



Planning Minnesota's  
Transportation Future

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# **NON-MOTORIZED TRANSPORTATION SAFETY TREND ANALYSIS**

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## SUMMARY

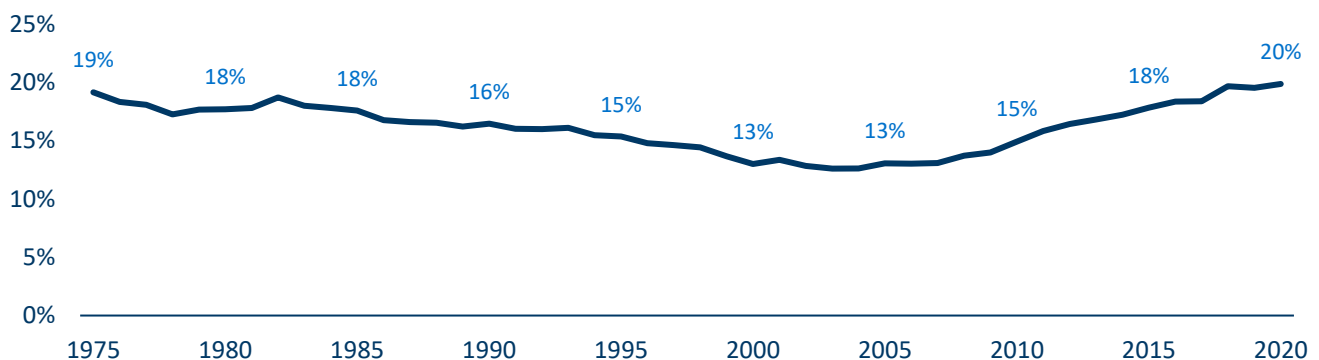
Traffic deaths have declined nationally from over 54,000 in the 1970s to under 39,000 in 2020.<sup>1</sup> This is a decrease of over 30%, occurring even as the population rose 60% over the same time. However, this decline does not account for differences in risk between motorized and non-motorized roadway users. Motor vehicle passengers have seen the greatest increases in safety measures, resulting in the largest decline in roadway related deaths. While pedestrian and bicycling deaths are slightly below earlier peaks, there has been a backslide in recent years. Now, more Americans are dying on foot or bicycle than any year since 1990.

Motor vehicles are safer than ever for drivers and passengers. However, these new vehicles are more likely to be heavier and more dangerous for pedestrians and bicyclists if a crash occurs. Investments in safety engineering and design have lowered severe traffic incidents considerably for vehicles; however, pedestrian and bicyclist infrastructure has lagged in the meantime.

In 2020, 7,709 (one-fifth) of roadway deaths were our roadway's most vulnerable users: pedestrians and bicyclists. In Minnesota, 58 of 364 roadway deaths were people walking and bicycling.<sup>2</sup> For much of the twentieth century, deaths or serious injuries resulting from traffic crashes were thought of as an unfortunate but unavoidable side effect of the automobile. That sentiment has changed with the growth of increased safety awareness and policies. Initiatives like Vision Zero and Minnesota's Toward Zero Deaths program have grown over the previous two decades, contending 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 more miles than ever, but deaths and injuries have fallen from their peak decades ago. For roadway users, deaths peaked in the 1970s. However, increased pedestrian and bicyclist deaths in the past decade have led to the highest share of deaths for those roadway users as seen in Figure 1. Transportation agencies have work to do in order to make the nation's transportation system safe for all users, especially the most vulnerable.

Figure 1. Total share of traffic deaths for pedestrians and bicyclists nationally from 1975 to 2020<sup>3</sup>



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<sup>1</sup> NHTSA 2020 Annual Report <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.

<sup>2</sup> "Transportation Safety, Minnesota," Bureau of Transportation Statistics, accessed June 1, 2021, <https://www.bts.gov/browse-statistical-products-and-data/state-transportation-statistics/transportation-safety>.

<sup>3</sup> "Traffic Safety Facts Annual Report Tables," National Highway Traffic Safety Administration, accessed June 1, 2021, <https://cdan.nhtsa.gov/tsftables/tsfar.htm#>; NHTSA 2020 Annual Report <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.

## TRAFFIC CRASH TRENDS

Since the 1970s, safety has generally increased on the nation’s roadways, with fewer deaths and serious injuries occurring annually in both absolute and relative numbers. However, pedestrians and bicyclists have not benefited from the same safety gains compared to motor vehicle passengers. As seen in Figure 2, roughly the same number of bicyclists were killed in 2020 as in 1979. While overall pedestrian deaths have declined between 1979 and 2020, deaths have increased 59% from the record low seen in 2009.<sup>4</sup> This trend is observed in Minnesota as well, with motor vehicle deaths continuing to decline through 2020 while pedestrian and bicyclist and deaths remain relatively flat, as seen in Figure 3. In Minnesota, the lowest number of annual pedestrian deaths occurred in 2014 with just 15 deaths. Deaths have since climbed to 45, an increase of 200%.

Figure 2. Total number of non-occupant traffic deaths separated by mode nationally from 1979 to 2020<sup>5</sup>

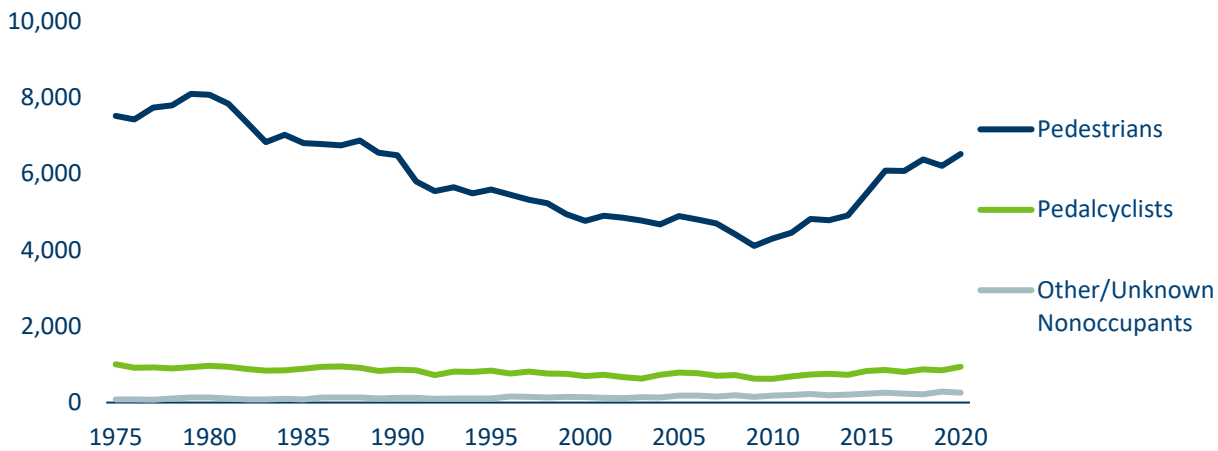
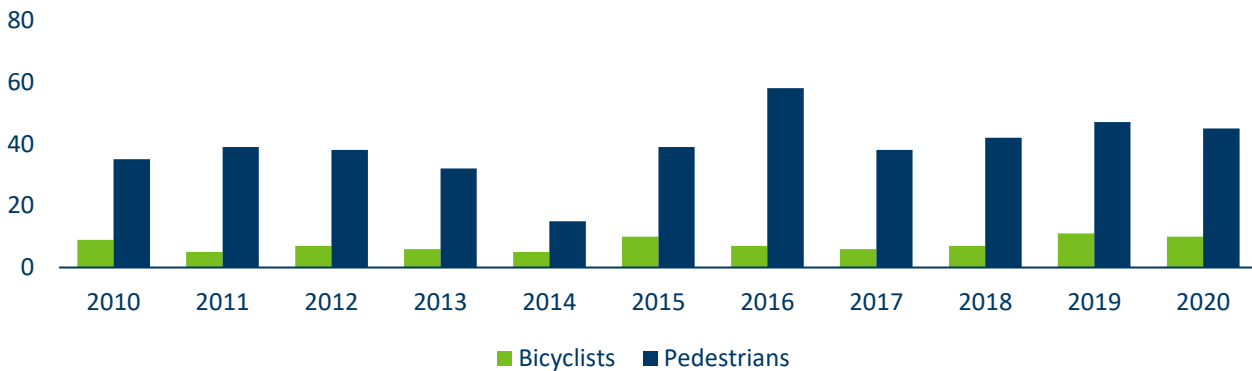


Figure 3. Pedestrian (including Other/Unknown Nonoccupant) and bicyclist deaths in Minnesota from 2010 to 2020.<sup>6</sup>



<sup>4</sup> “State Transportation Safety Statistics,” Bureau of Transportation Statistics, accessed June 1, 2021, <https://www.bts.gov/browse-statistical-products-and-data/state-transportation-statistics/transportation-safety>.

<sup>5</sup> “Traffic Safety Facts Annual Report Tables,” National Highway Traffic Safety Administration, accessed June 1, 2021, <https://cdan.nhtsa.gov/tsftables/tsfar.htm#>. NHTSA 2020 Annual Report <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.

<sup>6</sup> Ibid.

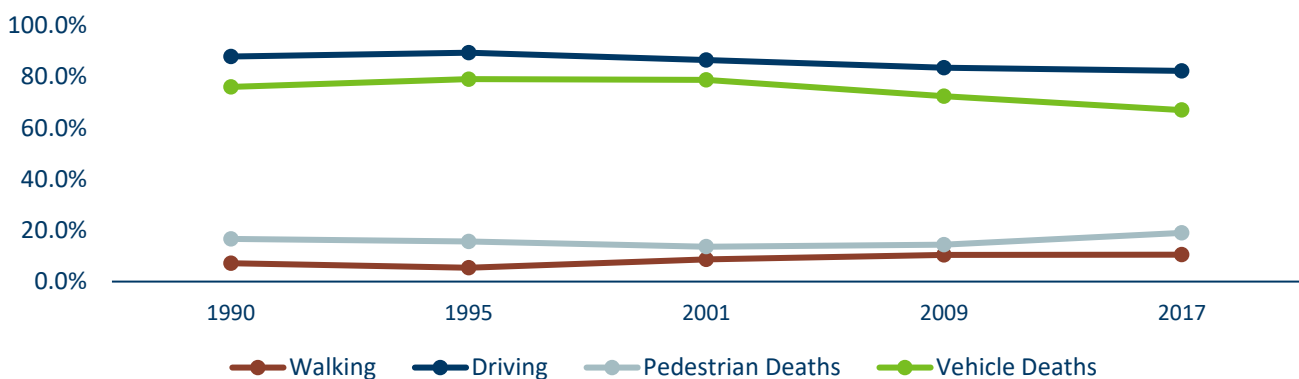
Many factors contribute to the decline of motor vehicle passenger deaths. Progressively safer vehicle design, 30 years of laws mandating seatbelt usage,<sup>7</sup> and advances in roadway design have improved vehicle safety outcomes. Crashes which may have resulted in fatal injuries for drivers and passengers prior to these advancements now result in less severe injuries.

These advancements have not provided safer roadways for nonmotorized users, however. Americans are increasingly driving larger trucks and SUVs. The proliferation of large personal vehicles can pose additional danger for people outside of the vehicles while providing better protection for vehicle occupants. Pedestrian and bicycle safety measures have also not received the same amounts of devoted resources as motorized vehicle safety has historically. Several past initiatives focused on driving under the influence, seatbelt use, and other motor vehicle passenger safety measures had marginal impact for pedestrians or bicyclists. In fact, many towns and cities across Minnesota and the nation have seen right-of-way dedicated for non-motorists dwindle over the 20<sup>th</sup> century as roadways have gotten wider to increase roadway capacity for motor vehicles. Overall, more needs to be done in order to protect the most vulnerable roadway users in this country and achieve the goal of zero traffic deaths.

## PEDESTRIAN SAFETY

Pedestrian safety has deteriorated over the last decade. After reaching a low in 2009 in absolute numbers, pedestrian deaths have steadily risen to a level not seen since 1990. In 2020, 6,516 pedestrians were killed by vehicles nationally (45 pedestrians were killed in Minnesota) (Figures 2 and 3). Several factors that contribute to the resurgence of pedestrian deaths are: increased cell phone use while driving, increasing rates of distracted driving, heavier and higher profile vehicles, inadequate pedestrian infrastructure, and a higher number of pedestrians. However, as seen in Figure 4, while the overall share of walk trips stayed flat between 2009 and 2017 at 10.5%, the share of pedestrian traffic deaths rose from 14% in 2009 to 19% in 2017 representing a 33% increase. In comparison, the opposite occurred for motor vehicles as the overall share of traffic deaths for passengers fell by 7.5% over the same timeframe. Americans may be walking more than the 1990s but increasing pedestrian deaths in the last decade cannot be attributed to increases in foot traffic.

Figure 4. Share of all trips taken by walking and driving and share of all traffic deaths for pedestrians and motor vehicle occupants selected by year of National Household Transportation Survey.<sup>8</sup>



<sup>7</sup> "Seat Belts," Insurance Institute for Highway Safety, accessed June 1, 2021, <https://www.iihs.org/topics/seat-belts>.

<sup>8</sup> "National Household Travel Survey, 2017," Federal Highway Administration, accessed June 1, 2021, <https://nhts.ornl.gov/>.

## CONTRIBUTING FACTORS TO VEHICLE IMPACTS ON PEDESTRIAN SAFETY

### Vehicle Type and Design

Motor vehicles have become increasingly safer for their occupants since the peak of traffic deaths in the 1970s. Vehicles in the late 20<sup>th</sup> century no longer resembled the large, heavy and steel-clad machines built before the oil crisis of 1973, when the United States faced an oil embargo and resulting shortage from oil producing countries. The embargo effects on supply and cost precipitated a decrease in vehicle size, weight and a shift to lighter materials, led by Japanese automakers. This decrease in size and weight, however, was not a long-lasting trend and new vehicles today weigh roughly the same as they did in 1975.<sup>9</sup> Notably, Americans are purchasing more large trucks and SUVs than ever before. This return to larger vehicle weight and size combined with improved safety features have made occupants much safer, but this increased safety for occupants has come at the expense of those outside of the vehicle, especially pedestrians.

In 2020, SUV sales reached a new high of 51% of all vehicle sales, even with total car sales decreasing nearly 14%.<sup>10</sup> By 2025, this number is predicted steadily rise: sales of SUVs, pickup trucks and vans will reach 78% of combined new vehicles sales.<sup>11</sup> SUV sales overtook sedan sales in 2014 and continue to increase their market share as seen in Figure 5.<sup>12</sup> Increased SUV use is associated with increased pedestrian deaths because their larger size and weight result in collisions with higher force. Light trucks and SUVs are generally heavier than passenger cars, have more horsepower, sit higher than a car, and feature a flat front end. A sedan striking a pedestrian will usually first hit a pedestrian's legs and likely result in an injury at slow speeds. SUVs and trucks have a higher profile and will instead strike a pedestrian higher up on the torso and thus are more likely to result in death in the event of a crash. Data indicates that as SUVs and trucks make up a greater share of overall vehicles on the road, pedestrian deaths increase. A recent study showed that fatal crashes between SUVs and pedestrians have increased 81% nationally from 2009 to 2016 while total fatal pedestrian and vehicle crashes have increased 29% during that same period.<sup>13</sup> As seen in Figure 2, pedestrian deaths have only increased since 2016, suggesting this trend will likely continue in following years.

In contrast to the growing risk for pedestrians in the United States, pedestrian deaths have continued to decrease in the European Union (EU). In the EU, regulators adopted new rules in 2010 to reduce pedestrian deaths by mandating certain vehicle design features intended to limit the physical harm to pedestrians from a vehicle collision.<sup>14</sup> These measures appear to be working, as pedestrian deaths have fallen from over 8,000 in 2007 to less than 4,000 in 2016.<sup>15</sup> The United States has no such requirements for motor vehicles. While this is likely one of

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<sup>9</sup> "Highlights of the Automotive Trends Report," U.S. Environmental Protection Agency, accessed June 1, 2021, <https://www.epa.gov/automotive-trends/highlights-automotive-trends-report#Highlight4>.

<sup>10</sup> "2020 U.S SUV Sales Analysis, goodcarbadcar.net, accessed May 24, 2022, [2020 US SUV Sales Figures by Model | GCBC \(goodcarbadcar.net\)](https://www.goodcarbadcar.net/2020-us-suv-sales-figures-by-model/)

<sup>11</sup> Tom Voelk, "Rise of the 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>.

<sup>12</sup> Ibid.

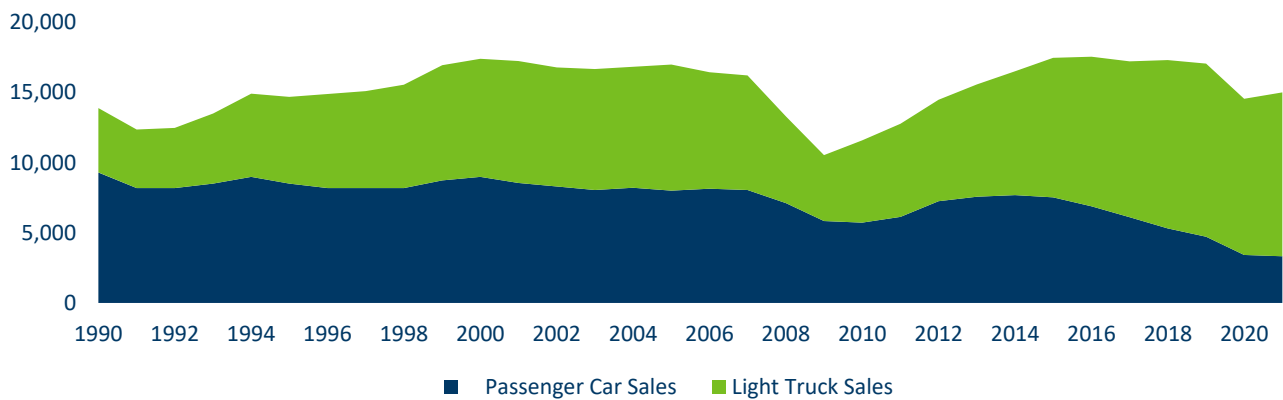
<sup>13</sup> "On Foot, at Risk," (Insurance Institute for Highway Safety, Status Report 53, No. 3, 2018).

<sup>14</sup> "Regulation (EC) No 78/2009 of the European Parliament and of the Council of 14 January 2009 on the Type-Approval of Motor Vehicles with Regard to the Protection of Pedestrians and Other Vulnerable Road Users, Amending Directive 2007/46/EC and Repealing Directives 2003/102/EC and 2005/66/EC," *Official Journal of the European Union* 7 (2009), <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:32009R0078>.

<sup>15</sup> "Traffic Safety Basic Facts 2018, Pedestrians," European Road Safety Observatory, accessed June 1, 2021, [https://ec.europa.eu/transport/road\\_safety/sites/roadsafety/files/pdf/statistics/dacota/bfs20xx\\_pedestrians.pdf](https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/statistics/dacota/bfs20xx_pedestrians.pdf).

the reasons pedestrian deaths have continued to decline in Europe, many factors such as land use, road design and modal share play a role in traffic deaths.

Figure 5. Total new passenger vehicle sales and leases (in thousands of vehicles) from 1990 to 2020. “Light truck” includes SUVs, pickups and crossovers.<sup>16</sup>



## Street Lighting

Lighting is another notable factor for nonmotorized safety--a lack of lights correlates strongly to increased nighttime deaths. Deaths occurring at night are increasing at a fast rate (64% increase from 1010 to 2020), indicating that street lighting, or lack thereof, is a major factor in pedestrian deaths.<sup>17</sup> Lighting systems on many roadways are designed for vehicles and do not do an adequate job of making pedestrians visible. The Florida DOT observed this connection and has invested \$100 million for lighting improvements to increase pedestrian visibility at night.<sup>18</sup> In Detroit, a large-scale lighting installation program on city streets saw pedestrian deaths drop 16% from 2009 to 2017 even as pedestrian deaths rose in Michigan by 47% over the same time period.<sup>19</sup>

## Street Design

Vehicle speed due to street design is also important for pedestrian safety as faster vehicles are deadlier to pedestrians. As American roadway projects prioritized vehicular traffic flow for decades, many roadways built in previous decades may lack pedestrian facilities and allow high vehicle speeds, making them unsafe for pedestrians. This practice is beginning to be reversed in many areas of the country, but due to the lifespan of our roadways, millions of miles still prioritize vehicle throughput and likely contribute to both the overall stagnation of roadway deaths and the rise of pedestrian deaths. An example of a typical design found on these roadways is pictured in Figure 6, where a pedestrian crossing leads to incomplete pedestrian facilities. Our street’s designs have for decades prioritized automobiles at the expense of nonmotorized users. Planning and traffic engineering efforts must continue to allot safe and useful space to pedestrians and bicyclists.

<sup>16</sup> “New and Used Passenger Car and Light Truck Sales and Leases,” Bureau of Transportation Statistics, accessed June 1, 2021, <https://www.bts.gov/content/new-and-used-passenger-car-sales-and-leases>.

<sup>17</sup> “Pedestrian Traffic Fatalities by State - 2021 Preliminary Data (January-December).pdf (ghsa.org)” (Governors Highway Safety Association, 2022).

<sup>18</sup> Danielle Boykin, “Danger on the Streets,” National Society of Professional Engineers, February 2020, <https://www.nspe.org/resources/pe-magazine/january-2020/danger-the-streets>.

<sup>19</sup> Angie Schmitt, “Detroit Streetlight Effort Dramatically Reduces Ped Deaths,” StreetsBlog USA, October 4, 2018, <https://usa.streetsblog.org/2018/10/04/the-understated-importance-of-street-lights/>.

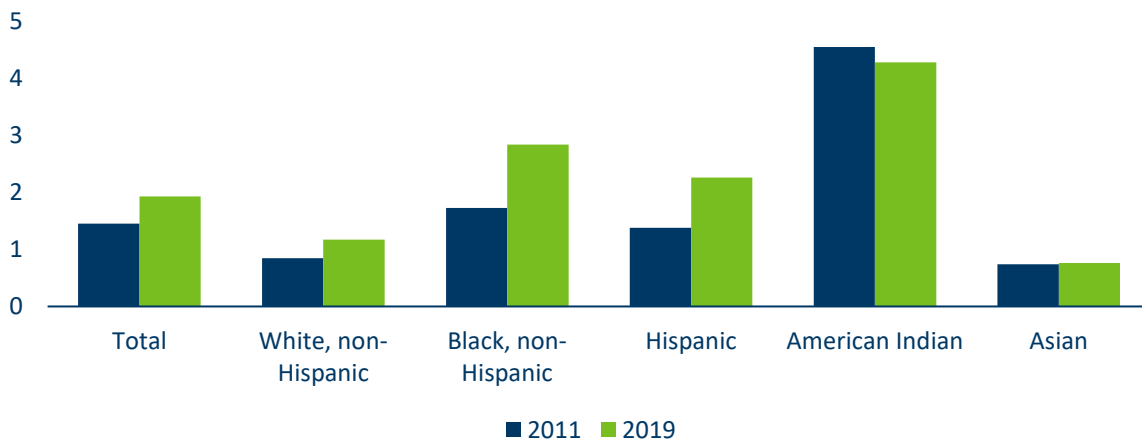
Figure 6. An example of an intersection with incomplete pedestrian facilities<sup>20</sup>



### DISPARATE IMPACTS ON BIPOC COMMUNITIES

Black, Indigenous and People of Color (BIPOC) have higher pedestrian death rates nationally when compared with white, non-Hispanic people.<sup>21</sup> The death rate increased for many racial groups from 2011-2019, but increased the most for Black people from 1.7 to 2.8 deaths per 100,000 people. American Indian pedestrians are killed at a much higher rate than other racial and ethnic groups, with 4.3 deaths per 100,000 people in 2019. In Minnesota, indigenous people make up 0.9% of the state’s population. However, they were involved in 3.5% of fatal vehicle crashes between 2015 and 2019.<sup>22</sup> Correlated factors include insufficient pedestrian infrastructure investments and higher rates of people walking.

Figure 7. Adjusted pedestrian death rates per 100,000 people nationally by race and ethnicity 2011 and 2019<sup>23</sup>



<sup>20</sup> Google maps (accessed June 1, 2021).

<sup>21</sup> “QuickStats: Age-Adjusted Pedestrian Death Rates, by Race/Ethnicity - National Vital Statistics System, United States, 2009 and 2018,” Centers for Disease Control and Prevention, October 1, 2020, <http://dx.doi.org/10.15585/mmwr.mm6939a7>. DOI: [http://dx.doi.org/10.15585/mmwr.mm6939a7external icon](http://dx.doi.org/10.15585/mmwr.mm6939a7external%20icon).

<sup>22</sup> “Fatality Analysis Reporting System (FARS), 2015-2019,” NHTSA, February 20, 2021, data table accessed through [nhtsa.gov](https://www.nhtsa.gov).

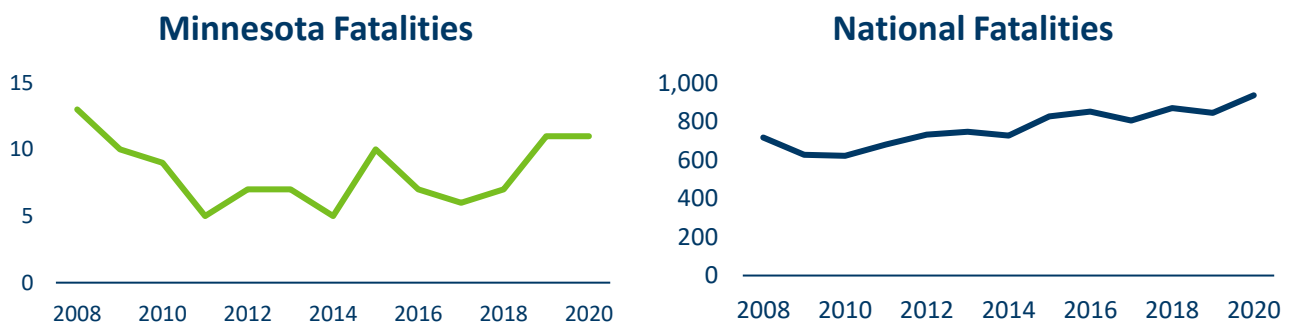
<sup>23</sup> NHTSA Fatality and Injury Reporting System Tool. <https://cdan.dot.gov/query>. Accessed May 25, 2022. Overall population statistics via US Census Bureau.



## BICYCLE SAFETY

National bicyclist deaths have risen over the previous decade, from a low of 623 in 2010 to 938 in 2020, an increase of nearly 51% (Figure 8). Fatalities for people bicycling have reached levels we have not seen since the turn of the century. Bicyclist deaths in Minnesota have held steady for the last decade, oscillating between five and a dozen deaths each year. A recent National Transportation Safety Board study found that unlike pedestrian-involved collisions, a majority of bicycle and vehicle collisions occur at or near intersections.<sup>24</sup> Still, the most severe injuries and deaths occur away from intersections, usually midblock and on higher speed roads.<sup>25</sup> A majority of bicycle deaths occur when a motorist is overtaking a cyclist and traveling at posted speed limits 30 MPH or higher.<sup>26</sup> Like pedestrian crashes, time of day is a significant factor in bicyclist deaths suggesting that poor lighting combined with higher speed roadway designs are endangering bicyclists in the same way they are endangering pedestrians.

Figure 8. National or Minnesota bicycle fatality trends from 2008 to 2020.<sup>27</sup>



The rise in bicyclist injuries and deaths may also be partially attributable to the stable nonmotorized use compounded with growing populations. Over the last decade, our cities and country grew in population while our active transportation share percentages remain unchanged. This large population growth combined with the stagnant walk and bike commute share percentages means that more people are walking and cycling for work every year (Figure 9). As more SUVs and active transportation users alike take to the roads, the inability of roadway design or regulations to respond is likely contributing to the rising human toll on America’s roadways.

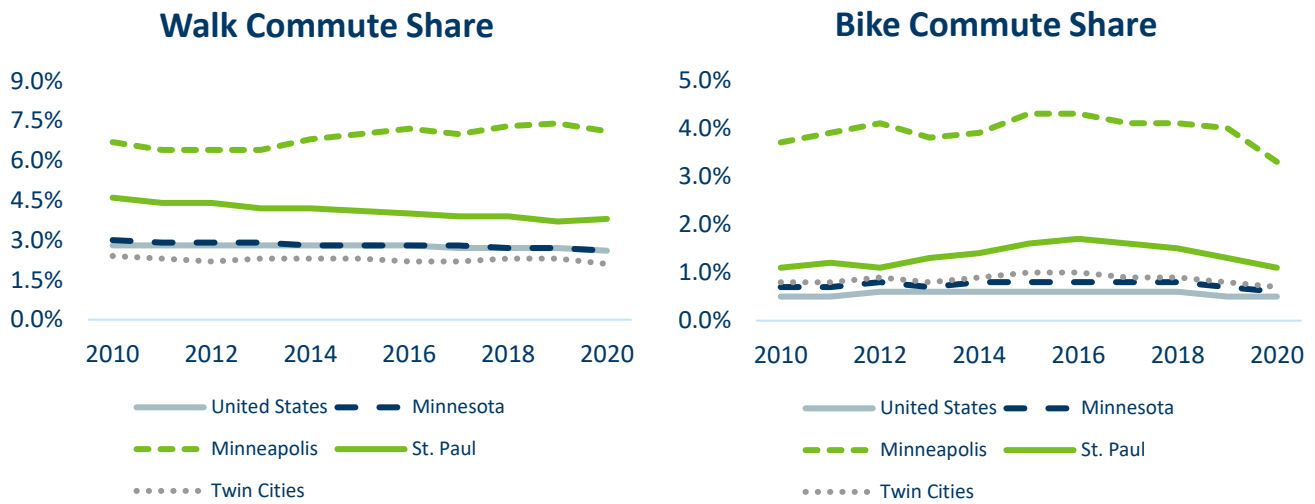
<sup>24</sup> “Safety Research Report - Bicyclist Safety on US Roadways: Crash Risks and Countermeasures,” National Transportation Safety Board, November 5, 2019, <https://www.nts.gov/news/events/Pages/2019-DCA18SS002-BMG.aspx>.

<sup>25</sup> Ibid.

<sup>26</sup> Ibid.

<sup>27</sup> “Traffic Safety Facts Annual Report Tables,” National Highway Traffic Safety Administration, accessed June 1, 2021, <https://cdan.nhtsa.gov/tsftables/tsfar.htm>. “Overview of Motor Vehicle Crashes in 2020”, NHTSA, accessed May 25, 2022, <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813266>.

Figure 9. Walk or bike commute share from 2010 to 2020 for various geographies.<sup>28</sup>



## ROADWAY DESIGN

For many decades, roadways were designed in the United States for one purpose: maximize the speed and flow of motor vehicles as shown in Figure 6.<sup>29</sup> Postwar America saw a boom in the construction of new freeways, the expansion of highways, and the development of neighborhoods and businesses that were designed exclusively around automobiles. This change in roadway design and priority caused a radical shift in land use, away from dense walkable downtowns and streetcar suburbs to a landscape of parking lots, separated land uses, and large setbacks from roadways. These new design practices led to a steep decline in walking and bicycling in the United States. The percent of Americans living in suburbs grew from 20% in 1950 to over 50% today, which corresponds with increased car use and decreased walking, biking, and transit use. In the Minneapolis-St. Paul Metropolitan Statistical Area, this share is even larger with 75% of the region’s population living outside of the core cities.

As automotive manufacturers focused on new safety features for vehicles, the nation’s transportation agencies also focused on new, safer designs for America’s roadways. These efforts reduced motorist deaths but have likely played a part in rising pedestrian and bicyclist deaths due to their omission from roadway design. Recently, however, while most automotive manufacturers still emphasize motor vehicle safety, non-motorized safety improvements are gaining ground. In 2010, MnDOT did not have a funding program to invest in pedestrian or bicycling safety measures or infrastructure, but just a decade later the agency identified \$300 million for these modes in its latest Capital Highway Investment Plan.<sup>30</sup> Local governments are also dedicating more funding for pedestrian and bicycling infrastructure and implementing designs intended to slow vehicles. Many municipalities have also developed Vision-Zero policies and placed supporting active transportation in their comprehensive plans.

<sup>28</sup> United States Census Bureau American Community Survey 5-Year Estimates. Data.census.gov. Accessed May 25, 2022.

<sup>29</sup> Norman Garrick, “Why America’s Roads are so Much More Dangerous than Europe’s,” Vox, November 30, 2016, <https://www.vox.com/the-big-idea/2016/11/30/13784520/roads-deaths-increase-safety-traffic-us>.

<sup>30</sup> “2021-2030 Capital Highway Investment Plan,” MnDOT, accessed June 1, 2021, <https://www.dot.state.mn.us/planning/10yearplan/#:~:text=The%2010%2Dyear%20Capital%20Highway,and%20add%20new%20planned%20projects>.

## ROADWAY INFRASTRUCTURE

Traditional safety measures altered roadway geometry to reduce conflict and potential collisions between motor vehicles. Some examples of altered geometry include reducing curves in roadways, eliminating conflict points along roadways (such as intersections and driveways), increasing capacity to reduce congestion related incidents, and implementing physical barriers along roadways. These treatments made driving generally safer. Total crashes on Minnesota roads declined by 22% from 1980 to 2029 while injuries fell by 40% and deaths by 58% (there was further decrease in 2020, but that could have been due to the pandemic and related factors).<sup>31</sup> Not only have automobile crashes declined in total, but they are also considerably less deadly than they were 30 years ago. This trend has slowed over the previous decade, with total crashes increasing slightly and motorist deaths declining at a much slower rate. Safety strategies to eliminate traffic conflicts and congestion seem to have reached a point of diminishing returns as crashes are still severe at higher speeds. Many new safety strategies thus involve slowing vehicles to lower the severity of crashes and benefit the safety of all users.

## TRAFFIC CALMING

Traffic calming describes rebuilding or reallocating roadway space to slow down motorized traffic, creating a safer experience for all roadway users. This strategy is a reversal of past roadway design practices that were intended to maximize speed and roadway capacity for motor vehicles. Traffic calming can come in many forms, from reconstruction of roadways with new features (roundabouts, curb extensions, widened sidewalks, or bicycle facility installation) to retrofitting of existing roadways (narrowed driving lanes, reduced driving lanes, reduced posted speeds or targeted closures).<sup>32</sup>

A common traffic calming measure is the “road-diet”, a strategy which reduces the space on a roadway intended for motor vehicle through traffic. Often, this describes a four-lane road with no dedicated turning lane redesigned to a three-lane road with a dedicated center turning lane featuring new bicycle and pedestrian facilities. Roadways redesigned in this configuration have seen crash rates decrease between 19% to 47% while generally experiencing little to no additional congestion.<sup>33</sup>

Roundabouts both lower the incidence of severe or fatal crashes and congestion compared to signalized intersections. Studies conducted by the Federal Highway Administration found that roundabouts greatly reduce severe crashes which result in injury and deaths while also reducing both motorist and pedestrian collisions considerably as shown in Figure 10.<sup>34</sup> Data shows that other traffic calming measures lower the speed of vehicles significantly, from 10% for curb extensions or center island installations to upwards of 20% for speed bumps.<sup>35</sup> These measures increase safety for all roadway users and as their adoption continues to increase, traffic safety is likely to improve.

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<sup>31</sup> “Crash Facts: Comprehensive Annual Traffic Crash Data Reports”. Office of Traffic Safety, Minnesota Department of Public Safety. Accessed 05/25/2022. <https://dps.mn.gov/divisions/ots/reports-statistics/Pages/crash-facts.aspx>.

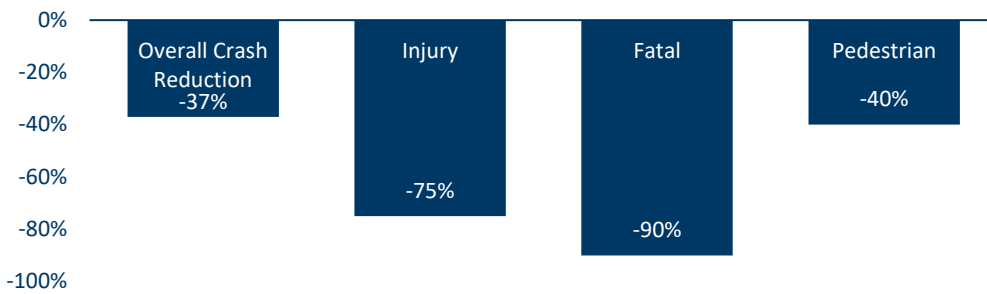
<sup>32</sup> “Traffic Calming to Slow Vehicle Speeds,” U.S. Department of Transportation, accessed June 1, 2021, <https://www.transportation.gov/mission/health/Traffic-Calming-to-Slow-Vehicle-Speeds>.

<sup>33</sup> “Did You Know a Road Can Go On a Diet?,” (Federal Highway Administration, n.d.).

<sup>34</sup> “Roundabouts: An Informational Guide,” (Federal Highway Administration, n.d.).

<sup>35</sup> “Engineering Speed Management Countermeasures,” Federal Highway Administration, accessed June 1, 2021, [https://safety.fhwa.dot.gov/speedmgt/ref\\_mats/eng\\_count/2014/reducing\\_speed.cfm](https://safety.fhwa.dot.gov/speedmgt/ref_mats/eng_count/2014/reducing_speed.cfm).

Figure 10. Average change in crashes for roundabouts compared to traditional intersections, by crash type<sup>36</sup>



## PEDESTRIAN INFRASTRUCTURE

Historically, pedestrian infrastructure, such as sidewalks and trails, is an afterthought compared to motor vehicle infrastructure. Many communities may lack dedicated pedestrian facilities and many more are substandard or unsafe, as seen in Figure 6. Poor pedestrian infrastructure combined with modern suburban road design and land use lead to dangerous situations for people walking or rolling and is likely a factor in growing pedestrian deaths. Studies have shown that land uses such as suburban retail centers and big box stores are anywhere from six to 14 times more likely to produce a crash than traditional main street retail or urban land uses.<sup>37</sup>

The first major federal effort for change came from the Americans with Disabilities Act (ADA). Along with provisions for making everyday life more accessible to disabled Americans, the ADA included mandates to make America more pedestrian accessible and safe. While the ADA legislation adopted in 1990 did not include requirements for pedestrian infrastructure in public rights-of-way, a 2011 guideline update issued by the United States Access Board included requirements for transportation agencies to construct ADA accessible infrastructure.<sup>38</sup> These updated mandates led state governments to increase funding for pedestrian infrastructure at the state level to meet these requirements. MnDOT plans to spend up to \$300 million on new accessible pedestrian infrastructure throughout the state in the 2021-2030 CHIP.

## BICYCLE INFRASTRUCTURE

Bicycle infrastructure in some form has existed in the United States since the early 20<sup>th</sup> century. The first dedicated right-of-way for bicycling was constructed in Pasadena, CA in 1897 but was later replaced by the CA-110 freeway. Widescale adoption of bicycle infrastructure, however, is a much more recent trend. Davis, CA was the first city to install widescale bicycle infrastructure in the early 1970s, so it may come as no surprise that Davis has the highest proportion of cyclists of any city in the country today.<sup>39</sup>

Bicycling infrastructure has since evolved significantly, starting with the first bikeway guide released by the American Association of State Highway and Transportation Officials in 1974. This and subsequent guides

<sup>36</sup> "Roundabout Benefits," Washington Department of Transportation, accessed June 1, 2021, <https://wsdot.wa.gov/Safety/roundabouts/benefits.htm>.

<sup>37</sup> Eric Dumbaugh and Robert Rae, "Safe Urban Form: Revisiting the Relationship Between Community Design and Traffic Safety," *Journal of the American Planning Association* 75, no. 3 (2009): pp. 309-329, <https://doi.org/10.1080/01944360902950349>.

<sup>38</sup> "Public Rights-of-Way Accessibility Guidelines," U.S. Access Board, accessed June 1, 2021, <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines>.

<sup>39</sup> U.S. Census Bureau; American Community Survey, 2018 American Community Survey 5-Year Estimates, S0802, generated by MnDOT using data.census.gov (accessed June 1, 2021).

throughout the 1980s advised against separated facilities for bicycles and advanced the concept of “vehicular cycling”.<sup>40</sup> Vehicular bicycling suggests that bikers are safest operating in the same way as cars. These guidelines likely stunted bicycle safety and bicycle infrastructure adoption efforts for decades as most people are uncomfortable biking in mixed traffic.

Separated and protected bicycling infrastructure, which has shown to be both preferred by bicyclists and safer for all users, began to be accepted in official guides and documents the 2010s and is now being deployed across the country.<sup>41</sup> However, its adoption has been slow, which allows for unsafe conditions for cyclists to remain unchanged nationwide. These conditions are likely leading to increases in bicycling deaths as more Americans ride bicycles for both commuting and recreation. Though slow, a shift is occurring: developments from bicycling safety research have helped governments develop safer bicycling facilities now in use. These include the National Association of City Transportation Officials’ Urban Bikeway Design Guide and the latest AASHTO guide published in 2012. The newest AASHTO guide did not fully recognize protected bicycle infrastructure, making it difficult for transportation agencies to implement safer bicycling infrastructure. However, the upcoming updated AASHTO guide will likely include guidelines for protected bicycle facilities and other recent bikeway designs which are proven to support safer bicycling on American roadways.<sup>42</sup> Safe bicycling infrastructure, much like pedestrian infrastructure, can provide safe and convenient access for all users.

## SAFE ROUTES TO SCHOOL

In 1969, 48% of students walked or biked to school daily but by 2009 that had plummeted to just 13%.<sup>43</sup> Despite this drop, approximately 20% of all children who die in traffic crashes are pedestrians.<sup>44</sup> During the same time period, childhood obesity has risen nationally from approximately 5% in the 1960s to nearly 20% today.<sup>45</sup> While many factors have contributed to this rise, inactivity is a major factor.

These statistics led to the creation and implementation of the Safe Routes to School (SRTS) Program by Congress in 2005. SRTS is a federally funded and MnDOT-managed program providing funding to cities, counties and school districts. Funding supports planning, designing, engineering and construction for projects that foster a safe and more walkable environment for students to get to school by walking or bicycling. Since its implementation, this program has helped nearly 300 school districts across the state implement SRTS plans, procure bicycles for students, and construct pedestrian friendly infrastructure near schools or on designated routes to schools, fostering a safer pedestrian environment for our students and other pedestrians statewide.<sup>46</sup>

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<sup>40</sup> William Schultheiss, et al., “[A Historical Perspective on the AASHTO Guide for the Development of Bicycle Facilities and the Impact of the Vehicular Cycling Movement](#),” (Toole Design, 2017).

<sup>41</sup> Ibid.

<sup>42</sup> “AASHTO Guide for the Development of Bicycle Facilities, 2020,” Toole Design, February 7, 2020, <https://tooledesign.com/project/update-to-the-aashto-guide-for-the-design-of-bicycle-facilities-2019/>.

<sup>43</sup> “The Decline of Walking and Bicycling,” Safe Routes To School, accessed June 1, 2021, [http://guide.saferoutesinfo.org/introduction/the\\_decline\\_of\\_walking\\_and\\_bicycling.cfm](http://guide.saferoutesinfo.org/introduction/the_decline_of_walking_and_bicycling.cfm).

<sup>44</sup> “Pedestrian Safety,” Centers for Disease Control and Prevention, accessed June 1, 2021, [https://www.cdc.gov/motorvehiclesafety/pedestrian\\_safety/index.html](https://www.cdc.gov/motorvehiclesafety/pedestrian_safety/index.html).

<sup>45</sup> Suzanne Bennett Johnson, PhD, “The Nation’s Childhood Obesity Epidemic: Health Disparities in the Making,” American Psychological Association, July 2012, <https://www.apa.org/pi/families/resources/newsletter/2012/07/childhood-obesity>. CDC, “Childhood Obesity Facts,” May 17, 2022. Accessed May 26, 2022. [Childhood Obesity Facts | Overweight & Obesity | CDC](#).

<sup>46</sup> [Safe Routes to School - MnDOT \(state.mn.us\)](#)

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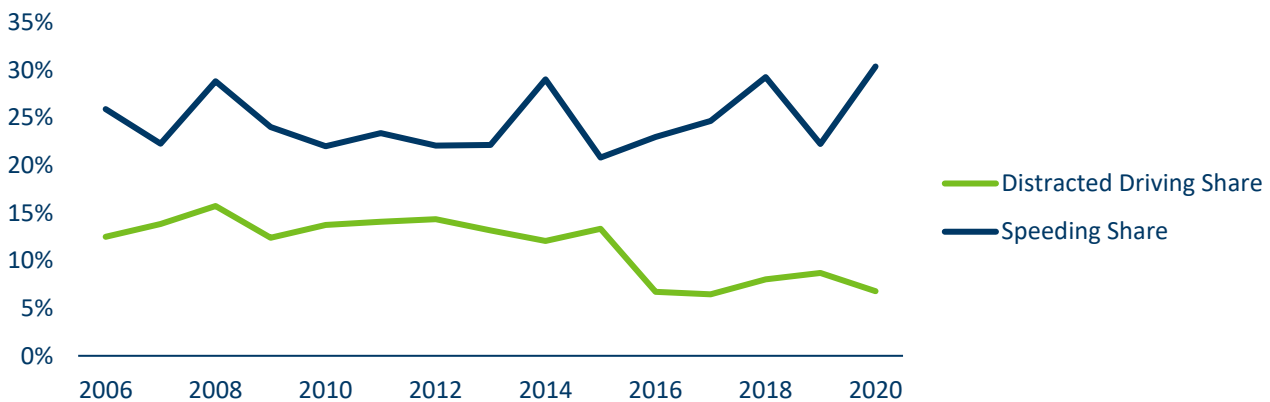
## TRAFFIC SAFETY POLICY AND LAW TRENDS

Roadway design plays a vital role in traffic safety but is only one part of efforts to reduce deaths on America’s roadways. Policies to curb dangerous and deadly driving also play a vital role. In 2020, the most common contributing factors for crashes and traffic fatalities were intoxicated and distracted driving and speeding.<sup>47</sup> There are other important factors and for more discussion on measures being taken to combat these issues, see the Motorized Traffic Safety Trend Analysis.

### DISTRACTED DRIVING

A dangerous 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. Eight percent of all traffic deaths in 2020 were caused by distracted driving and many of those specifically cited a cell phone in use while the crash occurred.<sup>48</sup> In Minnesota, the percent of crashes in Minnesota caused by a distracted driver was 8% in 2018, but cell phone specific data was not available (Figure 11). 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 new law revealed how commonly cell phones are used by drivers. In the first year of the new ban, Minnesota motorists received over 20 thousand citations for violating this law.<sup>49</sup> Data from 2020 shows that the rate of distraction-related fatalities has decreased by nearly 3%, promising yet early outcomes stemming from this new law.<sup>50</sup> This trend will need to be monitored over time, but initial numbers indicate that this effort has positively impacted Minnesota roads.

Figure 11. Share of fatal crashes being caused by distracted drivers or speeding in Minnesota from 2006-2020.<sup>51</sup>



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<sup>47</sup> “Minnesota Motor Vehicle Crash Facts 2020 (mn.gov),” (Minnesota Department of Public Safety, 2020).

<sup>48</sup> [Overview of Motor Vehicle Crashes in 2020 \(dot.gov\)](https://www.dot.gov/newsroom/2020/08/14/overview-of-motor-vehicle-crashes-in-2020), National Highway Traffic Safety Administration

<sup>49</sup> 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/>.

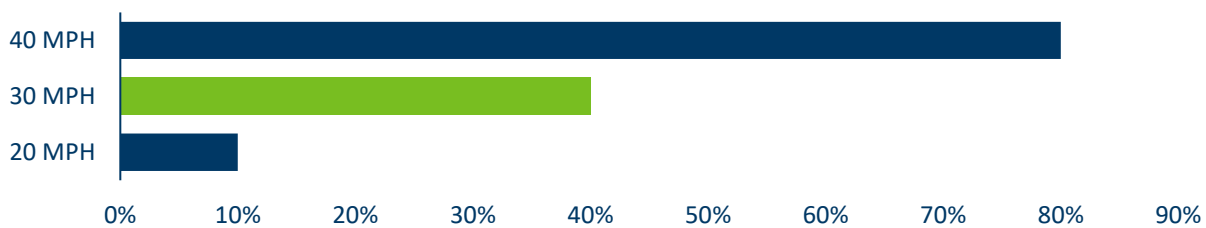
<sup>50</sup> “Minnesota Motor Vehicle Crash Facts 2020 (mn.gov),” (Minnesota Department of Public Safety, 2020).

<sup>51</sup> NHTSA Fatality and Injury Reporting System Tool. <https://cdan.dot.gov/query>. Accessed May 25, 2022.

## SPEED LIMITS

Speed is a major contributor to the severity of crashes. In Minnesota, speeding was cited as a factor for 4.9% of all crashes, but over 30% for fatal crashes.<sup>52</sup> Vehicle speed, as seen in Figure 12, is directly connected to the likelihood of a pedestrian surviving a crash. Higher speeds correspond to higher fatality rates for pedestrians. The NTSB released a report that found that one-fourth of all traffic deaths are directly attributable to excessive speed and that the practice of 85<sup>th</sup> percentile for speed limit setting<sup>53</sup> is inadequate to foster safer roadway conditions.<sup>54</sup> Retrofitting roadways has begun in many cities across the country, but due to the extent of existing infrastructure the impacts from new investments in safety may take some time to be represented in crash statistics.

Figure 12. The change in the likelihood of a collision with a pedestrian resulting in death from 20 miles per hour to 40 miles per hour.<sup>55</sup>



Until recently, Minnesota state law did not allow municipalities to set their own speed limits without an extensive engineering study conducted by MnDOT. This rule prevented 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.<sup>56</sup> As seen in Figure 12, vehicle and pedestrian crashes become significantly more dangerous as the speed of a vehicle increases. As speeds increase from 20 MPH to 40 MPH, the chance of a pedestrian death goes from relatively unlikely (10%) to very likely (80%). The cities of Minneapolis and Saint Paul jointly announced in 2020 that they would set speed limits on city-controlled streets to 20 MPH in order to make their streets safer for pedestrians. However, lower speed limits alone are not enough: measures like traffic calming need to continue in tandem with lowering speed limits to foster a safer environment.

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## RAIL SAFETY

Most deaths and injuries on railroads are the result of a train colliding with another vehicle or pedestrian. As seen in Figure 13, these have generally trended down nationally since 1990, reaching their lowest point in 2012. In recent years fatalities have remained steady. Minnesota has seen further reduction: in 2019 just eight deaths occurred on rail lines in the state, down from 27 in 1990.<sup>57</sup>

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<sup>52</sup> Ibid.

<sup>53</sup> 85th Percentile speed is the speed at or below which 85% of all vehicles are observed to travel during free-flow traffic conditions.

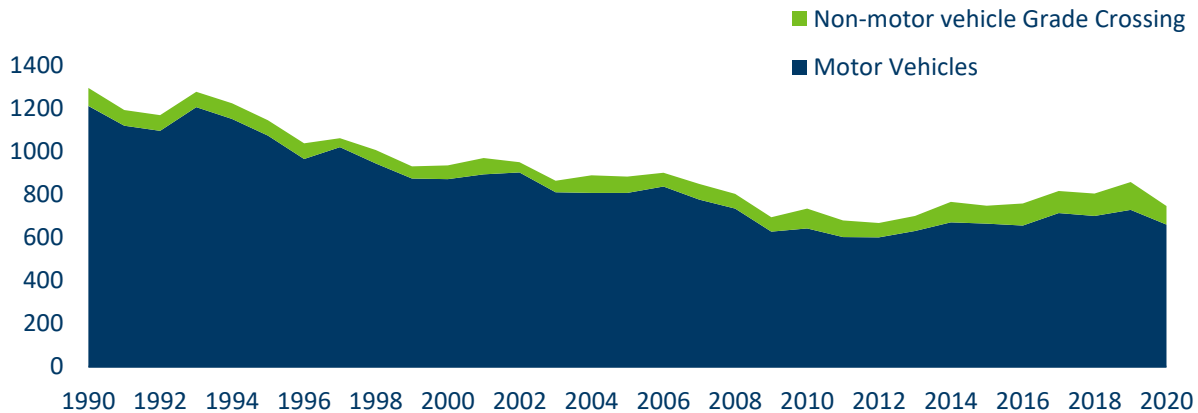
<sup>54</sup> "Reducing Speeding-Related Crashes Involving Passenger Vehicles," (National Transportation Safety Board, 2017).

<sup>55</sup> W.A. Leaf and D.F. Preusser, "Literature Review on Vehicle Travel Speeds and Pedestrian Injuries Among Selected Racial/Ethnic Groups," (U.S. Department of Transportation, 1999).

<sup>56</sup> Jennifer McCoy, Scott McBride, and Liz Forbes, "A Minnesota Vision For Speed Limits," League of Minnesota Cities, April 6, 2021, <https://www.lmc.org/news-publications/magazine/mar-apr-2021/speed-limits/>.

<sup>57</sup> Ibid.

Figure 13. U.S. Rail-related fatalities by year from 1990 to 2020.<sup>58</sup>



Railroad related deaths increasingly involve people on foot, while historically deaths were the result of collisions between motor vehicles and locomotives. Major efforts have long been in effect to limit at-grade crossings and make crossing safer. These efforts have been successful and deaths resulting from motor vehicle and train collisions are currently at their lowest rate ever. However, pedestrian deaths have steadily risen as a share of overall railroad related deaths throughout the decade. The growth in light rail track miles is a likely factor in the national increase in deaths seen in Figure 13. Since crossing deaths began rising in 2009, heavy rail (commuter rail and freight rail) has seen little change in the amount of track miles, increasing only by 5% and 2% respectively, but light rail has seen a 42% increase in track miles from 1,477 miles to 2,096 miles in 2020.<sup>59</sup> Light rail, unlike heavy rail systems, generally run at-grade in dense urban areas and feature many at-grade crossings. Light rail thus has a fatality rate more than double compared to heavy rail.<sup>60</sup> As light rail systems continue to grow in Minnesota and nationally, improved safety measures are needed reverse the increasing trend of pedestrian deaths on rail lines.

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## RELATED TRENDS

- General Transportation Safety
- Motorized Transportation Safety
- Race and Transportation
- [Transportation Behavior](#)

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).

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<sup>58</sup> "Railroad and Grade-Crossing Fatalities by Victim," Bureau of Transportation Statistics, accessed June 1, 2021, <https://www.bts.gov/content/railroad-and-grade-crossing-fatalities-victim-class>.

<sup>59</sup> "System Mileage Within the United States," Bureau of Transportation Statistics, accessed June 1, 2021, <https://www.bts.gov/content/system-mileage-within-united-states>.

<sup>60</sup> "Rail Safety Statistics Report," (Federal Transit Administration, 2016).



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## REVISION HISTORY

Date	Summary of revisions
June 2022	Original paper.