a learner's permit before the age of 16.

Learner's Stage: 6-Month Holding Period Provision - A beginning teen driver must be supervised by an adult licensed driver at all times during the learner's stage. If the learner remains citation-free for 6 months, he or she may progress to the intermediate stage. States have not been given credit if the length of the holding period is less than 6 months, or if there is a reduction in the length of the holding period for drivers who take a driver education course.

Teen Driving (cont'd)

Learner's Stage: 50 Hours of Supervised Driving Provision - A beginning teen driver must receive at least 50 hours of behind-the-wheel training, 10 of which must be at night, with an adult licensed driver during the learner's stage. States have not been given credit if the number of required supervised driving hours is less than 50, does not require 10 hours of night driving, or if there is a reduction in the required number of hours of supervised driving (to less than 50 hours) for drivers who take a driver education course.

Intermediate Stage: Nighttime Driving Restriction Provision - Unsupervised driving should be prohibited from at least 10 p.m. to 5 a.m. States have not been given credit if the nighttime driving restriction does not span the entire 10 p.m. to 5 a.m. minimum time range for all days of the week.

Intermediate Stage: Passenger Restriction Provision - This provision limits the number of passengers who may legally ride with a teen driver without adult supervision. The optimal limit is no more than one non-familial passenger younger than age 21.

Age 18 for Unrestricted License - A teen driver is prohibited from obtaining an unrestricted license until the age of 18, and either the nighttime or the passenger restrictions, or both, must last until age 18 and meet the definition for an optimal law. States have not been given credit if teen drivers can obtain an unrestricted license before age 18.

Impaired Driving

Ignition Interlock Devices (IIDs) for All-Offenders - This law mandates the installation of IIDs on the vehicles of all convicted drunk driving offenders. Without an optimal IID law, a state is deemed red for the impaired driving rating.

Child Endangerment Law - This law either creates a separate offense or enhances an existing penalty for an impaired driving offender who endangers a minor. No credit is given if this law applies only to drivers who are under 21 years of age.

Open Container Law - This law prohibits open containers of alcohol in the passenger area of a motor vehicle. To comply with federal requirements, the law must: prohibit both possession of any open alcoholic beverage container and the consumption of alcohol from an open container; apply to the entire passenger area of any motor vehicle; apply to all vehicle occupants except for passengers of buses, taxi cabs, limousines or persons in the living quarters of motor homes; apply to vehicles on the shoulder of public highways; and, require primary enforcement of the law. State laws are counted in this report only if they are in compliance with the federal law and regulation, based on annual determinations made by U.S. DOT.

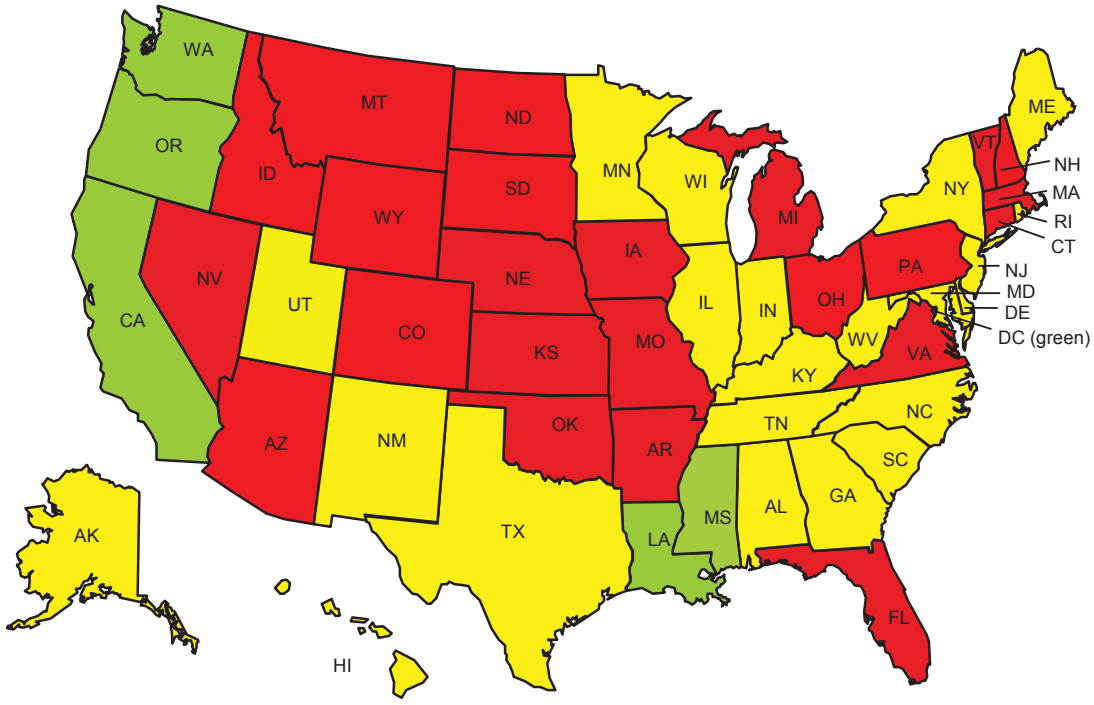
Distracted Driving

All-Driver Text Messaging Restriction - This law prohibits all drivers from sending, receiving, or reading a text message from any handheld or electronic data communication device, except in an emergency.

GDL Cell Phone Restriction - This restriction prohibits all use of cellular devices (hand-held, hands-free and text messaging) by beginning teen drivers, except in an emergency. States are only given credit if the provision lasts for the entire duration of the GDL program (both learner's and intermediate stages).

Occupant Protection

Primary Enforcement Front Seat Belt Law
Primary Enforcement Rear Seat Belt Law
All-Rider Motorcycle Helmet Law



State has all 3 laws, a primary enforcement front seat belt law, primary enforcement rear seat belt law and an all-rider motorcycle helmet law. *(5 states and DC)*

State has 2 of the 3 laws. *(22 states)*

State has 1 or none of the 3 laws. *(23 states)*

Note: No credit is given for laws that are subject to secondary enforcement. Please refer to page 11 for law definitions. See "States at a Glance", beginning on page 39 to determine which laws states lack.

Primary Enforcement Seat Belt Laws

Seat belt use, most often achieved by effective laws, is a proven lifesaver.

23,551 occupants of passenger vehicles were killed in motor vehicle crashes in 2017. Of the passenger vehicle occupant fatalities for which restraint use was known, 47% were not wearing seat belts. States with primary enforcement laws have higher seat belt use rates. Moreover, a study conducted by IIHS found that when states strengthen their laws from secondary to primary enforcement, driver death rates decline by an estimated 7%.

Needless deaths and injuries that result from non-use of seat belts cost society approximately $10 billion annually in medical care, lost productivity and other costs, according to NHTSA.

Nearly 15,000 lives were saved by seat belt use and over 2,500 more could have been saved with 100% belt use

Lives Saved in 2017 & Lives that Could Have Been Saved by 100% Seat Belt Use, By State, Age 5 and older (NHTSA, 2018)
States in red have laws that are subject only to secondary enforcement; NH has no law.

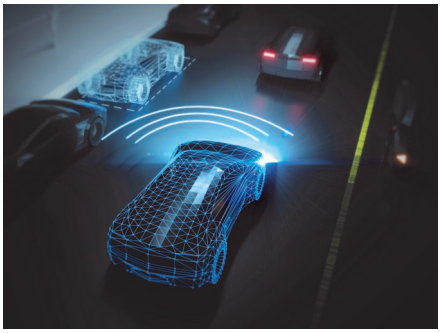
	Lives Saved	Could have been saved		Lives Saved	Could have been saved		Lives Saved	Could have been saved		Lives Saved	Could have been saved
AL	337	50	IL	483	50	MT	71	33	RI	25	5
AK	35	6	IN	436	49	NE	72	23	SC	387	53
AZ	281	69	IA	142	21	NV	78	14	SD	39	22
AR	214	72	KS	203	67	NH	23	19	TN	463	91
CA	1,488	89	KY	329	80	NJ	241	23	TX	1.725	227
CO	226	70	LA	278	64	NM	154	22	UT	96	21
CT	112	17	ME	68	14	NY	396	41	VT	28	7
DE	41	6	MD	209	27	NC	633	90	VA	323	88
DC	8	1	MA	61	45	ND	44	18	WA	283	22
FL	1,099	181	MI	510	47	OH	456	138	WV	128	24
GA	648	34	MN	192	23	OK	234	60	WI	289	51
HI	33	2	MS	283	111	OR	255	12	WY	40	13
ID	94	36	MO	309	103	PA	355	99	Total	14,957	2,550

This death toll has significant emotional and economic impacts on American families, but there are solutions at hand to address this public health epidemic — effective primary enforcement safety belt laws covering passengers in all seating positions.

All states except New Hampshire have an adult seat belt law.

Only 34 states and DC allow primary enforcement of their front seat belt laws. Among the states that have primary enforcement seat belt laws, only 19 and DC cover occupants in all seating positions (front and rear).

As driverless cars are deployed, strong seat belt laws will be especially critical. As more passengers move to the rear seat, as well as in the future when seat positioning may be reconfigured, the proper use of seat belts will be vital. A mixed fleet of traditional and driverless vehicles will be on the roads for decades to come. We must ensure all occupants are properly restrained during this risky, and likely elongated, transition period.



Primary Enforcement Seat Belt Laws

Lap-shoulder belts, when used, reduce the risk of fatal injury to front seat car occupants by 45% and the risk of moderate-to-critical injuries by 50%.

For light truck occupants, seat belts reduce the risk of fatal injury by 60% and moderate-to-critical injury by 65%.

- From 1975 to 2010, over 360,000 lives could have been saved and 5.8 million injuries could have been prevented if all occupants had worn seat belts, according to a NHTSA report. Over this same time period, nearly $1.1 trillion in economic costs have been needlessly incurred due to seat belt non-use.
- In fatal crashes in 2017, 83% of passenger vehicle occupants who were fully ejected from the vehicle were killed, according to NHTSA data. Further, only 1% of the occupants reported to have been using restraints were fully ejected, compared with nearly 30% of the unrestrained occupants.
- If every state with a secondary seat belt law upgraded to primary enforcement, about 1,000 lives and $4 billion in crash costs could be saved every year, according to NHTSA.
- Seat belt use rates increase from 10 to 15 percentage points when primary laws are passed, as experienced in a number of states.
- NHTSA reports that the average in-patient costs for crash victims who don't use seat belts are 55% higher than for those who do use them.
- Opponents often assert that highway safety laws violate personal choice and individual rights, overlooking the impact on society. In response, the U.S. District Court of Massachusetts stated in a decision, affirmed by the U.S. Supreme Court, that "from the moment of injury, society picks the person up off the highway; delivers him to a municipal hospital and municipal doctors; provides him with unemployment compensation if, after recovery, he cannot replace his lost job; and, if the injury causes disability, may assume the responsibility for his and his family's continued subsistence."
- According to a NHTSA study of the relationship between primary enforcement belt laws and minority ticketing, the share of citations for Hispanics and African Americans changed very little after states adopted primary enforcement belt laws. In fact, there were significant gains in seat belt use among all ethnic groups, none of which were proportionately greater in any minority group.

Rear Seat Safety

- Rear seat passengers are three times more likely to die in a crash if they are unbelted. Rear seat belt use was lower than front seat belt use in almost every state and was substantially lower in many states.
- According to IIHS, nearly 40% of people surveyed said they sometimes don't buckle up in the rear seat because there is no law requiring it. If there were such a law, 60% of respondents said it would convince them to do so.
- The majority of passengers in the rear seats of vehicles are teens and children, and studies have shown that seat belt use by teens is among the lowest of any segment of society.
- In 2017, the proportion of unrestrained passenger vehicle occupants killed who were seated in the front seat was 46%, compared to 56% of unrestrained passenger vehicle occupants killed who were seated in the rear seat, according to NHTSA.

All-Rider Motorcycle Helmet Laws

All-rider helmet laws increase motorcycle helmet use, decrease deaths and injuries, and save taxpayer dollars.

According to NHTSA, motorcycles are the most hazardous form of motor vehicle transportation.

5,172 motorcyclists were killed in 2017.

The number of motorcycle crash fatalities has more than doubled since a low of 2,116 in 1997.

In 2017: Where helmet use was known, 39% of all motorcyclists killed were not wearing a helmet. NHTSA estimates that helmets saved the lives of 1,870 motorcyclists and that over 750 more lives in all states could have been saved if all motorcyclists had worn helmets. Motorcyclists with observed use of U.S. DOT compliant helmets was 87% in states with all-rider helmet laws, compared to only 44% in other states. There were 10 times as many unhelmeted fatalities (1,777) in states without a universal helmet law compared to the number of fatalities (170) in states with a universal helmet law. These states were nearly equivalent with respect to total resident populations.

When crashes occur, motorcyclists need adequate head protection to prevent one of the leading causes of crash death and disability in America - head injuries. Studies have determined that helmets reduce head injuries without increased occurrence of spinal injuries in motorcycle crashes. NHTSA data shows that helmets reduce the chance of fatal injury by 37% for motorcycle operators and 41% for passengers. 80% of Americans favor state laws requiring all motorcyclists to wear helmets.

According to a 2012 GAO report, "laws requiring all motorcyclists to wear helmets are the only strategy proved to be effective in reducing motorcyclist fatalities."

Today, only 19 states and DC require all motorcycle riders to use a helmet.

Twenty-eight states have laws that cover only some riders (i.e., up to age 18 or 21). These age-specific laws are nearly impossible for police officers to enforce and result in much lower rates of helmet use.
Three states (IL, IA and NH) have no motorcycle helmet use law.

In 2018, there were attempts in nine states to repeal existing all-rider helmet laws, all of which were unsuccessful.

All-Rider Motorcycle Helmet Laws

Motorcycle helmets reduce the risk of head injury by 69% and reduce the risk of death by 42%.

- In 2010, the economic cost of motorcycle crashes was $12.9 billion and the total amount of societal harm was $66 billion, according to NHTSA. Additionally, helmets save $2.7 billion in economic costs and prevent $17 billion in societal harm annually.
- Per vehicle mile traveled, motorcyclist fatalities occurred almost 28 times more frequently than passenger car occupant fatalities in 2016.
- Motorcyclists represented 14% of the total traffic fatalities, yet accounted for only 3% of all registered vehicles in the U.S. in 2016, the latest year for which data is available.

A study in the American Journal of Surgery reported that after Michigan repealed its all-rider helmet law in 2012, the percentage of non-helmeted crash scene fatalities quadrupled. Further, after the repeal, trauma patients who were hospitalized with a head injury rose 14%.

- Motorcyclist fatalities of older Americans (aged 65 and older) increased by 140% over the ten year period, 2007 to 2016.
- The economic benefits of motorcycle helmet use are substantial, more than three and one-half times greater in states with all-rider helmet laws. In states that have an all-rider helmet law, cost savings to society from helmet use was $725 per registered motorcycle, compared to savings from helmet use of just $198 per registered motorcycle in states without a mandatory helmet use law, according to the CDC. States without an all-rider motorcycle helmet law realize some savings from voluntary helmet use and from partial laws that cover certain but not all riders.
- According to the American Academy of Pediatrics, in states with only youth-specific helmet laws, helmet use has decreased and youth mortality has increased. Serious traumatic brain injury among young riders was 38% higher in states with only age-specific laws compared to states with all-rider helmet laws.
- There is no scientific evidence that motorcycle rider training reduces crash risk and is an adequate substitute for an all-rider helmet law. In fact, motorcycle fatalities continued to increase even after a motorcycle education and training grant program included in federal legislation took effect in 2006.

Lives That Could Have Been Saved by Helmet Use

States Without All-Rider Motorcycle Helmet Laws & Lives that Could Have Been Saved in 2017 by 100% Helmet Use (NHTSA, 2018)

AK	2	ID	6	MN	15	RI	2
AZ	34	IL	42	MT	4	SC	38
AR	13	IN	40	NH	3	SD	4
CO	27	IA	13	NM	14	TX	94
CT	13	KS	13	ND	3	UT	10
DE	2	KY	22	OH	42	WI	17
FL	110	ME	6	OK	24	WY	5
HI	5	MI	27	PA	34	Total	686

Occupant Protection Laws Rating Chart

Primary Enforcement Front Seat Belt Law
Primary Enforcement Rear Seat Belt Law
All-Rider Motorcycle Helmet Law

Number of new occupant protection laws since January 2018: None.

	Primary Enforcement Front Seat Belt Law	Primary Enforcement Rear Seat Belt Law	All-Rider Motorcycle Helmet Law	Rating		Primary Enforcement Front Seat Belt Law	Primary Enforcement Rear Seat Belt Law	All-Rider Motorcycle Helmet Law	Rating
AL	●		●	●	MT				●
AK	●	●		●	NE			●	●
AZ				●	NV			●	●
AR	●			●	NH				●
CA	●	●	●	●	NJ	●		●	●
CO				●	NM	●	●		●
CT	●			●	NY	●		●	●
DE	●	●		●	NC	●		●	●
DC	●	●	●	●	ND				●
FL	●			●	OH				●
GA	●		●	●	OK	●			●
HI	●	●		●	OR	●	●	●	●
ID				●	PA				●
IL	●	●		●	RI	●	●		●
IN	●	●		●	SC	●	●		●
IA	●			●	SD				●
KS	●			●	TN	●		●	●
KY	●	●		●	TX	●	●		●
LA	●	●	●	●	UT	●	●		●
ME	●	●		●	VT			●	●
MD	●		●	●	VA			●	●
MA			●	●	WA	●	●	●	●
MI	●			●	WV	●		●	●
MN	●	●		●	WI	●	●		●
MS	●	●	●	●	WY				●
MO			●	●	Total	34+ DC	19+ DC	19+ DC	

STATUS OF STATE LAWS

16 states do not have primary enforcement seat belt laws for passengers, regardless of seating position.

No state adopted an all-rider motorcycle helmet law in 2018. *There were unsuccessful attempts to repeal all-rider motorcycle helmet laws in nine states.*

10 states have none of the three optimal laws. (AZ, CO, ID, MT, NH, ND, OH, PA, SD and WY).

13 states have only one of the three laws. (AR, CT, FL, IA, KS, MA, MI, MO, NE, NV, OK, VT and VA).

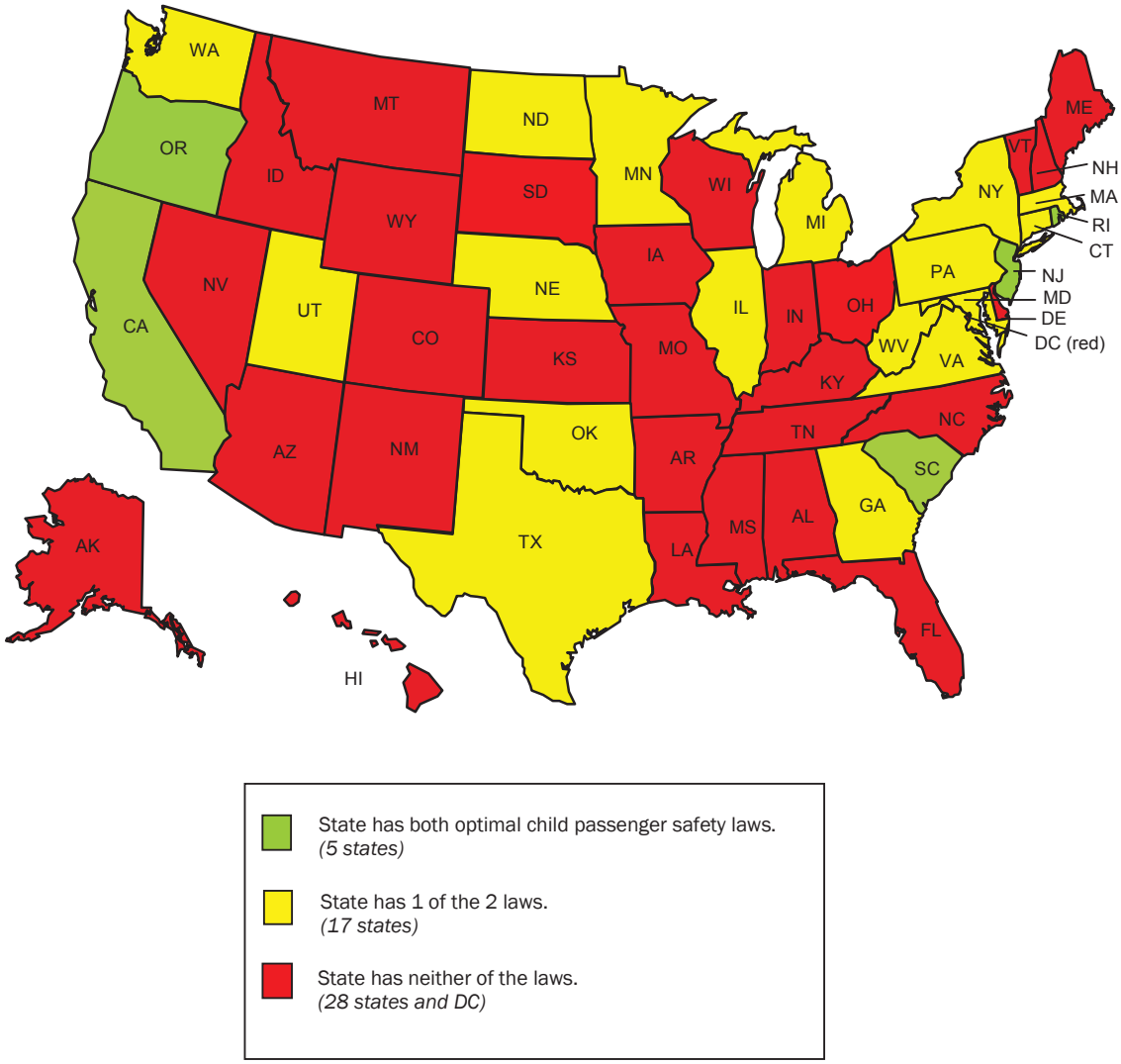
5 states and DC have all three laws (CA, LA, MS, OR and WA).

● = Optimal law
● = Good (3 optimal laws)
● = Caution (2 optimal laws)
● = Danger (1 or 0 optimal laws)

(No credit is given for laws that are subject to secondary enforcement)

Child Passenger Safety

Rear Facing Through Age 2 Law
Booster Seat Law



Note: No credit is given for laws that are subject to secondary enforcement. Please refer to page 11 for law definition. See "States at a Glance", beginning on page 39 to determine which laws the states lack.

Child Passenger Safety Laws

Motor vehicle crashes are a leading cause of death for American children age five to 14.

The best way to protect children from risks posed by the force of airbags is to place them in the back seat, restrained by a child safety seat, booster seat or safety belt, as appropriate.

An average of three children under age 14 were killed every day in motor vehicle crashes in the U.S. in 2017 -- amounting to a total of 1,147 fatalities. Further, there were 178,000 children under age 14 injured in crashes in 2015, the latest year for which data is available.

When children are properly restrained in a child safety seat, booster seat or safety belt, as appropriate for their age and size, their chance of being killed or seriously injured in a car crash is greatly reduced. According to NHTSA, when used properly, child safety seats reduce fatal injury by 71% for infants and 54% for toddlers in passenger cars. Nearly 325 lives were saved in 2017 by restraining children four and younger in passenger vehicles.

Advocates recommends a three component child passenger safety law that includes the following laws to adequately protect younger children:

Rear Facing Through Age 2
Infants and toddlers should remain in a rear facing child restraint system in the rear seat from birth through age two at a minimum. After the child reaches the maximum weight and height limit for the rear facing safety seat, the child may be placed forward facing in a harness-equipped child restraint system. The child restraint system should be certified by the manufacturer to meet U.S. DOT safety standards.
To date, only 12 states have enacted a rear facing through age 2 law.

Forward Facing Harness and Tether Seat
After the child reaches the maximum weight and height limit for their rear facing safety seat and is age two or older, the child may be turned forward facing in a harness-equipped child restraint. Children should remain in a harness-equipped restraint, certified by the manufacturer to meet U.S. DOT safety standards, until they meet the height and weight limit of the child restraint.
This law is not rated in this report.

Booster Seat
Requires that children who have outgrown the height and weight limit of a forward-facing safety seat be placed in a booster seat that should be used until the child can properly use the vehicle's seat belt when the child reaches 57 inches in height and age eight. The booster seat should be certified by the manufacturer to meet U.S. DOT safety standards.
To date, only 15 states have enacted an optimal booster seat law.

Child Passenger Safety Laws

Across all age groups, injury risk is lowest (less than 2%) when children are placed in an age-appropriate restraint in the rear seat.

According to the American Academy of Pediatrics (AAP), children younger than two years old are at an elevated risk of head and spine injuries in motor vehicle crashes because their heads are relatively large and their necks smaller with weak musculature. By supporting the entire torso, neck, head and pelvis, a rear facing car seat distributes crash forces over the entire body rather than focusing them only at belt contact points.

When a child is placed in a rear facing car seat through age two or older, they are provided with optimal support for their head and neck in the event of a crash.

After a child reaches age two, and the maximum height and weight limit for their rear facing safety seat, the child may be turned forward facing in a harness-equipped child restraint. Use of the top tether and LATCH system, when available, is preferred.

Children should remain in a forward facing harness and tether seat until they meet the height and weight limit of the restraint.

Note: This law is not rated in this report.

Booster seats are intended to provide a platform that lifts the child up off the vehicle seat in order to improve the fit of the child in a three-point adult safety belt. The seat should also position the lap belt portion of the adult safety belt across the child's hips or pelvic area. An improper fit of an adult safety belt can cause the lap belt to ride up over the stomach and the shoulder belt to cut across the neck, potentially exposing the child to serious abdominal and neck injury.

Using a booster seat with a seat belt instead of a seat belt alone reduces a child's risk of injury in a crash by 59%, according to Partners for Child Passenger Safety, a project of Children's Hospital of Philadelphia and State Farm Insurance.

According to IIHS, expanded child restraint laws covering children through age seven were associated with:

- 5% reduction in the rate of children with injuries of any severity;
- 17% reduction in the rate of children with fatal and incapacitating injuries;
- Children being three times as likely to be in appropriate restraints; and
- 6% increase in the number of booster-seat aged children seated in the rear of the vehicle where children are better protected.

94%

Of Americans support all states having booster seat laws protecting children age four through seven

Child Passenger Safety Laws Rating Chart

Number of new child passenger safety laws since January 2018: Three rear facing through age 2 laws (IL, NE, VA); No optimal booster seat law.

	Rear Facing Through Age 2 Law	Booster Seat Law	Rating		Rear Facing Through Age 2 Law	Booster Seat Law	Rating
AL			●	MT			●
AK			●	NE	●		●
AZ			●	NV			●
AR			●	NH			●
CA	●	●	●	NJ	●	●	●
CO			●	NM			●
CT	●		●	NY	●		●
DE			●	NC			●
DC			●	ND		●	●
FL			●	OH			●
GA		●	●	OK	●		●
HI			●	OR	●	●	●
ID			●	PA	●		●
IL	●		●	RI	●	●	●
IN			●	SC	●	●	●
IA			●	SD			●
KS			●	TN			●
KY			●	TX		●	●
LA			●	UT		●	●
ME			●	VT			●
MD		●	●	VA	●		●
MA		●	●	WA		●	●
MI		●	●	WV		●	●
MN		●	●	WI			●
MS			●	WY			●
MO			●	Total	12	15	

STATUS OF STATE LAWS

12 states have an optimal law requiring rear facing through age 2.

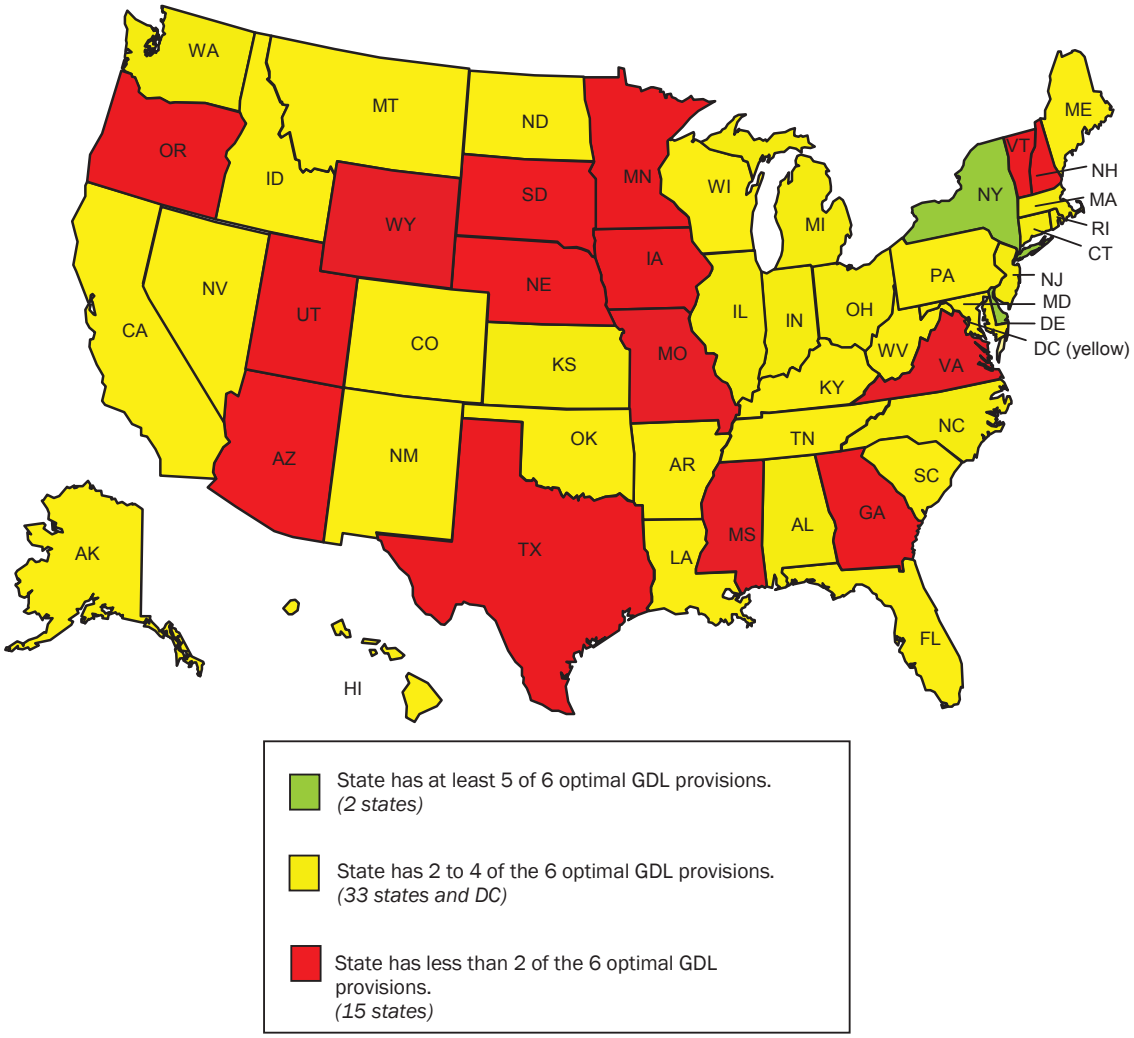
15 states have an optimal booster seat law.

● = Optimal law
● = Good (both laws)
● = Caution (one of the two laws)
● = Danger (neither law)

(No credit is given for laws that are subject to secondary enforcement)

Teen Driving:
Graduated Driver Licensing (GDL) Programs

Minimum Age 16 for Learner's Permit
6-Month Holding Period Provision
50 Hours of Supervised Driving Provision
Nighttime Driving Restriction Provision
Passenger Restriction Provision
Age 18 for Unrestricted License



Note: No credit is given for laws that are subject to secondary enforcement. Please refer to pages 11-12 for law definitions. See "States at a Glance", beginning on page 39 to determine which laws states lack.

Teen Driving Laws

Motor vehicle crashes are the number one killer of American teenagers.

Teen drivers are far more likely than other drivers to be involved in fatal crashes because they lack driving experience and tend to take greater risks.

According to NHTSA, 4,750 people were killed in crashes involving young drivers (age 15 - 20) in 2017.

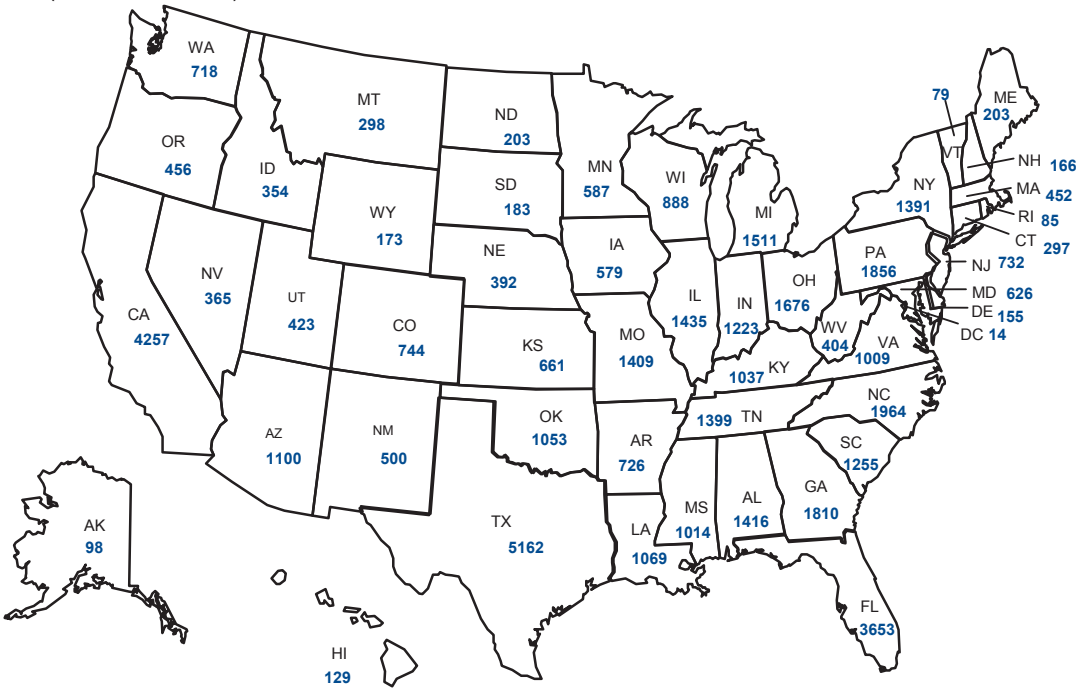
- 1,830 were young drivers;
- 979 were passengers of young drivers; and,
- 1,941 victims were pedestrians, pedalcyclists, and the occupants of the other vehicles involved in crashes with young drivers.

$40.8 billion

Estimated annual economic cost of police-reported crashes involving young drivers

GDL programs, which introduce teens to the driving experience gradually by phasing in full driving privileges over time and in lower risk settings, have been effective in reducing teen crash deaths. In this report, each of the six optimal GDL provisions is counted separately in rating the state.

The map below shows the number of fatalities caused by motor vehicle crashes involving drivers age 15 to 20 over the past decade (2008 to 2017).



No state has all of the optimal GDL provisions recommended in this report.

Teen Driving Laws

In states that have adopted GDL programs, studies have found overall crash reductions among teen drivers of about 10 to 30%.

- The crash rate for teen drivers (16- to 19-years) is three times that of drivers 20 and older, according to IIHS.
- Teenage motor vehicle crash deaths in 2016 occurred most frequently during the periods of 9 p.m. to 12 a.m. (18%), 6 p.m. to 9 p.m. (16%), and 3 p.m. to 6 p.m. and 12 a.m. to 3 a.m. (15% each). States with nighttime driving restrictions show crash reductions of up to 60% during restricted hours.
- Fatal crash rates are 21% lower for 15- to 17-year-old drivers when prohibited from having any teenage passengers in their vehicles, compared to when two or more passengers were permitted.
- For 16- and 17-year-old drivers, research has identified a 15% reduction in fatal crash rates was associated with a limit of no more than one teen passenger for 6-months or longer, when compared to no limit on the number of passengers.
- Delaying the minimum age for obtaining a learner's permit was associated with lower fatal crash rates for 15- to 17-year-olds combined; a 1-year delay (e.g., from age 15 to 16) reduced the fatal crash rate by 13%.
- Research has found that a minimum holding period of at least five months reduces fatal crash rates. Extending the holding period to 9 months to a year results in a 21% reduction in fatal crash rates.
- A 2010 survey conducted by IIHS shows that parents favor GDL laws that are as strict or even stricter than currently exist in any state. More than half think the minimum licensing age should be 17 or older.
- Almost three-quarters (74%) of teens approve of a single, comprehensive law that incorporates the key elements of GDL programs, according to a 2010 survey by the Allstate Foundation.

Older Novice Drivers: Studies have shown that GDL programs have contributed to a decline in teen driver crashes. However, older teen novice drivers are missing out on, yet still very much need, the safety benefits of GDL programs. These older teen drivers actually experience more crashes and near misses, though they are overconfident and perceive themselves as safer, according to a 2017 study by Liberty Mutual Insurance and SADD.

A study reported that the improvements are not as strong for 18- to 20-year-olds who have aged out of GDL. Research from Children's Hospital of Philadelphia Center for Injury Research and Prevention (CIRP) and AAA shows that, "about one-third of all drivers are not licensed by age 18, and by age 21, about 20% of all young adults still are not licensed."

GDL programs that extend beyond the mid-teen years cover a broader population and may experience additional safety benefits.

Teen Driving Laws Rating Chart

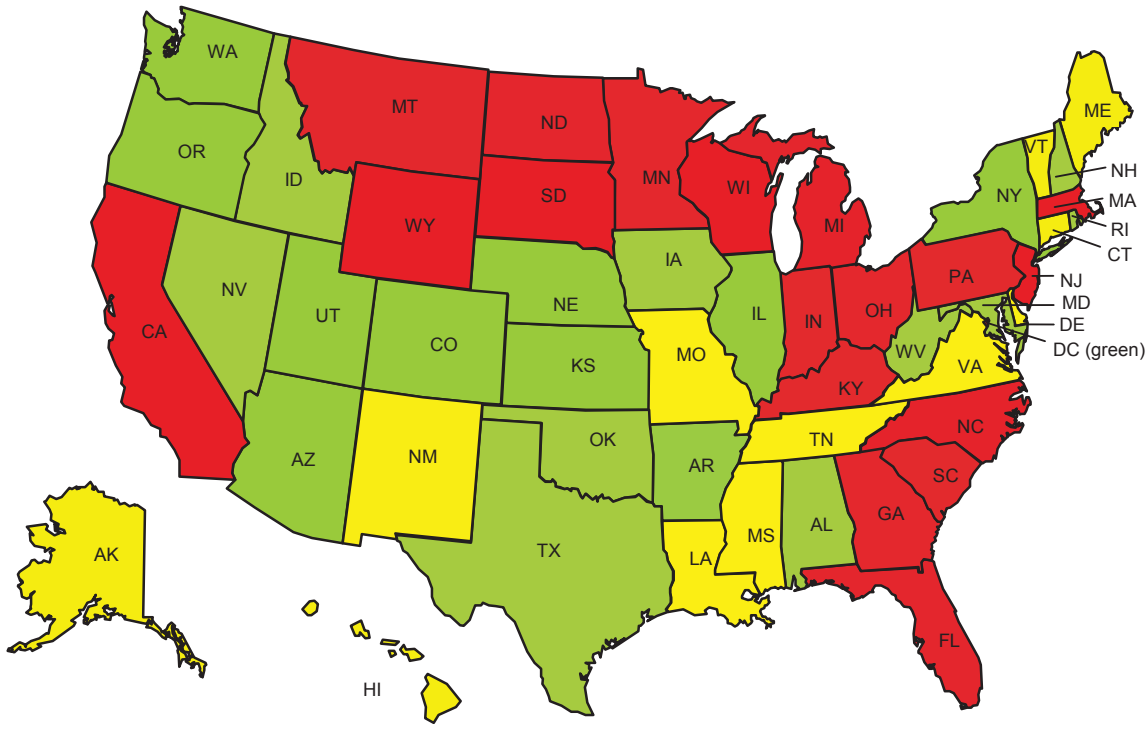
Number of new teen driving laws since January 2018: None.

	Minimum Age 16 for Learner's Permit	6-Month Holding Period Provision	50 Hours of Supervised Driving Provision	Nighttime Driving Restriction Provision	Passenger Restriction Provision	Age 18 Unrestricted License	Rating		Minimum Age 16 for Learner's Permit	6-Month Holding Period Provision	50 Hours of Supervised Driving Provision	Nighttime Driving Restriction Provision	Passenger Restriction Provision	Age 18 Unrestricted License	Rating
AL		●			●		🟡	MT		●	●				🟡
AK		●			●		🟡	NE		●					🔴
AZ		●					🔴	NV		●	●				🟡
AR		●			●	●	🟡	NH					●		🔴
CA		●	●				🟡	NJ	●	●			●	●	🟡
CO		●	●				🟡	NM		●	●		●		🟡
CT	●				●		🟡	NY	●	●	●	●	●		🟢
DE	●	●	●	●	●		🟢	NC		●	●	●	●		🟡
DC	●	●			●		🟡	ND		●		●			🟡
FL		●	●				🟡	OH		●	●		●		🟡
GA		●					🔴	OK		●	●	●	●		🟡
HI		●	●				🟡	OR		●					🔴
ID		●	●	●			🟡	PA	●	●	●				🟡
IL		●	●				🟡	RI	●	●	●		●		🟡
IN		●	●		●		🟡	SC		●		●			🟡
IA		●					🔴	SD				●			🔴
KS		●	●	●			🟡	TN		●	●		●		🟡
KY	●	●	●				🟡	TX		●					🔴
LA		●	●				🟡	UT		●					🔴
ME		●	●		●		🟡	VT		●					🔴
MD		●	●				🟡	VA		●					🔴
MA	●	●					🟡	WA		●	●				🟡
MI		●	●	●	●		🟡	WV		●		●			🟡
MN		●					🔴	WI		●			●		🟡
MS		●					🔴	WY			●				🔴
MO		●					🔴	Total	8+ DC	46+ DC	26	11	18+ DC	2	

● = Optimal law
🟢 = Good (At least 5 optimal provisions)
🟡 = Caution (Between 2 and 4 optimal provisions)
🔴 = Danger (Less than 2 optimal provisions)
(No credit is given for laws that are subject to secondary enforcement for any GDL provision that is exempted based on driver education)

Impaired Driving

Ignition Interlock Devices for All Offenders
Child Endangerment Law
Open Container Law



State has all 3 optimal impaired driving laws.
(20 states and DC)

State has optimal IID law in addition to one of either child endangerment or open container laws.
(12 states)

State has 1 or 0 optimal impaired driving laws. Further, any state without an optimal IID law is red, regardless of the number of other laws.
(18 states)

Note: No credit is given for laws that are subject to secondary enforcement. Please refer to page 12 for law definitions. See "States at a Glance", beginning on page 39, to determine which laws states lack.

Impaired Driving Laws

Impaired driving remains a substantial and serious safety threat, accounting for nearly a third of all traffic deaths in the U.S.

More than 10,000 people died in crashes involving drunk drivers in 2017.

An average of one alcohol-impaired driving fatality occurred every 48 minutes in 2017. This means that each day in America, 30 people are killed in drunk driving crashes on average. According to NHTSA data from 2010, alcohol-involved crashes (where the highest BAC was over .08%) resulted in $44 billion in economic costs and $201 billion in comprehensive costs to society. **Clearly, more still needs to be done to reduce the number of impaired drivers on our roads.** A common misconception is that most people who are convicted of their first drunk driving offense are social drinkers who made one mistake. However, data has shown that the average first offender will have driven drunk 87 times before getting arrested for the first time.

According to the CDC, adult drivers drank too much and got behind the wheel approximately 111 million times in 2016, which equates to more than **300,000 incidents of drinking and driving each day**. NHTSA reports that drivers with a BAC of .08% or higher involved in fatal crashes were nearly five times more likely to have a prior conviction for driving while intoxicated (DWI) than were drivers with no alcohol.

Impaired driving laws target a range of behavioral issues associated with alcohol consumption and operation of a motor vehicle on public roads. Federal leadership in critical areas such as impaired driving has resulted in the rapid adoption of lifesaving laws in states across the country. As a result of federal laws enacted with strong sanctions, all 50 states and DC have adopted .08% BAC laws, a national minimum drinking age of 21, and zero tolerance BAC laws for youth.

Drug-Impaired Driving:

As states continue to legalize marijuana, marijuana impaired driving and the impact on traffic safety raises serious concerns. While there is evidence that marijuana use impairs psychomotor and cognitive functions, its role in contributing to the occurrence of crashes remains unclear.

A study by IIHS which reviewed data from Colorado, Nevada, Oregon and Washington found the frequency of collision claims rose a combined 6% compared with neighboring states that have not legalized marijuana for recreational use. Still, definitive research linking impairment to specific blood levels of tetrahydrocannabinol (THC), the pharmacologically active ingredient in marijuana, remains inconclusive as does the link between the presence of a drug, driver impairment and crashes.

Research and data is needed to better understand the problem, and target solutions. Advocates encourages states to advance zero tolerance marijuana laws for youth and explicitly prohibit marijuana use while driving. Additionally, we urge increased funding for enforcement efforts, training and toxicology programs, and improved data collection and analysis.

Ignition Interlock Devices for All Offenders

A breath alcohol ignition interlock device (IID) is a mechanism similar to a breathalyzer which is linked to a vehicle's ignition system. Its purpose is to deter an individual who has a drunk driving conviction from driving the vehicle with a BAC that exceeds a specified level set by the state IID law.

Before the vehicle can be started, the driver must breathe into the device, and if the result is over the specified legal BAC limit, commonly .02% or .04%, the vehicle will not start. In addition, at random times after the engine has been started, the IID will require another breath sample. This prevents cheating where another person breathes into the device to bypass the system in order to enable an intoxicated person to get behind the wheel and drive. If a breath sample is not provided, or the sample exceeds the IID's preset BAC, the device will log the event, warn the driver and then set off an alarm (e.g., lights flashing, horn honking, etc.) until the ignition is turned off.

- Nearly eight in ten Americans support requiring ignition interlocks for all convicted driving under the influence (DUI) offenders, even if it is their first conviction, according to AAA.
- According to Mothers Against Drunk Driving (MADD), nationally, current IID laws have stopped more than 1.77 million attempts to drive drunk.
- A study from the University of Pennsylvania found that IIDs have reduced alcohol-involved crash deaths by 15%, and notes that the findings likely underestimate the effect of all-offender IID laws. The study also found that states with mandatory IID laws saw a decrease in deaths comparable to the estimated number of lives saved by frontal airbags.
- According to the CDC, when IIDs are installed, they are associated with a reduction in arrest rates for impaired driving of approximately 70%.
- NHTSA research shows that IIDs reduce recidivism among both first-time and repeat DWI offenders, with reductions in subsequent DWI arrests ranging from 50% to 90% while the interlock is installed on the vehicle.

Of offenders themselves who believe the IID was 82.9% effective in preventing them from driving after drinking.

Currently, IIDs are mandatory for all offenders, including first time offenders, in 32 states and DC.

Idaho and Iowa passed all-offender IID laws in 2018.

Credit is given only if a state's IID law applies to all offenders. These state laws offer the most effective means for denying drunk drivers the opportunity to get behind the wheel after having been convicted of a drunk driving offense. *As such, if a state does not have an optimal IID law, it receives a red rating for impaired driving.*

Child Endangerment Laws

In 2017, 220 children age 14 and younger were killed in crashes involving an alcohol-impaired driver. It is estimated that 46 million to 102 million drunk driving trips are made each year with children under the age of 15 in the vehicle, according to a national telephone survey sponsored by NHTSA in 1999.

Child endangerment laws either create a separate offense or enhance existing DWI and DUI penalties for people who drive under the influence of alcohol or drugs with a minor child in the vehicle. Drivers who engage in this conduct create a hazardous situation for themselves and for others on the road. They also put a child, who rarely has a choice as to who is driving, at risk of serious danger. Further, impaired drivers are less likely to ensure a child is properly restrained. Data has shown that in fatal crashes, impaired drivers restrained children only 18% of the time.

Child endangerment laws are enacted to encourage people to consider the consequences for younger passengers before they drive while impaired with a child in their vehicle. When properly defined and enforced, child endangerment laws act as a strong deterrent to protect children.

Currently, 47 states and DC have enacted child endangerment laws that create a separate offense or increase penalties for people who drive while impaired with children in their vehicle.

Open Container Laws

Studies have shown that open container laws are effective at deterring excessive drinking by drivers getting behind the wheel. States have also shown a significant decrease in hit-and-run crashes after adopting open container laws.

Federal legislation enacted in 1998 established a program to encourage states to adopt laws that ban the presence of open containers of any kind of alcoholic beverage in the entire passenger area of motor vehicles. To comply with the provisions in the law, a state open container law must:

- Prohibit both possession of any open alcoholic beverage container and consumption of any alcoholic beverage in a motor vehicle;
- Cover the entire passenger area of any motor vehicle, including unlocked glove compartments and accessible storage areas;
- Apply to all alcoholic beverages including beer, wine, and spirits;
- Apply to all vehicle occupants except for passengers of buses, taxi cabs, limousines or persons in the living quarters of motor homes;
- Apply to vehicles on the shoulder of public highways; and,
- Require primary enforcement of the law.

In an effort to encourage states to comply with the federal law, states that are non-compliant have 2.5% of certain federal highway construction funds diverted to highway safety programs that fund alcohol-impaired driving counter-measures and law enforcement activities. This federal requirement is known as “redirection,” and provides that states do not lose any funding, but some federal funds are diverted to other designated safety programs. Redirection has been largely ineffective as an incentive for encouraging lagging states to enact strong open container laws.

Currently, 38 states and DC have open container laws that meet federal requirements.

Impaired Driving Laws Rating Chart

Number of new impaired driving laws since January 2018: Two all-offender ignition interlock laws (ID, IA); No child endangerment law; and, No open container law.

	All-Offender Ignition Interlocks	Child Endangerment Law	Open Container Law	Rating		All-Offender Ignition Interlocks	Child Endangerment Law	Open Container Law	Rating
AL	●	●	●	●	MT		●	●	●
AK	●	●		●	NE	●	●	●	●
AZ	●	●	●	●	NV	●	●	●	●
AR	●	●	●	●	NH	●	●	●	●
CA		●	●	●	NJ		●	●	●
CO	●	●	●	●	NM	●		●	●
CT	●	●		●	NY	●	●	●	●
DE	●	●		●	NC		●	●	●
DC	●	●	●	●	ND		●	●	●
FL		●	●	●	OH		●		●
GA		●	●	●	OK	●	●	●	●
HI	●	●		●	OR	●	●	●	●
ID	●	●	●	●	PA		●	●	●
IL	●	●	●	●	RI	●	●	●	●
IN		●	●	●	SC		●	●	●
IA	●	●	●	●	SD			●	●
KS	●	●	●	●	TN	●	●		●
KY		●	●	●	TX	●	●	●	●
LA	●	●		●	UT	●	●	●	●
ME	●	●		●	VT	●		●	●
MD	●	●	●	●	VA	●	●		●
MA		●	●	●	WA	●	●	●	●
MI		●	●	●	WV	●	●	●	●
MN		●	●	●	WI		●	●	●
MS	●	●		●	WY		●		●
MO	●	●		●	Total	32+ DC	47+ DC	38+ DC	

STATUS OF STATE LAWS

30 states are missing one or more critical impaired driving law.

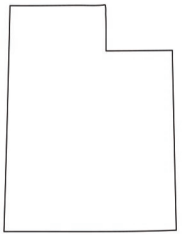
32 states and DC have optimal IID laws; 18 states do not.

● = Optimal law
● = Good (3 optimal laws)
● = Caution (2 optimal laws)
● = Danger (1 or 0 optimal laws; no IID)

(No credit is given for laws that are subject to secondary enforcement)

Safety Success in Utah

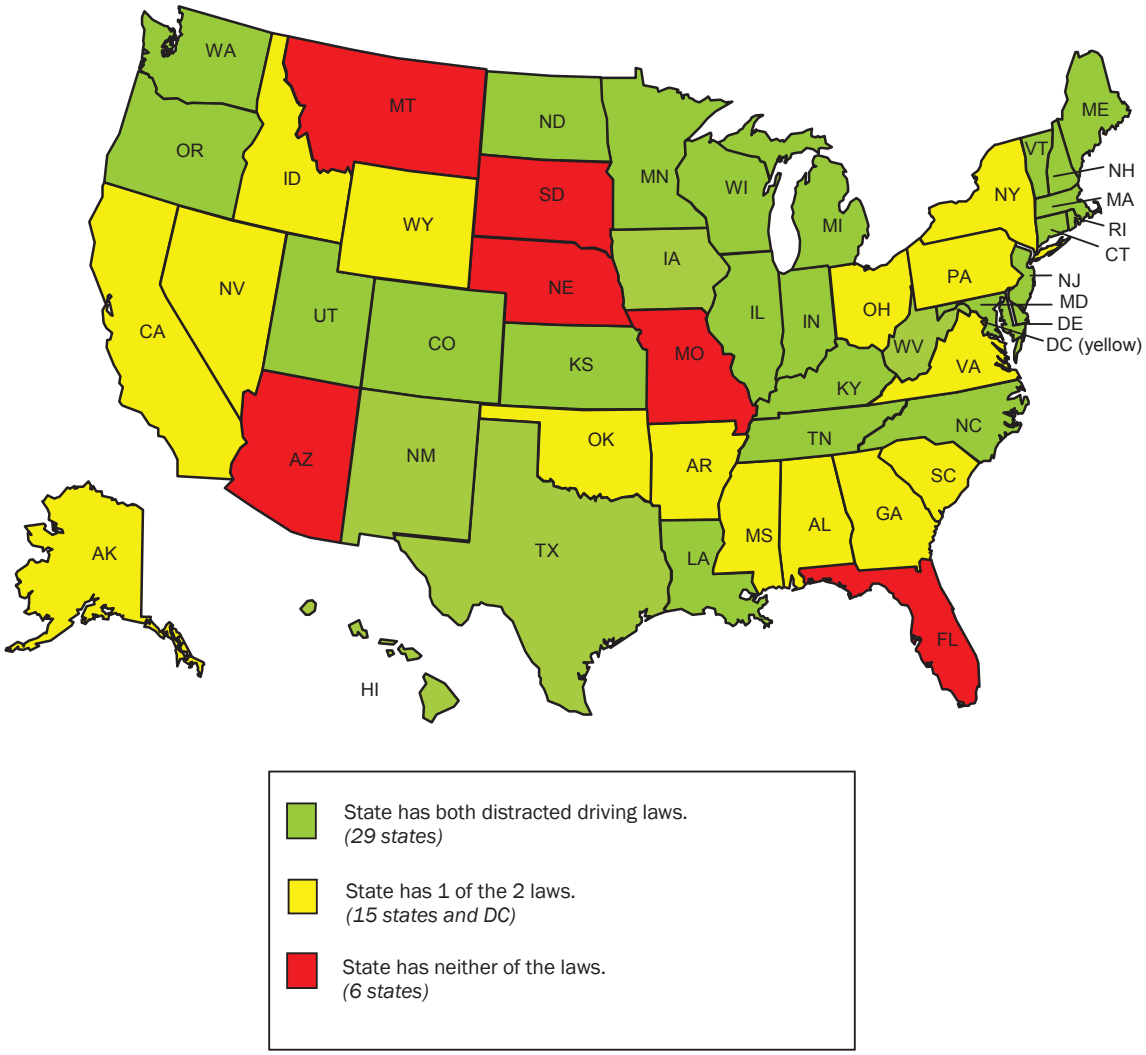
In 2018, a new law in Utah took effect making it the first state in the nation to lower the legal limit of alcohol-impaired driving to .05% BAC. While this is not a law rated in the Roadmap Report, Advocates commends Utah for this significant safety victory and encourages other states to enact similar legislation. Lowering the legal BAC limit is backed by scientific research, data and outcomes from over 100 countries that have already adopted this law and reduced impaired driving.



Note: The U.S. DOT has determined that the open container laws for HI, ME and OH are not in compliance with federal requirements. As such, they no longer receive credit for that law in the 2019 Roadmap Report.

Distracted Driving

All-Driver Text Messaging Restriction
GDL Cell Phone Restriction



Note: No credit is given for laws that are subject to secondary enforcement. Please refer to page 12 for law definition. See "States at a Glance", beginning on page 39 to determine which laws states lack.

Distracted Driving Laws

Research has shown that because of cognitive distraction, the behavior of drivers using mobile phones (whether hand-held or hands-free) is equivalent to the behavior of drivers at the threshold of the legal limit for alcohol.

According to NHTSA, in 2017 3,166 people were killed in crashes involving a distracted driver. There were 391,000 people injured in crashes involving a distracted driver in 2015, the latest year for which injury data is available. Additionally, crashes in which at least one driver was identified as being distracted imposed an economic cost of $40 billion in 2010. However, issues with underreporting crashes involving cell phones remain because of gaps in police crash report coding, database limitations, and other challenges. It is clear from an increasing body of research, studies and data that the use of electronic devices for telecommunications (such as mobile phones and text messaging), telematics and entertainment can easily distract drivers from the driving task.

Crash risk increases dramatically – as much as four times higher – when a driver is using a mobile phone, with no significant safety difference between hand-held and hands-free phones observed in many studies.

- According to NHTSA data, more than 8% of fatal crashes in 2017 were reported as distraction-affected crashes; however, as noted above, there are problems with underreporting.
- A 2016 survey conducted by State Farm found that accessing the internet, reading and updating social media networks on a cell phone while driving more than doubled from 2009 to 2016. Additionally about 10% of those surveyed in 2016 were also playing games on a cell phone while driving.
- Approximately 2 trillion text and multimedia messages are sent or received in the U.S. annually, on average.
- Four out of ten respondents claimed to have been hit or nearly hit as a result of a distracted driver, according to a survey by Nationwide Insurance.
- According to the NHTSA, the percentage of drivers visibly manipulating hand-held devices while driving increased by 250 percent between 2009 and 2016.
- Nine percent of drivers 15 to 19 years old involved in a fatal crash were reported distracted at the time of the crash in 2016, according to NHTSA. This age group has the largest proportion of drivers who were distracted.
- More than 80% of teens said they use their smartphones while driving, according to a report by State Farm.
- Nearly half (42%) of high school students who drove in the past 30 days reported sending a text or email while driving, according to a 2015 survey.
- Per a NHTSA survey, 92% of respondents supported state laws banning texting or emailing while driving.

Sending or receiving a text message causes the driver's eyes to be off the road for an average of 4.6 seconds. When driving 55 miles per hour, this is the equivalent of driving blind the entire length of a football field.

Currently, 43 states and DC ban text messaging for all drivers.

Given the growth of smart phone capability and usage and the broadening range of distracting electronic communication platforms (apps, social media, gaming, video chatting, etc.), Advocates will be redefining the optimal all-driver text messaging restriction in coming Roadmap Reports. This change will reflect the ongoing development of wireless communication technology, the growth of platforms and communication options, and concern about their use while driving.

30 states have a GDL cell phone restriction.

Distracted Driving Laws Rating Chart

Number of new distracted driving laws since January 2018: None.

	All-Driver Text Messaging Restriction	GDL Cell Phone Restriction	Rating		All-Driver Text Messaging Restriction	GDL Cell Phone Restriction	Rating
AL	●		🟡	MT			🔴
AK	●		🟡	NE			🔴
AZ			🔴	NV	●		🟡
AR	●		🟡	NH	●	●	🟢
CA	●		🟡	NJ	●	●	🟢
CO	●	●	🟢	NM	●	●	🟢
CT	●	●	🟢	NY	●		🟡
DE	●	●	🟢	NC	●	●	🟢
DC	●		🟡	ND	●	●	🟢
FL			🔴	OH		●	🟡
GA	●		🟡	OK	●		🟡
HI	●	●	🟢	OR	●	●	🟢
ID	●		🟡	PA	●		🟡
IL	●	●	🟢	RI	●	●	🟢
IN	●	●	🟢	SC	●		🟡
IA	●	●	🟢	SD			🔴
KS	●	●	🟢	TN	●	●	🟢
KY	●	●	🟢	TX	●	●	🟢
LA	●	●	🟢	UT	●	●	🟢
ME	●	●	🟢	VT	●	●	🟢
MD	●	●	🟢	VA	●		🟡
MA	●	●	🟢	WA	●	●	🟢
MI	●	●	🟢	WV	●	●	🟢
MN	●	●	🟢	WI	●	●	🟢
MS	●		🟡	WY	●		🟡
MO			🔴	Total	43+ DC	30	

STATUS OF STATE LAWS

43 states and DC have an optimal all-driver text messaging restriction.

3 states have yet to adopt an all-driver text messaging restriction (AZ, MO and MT) and 4 states have laws that are only subject to secondary enforcement (FL, NE, OH and SD).

30 states have an optimal GDL cell phone restriction.

● = Optimal law
🟢 = Good (both laws)
🟡 = Caution (one of the two laws)
🔴 = Danger (neither law)

(No credit is given for laws that are subject to secondary enforcement)

Note: In 2018, Georgia revised their distracted driving law. As such, they no longer qualify for an optimal GDL cell phone restriction in the 2019 Roadmap Report.

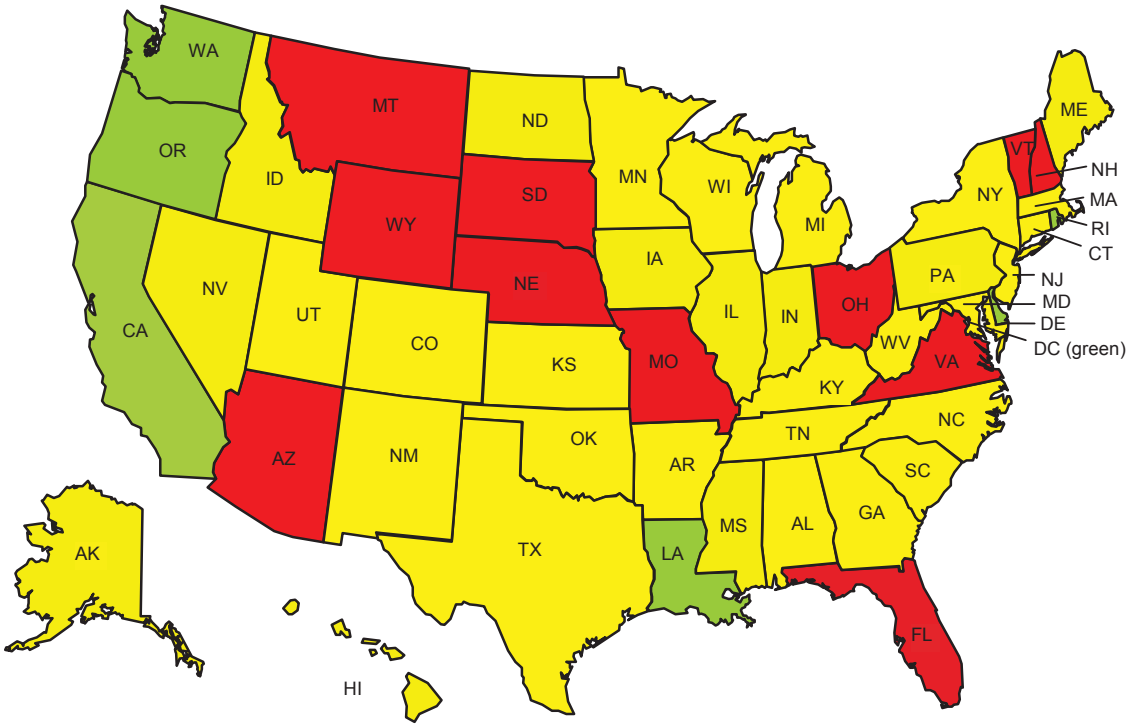
Overall State Ratings Based on Number of Laws

On the following pages, Advocates has given an overall rating to the states based on the number of laws in each state that are recommended in this report.

Credit is given *only* when the law meets Advocates' optimal law recommendations (see pages 11-12 for law definitions). No credit is given for laws that are subject to secondary enforcement or have a driver education exemption.

The overall rating takes into consideration whether a state has the recommended occupant protection laws. No state without a primary enforcement seat belt law covering passengers in all seating positions (front and rear), or that has repealed an existing all-rider motorcycle helmet law within the previous 10 years, is eligible for a green overall rating, no matter how many other laws it may have. This weighting is to emphasize the significance of comprehensive primary enforcement seat belt laws and all-rider motorcycle helmet laws in saving lives and reducing injuries.

Overall State Ratings Based on Number of Laws



Ratings Chart		
Color	**Number of Laws**	**Definition**
Green *(6 states and DC)*	11 to 16, with both (front and rear) primary enforcement seat belt laws, ***or*** 9 or more, with both (front and rear) primary enforcement laws and all-rider helmet law	State is significantly advanced toward adopting all of Advocates' recommended optimal laws
Yellow *(33 states)*	6 to 10, with both (front and rear) primary enforcement seat belt laws, ***or*** 7 and above, without both (front and rear) primary enforcement seat belt laws	State needs improvement because of gaps in Advocates' recommended optimal laws
Red *(11 states)*	Fewer than 7, without both (front and rear) primary enforcement seat belt laws	State falls dangerously behind in adoption of Advocates' recommended optimal laws

Overall State Ratings Based on Number of Laws

	Occ. Protection			CPS		Teen Driving Laws						Impaired Driving			Distraction			
	Primary Enforcement Front Seat Belt Law	Primary Enforcement Rear Seat Belt Law	All-Rider Motorcycle Helmet Law	Rear Facing Through Age 2 Law	Booster Seat Law	Minimum Age 16 for Learner's Permit	6 Mo. Holding Period Provision	50 Hours of Supervised Driving Provision	Nighttime Driving Restriction Provision	Passenger Restriction Provision	Age 18 Unrestricted License	All-Offender Ignition Interlocks	Child Endangerment Law	Open Container Law	All-Driver Text Messaging Restriction	GDL Cell Phone Restriction	Total Number of Laws 2019	Overall Safety Rating 2019
Alabama	●		●				●			●		●	●	●	●		8	●
Alaska	●	●					●			●		●	●		●		7	●
Arizona							●					●	●	●			4	●
Arkansas	●						●			●	●	●	●	●	●		8	●
California	●	●	●	●	●		●	●					●	●	●		10	●
Colorado							●	●				●	●	●	●	●	7	●
Connecticut	●			●		●				●		●	●		●	●	8	●
Delaware	●	●				●	●	●	●	●		●	●		●	●	11	●
District of Columbia	●	●	●			●	●			●		●	●	●	●		10	●
Florida	●						●	●					●	●			5	●
Georgia	●		●		●		●						●	●	●		7	●
Hawaii	●	●					●	●				●	●		●	●	8	●
Idaho							●	●	●			●	●	●	●		7	●
Illinois	●	●		●			●	●				●	●	●	●	●	10	●
Indiana	●	●					●	●		●			●	●	●	●	9	●
Iowa	●						●					●	●	●	●	●	7	●
Kansas	●						●	●	●			●	●	●	●	●	9	●
Kentucky	●	●				●	●	●					●	●	●	●	9	●
Louisiana	●	●	●				●	●				●	●		●	●	9	●
Maine	●	●					●	●		●		●	●		●	●	9	●
Maryland	●		●		●		●	●				●	●	●	●	●	10	●
Massachusetts			●		●	●	●						●	●	●	●	8	●
Michigan	●				●		●	●	●	●			●	●	●	●	10	●
Minnesota	●	●			●		●						●	●	●	●	8	●
Mississippi	●	●	●				●					●	●		●		7	●
Missouri			●				●					●	●				4	●
Montana							●	●					●	●			4	●

● = Optimal law

Overall State Ratings Based on Number of Laws

	Occ. Protection			CPS		Teen Driving Laws						Impaired Driving			Distraction			
	Primary Enforcement Front Seat Belt Law	Primary Enforcement Rear Seat Belt Law	All-Rider Motorcycle Helmet Law	Rear Facing Through Age 2 Law	Booster Seat Law	Minimum Age 16 for Learner's Permit	6 Mo. Holding Period Provision	50 Hours of Supervised Driving Provision	Nighttime Driving Restriction Provision	Passenger Restriction Provision	Age 18 Unrestricted License	All-Offender Ignition Interlocks	Child Endangerment Law	Open Container Law	All-Driver Text Messaging Restriction	GDL Cell Phone Restriction	Total Number of Laws 2019	Overall Safety Rating 2019
Nebraska			●	●			●					●	●	●			6	●
Nevada			●				●	●				●	●	●	●		7	●
New Hampshire										●		●	●	●	●	●	6	●
New Jersey	●		●	●	●	●	●			●	●		●	●	●	●	12	●
New Mexico	●	●					●	●		●		●		●	●	●	9	●
New York	●		●	●		●	●	●	●	●		●	●	●	●		12	●
North Carolina	●		●				●	●	●	●			●	●	●	●	10	●
North Dakota					●		●		●				●	●	●	●	7	●
Ohio							●	●		●			●			●	5	●
Oklahoma	●			●			●	●	●	●		●	●	●	●		10	●
Oregon	●	●	●	●	●		●					●	●	●	●	●	11	●
Pennsylvania				●		●	●	●					●	●	●		7	●
Rhode Island	●	●		●	●	●	●	●		●		●	●	●	●	●	13	●
South Carolina	●	●		●	●		●		●				●	●	●		9	●
South Dakota									●					●			2	●
Tennessee	●		●				●	●		●		●	●		●	●	9	●
Texas	●	●			●		●					●	●	●	●	●	9	●
Utah	●	●			●		●					●	●	●	●	●	9	●
Vermont			●				●					●		●	●	●	6	●
Virginia			●	●			●					●	●		●		6	●
Washington	●	●	●		●		●	●				●	●	●	●	●	11	●
West Virginia	●		●		●		●		●			●	●	●	●	●	10	●
Wisconsin	●	●					●			●			●	●	●	●	8	●
Wyoming								●					●		●		3	●
Total Number with Optimal Law	34+ DC	19+ DC	19+ DC	12	15	8+ DC	46+ DC	26	11	18+ DC	2	32+ DC	47+ DC	38+ DC	43+ DC	30		
Total Number Missing Optimal Law	16	31	31	38+ DC	35+ DC	42	4	24+ DC	39+ DC	32	48+ DC	18	3	12	7	20+ DC		

● = Optimal law

States at a Glance

Each state and DC are graphically represented in alphabetical order with the following information:

- The number of people killed in motor vehicle crashes in each state for the year 2017, as reported by NHTSA;
- The total number of fatalities over the past 10 years, as reported by NHTSA;
- The annual economic cost of motor vehicle crashes to the state, as reported in *The Economic and Societal Impact of Motor Vehicle Crashes, 2010* (NHTSA), (See chart on page 8);
- The state's background color represents its overall rating (Green, Yellow or Red) based on the chart on pages 37 and 38 of this report; and,
- A list of the optimal lifesaving laws that the state has not enacted, based on Advocates' definitions on pages 11 and 12 as discussed in this report.

States are credited with having laws only if their laws meet Advocates' optimal criteria (definitions on pages 11 and 12).

- **Only 6 states and DC** (CA, DE, LA, OR, RI and WA) **received a Green rating, showing significant advancement toward adopting all of Advocates' recommended optimal laws.**
- **33 states** (AL, AK, AR, CO, CT, GA, HI, ID, IL, IN, IA, KS, KY, ME, MD, MA, MI, MN, MS, NV, NJ, NM, NY, NC, ND, OK, PA, SC, TN, TX, UT, WV and WI) **received a Yellow rating, indicating that improvement is needed because of gaps in Advocates' recommended optimal laws.**
- **11 states** (AZ, FL, MO, MT, NE, NH, OH, SD, VT, VA and WY) **received a Red rating, indicating these states fall dangerously behind in adoption of Advocates' recommended optimal laws.**

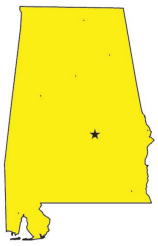
Abbreviation Key (Explanation for Laws Needed):

S = Highway Safety Law is **Secondary** Enforcement
(Advocates gives no credit for any law that is subject to secondary enforcement.)
DE = **Driver Education** exemption included in the GDL provision
(Advocates gives no credit for any GDL provision that is exempted based on driver education.)
Stronger = Indicates state has a law but it does not meet optimal criteria

Note: States without a primary enforcement seat belt law covering passengers in all seating positions (front and rear) or that have repealed an existing all-rider motorcycle helmet law within the previous 10 years are not eligible for a green rating, no matter how many other optimal laws they may have.

Alabama

2017 Fatalities: **948**
10-Year Fatality Total: **8,943**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.473 Billion**



Highway Safety Laws Needed in Alabama:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
GDL Cell Phone Restriction

Alaska

2017 Fatalities: **79**
10-Year Fatality Total: **665**
Annual Economic Cost Due to Motor Vehicle Crashes: **$592 Million**

Highway Safety Laws Needed in Alaska:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Open Container Law
GDL Cell Phone Restriction

Arizona

2017 Fatalities: **1,000**
10-Year Fatality Total: **8,631**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.183 Billion**

Highway Safety Laws Needed in Arizona:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Nighttime Restriction
GDL - Passenger Restriction
GDL - Age 18 Unrestricted License
All-Driver Text Messaging Restriction
GDL Cell Phone Restriction

Arkansas

2017 Fatalities: **493**
10-Year Fatality Total: **5,369**
Annual Economic Cost Due to Motor Vehicle Crashes: **$2.386 Billion**

Highway Safety Laws Needed in Arkansas:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL Cell Phone Restriction (Without S)

S = Secondary Enforcement

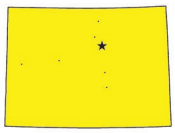
California

2017 Fatalities: **3,602**
10-Year Fatality Total: **31,378**
Annual Economic Cost Due to Motor Vehicle Crashes: **$19.998 Billion**

Highway Safety Laws Needed in California:
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
GDL Cell Phone Restriction (Without S)

Colorado

2017 Fatalities: **648**
10-Year Fatality Total: **5,151**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.173 Billion**



Highway Safety Laws Needed in Colorado:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

Connecticut

2017 Fatalities: **278**
10-Year Fatality Total: **2,624**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.880 Billion**

Highway Safety Laws Needed in Connecticut:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Booster Seat Law
GDL - 6-Month Holding Period (Without DE Exemption)
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Open Container Law

Delaware

2017 Fatalities: **119**
10-Year Fatality Total: **1,135**
Annual Economic Cost Due to Motor Vehicle Crashes: **$684 Million**

Highway Safety Laws Needed in Delaware:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Age 18 for Unrestricted License
Open Container Law

District of Columbia

2017 Fatalities: **31**
10-Year Fatality Total: **253**
Annual Economic Cost Due to Motor Vehicle Crashes: **$859 Million**

Highway Safety Laws Needed in Washington, D.C.:
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
GDL Cell Phone Restriction

S = Secondary Enforcement **DE** = Driver Education

Florida

2017 Fatalities: **3,112**
10-Year Fatality Total: **26,931**
Annual Economic Cost Due to Motor Vehicle Crashes: **$10.750 Billion**

Highway Safety Laws Needed in Florida:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
All-Driver Text Messaging Restriction (Without S)
GDL Cell Phone Restriction

Georgia

2017 Fatalities: **1,540**
10-Year Fatality Total: **13,306**
Annual Economic Cost Due to Motor Vehicle Crashes: **$10.787 Billion**

Highway Safety Laws Needed in Georgia:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
GDL Cell Phone Restriction

Hawaii

2017 Fatalities: **107**
10-Year Fatality Total: **1,073**
Annual Economic Cost Due to Motor Vehicle Crashes: **$577 Million**

Highway Safety Laws Needed in Hawaii:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Open Container Law

Idaho

2017 Fatalities: **244**
10-Year Fatality Total: **2,131**
Annual Economic Cost Due to Motor Vehicle Crashes: **$886 Million**

Highway Safety Laws Needed in Idaho:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
GDL Cell Phone Restriction

Illinois

2017 Fatalities: **1,097**
10-Year Fatality Total: **9,847**
Annual Economic Cost Due to Motor Vehicle Crashes: **$10.885 Billion**

Highway Safety Laws Needed in Illinois:
All-Rider Motorcycle Helmet Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

S = Secondary Enforcement

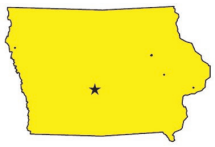
Indiana

2017 Fatalities: **914**
10-Year Fatality Total: **7,876**
Annual Economic Cost Due to Motor Vehicle Crashes: **$6.375 Billion**

Highway Safety Laws Needed in Indiana:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

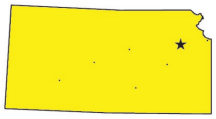
Iowa

2017 Fatalities: **330**
10-Year Fatality Total: **3,591**
Annual Economic Cost Due to Motor Vehicle Crashes: **$2.188 Billion**



Highway Safety Laws Needed in Iowa:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License

Kansas



2017 Fatalities: **461**
10-Year Fatality Total: **3,973**
Annual Economic Cost Due to Motor Vehicle Crashes: **$2.445 Billion**

Highway Safety Laws Needed in Kansas:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

Kentucky

2017 Fatalities: **782**
10-Year Fatality Total: **7,530**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.363 Billion**

Highway Safety Laws Needed in Kentucky:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Louisiana

2017 Fatalities: **760**
10-Year Fatality Total: **7,528**
Annual Economic Cost Due to Motor Vehicle Crashes: **$5.691 Billion**

Highway Safety Laws Needed in Louisiana:
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Open Container Law

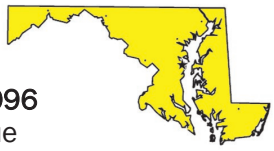
Maine

2017 Fatalities: **172**
10-Year Fatality Total: **1,540**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.303 Billion**

Highway Safety Laws Needed in Maine:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Open Container Law

Maryland

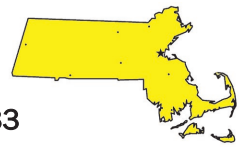
2017 Fatalities: **550**
10-Year Fatality Total: **5,096**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.476 Billion**



Highway Safety Laws Needed in Maryland:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

Massachusetts

2017 Fatalities: **350**
10-Year Fatality Total: **3,433**
Annual Economic Cost Due to Motor Vehicle Crashes: **$5.835 Billion**



Highway Safety Laws Needed in Massachusetts:
Primary Enforcement Seat Belt Law (Front & Rear)
Rear Facing Through Age 2 Law
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Michigan

2017 Fatalities: **1,030**
10-Year Fatality Total: **9,525**
Annual Economic Cost Due to Motor Vehicle Crashes: **$9.599 Billion**

Highway Safety Laws Needed in Michigan:
Primary Enforcement Seat Belt Law (Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Minnesota

2017 Fatalities: **357**
10-Year Fatality Total: **3,959**
Annual Economic Cost Due to Motor Vehicle Crashes: **$3.057 Billion**

Highway Safety Laws Needed in Minnesota:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Mississippi

2017 Fatalities: **690**
10-Year Fatality Total: **6,613**
Annual Economic Cost Due to Motor Vehicle Crashes: **$2.718 Billion**

Highway Safety Laws Needed in Mississippi:
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License
Open Container Law
GDL Cell Phone Restriction

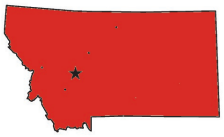
Missouri

2017 Fatalities: **930**
10-Year Fatality Total: **8,536**
Annual Economic Cost Due to Motor Vehicle Crashes: **$5.560 Billion**

Highway Safety Laws Needed in Missouri:
Primary Enforcement Seat Belt Law (Front & Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Open Container Law
All-Driver Text Messaging Restriction
GDL Cell Phone Restriction

Montana

2017 Fatalities: **186**
10-Year Fatality Total: **2,074**
Annual Economic Cost Due to Motor Vehicle Crashes: **$898 Million**



Highway Safety Laws Needed in Montana:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
All-Driver Text Messaging Restriction
GDL Cell Phone Restriction

Nebraska

2017 Fatalities: **228**
10-Year Fatality Total: **2,142**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.295 Billion**

Highway Safety Laws Needed in Nebraska:
Primary Enforcement Seat Belt Law (Front & Rear)
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement (Without DE Exemption)
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
All-Driver Text Messaging Restriction (Without S)
GDL Cell Phone Restriction (Without S)

S = Secondary Enforcement **DE** = Driver Education

Nevada

2017 Fatalities: **309**
10-Year Fatality Total: **2,842**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.978 Billion**

Highway Safety Laws Needed in Nevada:
Primary Enforcement Seat Belt Law (Front & Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Nighttime Restriction (Without S)
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
GDL Cell Phone Restriction

New Hampshire

2017 Fatalities: **102**
10-Year Fatality Total: **1,157**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.374 Billion**

Highway Safety Laws Needed in New Hampshire:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - 6-Month Holding Period
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License

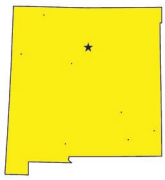
New Jersey

2017 Fatalities: **624**
10-Year Fatality Total: **5,830**
Annual Economic Cost Due to Motor Vehicle Crashes: **$12.813 Billion**

Highway Safety Laws Needed in New Jersey:
Primary Enforcement Seat Belt Law (Rear)
GDL - Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
Ignition Interlocks for All Offenders

New Mexico

2017 Fatalities: **379**
10-Year Fatality Total: **3,560**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.769 Billion**



Highway Safety Laws Needed in New Mexico:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Child Endangerment Law

New York

2017 Fatalities: **999**
10-Year Fatality Total: **11,309**
Annual Economic Cost Due to Motor Vehicle Crashes: **$15.246 Billion**

Highway Safety Laws Needed in New York:
Primary Enforcement Seat Belt Law (Rear)
Booster Seat Law
GDL - Age 18 for Unrestricted License (Without DE Exemption)
GDL Cell Phone Restriction

S = Secondary Enforcement **DE** = Driver Education

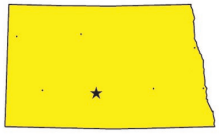
North Carolina

2017 Fatalities: **1,412**
10-Year Fatality Total: **13,402**
Annual Economic Cost Due to Motor Vehicle Crashes: **$7.909 Billion**

Highway Safety Laws Needed in North Carolina:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

North Dakota

2017 Fatalities: **115**
10-Year Fatality Total: **1,309**
Annual Economic Cost Due to Motor Vehicle Crashes: **$706 Million**



Highway Safety Laws Needed in North Dakota:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Ohio

2017 Fatalities: **1,179**
10-Year Fatality Total: **10,847**
Annual Economic Cost Due to Motor Vehicle Crashes: **$10.125 Billion**

Highway Safety Laws Needed in Ohio:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
Open Container Law
All-Driver Text Messaging Restriction (Without S)

Oklahoma

2017 Fatalities: **655**
10-Year Fatality Total: **6,887**
Annual Economic Cost Due to Motor Vehicle Crashes: **$2.910 Billion**

Highway Safety Laws Needed in Oklahoma:
Primary Enforcement Seat Belt (Rear)
All-Rider Motorcycle Helmet Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Age 18 for Unrestricted License
GDL Cell Phone Restriction

Oregon

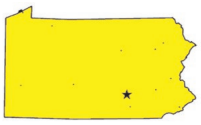
2017 Fatalities: **437**
10-Year Fatality Total: **3,826**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.768 Billion**

Highway Safety Laws Needed in Oregon:
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

S = Secondary Enforcement

Pennsylvania

2017 Fatalities: **1,137**
10-Year Fatality Total: **12,572**
Annual Economic Cost Due to Motor Vehicle Crashes: **$5.851 Billion**



Highway Safety Laws Needed in Pennsylvania:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Booster Seat Law
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
GDL Cell Phone Restriction

Rhode Island

2017 Fatalities: **83**
10-Year Fatality Total: **640**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.599 Billion**

Highway Safety Laws Needed in Rhode Island:
All-Rider Motorcycle Helmet Law
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License

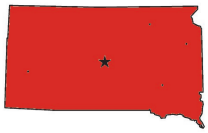
South Carolina

2017 Fatalities: **988**
10-Year Fatality Total: **8,886**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.045 Billion**

Highway Safety Laws Needed in South Carolina:
All-Rider Motorcycle Helmet Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
GDL Cell Phone Restriction

South Dakota

2017 Fatalities: **129**
10-Year Fatality Total: **1,283**
Annual Economic Cost Due to Motor Vehicle Crashes: **$720 Million**



Highway Safety Laws Needed in South Dakota:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - 6-Month Holding Period
(Without DE Exemption)
GDL - Supervised Driving Requirement
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
Child Endangerment Law
All-Driver Text Messaging Restriction (Without S)
GDL Cell Phone Restriction (Without S)

S = Secondary Enforcement **DE** = Driver Education

Tennessee

2017 Fatalities: **1,040**
10-Year Fatality Total: **10,002**
Annual Economic Cost Due to Motor Vehicle Crashes: **$5.667 Billion**

Highway Safety Laws Needed in Tennessee:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Open Container Law

Texas

2017 Fatalities: **3,722**
10-Year Fatality Total: **33,837**
Annual Economic Cost Due to Motor Vehicle Crashes: **$17.044 Billion**

Highway Safety Laws Needed in Texas:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Passenger Restriction (Without S)
GDL - Age 18 for Unrestricted License

Utah

2017 Fatalities: **273**
10-Year Fatality Total: **2,521**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.725 Billion**

Highway Safety Laws Needed in Utah:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Passenger Restriction (Without S)
GDL - Age 18 for Unrestricted License

Vermont

2017 Fatalities: **69**
10-Year Fatality Total: **651**
Annual Economic Cost Due to Motor Vehicle Crashes: **$538 Million**

Highway Safety Laws Needed in Vermont:
Primary Enforcement Seat Belt Law (Front & Rear)
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Child Endangerment Law

Virginia

2017 Fatalities: **839**
10-Year Fatality Total: **7,657**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.998 Billion**

Highway Safety Laws Needed in Virginia:
Primary Enforcement Seat Belt Law (Front & Rear)
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Stronger Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Open Container Law
GDL Cell Phone Restriction (Without S)

S = Secondary Enforcement

Washington

2017 Fatalities: **565**
10-Year Fatality Total: **4,937**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.469 Billion**

Highway Safety Laws Needed in Washington:
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Nighttime Restriction
GDL - Passenger Restriction
GDL - Age 18 for Unrestricted License

West Virginia

2017 Fatalities: **303**
10-Year Fatality Total: **3,172**
Annual Economic Cost Due to Motor Vehicle Crashes: **$1.482 Billion**

Highway Safety Laws Needed in West Virginia:
Primary Enforcement Seat Belt Law (Rear)
Rear Facing Through Age 2 Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement (Without DE Exemption)
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License

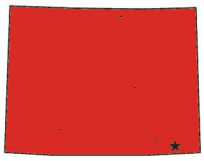
Wisconsin

2017 Fatalities: **613**
10-Year Fatality Total: **5,771**
Annual Economic Cost Due to Motor Vehicle Crashes: **$4.546 Billion**

Highway Safety Laws Needed in Wisconsin:
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - Supervised Driving Requirement
GDL - Stronger Nighttime Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders

Wyoming

2017 Fatalities: **123**
10-Year Fatality Total: **1,323**
Annual Economic Cost Due to Motor Vehicle Crashes: **$788 Million**



Highway Safety Laws Needed in Wyoming:
Primary Enforcement Seat Belt Law (Front & Rear)
All-Rider Motorcycle Helmet Law
Rear Facing Through Age 2 Law
Booster Seat Law
GDL - Minimum Age 16 for Learner's Permit
GDL - 6-Month Holding Period
GDL - Stronger Nighttime Restriction
GDL - Stronger Passenger Restriction
GDL - Age 18 for Unrestricted License
Ignition Interlocks for All Offenders
Open Container Law
GDL Cell Phone Restriction

DE = Driver Education

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Advocates would like to recognize the dedication and commitment of our Board of Directors. Their support and safety leadership have resulted in adoption of laws, regulations and programs that are saving lives, preventing injuries and containing costs resulting from motor vehicle crashes.

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ADVOCATES
FOR HIGHWAY
& AUTO SAFETY

Advocates for Highway and Auto Safety is an alliance of consumer, health and safety groups and insurance companies and agents working together to make America's roads safer.

Advocates encourages adoption of federal and state laws, policies and programs that save lives and reduce injuries. By joining its resources with others, Advocates helps build coalitions to increase participation of a wide array of groups in policy initiatives which advance highway and auto safety.

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ADVOCATES FOR HIGHWAY & AUTO SAFETY

Updates to 2019 Roadmap of State Highway Safety Laws Report
As of June 7, 2019

Arizona:	Enacted a primary enforcement all-driver texting ban.
Arkansas:	Enacted primary enforcement graduated driver licensing (GDL) cell phone ban.
Florida:	Enacted a primary enforcement all-driver texting ban.
Kentucky:	Enacted an all-offender ignition interlock device law.
Louisiana:	Enacted a requirement for children to remain in rear facing safety seats through age two or longer. The new law also extends booster seat use through age 9 but does not include a height requirement which is necessary to receive credit in the Report.
New Mexico:	Enacted a child endangerment law.
Washington:	Enacted a requirement for children to remain in rear facing safety seats through age two or longer and in booster seats through 57 inches in height.
Washington DC:	Enacted a requirement for children to remain in rear facing safety seats through age two or longer.

ATTACHMENT D

ADVOCATES FOR HIGHWAY & AUTO SAFETY

Public Opinion Polls Show Deep Skepticism About Autonomous Vehicles

2019 Reuters/Ipsos Poll [i]

- 64% of Americans said they would not buy a self-driving car.
- 67% said self-driving cars should be held to higher safety standards than traditional cars.

2019 AAA Poll[ii]

- 71% of U.S. drivers surveyed would be afraid to ride in a fully self-driving vehicle.

2018 SADD/State Farm Survey[iii]

- When asked to rate how safe they would feel riding in a fully autonomous vehicle on a one-to-five scale with one being least safe and five being most safe, 55.6% of high school students polled said one.

2018 Allianz Global Assistance Survey[iv]

- 57% of Americans say they are not very or not at all interested in utilizing self-driving/autonomous vehicles - up from 47% in 2017.
- When asked why they had a lack of interest in self-driving/autonomous cars, 71% of respondents cited safety concerns - up from 65% in 2017.
- The number of Americans who said they were not very or not at all confident that that self-driving/autonomous cars will develop safely enough to consider using jumped 12 percentage points from 36% in 2017 to 48% in 2018.

2018 Cox Automotive Survey[v]

- 45% of respondents believe roadways would be safer if all vehicles were fully autonomous – down from 63% who said so in 2016.
- 68% of consumers said they'd feel uncomfortable riding in an autonomous vehicle fully driven by a computer.
- 84% of consumers think people should always have the option to drive themselves even in an autonomous vehicle.
- 75% of respondents believe autonomous vehicles need real world testing in order to be perfected but:
    - 54% prefer that this testing take place in a different town or city from where they live;
    - 54% would not feel comfortable walking near roads where these tests take place; and,
    - 50% would not feel comfortable driving on the same roads where these tests take place.

2018 ORC International Poll[vi]

- 69% of respondents said they were concerned about sharing the road with driverless vehicles as motorists, bicyclists and pedestrians.
- 80% of Americans said that National Transportation Safety Board (NTSB) investigations of crashes involving cars equipped with self-driving technology will be helpful in identifying problems and recommending improvements.
- 84% of respondents believe the NTSB should complete these crash investigations before Congress acts on driverless car legislation.

2018 Public Policy Polling/Consumer Watchdog Poll[vii]

- When informed that Congress is currently considering legislation to allow more driverless cars onto America's roads, 75% of respondents from four states (FL, CA, MI, SD) agreed that we need to apply the brakes on driverless cars until the technology is proven safe.
    - 78% of voters agreed in Florida.
    - 71% agreed in California.
    - 74% agreed in Michigan.
    - 79% agreed in South Dakota.

- 76% of voters in Florida said they would not be likely to ride in a driverless car if it were available. 69% said so in California, 69% said so in Michigan and 77% said so in South Dakota.
- 84% of voters in Florida agreed that there should be regulations in place to help protect the public from public experiments with driverless cars. 87% agreed in California, 86% agreed in Michigan and 82% agreed in South Dakota.
- 80% of respondents agreed that federal and state governments, and not the driverless car industry, should regulate driverless vehicles for the safety of riders, pedestrians and other drivers.
- 56% of voters polled said they would be very concerned for their safety as a passenger, pedestrian, bicyclist or other driver on the road if a driverless car service were operating in their city.
- 56% of respondents said they were very concerned about the security of the data collected by driverless vehicles.
- 59% of voters polled said that they do not think that in their lifetimes, driverless cars will be safe enough to use.

2018 AAA Poll[viii]
- 73% of American drivers said they would be too afraid to ride in a fully self-driving vehicle, up from 63% in late 2017.
- 63% of U.S. adults said they would feel less safe sharing the road with a self-driving vehicle while walking or riding a bicycle.

2018 Gallup Poll[ix]
- 52% of Americans said that even after driverless cars are certified by government auto safety regulators, they would never want to use one.

2018 CARiD Survey[x]
- 53% of respondents said they would feel somewhat or very unsafe riding in an autonomous car.
- 66% of those polled said they think the U.S. government must be involved in regulating autonomous vehicles.
- 75% of poll respondents said that if given a choice, they would still rather drive than ride autonomously.

2018 Morning Consult Poll [xi]
- 50% of U.S. adults said that based on what they have seen, read or heard, they believe self-driving cars are somewhat less safe or much less safe than regular vehicles driven by humans.
- 57% of those polled said that based on what they have seen, read or heard, they have a not too favorable or not at all favorable view of self-driving cars.
- 38% of respondents said they would not ride in a self-driving car, versus 19% who said they would and 35% who said maybe in the future.

2018 Reuters/Ipsos Poll[xii]
- 67% of Americans polled said they were uncomfortable with the idea of riding in self-driving cars.

2018 Morning Consult Poll[xiii]
- 67% of adults polled were somewhat or very concerned about cyber threats to driverless cars.

2018 ORC International Poll[xiv]
- 64% of respondents said they were concerned about sharing the road with driverless cars.
- 63% said they are not comfortable with Congress increasing the number of driverless cars which do not meet existing federal vehicle safety standards and would be available for public sale.
- 75% of Americans said they weren't comfortable with manufacturers being able to disable vehicle controls, such as the steering wheel, and brake and gas pedals, when an AV is being operated by the computer.
- 73% of those polled support the development of U.S. Department of Transportation safety standards for new features related to the operation of driverless cars.
- 81% said they support U.S. Department of Transportation cybersecurity rules to protect against hacking of cars that are being operated by a computer.
- 84% of Americans said they support uniform U.S. Department of Transportation rules to ensure that the human driver is alert in order to safely take control from the computer.

- 80% of respondents support minimum performance requirements for computers that operate driverless cars similar to those for computers that operate commercial airplanes.
- 87% said it would be helpful to have a U.S. Department of Transportation website for consumers to look up information about the safety features of a new or used driverless car which they may be purchasing.

2017 Pew Research Center Survey[xv]
- 56% of U.S. adults surveyed said they would not ride in a self-driving vehicle.
- Of those who said they wouldn't, 42% of respondents said they didn't trust the technology or feared giving up control and 30% cited safety concerns.
- 30% of respondents think that autonomous vehicles will make roads *less* safe for humans if they become more widespread.
- 87% of respondents said they would favor a requirement that all driverless vehicles have a human in the driver's seat who can take control of the vehicle in case of an emergency.
- 53% of people surveyed said the development of driverless cars makes them feel very or somewhat worried.
- 52% said they would feel not too or not at all safe sharing the road with driverless passenger vehicles.
- 65% said they would feel not too or not at all safe sharing the road with driverless freight trucks.

2017 Morning Consult/POLITICO Poll[xvi]
- 51% of registered voters polled said they were not too likely or not likely at all to ride as a passenger in an AV.
- 61% of respondents said they aren't likely to buy self-driving cars once they become available.
- 35% of those polled said they believe AVs are less safe than the average human driver, compared to 22% who said they were safer than human drivers and 18% who said AVs were about the same level of safety as the average human driver. Over a quarter (26%) said they didn't know or had no opinion.

2017 Deloitte Study[xvii]
- 74% of U.S. consumers polled said they felt that fully autonomous vehicles will not be safe.
- 68% of respondents said an established track record of fully autonomous cars being safely used would make them more likely to ride in one.

2017 MIT AgeLab and New England Motor Press Association Survey[xviii]
- 13% of respondents said they would be comfortable with a fully autonomous car, down from 24% in a similar 2016 survey.
- 48% said they would never purchase a car that completely drives itself when asked about their interest in purchasing a self-driving car.
- Of those who said they wouldn't purchase a completely driverless car, 37% said they feared a loss of control, 29% said they don't trust it, 25% said they believe it will never work perfectly, and 21% said it's unsafe.

2017 AAA Survey[xix]
- 54% of U.S. drivers polled feel less safe at the prospect of sharing the road with a self-driving vehicle. Moreover, only 10% said they'd actually feel safer sharing the roads with driverless vehicles.
- 78% of Americans surveyed said they were afraid to ride in a self-driving vehicle.

2016 Kelley Blue Book Study[xx]
- 51% of respondents said they would prefer to have full control of their vehicle, even if it's not as safe for other drivers.
- 64% said they need to be in control of their vehicle.

2016 Morning Consult Poll[xxi]
- 43% of registered voters polled said autonomous cars are not safe. About one-third (32%) said they are safe, but that's not much more than the 25% who said they didn't know or didn't care.
- Majorities of voters found it unacceptable for a rider in a driverless car to text or email, read, watch movies or TV, be drunk or sleep.
- 76% said they were as worried about driverless cars operating on the same roads as cars driven by humans.
- When asked broadly about road safety, 80% said they were concerned. Likewise, 80% of respondents said they were concerned about glitches in an autonomous car's software.

Compiled by Advocates for Highway and Auto Safety, July 2019

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[i] Americans still don't trust self-driving cars, Reuters/Ipsos poll finds, April 2019
[ii] AAA Annual Automated Vehicle Survey, March 2019
[iii] SADD/State Farm, Teens' Thoughts Regarding the Future of Vehicle Technology, October 2018
[iv] Allianz Global Assistance, Sharing Economy Index, September 2018
[v] Cox Automotive, Evolution of Mobility: Autonomous Vehicles, August 2018
[vi] ORC International and Advocates for Highway and Auto Safety, CARAVAN Public Opinion Poll: Public to U.S. Senate: Pump the Brakes on Driverless Car Bill, July 2018
[vii] Consumer Watchdog, As Americans Hit the Road for Memorial Day, Consumer Watchdog Poll Finds Voters Want Congress to Apply the Brakes on Driverless Cars, May 2018
[viii] American Automobile Association (AAA), American Trust in Autonomous Vehicles Slips, May 2018
[ix] Gallup, Driverless Cars Are a Tough Sell to Americans, April 2018
[x] CARiD and SurveyMonkey, How do American feel about autonomous driving?, April 2018
[xi] Morning Consult, National Tracking Poll #180339, April 2018
[xii] Reuters and Ipsos, Reuters and Ipsos Poll poll of 2,592 participants conducted between Jan. 11-18, 2018, January 2018
[xiii] Morning Consult, National Tracking Poll #180108, January 2018
[xiv] ORC International and Advocates for Highway and Auto Safety, CARAVAN Public Opinion Poll: Driverless Cars January 2018
[xv] Smith, A. and Anderson, M., Pew Research Center, Automation in Everyday Life, October 2017
[xvi] Morning Consult and POLITICO, National Tracking Poll #170904, September 2017
[xvii] Deloitte Global Automotive Consumer Study, What's ahead for fully autonomous driving: Consumer opinions on advanced vehicle technology, January 2017
[xviii] Abraham, H., Reimer, B., Seppelt, B., Fitzgerald, C., Mehler, B. and Coughlin, J., MIT AgeLab and New England Motor Press Association (NEMPA), Consumer Interest in Automation: Preliminary Observations Exploring a Year's Change, May 2017
[xix] American Automobile Association (AAA), Vehicle Technology Survey – Phase II, March 2017
[xx] Kelley Blue Book and Cox Automotive, Future Autonomous Vehicle Driver Study, September 2016
[xxi] Nasr, A. and Johnson, F., Morning Consult, Voters Aren't Ready for Driverless Cars, Poll Shows, February 8, 2016

ATTACHMENT E

ADVOCATES FOR HIGHWAY & AUTO SAFETY

Key Priorities for Autonomous Vehicle (AV) Legislation

Include Level 2s as Appropriate

Mandatory Minimum Safety Standards and Requirements Needed

- Human-Machine-Interface (HMI) for driver engagement
- Cybersecurity standard
- Electronics safety standard
- Vision test for AVs to ensure that AVs can properly detect and respond to other roadway users and infrastructure
- Standardization and collection of crash data generated by AVs and requirement that it is accessible and made available to safety agencies and the public
- Functional safety standard wherein a manufacturer must state what a system can/cannot do
- Over-the-air updates to AV systems to ensure cybersecurity and that consumers are given timely and appropriate information on the details of the update
- Ensure the capability for a human to assume control of AV when it malfunctions or travels outside the operational design domain (ODD) (for those AVs that may require human to assume driving task)

Ensuring NHTSA Can Properly Regulate AVs

- Mandatory reporting by AV manufacturers to NHTSA of AV safety critical events
- Require AV manufacturers' submission to NHTSA (including but not limited to the following issue areas: system safety, data recording, cybersecurity, human-machine interface, crashworthiness, AV capabilities, post–crash behavior, design to comply with traffic laws and automation function)
    - Require documentation, and not descriptions, of submitted information
    - Make submission subject to significant civil penalties
    - Require submission be made public
    - Include Level 2 AVs in requirements as appropriate
- Prior to the issuance of AV safety standards by NHTSA, states must retain the legal authority to ensure public safety

Accessibility, Consumer Information and Safeguards Needed

- Ensure people with differing disabilities have access to ride-sharing AV fleets
- Consumer Information:
    - AV consumer database (language modeled after establishment of safercar.gov) to include, at a minimum: the level of automation, any exemptions from FMVSS, and the ODD which includes limitations and capabilities of each autonomous driving system
    - Rulemaking requiring consumers be given information about AV at point of sale and in owner's manual:
        - Interim final rule (IFR)
        - Level 2 AVs and used AVs subject to rule
        - Vehicle label requirements

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