

# Post-Crash Care: EMS Response to MVC-Related Injuries

December 2022  
NEMSIS Technical Assistance Center



This document is provided by NHTSA to help state and national EMS partners better understand the characteristics of EMS response to motor vehicle crash-related injuries.

It will be updated periodically to provide current information regarding temporal variations in the type and characteristics of motor vehicle crash EMS activations occurring in the U.S.

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## NHTSA Office of EMS

Improving patient care and field clinician safety in the out-of-hospital setting by:

1. Bringing together available data and industry experts to identify the most critical issues facing the profession,
2. Tackling those issues through collaboration with partners, including other federal agencies and leading associations, and
3. Providing awareness and education about best practices and evidence-based guidelines.



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The NHTSA Office of EMS supports the improvement of patient care in the out-of-hospital setting on a national level.

It is accomplished primarily in three ways:

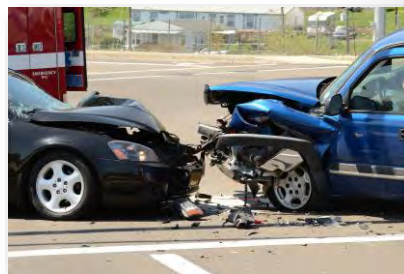
- 1) Bringing together available data and industry experts to identify the most critical issues facing the profession,
- 2) Tackling those issues through collaboration with partners, including other federal agencies and leading associations, and
- 3) Providing awareness and education about best practices and evidence-based guidelines.

The backbone to making EMS successful are the hundreds of thousands field clinicians. Prehospital care doesn't happen without them.

## National Roadway Safety Strategy

The National Roadway Safety Strategy (NRSS) focuses on five key objectives:

1. Safer People.
2. Safer Roads.
3. Safer Vehicles.
4. Safer Speeds.
5. Post-Crash Care.



Between 2011-2020, over **370,000** people died in transportation incidents in the U.S. More than **94%** of them died on our roads.

<https://www.transportation.gov/NRSS>

**National Roadway Safety Strategy**

United States Department of Transportation | January 2022



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*Directly from NRSS PPT:*

NRSS overview – elements of NRSS

On January 27, 2022 Secretary Buttigieg released the National Roadway Safety Strategy. At the core of this strategy is a Department-wide adoption of the Safe System Approach, which focuses on five key objectives: safer people, safer roads, safer vehicles, safer speeds, and post-crash care.

- **Safer People:** Encourage safe, responsible behavior by people who use our roads and create conditions that prioritize their ability to reach their destination unharmed.
- **Safer Roads:** Design roadway environments to mitigate human mistakes and account for injury tolerances, to encourage safer behaviors, and to facilitate safe travel by the most vulnerable users.
- **Safer Vehicles:** Expand the availability of vehicle systems and features that help to prevent crashes and minimize the impact of crashes on both occupants and non-occupants.
- **Safer Speeds:** Promote safer speeds in all roadway environments through a combination of thoughtful, context-appropriate roadway design, targeted

education and outreach campaigns, and enforcement.

- Post-Crash Care: Enhance the survivability of crashes through expedient access to emergency medical care, while creating a safe working environment for vital first responders and preventing secondary crashes through robust traffic incident management practices.

## Safe System Approach

The Safe System Approach (SSA) of the NRSS emphasizes preventing fatalities and serious injuries.

### Key Principles:

1. Death and serious injury are unacceptable.
2. Humans make mistakes.
3. Humans are vulnerable.
4. Responsibility is shared.
5. Safety is proactive.
6. Redundancy is crucial.

**“We must strive for zero roadway fatalities and severe injuries - no other number is acceptable.”**

- U.S. Secretary of Transportation,  
Pete Buttigieg



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*Directly from NRSS PPT:*

<https://www.transportation.gov/NRSS>

The Safe System Approach of the National Roadway Safety Strategy emphasizes preventing fatalities and serious injuries over preventing crashes. This approach, combined with a focus on redundancy, means that our responsibility does not end when a crash occurs. Caring for people injured in a crash to prevent their injuries from becoming fatal is just as critical. In the safe systems approach, post-crash care is our last best chance to prevent serious injury or death.

EMS is one of the major elements of post-crash care, which is why NHTSA has supported EMS system improvement since EMS services first came to be in the 1960s.


### SSA Principles:

- **Death and Serious Injuries are Unacceptable:** While no crashes are desirable, the Safe System Approach prioritizes the elimination of crashes that result in death and serious injuries since no one should experience either when using the transportation system.

- **Humans Make Mistakes:** People will inevitably make mistakes and decisions that can lead or contribute to crashes, but the transportation system can be designed and operated to accommodate certain types and levels of human mistakes, and avoid death and serious injuries when a crash occurs.
- **Humans Are Vulnerable:** People have physical limits for tolerating crash forces before death or serious injury occurs; therefore, it is critical to design and operate a transportation system that is human-centric and accommodates physical human vulnerabilities.
- **Responsibility is Shared:** All stakeholders – including government at all levels, industry, nonprofit/advocacy, researchers, and the public – are vital to preventing fatalities and serious injuries on our roadways.
- **Safety is Proactive:** Proactive tools should be used to identify and address safety issues in the transportation system, rather than waiting for crashes to occur and reacting afterwards.
- **Redundancy is Crucial:** Reducing risks requires that all parts of the transportation system be strengthened, so that if one part fails, the other parts still protect people.

# Post-Crash Care Facts

**200 Million**  
Over 5,300 public safety answering points answer 200 million requests for emergency assistance annually<sup>1</sup>

 Deaths rates increase by 3% for every minute first responders are delayed<sup>3</sup>

**12,000**  
EMS agencies responded to 1,436,763 motor vehicle crashes in 2021<sup>2</sup>

**164,978**  
patients were severely injured in motor vehicle crashes in 2021<sup>2</sup>

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BETTER DATA. BETTER CARE.

CONTACT INFO  
<https://www.nemsis.org/>  
<https://nemsis.org/>



SOURCES  
<sup>1</sup> Federal Highway Traffic Safety Administration (FHVTA) National 911 Progress Report, 2021 Data  
<sup>2</sup> NEMSIS System Entry Criteria: Responsibility of our local, state, and federal agencies  
<sup>3</sup> Bureau of Motor Vehicle Safety, Association Database Emergency Medical Service Response Time and Motor Vehicle Crash Mortality in the United States  
<sup>4</sup> <https://www.nemsis.org/> NEMSIS Data Center  
 NEMSIS: National Emergency Reporting System (NEMSIS)

Updated 11/3/2022



# Post-Crash Care Facts

**2 out of 5**  
crash victims were alive when first responders arrived, but later died<sup>1</sup>

**10%**  
For every crash death, there are another 10% who suffer a severe or debilitating injury<sup>2</sup>

**3%**  
First responders only learn 3% of crash victim outcomes<sup>2</sup>

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CONTACT INFO  
<https://www.nemsis.org/>  
[info@nemsis.org](mailto:info@nemsis.org)

SOURCES  
1 National Highway Traffic Safety Administration (NHTSA) National 911 Progress Report, 2012-2013  
2 National Center for Injury Prevention and Control, National Institute for Trauma and Injury Control  
3 National Center for Injury Prevention and Control, National Institute for Trauma and Injury Control  
4 National Center for Injury Prevention and Control, National Institute for Trauma and Injury Control  
5 National Center for Injury Prevention and Control, National Institute for Trauma and Injury Control

Updated 11/3/2022

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“2 out of 5” quote refers to those that died, not all MVC patients.

## Key NHTSA Actions for Post-Crash Care

- EMS on-scene safety.
- Traffic Incident Management training and technologies.
- Expand the use of and support for NEMSIS.
- Improve the delivery of EMS throughout the nation.



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1. Develop and implement an outreach plan for EMS personnel for on-scene safety and traffic incident training.
2. Advance Traffic Incident Management training and technologies targeted at improved responder and motorist safety.
3. Expand the use of and support for NEMSIS by funding applied research and data quality improvements.
4. Improve the delivery of EMS throughout the nation in collaboration with FICEMS and NEMSAC by focusing on shortening ambulance on-scene response times.

## Report Considerations

- Date Range: January 2018 to present day
- All data is from the National EMS Data Repository (NEMSIS)
  - Exception is FARS Comparison slides
- Rate is used instead of count due to the variation in submitting states/agencies over the years
- This is preliminary data. For research data that is reproducible, use the Public-Release Research Dataset provided annually.

*Please see the Appendices for specific parameters, inclusion, and descriptions.*



## NEMSIS Dataset Counts

EMS data are voluntarily submitted by states/territories wishing to participate in the National EMS Data Repository. Not all states collect nor submit all EMS activations that occur in their state/territory.

Year	Total Annual Count of 911 Records Reported to NEMSIS	Total Annual Count of MVC-Related Records	Reporting States/Territories
2016	19,021,555	1,041,314	49
2017	8,021,832	441,623	35
2018	16,953,577	896,693	43
2019	22,945,698	1,202,904	47
2020	28,547,098	1,313,017	50
2021	31,405,223	1,497,179	52
2022	32,977,804*	1,484,989*	53

Preliminary Data

\*Will increase each month.

For additional information regarding which states/territories submitted data each year, see the Research User Guide here: <https://nemsis.org/using-ems-data/request-research-data/research-data-resources/>.



See Appendix F: Historical Data Submission for more details.

Inclusion: January 4, 2016 to December 31, 2022

## Trend of Motor-Vehicle Crashes Regardless of Injury: 2016-2022

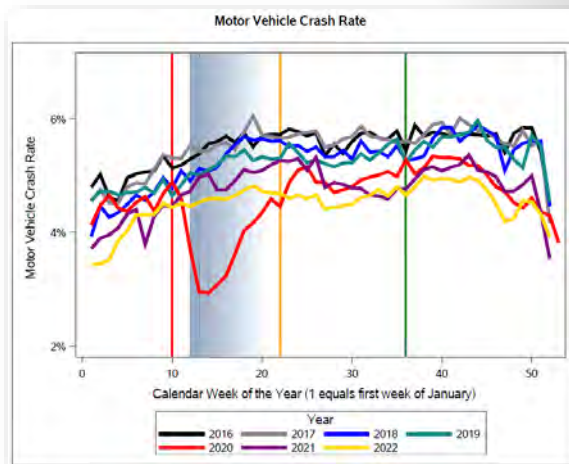
### MVC Rate:

All activations with a motor-vehicle crash related injury over all 911 activations with patient contact. \*

"Patient" refers to the person involved in the MVC that EMS encounters when dispatched to a crash. Not all patients sustain injuries in an MVC.

### Date Lines

- Orange: 2020 CDC reports COVID community spread (week 10)
- Blue gradient: 2020 States begin initiating Stay-at-Home orders phasing out in Week 19 (weeks 12-19)
- Yellow: Memorial Day (week 22)
- Green: Labor Day (week 36)



\*Motor-vehicle crashes may generate multiple activations, patient encounters, and ePCRs. See Appendix B: Definitions/Descriptions.

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### Data through 12.31.22

Motor vehicle crash rates are calculated by MVC-related injuries out of all 911 EMS responses with patient contact.

2016 and 2017 data are not included in the following graphs. Please contact [nemsis@hsc.Utah.edu](mailto:nemsis@hsc.Utah.edu) if you need these years.

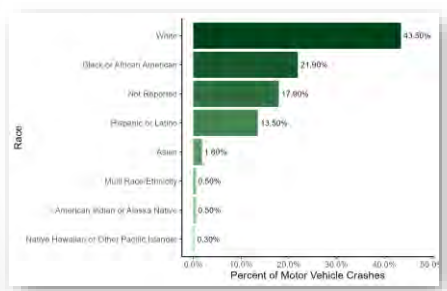
The "drop" at the end of the years is an artifact of calculating the weekly calendar: When reporting numbers by week, the first week and last week usually do not align with year perfectly. We add extra days from another year to make every week whole week.

***This is the only slide that uses ALL activations as the denominator and MVC as the numerator.***

This is different from the EMS by Numbers report which is calculated by an MVC complaint reported to dispatch.

## MVC Patient Demographics

- Date Range: Aggregated for 2018 – 2022.
- Includes all types of MVC-related injuries.
- Race is entered into the patient care report (ePCR) by the clinician in the field. They can select as many descriptors as needed.
- Click here to access the [Public Motor Vehicle Crash Dashboard](#).



Age Range	Female	Male
0-4 Years	0.20%	0.20%
5-9 Years	0.00%	0.00%
10-14 Years	3.30%	3.40%
15-19 Years	5.10%	4.70%
20-24 Years	6.20%	6.00%
25-29 Years	5.30%	5.50%
30-34 Years	4.50%	4.90%
35-39 Years	3.80%	4.10%
40-44 Years	3.30%	3.50%
45-49 Years	3.10%	3.20%
50-54 Years	3.10%	3.30%

55-59 Years	3.00%	3.30%
60-64 Years	2.50%	2.70%
65-69 Years	1.90%	1.90%
70-74 Years	1.50%	1.40%
75-79 Years	1.00%	0.90%
80-84 Years	0.60%	0.60%
85-89 Years	0.30%	0.30%
90-94 Years	0.10%	0.10%
95-99 Years	0.00%	0.00%
100+ Years	0.00%	0.00%
Unknown	0.20%	0.20%

Preliminary Data

Race, age, and gender are calculated for MVC-related activations with patient contact.

Race/ethnicity is not well documented due to some states and agencies not allowing collection of the element.

The age groups for 95-100+ are a very low percentage of activations. That is why the rate shows 0.00%.

Dashboard: <https://nemsis.org/view-reports/public-reports/version-3-public-dashboards/v3-public-motor-vehicle-crash-dashboard/>

## Defining Severe Injury

Distinguishing “severe injury” from all injuries provides perspective regarding the national burden of injury. Severe injury may be identified in EMS data in different ways.

Need for Time-Sensitive Care	Need for Critical Trauma Care	Probability of Patient Survival*
Provider assessment of Final Patient Acuity = “Critical” or “Emergent”	Pre-arrival alert or activation to the receiving facility for trauma	Revised Trauma Score (RTS) translated to probability of survival (POS)
Data element: eDisposition.19-Final Patient Acuity	Data element: eDisposition.24-Destination Team Pre-Arrival Alert or Activation	Based on patient vital signs



\*See Appendix D: Calculation for Injury Severity.

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“Severely injured” is assessed using a measure called the revised trauma score (or RTS) to calculate an approximate probability of survival. Patients who present with a probability of survival of 36.1% or less are considered severely injured and require care at a Level I or Level II Trauma Center.

Verified Trauma Center Process: <https://www.facs.org/search/trauma-centers>  
 eDisposition.19-Final Patient Acuity is defined in the NEMSIS Data Dictionary:  
<https://nemsis.org/technical-resources/version-3/version-3-data-dictionaries/>

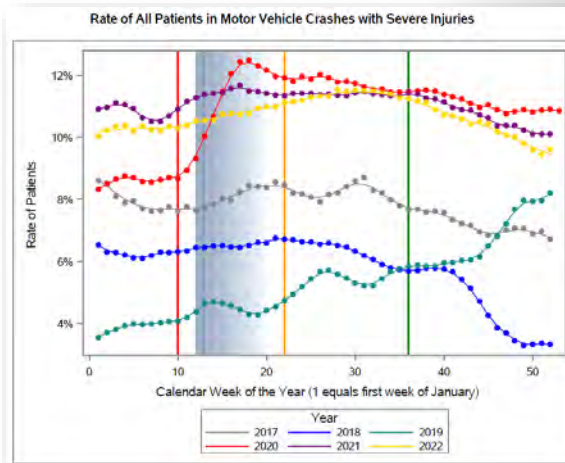
## MVC Severely Injured Patients

- “Severe injuries” are assessed using measures for patient acuity, trauma team activation (pre-alert), and probability of survival (POS).\*
- Severe injuries increased with the onset of the COVID-19 pandemic.

Some trends have a LOESS (locally estimated scatterplot smoothing) curve applied to a 5 week moving average.

EMS trends that are more infrequent are illustrated using this process as it smooths the “sawtooth” impact of fewer or sporadic activations helping to better communicate the trend of activations.

Each dot is the weekly data point.



Preliminary Data

\*See Appendix D. Calculation for Injury Severity.

### Data through 12.31.22

Injury for this report is defined by ICD-10 codes consistent with motor-vehicle crashes.

For a complete list of codes, please contact [nemsis@hsc.utah.edu](mailto:nemsis@hsc.utah.edu).

Severe Injury is calculated using:

Probability of Survival  $\leq$  .361

OR

eDisposition.19 - Final Patient Acuity =RED only

OR

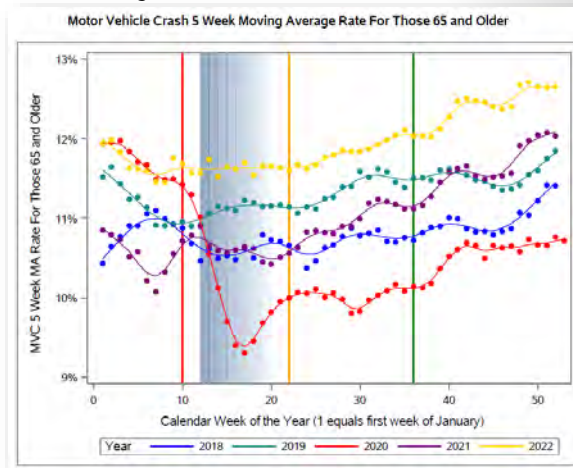
eDisposition.24 - Destination Team Pre-Arrival Alert or Activation = 4224003 Yes-Adult Trauma OR 4224011 Yes-Pediatric Trauma OR 4224017 Yes-Trauma (General)

Severe injury calculation information is available in **Appendix D**



## How Often are Older Adults Injured in an MVC?

Trend lines represent patients 65 years and older who sustained an MVC-related injury.



\*LOESS applied to 5 week moving average.

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### Data through 12.31.22

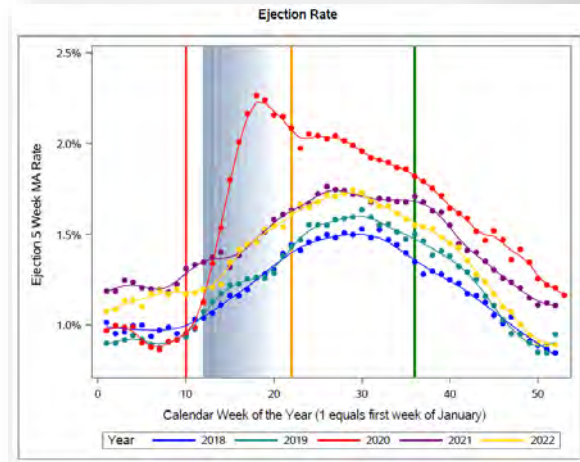
In the NEMSIS MVC Crash Dashboard, users can filter to a specific 5 year age range: <https://nemsis.org/view-reports/public-reports/version-3-public-dashboards/v3-public-motor-vehicle-crash-dashboard/>

#### Inclusion Criteria:

Adults  $\geq$  65 who sustained an MVC-related injury over MVC injuries of all ages.

## How Often are Patients Ejected From the Vehicle During an MVC?

- The rate represented are patients with an injury risk factor of "crash ejection from automobile".\*
- This is not a rate of crashes. This is a rate of activations in which EMS encountered a patient who was ejected from a vehicle during a crash. Crashes can have multiple patients, each one with a unique ePCR.



Preliminary Data

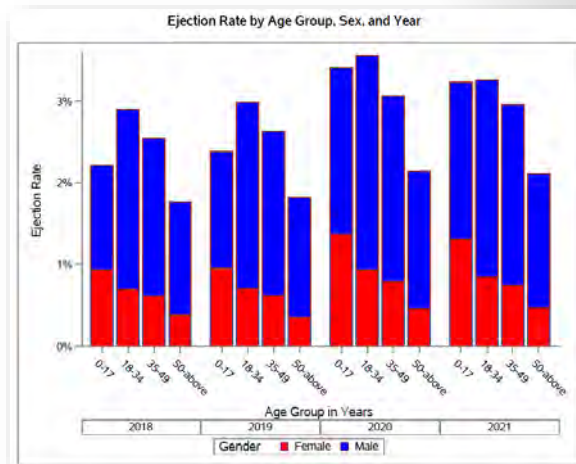
\*eInjury.04 - Vehicular, Pedestrian, or Other Injury Risk Factor. \*\*LOESS applied to 5 week moving average.

### Data through 12.31.22

Inclusion criteria: eInjury.04 is 2904009--Crash Ejection from automobile.  
"Crash ejection from automobile" does not distinguish between partial and full ejection.

## MVC Ejections by Age and Sex

- The rate represented are patients with an injury risk factor of “crash ejection from automobile” based on age group, sex, and year.\*
- This is not a rate of crashes. This is a rate of activations in which EMS encountered a patient who was ejected from a vehicle during a crash. Crashes can have multiple patients, each one with a unique ePCR.



Preliminary Data



\*eInjury\_04 - Vehicular, Pedestrian, or Other Injury Risk Factor.

### Data through 12.31.2022

These are EMS activations with a patient encounter in which they were ejected from a vehicle during an MVC. There is no distinction in NEMSIS data between full and partial ejection.

Crashes can have multiple patients, each one with their own unique ePCR. Patients may have more than one ePCR depending on how many agencies cared for or transported the patient.

Counts are by activation, not by crash.

# What Types of Injuries Qualify Patients for Trauma Center Care?

- Date Range: January 01, 2018 to December 31, 2021.
- Includes all types of MVC-related injuries.
- Demonstrates changes in WHY patients are qualified to go to a Level I or II Trauma Center. More patients were severely injured during the pandemic associated with critical vital signs.

Table of Trauma Center Criteria

Select Trauma Center Criteria	
<span style="color: blue;">■</span>	All penetrating injuries to head, neck, torso, and extremities proximal to elbow or knee
<span style="color: lightblue;">■</span>	Amputation proximal to wrist or ankle
<span style="color: orange;">■</span>	Chest wall instability or deformity (e.g., flail chest)
<span style="color: yellow;">■</span>	Crushes, degloved, mangled, or pulseless extremity
<span style="color: green;">■</span>	Glasgow Coma Score < 14
<span style="color: lightgreen;">■</span>	Open or depressed skull fracture
<span style="color: yellowgreen;">■</span>	Paralysis
<span style="color: limegreen;">■</span>	Pelvic fractures
<span style="color: teal;">■</span>	Respiratory Rate <10 or >29 breaths per minute (<20 in infants aged <1 year) or need for ventilatory support
<span style="color: darkteal;">■</span>	Respiratory Rate <10 or >29 breaths per minute (<20 in infants aged <1 year) or need for ventilatory support
<span style="color: bluegray;">■</span>	Systolic Blood Pressure <90 mmHg
<span style="color: red;">■</span>	Two or more proximal long-bone fractures

Preliminary Data



\*This does not necessarily represent patients transported to a Trauma Center - just those who were identified as needing one. There are many factors that influence transport to a Trauma Center.

[Click here for the Public MVC Severity Dashboard.](#)  
[Click here for the Federal Access MVC Severity Dashboard.](#)

Trauma Center criteria is based on vital signs and anatomical injury. These patients should be transported to a Level 1 or 2 Trauma Center based on their instability. For example, the arrow points to Q1 of 2020. 24 patients out of 1,000 qualified for transport to a Level 1 or 2 Trauma Center based on a Glasgow Coma Score of under 14.

### Inclusion:

The denominator for the rate is all crashes. Each column represents a single quarter in a year. Unit notified by dispatch date is used to segment the records by quarter and year. The color bands segment the records by injury risk factor (eInjury.04). Each colored band within a column could therefore be described as the *Rate (per 1000 motor vehicle crashes) of each injury risk factor (eInjury.04) for a single calendar quarter in a single year identified using unit notified by dispatch (eTimes.03)*

1:M – clinicians may select as many options as needed to accurately describe the event.

This DOES NOT represent actual transport to a Trauma Center – just that the patient qualified for Trauma Center Care.

MVC-related injuries only

Public Dashboard: <https://nemsis.org/v3-nhtsa-motor-vehicle-crash-severity-dashboard-pubilc/>

Federal Dashboard: <https://nemsis.org/view-reports/federal-reports/version-3-federal-dashboards/v3-ems-performance/>



## What Other Injury Risk Factors Influence Transport to a Trauma Center?

- Date Range: January 01, 2018 to December 31, 2021.
- Includes all types of MVC-related injuries.
- Demonstrates changes in risk factors that help to inform severity and trauma center criteria.

Table of Risk Factors

Anticoagulants and Bleeding Disorders
Auto v. Pedestrian/Bicyclist Thrown, Run Over, or > 20 MPH Impact
Burn, with trauma mechanism
Burn, without other trauma
Crash Death in Same Passenger Compartment
Crash Ejection (partial or complete) from vehicle
Crash Intrusion, including roof: > 12 in. occupant side; > 18 in. any site
Crash Vehicle Telemetry Data (AACN) Consistent with High Risk of Injury
EMS Provider Judgment
Fall Adults: > 20 ft. (one story is equal to 10 ft.)
Fall Children: > 10 ft. or 2-3 times the height of the child
Motorcycle Crash > 20 MPH
Pregnancy > 20 weeks
SBP < 110 for age > 65



Preliminary Data

Injury Risk Factors (which include cause of injury and special circumstances) help to determine if the patient should go to a trauma center but does not indicate it must be a Level I or Level II Trauma Center.

These risk factors do not appear to be as sensitive to the pandemic except for Motorcycle Crashes above 20 MPH where the rate rose in 2021.

Orange Box: Motorcycle crash >20 mph as Injury Risk Factor for Trauma Center Criteria

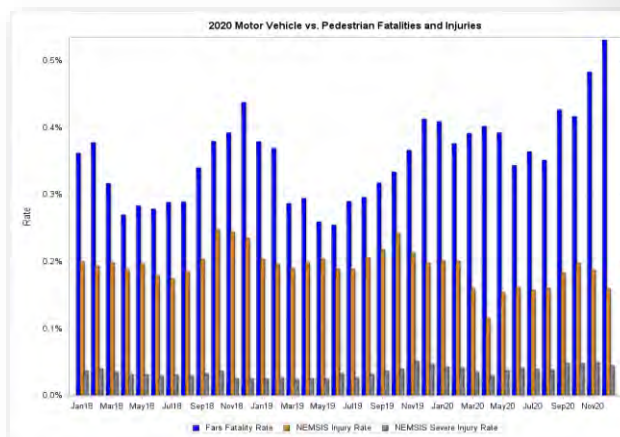
Public Dashboard: <https://nemsis.org/v3-nhtsa-motor-vehicle-crash-severity-dashboard-public/>

Federal Dashboard: <https://nemsis.org/view-reports/federal-reports/version-3-federal-dashboards/v3-ems-performance/>

## Comparing Fatalities and Injuries: Motor Vehicle vs. Pedestrian

The FARS and NEMSIS data have different denominators:

- **FARS Data:** Total motor-vehicle crashes vs. pedestrian fatalities over all MVC activations\*
- **NEMSIS Injury:** Total motor-vehicle crashes vs. pedestrian injuries over all MVC activations
- **NEMSIS Severe Injury:** Total motor-vehicle crashes vs. pedestrian who sustained a severe injury over all MVC activations



Preliminary Data

\*See Appendix E: Process for FARS calculation. \*\*See Slide 7: Defining Severe Injury.

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The next three graphs compare Fatality Analysis Reporting System (FARS) data and NEMSIS data.

FARS is a nationwide census providing NHTSA, Congress and the American public yearly data regarding fatal injuries suffered in motor vehicle traffic crashes:

<https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>

FARS data represent fatalities and NEMSIS data include injury and severe injury rates. FARS data for 2020 and 2021 are not yet available.

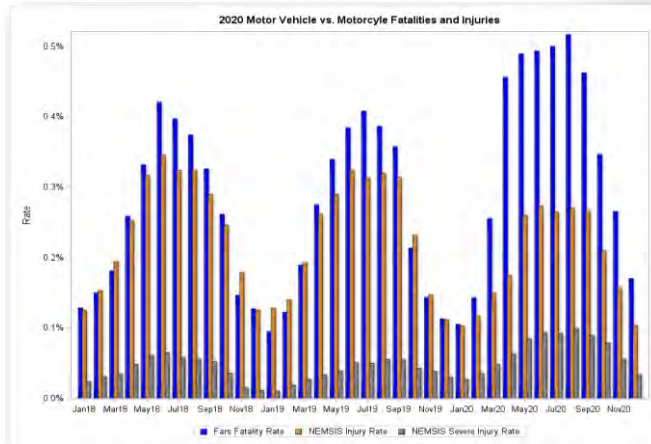
Pedestrian is defined by FARS “as any person who is on a traffic way or on a sidewalk or path contiguous with a traffic way, and who is not in or on a nonmotorist conveyance.”

Pedestrian is indicated in NEMSIS data by ICD-10 injury codes.

## Comparing Fatalities and Injuries: Motor Vehicle vs. Motorcyclist

The FARS and NEMSIS data have different denominators:

- **FARS Data:** Total motor-vehicle crashes vs. pedestrian fatalities over all MVC activations\*
- **NEMSIS Injury:** Total motor-vehicle crashes vs. pedestrian injuries over all MVC activations
- **NEMSIS Severe Injury:** Total motor-vehicle crashes vs. pedestrian who sustained a severe injury over all MVC activations



\*See Appendix E: Process for FARS calculation. \*\*See Slide 7: Defining Severe Injury.

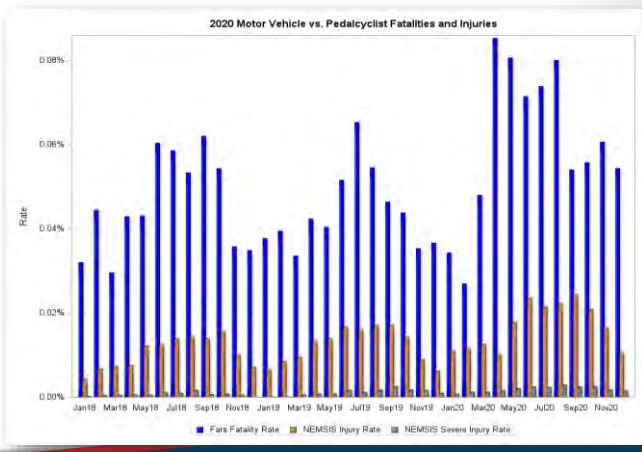
FARS: Motorcycle fatalities are quantified the same way as a vehicle occupant or a nonmotorist.



# Comparing Fatalities and Injuries: Motor Vehicle vs. Bicyclist

The FARS and NEMSIS data have different denominators:

- **FARS Data:** Total motor-vehicle crashes vs. pedestrian fatalities over all MVC activations\*
- **NEMSIS Injury:** Total motor-vehicle crashes vs. pedestrian injuries over all MVC activations
- **NEMSIS Severe Injury:** Total motor-vehicle crashes vs. pedestrian who sustained a severe injury over all MVC activations



Preliminary Data

\*See Appendix E: Process for FARS calculation. \*\*See Slide 7: Defining Severe Injury.

FARS data refers to this group as “pedalcyclists”.

## Questions?

For more information, visit [www.nemesis.org](http://www.nemesis.org) or  
Email the Technical Assistance Center [nemesis@hsc.utah.edu](mailto:nemesis@hsc.utah.edu)



Please contact the NEMESIS Technical Assistance Center for updates to this document or for additional information.  
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Julianne Ehlers, Project Management  
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## Appendix A: Parameters of Data

Source: Unless otherwise noted, all data in this report are from the National EMS Information System ([NEMSIS](#)) National EMS Data Repository managed by the NEMSIS Technical Assistance Center (TAC). This is often referred to as "NEMSIS Data."

Date Range: January 01, 2018 through present day. The report is updated monthly and the current date is reflected on the title slide.

Data inclusion criteria (unless otherwise specified):

- 911-Initiated EMS responses.
- Motor-vehicle crashes (MVC).
- Positive for patient contact. (Not all patients present with MVC-related injuries.)
- Response date is within the year represented.
- Excludes Standby, Assist, and Cancelled calls where no patient contact occurred.

Date lines on selected graphs:

**Orange:** 2020 CDC reports COVID community spread (week 10).

**Blue gradient:** 2020 States begin initiating Stay-at-Home orders phasing out in Week 19 (weeks 12-19).

**Yellow:** Memorial Day (week 22).

**Green:** Labor Day (week 36).

Smoothing: Some trends have a LOESS (locally estimated scatterplot smoothing) curve applied to a 5 week moving average. EMS trends that are more infrequent are illustrated using this process as it smooths the "sawtooth" impact of fewer or sporadic activations helping to better communicate the trend of activations.



## Appendix A: Parameters of Data (continued)

**Timeliness:** 75% of EMS data submitted to the National EMS Data Repository are generally available within 8 days of the EMS encounter.

**Completeness:** Approximately 92% of all 911 EMS activations across the country are represented.

**Duplicates:** Resubmission of an electronic patient care report (ePCR) supersedes and replaces the previous ePCR submission. This helps to reduce duplicate records in the database.

**Preliminary Data:** For research data that is reproducible, use the [Public-Release Research Dataset](#) provided annually.

**Use of Report:** Please refrain from removing single slides or graphs from this report without additional pages or clear reference to the parameters and source of the data. Taken out of context, the individual slides or graphs may not be represented accurately. Please contact the NEMSIS TAC for specific and updated slides or graphs when needed.

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## Appendix B: Definitions/Descriptions

**Activation:** An event in which EMS is dispatched to respond to a call for medical assistance. Also referred to as a "run" or a "call". Not all activations have a patient encounter. Motor-vehicle crashes may generate multiple activations, patient encounters, and ePCRs.

**EMS Data:** The data represented in the National EMS Data Repository are documented by EMS field clinicians during or after the activation through electronic patient care report software. Although only data that are consistent with the current National EMS Data Standard are accepted, and while much care is taken to ensure quality with 400+ validation rules, the data are largely left "as entered".

**ePCR:** An Electronic Patient Care Report is initiated when an EMS unit is dispatched to an event. ePCRs are created even when there is no patient contact such as a standby, assist, or cancelled call. The EMS unit that is dispatched or sent to the event is the originator of the record or ePCR.

**LOESS:** Locally estimated scatterplot smoothing technique. Some trends have a LOESS curve applied to a 5 week moving average. This process smooths the "sawtooth" impact of fewer or sporadic activations helping to better communicate the trend of activations.

**MVC:** Motor vehicle crashes are documented in EMS data when there is a patient encounter. Not all patients require medical assistance. When there is no patient present upon EMS arrival, that is generally documented as a cancelled call/event/activation and is not included in the denominator of the data represented in this report unless otherwise indicated.

**Patient:** Refers to the person that EMS encounters when responding to a 911 call for medical assistance. Not all patients are injured or require medical assistance.



## Appendix C: Frequently Asked Questions

### Why use RATE and not COUNT?

Over the years, the number of states and EMS agencies submitting data to the National EMS Data Repository has increased. RATE is used to account for variations in submissions and is a more consistent descriptor of EMS response characteristics.

### Do these data represent a complete census of all EMS activations?

The NEMSIS Technical Assistance Center receives an estimated 92% of all EMS activations from across the country. There are some states that do not require all EMS agencies to report their data. As of March 2022, there was 1 state and 2 territories that do not submit data to NEMSIS (Delaware, American Samoa, Puerto Rico).

### Is the National EMS Data Repository a registry of patients?

No. One patient may initiate multiple EMS activations. Each EMS encounter with the patient is generally recorded as a new record or ePCR. For example: A patient is injured in an MVC and a first response EMS unit arrives on scene to stabilize the patient (ePCR #1). The first response unit transfers care to a transporting unit that takes the patient to the hospital (ePCR #2). The hospital transfers the patient to a higher level facility via ground or air transport (ePCR #3). This is minimized by filtering data to 911-initiated activations.

### Why is there variation in documentation practices throughout the country?

Hundreds of thousands EMS clinicians from every walk of life, in every demographic, and multiple staffing models document their patient encounters. There is no single right way to complete a patient care report (PCR) and documentation training is extremely varied. As such, EMS data are rarely collected in calm, sterile, predictable environments. States, territories, and agencies all impact the methods and requirements used to document EMS response activities.

### Why are fatalities not well accounted for in EMS data?

EMS clinicians do not always complete a patient care report when there is an obvious fatality upon arriving at the scene. EMS is also not always activated when an obvious fatality has occurred. Thus, EMS data are far better suited to injury and not a complete resource for fatalities.

### Do deceased patients (fatalities) show up in EMS data?

Generally, EMS documents activations where they treat and/or transport a patient. If a patient is clearly deceased at the scene, it is not uncommon for EMS to be cancelled prior to arrival. If the patient expires during treatment or transport, it is usually captured in the ePCR.



Additional details about EMS research data are located here: <https://nemsis.org/using-ems-data/request-research-data/research-data-resources/>

## Appendix D: Calculation for Injury Severity

- Injury severity is determined using a measure called the revised trauma score (RTS) to calculate an approximate probability of survival (POS).
- Patients who present with a probability of survival of 36.1% or less are considered severely injured and should be transported to a Level 1 Trauma Center.
- RTS is calculated as described in the box below, and its value translates to a probability of survival (POS) score as described in the companion bar chart.

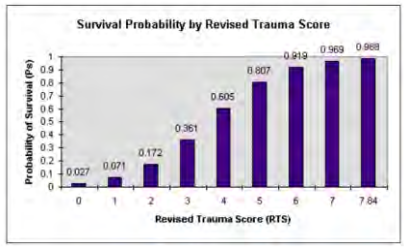
**Revised Trauma Score**

The Revised Trauma Score is a physiological scoring system, with high inter-rater reliability and demonstrated accuracy in predicting death. It is scored from the first set of data obtained on the patient, and consists of Glasgow Coma Scale, Systolic Blood Pressure and Respiratory Rate.

Glasgow Coma Scale (GCS)	Systolic Blood Pressure (SBP)	Respiratory Rate (RR)	Code/Value
13-15	>91	10-29	4
9-12	76-90	>25	3
6-8	50-75	6-9	2
4-5	1-49	1-5	1
3	0	0	0

$RTS = 0.9368 \text{ GCS} + 0.7326 \text{ SBP} + 0.2908 \text{ RR}$

Values for the RTS are in the range 0 to 7.6408. The RTS is heavily weighted towards the Glasgow Coma Scale to compensate for major head injury without multi-system injury or major physiological changes. A threshold of RTS < 4 has been proposed to identify those patients who should be treated in a trauma center, although this value may be somewhat low.



Preliminary Data



## Appendix E: Process for FARS Comparison

### Fatality Analysis Reporting System (FARS)

<https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars>

FARS is a nationwide census providing NHTSA, Congress and the American public yearly data regarding fatal injuries suffered in motor vehicle traffic crashes.

The FARS Fatality Data used in this report was run online by using the FARS Query System for 2018 – 2020.

The calculations are as follows using pedestrian as the example:

FARS rate = FARS pedestrian death over FARS total MVC count

NEMSIS injury rate = NEMSIS pedestrian injury over NEMSIS total MVC

NEMSIS severe injury rate = NEMSIS pedestrian injury with Probability of Survival (POS) less than .361 over NEMSIS total MVC (See Appendix C: Calculation for Injury Severity)



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FARS Definitions: (NHTSA Field Crash Investigation 2019 Coding and Editing Manual)  
<https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813042>

### **Pedestrian**

Is defined as any person who is on a traffic way or on a sidewalk or path contiguous with a traffic way, and who is not in or on a nonmotorist conveyance. This includes persons who are in contact with the ground, roadway, etc., but who are holding onto a vehicle. A nonmotorist conveyance is defined as any human-powered device by which a nonmotorist may move, or by which a pedestrian or nonmotorist may move another nonmotorist, other than by pedaling. A nonmotorist conveyance includes the following: baby carriage, coaster wagon, ice skates, roller skates, push cart, scooter, skate board, skis, sled, wheelchair, rickshaw, etc. This includes those persons in a nonmotorist conveyance who hold onto a motor vehicle in motion. Excluded are pedalcyclists.

### **Cyclist or cycle**

Refers to any occupant of a pedalcycle, the cycle, or both. This includes those cyclists who hold onto a motor vehicle in motion.

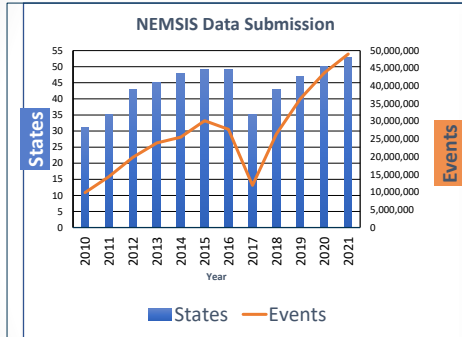
### **Motored cycle**

Refers to Body Type, Motorcycle, Moped (motorized bicycle), Three-wheel motorcycle or moped, Other motored cycle (minibike, motor scooter) and Unknown



motored cycle type.

# Appendix F: Historical Data Submission



Statistical Year	Reporting States/Territories <sup>1</sup>	Reporting Agencies <sup>2</sup>	Number of Events	Treated and Transported 9-1-1 Response <sup>2</sup>
2009	26	1,673	5,767,090	3,367,668
2010	31	3,529	9,874,748	4,874,061
2011	35	5,395	14,371,941	7,701,605
2012	43	6,415	19,831,189	10,733,925
2013	45	8,183	23,897,212	12,595,958
2014	48	8,785	25,835,729	13,769,286
2015	49	10,137	30,206,450	15,729,516
2016	49	9,993	29,919,652	15,361,777
2017	35	4,016	7,907,829	3,835,110
2018	43	9,599	22,532,890	10,675,178
2019	47	10,062	34,203,087	15,873,573
2020	50	12,319	43,488,767	19,533,036
2021	53	13,949	48,982,990	21,886,915
<b>TOTALS</b>			<b>316,819,574</b>	<b>134,050,693</b>

<sup>1</sup> Number of reporting states and territories of the United States.  
<sup>2</sup> Only including the events that are 9-1-1 calls, treated and transported by EMS.

Preliminary Data



## NRSS Post-Crash Care Goals

1. Develop and implement an outreach plan for EMS personnel for on-scene safety and traffic incident training.
2. Advance Traffic Incident Management training and technologies targeted at improved responder and motorist safety.
3. Expand the use of and support for the National Emergency Medical Services Information System — the national database that is used to store EMS data from the U.S. States and Territories — by funding applied research and data quality improvements.
4. Improve the delivery of EMS throughout the nation in collaboration with the Federal Interagency Committee on Emergency Medical Services and the National Emergency Medical Services Advisory Council by focusing on shortening ambulance on-scene response times.

### [National Roadway Safety Strategy](#)

