

Senior Driver Crashes in Michigan: 2016-2020

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Special Note

The Michigan Office of Highway Safety Planning and the University of Michigan Transportation Research Institute acknowledge the differences in traffic and commuting patterns in 2020 due to the COVID-19 pandemic. Travel restrictions from the “Stay Home, Stay Safe” Executive Order (EO 2020-21) were initially in place starting on March 24, 2020. That order was then extended through additional executive orders. The stay-at-home order was officially lifted June 1, 2020.

Overall, the total number of police-reported crashes on Michigan roadways decreased by 21.93 percent, declining from 314,376 in 2019 to 245,432 in 2020. The 2020 fatality count was 1,083, up 9.95 percent from the 2019 figure of 985. Compared with 2019, people sustaining injuries were down 18.65 percent. Vehicle miles traveled, licensed drivers, and vehicle registrations decreased in 2020: vehicle miles traveled decreased 15.53 percent to 86.31 billion, motor vehicle registrations were down 0.49 percent to 9.04 million, and the number of licensed drivers was down 1.86 percent to 7.12 million. The increased fatality count in combination with the reduction of the exposure factors contributed to the fatality rate of 1.25 per 100 million miles of travel, a 30.16 percent increase from 2019 (0.96 per 100 million miles). The 2020 fatality rate is also above the 10-year (2011-2020) average of 1.01 fatalities per 100 million miles.

1.0 Executive Summary

This report highlights the crash patterns related to senior drivers age 65 and over in Michigan from 2016 to 2020. Highlights of the analysis include:

- Senior driver crashes had been gradually increasing with a 7.8% increase from 2016 to 2019. In 2020, there was a sharp decrease in senior driver crashes (-28.1% from 2019).
- Crashes involving senior drivers have a slightly higher probability of involving injuries compared to crashes not involving senior drivers (20.6% vs. 17.5%).
- Senior driver crashes involved more head-on, angle, rear-end, sideswipe, and backing crashes than crashes not involving senior drivers. They're also involved in fewer single motor vehicle crashes.
- Senior drivers are involved in more crashes during weekdays (9 AM to 6 PM), in daylight conditions, and in clear weather, which are consistent with their travel patterns.
- Crashes involving senior drivers occurred more often at intersections and on mid-speed roads (speed limits 30-45 mph) compared to non-senior driver crashes.
- Senior drivers were less often involved in alcohol crashes or pedestrian crashes compared to crashes involving only drivers younger than 65.

2.0 Introduction

This report utilizes crash data involving senior drivers in Michigan from 2016 to 2020. Michigan traffic crashes are defined as taking place on public roadways in Michigan, involving at least one motor vehicle in transport, and resulting in death, injury, or property damage of \$1,000 or more. For the purposes of this report, a senior driver is a driver age 65 and over. Safety problems for the senior driver are directly tied to the aging process, including changes in vision, physical fitness, and reflexes, which can contribute to driving errors¹. Senior drivers generally drive less and at different times of day compared to younger drivers, so they have different crash patterns.

In this report, injury severity of people involved in crashes is frequently categorized according to the KABCO scale:

- K - Fatal Injury
- A - Suspected Serious Injury
- B - Suspected Minor Injury
- C - Possible Injury
- O - No Apparent Injury

Similarly, crashes are sometimes classified according to the most severe injury suffered by anyone involved in the crash. Again, the KABCO scale is used, but for O-level severity this refers to crashes with property damage only (PDO) instead of no injury or fatality.

3.0 Crash Counts, Types, and Severity

As shown in Figure 1, crash counts for senior drivers had been increasing between 2016 and 2019, with a total increase of about 7.8% over this period. These crash counts are not normalized by exposure, making it difficult to determine whether the increase reflects an increase in the number of senior drivers on the road or a worsening of senior driver safety. In 2020, there were many fewer crashes, a 28.1% decrease compared to 2019.

Michigan vehicle miles traveled (VMT) increased each year over the same time period, with the exception of 2019, which may have an impact on overall crash counts as well as those for senior drivers. Statewide VMT increased from 97.8 billion in 2015 to 102.4 billion in 2018, an increase of 9.6%. In 2019, VMT decreased slightly to 102.2 billion, and in 2020, due to the pandemic, VMT decreased to 86.3 billion.

¹ National Highway Transportation Safety Administration (NHTSA). *Road Safety - Older Drivers*. Retrieved Jan 25, 2022, from <https://www.nhtsa.gov/road-safety/older-drivers>.

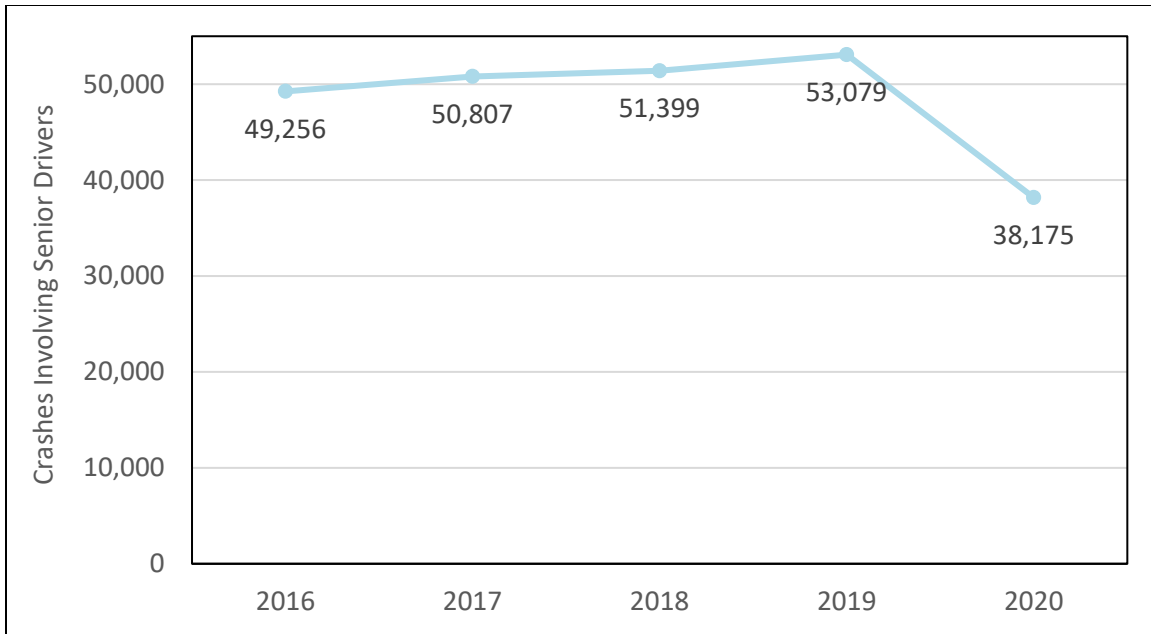


Figure 1 - Senior Driver Crashes by Year

Figure 2 shows the senior driver crash distribution and the number of licensed senior drivers on the same graph. The trend in the increase of number of licensed senior drivers continued into 2020. The number of licensed senior drivers has increased steadily each year. In 2016, 20.0% of the total licensed drivers in Michigan were age 65 and over. By 2020, the senior licensed driver percentage had increased to 22.5%. Between 2016 and 2020, the number of senior licensed drivers in Michigan increased by 11.6%, while overall licensure for all age groups decreased by 0.8% during the same time period. The number of senior drivers has increased every year since 2011 when baby boomers started turning 65.

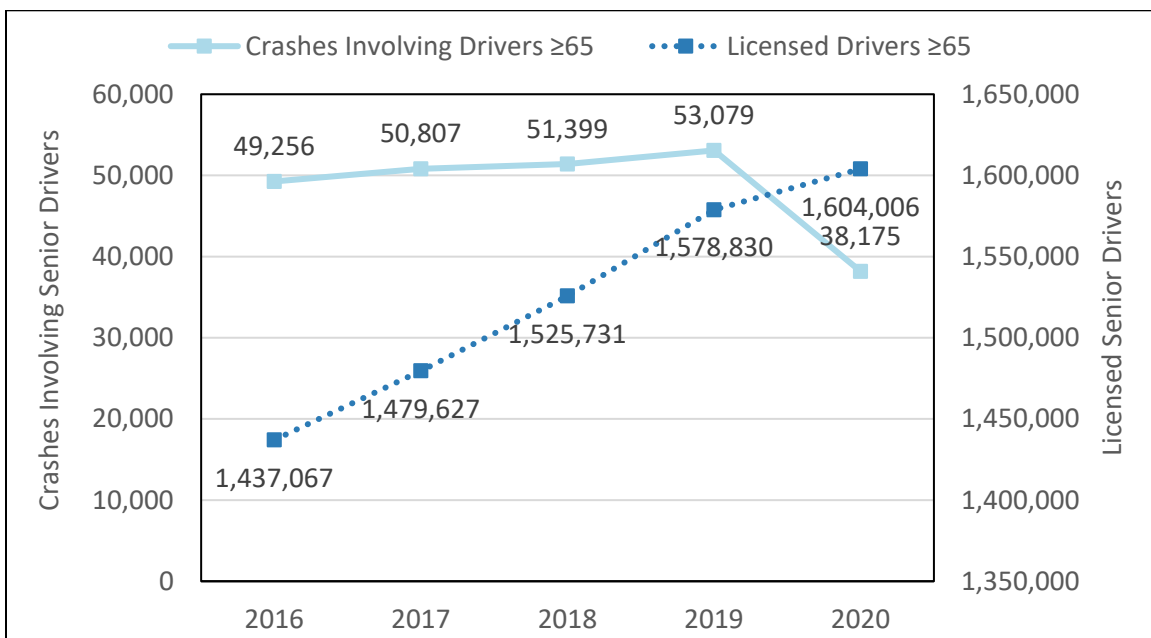


Figure 2 - Senior Driver Crashes and Licensed Senior Drivers by Year

Senior Driver Crashes in Michigan: 2016-2020

Table 1 shows the count and proportion of crashes by worst injury in the crash and whether a senior driver was involved. Worst injury in the crash is coded using the KABCO scale, where K is Killed, A is Suspected Serious Injury, B is Suspected Minor Injury, C is Possible Injury and O is No Injury, sometimes called Property Damage Only (PDO). Every injury category has a greater percentage of crashes for senior drivers compared to crashes involving no senior driver.

Table 1. Crash Severity for Senior Driver-Involved and Senior Driver Not Involved Crashes, 2016-2020

Crash Severity - Worst Injury in Crash	Senior Driver Involvement Count (Column Percent)	
	Yes	No
Fatal Injury (K)	1,035 (0.4%)	3,699 (0.3%)
Suspected Serious Injury (A)	4,022 (1.7%)	19,410 (1.5%)
Suspected Minor Injury (B)	14,393 (5.9%)	62,845 (5.0%)
Possible Injury (C)	31,695 (13.1%)	137,158 (10.9%)
No Injury (O)	191,571 (78.9%)	1,033,871 (82.3%)
Total	242,716	1,256,983

Figure 3 shows the same data as Table 1 but all injury levels have been combined to make the charts more readable. The overall fatal crash rate is 0.4% for crashes involving a senior driver and 0.3% for crashes not involving a senior driver. The injury crash rate for senior driver crashes is 20.6% compared to crashes without a senior driver at 17.5%.

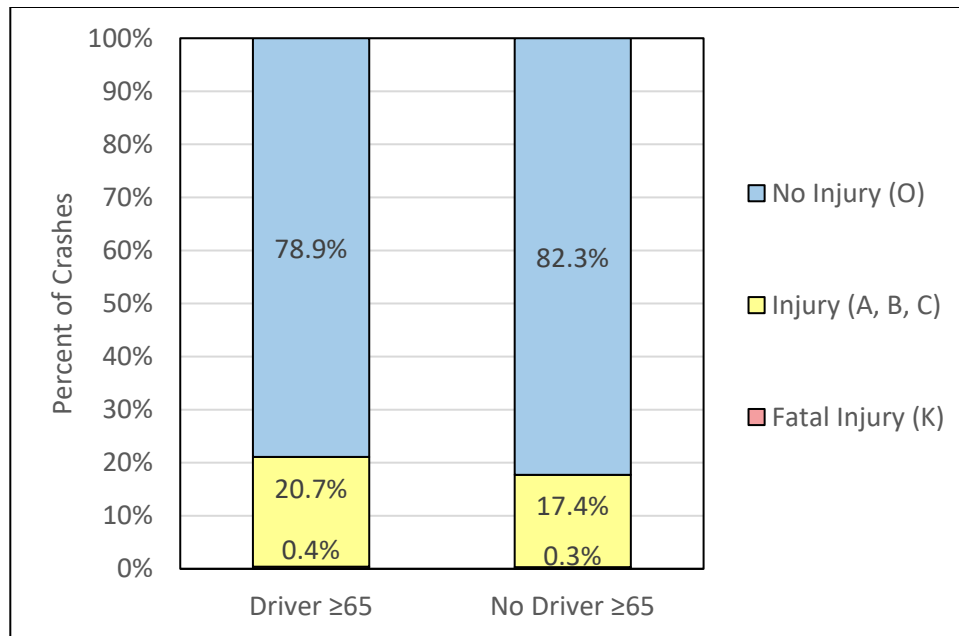


Figure 3 - Crash Severity in Crashes With and Without a Senior Driver, 2016-2020

The number of crashes with and without a senior driver by crash type is shown in Table 2. Table 3 shows the same breakdown for crashes in which at least one occupant sustained a suspected serious injury or fatality (KA crashes). For all crash types, senior driver-involved crashes are less likely to be single motor vehicle crashes than crashes not involving a senior driver (20.0% vs. 37.9%). Senior driver-involved crashes are more likely to be head-on, angle, rear-end, sideswipe, and backing crashes than crashes not involving senior drivers. The same comparisons are true for senior driver and non-senior driver KA crashes, except for backing crashes, which occur at 0.1% for both senior driver and non-senior drivers.

Table 2. Senior Driver and Non-Senior Driver Crashes by Crash Type, 2016-2020

Crash Type	Senior Driver Involvement Count (Column Percent)	
	Yes	No
Single Motor Vehicle	48,608 (20.0%)	475,793 (37.9%)
Head-On	11,639 (4.8%)	40,329 (3.2%)
Angle	54,300 (22.4%)	167,850 (13.4%)
Rear-End	70,056 (28.9%)	328,238 (26.1%)
Sideswipe	40,209 (16.6%)	159,590 (12.7%)
Backing	5,967 (2.5%)	22,917 (1.8%)
Other	11,338 (4.7%)	50,668 (4.0%)
Unknown	599 (0.2%)	11,598 (0.9%)

Table 3. Senior Driver and Non-Senior Driver KA Crashes by Crash Type, 2016-2020

KA Crash Type	Senior Driver Involvement Count (Column Percent)	
	Yes	No
Single Motor Vehicle	1,073 (21.2%)	11,178 (50.0%)
Head-On	935 (18.5%)	2,424 (10.8%)
Angle	1,585 (31.3%)	4,178 (18.7%)
Rear-End	757 (15.0%)	2,577 (11.5%)
Sideswipe	285 (5.6%)	228 (1.0%)
Backing	4 (0.1%)	21 (0.1%)
Other	409 (8.1%)	1,642 (7.3%)
Unknown	9 (0.2%)	115 (0.5%)

4.0 Temporal Variables

4.1 Day of Week

The distribution of crashes with and without senior drivers by day of the week is shown in Figure 4 for all crashes and just KA injury crashes in Figure 5. Overall, senior drivers have a slightly higher percentage of weekday crashes compared to non-senior drivers. Drivers less than age 65 account for proportionally more crashes on Saturday and Sunday compared to senior drivers. For KA injury crashes, the senior and non-senior weekday and weekend crashes follow a similar trend. Friday had the highest percentage of all senior driver crashes (16.9%) and KA senior driver crashes (16.6%) over the five-year period.

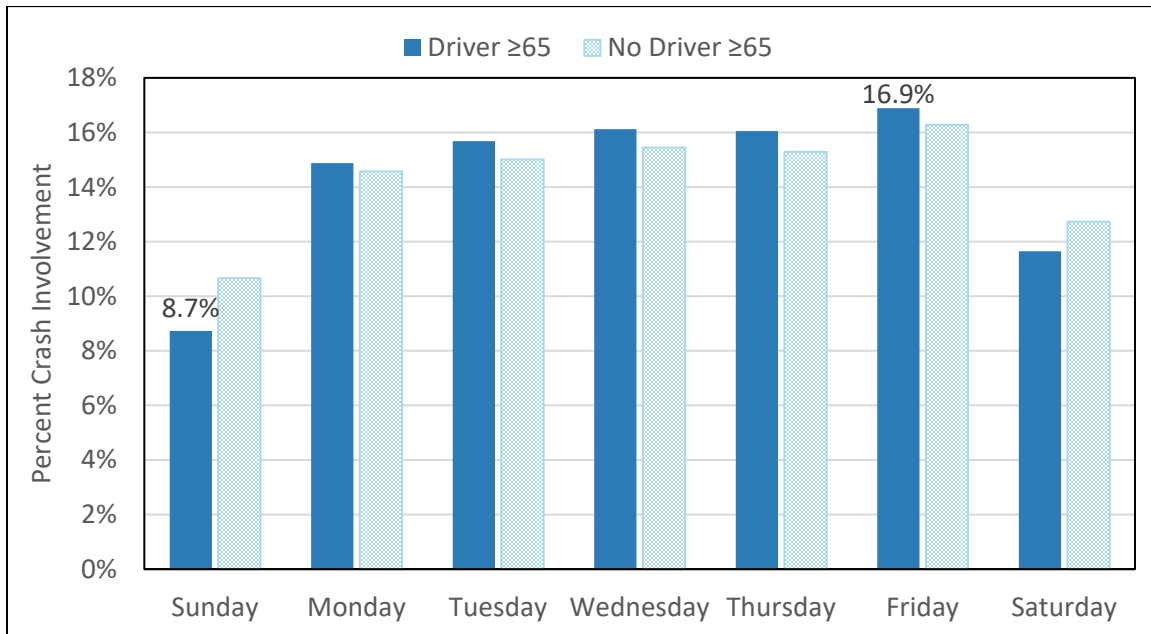


Figure 4 – Crashes With and Without Senior Drivers by Day of Week, 2016-2020

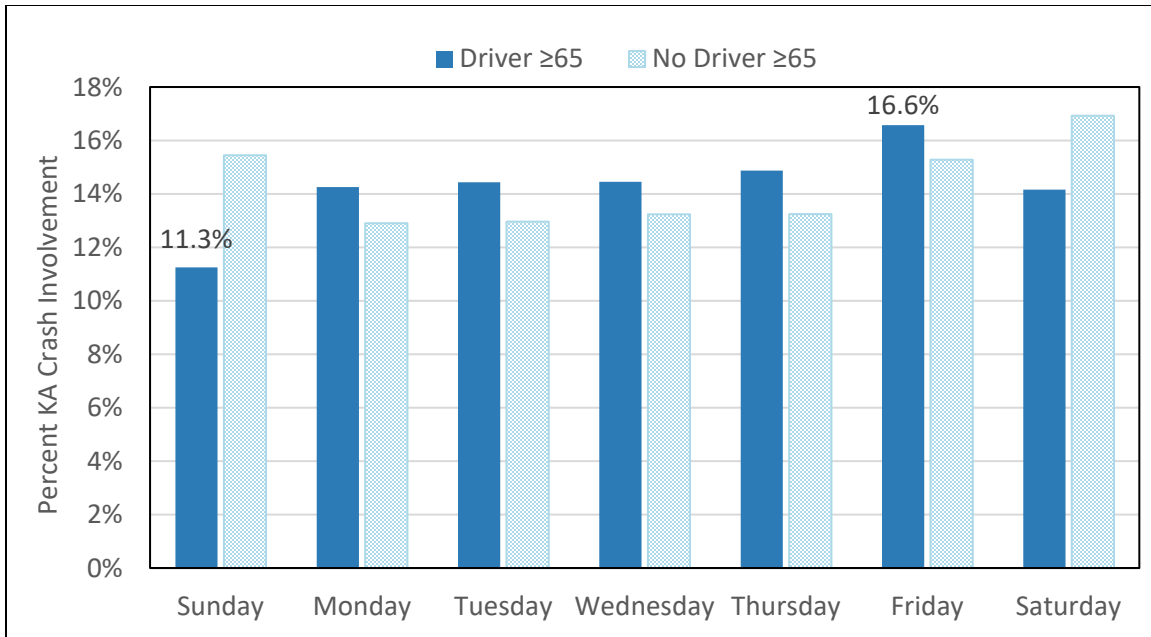


Figure 5 – KA Crashes With and Without Senior Drivers by Day of Week, 2016-2020

4.2 Time of Day

The distribution of crashes with and without senior drivers by time of day is shown in Figure 6 for all crashes. Figure 7 shows a more detailed timeline for KA injury crashes. Senior driver crashes more typically occur between 9 AM and 6 PM with a peak at the 3-4 PM hour, compared to 7 to 9 AM and 6 to 9 PM for crashes without senior drivers. The crash distribution for senior driver crashes is generally unimodal, while it is bimodal for crashes involving all other drivers, corresponding to morning and evening peak rush hours. These crash proportions align with the general understanding that senior drivers drive during off-peak hours, which results in an increase in senior driver crashes during that period compared to other times of day. The distribution of times of crashes involving KA injury with senior driver crash and non-senior drivers have little change in its pattern relative to the total crash distribution. The distribution of KA injury crashes involving senior drivers still peaks from 3 to 4 PM.

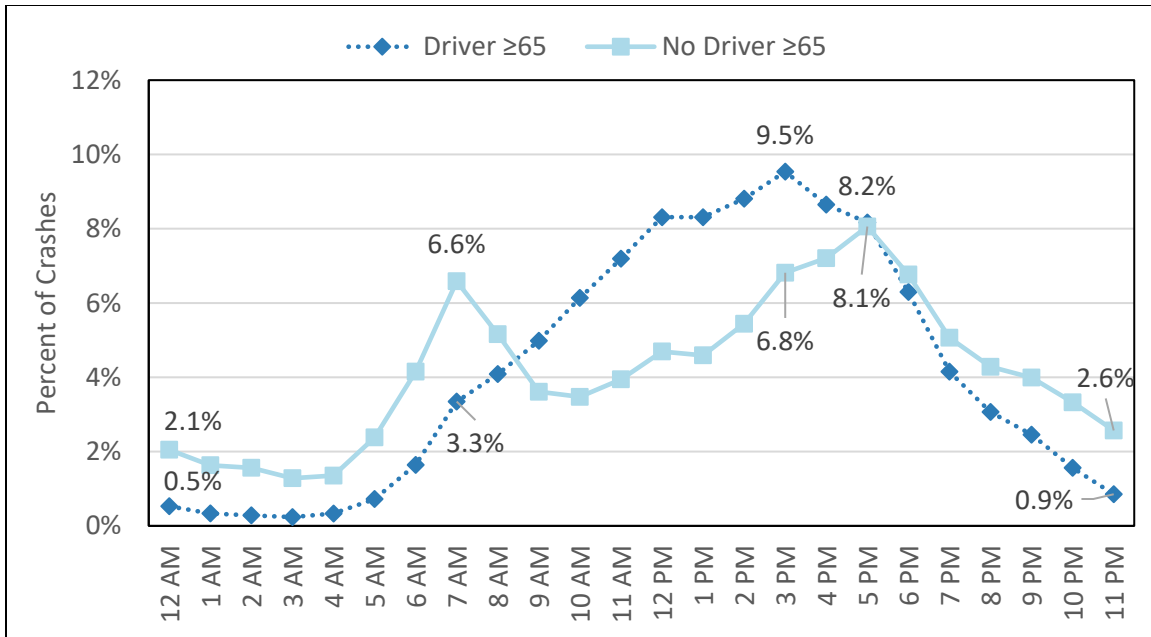


Figure 6 – Crashes With and Without Senior Drivers by Time of Day, 2016-2020

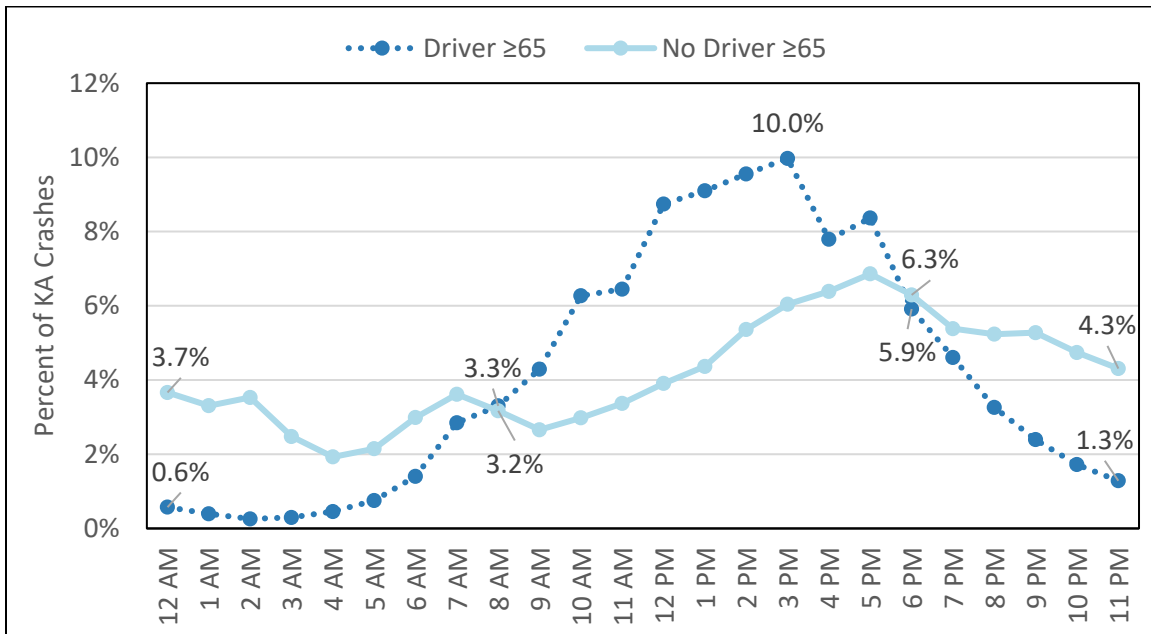


Figure 7 – KA Crashes With and Without Senior Drivers by Time of Day, 2016-2020

5.0 External/Environmental Conditions

5.1 Light Conditions

Figure 8 and Figure 9 show the distribution of crashes with and without senior drivers by light condition for all crashes and KA injury crashes. Other and unknown lighting conditions, making up 0.9% total crashes, are excluded from the two figures. A higher percentage of senior driver crashes (77.7%) take

place in the daylight compared with crashes that do not involve senior drivers (58.7%). Crashes with senior drivers occur more frequently during the day most likely due to limited night-time driving. The estimated VMT of senior drivers traveling at night or during daylight is not available to specifically calculate this risk differential. The patterns observed in KA injury crashes are similar to those for all crashes. Crashes with a KA injury involving a driver age 65 or over occurred during the daylight 80.2% of the time compared to 54.4% during daylight lighting conditions for crashes not involving senior drivers.

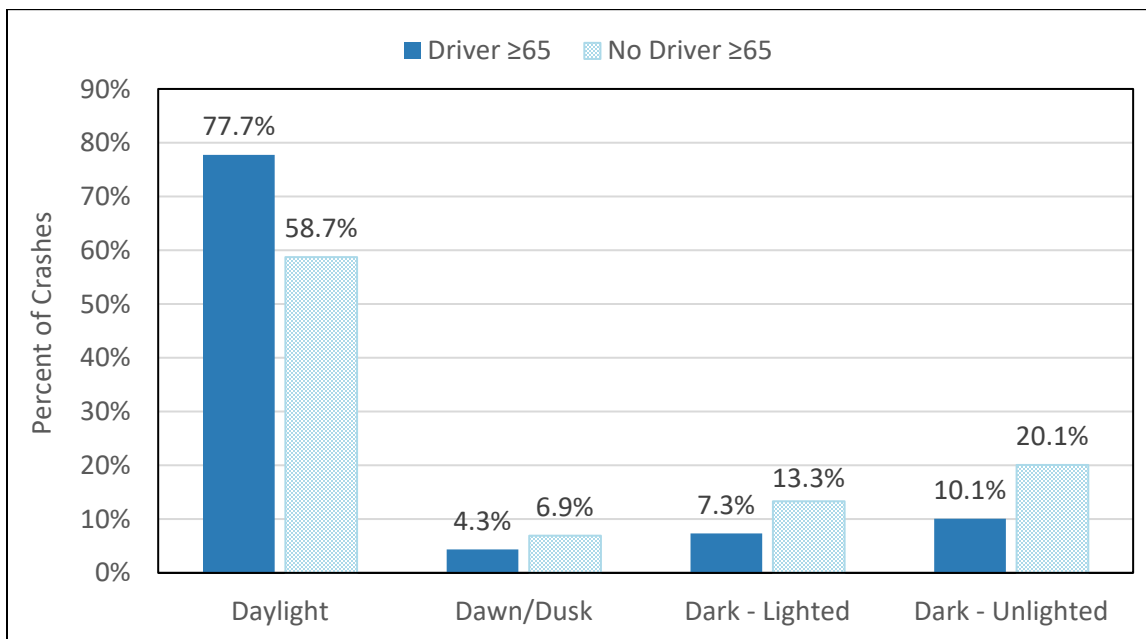


Figure 8 – Crashes With and Without Senior Drivers by Light Condition, 2016-2020

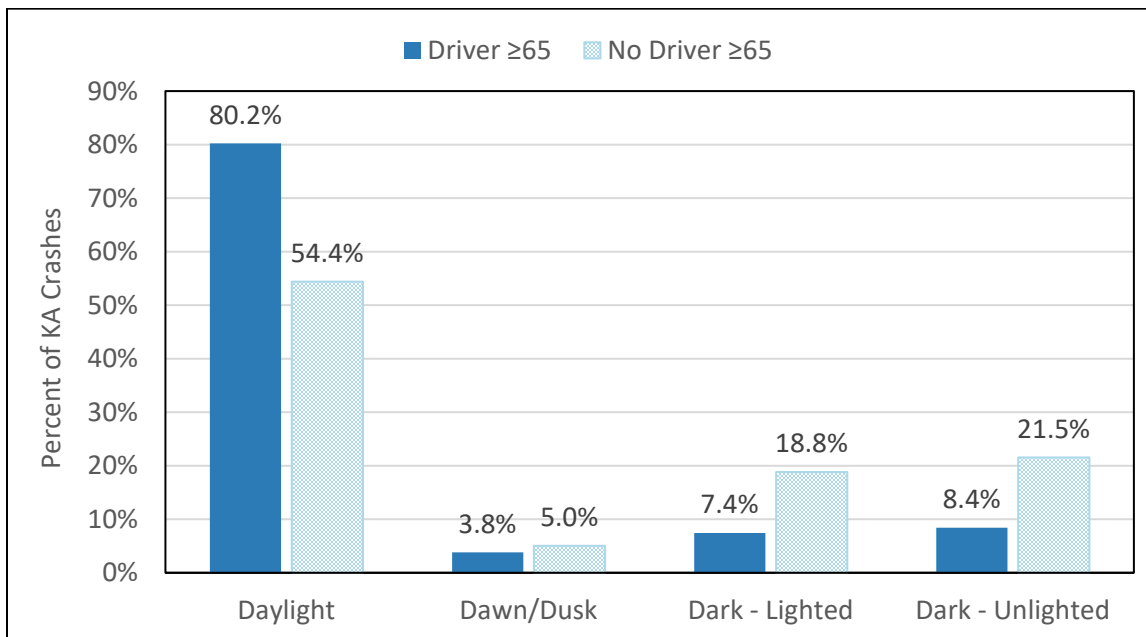


Figure 9 – KA Crashes With and Without Senior Drivers by Light Condition, 2016-2020

5.2 Weather Conditions

The distribution of crashes by weather condition with and without senior drivers is shown in Figure 10 for all crashes and Figure 11 for KA injury crashes. Other and unknown crash weather conditions have been removed from the graphs (3.2% of total crashes). In general, patterns for senior driver crashes are very similar to crashes without senior drivers. Typically, senior driver crashes are somewhat less likely to occur in rainy or snowy conditions possibly because senior drivers self-limit more than drivers under the age of 65. The pattern for KA crashes is very similar for the two age groups.

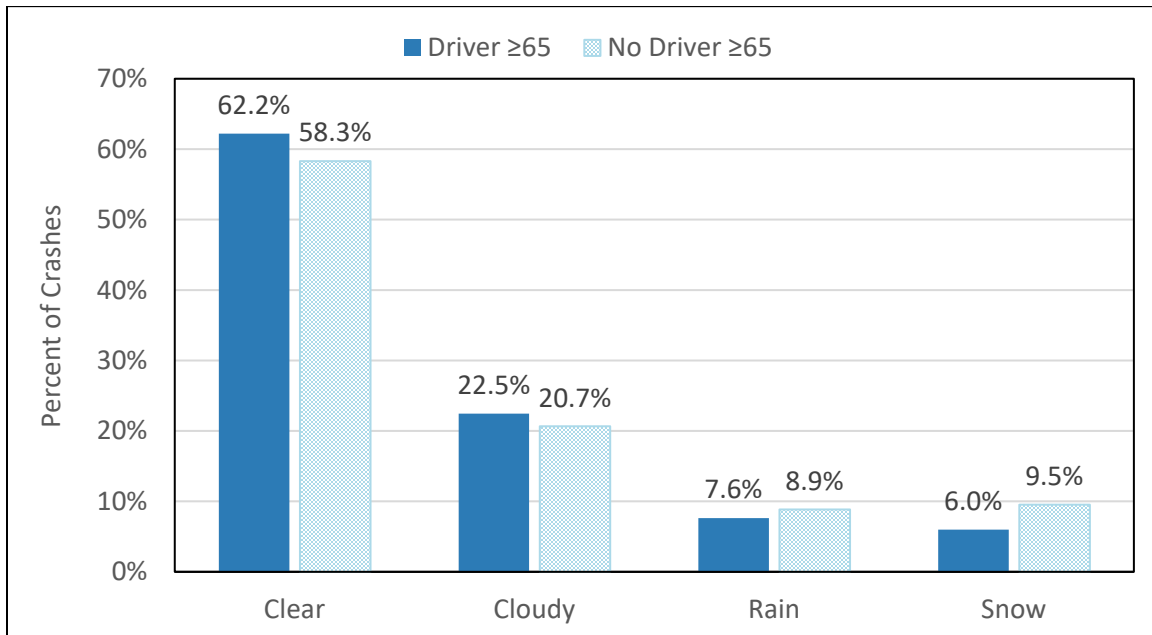


Figure 10 – Crashes With and Without Senior Drivers by Weather Condition, 2016-2020

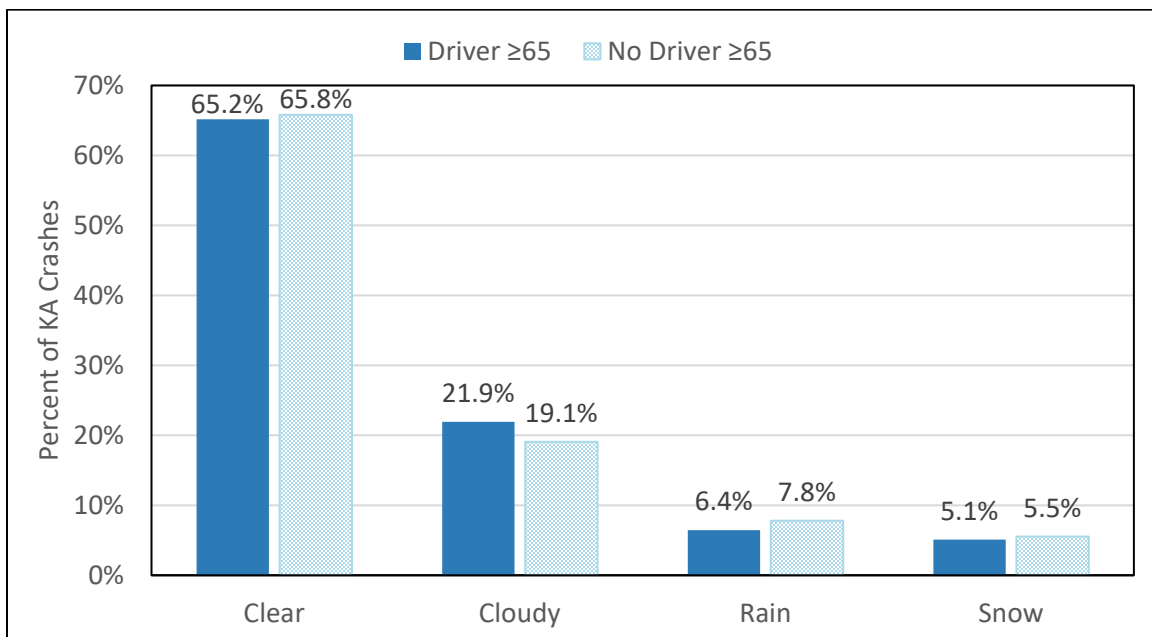


Figure 11 – KA Crashes With and Without Senior Drivers by Weather Condition, 2016-2020

6.0 Roadway Factors

6.1 Relation to Intersection

Table 4 shows the distribution of all crashes and KA injury crashes with and without senior drivers by whether they occurred at intersections. Senior driver crashes occur more frequently at intersections (41.8%) compared to crashes without senior drivers (30.1%). For KA crashes, the proportions at intersections are also greater for senior driver-involved crashes (48.6%) than for non-senior driver crashes (33.4%). These trends may reflect cognitive and physiological difficulties senior drivers can face in navigating intersections.²

Table 4. All and KA Only Crashes by Relation to Intersection and Senior Driver Involvement, 2016-2020

Intersection-Related	All Crashes		KA Crashes	
	Driver ≥65	No Driver ≥65	Driver ≥65	No Driver ≥65
Yes	101,525 (41.8%)	378,266 (30.1%)	2,457 (48.6%)	7,717 (33.4%)
No	141,191 (58.2%)	878,717 (69.9%)	2,600 (51.4%)	15,392 (66.6%)

6.2 Speed Limit

The distribution of crashes with and without senior drivers according to speed limit is shown in Figure 12 for all crashes and Figure 13 for KA injury crashes. A total of 1.5% of all crashes and 1.7% of KA crashes where speed limit was unknown have been excluded from the figures. Crashes occur most frequently at speed limits of 40-45 mph for senior-involved crashes (31.5%) compared to non-senior-involved crashes (23.3%). Senior driver crashes are overrepresented at moderate speeds (30-45 mph) and underrepresented at higher speeds (50+ mph) for total crashes on Michigan roadways. These results suggest a preference for senior drivers to use urban arterial roads rather than highways with higher speeds. For KA crashes, there is a greater proportion of senior driver crashes at the posted speed limit groups of 40-45, 50-55, and 60-65 mph. This may reflect the higher crash risk for more severe crashes at these speeds or greater susceptibility for more severe injuries to seniors at these speeds compared to non-senior drivers. For both groups, the proportion of a KA injury crash at 50-55 mph is much greater than for overall crashes. For crashes involving senior drivers at 50-55 mph, the crash proportion changes from 27.9% in all crashes to 45.7% in KA injury crashes.

² Stutts, J., Martell, C., and Staplin, L. (2009). *Identifying Behaviors and Situations Associated With Increased Crash Risk for Older Drivers*. Report No: DOT HS 811 093

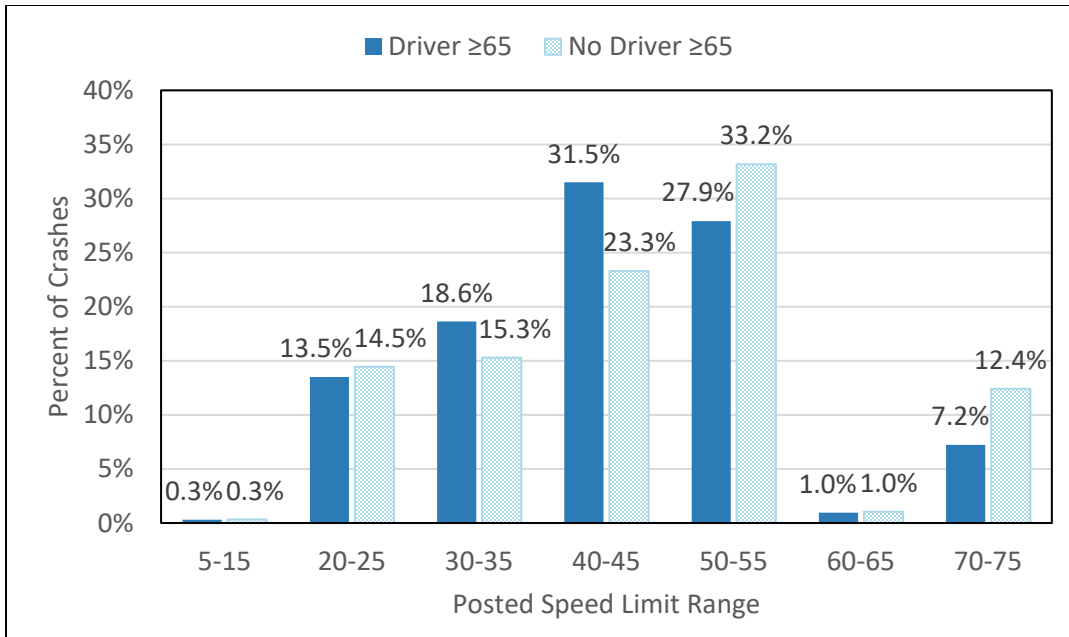


Figure 12 – Crashes With and Without Senior Drivers by Speed Limit, 2016-2020

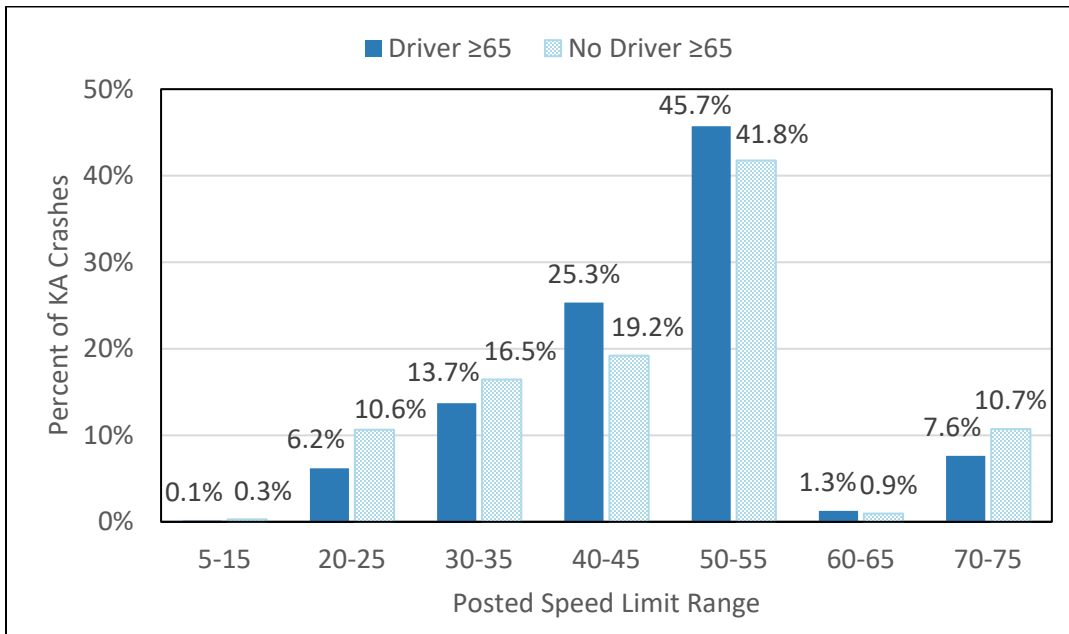


Figure 13 – KA Crashes With and Without Senior Drivers by Speed Limit, 2016-2020

6.3 Number of Lanes

Figure 14 and Figure 15 show the distribution of crashes with and without senior drivers by the number of lanes in the roadway for all crashes and KA injury crashes, respectively. Fewer than 0.1% of crashes had an unknown number of lanes or occurred off the roadway. A smaller proportion of senior driver crashes, including KA crashes, occurred on two-lane roads. Senior drivers had a higher proportion of

total and KA crashes on roads with three or more lanes, compared to crashes not involving senior drivers.

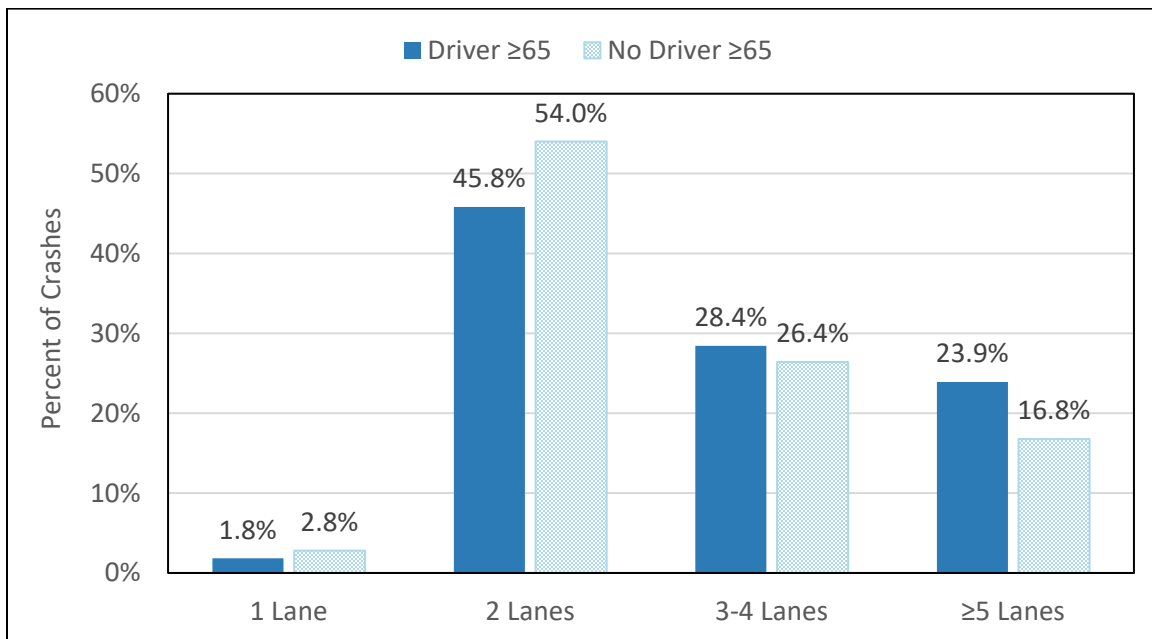


Figure 14 – Crashes With and Without Senior Drivers by Number of Lanes, 2016-2020

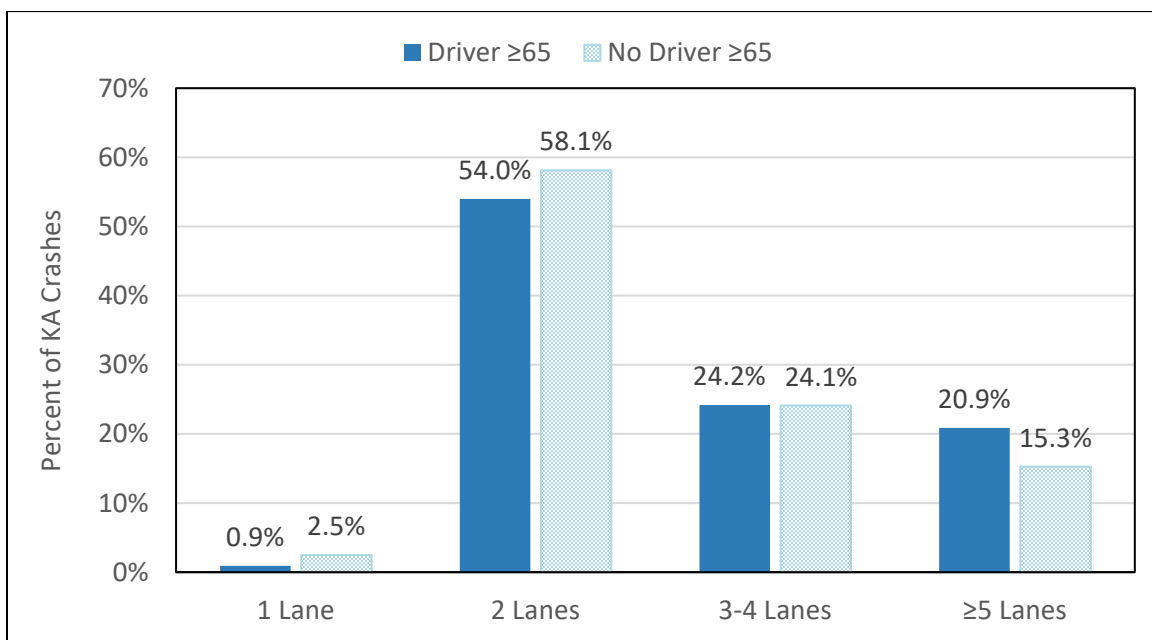


Figure 15 – KA Crashes With and Without Senior Drivers by Number of Lanes, 2016-2020

7.0 Other Factors

Two additional areas where senior driver crashes differ from non-senior driver crashes are alcohol involvement and pedestrian crashes. Table 5 shows the percentage of all crashes and KA crashes that involve drinking by senior driver involvement. Among senior driver-involved crashes, only 1.4% involve alcohol, compared to 2.6 times that for non-senior driver-involved crashes (3.6%). When there is a senior driver in a KA crash, the rate of alcohol involvement is 8.6%, while non-senior driver-involved crashes are 2.6 times that at 22.0%.

Table 5. Proportion of Alcohol Involvement Among All Crashes and KA Crashes by Senior Driver Involvement, 2016-2020

Alcohol Involvement	All Crashes		KA Crashes	
	Driver ≥65	No Driver ≥65	Driver ≥65	No Driver ≥65
Drinking Involved	1.4%	3.6%	8.6%	22.0%
No Drinking Involved	98.6%	96.4%	91.4%	78.0%

Table 6 shows all pedestrian and KA pedestrian crashes broken down by light level and senior driver involvement. Pedestrian crashes make up 0.5% of senior driver-involved crashes and 0.7% of non-senior driver-involved crashes. Pedestrian crashes involving senior drivers occur relatively more often in daylight compared to when no senior driver is involved for all crashes and KA crashes (64.9% vs. 49.9% and 49.1% vs. 35.0%, respectively). While pedestrians are more vulnerable in darkness no matter the age of the driver, seniors' self-limiting to primarily daylight conditions (see Figure 8 and Figure 9) may reduce their proportion of pedestrian crashes in darkness and may be responsible for their generally lower rate of pedestrian crashes overall.

Table 6. Proportion of Light Conditions Among all Pedestrian Crashes and KA Pedestrian Crashes by Senior Driver Involvement, 2016-2020

Light Condition	All Pedestrian Crashes		KA Pedestrian Crashes	
	Driver ≥65	No Driver ≥65	Driver ≥65	No Driver ≥65
Daylight	64.9%	49.9%	49.1%	35.0%
Dark	30.8%	44.0%	45.9%	59.6%
Dawn/Dusk	4.0%	5.1%	4.6%	4.8%
Other	0.0%	0.1%	0.0%	0.1%
Unknown	0.3%	0.9%	0.4%	0.6%

8.0 Summary

Senior driver-involved crashes dropped significantly in 2020 but 5-year trends continue to show the similar exposure and risk factors. As this report shows, senior driver-involved crashes differ from other crashes in that they happen mostly during the daytime (generally afternoon, not during rush hours) and on weekdays. These crashes occur on roads that have lower speed limits and in mostly clear conditions during the day. Senior drivers are overrepresented in intersection-related crashes and in crashes on

roadways consisting of five lanes or more, possibly due to cognitive challenges related to the aging process. Senior drivers are underrepresented in crashes happening in the dark, in crashes involving pedestrians, and in alcohol-involved crashes. The characteristics of crashes involving senior drivers are consistent with seniors' self-limiting decisions (i.e., to daytime, better weather, and non-highway driving) as well as the potential for cognitively complex situations to be riskier for senior drivers than younger drivers.