Methodology, Statistics, and Traffic
17 Dec 2023

1. Introduction

I'm keen on developing a test, one that I call the Matrix Test. In this test, you would watch portions of the news (e.g., local, state, and national) about a given topic for a month. After that month, I would test your knowledge of that topic based on what was covered by the news. If you tested well, we would say that you learned it from the news. Afterward, I would compare your test results to the best statistics we have for that topic. If it compared well, we would say that you live in reality. If it differed significantly, we would say you live in the Matrix. What the Matrix means is that your perceptions, opinions, and knowledge about a topic are independent of its manifest reality.

A simple example of the Matrix test amounts to an ordinary civilian watching the news about the lottery. Of course, the news focuses on the winners and their life changing winnings. However, it is often easy to get confused about probability: the probability of someone winning versus the probability of a specific person (i.e., the viewer) winning. After a month of watching newscasts on lottery winners, we could take a test on whether the viewer understood what they had watched. If they pass, they could then take another test: Irrespective of whether the Powerball lottery would pay out to you, is there a *practical difference* in probability between buying the winning Powerball ticket versus finding a winning Powerball ticket on the street somewhere?

Ideally, a newscast should leave you better informed of *probable* reality. Sometimes it accomplishes its mission, sometimes it does not. When it does not, ordinary civilians like us are worse off. Can you imagine developing self-defense tactics when your knowledge about the threats you face isn't grounded in probable reality? This reason is why I started my book off with a chapter on Perceptions to showcase that our knowledge of violent crime, which for most ordinary civilians comes from the news, isn't based on probable reality. Hence, ordinary civilians are in the Matrix when it comes to violent crime.

An analysis of various ways in which information is censored and narratives established in the news media would take us too far afield. I would like to discuss something much more common and seemingly benign, which I discussed in my book. I called it the Engagement Bias. In short, for non-subscription-based news media, there is a considerable amount of pressure to get engagement. Engagement, at least from a social media perspective, is measured by likes, comments, shares, and pageviews for a given news item. In this way, it is similar to Nielsen ratings on television. These two metrics allow the news media to sell advertising space and earn money. The more engagement (or higher Nielsen ratings), the more money can be charged for advertising.

The pressure to increase engagement distorts the types of stories that are pursued as well as the content of these stories. This distortion is the Engagement Bias. For example, telling the truth about practical lottery probabilities is boring. In contrast, showing excited lottery winners and any drama they experience makes for good engagement. For violent crime, strangers, firearms, and murders are very commonly portrayed in the news media. This type of coverage is more engaging than friends or spouses having violent interactions. This constant exposure can easily

lead to the consumer of this news media to believe strangers, firearms, and murder are extremely common. In fact, it can lead them to pursue self-defense strategies that can lead to more harm than good. In short, it is tough to develop the appropriate self-defense strategies when you are living in the Matrix about violent crime.

In many cases, what the news media reports about traffic accidents is like violent crime. Fatal car crashes seem prevalent. Can the same methodology that I used on violent crime help prepare ordinary civilians to avoid traffic accidents and be safer on the road? Let's find out.

2. The Basics of Traffic Crashes[1]

A crash can be broken up into two types:

- A single motor vehicle crash or SVC.
- A multiple motor vehicle crash or MVC.
    - An MVC can involve exactly two motor vehicles.
    - An MVC can involve more than two motor vehicles.

The next question we should answer is: what is a motor vehicle? In what follows, a motor vehicle is a vehicle with a safety skeleton (e.g., a passenger car, truck, semi-truck, etc.) as well as a motorcycle. Obviously, if you are in a crash, it is safer to be restrained in a motor vehicle with a safety skeleton than on a motorcycle due to the protection the safety skeleton provides.

Going back to the single motor vehicle crash, or SVC, we can ask: what made it a crash? We'll, the motor vehicle with a safety skeleton, hereafter MVSS, or motorcycle could hit one of the following objects:

- A non-motorist, such as a pedestrian or pedalcyclist.
- A moving object, such as a live animal
- A fixed object, such as a guard rail or tree.
- A hazard in the road, such as a pothole.

There are also cases where there is no object struck in an SVC:

- Going too fast to navigate a curve or other road feature.
- Going off the shoulder and losing control

For all crash types, there may be critical conditions that were implicated in the crash. For instance:

- The driver was distracted by something, such as their phone.

[1] Rather than use the term "accidents," the National Highway Traffic Safety Administration (NHTSA) uses the term "crash." I will follow suit here.

- The driver was speeding too fast for the road or road conditions.
- The driver was under the influence of alcohol, illegal drugs, or prescription drugs.
- The light conditions were bad.
- The weather conditions were bad.
- There was a mechanical problem or safety issue with the motor vehicle.

The considerations in this section are not meant to be exhaustive, but just to get an idea of the various factors that must be considered for a crash.

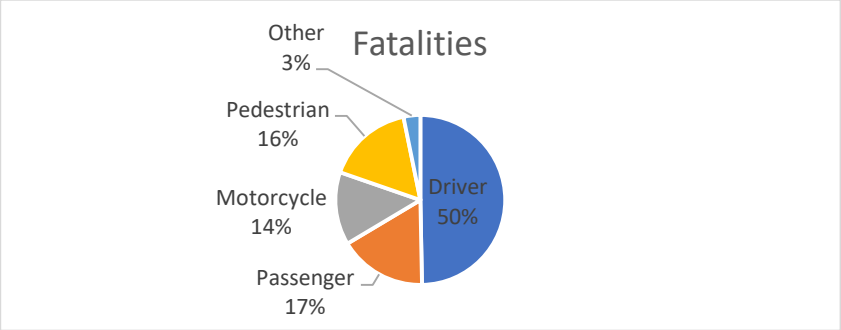
3. Overview Statistics and Methodology

I will be looking at the year 2015 up to and including the year 2019. How I obtained the statistics will be included in the Appendix so that you may reproduce this research as well as move forward with it. In this main text, I will focus on the following situations that I believe have the most relevance for ordinary civilians.

One of the things I want to focus on is vulnerabilities. When it comes to vehicle crashes, who is the most vulnerable and how does that relate to injuries and fatalities? Let's look at a prioritized list from *least vulnerable* to *most vulnerable* in a vehicle crash. This list represents a hypothesis and may be altered based upon the data we uncover.

- Motor Vehicle with a Safety Skeleton (MVSS) occupants who are restrained and not ejected.
- MVSS occupants who are not restrained but also not ejected.
- Motorcycles.
- Pedalcyclists.
- Pedestrians.
- MVSS occupants who are ejected.

From 2015-2019, there were 189,953 fatalities in car crashes. There were 169,252 fatal car crashes, meaning about 89% of fatal car crashes involved one fatality. Here is the breakdown of fatalities.



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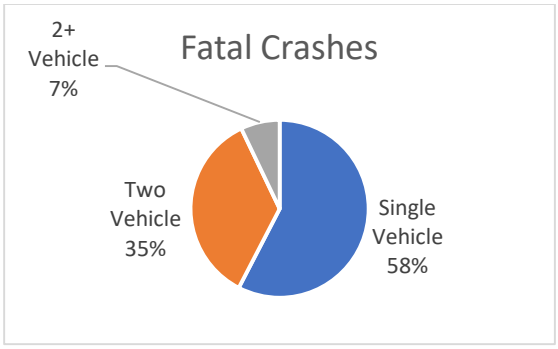
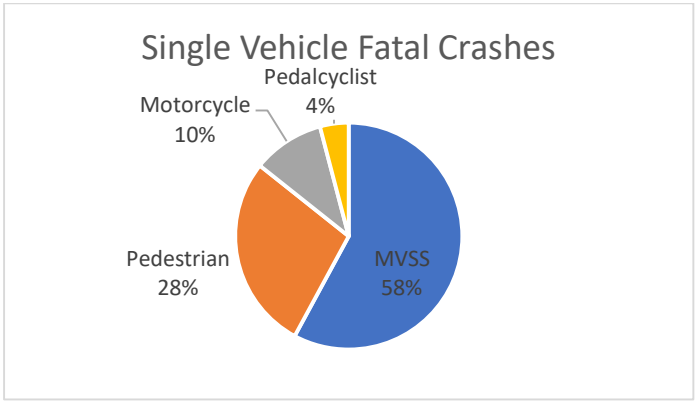
Around 89% of fatal car crashes involve only one fatality and we now know that drivers are impacted more than any other category. Of course, you can't have a fatal car crash without at least one driver, so this fact may simply reflect the data.

Now let's look at the breakdown of fatal crashes from the statistics.



Interestingly, SVCs are over 50 percent of the fatal crashes. Using our prioritized list of vulnerable vehicles and people, let's cover each of these fatal crash types to determine who was involved.



We know that single vehicle crashes are the most common crash type at over 50 percent. For single vehicle fatal crashes, there are two subtypes of crashes. The first subtype would be a motor vehicle (an MVSS or motorcycle) crashing but the crash did not involve a pedestrian or pedalcyclist. For example, a motor vehicle goes too fast on a curve and loses control. A couple of key factors determining whether a fatality occurs in an MVSS are whether the vehicle driver and any passengers are restrained and not ejected. For a motorcycle, whether the driver was wearing a helmet would be a similar factor. The second subtype would be a motor vehicle hitting a pedestrian or pedalcyclist. In this case, the speed of the motor vehicle is likely the determining factor on whether the pedestrian or pedalcyclist is killed.

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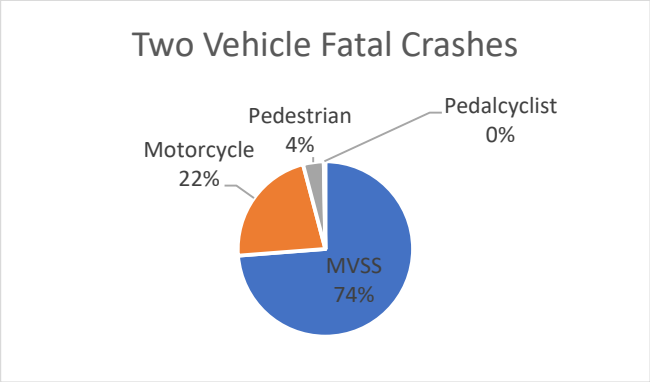

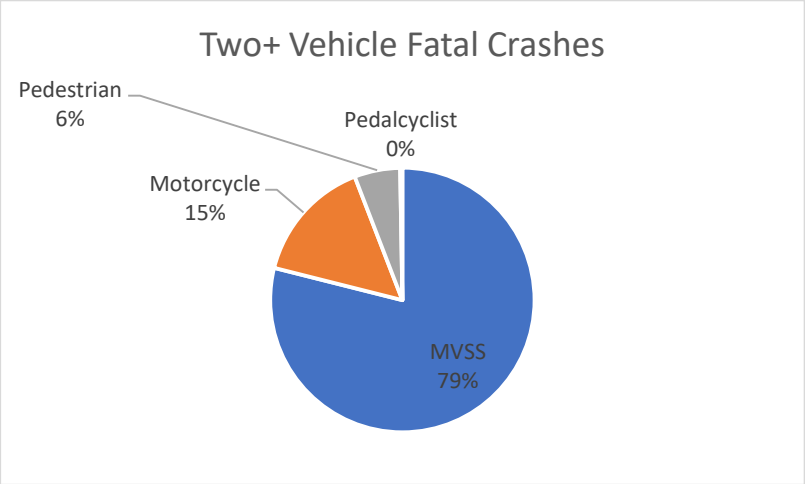

For the most part, two and two+ vehicle fatal crashes are very similar. We know that two motor vehicle crashes are much more common than two+ motor vehicle crashes, but because they are similar in terms of fatalities, I'll just combine them. There are primarily two subtypes here: First, an MVSS hitting another MVSS. In this subtype, besides restraint use and not being ejected, speed and the collision type, such as a head-on collision, become critical. Second, an MVSS hitting a motorcycle. In this subtype, speed is probably the critical factor since the motorcycle is at a tremendous disadvantage when hit by an MVSS.

Let's take a look at crashes that resulted in injuries. Note that injuries are in the millions (9,530,274) and that they are *estimated*. Hence, the data is not as reliable as fatalities. However, a general comparison looking at major percentage differences should be useful.

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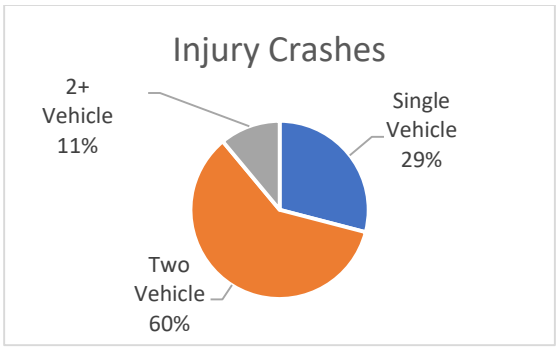

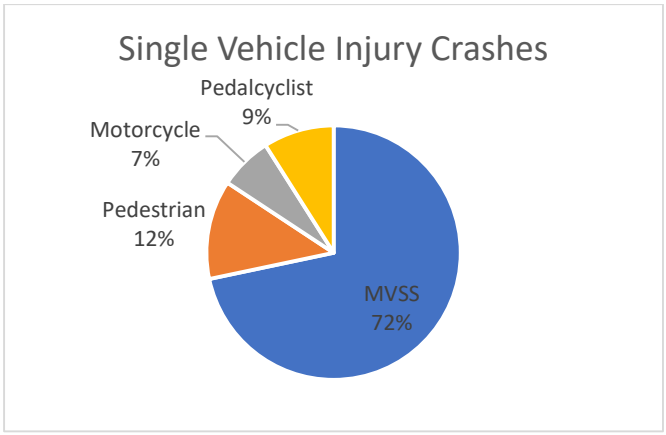

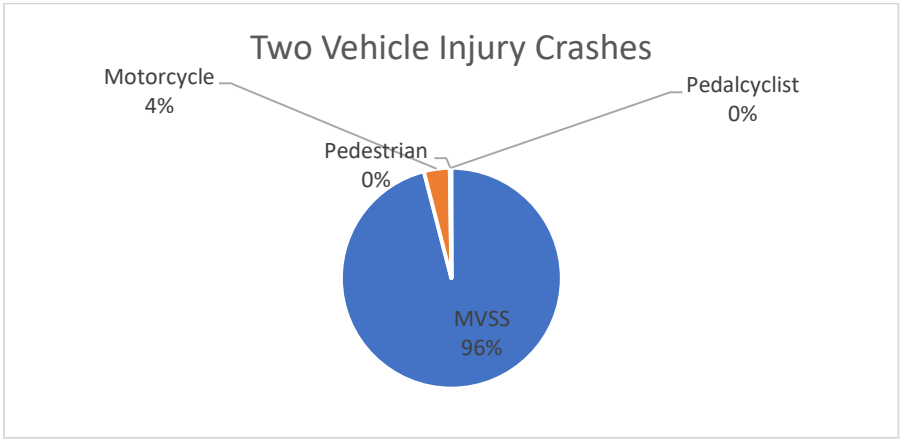

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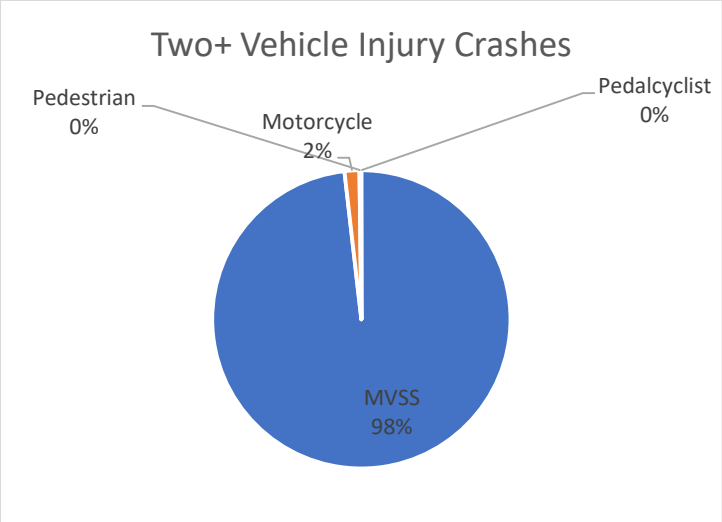

What the estimated injury-only statistics show is a big swap between single-vehicle crashes and two-or-more vehicle crashes. 71% were two-or-more-vehicle injuries compared to 42% with fatalities. Single-vehicle crashes were at 29% compared to 57% with fatalities, but further note that about 72% of the 29% did not involve a motorcycle, pedestrian, or pedalcyclists. This percentage is more than the 58% recorded for fatalities. We can understand why injury statistics behave this way because these three groups are the most vulnerable when hit by an MVSS.

In essence, injury-only crashes are more likely to involve 2 or 2+ motor vehicles that have a safety skeleton (e.g., passenger vehicles). Fatalities are more likely to occur in single vehicle accidents where a motor vehicle hits a more vulnerable object, such as a pedestrian or pedalcyclist. Remember, motorcycles are considered motor vehicles, so multi-vehicle accidents are much more fatal for motorcyclists due to their lack of a safety skeleton.

Based upon this overview, we can begin to see how we might use these high-level statistics to determine the groups to study.

- **Study Group MVSS**: MVSS stands for Motor Vehicle Safety Skeleton. This group only includes motor vehicles like ordinary passenger cars, light trucks, and the like. It does NOT include motorcycles, pedestrians, and pedalcyclists.
- **Study Group MVMC**: MVMC stands for the drivers of motorcycles. This group only includes motorcycles.
- **Study Group PD**: PD stands for pedestrians. This group only includes pedestrians.
- **Study Group PC**: PC stands for pedalcyclists. This group only includes pedalcyclists.

There are a couple of different circumstances I'll investigate for these groups:

- Circumstance-1: Single Vehicle Crash or SVC
- Circumstance-2: Two (TVC) or Two+ Vehicle Crashes (MVC). I will be combining these and use all vehicle-to-vehicle crashes or AVVC

For PD and PC, I will only investigate single vehicle crashes.

4. Study Group MVSS-SVC

   For motor vehicles with a safety skeleton in a single-vehicle crash, there are a couple of troubling statistics.
   - Around 50% of our SVC fatalities don't have any special circumstances (e.g., weather, light conditions, etc.) to explain them except for driver inattention.
   - Around 50% of our SVC fatalities involve speeding or being legally drunk (or both).
   - Fatalities have more speeding, less restraint use, and more ejections compared to injuries.

   In sum, for MVSS-SVC, bad driver decisions account for 50% while driver inattention seems to be the other 50%. In other words, this category could be almost eliminated with better driver decisions and focus.

5. Study Group MVSS-AVVC

   - Most of our crashes don't have any special circumstances (e.g., weather, light conditions, etc.) to explain them.
   - Fatalities have many head-on collisions while injury-only crashes have many rear-end collisions.
   - Speed, restraint-use, and ejection are factors that differ between fatal crashes and injury-only crashes.

6. Study Group MVMC-SVC

   Similar to MVSS-SVC. Helmet use is comparable to restraint use, speeding is comparable, and alcohol is comparable.

7. Study Group MVMC-AVVC

   When an MVSS hits a motorcycle, the biggest circumstance seems to be the MVSS is turning left.

8. Study Group PD-SVC

   - Most pedestrians are not killed on a sidewalk or in a crosswalk. Most are killed at night. Some are making the wrong decisions, possibly due to alcohol consumption.
   - The most common cause was the pedestrian failed to yield to motorist at 34%.

9. Study Group PC-SVC

   - Most pedalcyclists are killed when being overtaken by a motor vehicle that did not see them in time (likely due to road contours, curves and the like). These

pedalcyclists are in the travel lane, not bicycle lanes (likely because the road did not have them). U.S. Highways, State Highways and Country Roads make up about 52% of the total.
- There is almost a 50/50 daylight/nighttime split, with dawn/dusk accounting for 5%.
- Around 22% of the fatalities involved the bicyclists failing to yield.

10. Uncomfortable Truths

- 48% of all fatalities can be prevented as they are single-vehicle accidents that do not involve a pedestrian or pedalcyclist. These are simply drivers failing to be good drivers due to what appears to be inattention, speeding, alcohol, lack of restraint use, or some combination of all four.
- 46% of fatalities when an MVSS hits an MVSS are head-ons and rear-ends. These appear to be due to inattention, speeding, or alcohol
- Restraint use isn't a magic shield when an MVSS hits another MVSS. For drivers and passengers killed, restraint use is around 60%.
- Your best chance of staying alive as a pedestrian is to always use sidewalks, crosswalks, walk during the day, follow the rules of the road, and don't be drunk.
- Your best chance of staying alive as a pedalcyclist is to use bike lanes or bike paths, bike during the day, and follow the rules of the road as if you were in a motor vehicle. If you must use a travel lane that does not have a bike lane, only use them on straight roads with reflective clothing and lights.

11. Reflections and More Uncomfortable Truths

In what follows, I'll reflect further on these problems. Part of this reflection comes from experience and part of it comes from the data. I have over a million miles of driving in both urban and rural environments; importantly, even after all this travel, I've never been in an accident or been ticketed for a moving violation. I've driven heavy farm equipment all the way down to a dorky electric car, from congested commuting environments to rural roads, from straight desert roads to curvy mountain roads. I've been first on the scene to several accidents. I personally knew and talked with people who later were permanently injured in vehicle crashes and one person that was later killed. I've also known a lot of people that were involved in crashes, but not injured or not injured permanently.

This experience combined with the data leads to more uncomfortable truths:

- Vehicle safety features do not create better drivers. I'm old enough to remember when seat belt laws didn't exist. As I grew up on a farm and we were in and out of our work trucks hundreds of times a day, we didn't wear seatbelts. If you were out on the town with a friend and they said "time to buckle up," it was a "hold my beer moment." They were getting ready to do something stupid driving the vehicle. Incidentally, in these times, if you jumped in as a passenger and the driver was wearing their seatbelt, you needed to be smart and put yours on too. If he didn't trust his driving, neither should you. Now, given how seatbelt laws are enforced, there really is no contrast between what it is like not to wear a seatbelt. My point

isn't that seatbelts are bad. My point is that back in the day, seatbelts were deliberately put on when violations of the road were going to occur. Today, you can't tell if someone is a good driver or a bad driver by whether they are wearing their seatbelt. This "safety" feature is now ubiquitous. Do people drive better because of the seatbelt, or do they feel slightly invulnerable and become worse drivers (like back in the old days)? Is someone who learned to back up with a camera a better driver than someone who did not? Is someone whose car tells them they are crossing a lane a better driver than someone who pays attention and doesn't drift? Is someone who gets used to their car's autonomous driving feature going to be okay when they change vehicles to a vehicle that doesn't have that feature?

- Learning on a manual transmission makes you a better driver. The key to manual transmissions is that you understand RPM, speed, and gear-ratio. You will understand the difference between going around a curve in 4th at a low RPM and going around a curve in 3rd at a high RPM. You understand the uphill and downhill considerations of pulling a heavy trailer. The key is that you understand your driving environment better. You are in tune with it. You are immersed in it. It becomes who you are when you are on the road.
- Visibility in modern vehicles is poor. On the farm, I drove around in a 1972 Dodge truck and a 1969 Ford truck. Visibility was great. Today, none of my vehicles have good cab visibility, certainly nothing compared to those trucks. I'm assuming that federal standards to protect occupants in rollover crashes contributed to the strength of the cab. This strength has dramatically reduced visibility. My hypothesis is that this reduced visibility is directly related to MVSS angle crashes on motorcycles (often fatal) and SVCs involving pedestrians and pedalcyclists.
- The belief that speed will save you time in urban environments. These folks will pass you at 55 mph in a 35 mph zone with the sun in their eyes just to get to the next stoplight. You know that they have 30 minutes worth of congestion commuting to go through, but by damn, they are going to be first to get to that congestion. After they dangerously pass you, you'll often see them one or two stoplights ahead of you.
- Not being immersed in your road environment kills. I've called this inattention. It is better referred to as a lack-of-immersion. Today's new vehicle cab is better equipped than most home theaters. Combine that with your smart phone, it is a wonder that more people aren't dead.

12. What the Future Holds

Autonomous rideshares and vehicles. You'll see roads change to accommodate them and be a pain to regular drivers.

Unheard of when I was growing up, many people today don't get driver's licenses until well into their twenties. I know a couple of people that are over 40 and never had one. These people rely on their family to take them places or they bike or walk. Expect that rideshares and taxis will be replaced by automated vehicles as the first step, with some of these being publicly funded, like buses.

13. What the Future Should Hold

Creating better drivers. In America, the driving tests are kind of a joke. You study at 16 for the test. Eventually pass it, and then never look at it again. There are a variety of private driving instruction companies that allow someone with their permit to gain experience on the road so that they can pass a driving test, should that be required. However, they are focused on passing any government test.

It has been almost 40 years since I had my first driving test. I had to take a couple more since I bounced around a couple of states in my working career. However, the routine was the same: study a manual, pass the test, never look at it again. The sad fact is that in America, most people are simply not qualified to drive a multi-ton vehicle at any speed.

There is a technology that could do much better – simulation. Firearm simulators are beginning to transform self-defense training. That said, quality personal firearms training is the best, but once you have received some, you can re-enforce those good habits with simulator training using recoil-enabled firearms and infrared lasers. In fact, they are becoming affordable for the home.

Vehicle simulators can provide a similar function with many 3rd parties providing simulation cars and programs. Nothing beats getting great personalized instruction in an actual vehicle, but what I like about simulations is the ability to show common dangerous situations and their proper handling. In short, you can gain experience without endangering anyone, including yourself. Such experience includes things like the difference between being safe and being legal.

Fully embracing a simulated test for a license and having it renewed yearly is the best way forward to creating better drivers. These tests should be hard. Hard in-person simulation tests are a key component in creating qualified drivers on the road.

14. What are the Characteristics of a Good Driver?

Besides experience, there are several qualities in a good driver:

- Patience
- Not being in a hurry
- Immersion in driving
- Anticipation
- Mirror Awareness

Patience is about being legal and safe rather than just about being legal. These situations come up all the time in driving. For instance, it is extremely rare for me to cross several lanes of traffic to make a left-hand turn coming out of a business exist. I will often make three right hand turns until I find a street with a light and then make another right, then a left. While it is legal to make a left across lanes of traffic, it isn't as safe. If you are a patient driver, you choose to be safe and legal rather than just legal.

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Being in a hurry contributes to impatience. It also contributes to the rather silly belief that you can make up substantial time in an urban environment filled with traffic lights and congestion. My stance is that on some days you may make up some time, but this time is insignificant. It is far better to start early in the day and spend several minutes in your work parking lot waiting for the door to open. Take a book or some work you can do in the cab of your car. Having plenty of time to get to your destination will drastically reduce your chances of being in a crash or causing one.

Thirdly, immersion. When I drive, every vehicle on the road is a conscious risk-management decision. Are they driving too fast, are they loaded, are they distracted, and so on. Do I want this vehicle ahead of me or behind me? To drive this way, in-cab distractions must be reduced. Phones, navigation, radio, and all of that need to be off or severely limited. Driving this way is mentally fatiguing rather than physically fatiguing. Nowadays, I can only travel about 6 hours before I'm mentally exhausted.

Fourthly is anticipation. Being patient and immersed in the road allows you the ability to anticipate other drivers and take precautionary measures. You never want to assume something is going to happen and place yourself in more danger if it doesn't. However, you do want to take actions that make you safer overall based upon what other drivers are doing. For instance, when I see brake lights, it means that cars are slowing down or stopping. Besides slowing and stopping, I also think "impatient drivers." This means that I expect dumb decisions to happen. Have you ever been stopped at a stoplight and one lane is backed up and the other is free? Then a car going really fast comes up to the stoplight and chooses the free lane at the same time a stopped car decides it will be a good opportunity to change lanes? I've seen that particular crash many many times. Another example: you and several vehicles have been delayed by road construction. The flagman finally lets a group of cars get past the road construction. At this point, I simply get into the slow lane because I'm anticipating impatient drivers who will do anything to make up irrelevant time, such as excessive speeding or dangerous lane changes. I'm never disappointed. Last example: you are traveling with several cars on an undivided highway. On the opposite side, a car is attempting to take a left. You look in your rearview mirror and see that there are no cars behind you. A naïve driver would assume that the guy turning left will wait until you go by and then turn. However, you can see that there will be a short break in the traffic in front of you and anticipate that this impatient driver will attempt to make their left in front of you. If the guy making the left would simply wait until you go by and then turn, it would be at an incredibly safer time. However, you are not naïve and you are anticipating, so you are prepared when the car turns right in front of you.

Lastly is what I call Mirror Awareness. The ability to understand how your driving is interpreted by other drivers. While you can't control bad drivers, you can make your intentions known to good drivers. Using your blinker, slowing down using your brakes rather than just the accelerator, and many other techniques let other drivers know what you are doing.

Appendix

To do a deep dive into these statistics, we want to go to the NHTSA's query tool called FIRST (Fatality and Injury Reporting System Tool). FIRST is a very powerful query tool and I used it to get the general statistics presented previously. There are several different FIRST report types. Depending on the report used, different totals would be realized. For instance, there are more vehicles involved in fatal crashes than there are fatal crashes, simply because two and two+ vehicle crashes exist. I'll place the totals in parentheses by the report type.

2015-2019

- Crashes
  - Fatal Motor Vehicle Crashes. SVC 57% (97,184). TVC 35% (59,826). MVC 7% (12,242). Total (169,252)
  - Estimated Injury Only Motor Vehicle Crashes. SVC 29% (2,773,399). TVC 60% (5,706,543). MVC 11% (1,050,332). Total (9,530,274)
- Vehicles
  - Vehicles Involved in Fatal Crashes. SVC 37% (97,184). TVC 46% (119,652). MVC 16% (42,393). Total (259,229)
  - Estimated Vehicles Involved in Injury Only Motor Vehicle Crashes. SVC 16% (2,773,399). TVC 65% (11,413,086) MVC 19% (3,415,869). Total (3,415,869)
- People
  - Persons Involved in Fatal Crashes. SVC 42% (176,689). TVC 43% (179,439). MVC 15% (64,993). Total (421,121)
  - Persons Killed in Fatal Crashes. SVC 55% (101,840). TVC 37% (67,525). MVC 8% (14,488). Total (183,953)
  - Persons Injured in Fatal Crashes. SVC 25% (31,632). TVC 55% (69,181). MVC 20% (25,477). Total (126,290)
  - All Persons Injured in Motor Vehicle Crashes. SVC 24% (3,201,286). TVC 62% (8,436,445). MVC 14% (1,948,110). Total (13,585,841)
- Drivers
  - Drivers Involved in Fatal Crashes. SVC 38% (96,785). TVC 46% (118,803). MVC 16% (41,933). Total (257,521).
  - Drives Killed in Fatal Crashes. SVC 47% (54,839). TVC 44% (50,627). MVC 9% (10,148). Total (115,614).
  - Drivers Injured in Fatal Crashes. SVC 17% (10,900). TVC 60% (38,717). MVC 23% (15,154). Total (64,771)
  - All Drivers Injured in Motor Vehicle Crashes. SVC 21% (2,002,921). TVC 64% (6,030,356). MVC 15% (1,410,553). Total (9,443,830)
- Occupants
  - Occupants Involved in Fatal Crashes. SVC 37% (141,144). TVC 46% (176,189). MVC 17% (63,949). Total (381,282).
  - Occupants Killed in Fatal Crashes. SVC 47% (69,385). TVC 44% (65,067). MVC 9% (13,750). Total (148,202)

  - All Occupants Injured in Fatal Motor Vehicle Crashes. SVC 24% (29,334). TVC 56% (68,663). MVC 20% (25,241). Total (123,238).
  - All Occupants Injured in Motor Vehicle Crashes. SVC 20% (2,521,466). TVC 65% (8,420,600). MVC 15% (1,944,824). Total (12,886,891)
- Pedestrians
  - Pedestrians Involved in Fatal Crashes. SVC 89% (28,721). TVC 8% (2,736). MVC 3% (902). Total (32,359)
  - Pedestrians Killed in Fatal Crashes. SVC. 90% (27,266). TVC 8% (2,331). MVC 2% (698).
  - All Pedestrians Injured in Fatal Crashes. SVC 71% (1,404). TVC 20% (390). MVC 10% (191). Total (1,985)
  - All Pedestrians Injured in Motor Vehicle Crashes. SVC 97% (363,620). TVC 3% (10,369). MVC 1% (2,599). Total (376,589)
- Pedalcyclists
  - Pedalcyclists Involved in Fatal Crashes. SVC 95% (4,162). TVC 4% (183). MVC 1% (34). Total (4,379)
  - Pedalcyclists Killed in Fatal Crashes. SVC 95% (4,022). TVC 4% (167). MVC 1% (29). Total (4,218).
  - Pedal Cyclists Injured in Fatal Crashes. SVC 87% (130). TVC 9% (14). MVC 3% (5). Total (149).
  - All Pedalcyclists Injured in Motor Vehicle Crashes. SVC 99% (252,850). TVC 1% (1,409). MVC 0% (166). Total (254,426).

We will examine the statistics for these groups to determine the circumstances of fatal crashes and injury-only crashes. We want to look at these circumstances so we can develop strategies to avoid them or mitigate them in some way. There are three key events that we will investigate.

- First Harmful Event (FHE)
- Most Harmful Event (MHE)
- Pre-Crash Critical Event (PCE)

Let's explain these events from the manual provided by the NHTSA.

> **First Harmful Event** - The First Event During A Crash That Caused Injury Or Property Damage.

There are 4 main FHE types:

- Collision with Fixed Object
- Collision with Motor Vehicle In-Transport
- Collision with Object Not Fixed
- Non-Collision.

The second event is the Most Harmful Event.

> **Most Harmful Event** - The Event During A Crash For A Particular Vehicle That Is Judged To Have Produced The Greatest Personal Injury Or Property Damage.

Here is an example where FHE and MHE intuitively map to a crash: A motorcycle is unable to negotiate a curve and the motorcycle begins to slide on the pavement. The motorcycle slides directly into oncoming traffic and hits a passenger car.

In this case, the crash will be classified as a two-vehicle crash (remember, motorcycles are considered motor vehicles). The FHE will be on the motorcycle for failing to negotiate a curve. The MHE would be when the motorcycle hits the passenger car. This seems straightforward.

Here is a more complicated case: On a two-lane undivided road, a passenger car attempts to pass another passenger car. The passing passenger car did not see an oncoming motorcycle, going in the opposite direction, and hit the motorcycle, killing the motorcyclist.
Here, the FHE and MHE would be a motor vehicle collision, but that is not the root cause of the crash. To get at the root cause, we have to look at another event.

> **Pre-Crash Critical Event (since 2010)** - "[…] the critical event that made the crash imminent (i.e., something occurred that made the collision possible). A CRITICAL PRECRASH EVENT is coded for each vehicle and identifies the circumstances leading to this vehicle's first impact in the crash."

In this situation, we would have:

> Passenger Car: Over the Lane Line on Left Side of Travel Lane
> Motorcycle: From Opposite Direction Over Left Lane Line

The Pre-Crash Critical Event seems perfect for us. There is only one problem – this event only exists for fatalities. It is not recorded for injury-only crashes. For injury-only crashes, only the FHE and MHE are recorded. Therefore, we will need to use all three measures to get the best picture of circumstances.

For pedestrians and pedalcyclists, there is another manual to review.

Study Group MVSS-SVC – Using FIRST Vehicle Report Type

FIRST Settings

Report Type: Vehicles

Vehicles Involved in Fatal Injury

Time Frame: 2015-2019

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State: All States

Filter Your Selection

Crash Type: Single Vehicle Crash

Involving Motorcycles: No

Involving Pedalcyclists: No

Involving Pedestrians: No

Build Your Report

Row: Crash Year

Row Percentage Selected

Column: Pre-Crash Critical Event (Since 2010)

Fatal Report: Pre-Crash Critical Event (56,172)

- Off the edge of the road right side: 35% (19,667)
- Off the edge of the road left side: 25% (13,966)
- Traveling too fast for conditions: 15% (8,285)
- Unknown cause of control loss: 5% (2,933)
- Other critical precrash event (specify): 3% (1,513)
- Over the lane line on left side of travel lane: 2% (1,331)
- Other cause of control loss (specify): 2% (1,252)
- Over the lane line on the right side of travel lane: 2% (1,152)

These represent about 89% of the total, with the first three events being 75% of the total. Let's look at the definitions for the first three.

Off the edge of the road right side - identifies a situation where the initial precrash event occurred beyond the right-side shoulder area

Off the edge of the road left side - identifies a situation where the initial precrash event occurred beyond the left side shoulder area. This also includes departure into a median

Traveling too fast for conditions - identifies this vehicle's movement and speed were not appropriate relative to its surroundings in which the subsequent loss of control led to the collision. This attribute applies when the loss of control is due to a vehicle traveling at a speed that was unsafe for the road configuration or conditions and has no bearing on the SPEED LIMIT. The officer does not necessarily have to indicate that speed was a factor in the crash, and therefore this attribute is independent of SPEEDING RELATED.

Unfortunately, we cannot use "Pre-Crash Critical Event (Since 2010)" for injuries. We must use First Harmful Event and Most Harmful Event. In order to compare injuries with fatalities, let's get the fatalities for these two values first.

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FIRST Settings

Build Your Report

Column: First Harmful Event

Fatality Report FHE (56,172)

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Vehicles Involved in Fatal Crashes
Filter Selected: Crash Type: *Single-Vehicle Crash*; Involving A Motorcycle: *No*; Involving A Pedestrian: *No*; Involving A Pedalcyclist: *No*
Years: *2015-2019*

- Tree (Standing Only): 20% (11,363)
- Rollover/Overturn: 17% (9,780)
- Embankment: 7% (3,937)
- Ditch: 7% (3,875)
- Curb: 6% (3,282)
- Utility Pole/Light Support: 5% (2,969)
- Guardrail Face: 4% (2,332)
- Culvert: 3% (1,925)
- Fence: 3% (1,844)
- Traffic Sign Support (since 2010): 3% (1,714)
- Parked Vehicle: 2% (1,252)
- Post, Pole or Other Supports: 2% (1,103)
- Mail Box: 2% (1,054)
- Other Fixed Object: 2% (1,024)
- Concrete Traffic Barrier: 2% (980)

These are about 85% of the total with various other fixed objects each contributing 1%.

Now, let's look at the most harmful event. This is the event that "[…] resulted in the most severe injury or, if no injury, the greatest property damage involving this motor vehicle." Given our other settings, this will likely identify the root cause of the fatality.

FIRST Settings

Build Your Report

Column: Most Harmful Event

Fatal Report MHE (56,172)

- Rollover/Overturn: 37% (20,759)
- Tree (standing only): 27% (15,424)
- Utility Pole/Light Support: 6% (3,387)

These make up about 70% of the total, with the other categories very similar to the first harmful event. Let's compare to injuries.

Injury-Only Report FHE (1,985,376)

- Parked Motor Vehicle: 12% (248,084)
- Tree (Standing Only): 12% (228,488)
- Ditch: 10% (201,112)
- Utility Pole/Light Support: 9% (176,503)
- Curb: 5% (104,686)
- Embankment: 5% (105,846)
- Guardrail Face: 5% (103,656)
- Live Animal: 5% (93,599)
- Concrete Traffic Barrier: 4% (78,939)
- Fence: 3% (59,773)

These represent about 70% of the total with the rest in line with fatalities.

Injury-Only Report MHE (1,985,376)

- Rollover/Overturn: 20% (403,005)
- Tree (Standing Only): 14% (281,777)
- Parked Motor Vehicle: 13% (250,933)
- Utility Pole/Light Support: 10% (194,134)
- Ditch: 6% (111,724)
- Guardrail Face: 4% (86,481)
- Concrete Traffic Barrier: 4% (75,820)

These make up about 70% of the total, with the other categories very similar to fatalities. The big difference is the "Parked Motor Vehicle."

Given that rollovers/overturn and hitting a fixed object account for most of these events, we should check what the road conditions are.

FIRST Settings

Build Your Report

Column: Road Surface Conditions (Since 2010)

Fatal Report Road Conditions (56,172)

- Dry: 81% (45,385)
- Wet: 14% (7,697)

Most of these fatalities happened with dry road conditions. Unfortunately, this query is not available for injuries.

There were three most harmful events that accounted for 70% of the total. Let's see if speeding is a factor in those events.

FIRST Settings

Build Your Report

Row: Most Harmful Event

Column: Speeding

Column Percentage checked.

Fatal Report MHE / Speeding (56,172)

- Rollover/Overturn: 37% (20,759). Speeding Yes: 38% (7,979) / No: 62% (12,780)
- Tree (Standing Only): 27% (15,424). Speeding: Yes 41% (6,292) / No: 59% (9,132)
- Utility Pole/Light Support: 6% (3,387). Speeding: Yes 43% (1,454) / No: 57% (1,933)

For our top three most harmful events with single vehicle crashes, we can see speeding is a definite factor at around 40% of the time. Let's check injuries.

Injury-Only Report MHE / Speeding (1,985,376)

- Rollover/Overturn: 20% (403,005). Speeding Yes: 29% (116,863)/No: 71% (286,142)
- Tree (Standing Only): 14% (281,777). Speeding Yes: 24% (68,801)/No: 76% (212,976)
- Parked Motor Vehicle: 13% (250,933). Speeding Yes: 10% (25,354)/No: 90% (225,588)
- Utility Pole/Light Support: 10% (194,134) Speeding Yes: 19% (36,492)/No: 81% (157,642)
- Ditch: 6% (111,724). Speeding Yes: 22% (24,844)/No: 78% (86,880)
- Guardrail Face: 4% (86,481). Speeding Yes: 27% (23,357)/No: 73% (63,125)
- Concrete Traffic Barrier: 4% (75,820). Speeding: Yes (27% (20,787)/No: 73% (55,033)

Speeding is not as common in injury-only crashes. Let's check the weather.

FIRST Settings

Build Your Report

Row: Crash Date (Year)

Column: Atmospheric Conditions

Column Percentage Unchecked.

Fatal Report Atmospheric Conditions (56,172)

- No Adverse Atmospheric Conditions: 66% (37,163)
- Cloudy: 16% (8,868)
- Rain: 8% (4,632)

There is a category of "Fog, Smog, and Smoke," I don't feel "Cloudy" is an adverse condition. Here is the definition: "usually refers to "overcast" but may include partial cloudiness if light is diminished." In short, 82% represents no adverse conditions on my reading since I don't consider "overcast" to be adverse.

Injury-Only Report

- No Adverse Atmospheric Conditions: 66% (1,314,971)
- Cloudy: 16% (313,270)
- Rain: 13% (249,672)

Injuries are very similar to fatalities, with a bit of an increase in rainy conditions.

FIRST Settings

Build Your Report

Column: Light Conditions

Fatal Report Light Conditions (56,172)

- Daylight: 44% (24,524)
- Dark – Not Lighted: 35% (19,769)
- Dark – Lighted: 15% (8,533)

These three represent 94% of the total. We should investigate Dark – Not Lighted more. We can create a report that uses the Light Condition as the row and Rural/Urban as the columns. By doing so, we can see that 73% of Dark – Not Lighted is in rural environments (i.e., of the 35% that represent Dark – not lighted, 73% of that is in rural environments). When driving at night in rural environments, drivers expect that roads will not be lighted. This should not be a surprise.

Injury-Only Report

- Daylight: 52% (1,031,577)
- Dark – Not Lighted: 24% (481,661)
- Dark – Lighted: 19% (371,895)

Injuries differ from fatalities with more crashes happening in the daylight hours and at nighttime in urban environments.

Study SubGroup MVSS:DRV:SVC

FIRST allows for more detailed filtering if the main report is for drivers.

Fatal Crashes Driver Ejection

- Not Ejected: 66% (29,935)
- Ejected: 33% (14,981)
- Unknown: 1% (300)
- Total: 45,216

Drivers Injured in Fatal Crashes: Ejection

- Not Ejected: 88% (7,188)
- Ejected: 11% (910)
- Unknown: 1% (90)

Drivers Injured in Injury-Only Crashes: Ejection

- Not Ejected: 99% (1,766,379)
- Ejected: 1% (24,129)

Fatal Crashes Driver Restraint Use

- Unrestrained: 57% (25,552)
- Restrained: 35% (15,676)
- Unknown: 9% (3,988)
- Total: 45,216

Drivers Injured in Fatal Crashes: Restraint Use

- Restrained: 59% (4,850)
- Unrestrained: 32% (2,648)
- Unknown: 8% (690)

Drivers Injured in Injury-Only Crashes Restraint Use

- Restrained: 72% (1,292,009)
- Unrestrained: 10% (177,512)
- Unknown:18% (320,987)

Fatal Crashes Driver Alcohol

- Positive BAC: 38% (16,988)
- No Alcohol: 35% (15,920)
- Not Tested: 20% (9,122)
- Unknown if Tested: 5% (2,161)
- Tested, Unknown Results: 2% (1,025)
- Total: 45,216

Study SubGroup MVSS:PG:SVC

This is another report type in FIRST. However, it includes drivers. So we will use seating positions to filter out the drivers. The total occupant fatalities in this section are 59,126. The seating positions where most occupant fatalities were reported are:

- Driver – Front Seat, Left Side: 76% (45,219)
- Front Seat, Right Side: 14% (8,241)
- Second Seat, Right Side: 3% (1,691)
- Second Seat, Left Side: 2% (1,434)
- Unknown: 1% (721)
- Second Seat, Middle: 1% (530)

Combined with the driver, these make up 97% of the occupant fatalities. The remaining queries will eliminate the driver from consideration. The total number of occupants who are not drivers is 13,907.

Fatal Crash Passenger Killed Ejection

- Not Ejected: 61% (8,420)

- Ejected: 38% (5,336)
- Unknown: 1% (151)

Fatal Crash Passenger Injured Ejection (17,281)

- Not Ejected: 80% (13,909)
- Ejected: 17% (2,990)
- Unknown: 2% (382)

Injury-Only Crash Passenger Ejection (495,520)

- Not Ejected: 98% (484,270)
- Ejected: 2% (11,251)

Fatal Crash Passenger Killed Restraint Use

- Unrestrained: 59% (8,184)
- Restrained: 30% (4,191)
- Unknown: 11% (1,532)

Fatal Crash Passenger Injured Restraint Use

- Restrained: 47% (8,038)
- Unrestrained: 44% (7,606)
- Unknown: 9% (1,637)

Injury-Only Crash Passenger Restraint Use

- Restrained: 71% (352,144)
- Unrestrained: 17% (83,864)
- Unknown: 12% (59,513)

Study Group MVSS – Two and Two+ Vehicle Crash

This study group is motor vehicles with a safety skeleton where the crash type was two or two+ vehicles. Let's review our statistics.

Fatal Crashes

- 35% were two-vehicle crashes (59,826).
    - 73.7% did not involve a motorcycle, pedestrian, or pedalcyclist (44,089)
    - 22.1% involved a motorcycle (13,216)
    - ~~3.8% involved a pedestrian (2,294)~~
    - ~~0.3% involved a pedalcyclist (164)~~
    - Subtotal: 59,763*
- 7% were more than two vehicle crashes (12,242).
    - 78.8% did not involve a motorcycle, pedestrian, or pedalcyclist (9,646)
    - 15.2% involved a motorcycle (1,863).
    - ~~5.6% involved a pedestrian (688)~~
    - ~~0.245% involved a peda]lcyclist (30)~~
    - Subtotal: 12,277*

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Injury-Only Crashes

- 60% were two-vehicle crashes (5,706,543).
    - 96% did not involve a motorcycle, pedestrian, or pedalcyclist (5,481,513)
    - 3.75% involved a motorcycle (213,930).
    - ~~0.167% involved a pedestrian (9,521)~~
    - ~~0% involved a pedalcyclist (1,368)~~
    - Subtotal: 5,706,332*
- 11% were more than two vehicle crashes (1,050,332).
    - 98.2% did not involve a motorcycle, pedestrian, or pedalcyclist (1,031,635)
    - 1.6% involved a motorcycle (16,599).
    - ~~0.18% involved a pedestrian (1,906)~~
    - ~~0% involved a pedalcyclist (166)~~
    - Subtotal: 1,050,306*

The First Harmful Event is at 95% (51,025) a motor vehicle in transport for fatalities and 99% (6,431,397) for injury-only. This confirms that the motor vehicle crashing into another motor vehicle is by far the first harmful event. For fatalities, let's look at the Pre-Crash Critical Event.

Vehicles Involved in Fatal Crashes

- Total for the 5-year period: 121,809
- From the opposite direction over left lane line: 21% (25,114)
- Over the lane line on left side of travel lane: 12% (14,410)
- Traveling in same direction with higher speed: 10% (11,593)
- Crossing Over (Passing Through) Junction: 9% (10,544)
- From crossing street, across path: 8% (9,412)
- Traveling in opposite direction: 6% (7,450)
- Turning Left: 6% (7,147)
- Other vehicle stopped: 4% (4,846)
- Traveling in same direction with lower steady speed: 3% (3,826)
- Traveling in same direction while decelerating: 2% (1,867)

Vehicles involved in fatal crash: Manner of Collision

- Angle – 40% (48,692)
- Head-On – 27% (33,225)
- Rear-End – 19% (23,400)
- Sideswipe – 7% (8,868)
- Not collision with motor vehicle in transport: 5% (6,106)
- Other: 1% (1,117)
- Total: 121,809

Injury-Only Crash: Manner of Collision

- Rear-End – 45% (2,955,773)
- Angle – 38% (2,456,234)
- Sideswipe – 9% (576,536)
- Head-On – 6% (395,583)

- Other – 1% (65,393)

Injury-only crashes feature a massive increase in rear-end collisions and a massive drop in head-on collisions. Angles and sideswipes are about the same.

Fatal Crashes: At an intersection

- No – 65% (78,929)
- Yes – 35% (42,801)

Injury-only Crashes: At an intersection

- No – 59% (3,824,047)
- Yes – 41% (2,689,101)

Because we have two or two+ vehicles in the crash, we have at least two drivers. As we saw earlier, there is usually one fatality per fatal crash. This fact greatly improves our ability to get reliable information about the circumstances of the crash due to other witnesses (as compared to single vehicle accidents).

Injury-Only: Involving Speeding

- No: 89% (5,810,035)
- Yes: 11% (703,113)

Injury-Only: Involving Young Driver (Aged 15-20)

- No: 78% (5,055,218)
- Yes: 22% (1,457,930)

Injury-Only: Involving Older Driver (Aged 65+)

- No: 79% (5,165,193)
- Yes: 21% (1,347,955)

Fatal Crashes: Light Conditions

- Daylight: 61% (31,289)
- Dark Not Lighted: 21% (10,535)
- Dark Lighted: 13% (6,728)
- Dawn: 2% (1,192)
- Dusk: 2% (1,153)

Injury-Only Crashes: Light Conditions

- Daylight: 75% (4,907,290)
- Dark Not Lighted: 5% (331,709)
- Dark Lighted: 16% (1,016,996)
- Dawn: 1% (81,153)
- Dusk: 2% (149,389)

Compared with Fatal, we see an increase in “Daylight” and a decrease in “Dark Not Lighted”

Fatal Crashes: Atmospheric Conditions

- No Adverse Condition: 67% (34,198)
- Cloudy: 16% (8,308)
- Rain: 8% (4,239)
- Unknown/Not Reported: 5% (2,532)
- Snow: 2% (825)
- Fog, Smoke, Smog: 1% (682)

Note: I don’t consider cloudy an adverse condition when “fog, smoke, smog” is available as a selection.

Injury-Only Crashes: Atmospheric Conditions

- No Adverse Condition: 73% (4,759,164)
- Cloudy: 16% (1,024,562)
- Rain: 9% (606,207)
- Snow: 1% (78,697)

Note: I don’t consider cloudy an adverse condition when “fog, smoke, smog” is available as a selection.

Alcohol

FIRST Warnings:

Important: Alcohol Imputation Information

- *BAC levels are estimates*
- *BAC levels cannot be mapped. This is summarized data and BAC levels cannot be attributed to individual persons.*
- *The estimated BAC methodology is optimal for summary reports. The smaller the cells counts the larger the standard error.*
- *Please read all footnotes under the report table and view all documentation.*

Person BAC

- *This is the estimated BAC of the Person involved: Only Driver, Pedalcyclist or Pedestrian*
- *There is no BAC coded for other Occupants (non Drivers)*

Highest Driver BAC

- *This is the highest estimated Driver BAC in the fatal crash event.*

Given the restrictions, I’ll simply report .00 and .08+ for Highest Driver BAC.

Highest Driver BAC*

- .00 g/dL: 71% (36,307)
- .08+ g/dL: 24% (12,467)

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Footnotes:

*BAC Note: *BAC of .08 g/dL or higher indicates alcohol-impaired driving.*

BAC Note: NHTSA estimates alcohol involvement when alcohol test results are unknown. (See Details Here)

BAC Note: The sum of the individual BAC values may not equal to the total due to individual value rounding.

BAC Note: Percentages are computed based on unrounded estimates.

BAC Note: Total includes information from crashes in which there was no driver or motorcycle rider present.

BAC Note: Alcohol involvement cannot be mapped due to the complexities of the statistical methodology applied to generate estimates (see report link above)

Study SubGroup MVSS:DRV. Two and Two+ Vehicle Collisions.

FIRST allows for more detailed filtering if the main report is for drivers. See the appendix for details on how to generate this report. Because we are only looking at drivers, the fatalities are down to 43,687.

Drivers Killed: Critical Event- Precrash (since 2010)

- Over the lane line on the left side of travel lane – 21% (9,100)
- From Opposite Direction over left lane line: 14% (6,049)
- Crossing Over (Passing Through Junction): 12% (5,098)
- Turning Left: 9% (3,836)
- Traveling in opposite direction: 8% (3,461)
- Traveling in same direction with higher speed: 6% (2,763)
- From Crossing Street, across path: 5% (2,378)
- Other Vehicle Stopped: 4% (1,683)
- Traveling Same Direction with lower steady speed: 4% (1,621)
- Traveling Too Fast for Conditions or Road Configuration – 3% (1,195)
- Over the lane line on the right side of the travel lane – 2% (657)
- Off the edge of the road on the left side – 1% (513)
- Off the edge of the road on the right side – 1% (397)
- Unknown cause of control loss – 1% (389)

These make up about 91% of the total.

Drivers Killed in Fatal Crashes Ejection

- Not Ejected – 89% (39,041)
- Ejected – 10% (4,495)

Drivers Injured in Fatal Crashes: Ejection

- Not Ejected – 99% (44,630)
- Ejected – 1% (562)

Drivers Injured in Injury-Only Crashes: Ejection

- Not Ejected – 100% (7,094,810)
- Ejected – 0% (11,603)

Drivers Killed Fatal Crashes: Restraint Use

- Restrained – 61% (26,544)
- Unrestrained – 31% (13,586)
- Unknown – 8% (3,557)

Drivers Injured in Fatal Crashes: Restraint Use

- Restrained – 83% (37,495)
- Unrestrained – 12% (5,361)
- Unknown – 5% (2,437)

Drivers Injured in Injury-Only Crashes Restraint Use

- Restrained – 89% (6,290,250)
- Unrestrained – 2% (164,566)
- Unknown – 9% (651,598)

Drivers Killed in Fatal Crashes: Alcohol Testing

- No Alcohol – 53% (23,345)
- Not Tested – 24% (10,618)
- Positive BAC – 15% (6,657)
- Unknown if Tested – 5% (2,183)
- Tested, Unknown Results – 2% (884)

Study SubGroup MVSS:PG:AVVC

The total occupant fatalities in this section is 58,867. Drivers make up 73% (47,701) as they are seated in the front seat, left side. The seating positions where most passenger fatalities were reported are:

- Front Seat, Right Side: 17% (10,180)
- Second Seat, Right Side: 4% (2,320)
- Second Seat, Left Side: 3% (1,977)
- Unknown: 1% (344)
- Second Seat, Middle: 1% (566)

Combined with the driver, these make up 99% of the occupant fatalities. The remaining queries will eliminate the driver from consideration.

Fatal Crash Passenger Ejection

- Not Ejected: 86% (13,953)
- Ejected: 13% (2,124)

Fatal Crash Passenger Injured Ejection

- Not Ejected: 96% (33,727)
- Ejected: 3% (1,007)

Injury-Only Crash Passenger Ejection

- Not Ejected: 100% (2,836,349)
- Ejected: 0% (7,644)

Fatal Crash Passenger Restraint Use

- Restrained: 57% (9,264)
- Unrestrained: 33% (5,351)

Fatal Crash Passenger Injured Restraint Use

- Restrained: 71% (24,708)
- Unrestrained: 22% (7,698)

Injury-Only Crash Passenger Restraint Use

- Restrained: 88% (2,498,874)
- Unrestrained: 6% (161,248)

Study Group MVMC:SVC

Vehicles

Vehicles (motorcycles) involved in fatal crashes that were single vehicle crashes.

Pre-Crash Critical Event

- Off the edge of the road on the right side: 34% (3,408)
- Off the edge of the road on the left side: 18% (1,790)
- Traveling too fast for conditions or road configuration: 17% (1,672)
- Unknown cause of control loss: 6% (620)
- Animal in road: 5% (491)
- Other critical precrash event: 4% (407)

Speeding

- Speed Involved: 42% (4,195)
- No Speed Involved: 58% (5,708)

First Harmful Event

- Rollover/overturn: 27% (2,674)
- Curb: 14% (1,408)
- Guardrail Face: 8% (802)
- Tree (standing only): 6% (589)

- Ditch: 6% (576)
- Live Animal: 5% (477)
- Embankment: 4% (366)
- Fell/Jumped from vehicle: 3% (255)

Most Harmful Event

- Rollover/Overturn: 30% (2,929)
- Tree (standing only): 10% (957)
- Guardrail face: 9% (851)
- Curb: 7% (687)
- Utility Pole/Light support: 6% (589)
- Live Animal: 4% (404)
- Ditch: 4% (402)
- Fell/Jumped from vehicle: 4% (354)

Involving young driver (aged 15-20)

- No: 96% (9,555)
- Yes: 4% (348)

Involving an older driver (aged 65+)

- No: 89% (8,831)
- Yes: 11% (1,072)

Drivers

Helmeted

- Yes: 55% (5,191)
- No: 43% (4,038)
- Unknown: 3% (243)

Alcohol

- None: 32% (3,040)
- Positive: 38% (3,575)
- Not Tested: 23% (2,142)
- Tested, Unknown Results: 2% (212)
- Unknown if tested: 5% (503)

Roadway Surface Conditions

- Dry: 93% (8,855)
- Wet: 4% (383)

(Vehicles?) Rural / Urban

- Rural: 50% (4,713)

- Urban: 50% (4,711)

Total Lanes in Roadway

- Two: 78% (7,392)
- Three: 8% (773)
- Four: 5% (494)
- Five: 3% (284)

(Vehicles?) Light Condition

- Daylight: 53% (4,975)
- Dark – Not lighted: 24% (2,246)
- Dark – Lighted: 18% (1,664)

(vehicles?) Atmospheric Condition

- No adverse: 78% (7,378)
- Cloudy: 12% (1,115)

Study Group MVMC-PG:SVC

Helmeted

- No: 54% (319)
- Yes: 43% (251)
- Unknown: 3% (16)

Study Group MVMC:AVVC

With this study group, we can look at a couple of different ways to query. If we restrict it to two-vehicle accidents, where one motor vehicle is a motorcycle, we know that the motorcycle rider is usually the fatality. The other driver is either non-injured or injured. This type of query is available under the Drivers report, Drivers Involved in Fatal Crashes.

Here we would be looking at two vehicle crashes involving a motorcycle, but not a pedestrian or pedalcyclist, where the driver is non-injured or injured, but not fatally.

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Drivers Involved in Fatal Crashes
Filter Selected: Crash Type: *Two-Vehicle Crash*; Involving A Motorcycle: *Yes*; Involving A Pedestrian: *No*; Involving A Pedalcyclist: *No*; Person Injury Type: *Injured, Incapacitating ; or Injured, Non-incapacitating ; or Injured, Other ; or Not Injured*; Person Type: *Driver*
Years: *2015-2019*

Critical Event- Precrash (since 2010) - Total

- Turning Left: 35% (4,586)
- Traveling in same direction with higher speed: 11% (1,442)
- From opposite direction over left lane line: 9% (1,233)

- Crossing Over (Passing Through) Junction: 8% (1,067)
- From crossing street, across path: 6% (795)
- Traveling in same direction with lower steady speed: 4% (463)
- Over the lane line on left side of travel lane: 4% (522)
- Traveling in opposite direction: 3% (397)
- Other critical precrash event: 3% (395)

Pre-Event Movement

- Turning Left: 43% (5,643)
- Going Straight: 32% (4,283)
- Negotiating a Curve: 9% (1,131)

Pre-Impact Location

- Stayed in original travel lane: 83% (11,016)
- Stayed on roadway, but left original travel lane: 12% (1,518)

Alcohol

- BAC .00 g/dL: 87% (11,489)
- BAC .08+ g/DL: 10% (1,327)

Motorcycle – Same query, but Person Injury Type is now Fatal, which more than likely would be the motorcycle.

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Drivers Involved in Fatal Crashes
Filter Selected: Crash Type: *Two-Vehicle Crash*; Involving A Motorcycle: *Yes*; Involving A Pedestrian: *No*; Involving A Pedalcyclist: *No*; Person Injury Type: *Fatal*; Person Type: *Driver*
Years: *2015-2019*

Critical Event- Precrash (since 2010) – Total 12,894

- From opposite direction over left lane line: 23% (2,936)
- Crossing Over (Passing Through) Junction: 10% (1,339)
- From crossing street, across path: 9% (1,133)
- Over the lane line on left side of travel lane: 8% (1,000)
- From crossing street, turning into opposite direction: 8% (984)
- Traveling in same direction with higher speed: 5% (618)
- Traveling in same direction with lower steady speed: 5% (683)
- Other vehicle stopped: 3% (402)
- Other critical precrash event: 3% (381)
- Traveling in opposite direction: 3% (358)

Pre-Event Movement

- Going Straight: 73% (9,427)
- Negotiating a Curve: 11% (1,444)

- Passing or Overtaking Another Vehicle: 6% (710)

Pre-Impact Location

- Stayed in Original Travel Lane: 77% (9,940)
- Stayed on roadway, but left original travel lane: 16% (2,042)

Alcohol

- BAC .00 g/dL: 74% (11,489)
- BAC .08+ g/DL: 18% (1,327)

Helmet Use

- Yes: 63% (8,100)
- No: 34% (4,410)
- Unknown: 3% (384)

Vehicle

Intersection

- At intersection: 49% (16,114)
- Not at intersection: 51% (16,524)]

Speeding Vehicle

- No Speed Involved: 85% (27,797)
- Speed involved: 15% (4,857)

Light Condition

- Daylight: 61% (19,863)
- Dark – Not lighted: 13% (4,341)
- Dark-Lighted: 20% (6,653)

Atmospheric Conditions

- No Adverse Conditions: 80% (26,253)
- Cloudy: 12% (3,759)

Manner of collision

- Not Collision with Motor Vehicle in Transport: 10% (3,292)
- Rear-End: 18% (5,967)
- Head-On: 14% (4,427)
- Angle: 49% (16,013)

First Harmful Event

- Rollover/Overturn: 7% (2,285)
- Motor Vehicle In-Transport: 92% (29,274)

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Drivers killed in fatal crashes

Total for report: 14,740

Helmet Use

- Yes: 64% (9,373)
- No: 33% (4,921)

Alcohol

- None: 51% (7,512)
- Positive BAC: 20% (2,943)
- Not Tested: 20% (2,957)
- Unknown if tested: 7% (1,049)

Initial Impact Point

- Non-Collision: 8% (1,137)
- Front: 72% (10,565)
- Right Side: 5% (688)
- Front: 6% (911)
- Left Side: 7% (975)

Trafficway Description

- Two-Way, Not Divided: 54% (7,917)
- Two-Way, Divided, Unprotected Median: 20% (3,018)
- Two-Way, Divided, Positive Median Barrier: 13% (1,925)
- Two-Way, Not Divided With a Continuous Turn Lane: 10% (1,429)

Traffic Control Device

- No Controls: 75% (11,114)
- Traffic control signal(on colors) not known whether or not Pedestrian Signal: 13% (1,975)

Study Group PD-SVC

Here, I am only looking at MVSS and pedestrian crashes that led to pedestrian fatalities. Total (27,091).

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Pedestrians Killed in Fatal Crashes
Filter Selected: Crash Type: *Single-Vehicle Crash*; Involving A Motorcycle: *No*; Involving A Pedalcyclist: *No*; Person Injury Type: *Fatal*; Person Type: *Pedestrian*
Years: *2015-2019*

Pedestrian Crash Type

- Pedestrian failed to yield: 34% (9,154)
- Walking/Running Along Roadway With Traffic - From Behind: 8% (2,142)
- Not at intersection - other/unknown: 8%
- Dash -Run, No Visual Obst. Noted: 6% (1,689)

- Motorist failed to yield: 5% (1,427)
- Crossing an expressway: 4% (1,203)
- Motorist left turn, parallel paths: 3% (904)
- Lying in Roadway: 3% (868)
- At intersection - other /unknown: 3% (863)
- Disabled Vehicle-Related: 3% (729)
- Standing in Roadway: 2% (471)
- Walking in Roadway: 2% (526)

Light Condition

- Daylight: 21% (5,821)
- Dark – Lighted: 39% (10,632)
- Dark – not Lighted: 34% (9,185)

Non-Motorist Use of Lighting (available for 2017, 2018, 2019)

- Not Reported: 40% (10,863)
- No: 21% (5,567)
- Yes: 0% (48)
- Not Available for 2015, 2016: 38% (10,415)

Alcohol

- BAC .00 g/dL: 63% (17,106)
- BAC .08+ g/DL: 32% (8,729)

Pedestrian Crash Location

- Not at Intersection: 71% (19,327)
- At intersection: 18% (5,010)
- Intersection-related: 9% (2,321)

Pedestrian Position

- Travel Lane: 70% (18,945)
- Crosswalk: 14% (3,864)
- Intersection Area: 4% (1,189)
- Paved Shoulder / bicycle lane / parking lane: 4% (1,083)

NOTE: “1 (Travel Lane) is used when a person is on a roadway (travel lane) and not in a bicycle lane or crosswalk (marked/unmarked crosswalk or shared-use path crossing).”

Atmospheric Conditions

- No adverse conditions: 70% (19,085)
- Cloudy: 14% (3,771)
- Rain: 8% (2,289)

Sidewalk Presence

- None Noted: 61% (16,522)
- Yes: 37% (10,029)
- Unknown: 2% (540)

Marked Crosswalk

- None Noted: 81% (21,957)
- Yes: 18% (4,857)
- Unknown: 1% (277)

Study Group PC-SVC

Here, I am only looking at MVSS and pedalcyclist crashes that led to pedalcyclist fatalities. Total (3,989).

National Highway Traffic Safety Administration (NHTSA) Motor Vehicle Crash Data Querying and Reporting

Pedalcyclists Killed in Fatal Crashes
Filter Selected: Crash Type: *Single-Vehicle Crash*; Involving A Motorcycle: *No*; Involving A Pedestrian: *No*; Person Injury Type: *Fatal*; Person Type: *Pedalcyclist*
Years: *2015-2019*

Bicyclist Crash Type

- Bicyclist Ride Through - Sign-Controlled Intersection: 5% (183)
- Bicyclist Ride Through - Signalized Intersection: 6% (232)
- Bicyclist Left Turn - Same Direction: 6% (235)
- Motorist Overtaking - Undetected Bicyclist or Detected - Too Late to Avoid: 11% (431)
- Motorist Overtaking - Misjudged Space: 5% (209)
- Motorist Overtaking - Other/ Unknown: 13% (513)
- Wrong-Way / Wrong-Side – Bicyclist: 4% (160)
- Parallel Paths - Other / Unknown: 6% (255)
- Bicyclist Ride Out - Other Midblock: 4% (166)
- Unknown Approach Paths: 5% (209)
- Bicyclist Ride Out - Sign-Controlled Intersection: 2% (88)
- Crossing Paths - Uncontrolled Intersection: 2% (79)
- Motorist Left Turn- Opposite Direction: 2% (87)
- Motorist Right Turn - Same Direction: 2% (76)
- Bicyclist Ride Out - Midblock – Unknown: 2% (64)

Bicyclist Crash Location

- At Intersection: 29% (1,158)
- Intersection-Related: 8% (317)
- Not at intersection: 62% (2,488)

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Bicyclist Crash Group

- Loss of Control / Turning Error: 4% (155)
- Bicyclist Failed to Yield - Sign-Controlled Intersection: 7% (272)
- Bicyclist Failed to Yield - Signalized Intersection: 7% (285)
- Crossing Paths - Other Circumstances: 7% (286)
- Motorist Left Turn / Merge: 3% (119)
- Motorist Right Turn / Merge: 3% (108)
- Bicyclist Left Turn / Merge: 7% (269)
- Motorist Overtaking Bicyclist: 30% (1,199)
- Wrong-Way / Wrong-Side: 5% (195)
- Parallel Paths – Other Circumstances: 7% (293)
- Bicyclists Failed to Yield – Midblock: 8% (314)
- Other / Unknown – Insufficient Details: 6% (232)

Bicyclist Position

- Travel Lane: 79% (3,132)
- Bicycle Lane / Paved Shoulder / Parking Lane: 8% (326)
- Sidewalk / Crosswalk / Driveway Access: 11% (433)

Light Condition

- Daylight: 49% (1,940)
- Dark – Not Lighted: 22% (861)
- Dark – Lighted: 24% (953)
- Dawn: 2% (84)
- Dusk: 3% (106).

Non-Motorist Use of Lighting

- Not Reported: 34% (1,358)
- No: 22% (884)
- Yes: 3% (109)
- Not Available for Years 2015, 2016: 40% (1,590)

Atmospheric Conditions

- No Adverse Conditions: 78% (3,093)
- Cloudy: 13% (499)

Involved Speeding

- Yes: 8% (325)
- No: 92% (3,664)

Involving An Older Driver (Aged 65+)

- No: 89% (3,549)

- Yes: 11% (440)

Involving A Young Driver (Aged 15-20)

- No: 91% (3,646)
- Yes: 9% (343)

Non-Motorist Helmet Use

- No: 35% (1,411)
- Yes: 9% (370)
- Not Reported: 14% (550)
- Not Available for 2015, 2016: 40% (1,590)

Trafficway Route Signing (since 2010)

- State Highway: 25% (980)
- U.S. Highway: 14% (541)
- County Road: 13% (524)
- Local Street – Municipality: 32% (1,264)

Rural/Urban

- Urban: 76% (3,031)
- Rural: 24% (946)