



Planning Minnesota's
Transportation Future

MOTORIZED TRANSPORTATION SAFETY TREND ANALYSIS

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SUMMARY

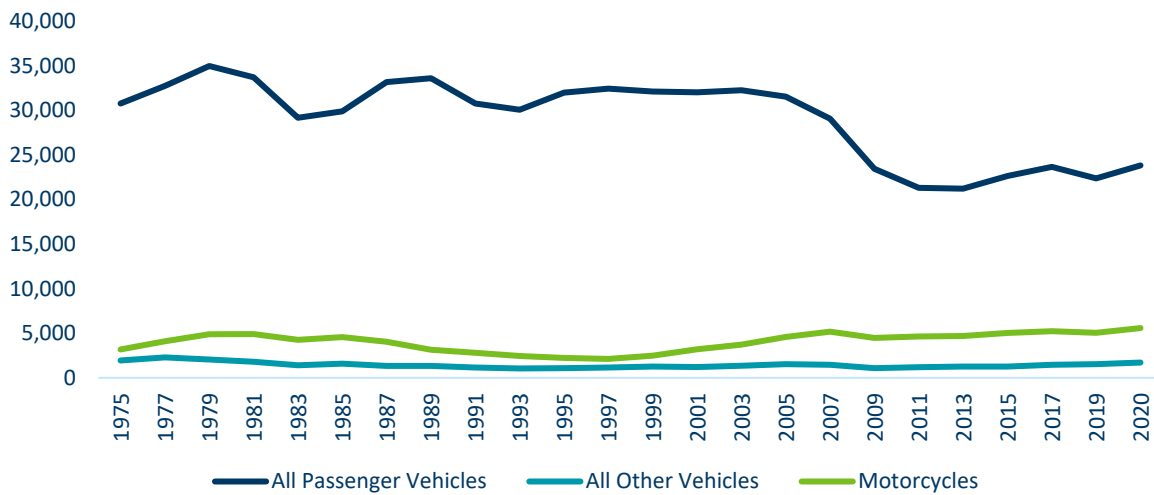
In 2021, the National Highway Traffic Safety Administration estimated that 42,915 people died in motor vehicle traffic crashes. This is an increase of approximately 10% from the 38,824 fatalities in 2020.¹ In Minnesota, 488 people died on the state's roadways in 2021, a 24% increase in traffic fatalities from 2020. The nation's transportation network has prioritized mobility over safety since cars first started sharing roadways with pedestrians, bicyclists, streetcars and horses over a century ago. For much of the twentieth century, deaths or serious injuries related to traffic crashes were seen as an unfortunate, but unavoidable, side effect of the automobile. However, this sentiment has started to change. The federal government began enacting requirements for vehicle safety starting in the 1970s. Initiatives like Vision Zero and Minnesota's Toward Zero Deaths program have grown over the previous two decades. These initiatives contend that even a single death on the nation's roadways is too many.

U.S. roadways have become safer even as they handle more traffic every year. More people are traveling, but deaths and injuries have fallen from their peak decades ago. For roadway users, deaths peaked in the 1970s (Figure 1). Note that the 2020 data is based on the most recent year available from Fatality Analysis Reporting System (FARS) Annual Report File (ARF). The data is subject to change when it is finalized the following year. The decline in deaths and serious injuries is the result of many efforts. Vehicle design changes have made for a safer driver experience. Improvements to roadway design and added laws and policies have improved traffic safety since the mid-twentieth century. Even with these improvements, however, driving a motor vehicle is still one of the main causes of unintentional death in the country. In the first half of life, more Americans die from unintentional injuries, which include motor vehicle crashes, than any other cause, include suicide, homicide, cancer, HIV or the flu.² Transportation safety must be improved until there are no deaths from motor vehicle crashes.

¹ U.S. Department of Transportation, "Newly Released Estimates Show Traffic Fatalities Reached a 16-Year High in 2021," May 17, 2022, <https://www.nhtsa.gov/press-releases/early-estimate-2021-traffic-fatalities>.

² Centers for Disease Control and Prevention, "Injuries and violence are leading causes of death," Injury Center, page last reviewed February 28, 2022, <https://www.cdc.gov/injury/wisqars/animated-leading-causes.html>.

Figure 1: National total deaths in motor vehicle crashes separated by vehicle type (1975 to 2020).³⁴



TRAFFIC CRASH TRENDS

Safety has generally increased on the nation’s roadways since the 1970s with less death and fewer serious injuries happening annually in both absolute and relative numbers, as seen in Figure 1. In 2020, there were 38,824 motor vehicle traffic fatalities in the United States, an increase of 2,469 from the 36,355 fatalities in 2019. The traffic fatality count in 2020 is the highest since 2007 (41,259) and is an increase after three consecutive years of declines from 37,806 in 2016.⁵ However, those without the protection of a car or truck have not seen the same safety improvements over time. Nationally, more motorcyclists lost their lives on roadways in 2020 than did in 1975, and more bicyclists were killed in 2020 than in 1976 (Figure 1). While pedestrian deaths have generally declined since 1979, deaths have increased 65% from a low in 2009. This trend is true in Minnesota as well, with motor vehicle deaths continuing to decline while pedestrian, bicycle and motorcycle deaths remain relatively flat. For example, in 2015 there were 41 pedestrian and 10 bicyclist fatalities compared to 55 pedestrian and 9 bicyclist fatalities according to preliminary 2021 crash data.

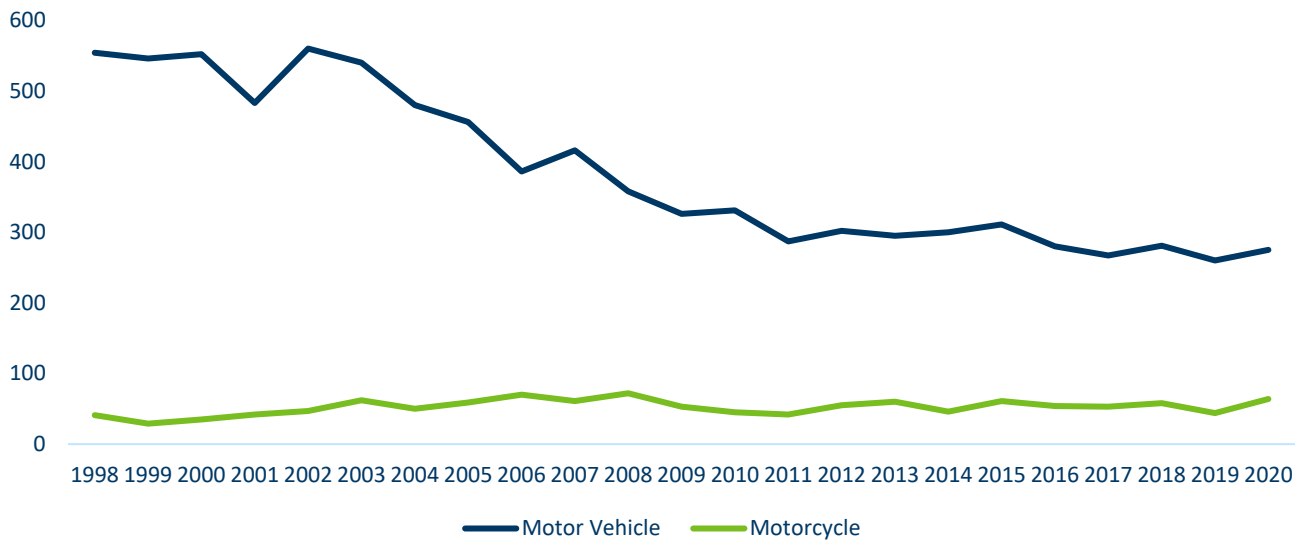
Many factors contributed both to the continued decline of motor vehicle occupants’ deaths and the lack of change for other road users. Vehicle design has become much safer, laws have passed mandating safer practices for vehicle occupants and highway design has improved safety outcomes, ensuring that crashes which may have resulted in a fatality in the past now result in injuries or less. Americans are also driving more large trucks and SUVs than ever before, and the proliferation of large personal trucks and SUVs can pose additional danger for those outside of the vehicles. Safety improvements should be lauded, but far too many Americans lives are taken prematurely while both within and outside of motor vehicles.

³ “Traffic Safety Facts Annual Report Tables,” National Highway Traffic Safety Administration, May 25, 2021, <https://cdan.nhtsa.gov/tsftables/tsfar.htm#>.

⁴ National Highway Traffic Safety Administration, “Occupants killed in fatal crashes,” Fatality Analysis Reporting System: 2006-2019 Final File and 2020 Annual Report File, <https://cdan.dot.gov/SASStoredProcess/guest>

⁵ U.S. Department of Transportation “Overview of Motor Vehicle Crashes in 2020,” National Highway Traffic Safety Administration, March 2022, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.

Figure 2: Minnesota traffic fatality trends from 1998 to 2020 for passenger vehicles and motorcycles.⁶⁷



MOTOR VEHICLE SAFETY

Motor vehicles have become much safer since the peak of traffic deaths in the 1970s. Vehicles no longer resemble the large, heavy, steel-clad machines built before the first oil crisis of 1973 when the United States faced an oil shortage from an embargo from oil-producing countries. Vehicles today are loaded with safety features, clad in more forgiving material and are physically larger than those built in the 1970s and before.

The embargo effects on supply and price of oil precipitated a change in personal vehicle size, weight and material led by Japanese automakers. This change alone does not account for the long-term drop in deaths, as average vehicle weight dropped significantly from 1975 to 1980 (20%) but has steadily increased since then. New vehicles today weigh roughly the same as they did in 1975.⁸ However, today, the weight of vehicles comes from different features than in 1975. In 1975 that weight largely came from the vehicle’s steel-clad body and engine but now that additional weight comes from advanced safety features, embedded technology and the vehicle’s overall size. Americans are purchasing more large trucks and SUVs than ever before, which has driven up the average weight of a new vehicle while making occupants safer in the event of a crash. As seen in Figure 3, sales of new light trucks (pickups and SUVs) surpassed passenger cars in 2010 and continue to make a larger share of new vehicle sales. In 2019, SUV sales reached a new high of 47% of all vehicle sales. By 2025 this number is predicted to be above 50%, while all together sales of SUVs, pickup trucks and vans will reach 78% of new vehicles sold.⁹ This trend of larger and more heavy vehicles has improved safety outcomes for the occupants of vehicles and is likely a factor in the continued improvement in motorized traffic safety outcomes.

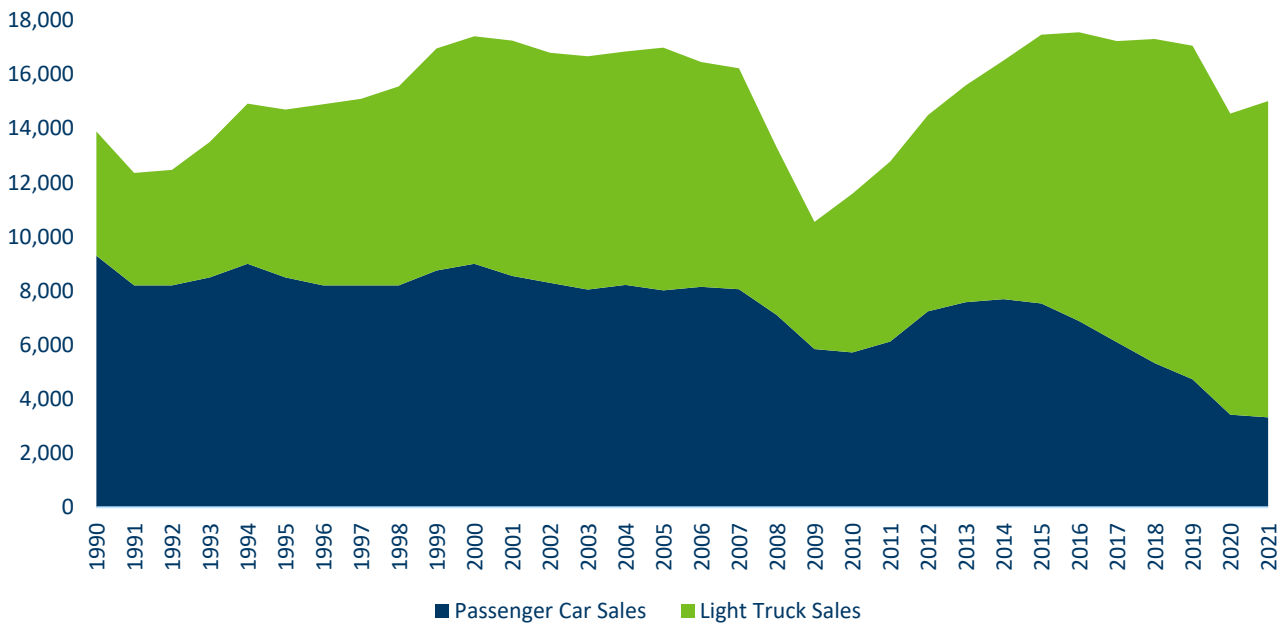
⁶ “Minnesota Traffic Crashes in 2018,” (Department of Public Safety, Office of Traffic Safety, 2018).

⁷ “Minnesota Traffic Crashes in 2020,” (Department of Public Safety, Office of Traffic Safety, 2020).

⁸ “Highlights of the Automotive Trends Report,” Automotive Trends Report (United States Environmental Protection Agency, January 6, 2021), <https://www.epa.gov/automotive-trends/highlights-automotive-trends-report#Highlight4>.

⁹ Tom Voelk, “Rise of S.U.V.s: Leaving Cars in Their Dust, With No Signs of Slowing,” The New York Times, May 21, 2020, <https://www.nytimes.com/2020/05/21/business/suv-sales-best-sellers.html>.

Figure 3: Total new passenger vehicle sales (in thousands of vehicles) from 1990 to 2021. “Light truck” includes SUVs, pickups and crossovers.¹⁰



Vehicle size and type have played a role in the survivability of a crash, but the last 50 years have seen major improvements in vehicle safety features as well. The 1970s brought child safety seats, side impact and roof protections to vehicles. In 1984, the front air bag was introduced. In the 1990s, child protection improved further and even more effective airbags were introduced. The 2000s saw advancements like electronic stability control, fuel integrity and tire pressure monitoring systems.¹¹ These features are being improved constantly by vehicle manufacturers and government agencies like the National Highway Traffic Safety Administration through safety testing. These safety improvements, the growth in vehicle weight and increased adoption of larger vehicles has made operating a motor vehicle safer than ever but this safety has come at the price of those outside of the vehicle, especially pedestrians. For more on pedestrian safety trends, see the Non-motorized Safety Trend Analysis.

VEHICLE CRASH AVOIDANCE

In addition to significant improvements in the manufacturing of vehicles with safety in mind, crash avoidance systems have also improved greatly. By 2018, 92.7% of all new vehicles sold featured some level of crash avoidance systems installed.¹² These systems aid the driver in a myriad of ways including automatic emergency braking systems which apply the vehicle’s breaking system if the driver does not in an emergency situation, forward collision warning systems, lane assist which helps the driver stay in their lane if it detects the vehicle drifting, adaptive headlights, back-up cameras, blind spot detectors and drowsiness detection systems all

¹⁰ “New and Used Passenger Car and Light Truck Sales and Leases,” Bureau of Transportation Statistics, accessed June 16, 2021, <https://www.bts.gov/content/new-and-used-passenger-car-sales-and-leases-thousands-vehicles>.

¹¹ U.S. Department of Transportation, “Timeline of Federal Motor Vehicle Safety Standards,” National Highway Traffic Safety Administration, date accessed May 12, 2022.

¹² “Advanced Driver-Assistance System Trends and Challenges,” Mitchell International, June 23, 2019, https://www.mitchell.com/mitchellnews/detail/articleid/3597/Advanced-Driver-Assistance-System-Trends-and-Challenges-#_ftn1.

augment a human's ability to drive a vehicle. These advances have made operating a vehicle safer than at any time in the past and have afforded drivers more opportunity to correct mistakes before they become a serious collision.

These technologies serve as precursors to more fully automated systems which will operate vehicles without any human input. Some new vehicles, like those from Tesla, already offer nominal self-driving ability but still are not able, legally or technologically, to offer fully automated systems. As fully automated systems build upon existing safety features, traffic safety will likely continue to improve. Fully automated systems provide reason to hope that, in the future, vehicle collisions could be reduced to nearly zero and provide the greatest potential for eliminating traffic deaths. For more discussion on this topic, see the [Connected and Automated Vehicles Trend Analysis](#).

MOTORCYCLES

Despite the dramatic improvements in car and truck safety, motorcycles have not seen the same improvement in deaths on the roadways in the previous 30 years, as shown in Figure 1. In fact, national motorcycle deaths have risen dramatically from a low of 2,000 deaths in 1997 to an average of 5,000 deaths per year in the last decade. Unlike cars and trucks, motorcycles are not required to use lifesaving technology and new motorcycles are generally not built with updated safety technology. Helmet laws were put into place in most states beginning in 1967, when the federal government mandated states enact laws in order to receive federal safety funding.¹³ These laws mandated helmet use when riding motorcycles for everyone because helmets have been proven to save lives and reduce head injuries. Motorcycle helmets are 37% (for riders) and 41% (for passengers) effective in preventing deaths.¹⁴ This would mean that for every 100 motorcycle riders killed in crashes while not wearing helmets, 37 of them could have been saved had all 100 worn helmets.¹⁵ After Congress repealed the state helmet law requirement in 1976, eight states fully repealed their helmet laws while 20 more, including Minnesota, greatly weakened their helmet laws.

Many of the states that weakened or eliminated universal helmet laws have seen fatality rates rise considerably. Texas repealed their helmet law in 1997 and saw a year over year increase in motorcycle deaths of 31%, while Kentucky saw a 50% increase and Louisiana saw a 100% increase after repealing their own helmet laws.¹⁶ Minnesota repealed its universal helmet law in 1977 and soon after saw the highest annual amount of deaths on record for motorcycles with 121 deaths in 1980. Deaths fell after this to a low of 29 in 1999 but have subsequently risen back to an average of 55 deaths per year from 2015 to 2020 (Figure 2). As of 2020, 19 states and the District of Columbia required all motorcyclists to wear helmets. Twenty-eight states required only a subset of riders or motorcycle passengers to wear helmets. Illinois, Iowa and New Hampshire have no motorcycle helmet requirements.¹⁷ In states without universal helmet laws, 57% of motorcyclists killed in 2020 were not

¹³ "Motorcyclists," Governors Highway Safety Association, accessed June 18, 2021, <https://www.ghsa.org/state-laws/issues/Motorcyclists>.

¹⁴ National Highway Traffic Safety Administration. Motorcycles (Traffic Safety Facts. Report No. DOT HS 813 112). U.S. Department of Transportation, Washington, DC; 2021, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813112>external icon.

¹⁵ U.S. Department of Transportation, "Motorcycles," National Highway Traffic Safety Administration, May 2022, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813306>.

¹⁶ Ibid.

¹⁷ U.S. Department of Transportation, "Traffic Safety Facts – Motorcycle Helmet Use in 2020," National Highway Traffic Safety Administration, June 2021, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813143>.

wearing helmets, as compared to 11% in states with universal helmet laws.¹⁸ The data makes it clear that helmets save lives, but compared to federal mandates related to car safety, like seatbelts or airbags, universal helmet laws have proven to be more difficult to mandate. Until these laws are enacted, motorcycle deaths will likely not see significant reduction.

ROADWAY DESIGN

For many decades, roadways were designed in the United States to do two things: maximize the speed of motor vehicles and the throughput of motor vehicles on that roadway.¹⁹ Postwar America saw a boom in the construction of new freeways, expanded highways, faster vehicles and new neighborhoods and businesses which catered exclusively to the automobile. This change in roadway design and priority simultaneously caused a radical shift in land use as well, which led to a decline in active transportation in the United States. The percent of Americans living in suburbs grew from 20% of Americans in 1950 to over 50% today, which corresponds with increased car use and decreased walking and bicycling.²⁰ In the seven-county metro area, 75% of the region's population lives outside of the core cities.

Early roadway designs centered on reducing conflicts and congestion as more Americans began to alter their daily commute around the automobile. This radical shift in both living patterns and mode of travel raced ahead of safety efforts in the 1950s, 60s and 70s and traffic fatality rates peaked, as seen in Figure 1. These surging numbers necessitated safety advances and as automotive firms focused on new safety features for vehicles, the nation's transportation agencies also began to shift some focus to new, safer designs for America's roadways. This additional focus has led to the lower levels of motorist deaths in recent decades, but still tens of thousands of Americans die every year on roadways. While the U.S. traffic death rate has fallen, peer nations where less of the population lives in car dependent suburbs and rural areas and roadway designs are less likely to maximize vehicle speed and have seen fatality rates fall much faster than in the United States. This singular focus has begun to change much more in transportation agencies around the country, however and vehicle speed and congestion mitigation has taken a somewhat diminished role in highway planning. Local governments also are now dedicating far more funding for making roadway investments intended to reduce the speed of motor vehicles rather than increase them, ultimately making roads safer for all users and not just motorists.

ROADWAY TREATMENTS

Traditional safety measures were aimed toward reducing conflicts on roadways by altering roadway geometry. Some examples of altered geometry include reducing curves in roadways, eliminating conflict points on roadways like intersections or driveways, capacity enhancements to reduce congestion related incidents and physical barriers along roadways like guardrails. These treatments have made driving generally safer, as seen in Figure 4. Total crashes on Minnesota roads have declined by 45% from 1980 to 2020 while injuries fell by 55% and deaths by 54%. This indicates that not only have automobile crashes declined in total, but they are also considerably less

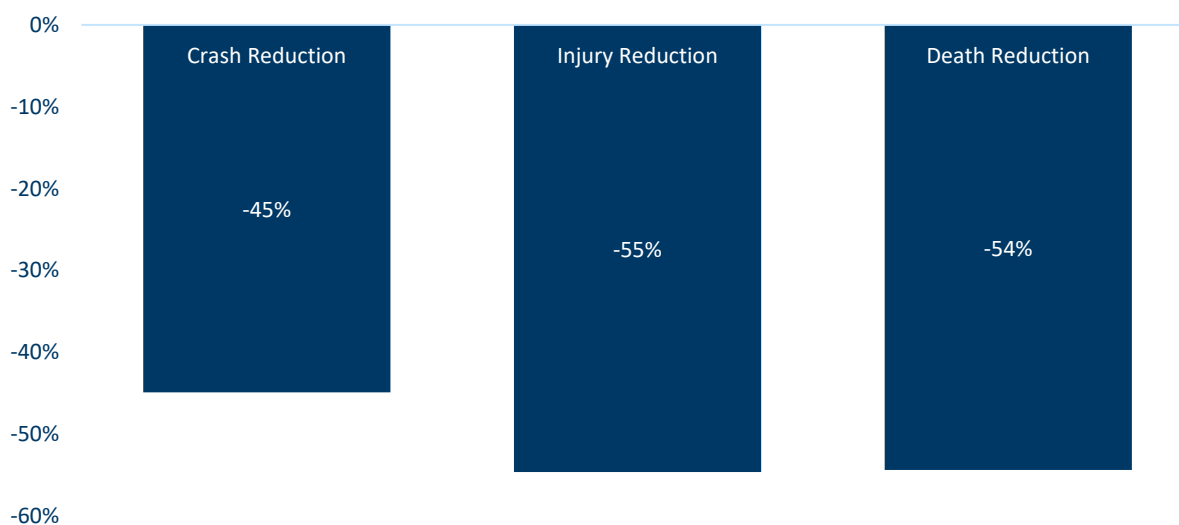
¹⁸ U.S. Department of Transportation, "Motorcycles," National Highway Traffic Safety Administration, May 2022, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813306>.

¹⁹ Transportation for America, "Safety over speed: Safe streets are climate-friendly streets," T4America Blog, November 8, 2019, <https://t4america.org/2019/11/08/safety-over-speed-safe-streets-are-climate-friendly-streets/>.

²⁰ Ross C. Bowman, Tegan K. Boehmer and Douglas A. Luke, "Declining Rates of Physical Activity in the United States: What are the Contributions?" (Annual Review Public Health, 2005).

deadly over the last 30 years. This trend has slowed over the previous decade, with total crashes increasing and motorist deaths declining at a much slower rate. 2021, however, represented a change in trend and was the deadliest year on Minnesota’s roads in over a decade. A preliminary report from the Minnesota Department of Public Safety states that in 2021, 488 people lost their lives due to motor vehicle crashes compared to 394 fatalities in 2020, a 24% increase. Note that 2021 numbers are preliminary and are subject to change when the Office of Traffic Safety publishes the 2021 Crash Facts report. Strategies to eliminate conflicts and introduce geometries that speed vehicles up seem to have reached a point of diminishing returns because crashes are inherently more severe at higher speeds. Many new safety strategies thus involve slowing vehicles to lower the severity of crashes.

Figure 4: Reduction of crashes, injuries and deaths on Minnesota roadways from 1980 to 2020.²¹



ROUNDBABOUTS

Roundabouts are common in other countries, especially in Western Europe. Roundabouts have been found to both lower the incidence of severe or fatal crashes and lower congestion from signalized intersections. Studies conducted by the Federal Highway Administration (FHWA) and the Insurance Institute for Highway Safety (IIHS) have found that roundabouts greatly reduce severe crashes which result in injury and deaths and reduce all collisions and pedestrian collisions considerably (Figure 5).²² Since the first roundabout was built in Minnesota in 1995, there are nearly 200 roundabouts that have been installed throughout the state, and more are being built every year. Roundabouts in Minnesota have shown reductions in crash rates consistent with those observed by the FHWA.²³ Roundabouts also reduce traffic congestion by better improving traffic flow from a traditional signalized intersection.²⁴ Roundabouts will likely continue to proliferate statewide and will lead to safer and steadier traffic throughout the state.

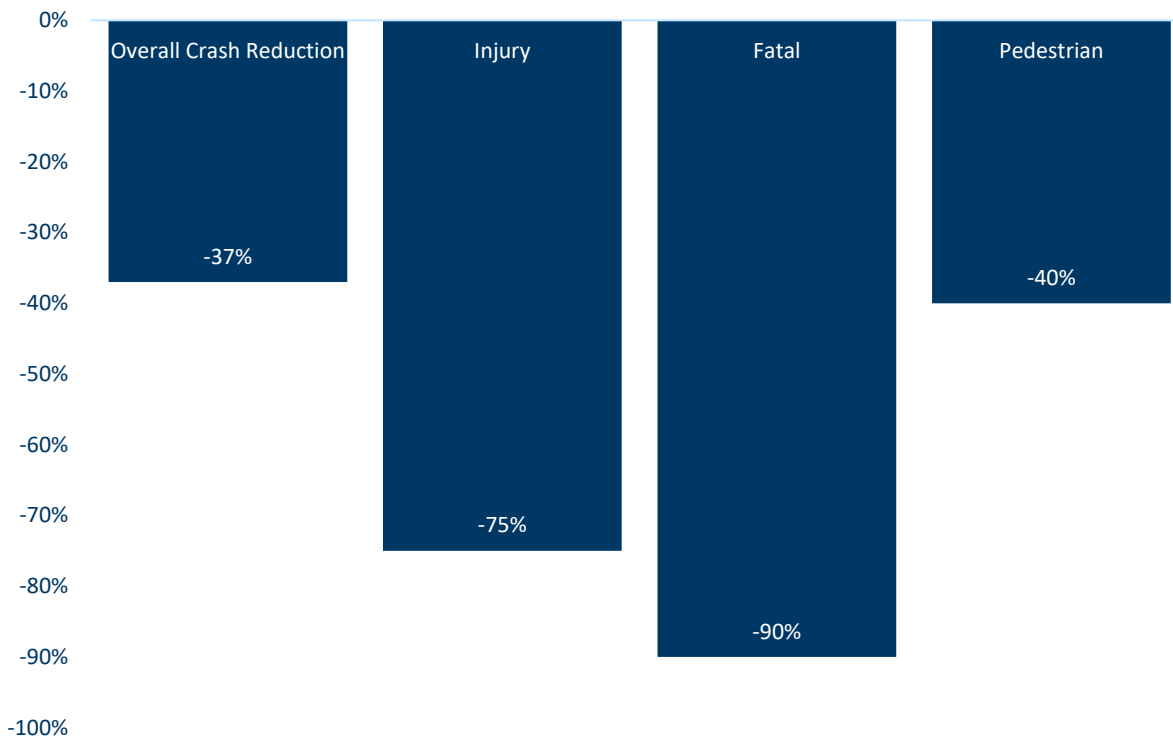
²¹ “Comprehensive Annual Traffic Crash Data Reports,” Crash Facts (Office of Traffic Safety), accessed June 18, 2021, <https://dps.mn.gov/divisions/ots/reports-statistics/Pages/crash-facts.aspx>.

²² “Roundabouts: An Informational Guide,” (U.S. Department of Transportation, Federal Highway Administration, n.d.).

²³ Minnesota Department of Transportation, “A Study of the Traffic Safety at Roundabouts in Minnesota,” Office of Traffic Engineering, Revised September 15, 2021, <https://www.dot.state.mn.us/trafficeng/safety/docs/roundaboutstudy.pdf>.

²⁴ “Roundabouts,” Insurance Institute for Highway Safety, March 2021, <https://www.iihs.org/topics/roundabouts>.

Figure 5: Average reduction in overall and different type crashes for roundabouts compared to traditional intersections.²⁵



TRAFFIC CALMING

Traffic calming describes rebuilding or retrofitting roadways to slow down motorized traffic for a safer experience for all roadway users. This newer strategy for roadway design is the opposite of past roadway design intended to maximize speed and capacity of roadways for motor vehicles. Traffic calming can come in many forms, from reconstruction of roadways (speed bump installation, widened sidewalks or bicycle facility installation) to retrofitting of existing roadways (narrowed driving lanes, reduced driving lanes or targeted closures).²⁶ The most popular traffic calming measure is the “road-diet”, a strategy which reduces the space on a roadway intended for through traffic of motor vehicles. Often, this describes a four-lane road with no dedicated turning lane converted into a three-lane road with a dedicated center turning lane. Roadways redesigned in this configuration have seen crash rates decrease from 19% to 47% while generally experiencing little to no additional congestion.²⁷ Other traffic calming measures have been found to reduce the speed of vehicles significantly, from 10% for sidewalk

²⁵ “Roundabout Benefits,” Washington State Department of Transportation, accessed April 23, 2021, <https://wsdot.wa.gov/Safety/roundabouts/benefits.htm>.

²⁶ “Traffic Calming to Slow Vehicle Speeds,” U.S. Department of Transportation, August 12, 2019, <https://www.transportation.gov/mission/health/Traffic-Calming-to-Slow-Vehicle-Speeds>.

²⁷ U.S. Department of Transportation, “Road Diets,” Federal Highway Administration, date accessed May 31, 2022, https://safety.fhwa.dot.gov/road_diets/.

extensions or center island installations to between 20-25% for speed bumps.^{28,29} These measures increase safety for all roadway users and as their adoption continues to increase, traffic safety is likely to improve as well.

TRAFFIC SAFETY POLICY AND LAW TRENDS

Roadway design plays an important role in traffic safety, but engineering is only one part of overall efforts to limit the carnage on America's roadways. The Vision Zero movement has established a strong network for safety advocates and has pushed a more aggressive approach to achieving better safety outcomes. Another vital aspect includes new policies to curb dangerous and deadly driving. In 2020, the four highest causes of roadway deaths in Minnesota were speeding, unbuckled motorists, impaired driving and distracted driving.³⁰ Impaired driving makes up a disproportionate amount of deaths on the roads. In 2020, 23% of the 394 deaths on Minnesota roadways were caused by a legally impaired driver.³¹ While laws to limit dangerous driving are intended to save lives and make a safer environment for all users, new discussions on the unintended consequences of traffic enforcement have led some to question if the risks of heavy traffic enforcement for lower income and minority populations outweigh the safety benefits to society at large.

TOWARD ZERO DEATHS AND VISION ZERO

Vision Zero is a movement contending that all traffic related deaths are preventable. The Vision Zero Network is a collaborative campaign aimed at reducing traffic deaths by advancing a shift toward safe, healthy and equitable mobility for all users of the transportation system. Traffic safety policy has advanced in dozens of cities across the United States because of Vision Zero providing resources, policy initiatives and a lobbying network to local officials and advocates. The Vision Zero initiative began in Sweden in the 1990s, with the national government adopting the Vision Zero principles and policies in 1997. Since then, fatality rates for motorists and pedestrians haven't fallen by more than half with Sweden becoming a global leader in traffic safety. Sweden's traffic fatality rate is just 1.9 traffic deaths per 100,000 residents in 2020, compared to a rate of 110 in the United States in 2019.^{32, 33} Many cities in the United States, including Minneapolis, have since taken Sweden's lead in the Vision Zero movement and have adopted Vision Zero policies themselves. Although the Vision Zero Network in the United States is focused on shifting traffic policy in America's cities, MnDOT and other partners are implementing a similar traffic safety approach statewide known as Toward Zero Deaths (TZD).

TZD is Minnesota's approach to reducing traffic deaths to zero on roadways in the state. TZD was originally adopted in 2003 and is a partnership between MnDOT, the Minnesota Department of Public Safety and the Minnesota Department of Health. It uses an integrated application of education, engineering, enforcement and emergency medical and trauma services to reduce deaths on roadways. TZD outlines three overarching goals which have driven transportation safety policy: to promote and implement effective safety initiatives, to pursue

²⁸ "Engineering Countermeasures for Reducing Speeds," Safety, Federal Highway Administration, July 2014, https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm.

²⁹ A Community of Transportation Professionals, "Traffic Calming Fact Sheets," updated May 2018, <https://www.ite.org/pub/?id=2c815e39%2Dbb70%2D72a3%2D4e31%2D0356ae6af6b0>.

³⁰ Minnesota Department of Public Safety, "2020 Crash Facts," Office of Traffic Safety, 2020, <https://dps.mn.gov/divisions/ots/reports-statistics/Documents/2020-minnesota-motor-vehicle-crash-facts.pdf>

³¹ Ibid.

³² "Road Deaths Per Million Inhabitants," European Transportation Safety Council, accessed June 1, 2021, <https://etsc.eu/euroadsafetydata/>.

³³ "National Statistics," National Highway Traffic Safety Administration, accessed June 1, 2021, <https://www.fars.nhtsa.dot.gov/Main/index.aspx>.

public support of traffic safety as a priority and to emphasize TZD as a priority for all units of government and traffic safety partnerships.³⁴ While Vision Zero's goal is to reduce deaths to zero immediately, TZD takes a more incremental approach. TZD's ultimate goal is zero deaths on Minnesota roadways, but the program also sets interim targets. The latest target goal is set at 225 annual deaths or less on Minnesota roadways by 2025. Deaths on Minnesota roadways declined 39% since TZD was adopted, from 655 deaths recorded in 2003 to 394 deaths in 2020. However, Minnesota missed the interim target of 300 or fewer traffic deaths by 2020, recording 394 deaths in 2020 and 2021 saw even greater number of deaths. TZD has guided MnDOT's overarching safety mission and goals, but the Strategic Highway Safety Plan guides more detailed safety implementation on the state's highways.

The Strategic Highway Safety Plan is a federally mandated plan updated every five years which considers new data, safety trends and stakeholder input. The SHSP guides changes in policy, planning, enforcement and roadway design to make driving culture more safety conscious. The most recent SHSP, adopted in 2020, sets goals, priorities and strategies for MnDOT to pursue for the next five years to reach the interim target of reducing traffic deaths to 225 by the year 2025. The Plan outlines dozens of strategies to reduce traffic deaths and injuries, grouped into 21 focus areas based on where or with whom motor vehicle crashes are most likely to occur. The statewide SHSP is only a portion of the safety planning MnDOT does, as each District creates and implements their own plans, along with many counties and cities. All these plans work in conjunction to foster a safer roadway network to continue the trend of fewer traffic deaths, but do not represent all the efforts to reduce death on Minnesota's transportation system.

IMPAIRED DRIVING

Driving under the influence of alcohol has been a major issue for traffic safety since the first days of the automobile. New Jersey enacted the first laws against drunk driving in 1906, punishable by a \$500 fine (\$16,000 in today's dollars) or 60 days in jail.³⁵ Impaired driving has historically been one of the leading causes of death in traffic crashes. In 2020 30% of roadway deaths nationally were attributed to impaired driving.³⁶ In 2019, there were 568 fewer fatalities, or a 5.3% decrease in roadway deaths nationally that were attributed to impaired driving.³⁷ However, this share of deaths has historically been higher. In 1982, when record keeping for drunk driving began nationally, drunk driving deaths totaled more than 40% of all traffic deaths.³⁸

Minnesota first criminalized driving drunk in 1911 and this law remained in effect but the punishments for driving drunk slowly began increasing in 1988 with license plate impoundment. This tweaking of existing laws continued through the 1990s and 2000s, lowering the legal blood alcohol level to 0.08 in 2004, adding ignition locks to repeat offenders in 2010 and lowering the gross misdemeanor blood alcohol level to 0.16 in 2015.³⁹ These actions seem to have affected drunk driving levels as DWI citations fell from approximately 32,500 in 1998 to

³⁴ "About Minnesota TZD," Toward Zero Deaths, accessed June 1, 2021, <https://www.minnesotatzd.org/about>.

³⁵ "Don't Hold Your Breath: Furthering the Fight Against Drunken Driving Until Autonomous Vehicles Arrive," Journal on Legislation (Harvard Law School, January 3, 2018), <https://harvardjol.com/2017/11/11/ignition-interlock-devices-drunk-driving/>.

³⁶ "Drunk Driving Fatality Statistics," Responsibility.org, date accessed, May 24, 2022, <https://www.responsibility.org/alcohol-statistics/drunk-driving-statistics/drunk-driving-fatality-statistics/#:~:text=Alcohol-impaired%20driving%20fatalities%20accounted%20for%2030%25%20of%20the,the%20gains%20being%20made%20to%20fight%20drunk%20driving.>

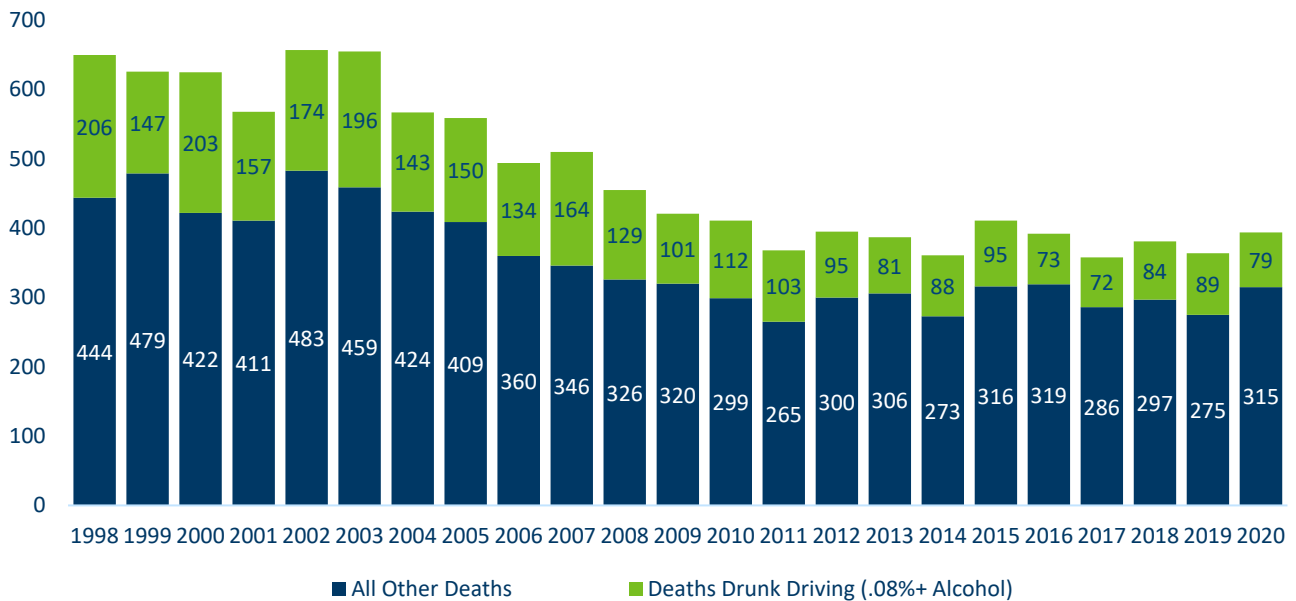
³⁷ U.S. Department of Transportation, "Traffic Safety Facts," December 2020, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813060>

³⁸ "Drunk Driving Fatality Statistics," Responsibility.org, March 29, 2021, <https://www.responsibility.org/alcohol-statistics/drunk-driving-statistics/drunk-driving-fatality-statistics/>.

³⁹ Sgt. Troy Christianson, "Facts, History about Drunk Driving in Minnesota," Winona Post, August 17, 2016, <https://www.winonapost.com/Article/ArticleID/50520/Facts-history-about-drunk-driving-in-Minnesota>.

approximately 22,000 in 2020. Deaths involving a driver exceeding today’s legal blood alcohol content limit of 0.08 have fallen from 206 in 1998 to just 79 in 2020 as seen in Figure 6. As alcohol impaired driving has become less common however, other impairments have become greater issues on the road.

Figure 6: Drunk driving deaths as part of all traffic deaths in Minnesota, 1998 to 2020.^{40,41}



While drunk driving is still the most common impairment for motorists, other impairments like opioids and marijuana have become more common as the opioid epidemic continues unabated and marijuana is legalized in more states. The latest National Highway Traffic Safety Administration roadside survey done in 2014 found that drivers impaired by any drug were more than twice as common as those found to have any alcohol in their system and those who had illegal drugs in their system was higher than any alcohol prevalence.⁴² Marijuana is the most common illegal drug found in drivers with 12.6% of those in the survey having some amount of marijuana in their system. While marijuana was found to be more prevalent during weekends and evenings, prescription drugs (10.3%) were far more prominent during daytime than either alcohol (1.1%) or marijuana (9.5%).⁴³ This survey was conducted in 2014, when only Colorado and Washington had legalized recreational use.

More recently, NHTSA’s 2020 study of seriously or fatally injured road users at studied trauma centers suggested that the prevalence of alcohol, cannabinoids and opioids increased during the COVID-19 public health emergency. Drivers showed significantly higher overall drug prevalence during the public health emergency, with 64.7% testing positive for at least one active drug, compared to 50.8% before the public emergency. Further, active THC

⁴⁰ “Minnesota Traffic Crashes in 2018,” (Department of Public Safety, Office of Traffic Safety, 2018).

⁴¹ “Minnesota Traffic Crashes in 2020,” (Department of Public Safety, Office of Traffic Safety, 2020).

⁴² Amy Berning, Richard Compton and Kathryn Wochinger, “Results of the 2013-2014 National Roadside Survey of Alcohol and Drug Use by Drivers,” (U.S. Department of Transportation, National Highway Traffic Safety Administration, 2015).

⁴³ Ibid.

(main active ingredient of cannabis) was more prevalent among drivers during the public health emergency than alcohol (32.7% versus 28.3%), and opioid use among drivers almost doubled from 7.5% to 13.9%.⁴⁴

The AAA Foundation's Annual Traffic Safety Culture Index found that drivers who use both marijuana and alcohol were significantly more prone to drive under the influence of alcohol versus those who only drink alcohol but do not use marijuana. Drivers who admitted to using both were more likely to speed on residential streets (55% versus alcohol-only 35%), aggressive driving (52% versus alcohol-only 28%), intentional red-light running (48% versus alcohol-only 32%) and texting while driving (40% versus alcohol-only 21%).⁴⁵

In Minnesota, marijuana and opioids are medicinally legal for a limited number of chronic ailments, but a 2022 state law legalized recreational use of THC in limited edible gummies. Minnesota has a zero-tolerance policy for any level of substance found in a driver, the same as most states in the United States where marijuana is still illegal. Still, drug use involved in crashes has continued to increase.

Currently, five states set a limit on the amount of marijuana found in a driver's system, while 17 more have zero-tolerance policies specific to marijuana.⁴⁶ Nineteen states and Washington D.C. have legalized recreational use, and more are likely to follow. As more states legalize the recreational use of marijuana, the lack of a reliable roadside test, like a breathalyzer for alcohol, is becoming a larger issue. Early prototypes of a saliva test developed at the University of Texas could prove to be effective. The test only requires a simple cheek swab at a traffic stop which can detect both high and low levels of THC in saliva at the nanogram level, but still is being tested by researchers.⁴⁷ Until a reliable test has been created, roadside testing for marijuana will continue to be legally fraught and difficult to perform. With a rise in those drivers impaired by marijuana and more states legalizing the substance, more work will need to be done to ensure vehicles are being safely operated on the roadways.

DISTRACTED DRIVING

Another trend in traffic safety is distracted driving. Distracted driving can take many forms, such as eating or speaking with other occupants of a vehicle, but the most alarming rise is cell phone use while driving. Nine percent of all traffic deaths in 2019 were caused by distracted driving and 13% of those specifically cited a cell phone in use while the crash occurred.⁴⁸ In Minnesota, the rate was 9% in 2020, but cell phone specific data was not available. In response to this rise in distracted driving, the Minnesota legislature passed a hands-free law which went into effect in 2019 that bans holding cell phones while driving. This law revealed how commonly cell phone use is in vehicles. In the first year of the new ban, Minnesota motorists received over 20,000 citations for using a cell phone while driving.⁴⁹ Initial crash estimates comparing the time frame since the ban (August 2019 to

⁴⁴ United States Department of Transportation, "Drug and Alcohol Prevalence in Seriously and Fatally Injured Road Users Before and During the COVID-19 Public Health Emergency," National Highway Traffic Safety Administration, October 2020, <https://rosap.nhtsa.gov/view/dot/50941>

⁴⁵ "Risky Driving Behaviors of Drivers Who Use Alcohol and Marijuana," AAA Newsroom, April 13th 2021, <https://newsroom.aaa.com/2021/04/risky-driving-behaviors-of-drivers-who-use-alcohol-and-marijuana/>.

⁴⁶ "Marijuana-Related Laws," Governors Highway Safety Association, date accessed May 24, 2022, <https://www.ghsa.org/state-laws/issues/drug%20impaired%20driving>.

⁴⁷ "Saliva Test for Cannabis Could Someday Help Identify Impaired Drivers," ScienceDaily, March 30, 2020, <https://www.sciencedaily.com/releases/2020/03/200330152114.htm>.

⁴⁸ U.S. Department of Transportation, "Distracted Driving 2019," Traffic Safety Facts, April 2021, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813111>

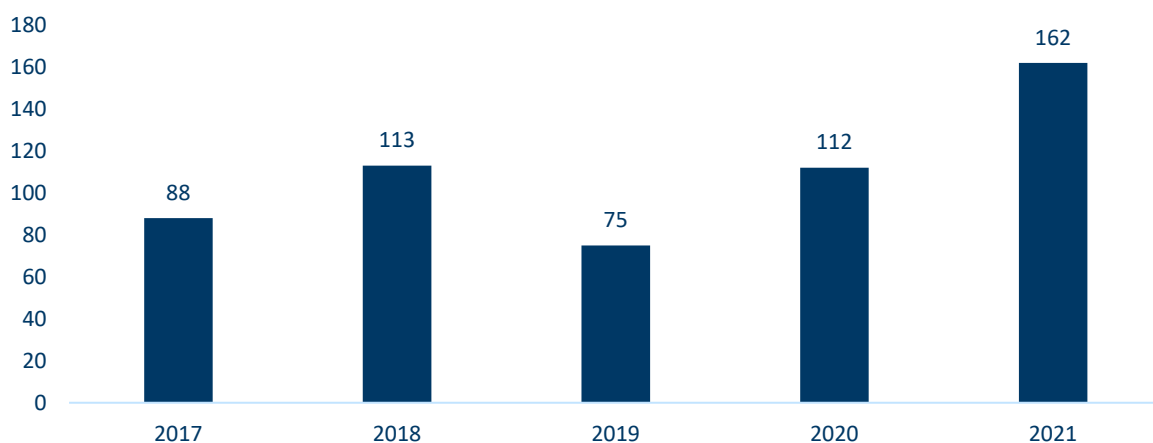
⁴⁹ Emma Eidsvoog, "Despite One Year since Minnesota's Hands-Free Cellphone Law, 1,400 Motorists Cited This Month," Twin Cities, August 14, 2020, <https://www.twincities.com/2020/08/14/hands-free-driving-enforcement-campaign-leads-to-more-than-1400-citations-issued-in-minnesota/>.

August 2020) shows the percent of fatal crashes attributed to distracted driving has fallen by 4% over the previous comparable time frame, indicating that the ban is having an effect on distractions while driving.⁵⁰ This trend will need to be monitored over time, but initial numbers indicate that this new law has positively impacted Minnesota roads.

SPEEDING

Speed is one of the major contributors to the deadliness of traffic crashes. Recently, in Minnesota, there were 162 speed-related deaths, which is a 33% increase from 2020 and a 116% increase from 2019 (Figure 7). Speed was a factor in at least a third of all traffic fatalities in 2021.⁵¹

Figure 7: Speed-related fatal crashes, 2017-2021.⁵²



Additionally, as seen in Figure 8, vehicle speed is directly connected to the pedestrian survival in the event of a crash, with higher speeds corresponding to worse outcome for pedestrians. Road designs and transportation policies did not begin to attempt to limit vehicle speed until relatively recently, leaving millions of miles of roads in Minnesota and the nation which were built to maximize speed and vehicle throughput in operation today. Many completely lack pedestrian infrastructure and many more have substandard facilities. Retrofitting this extensive network has begun in many cities across the country, but due to the extent of existing infrastructure the rise in pedestrian, bicycling and motorcycling deaths over the previous decade is unlikely to decline soon.

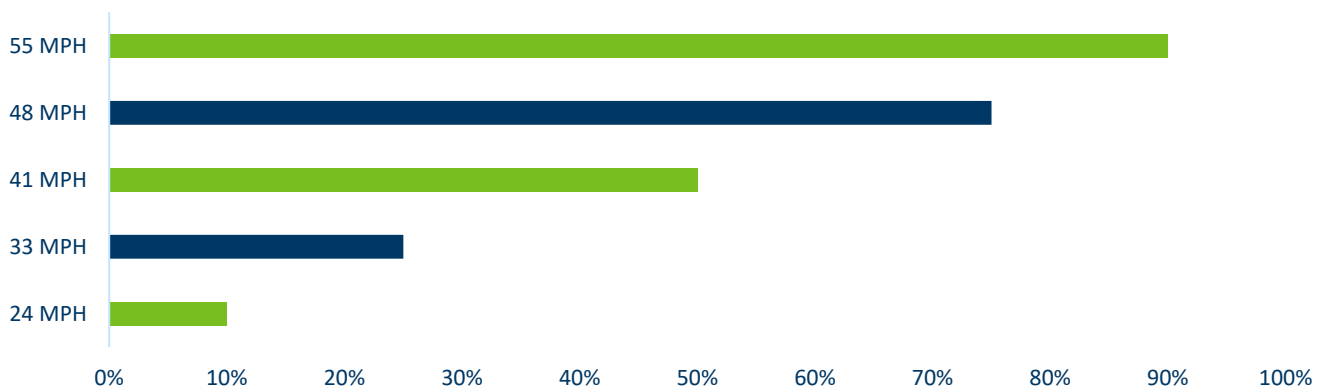
While this excessive speed impacts vulnerable road users, it also impacts the survivability of crashes for motor vehicle occupants as vehicle crashes will be inherently more severe at higher speeds, excessive speeds are not simply an issue for pedestrians or bicyclists.

⁵⁰ Ibid.

⁵¹ Minnesota Department of Public Safety, "Traffic Safety Update," Office of Traffic Safety, April 2022.

⁵² Ibid.

Figure 8: The increase in the likelihood of a collision with a pedestrian resulting in death from 24 miles per hour to 55 miles per hour.⁵³



Until recently, Minnesota state law did not allow municipalities to set their own speed limits without an engineering study conducted by MnDOT. This rule essentially froze municipalities from lowering speed limits below the statutory 30 miles per hour. In 2019, as part of the larger transportation bill, the Minnesota legislature authorized municipalities to set their own speed limits on city streets below 30 MPH.⁵⁴ As seen in Figure 8, vehicle and pedestrian crashes become significantly more dangerous as the speed of a vehicle increases. As speeds increase from 24 MPH to 48 MPH the chance of a pedestrian death goes from relatively unlikely (10%) to very likely (75%). The cities of Minneapolis and St. Paul jointly announced in 2020 that they would both be setting speed limits on city-controlled streets to 20 MPH to make their streets safer for pedestrians, but this move will also make the roads safer for motor vehicles as well. However, setting a lower speed limit by itself generally has only a minor effect on the average speed of vehicles, instead roadway design plays a major role in the average speed of vehicles and measures like traffic calming need to be implemented in tandem with lowering speed limits to foster a safer environment.

TRAFFIC ENFORCEMENT

Traffic laws have traditionally been enforced by local, county and state police departments. Ostensibly, traffic laws are enacted to protect the public from erratic or dangerous behavior of drivers of motor vehicles. However, studies conducted in Minnesota and nationwide have shown that traffic laws may not be enforced equally and that differing level of enforcement fall along racial lines. A recent Hennepin County study found that from June 2019 to May 2020, 54% of motorists stopped in Minneapolis were African American despite making up only 19% of the city’s population.⁵⁵ Traffic stops of white motorists only accounted for 30% of total traffic stops while making up 65% of the city’s population.⁵⁶ The disparities found in Minneapolis are not unique to the city and

⁵³ Science Direct, “Impact speed and a pedestrian’s risk of severe injury or death,” *Accident Analysis and Prevention*, Volume 50, pages 871-878, January 2013, <https://www.sciencedirect.com/science/article/abs/pii/S000145751200276X?via%3Dihub>.

⁵⁴ Minnesota Legislative Reference Library, “Minnesota Speed Limits,” MN House Research, January 2020, <https://www.lrl.mn.gov/docs/2020/other/200366.pdf>.

⁵⁵ Andy Mannix, “Black Drivers Make up Majority of Minneapolis Police Searches during Routine Traffic Stops” (Star Tribune, August 7, 2020), <https://www.startribune.com/black-drivers-make-up-majority-of-minneapolis-police-searches-during-routine-traffic-stops/572029792/>.

⁵⁶ Ibid.

similar levels of disparities in traffic stops exist in many cities across the country.⁵⁷ These numbers are used by some as an argument for the reduction or elimination of traffic enforcement by local police departments due to its harmful effects on minority communities.⁵⁸ Speeding, failure to yield and erratic driving were the top three causes for deaths on Minnesota roads in 2020, indicating that unsafe driver behavior leads to a vast majority of crashes and deaths.⁵⁹ As social justice issues remain in the forefront of American public policy and the decline of traffic deaths slows, transportation agencies will need to find a balance on traffic enforcement to ensure all Americans are safe and comfortable on America's roads.

RAIL SAFETY

Rail safety includes trains as they travel on rails, the materials carried on trains and the points of conflict with other modes of travel. Rail safety encompasses so much because trains generally have primacy in the ground transportation network and any collision between a train and another vehicle will cause far more damage to the other vehicle than the train. Most deaths and injuries on railroads come from collisions with another vehicle or pedestrian.

Death in motor vehicles in railroad collisions have become exceedingly rare, as seen in Figure 9. Deaths of motor vehicle occupants have generally trended down over the previous three decades, reaching their lowest point in 2020, but predicted to increase again in 2021. 2020 was the first time in over a decade where there was only one fatality. This large and sustained decline in collisions and deaths between trains and automobiles has come about from a concerted effort by both the railroads and various government agencies to eliminate rail crossings where they can and to make existing crossings significantly safer. In Minnesota, rail crossings are down over 50% from historical levels and those still operating have greatly improved crossing control techniques and technology.⁶⁰ With grade crossing deaths reduced to such an extent, the collaborative work done by the railroads, federal and state agencies could serve as an example for future safety improvements on other surface transportation systems.

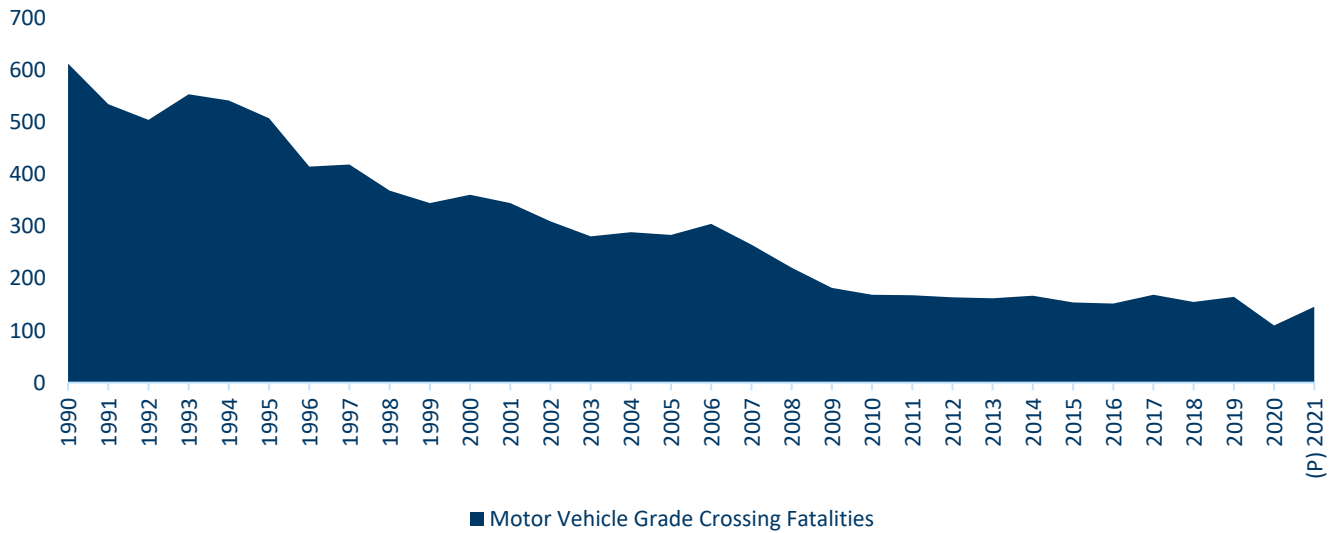
⁵⁷ Pierre Thomas et al., "Driving While Black: ABC News Analysis of Traffic Stops Reveals Racial Disparities in Several US Cities," ABC News, September 9, 2020, <https://abcnews.go.com/US/driving-black-abc-news-analysis-traffic-stops-reveals/story?id=72891419>.

⁵⁸ Emily Wade, "Why We Don't Support Traffic Enforcement," Our Streets Minneapolis, July 18, 2019, https://www.ourstreetsmpls.org/why_we_don_t_support_traffic_enforcement.

⁵⁹ DPS 2020 Crash Facts.

⁶⁰ "Crossing Inventory" (U.S. Department of Transportation Federal Railroad Administration), accessed June 18, 2021, <https://railroads.dot.gov/crossing-and-inventory-data/grade-crossing-inventory/crossing-inventory>.

Figure 9: Railroad grade crossing deaths for motor vehicles in the United States by year from 1990 to 2021.⁶¹



RELATED TRENDS

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Minnesota's vision for transportation is known as Minnesota GO. The aim is that the multimodal transportation system maximizes the health of people, the environment and our economy. A transportation vision for generations, Minnesota GO guides a comprehensive planning effort for all people using the transportation system and for all modes of travel. Learn more at [MinnesotaGO.org](https://www.minnesotago.org)

REVISION HISTORY

Date	Summary of revisions
July 2022	Original paper.

⁶¹ Bureau of Transportation Statistics, "Railroad and Grade-Crossing Fatalities by Victim Class," March 2, 2022, https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.bts.gov%2Fsites%2Fbts.dot.gov%2Ffiles%2F2022-03%2Ftable_02_39_032622_0.xlsx&wdOrigin=BROWSELINK.