

What Should I Know Before Using Motor Vehicle Traffic Injury Data?

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DATA CONSIDERATIONS

[Injury and Violence Prevention Branch \(IVPB\)](#) MVT injury data can be used in many ways, from identifying risks, tracking trends, and developing effective prevention strategies, to supporting advocacy, funding decisions, and public awareness campaigns.

This document outlines what you should know and consider before using IVPB MVT injury data resources.

How MVT Injuries are Measured

Who Is Included in MVT Injury Data?

Occurrence vs. Residence When Measuring Overdose

Occurrence describes where something happened. Residence describes the area where someone has reported that they live.

Residence Rates

MVT injury data are limited to NC residents.

- Limiting to residents allows for rate calculations using NC resident population estimates.
 - This ensures that the information used to calculate rates is consistent.
- Limiting to residents allows for more accurate comparisons across groups and between counties.
 - This excludes people that were injured or died from a motor vehicle crash in a given county but are not residents of that county.
 - Someone living in a county, but who has not yet updated their residence status to that county would also be excluded.
- While limiting to county residents works well for most counties, there are some counties where this may have a large impact on the MVT injury rate.

Occurrence Rates

- Occurrence rates include all MVT injuries that happened in a given area, regardless of whether the individuals were residents of that area.
- For counties with lots of people coming and going, the occurrence rate is often higher than the resident rate. This is especially true for:
 - Counties with college towns
 - Counties that have popular tourist destinations, such as beach towns



- Counties that have large commuter or employment destinations (e.g., Wake County)
 - Counties containing major interstates and highways (e.g. counties where I-95 passes through)
- Limiting to residents would exclude these transient populations and can underestimate the burden of MVT injuries on local systems.
- Counting cases based on where they happen rather than where people live helps us understand how MVT injuries affect local systems and services and can inform local MVT injury prevention planning.
 - Occurrence rates are not regularly included in IVPB MVT injury resources but can be requested for your area if this is a concern for your county.

Differences in Injury Location and Residence

Where a MVT injury occurs or where an MVT injury is treated can be different from where a person lives.

- This distinction is especially true in rural areas where a single hospital or health care facility may serve a large area across multiple counties.
- Someone may experience an MVT injury in one county and then be transported to and treated in a hospital in another county.
 - This transfer of care to another county is common for people with serious injuries that require treatment at a designated trauma center.
- These differences in where injuries occur are not reflected in the IVPB MVT injury data.

For more information, visit [Understanding Injury Surveillance Case Definitions](#).

What Is Counted in MVT Injury Data?

IVPB MVT injury data are limited to traffic injuries that occur on public roadways¹.

MVT injuries represent injuries from motor vehicle crashes that take place on a public roadway, like a city street or highway.

- An injury from a motor vehicle crash that happened at an intersection should be included as an MVT injury.
- An injury from a motor vehicle crash that happened in a parking lot should not be included as an MVT injury.



IVPB MVT injury data are normally limited to unintentional MVT injuries.

- Assaults involving a motor vehicle, self-inflicted MVT injuries, and MVT injuries of undetermined intent are excluded.
- Almost all MVT injuries and deaths (more than 99%) are unintentional injuries.
- For more information on intent, visit [Injury Mechanism and Intent](#).

IVPB monitors MVT injuries that are treated in a hospital setting or that result in death.

Non-fatal MVT injury data do not capture:

- Unintentional MVT injuries treated outside of the ED or hospital
 - This can include MVT injuries treated at urgent care clinics, or by primary care providers, chiropractors, or by other health care providers.
- MVT injuries where someone does not seek medical care or that are treated at home.

MVT injury data are broken out further to describe the person's mode of transportation.

Understanding the mode of transportation or sub-cause of MVT injury can be helpful with informing MVT injury prevention strategies.

IVPB monitors the following sub-cause categories for MVT injuries¹:

- **Motor Vehicle Occupant** – Injury to the driver or a passenger of a motor vehicle involved in a motor vehicle crash.
 - Includes occupants of cars, pickup trucks, vans, heavy transport vehicles, buses, and SUVs.
 - Other types of vehicles such as ATVs, snowmobiles, and go-carts are not included unless they were involved in a traffic accident (see “other land transport” below).
 - MVT injuries include those caused by a collision, rollover, or another event.
 - Crashes may involve another vehicle, an object, or a pedestrian.
- **Motorcyclist** – Injury to a driver or passenger of motorcycles (classic style), sidecars, mopeds, motorized bicycles (dirt bikes), motor-powered scooters, and electronic-motorcycles (e-motos).
 - Injury may result from collision, loss of control, crash, or some other event involving a vehicle, object, or pedestrian.
- **Pedal Cyclist** – Injury to a pedal cycle rider, including riders of unicycles, bicycles, tricycles, mountain bikes, and electronic bicycles (e-bikes).
 - Injury may result from a collision, loss of control, crash, or some other event involving a moving vehicle or pedestrian.
 - Injuries unrelated to transport, such as repairing a bicycle, are not included.
- **Pedestrian** – Injury to a person struck by or against a vehicle when they were not in or on a motor vehicle, railway train, motorcycle, bicycle, airplane, streetcar, animal-drawn vehicle, or other vehicle.
 - Pedestrians include people walking, as well as people using personal conveyances, such as roller skates, skateboards, and kick and standing electric scooters (e-scooters).
 - This category includes pedestrians struck by cars, pickup trucks, vans, heavy transport vehicles, buses, and SUVs.
 - Injuries from being struck by other vehicles such as motorcycles, trains, or bicycles are not included (see “other transport” below).
- **Unspecified** – The mode of transportation for the person injured in the motor vehicle crash was not described.
- **Other** – the mode of transportation for the person injured in the motor vehicle crash does not fall into one of the other specified categories.
 - This can include animal rider (e.g. someone on horseback) or an occupant of an animal drawn vehicle, a railway train, or a streetcar injured in a traffic collision involving a motor vehicle.

MVT injuries are among a variety of transportation-related injuries and deaths.

IVPB also monitors the following transportation-related injuries that **are not** included in the MVT injury category¹:

- **Motor Vehicle Non-Traffic** – Injuries from crashes involving motor vehicles (e.g., motorcycles, cars, pickup trucks, vans, buses, heavy trucks, three wheeled vehicles, ATVs, and special purpose vehicles) that happen off public roadways (e.g., driveway, private farm, parking lot).
 - This category is not used in the death certificate data.
- **Other Land Transport** – Injuries involving animal riders (e.g. horseback rider), occupants of animal drawn vehicles, railway or streetcar users, and off road (e.g., ATV) or special-purpose vehicles (e.g., construction vehicles), caused by crashes, falls, or other accidents.

- **Other Transport** – Injuries involving watercraft (e.g., boating injuries), aircraft, spacecraft, and other specialized vehicles such as cable cars or ski lifts, caused by crashes, collisions, fires, explosions, falls, or other events.
 - For more information on boating-related injuries, visit [Boating-Related Injuries and Fatalities in North Carolina, 2019-2023](#)
- **Pedal Cyclist Other** – Injuries to bicycle riders (actively riding or getting on or off a bicycle) occurring outside of the public roadway as well as injuries involving collisions with pedestrians, animals, other bicycles, motor vehicles, trains, non-motorized vehicles, fixed objects, or through other non-collision events.
- **Pedestrian Other** – Injuries to people on foot or who are using things like skates, skateboards, scooters, or other small devices when they are hit by a pedal cycle (e.g., bicycles) or another non-motorized vehicle in a traffic or not traffic event.

For more information on injury mechanism and sub-cause of injury, visit [Injury Mechanism and Intent](#).

What Else is Measured to Monitor MVT Injuries?

Self-Reported Driving Behaviors

In addition to how many people died or were injured from motor vehicle crashes, IVPB also monitors self-reported driving behaviors using survey data.

- IVPB uses data from the NC Behavioral Risk Factor Surveillance System (BRFSS) to understand seat belt use and drinking and driving among adults in NC.
 - Visit NC State Center for Health Statistics [NC BRFSS website](#) for more information on NC BRFSS.
- Data from the NC YRBS are used to understand texting and driving and seat belt use among high school students.
 - Visit [NC Health Schools Data](#) for more information on NC YRBS.
- See the [Survey Data section](#) below for considerations when using NC BRFSS and NC YRBS data.
 - For more information on NC BRFSS and NC YRBS data, visit [Data Sources IVPB Uses for Injury Surveillance](#).

Considerations for MVT Injury Data by Data Source

No single data source captures the full scope of MVT injury in NC. Data sources should be used together to more fully understand the statewide impact of MVT deaths, injuries, and related health outcomes.

For more information on a specific data source, visit [Data Sources IVPB Uses for Injury Surveillance](#).



MVT Injury Death Data

IVPB uses vital statistics death certificate data to monitor deaths from motor vehicle crashes.

- Unintentional MVT injury deaths are limited to deaths where the MVT was the primary cause of death.
 - Primary causes of death are the injuries or conditions that directly resulted in the death.

Mode of Transportation for MVT Injury Deaths

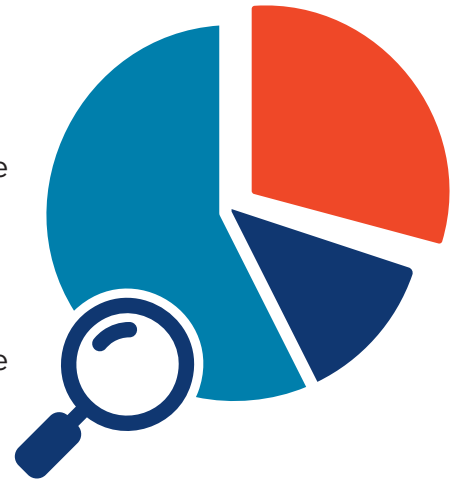
- The mode of transportation (sub-cause) for MVT injury deaths is not always known.
- An average of 60% of MVT injuries have an unspecified mode of transportation each year.
- Understanding the transportation mode for the remaining deaths can still be helpful with informing MVT injury prevention strategies.

MVT Injury Hospital Discharge Data

Hospital discharge data are encounter-based, meaning that the same person may have multiple hospital stays during any given time period.

Identifying MVT injury hospitalizations.

- ICD-10-CM codes are used to group and classify diagnoses and reasons for health care visits in administrative health care systems, including hospital discharge data.
 - ICD-10-CM codes are intended for administrative and billing purposes, not public health surveillance.
 - This purpose can affect which codes are or are not assigned to a record and therefore which events are included or excluded as MVT injury cases.
 - For more information on ICD-10-CM codes, visit [Understanding Injury Surveillance Case Definitions](#).
- IVPB includes hospital records as an MVT injury hospitalization when there is an ICD-10-CM code for any injury listed as the primary diagnosis, and an unintentional MVT injury ICD-10-CM code listed anywhere in the record.
 - Records with another non-injury ICD-10-CM code listed as the primary cause are excluded, even if there is also a code for an MVT injury later in the record.
- IVPB does not exclude hospitalizations that result in death.
 - Including hospitalizations resulting in death helps to understand the full burden of MVT injuries on the NC health care system.
- IVPB's expanded case definition can contribute to differences in the number of MVT injury hospitalizations IVPB identifies compared to those shared by CDC or other sources.
- For more detailed information on how these cases are identified, see [Injury Surveillance Technical Notes](#).



Mode of Transportation for MVT Injury Hospitalizations

The mode of transportation (sub-cause) is available for almost all MVT injury hospitalizations.

- Sub-cause is unspecified for less than 1% of MVT injury hospitalizations each year.

Costs of MVT Injury Hospitalizations

Hospital discharge data include information on the total charges from the hospital stay as billed.

- This information can be used to understand the financial costs related to MVT injury hospitalizations.
- The total charges billed is not necessarily the same amount that was paid for the hospital visit.
 - Insurance companies typically negotiate the rates for hospital charges down.

MVT Injury ED Visit Data

ED visit data are encounter-based. The same person may have multiple ED visits during any given time period.



Data Quality

- Trends may be impacted by missing data.
- There were changes in the number of people going to the ED for any reason (ED utilization) during the COVID-19 pandemic.
 - See the [Unintentional MVT Injuries and COVID-19](#) section below for more information.

Using Provisional Data

Provisional ED visit data are sometimes used to:

- Share information about MVT injuries in NC quickly.
- Spot changes in trends before the final data are available.
- See patterns that help us know when to take action.
- Provisional numbers can change as more information becomes available.
- Provisional data should be used carefully because there may be missing information or delays in reporting.

For more information on provisional data and when they become available, visit [Using Provisional Data for Monitoring Injuries](#).

Identifying Unintentional MVT Injury ED Visits

ICD-10-CM codes are also used to identify ED visits for unintentional MVT injuries. For more information on ICD-10-CM codes, visit [Understanding Injury Surveillance Case Definitions](#).

- ED visits with an ICD-10-CM code for an unintentional MVT injury anywhere in the record are included.
- IVPB does not exclude ED visits where the patient is admitted to the hospital or visits that result in death.
 - Including ED visits resulting in hospitalization or death helps us understand the full burden of MVT injuries on the NC health care system.
 - This inclusion can contribute to a difference in the number of MVT injury ED visits IVPB identifies compared to those shared by CDC or other sources.
- ICD-10-CM codes are intended for administrative and billing purposes, not public health surveillance.
 - This purpose can affect which codes are or are not assigned to a record and therefore which events are included or excluded as MVT injury cases.
- Some ED visit case definitions, called syndromes, also search the chief complaint and/or triage notes fields for keywords to identify MVT injury ED visits.
 - NC DETECT uses a syndrome to identify injuries due to motor vehicle collisions based on keywords.
 - Because these definitions also use keywords, they identify more ED visits than when using ICD-10-CM codes alone.
 - Additional syndromes for all MVT injuries and MVT injuries by mode of transportation (e.g. motor vehicle occupant, motorcyclist, pedestrian) search for ICD-10-CM codes but do not use keywords.
- For more detailed information on how these cases are identified, see [Injury Surveillance Technical Notes](#).

ED Visits with Multiple ICD-10-CM Codes

Some unintentional MVT injury ED visits may receive multiple ICD-10-CM codes related to the MVT injury and for other types of injury.

Multiple Mechanisms of Injury

- There may be codes to describe multiple types of injuries, for example an MVT injury and a medication/drug overdose.
- These records may have the same intent or different intents (e.g. one is self-inflicted and one is unintentional).

Multiple Injury Intent

- In some instances, there may be multiple injury codes with conflicting intent information, such as a code for an unintentional MVT injury in addition to a code for self-inflicted MVT injury.
 - The ICD-10-CM coding guidance defaults to classifying injuries as unintentional.
 - Multiple codes may be used to document different aspects of the ED visit, which can contribute to conflicting or inconsistent coding.

Multiple Modes of Transportation for Unintentional MVT Injuries

- In some instances, there may be multiple injury codes with conflicting sub-cause information, such as a code for an unintentional MVT injury for a motor vehicle occupant and for a motorcyclist.
 - Multiple codes may be used to document the chain of events and all modes of transportation involved in a motor vehicle crash rather than the individual patient's mode of transportation.
 - There is not a way to know for certain which sub-cause applies to the person seen in the ED, so IVPB includes the visit in both sub-cause groups.
- Multiple sub-causes are documented in fewer than 1% of unintentional MVT injury ED visits each year.

A visit with multiple ICD-10-CM codes is counted once in each mechanism and intent category that applies to that ED visit, but only once in the total number of injury ED visits.

For example:

- An ED visit that had multiple sub-causes identified for an unintentional MVT injury, such as codes for both a motor vehicle occupant and a motorcyclist, would be counted one time in each category:
 - The total number of unintentional MVT injury ED visits for motor vehicle occupants
 - The total number of unintentional MVT injury ED visits for motorcyclists
 - The total number of unintentional MVT ED visits
 - The total number of injury ED visits
- If multiple types of injuries were identified, such as codes for both an unintentional MVT injury and a self-inflicted MVT injury, the ED visit would be counted once in each category:
 - The total number of unintentional injury ED visits
 - The total number of self-inflicted injury ED visits
 - The total number of MVT injury ED visits
 - The total number of injury ED visits
- Similarly, an ED visit that had codes for both an unintentional MVT injury and an unintentional medication/drug overdose would be counted one time each in:
 - The total number of unintentional injury ED visits
 - The total number of unintentional MVT ED visits
 - The total number of unintentional medication/drug overdose ED visits
 - The total number of injury ED visits

Injury ICD-10-CM Codes in the ED Visit Record

How IVPB Counts the Injury ED Visit (each box represents the visit being counted one time)

ED Visit	Multiple Sub-Causes	Intent	Intent	Mechanism	Total Injury
ED Visit A	- MVT Injury – Occupant - MVT Injury – Motorcyclist	Occupant	Unintentional	MVT Injury	Injury ED Visit
ED Visit B	Unintentional MVT Injury Self-Inflicted MVT Injury	Occupant	Unintentional Self-Inflicted	MVT Injury	Injury ED Visit
ED Visit C	- Unintentional MVT Injury - Unintentional Medication/ Drug Overdose	Occupant	Unintentional	MVT Injury Medication/ Drug Overdose	Injury ED Visit

Mode of Transportation for MVT Injury ED Visits

The mode of transportation (sub-cause) is available for almost all MVT injury ED visits.

- Sub-cause is unspecified for less than 1% of MVT injury ED visits each year.

Emergency Medical Services (EMS) Data

- EMS data are useful for identifying the broader impact from MVT injuries, especially when the injury does not require medical attention in the ED or hospital.
 - EMS data include EMS responses where the patient is treated on-scene and not transported to the hospital, as well as those that are transported.
- EMS data are encounter-based. The same person may be involved in multiple EMS responses during any given time period.

Survey Data

IVPB uses data from the NC Behavioral Risk Factor Surveillance System (BRFSS) and the NC Youth Risk Behavior Survey (YRBS) to understand risk and protective factors for MVT injuries.

- Survey data can provide more context on shared risk and protective factors associated with MVT injury in NC and can be used to understand connections to other health behaviors.
- Visit [Data Sources IVPB Uses for Injury Surveillance](#) for more information on how IVPB uses NC BRFSS and YRBS data and considerations for using these data.

NC BRFSS Data

- The NC BRFSS surveys adults living in NC about behaviors and experiences that impact their health, including:
 - How often they wear a seatbelt
 - How often they drink and drive

- [NC BRFSS data](#) are available statewide and regionally.
 - NC BRFSS data are not available at the county level.
- The NC BRFSS is conducted every year. However, the questions included in the NC BRFSS vary from year to year and may change over time.
 - For information on the specific questions included in these surveys and when questions were asked, visit [NC State Center for Health Statistics, BRFSS](#)

NC YRBS Data

- The NC YRBS asks middle school and high school students in NC about behaviors that impact their health.
- NC YRBS includes questions to understand how many students text and drive and how often students use seat belts.
- The NC YRBS is conducted every other year.
 - Questions about driving-related behaviors may not be included in every cycle of the NC YRBS.
 - Questions about seat belt use have not been included in recent surveys but could be included again in the future.
 - Visit [NC Healthy Schools Data](#) for more information on specific questions asked and to access YRBS data.
- NC YRBS data are available statewide and regionally.
 - NC YRBS data are not available at the county level.

Considerations For Using Survey Data

Survey data are self-reported and may show different results from what people are actually experiencing. Survey data on MVT injury risk and protective factors can be affected by:

- **Social Desirability Bias** – People may report using seatbelts more often than they actually do or may report drinking or texting and driving less often than they actually do.
 - People may be embarrassed by or not want others to know about these behaviors.
 - People may respond with what they think will make them look good.
- **Recall Bias** – People may forget exactly how often over the reporting period that they engaged in a specific behavior.
- **Nonresponse Bias** – People may not respond to the survey questions about risk and protective factors for MVT injuries.
 - They may feel uncomfortable and skip the question.
 - Some respondents may have stopped participating in the survey before getting to that question.
 - They may choose not to participate in the survey at all.

Changes in MVT Injury Metrics Over Time

MVT injury case definitions have not changed much over the years.

If changes are made, they are also applied to historical data whenever possible.

- Changes are applied retroactively so that data can be counted the same way across multiple years of data.
 - This allows IVPB to accurately monitor trends.

- Because of this, data IVPB shared before a change was implemented can be different from data shared for the same time-period today.
 - Use the data resources posted to the [Motor Vehicle Traffic Injury Data](#) webpage to be sure you are accessing the most up-to-date information on MVT injuries in NC.
 - If you have questions about data you have received from IVPB previously, email us at InjuryData@dhhs.nc.gov.

ICD-10-CM Coding Transition

- The system used to code diagnoses and other information in ED visit, hospital discharge, and other outpatient data was updated in 2015.
- The codes used previously (ICD-9-CM codes) are not directly comparable to the new codes (ICD-10-CM codes).
- Since the data are not comparable, data from before 2016 are not usually shared.
- For more information on this transition and impacts to injury surveillance, visit [ICD-10-CM Coding Transition](#).

Unintentional MVT Injuries and COVID-19

There are many implications from the COVID-19 pandemic that began in 2020, including major changes to the numbers and rates of unintentional MVT injuries.

- Despite people driving less during the pandemic, severe injuries and deaths from MVT crashes increased.^{2,3}
 - MVT injury deaths and active travel deaths (deaths among pedestrians and bicyclists) were already gradually increasing in NC and continued to increase during the pandemic.
 - MVT injury deaths increased by 7% from 2017 to 2019 but then jumped by more than 19% from 2019 to 2021.
 - Deaths among pedestrians and bicyclists increased by 16% from 2017 to 2019, and by another 19% from 2019 to 2021.
 - MVT injury deaths and active travel deaths have decreased some since 2021 but remain higher in 2023 than they were before the pandemic started.
 - There was an 8% increase in the number of MVT injury hospitalizations from 2019 to 2023.
 - There was a large drop in the number of people going to the ED for any reason (ED utilization) starting in March 2020 when the COVID-19 stay at home order was implemented.
 - ED utilization slowly increased but remained lower than normal throughout most of 2020.
 - This drop in ED utilization also impacted the number of ED visits for MVT injury, which dropped by more than 22% from 2019 to 2020.
 - MVT injury ED visits increased during the pandemic but remain lower than before the pandemic started (2% decrease from 2019 to 2023).
- Increases in MVT injuries and deaths during this time were driven in part by risky behaviors, like impaired driving, speeding, and not wearing a seat belt.²⁻⁴
- Some groups were impacted more than others by the rise in MVT injuries and deaths during the pandemic.
 - For more information, see [The Impact of the COVID-19 Pandemic on Disparities in Motor Vehicle Traffic Deaths and Injuries among North Carolina American Indians](#).
- Changes to MVT injuries in NC align with trends seen across the United States during the pandemic.

Who is Most Affected by Motor Vehicle Traffic (MVT) Injury?

Who we count — and how — changes what we know about MVT injury.

The most reliable way to collect information on race and ethnicity is when it is self-reported, where individuals choose the race and ethnicity they use to describe themselves.

Asking someone to report their own race and ethnicity ensures the data are accurate.

- In some cases, race and ethnicity may not be self-reported and may instead be assigned based on someone's name or their appearance.
- This is most likely to happen if the person was unresponsive when EMS responded or when they arrived at the ED.
- This assumption can result in misclassification of race and ethnicity, when someone is categorized into a racial or ethnic group with which they do not identify with.

For more information on how race and ethnicity are collected in the data sources IVPB uses, and how IVPB groups race and ethnicity, visit [Using Injury Data by Race and Ethnicity](#).

Monitoring MVT Injuries by Demographic Groups

IVPB uses rates to compare the burden of MVT injury across groups, including by age group, sex, and race/ethnicity.

- This approach allows IVPB to identify groups that are experiencing the greatest burden of MVT injuries in NC.
 - IVPB regularly breaks out data to consider differences in MVT injuries by sex, age group, race/ethnicity, and county.
 - Rates account for the size of the population and allow us to compare injuries that happened in small populations to injuries in larger groups.
 - Comparing rates helps us understand differences in MVT injuries between groups.
 - For more information, visit [Understanding Counts and Rates](#).
- When data are broken out for specific groups, results may need to be suppressed if there are very few MVT injuries within a given group.
 - When the number of injuries or deaths is small, it becomes difficult to separate data further to understand more specifically who was impacted.
 - For more information, visit [Data Suppression and Working with Small Numbers](#).



FOR MORE RESOURCES:
Visit our [Injury Data Users Toolkit](#)

¹ Centers for Disease Control and Prevention. (n.d.). About Nonfatal Injury Data: Data definitions. WISQARS. Retrieved March 31, 2026, from <https://wisqars.cdc.gov/about/nonfatal-injury-data/#data-definitions>

² National Highway Traffic Safety Administration. 2020 Fatality Data Show Increased Traffic Fatalities During the Pandemic. News Release. Published June 3, 2021. <https://www.nhtsa.gov/press-releases/2020-fatality-data-show-increased-traffic-fatalities-during-pandemic>

³ Geary, S., Proescholdbell, S., Cox, M. E., & Bell, R. (2022). The impact of the COVID-19 pandemic on disparities in motor vehicle traffic deaths and injuries among North Carolina American Indians. North Carolina Medical Journal, 83(5), 361-365. <https://doi.org/10.18043/ncm.83.5.361>

⁴ National Highway Traffic Safety Administration Office of Behavioral Safety Research. Update to Special Reports on Traffic Safety During the COVID-19 Public Health Emergency: Third Quarter Data. Published January 2021. https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/traffic_safety_during_co-vid19_01062021_O.pdf

