Virginia Department of Health

Office of Emergency Medical Services (OEMS)

Report: Motor Vehicle Crashes in Virginia from July 1, 2021 – June 30, 2022

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This report is based on the deliberations and analyses performed by Office of EMS Epidemiology staff. See MVC Report Appendix for information on the data source and processing steps that generated this report.

*Important Note: The Office of Emergency Medical Services is currently in the process of transitioning to a new data management system for all pre-hospital data. System performance issues identified and corrected during the transition may limit the accuracy of the data contained within this report. As such, this report is considered preliminary and subject to change. Thank you for your understanding and patience during this transition.

Key Findings

- Of the 34,656 total motor vehicle crash (MVC) incidents reported to emergency medical services (EMS) in Virginia between July 2021 and June 2022, 28,975 (83.6%) occurred in metro areas and 5,681 (16.4%) occurred in rural areas. During this one year, 3.9 MVC incidents occurred per every 1,000 people in metro areas and 4.8 incidents occurred per every 1,000 people in rural areas.

- Of the 34,656 MVC incidents, persons of white race experienced the highest number of MVCs (16,930; 48.9%). However, persons of black race experienced the highest rate of MVCs, with 6.5 MVC incidents per every 1,000 persons of black race between July 2021 and June 2022.

- Of the 34,656 MVC incidents, the 15-24-year-old age group experienced the most MVCs (7,382; 21.3%) followed by 25-34-year-olds (7,149; 20.6%).

- Of the 34,656 MVC incidents, 28,257 (81.5%) incidents involved passenger vehicles, 2,007 (5.8%) incidents occurred on motorcycles, 1,074 (2.2%) incidents involved special types of passenger vehicles, and 3,393 (9.8%) incidents either had vehicle type reported as unknown or contained insufficient information to determine the vehicle type.

47% of passenger vehicle MVCs involved airbag deployment

60% of patients ≤ 7 years old involved in passenger vehicle MVCs were reported to be using a booster seat

66% of motorcyclists involved in a MVC were reported to be wearing a helmet

49% of all MVCs, **68%** of severe crashes* and **73%** of crash ejections occurred among male patients

7% of all MVCs, **14%** of severe crashes* and **20%** of crash ejections involved possible drug or alcohol impairment

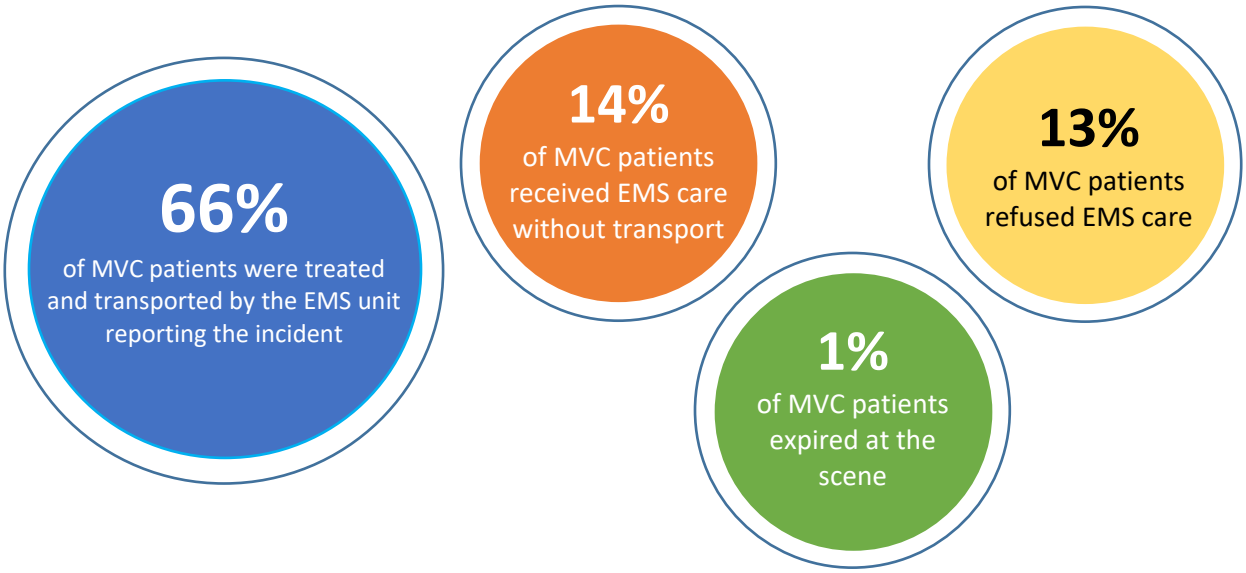
27% of passenger vehicle MVCs, **65%** of severe passenger vehicle crashes* and **88%** of passenger vehicle ejections occurred among persons not wearing a seat belt

*Severe crash: incidents with Red or Black Comprehensive Patient Acuity

Overview

Patient Disposition

Between July 1, 2021 and June 30, 2022, emergency medical services (EMS) agencies in Virginia responded to a total of 1,584,799 EMS calls; of these, 37,145 (2.3%) Virginia EMS patient records contained a cause of injury representing a motor vehicle crash (MVC), per the NEMSIS MVC case definitions (see Appendix 1, Methodology). Of that MVC total, 24,639 (66.3%) patients had a disposition of treated and transported by the EMS unit reporting the incident, 5,169 (13.9%) patients received EMS treatment but were not transported by EMS to an acute care facility for further care (i.e., 5,065 [13.6% of all MVCs] had a disposition of treated and released, 61 [0.2% of all MVCs] were treated by EMS and transported by private vehicle, and 43 [0.1% of all MVCs] were treated by EMS and transported by law enforcement), 4,665 (12.6%) patients refused EMS evaluation/care, 1,029 (2.8%) patients had a disposition of treated and transferred care to another EMS unit, 1,013 (2.7%) patients were evaluated by an EMS provider but required no treatment or transport, 324 (0.9%) patients were documented as dead at the scene, 277 (0.7%) patients had a disposition of EMS assist or standby, and 29 (0.1%) had a disposition of canceled. Out of all MVC-related EMS calls, **34,656** incidents met all inclusion criteria and no exclusion criteria for this analysis (see Appendix 1, Methodology); these records are the focus of this report.



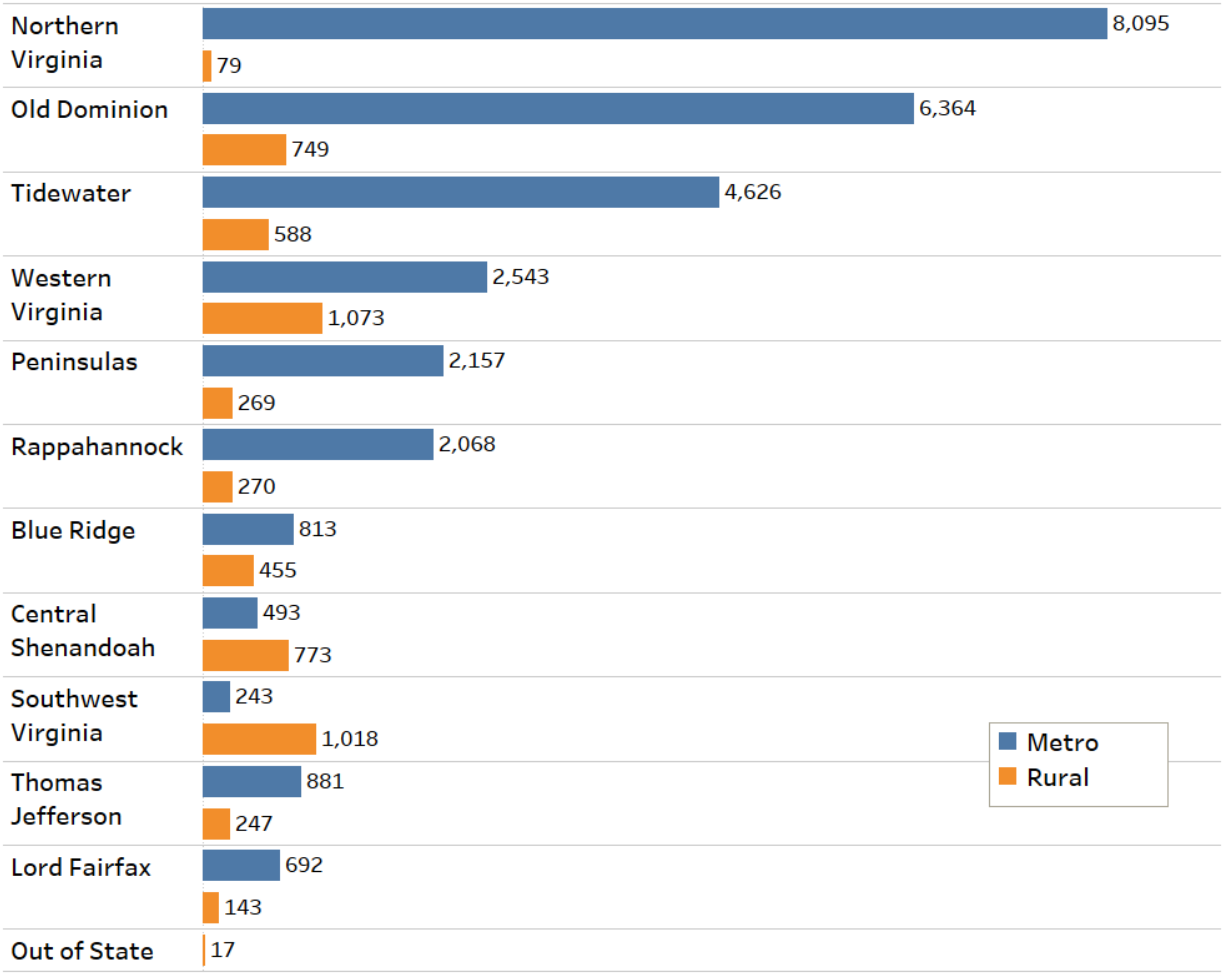
Mass Casualty Events

Of the 34,656 MVC-related EMS calls included in this analysis, 29,945 (86.4%) incidents were reported as non-mass casualty events, 472 (1.4%) incidents were reported as mass casualty events, and 4,239 (12.2%) incidents did not contain information on mass casualty status.

Region and Land Usage

The Northern Virginia EMS Council responded to the highest number of MVC-related incidents (8,174; 23.6%), followed by the Old Dominion EMS Alliance (7,113; 20.5%) and the Tidewater EMS Council (5,214, 15.0%) (Figure 1). Of the 34,656 motor vehicle crash incidents, 28,975 (83.6%) occurred in metro areas and 5,681 (16.4%) occurred in rural areas (as defined by the Census Bureau's 2010 Urbanized Areas and Urban Cluster Designations; see Appendix 1, Methodology).

Figure 1. Number of Motor Vehicle Crash Incidents by EMS Council Region of the Response Unit and Scene Incident Location Land Use, July 2021 through June 2022, Virginia

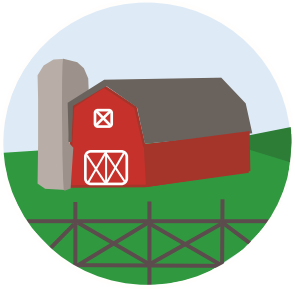


- According to the Annual Resident Population Estimates from the U.S. Census Bureau as of July 2021, an estimated 7,455,240 (86.3%) of the Virginia population lived in metro areas.
    - The 28,975 MVC incidents in metro areas accounted for 83.6% of motor vehicle crashes in Virginia. In the one year from July 2021 through June 2022, 3.9 motor vehicle crash incidents occurred per every 1,000 people in metro areas.
- According to the Annual Resident Population Estimates from the U.S. Census Bureau as of July 2021, an estimated 1,187,034 (13.7%) of the Virginia population lived in rural areas.
    - The 5,681 MVC incidents in rural areas accounted for 16.4% of motor vehicle crashes in Virginia. In the one year from July 2021 through June 2022, 4.8 motor vehicle crash incidents occurred per every 1,000 people in rural areas.

86%
of the Virginia population live in metro areas

84%
of MVC incidents occurred in metro areas

14%
of the Virginia population live in rural areas



16%
of MVC incidents occurred in rural areas

Crash Characteristics

Time of Day

Of the 34,656 motor vehicle crash incidents reported to Virginia EMS agencies between July 2021 and June 2022, 21,730 (62.7%) occurred during the day (6 a.m. to 5:59 p.m.) and 12,926 (37.3%) occurred at night (6 p.m. to 5:59 a.m.). More motor vehicle crashes occurred during the day than at night for both metro and rural areas.

- Of the 28,975 metro motor vehicle crashes, 18,081 (62.4%) occurred during the day and 10,894 (37.6%) occurred at night.
- Of the 5,681 rural motor vehicle crashes, 3,649 (64.2%) occurred during the day and 2,032 (35.8%) occurred at night.

EMS responses to MVC incidents occurred

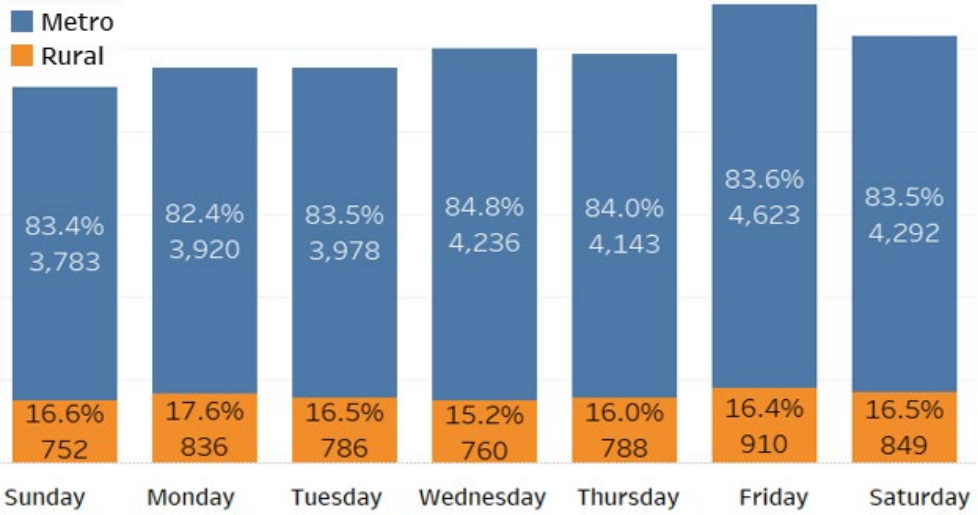
vs

during the day compared to at night

Day of the Week

Of the 34,656 total motor vehicle crash incidents in Virginia, the most MVCs occurred on Fridays (5,533; 16.0%) while the least MVCs occurred on Sundays (4,535; 13.1%) (Figure 2).

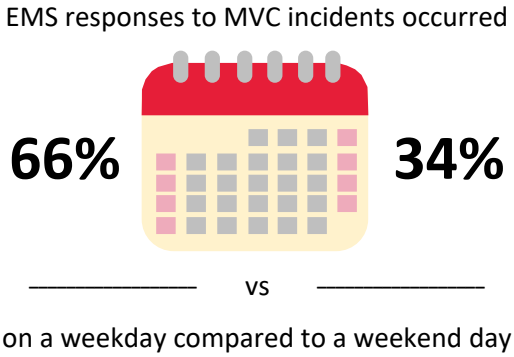
Figure 2. Number of EMS Responses for Motor Vehicle Crashes by Land Use and Day of the Week, July 2021 through June 2022, Virginia



Time of Week

Of the 34,656 total motor vehicle crash incidents in Virginia, 22,908 (66.1%) occurred on a weekday (4.5 days; Monday 6 a.m. to Friday 5:59 p.m.), while 11,748 (33.9%) occurred on the weekend (2.5 days; Friday 6 p.m. to Monday 5:59 a.m.). More motor vehicles crashes occurred on a weekday than on the weekend for both metro and rural areas.

- Of the 28,975 metro motor vehicle crashes, 19,176 (66.2%) occurred on a weekday and 9,799 (33.8%) occurred on the weekend.
- Of the 5,681 rural motor vehicle crashes, 3,732 (65.7%) occurred on a weekday and 1,949 (34.3%) occurred on the weekend.



Patient Characteristics

Race and Gender

According to the Vintage 2020 Bridged-Race Postcensal Population Estimates Data from the U.S. Census Bureau, an estimated 5,337,294 (62.1%) of the 8,590,563 total Virginia population identified their race as white, while 1,721,838 (20.0%) identified their race as black. Of the 34,656 MVC incidents reported in Virginia between July 2021 and June 2022, persons of white race experienced the highest number of MVCs (16,930; 48.9%). However, persons of black race experienced the highest rate of MVCs, with 6.5 MVC incidents requiring EMS response out of every 1,000 persons of black race between July 2021 and June 2022 (Table 1).

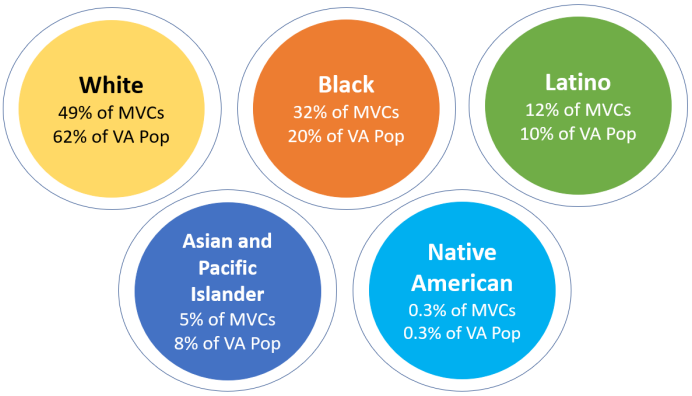


Table 1. Number of EMS Responses for Motor Vehicle Crashes by Race, Gender, and Land Use, July 2021 through June 2022, Virginia

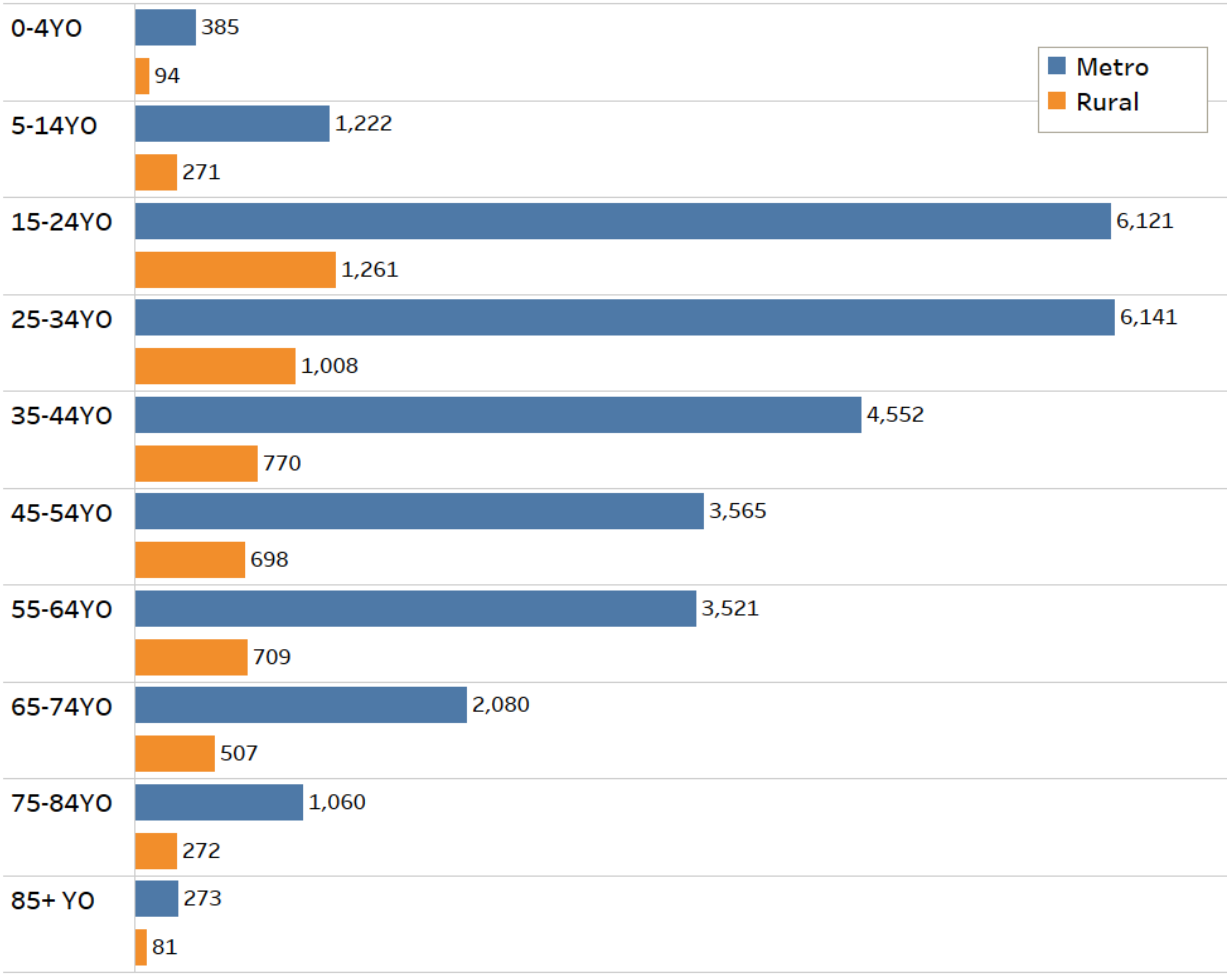
Patient Demographics		MVCs by Land Usage		Total MVCs		Virginia Population		
Race	**Gender**	**Metro**	**Rural**	**Total MVC Count**	**% of all MVCs**	**Total VA population**	**% of VA population**	**Rate per 1,000 persons**
White	Female	6,618	1,811	8,429	24.3			
	Male	6,514	1,961	8,475	24.5			
	Unknown	16	10	26	0.1			
	Total	**13,148**	**3,782**	**16,930**	**48.9**	5,337,294	62.1	3.2
Black	Female	4,997	659	5,656	16.3			
	Male	4,716	756	5,472	15.8			
	Unknown	10	2	12	0.0			
	Total	**9,723**	**1,417**	**11,140**	**32.1**	1,721,838	20.0	6.5
Latino	Female	1,878	114	1,992	5.7			
	Male	1,863	151	2,014	5.8			
	Unknown	9	0	9	0.0			
	Total	**3,750**	**265**	**4,015**	**11.6**	855,301	10.0	4.7
Asian or Pacific Islander	Female	883	38	921	2.7			
	Male	698	23	721	2.1			
	Unknown	1	0	1	0.0			
	Total	**1,582**	**61**	**1,643**	**4.7**	650,090	7.6	2.5
Native American	Female	45	2	47	0.1			
	Male	47	5	52	0.2			
	Unknown	0	0	0	0.0			
	Total	**92**	**7**	**99**	**0.3**	26,040	0.3	3.8
Two or More Races	Female	75	8	83	0.2			
	Male	49	3	52	0.2			
	Unknown	1	0	1	0.0			
	Total	**125**	**11**	**136**	**0.4**			
Unknown	Female	252	62	314	0.9			
	Male	240	70	310	0.9			
	Unknown	63	6	69	0.2			
	Total	**555**	**138**	**693**	**2.0**			
Grand Total		**28,975**	**5,681**	**34,656**	**100**	**8,590,563**	**100**	

Age Groups

Of the 34,656 MVC incidents from July 2021 through June 2022 requiring an EMS response, the 15–24-year-old age group experienced the most MVCs (7,382; 21.3%) followed by 25–34-year-olds (7,149; 20.6%) and 35–44-year-olds (5,322; 15.4%). Age was not captured or unknown for 65 (0.2%) patients.

- In contrast, for the 28,920 metro incidents, persons 25-34 years old experienced the most MVCs (6,141; 21.2%), followed closely by 15–24-year-olds (6,121; 21.2%). The third highest count was among 35–44-year-olds (4,552; 15.7%) (Figure 3).
- In rural areas, the 15–24-year-old age group experienced the most MVCs (1,261; 22.2% of 5,671 rural incidents), followed by persons 25-34 years old (1,008; 17.8%) and 35–44-year-olds (770; 13.6%) (Figure 3).

Figure 3. Number of EMS Responses for Motor Vehicle Crashes by Age Group and Land Use, July 2021 through June 2022, Virginia

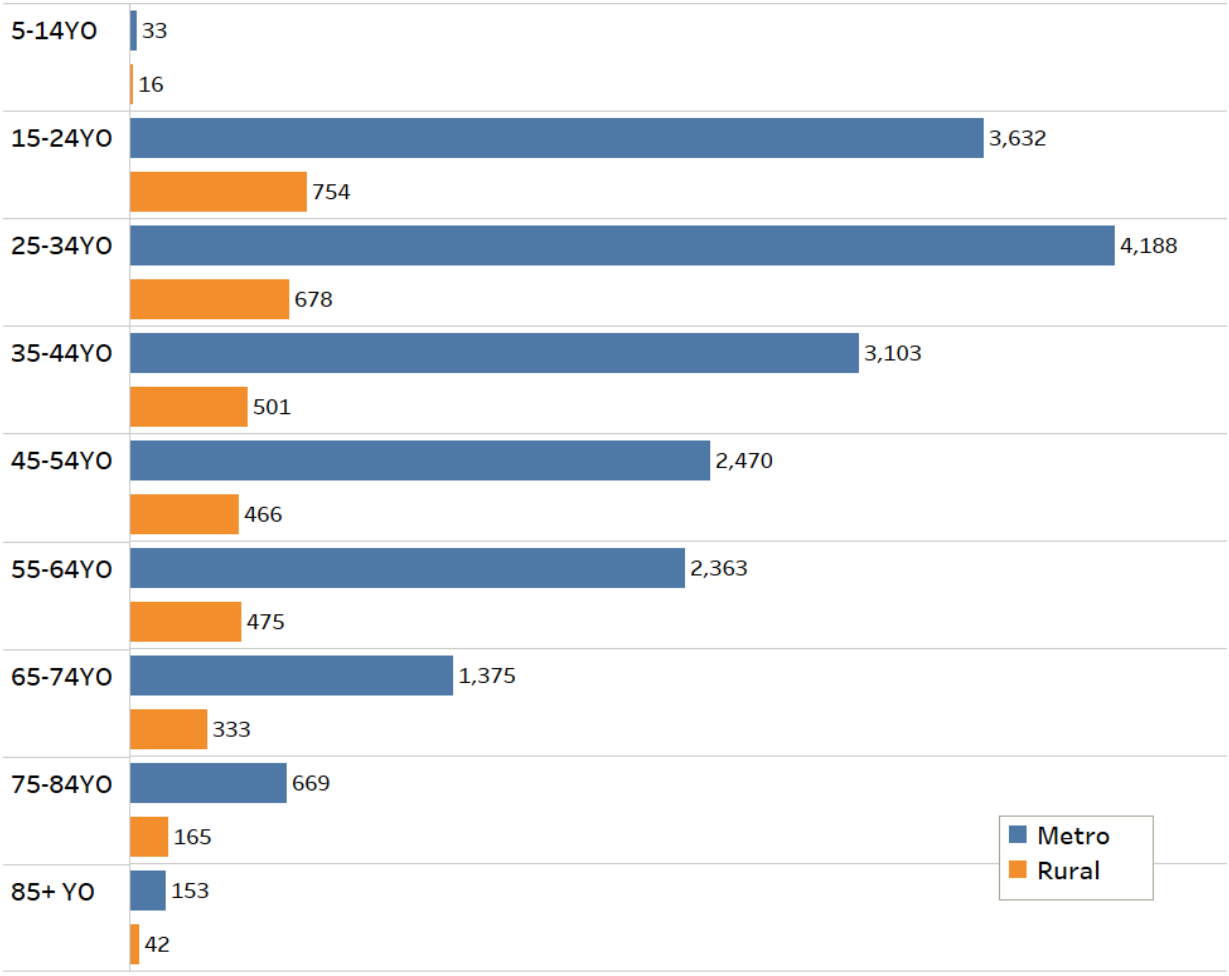


Drivers and Passengers

From July 2021 through June 2022, there were 21,456 (61.9%) drivers and 7,084 (20.4%) passengers involved in motor vehicle crashes requiring EMS response. For 66 (0.2%) incidents, the person involved was in some other position relative to the vehicle (e.g., on the vehicle exterior). For the remaining 6,050 (17.5%) incidents, the record contained insufficient information to determine the position in the vehicle of the person involved.

- Of the 21,456 EMS incidents involving drivers, 18,020 (84.0%) crashes occurred in metro areas and 3,436 (16.0%) incidents occurred in rural areas (see Figure 4).
- Of the 7,084 EMS incidents involving passengers, 5,937 (83.8%) crashes occurred in metro areas and 1,147 (16.2%) incidents occurred in rural areas.

Figure 4. Number of EMS Responses for Motor Vehicle Drivers Involved in a Crash by Age Group and Land Use, July 2021 through June 2022, Virginia



Non-Occupants

Non-occupants (i.e., pedestrians, animals) were involved in a total of 2,335 (6.7% of 34,656) motor vehicle crashes between June 2021 and July 2022. Of these, 1,953 (83.6%) incidents occurred in metro areas and 382 (16.4%) occurred in rural areas.

- Of the 2,335 incidents involving non-occupants, 2,011 (5.8% of 34,656) occurred among pedestrians. Of these 2,011 known pedestrian incidents, 1,732 (86.1%) took place in metro areas and 279 (13.9%) occurred in rural areas.
- The remaining 324 (0.9% of 34,656) incidents involving non-occupants were reported to occur among either pedestrians or animals. Of these 324 pedestrian or animal incidents, 221 (68.2%) took place in metro areas and 103 (31.8%) occurred in rural areas.

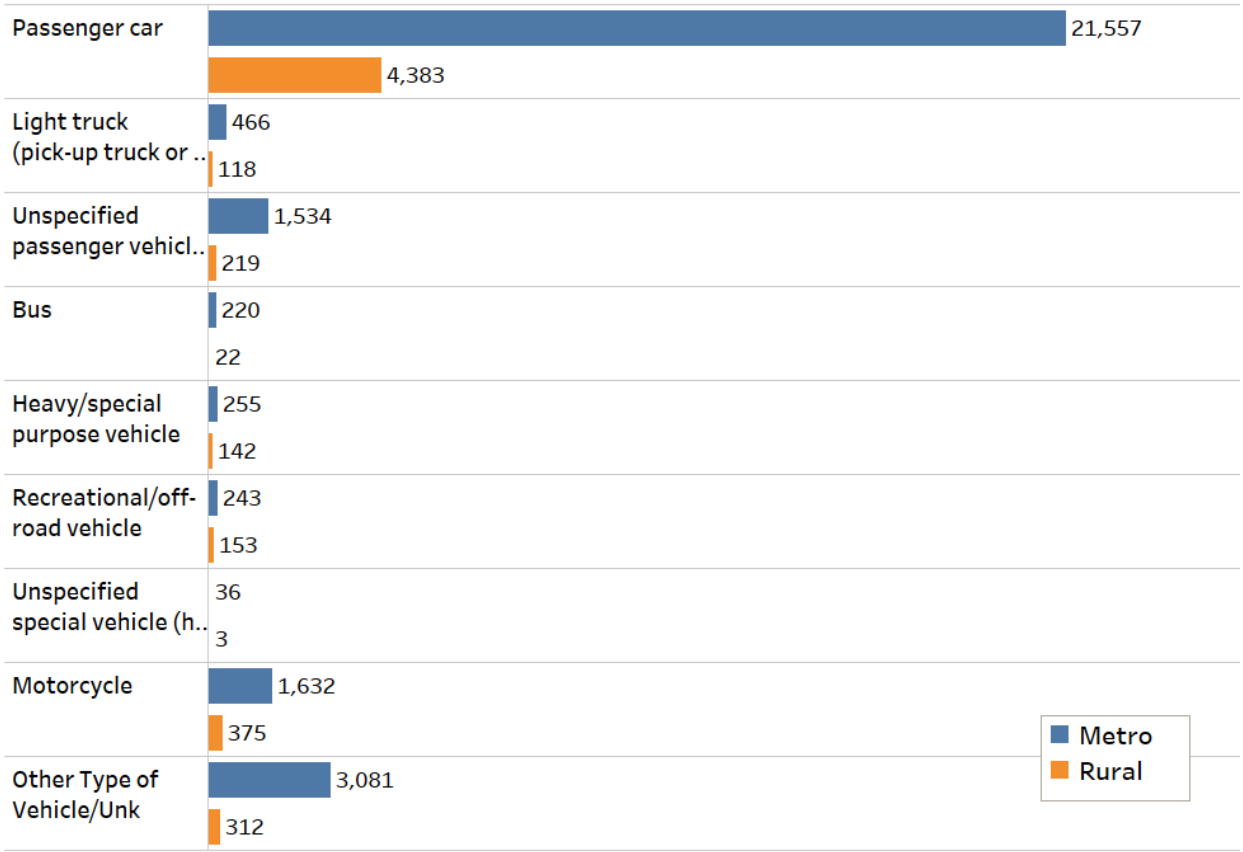
Vehicle Type

Of the 34,656 MVC incidents occurring in Virginia between July 2021 and June 2022, 28,257 (81.5%) involved passenger vehicles (i.e., passenger cars [25,940 incidents, 74.8% of all MVCs]; light trucks, defined as pick-up trucks or vans [584 incidents, 1.7% of all MVCs]; and passenger vehicles unspecified as either cars, pick-up trucks, or vans [1,753 incidents, 5.1% of all MVCs]), 2,007 (5.8%) occurred on motorcycles, 1,074 (3.1%) involved special types of passenger vehicles (i.e., heavy/special purpose vehicles, such as for military or agricultural purposes [397 incidents, 1.1% of all MVCs], recreational or off-road vehicles [396 incidents, 1.1% of all MVCs], buses [242 incidents, 0.7% of all MVCs], and special purpose vehicles unspecified as either heavy transport vehicles or buses [39 incidents, 0.1% of all MVCs]), and 3,393 (9.8%) either had vehicle type reported as unknown or the record contained insufficient information to determine vehicle type. Importantly, as MVCs can involve multiple vehicles with more than one vehicle type reported per record, the total counts for vehicle subtypes (e.g., passenger cars, buses) equal more than the parent vehicle types (e.g., passenger vehicles, special types of passenger vehicles) and the 34,656 MVC-related incidents reported. Figure 5 presents the breakdown of MVC incidents by vehicle type and land use.

- Of the 28,257 incidents involving passenger vehicles, 23,548 (83.3%) occurred in metro areas and 4,709 (16.7%) occurred in rural areas.
    - Of the 25,940 incidents involving passenger cars, 21,557 (83.1%) occurred in metro areas and 4,383 (16.9%) occurred in rural areas.
    - Of the 584 incidents involving light trucks (i.e., pick-up trucks or vans), 466 (79.8%) occurred in metro areas and 118 (20.2%) occurred in rural areas.
    - Of the 1,753 incidents involving passenger vehicles unspecified as either cars, pick-up trucks, or vans, 1,534 (87.5%) occurred in metro areas and 219 (12.5%) occurred in rural areas.
- Of the 2,007 incidents involving motorcycles, 1,632 (81.3%) occurred in metro areas and 375 (18.7%) occurred in rural areas.

- Of the 1,074 incidents involving special types of passenger vehicles, 754 (70.2%) occurred in metro areas and 320 (29.8%) occurred in rural areas.
    - Of the 242 incidents involving buses, 220 (90.9%) occurred in metro areas and 22 (9.1%) occurred in rural areas.
    - Of the 397 incidents involving heavy/special purpose vehicles, such as those used for military or agricultural purposes, 255 (64.2%) occurred in metro areas and 142 (35.8%) occurred in rural areas.
    - Of the 396 incidents involving recreational or off-road vehicles, 243 (61.4%) occurred in metro areas and 153 (38.6%) occurred in rural areas.
    - Of the 39 incidents involving special purpose vehicles unspecified as either heavy transport vehicles or buses, 36 (92.3%) occurred in metro areas and 3 (7.7%) occurred in rural areas.
- Of the 3,393 incidents reported as unknown or with insufficient information to determine the vehicle type, 3,081 (90.8%) occurred in metro areas and 312 (9.2%) occurred in rural areas.

Figure 5. Number of EMS Responses for Motor Vehicle Crashes by Type of Vehicle and Land Use, July 2021 through June 2022, Virginia



Drug and Alcohol Impairment

Drug or Alcohol Impairment-Related Incidents

Of the 34,656 motor vehicle crash incidents occurring between July 2021 and June 2022, 1,901 (5.5%) involved known drug or alcohol impairment (i.e., the EMS patient admitted to substance use or a positive level was identified on screening test) and 634 (1.8%) involved suspected impairment (i.e., indicators of drug or alcohol use were present on scene, though it could not be determined with certainty which vehicle occupant was impaired). Drug or alcohol impairment was not reported (i.e., the field contained a "null" value) for the remaining 32,121 (92.7%) motor vehicle crashes. Of the 2,535 motor vehicle crashes known or suspected to be drug- or alcohol-related, 2,105 (83.0%) occurred in metro areas and 430 (17.0%) occurred in rural areas.

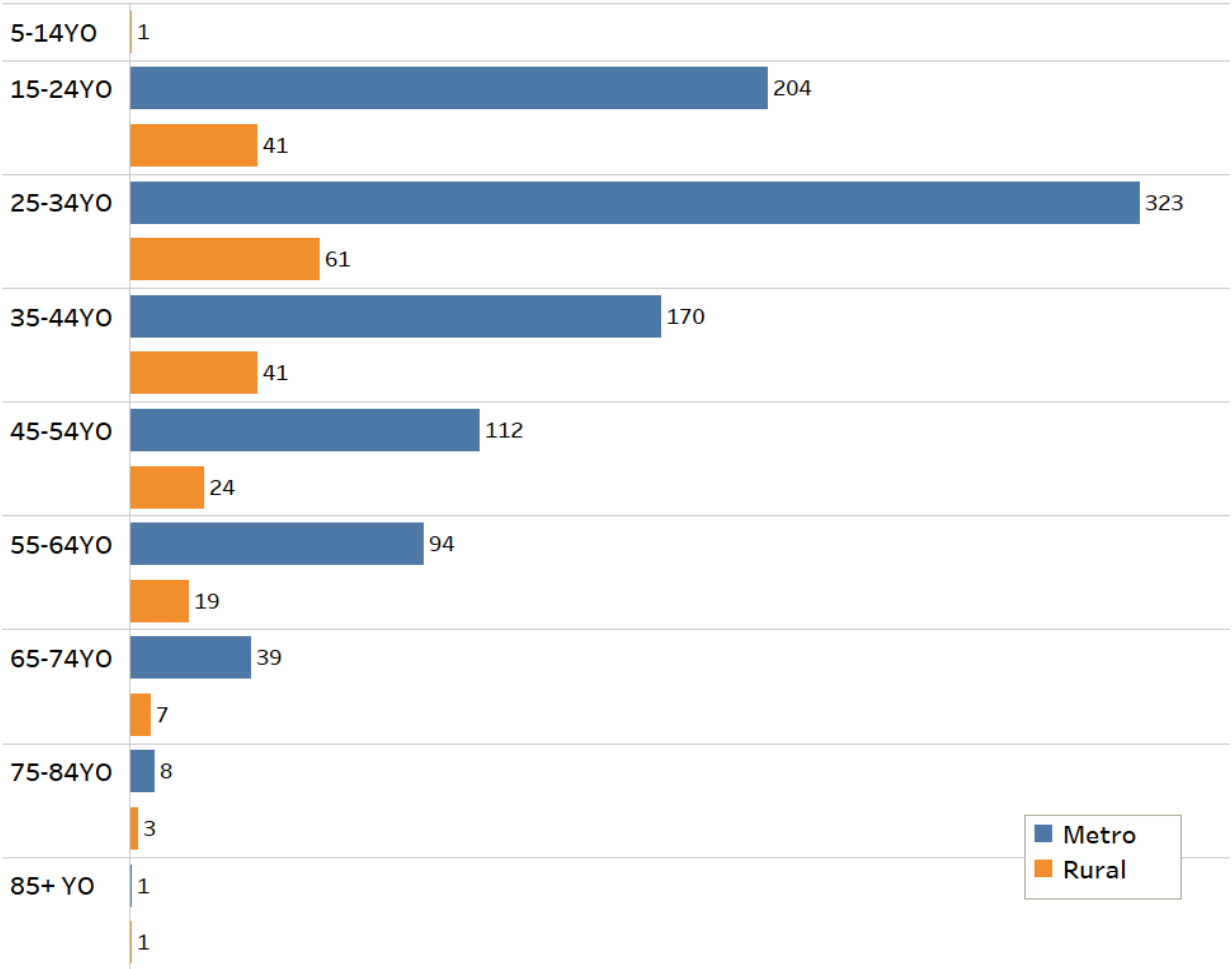
- Of the 28,975 total MVC incidents occurring in metro areas, 1,588 (5.5%) involved known drug or alcohol impairment and 517 (1.8%) involved suspected impairment.
- Of the 5,681 total MVC incidents occurring in rural areas, 313 (5.5%) involved known drug or alcohol impairment and 117 (2.1%) involved suspected impairment.

Drug- or Alcohol-Impaired Drivers

Of the 21,456 drivers involved in motor vehicle crashes from July 2021 through June 2022, 1,151 (5.4%) were known to be drug- or alcohol-impaired and 398 (1.9%) were suspected to be impaired, totaling 1,549 drivers. Of these 1,549 drivers, 1,272 (82.1%) were driving in metro areas and 277 (17.9%) were driving in rural areas at the time of the crash.

- Of the 18,020 total MVC-related incidents occurring among drivers in metro areas, 953 (5.3%) involved known drug or alcohol impairment and 319 (1.8%) involved suspected impairment.
- Of the 3,436 total MVC-related incidents occurring among drivers in rural areas, 198 (5.8%) involved known drug or alcohol impairment and 79 (2.3%) involved suspected impairment.
- Of the 1,151 drivers known to be drug- or alcohol-impaired, the highest count of incidents occurred among the 25–34-year-old age group (384; 33.4%), followed by persons 15-24 years old (245; 21.3%) (see Figure 6).

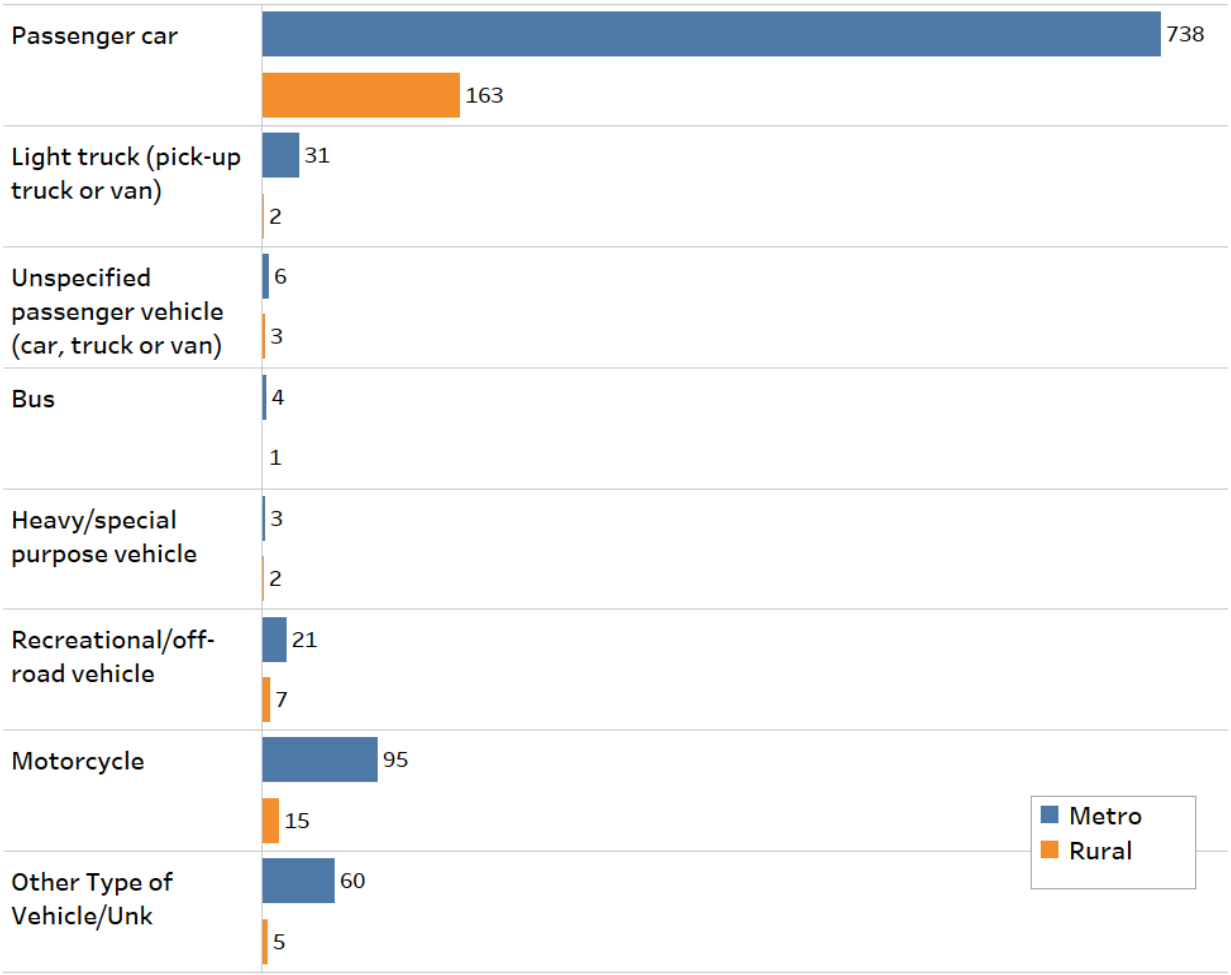
Figure 6. Number of EMS Responses for Motor Vehicle Crashes Involving a Driver with Known Impairment by Age Group and Land Use, July 2021 through June 2022, Virginia



Drug- or Alcohol-Impaired Drivers by Vehicle Type

Of the 1,151 MVC incidents involving drivers known to be impaired by drugs or alcohol between July 2021 and June 2022, 940 (81.7%) involved passenger vehicles (i.e., passenger cars [901 incidents, 78.3% of all MVCs involving known impaired drivers]; light trucks, such as pick-up trucks or vans [33 incidents, 2.9%]; and passenger vehicles unspecified as either cars, pick-up trucks, or vans [9 incidents, 0.8%]), 110 (9.6%) occurred on motorcycles, 38 (3.3%) involved special types of passenger vehicles (i.e., recreational or off-road vehicles [28 incidents, 2.4%], heavy/special purpose vehicles, such as for military or agricultural purposes [5 incidents, 0.4%], and buses [5 incidents, 0.4%]), and 65 (5.6%) incidents had vehicle type reported as unknown. Importantly, as MVCs can involve multiple vehicles with more than one vehicle type reported per record, the total counts for vehicle type equal more than the 1,151 MVCs reported among impaired drivers. Figure 7 presents a breakdown of MVC incidents involving drivers known to be impaired by drugs or alcohol, stratified by vehicle type and land use.

Figure 7. Number of EMS Responses for Motor Vehicle Crashes Involving a Driver with Known Impairment by Type of Vehicle and Land Use, July 2021 through June 2022, Virginia



Restraint Usage

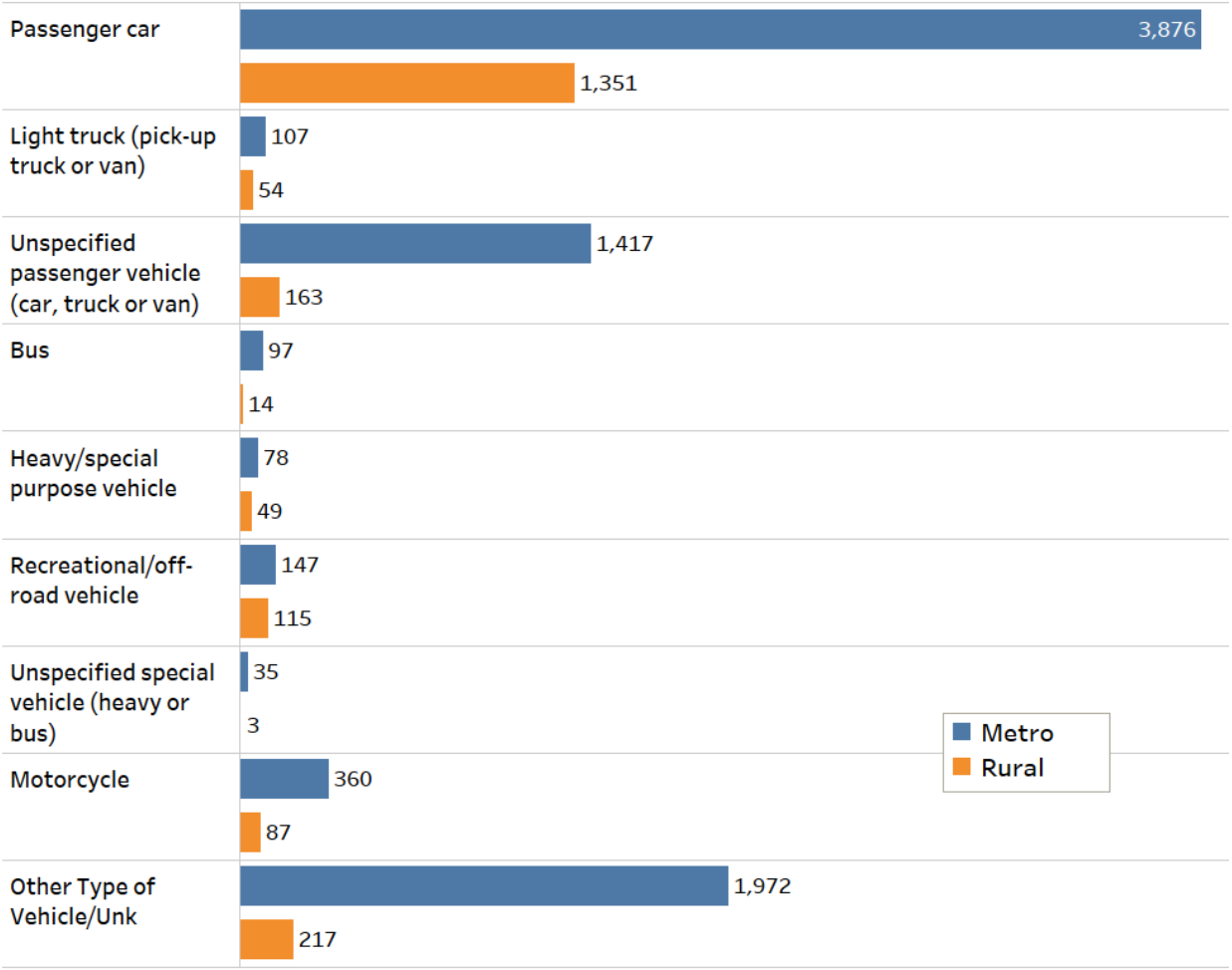
Data collected from the National Highway Traffic Safety Administration's 2020 National Occupant Protection Use Survey demonstrates that the proportion of front-seat occupants in passenger vehicles (i.e., passenger cars and light trucks) who use seat belts is 90.5% in metro areas and 89.9% in rural areas (see the NHTSA Research Note, Seat Belt Use in 2020 – Overall Results, at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813072).

Passenger Vehicles

Of the 28,257 MVC incidents occurring in Virginia between July 2021 and June 2022 that involved passenger vehicles, 20,662 (73.1%) incidents were reported to involve restraint (i.e., shoulder and/or lap seat belt) usage. An additional 640 (2.3%) incidents were reported to involve the use of other safety equipment (e.g., car seats, helmets), but no restraint usage. Helmet usage in passenger vehicles is unexpected, suggesting a potential data quality issue with safety equipment reporting. A total of 2,959 (10.5%) incidents had both restraint and safety equipment usage reported as "none," while information on restraint and safety equipment usage was left blank for 3,996 (14.1%) incidents.

- Of the 23,548 (83.3% of 28,257) passenger vehicle occupants involved in motor vehicle crashes in metro areas, 17,620 (74.8%) were reported to be restrained and 532 (2.3%) were reported to be using other safety equipment, though restraint usage was reported as unknown.
    - For 2,181 (9.3%) incidents, the use of both restraints and safety equipment were reported as none, while information on restraint and safety equipment usage was left blank for 3,215 (13.7%) incidents.
- Of the 4,709 (16.7% of 28,257) passenger vehicle occupants involved in motor vehicle crashes in rural areas, 3,042 (64.6%) were reported to be restrained and 108 (2.3%) were reported to be using other safety equipment, though restraint usage was reported as unknown.
    - For 778 (16.5%) incidents, the use of both restraints and safety equipment were reported as none, while information on restraint and safety equipment usage was left blank for 781 (16.6%) incidents.

Figure 8. Number of EMS Responses for Motor Vehicle Crashes Involving an Unrestrained Occupant or Occupants with Unknown Restraint Usage by Type of Vehicle and Land Use, July 2021 through June 2022, Virginia



Other Safety Equipment

Helmet and Safety Equipment Usage among Motorcyclists

Of the 34,656 MVC-related incidents occurring in Virginia from July 2021 through June 2022, 2,007 (5.8%) were motorcycle accidents. During these motorcycle accidents, 1,323 (65.9%) riders were reported to be wearing a helmet. Helmet usage was unknown or not reported for 684 (34.1%) riders.

- Of the 1,632 (81.3% of 2,007) total metro motorcycle incidents, 1,093 (67.0%) riders were reported to be wearing a helmet, while helmet usage was unknown or not reported for 539 (33.0%) riders.
- Of the 375 (18.7% of 2,007) total rural motorcycle incidents, 230 (61.3%) riders were reported to be wearing a helmet, while helmet usage was unknown or not reported for 145 (38.7%) riders.

While helmets are the most commonly used protective equipment employed by motorcyclists, use of other items (e.g., protective clothing, eye protection) may also shield riders from injury during a motorcycle crash. Of the 2,007 motorcycle riders requiring EMS care between July 2021 and June 2022, 320 (15.9%) were reported to be wearing protective clothing, eye protection, and/or protective non-clothing gear.

Importantly, restraint and car seat usage were reported in motorcycles crashes in this dataset, even though such usage would be atypical, suggesting potential data quality issues with safety equipment reporting. Of the 2,007 motorcycle incidents occurring in the dataset, 206 (10.3%) were reported to involve restraint usage (i.e., use of a shoulder or lap seat belt), while 10 (0.5%) contained documentation of child booster seat or car seat usage. Restraint and safety equipment usage were reported as "none" for 173 (8.6%) motorcycle incidents, while 274 (13.7%) had all restraint and safety equipment usage information left blank.

Booster Seat Usage

According to Virginia law, all children seven years of age and younger are required to sit in a child safety seat or booster seat while riding in a vehicle. Virginia law does not stipulate height or weight requirements for the use of child safety seats or booster seats (see https://www.vdh.virginia.gov/child-passenger-safety/). Between June 2021 and July 2022, a total of 889 (2.6% of 34,656) motor vehicle crash incidents requiring EMS response occurred among patients aged seven years or younger in Virginia. Of these incidents, 763 (85.8%) involved a passenger vehicle (e.g., passenger cars, light trucks), of which 624 (81.8%) occurred in metro areas and 139 (18.2%) occurred in rural areas. Among all children 7 years of age and younger injured in passenger vehicles, 461 (60.4%) were documented to be using a booster seat, while booster seat usage was unknown or unreported for 302 (39.6%) children.

- Among the 624 incidents of metro vehicle crashes involving patients seven years old or younger traveling in passenger vehicles, 375 (60.1%) children were reported to be using booster seats. For 249 (39.9%) incidents, booster seat usage was unknown or unreported.
- Among the 139 incidents of rural vehicle crashes involving patients seven years old or younger traveling in passenger vehicles, 86 (61.9%) children were reported to be using booster seats. For 53 (38.1%) incidents, booster seat usage was unknown or unreported.

Airbag Deployment

Of the 28,257 MVC incidents occurring in Virginia between July 2021 and June 2022 that involved passenger vehicles, the airbag deployed in 13,261 (46.9%) incidents and did not deploy or was not present in 11,676 (41.3%) incidents. For 38 (0.1%) passenger vehicle incidents, conflicting values rendered the airbag status unknown (e.g., "airbag deployed" and "airbag not present" reported in the same record). Airbag deployment information was left blank for the remaining 3,282 (11.6%) passenger vehicle incidents.

Crash Severity Measures

Initial Patient Acuity

Patient Acuity can be used in the prehospital setting as an indicator of the severity of a motor vehicle crash. The initial patient acuity recorded represents the acuity of the patient's condition at the time of the patient's first assessment by an EMS provider. Of the 34,656 motor vehicle crash patients seen by Virginia EMS providers between July 2021 and June 2022, 244 (0.7%) patients had an Initial Patient Acuity of Dead without Resuscitation Efforts (Black), 1,523 (4.4%) patients were reported as Critical (Red), and 6,067 (17.5%) patients were reported as Emergent (Yellow). Almost three-fourths of MVC patients had an Initial Patient Acuity of Lower Acuity (Green) (25,559, 73.8%). A total of 1,263 (3.6%) incidents had an Initial Patient Acuity either reported as Null or later marked as Unknown during quality assurance of individual records (see Appendix 1).

Final Patient Acuity

In contrast to Initial Patient Acuity, the Final Patient Acuity field represents the acuity of the patient's condition after EMS care has concluded. Table 2 depicts the progression from Initial to Final Patient Acuity among the 34,656 motor vehicle crash incidents that are the focus of this report. A total of 21,741 (62.7%) incidents reported the same Initial and Final Patient Acuity (excluding incidents with an unknown patient acuity). A total of 25 incidents reported a progression from a Green, Yellow, or Red Initial Acuity to a Final Acuity of Dead without Resuscitation Efforts (Black).

Table 2. Patient Acuity Progression from Initial to Final Acuity Documentation, July 2021 through June 2022, Virginia

Initial Patient Acuity*	Final Patient Acuity*					
	Green	Yellow	Red	Black	Unknown	**Total**
Green	16,515	1,655	59	5	7,325	**25,559 (73.8%)**
Yellow	1,409	4,071	113	3	471	**6,067 (17.5%)**
Red	97	258	1,059	17	92	**1,523 (4.4%)**
Black	0	0	0	96	148	**244 (0.7%)**
Unknown	91	13	3	2	1,154	**1,263 (3.6%)**
Total	**18,112 (52.3%)**	**5,997 (17.3%)**	**1,234 (3.6%)**	**123 (0.4%)**	**9,190 (26.5%)**	**34,656**

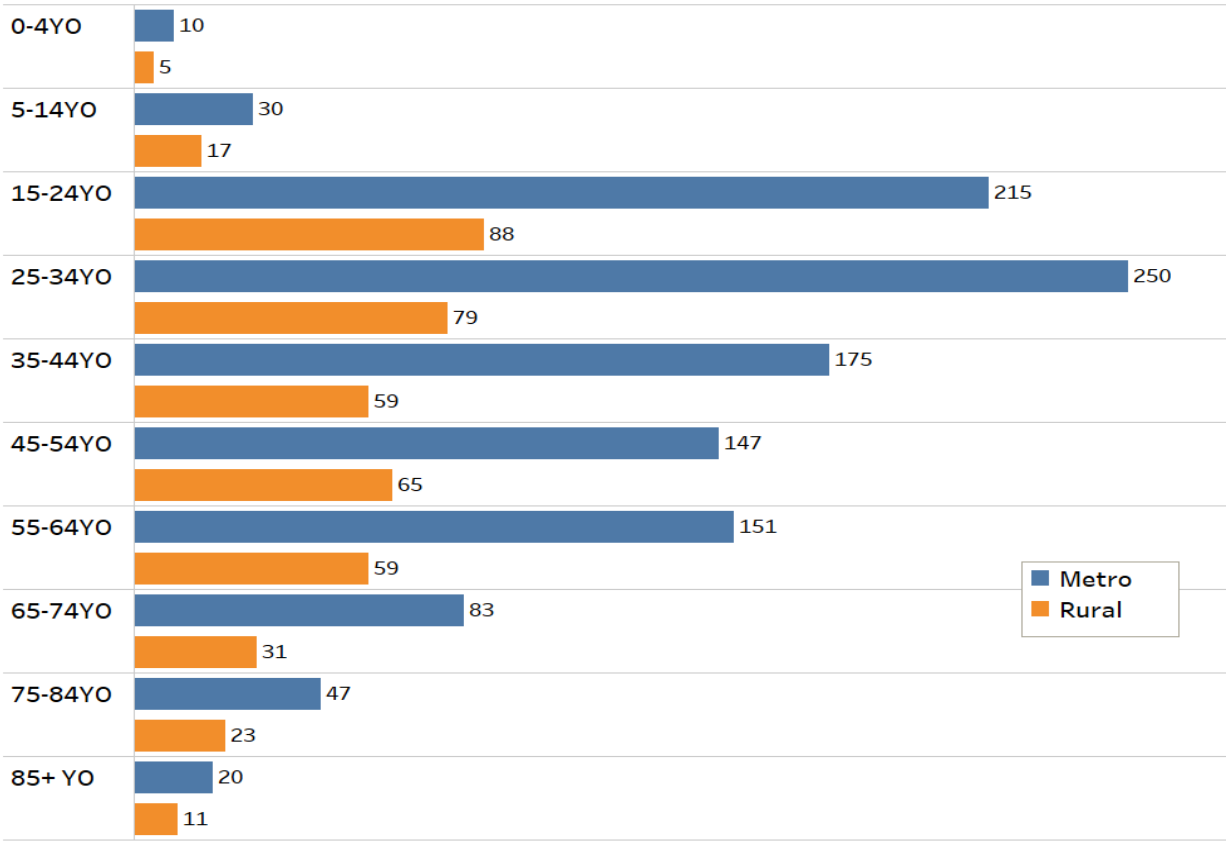
*Patient Acuity Categories: Green = Lower Acuity; Yellow = Emergent; Red = Critical; Black = Dead without Resuscitation Efforts

Initial and Final Patient Acuity Combined: Comprehensive Patient Acuity

To capture the most accurate snapshot of patient condition following an MVC, this report assesses a combination of the Initial and Final Patient Acuity fields, denoted as Comprehensive Patient Acuity. Comprehensive Patient Acuity represents Final Patient Acuity for records with a reported value in that field (25,466, 73.5%), filling in Initial Patient Acuity for the records missing a Final Acuity (9,190, 26.5%). Of the 34,656 motor vehicle crashes requiring Virginia EMS response from July 2021 to June 2022, the Comprehensive Acuity for 271 (0.8%) was Dead without Resuscitation Efforts (Black), for 1,326 (3.8%) was Critical (Red), and for 6,468 (18.7%) was Emergent (Yellow). Almost three-fourths of MVC incidents had a Comprehensive Acuity of Lower Acuity (Green) (25,437; 73.4%). There were 1,154 (3.3%) records that were blank for both Final and Initial Patient Acuity.

Of the 1,597 total MVC incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black), 1,157 (72.4%) incidents occurred in metro areas and 440 (27.6%) occurred in rural areas. Patients aged 24-34 years old experienced the most Red or Black Acuities (329; 20.6%), followed by patients 15-25 years old (303; 19.0%). Figure 9 shows a breakdown of patients with Red or Black Acuity by age.

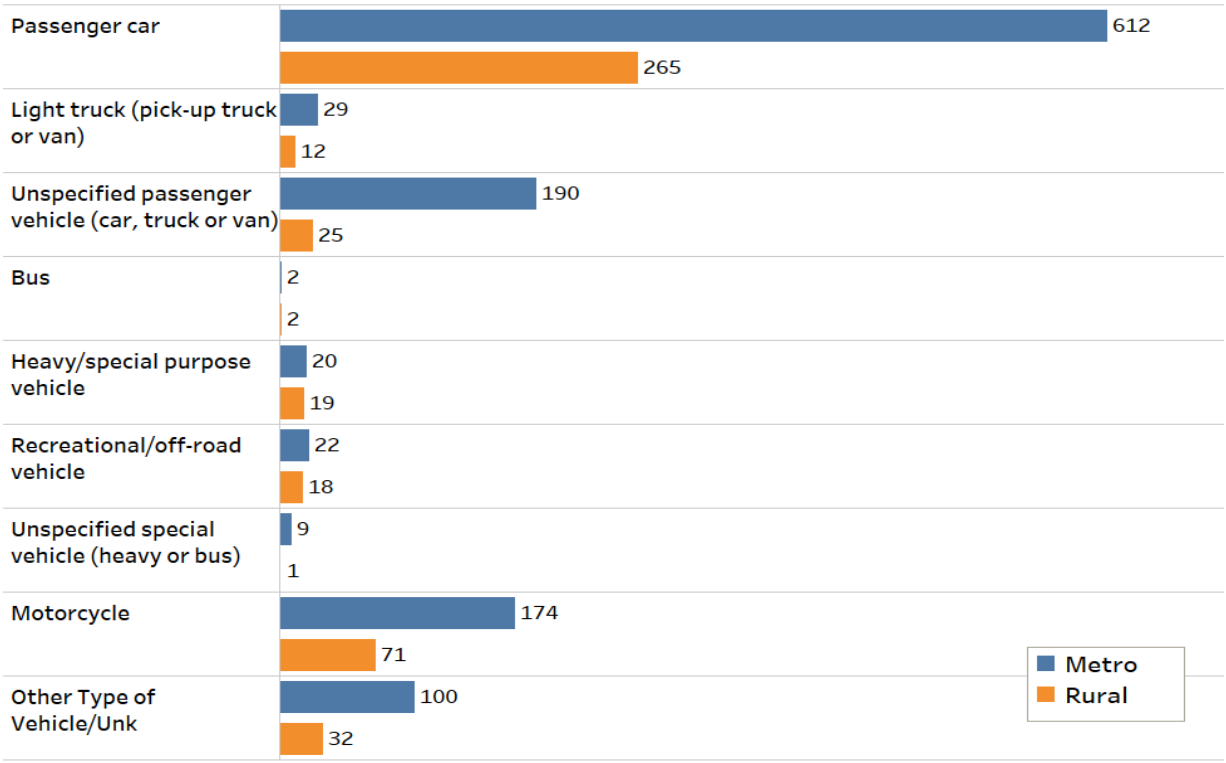
Figure 9. Number of EMS Responses for Motor Vehicle Crashes with Comprehensive Patient Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black) by Age Group and Land Use, July 2021 through June 2022, Virginia



In addition to land usage and age, numerous other demographic and collision characteristics also point to differential risk of serious patient injury:

- **Race:** Of the 1,597 total MVC incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black), 973 (60.9%) occurred among persons of white race, 425 (26.6%) occurred among persons of black race, 130 (8.1%) occurred among persons of Latino race, 38 (2.4%) occurred among persons of Asian and Pacific Islander race, and 1 occurred among persons of Native American race (0.1%). Two (0.1%) Red or Black Acuity incidents occurred among persons of two or more races and 28 (1.8%) incidents occurred among incidents for which race information was unknown.
- **Gender:** Of the 1,597 total MVC incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black), 1,079 (67.6%) occurred in male patients, while 505 (31.6%) occurred in female patients. Sex or gender information was unknown for 13 (0.8%) patients with Red or Black Acuity.
- **Drivers and Passengers:** There were 879 (55.0% of the 1,597 total) drivers and 247 (15.5%) passengers involved in motor vehicle crash incidents with Red or Black Comprehensive Patient Acuity. For 9 (0.6%) incidents, the person involved was in some other position relative to the vehicle (e.g., on the vehicle exterior or in a side car). For the remaining 462 (28.9%) incidents, the record contained insufficient information to determine the position in the vehicle of the person involved.
- **Type of Vehicle:** Of the 1,597 total MVC incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black), 1,131 (70.8%) involved passenger vehicles (i.e., passenger cars [877 incidents, 54.9% of all MVC Red and Black incidents]; light trucks, such as pick-up trucks or vans [41 incidents, 2.6%]; and passenger vehicles unspecified as either cars, pick-up trucks, or vans [215 incidents, 13.5%]), 245 (15.3%) occurred on motorcycles, 93 (5.8%) involved special types of passenger vehicles (i.e., recreational or off-road vehicles [40 incidents, 2.5%], heavy/special purpose vehicles, such as for military or agricultural purposes [39 incidents, 2.4%], buses [4 incidents, 0.3%], and unspecified special vehicles [10 incidents, 0.6%]), and 132 (8.3%) incidents had vehicle type reported as unknown. Figure 10 presents a breakdown of MVC incidents involving a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black).

Figure 10. Number of EMS Responses for Motor Vehicle Crashes with Comprehensive Patient Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black) by Type of Vehicle and Land Use, July 2021 through June 2022, Virginia



Finally, behavioral risk factors exist that may increase the risk of serious patient injury:

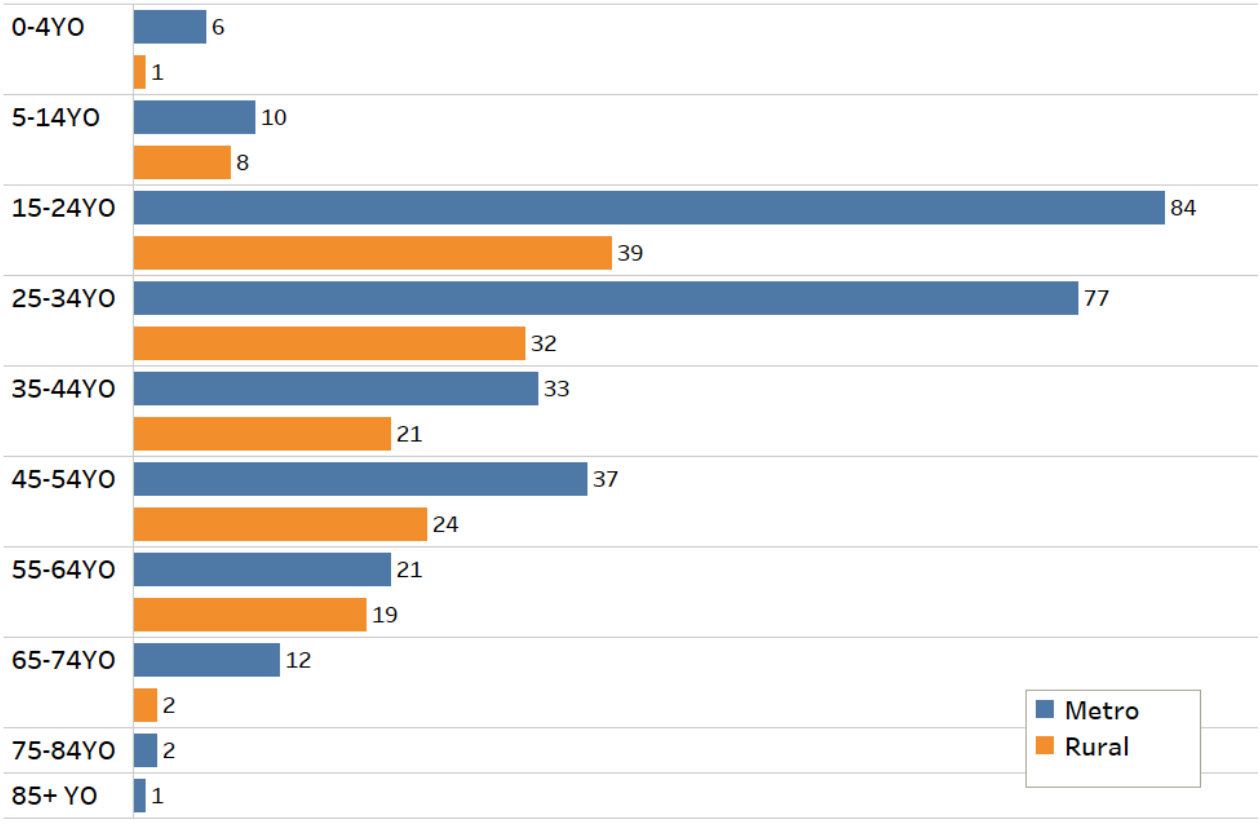
- **Drug or Alcohol Impairment:** Of the 1,597 total MVC incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black), 111 (7.0%) involved known drug or alcohol impairment (i.e., the EMS patient admitted to substance use or a positive level was identified on screening test) and 123 (7.7%) involved suspected impairment (i.e., indicators of drug or alcohol use were present on scene, though it could not be determined with certainty which vehicle occupant was impaired). Drug or alcohol impairment was not reported (i.e., the field contained a "null" value) for the remaining 1,363 (85.3%) motor vehicle crashes. Of the 234 total motor vehicle crashes known or suspected to be drug- or alcohol-related, 176 (75.2%) occurred in metro areas and 58 (24.8%) occurred in rural areas.
- **Restraint Usage:** Among the 28,257 MVC incidents involving a passenger vehicle, 1,131 (4.0%) were incidents with a Comprehensive Acuity of Critical (Red) or Dead without Resuscitation Efforts (Black). Of these 1,131 incidents, only 396 (35.0%) were reported to involve restraint (i.e., shoulder and/or lap seat belt) usage. An additional 62 (5.5%) were reported to involve the use of other safety equipment (e.g., car seats, helmets), but no restraint usage. A total of 398 (35.2%) incidents had both restraint and safety equipment usage reported as "none," while information on restraint and safety equipment usage was left blank for 275 incidents (24.3%). Of the 398 incidents reported with restraint or safety equipment usage documented as "none," 269 (67.6%) incidents occurred in metro areas and 129 (32.4%) occurred in rural areas.

Crash Ejection

Of the 34,656 MVC incidents requiring Virginia EMS response from July 2021 through June 2022, 435 (1.3%) incidents involved a crash ejection. The remaining 34,221 (98.7%) records did not contain information indicating a crash ejection occurred. Of these 435 crash ejections, 79.8% resulted in severe injuries, as defined by Comprehensive Patient Acuities of either Dead without Resuscitation Efforts (Black: 35, 8.0%), Critical (Red: 142, 32.6%), or Emergent (Yellow: 170, 39.1%). Only 76 (17.5%) ejection patients were reported to have a Lower Acuity (Green) status, while 12 (2.8%) incidents did not contain information on patient acuity.

Of the 435 ejections, 289 (66.4%) incidents occurred in metro areas and 146 (33.6%) occurred in rural areas. Patients aged 15-24 years old experienced the most crash ejections (123; 28.3%), followed by patients 25-34 years old (109; 25.1%). Figure 11 shows a breakdown of crash ejections by age.

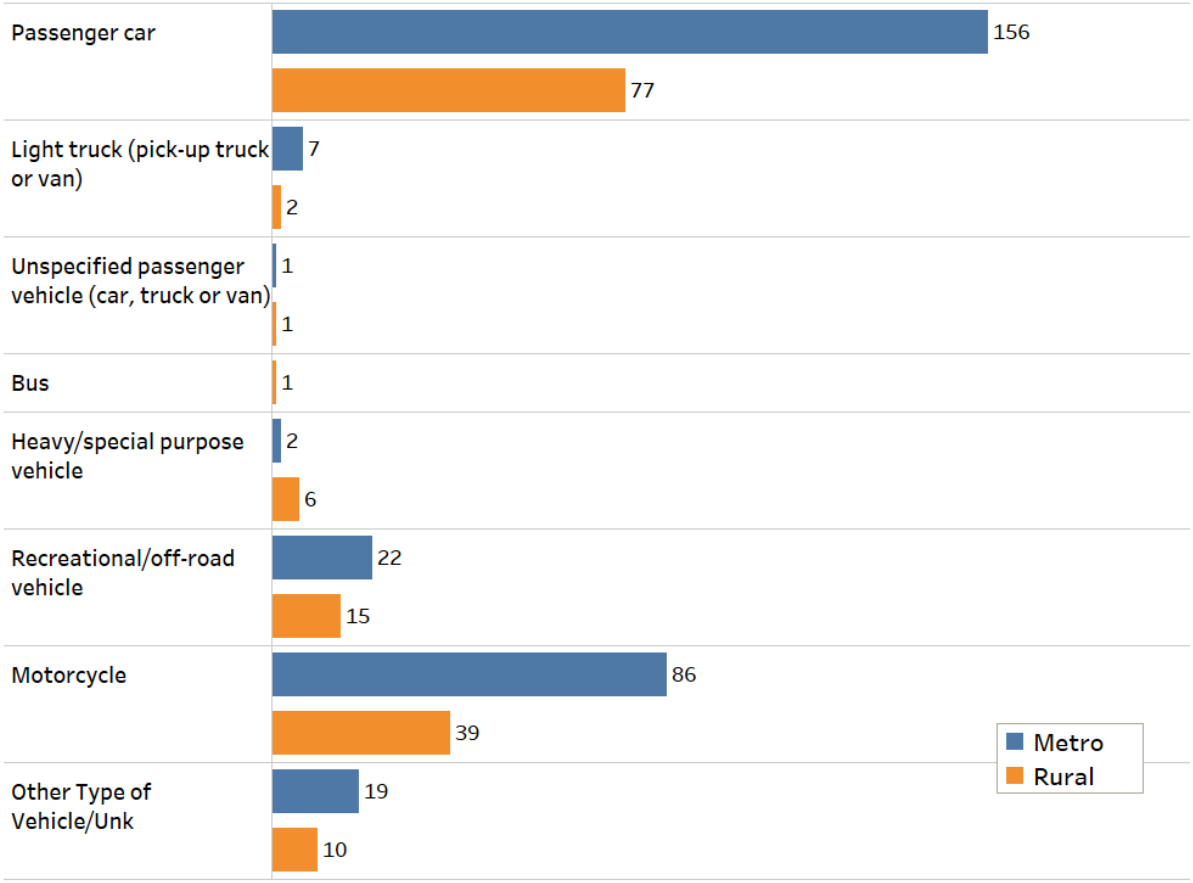
Figure 11. Number of EMS Responses for Motor Vehicle Crash Ejections by Age Group and Land Use, July 2021 through June 2022, Virginia



In addition to land usage and age, numerous other demographic and collision characteristics also point to differential risk of crash ejection:

- **Race:** Of the 435 ejection incidents, 249 (57.2%) occurred among persons of white race, 134 (30.8%) occurred among persons of black race, 31 (7.1%) occurred among persons of Latino race, and 5 (1.1%) occurred among persons of Asian and Pacific Islander race. No crash ejections occurred among persons of Native American race and 3 (0.7%) ejections occurred among persons of two or more races. There were 13 (3.0%) incidents for which race information was unknown.
- **Gender:** Of the 435 ejection incidents, 317 (72.9%) occurred in male patients while 114 (26.2%) occurred in female patients. Sex or gender information was unknown for 4 (0.9%) crash ejection patients.
- **Drivers and Passengers:** There were 275 (63.2% of 435 total ejection incidents) drivers and 82 (18.9%) passengers involved in motor vehicle crash ejections. For 4 (0.9%) incidents, the person involved was in some other position relative to the vehicle (e.g., on the vehicle exterior or in a side car). For the remaining 74 (17.0%) incidents, the record contained insufficient information to determine the position in the vehicle of the person involved.
- **Type of Vehicle:** Of the 435 MVC incidents involving crash ejection between July 2021 and June 2022, 242 (55.6%) involved passenger vehicles (i.e., passenger cars [233 incidents, 53.6% of all MVC ejections]; light trucks, such as pick-up trucks or vans [9 incidents, 2.1%]; and passenger vehicles unspecified as either cars, pick-up trucks, or vans [2 incidents, 0.5%]), 125 (28.7%) occurred on motorcycles, 46 (10.6%) involved special types of passenger vehicles (i.e., recreational or off-road vehicles [37 incidents, 8.5%], heavy/special purpose vehicles, such as for military or agricultural purposes [8 incidents, 1.8%], and buses [1 incident, 0.2%]), and 29 (6.7%) incidents had vehicle type reported as unknown. Figure 12 presents a breakdown of MVC incidents involving ejections.

Figure 12. Number of EMS Responses for Motor Vehicle Crashes Involving Ejection by Type of Vehicle and Land Use, July 2021 through June 2022, Virginia



Finally, behavioral risk factors exist that may increase the risk of crash ejection:

- **Drug or Alcohol Impairment:** Of the 435 crash ejection incidents, 49 (11.3%) involved known drug or alcohol impairment (i.e., the EMS patient admitted to substance use or a positive level was identified on screening test) and 36 (8.3%) involved suspected impairment (i.e., indicators of drug or alcohol use were present on scene, though it could not be determined with certainty which vehicle occupant was impaired). Drug or alcohol impairment was not reported (i.e., the field contained a "null" value) for the remaining 350 (80.5%) motor vehicle crashes. Of the 85 total motor vehicle crashes known or suspected to be drug- or alcohol-related, 56 (65.9%) occurred in metro areas and 29 (34.1%) occurred in rural areas.
- **Restraint Usage:** Among the 28,257 MVC incidents involving a passenger vehicle, 242 (0.9%) crash ejections occurred. Of these 242 ejection incidents, only 28 (11.6%) were reported to involve restraint (i.e., shoulder and/or lap seat belt) usage. An additional 18 (7.4%) were reported to involve the use of other safety equipment (e.g., car seats, helmets), but no restraint usage. A total of 171 (70.7%) ejections had both restraint and safety equipment usage reported as "none," while information on restraint and safety equipment usage was left blank for 25 incidents (10.3%). Of the 171 crash ejections with restraint or safety equipment usage reported as "none," 115 (67.3%) incidents occurred in metro areas and 56 (32.7%) occurred in rural areas.

Summary Results

47% of passenger vehicle MVCs involved airbag deployment

60% of patients ≤ 7 years old involved in passenger vehicle MVCs were reported to be using a booster seat

66% of motorcyclists involved in a MVC were reported to be wearing a helmet

49% of all MVCs, **68%** of severe crashes* and **73%** of crash ejections occurred among male patients

7% of all MVCs, **14%** of severe crashes* and **20%** of crash ejections involved possible drug or alcohol impairment

27% of passenger vehicle MVCs, **65%** of severe passenger vehicle crashes* and **88%** of passenger vehicle ejections occurred among persons not wearing a seat belt

*Severe crash: incidents with Red or Black Comprehensive Patient Acuity

Conclusions

From June 2021 through July 2022, 1 out of every 43 EMS calls was related to a motor vehicle crash. Though the dataset used for this report only reflects prehospital data and does not include hospital information to assess long-term or final patient outcomes, trauma triage reports generated by OEMS staff (located at https://www.vdh.virginia.gov/emergency-medical-services/trauma-critical-care/examples-of-oems-data-in-use/data-related-links/) found MVCs were the second highest cause of injury for trauma patients between July 2021 and June 2022. This, along with the Patient Acuity and Crash Ejection data presented in this prehospital report, together underscore the possibility of serious injury or death from MVCs. Motor vehicle crash data should continue to be monitored to evaluate trends and identify opportunities for injury prevention.

We want to thank our EMS providers and agencies who spend considerable time and effort reporting EMS encounter data. Without you, we would not be able to conduct meaningful prehospital research. Your work helps improve EMS patient care in Virginia and greatly increases industry knowledge.

thank you

Appendix 1: Methodology

- The data fields utilized in this report were Patient Care Report Number (erecord.01); Incident Number (eresponse.03); Type of Service Requested (eresponse.05); Incident/Patient Disposition (edisposition.12); EMS Transport Method (edisposition.16); EMS Transport Number (edisposition.16); EMS Agency Number (eresponse.01); Incident City (escene.17); Incident Zip Code (escene.21); Incident Location Type (escene.09); Mass Casualty Event (escene.07) Provider's Primary Impression (esituation.11); EMS Agency Name (response.02); Unit Notified by Dispatch Date/Time (etimes.03); Age (epatient.15); Age Units (epatient.16); Date of Birth (epatient.17); Gender (epatient.13); Race (epatient.14); Destination/Transferred To; Name (edisposition.01); Destination/Transferred To, Code (edisposition.02); Alcohol/Drug Indicators (ehistory.17); Cardiac Arrest (earrest.01); Natural, Suspected, Intentional, or Unintentional Disaster (eother.07); Cause of Injury (einjury.01); Main Area of Vehicle Impacted by the Collision (einjury.05); Location of Patient in Vehicle (einjury.06); Mechanism of Injury (einjury.02); Vehicular, Pedestrian, or Other Injury Risk Factor (einjury.04); Use of Occupant Safety Equipment (einjury.07); and Airbag Deployment (einjury.08).
- Inclusion criteria:
    - Date Unit Notified by Dispatch is between July 1, 2021, and June 30, 2022, and
    - Cause of Injury Code (einjury.01) is equal to the first 3 digits of any ICD-10 code contained in the National EMS Information System (NEMSIS) MVC case definitions (located at https://nemsis.org/case-definitions/ as of September 1, 2022).
- Exclusion criteria:
    - Records with the type of service requested (eresponse.05) reported as:
        - Interfacility transport,
        - Medical transport,
        - Mutual aid,
        - Public assistance/other not listed, or
        - Standby,
    - Records with a patient disposition of:
        - Assist, Agency,
        - Assist, Public,
        - Assist, Unit,
        - Canceled (Prior to Arrival at Scene),
        - Canceled on Scene (No Patient Contact),
        - Canceled on Scene (No Patient Found),
        - Patient Treated, Transferred Care to Another EMS Unit,
        - Standby – No Services or Support Provided, or
        - Standby – Public Safety, Fire, or EMS Operational Support Provided, and
    - Records that did not have a submission status of "passed".
    - Note: Nine records listed as public assistance were manually reviewed to assess patient/incident disposition. These records were determined to represent emergency calls and were included in the dataset.

Appendix 1: Methodology (continued)

- Gender was grouped into Male, Female, and Unknown based on the values reported in the Gender (epatient.13) field.
- Per VDH guidelines, patient race and ethnicity were grouped into the following categories: Asian or Pacific Islander, Black, Latino, Native American, Other, Two or More Races, Unknown, and White.
    - Population totals were obtained from the Vintage 2020 Bridged-Race Postcensal Population Estimates Data from the U.S. Census Bureau (located at https://www.cdc.gov/nchs/nvss/bridged_race/data_documentation.htm#vintage2020 as of October 26, 2022).
    - Limitation: The Vintage 2020 Bridged-Race Postcensal Population Estimates dataset only provides data on primary race reported (i.e., White, Black, Latino, Asian or Pacific Islander, and Native American) and provides no information on individuals reporting more than one race. In contrast, the data used for this report do not provide information on primary race; therefore, records with more than one race reported are captured in the Two or More Races group.
- Patient age (epatient.15) and age units (epatient.16) were grouped into the following increments: 0-4 years old, 5-14 years old, 15-24 years old, 25-34 years old, 35-44 years old, 45-54 years old, 55-64 years old, 65-74 years old, 75-84 years old, and 85+ years old.
- Region was determined according to EMS agency geography using EMS Agency Number (eresponse.01). For EMS agencies that serve multiple regions, region was determined according to incident FIPS code (escene.21). For records missing FIPS code, region was determined using incident zip code (escene.19).
- Metro and rural categories were defined according to the Census Bureau's 2010 Urbanized Areas and Urban Cluster Designations (located at https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural/2010-urban-rural.html as of October 26, 2022). The Census Bureau plans to announce final metro areas based on the 2020 Census in December 2022 and this report was created before that release.
    - The Census Bureau FIPS codes were matched with Incident County Code (escene.21), which is a data field containing the incident FIPS code.
    - All instances of an outdated Incident County Code for Bedford, VA (51515) were rolled up into the current FIPS code for Bedford (51019).
    - For records with Incident County Code missing, Incident Zip Code (escene.19) was used to identify FIPS codes and match to the Census Bureau data.
    - For records with Incident County Code and Incident Zip Code missing, patient narratives were used to determine incident location.
    - Metro and rural population totals were obtained from the Annual Resident Population Estimates from the U.S. Census Bureau as of July 2020 (located at https://www.census.gov/data/tables/time-series/demo/popest/2020s-counties-total.html as of October 26, 2022).

Appendix 1: Methodology (continued)

- Day/Night and Weekday/Weekend designations were determined according to the definitions used in the NHTSA Traffic Safety Facts 2020 Data report (located at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813336).
    - Daytime: 6 a.m. to 5:59 p.m.
    - Nighttime: 6 p.m. to 5:59 a.m.
    - Weekday: Monday 6 a.m. to Friday 5:59 pm., 4.5 days
    - Weekend: Friday 6 p.m. to Monday 5:59 a.m., 2.5 days
- Type of Vehicle designations were based on the vehicle categories reported in the NHTSA Traffic Safety Facts 2020 Data report (located at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813336) and the V13 vPIC Body Class field in the 2020 FARS/CRSS Coding and Validation Manual (located at https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813251).
    - Type of Vehicle designations were built for this OEMS MVC Report using the Cause of Injury (einjury.01) field, defined as values containing:
        - Passenger Vehicle (all): “car”, “truck” or “van”
            - Passenger car: “car occupant” or “car” (excluding “car, pick-up truck or van”)
            - Light truck (pick-up truck or van): “truck” or “van” (excluding “car, pick-up truck or van”)
            - Passenger vehicle, unspecified: “car, pick-up truck or van”
        - Special Passenger Vehicle (all): “ATV”, “snowmobile”, “all terrain”, “special all-terrain”, “off-road”, “bus”, “military”, “agricultural”, “industrial”, “construction”, “ambulance”, “fire engine”, or “heavy transport”
            - Heavy/special-purpose vehicle: “military”, “agricultural”, “industrial”, “construction”, “ambulance”, “fire engine”, or “heavy transport” (excluding “heavy transport vehicle or bus”)
            - Recreational/off-road vehicle: “ATV”, “snowmobile”, “all terrain”, “special all-terrain”, “off-road”
            - Bus: “bus” (excluding “heavy transport vehicle or bus”)
            - Special passenger vehicle, unspecified: “heavy transport vehicle or bus”
        - Motorcycle: “motorcycle”
        - Unknown/Other: all else (e.g., “person injured in unspecified vehicle accident”, “assault by crashing of motor vehicle”, “collision with two- or three-wheeled motor vehicle”, “mode of transport unknown”)
    - Type of Vehicle designations were not mutually exclusive (e.g., all ICD-10 codes contained in a record were categorized separately), except when the record contained both an ICD-10 code falling into an unspecified category (e.g., unspecified passenger vehicle) and a corresponding specified category (e.g., passenger car). When this occurred, the type of vehicle designation was grouped solely into the specified category.

Appendix 1: Methodology (continued)

    - Limitations: as MVCs can involve multiple vehicles with more than one vehicle type reported per record, the total counts for vehicle subtype (e.g., passenger car, buses) equal more than the parent vehicle type (e.g., passenger vehicles, special types of passenger vehicles) and more than the 34,656 MVC-related incidents reported. However, as the number of vehicles involved in a crash is not reported in each EMS record, each vehicle type was only counted once even if reported twice or more for one record. In addition, some einjury.01 values list numerous vehicle types without specifying one, therefore providing sufficient information to determine parent vehicle type but insufficient to determine subtype.
- Driver and Passenger designations were determined using the Location of Patient in Vehicle (einjury.06) field, defined as values containing:
    - Driver: "front seat-left side (or motorcycle driver)"
        - For all records designated as Driver with an age under 12 years old, patient narratives were used to determine the correct designation.
    - Passenger: "seat" or "row" (excluding "front seat-left side"); "passenger"
    - Unknown: "unknown" or null
    - Other: all else (e.g., "riding on vehicle exterior", "trailing unit")
- Non-occupant designations (i.e., pedestrians, animals) were determined using the Cause of Injury (einjury.01) field, defined as values containing:
    - Pedestrian or animal: "pedestrian or animal"
    - Known pedestrian: "pedestrian" (excluding "pedestrian or animal")
        - Three records containing both the phrases "pedestrian" and "pedestrian or animal" were manually reviewed to assess pedestrian/animal involvement. These records were determined to involve pedestrians and were classified into the "pedestrian" category.
- Drug or Alcohol Impairment designations were determined using the Alcohol/Drug Indicators (ehistory.17) field, defined as values containing:
    - Known impairment: "patient admits to" or "known"
    - Unknown impairment: null
    - Suspected impairment: all else (e.g., "paraphernalia at scene", "smell on breath")
- Seat Belt Restraint and Safety Equipment Usage designations were determined using the Use of Occupant Safety Equipment (einjury.07) field, defined as values containing:
    - Restrained/seat belt used: "lap belt" and/or "shoulder belt"
    - No restraint or other safety equipment used or not reported: "None" or null
    - Restraint use unknown or not reported, but other safety equipment use known: all else (e.g., "child booster seats", "helmets")
- Among all records designated as motorcycle within the Type of Vehicle field, Motorcyclist Helmet Usage was then determined using the Use of Occupant Safety Equipment (einjury.07) field as values containing:
    - Wearing a helmet: "Helmet"
    - Helmet usage unknown or not reported: all else

Appendix 1: Methodology (continued)

- Among all patients with ages listed as 7 years and younger (as determined using the Age (epatient.15) and Age Units (epatient.16) fields), Booster Seat Usage was then determined using the Use of Occupant Safety Equipment (einjury.07) field as all values containing:
    - Booster seat used: “child booster seat” or “infant car seat”
    - Booster seat unknown or not reported: all else
- Airbag Deployment designations were determined using the Airbag Deployment (einjury.08) field, defined as values containing:
    - Airbag deployed: “airbag deployed” (excluding any records also containing “no airbag”)
    - No airbag deployed/present: “no airbag deployed” or “no airbag present”
    - Unknown or conflicting: all else (e.g., cells that contain both “no airbag” and “airbag deployed” values).
- Initial Patient Acuity reflects the values reported in the Initial Patient Acuity (eSituation.13) data element. Final Patient Acuity directly reflects the values reported in the Final Patient Acuity (eDisposition.19) data element.
    - A total of 13 records were marked for quality assurance review due to Initial Patient Acuity being reported as Dead without Resuscitation Efforts (Black), but Final Patient Acuity being reported as Red, Yellow, or Green. Based on review of the patient care narrative, eight records were corrected to depict an Initial Patient Acuity of Lower Acuity (Green). The remaining five records were marked as Null/Unknown for Initial Patient Acuity because the narrative did not provide sufficient information to confirm the Initial Patient Acuity as Dead without Resuscitation Efforts (Black) or to recategorize them with the correct acuity.
- The Comprehensive Patient Acuity field represents a combination of Final and Initial Patient Acuities. For records with a reported value (i.e., not blank) for Final Patient Acuity (eDisposition.19), that value was maintained as the Comprehensive Patient Acuity value. For records missing a Final Patient Acuity, the Initial Patient Acuity (eSituation.13) value for that record was filled in to complete Comprehensive Patient Acuity.
- Crash Ejection designations were determined using the Vehicular, Pedestrian, or Other Injury Risk Factor (einjury.04), defined as values containing “Ejection”.