Vehicle and Driver At-Fault Comparisons

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Introduction

This document reports the results of a study to determine, on average over a large number of cases, which driver is more apt to be at fault in two-vehicle crashes that involve two different vehicle types (e.g., large truck and car; car and pedestrian, car and bicycle, car and motorcycle, etc.). This information is essential to effective countermeasure development with regard to changing driver behavior since ignoring who it typically at fault could lead to a miss-allocation of resources (e.g., targeting truck drivers in fatal large truck crashes, when cars are most often at fault). To some extent the analysis was also extended to subjects other than vehicle types; for examples, driver ages, distance from home, and particular contributing circumstances.

For the original study, traffic crash data were obtained from data that included the 2009-2013 calendar years. This report updates those original findings using 2012-2016 data, and reference back to the 2009-2013 findings will only be made in cases where significant differences between the two time periods is determined.

The officer's opinion as to which driver was at-fault (also referenced as the *causal* driver) is the data element in the crash record that was used to determine which of the vehicles was causal. Records that did not have an officers' indication of the causal unit were omitted. In order to make a fair comparison it was necessary to create subsets of the data that did not bias the data in either direction. For example, all single-vehicle crashes were omitted from consideration. For the comparison to be valid one of the units had to be of one type (e.g., truck) and the other of the second type (e.g., passenger cars and other non-truck vehicles). This led to a fair comparison and an unbiased estimate of the relative frequency (i.e., the probability) of a given unit or driver type causing the category of crash under consideration.

The following give a brief explanation of the various vehicles and/or drivers that were compared:

- Truck Involved – this compared large trucks, most of which were large commercial vehicles, with passenger vehicles of all types. "Trucks" in this case would include all tractor trailer trucks and all vehicles larger than normal pick-up trucks.
- Pedestrians – this covered all crashes that involved pedestrians, answering the question of whether the pedestrian or the motor vehicle was typically at fault.
- Motorcycles – this considered all motorcycle crashes with other types of motor vehicles.
- Bicycles – comparable to the motorcycle analysis, but involving bicycles as opposed to motorcycles.
- School Bus – all crashes in which one of the vehicles was a school bus.
- Pickups – this was for all vehicles reported to be pickup trucks in a wreck with a passenger car.
- Age 16-20 – all crashes where one of the drivers was in this age range.
- Age 65+ – all crashes in which one of the drivers was of an age greater than 64.
- Age 75+ – all crashes in which one of the drivers was of an age greater than 74.

- Local or 25+ Miles – local drivers were considered to be within 25 miles of their homes, and these were compared with those more than 25 miles from home.
- Out of State Drivers – similar to the "local" comparison above, but in this case one driver had an Alabama driver's license while the other had a license that was out of state.
- Changing Lanes – one driver was reported to be changing lanes while the other was not.

As you survey the list above ask yourself which vehicle or driver type you think would be most apt to be at fault in a crash with a car. In the sections below a question is posed for each category and we urge readers to take a moment and try to answer the question *before* reading the blurb that follows it.

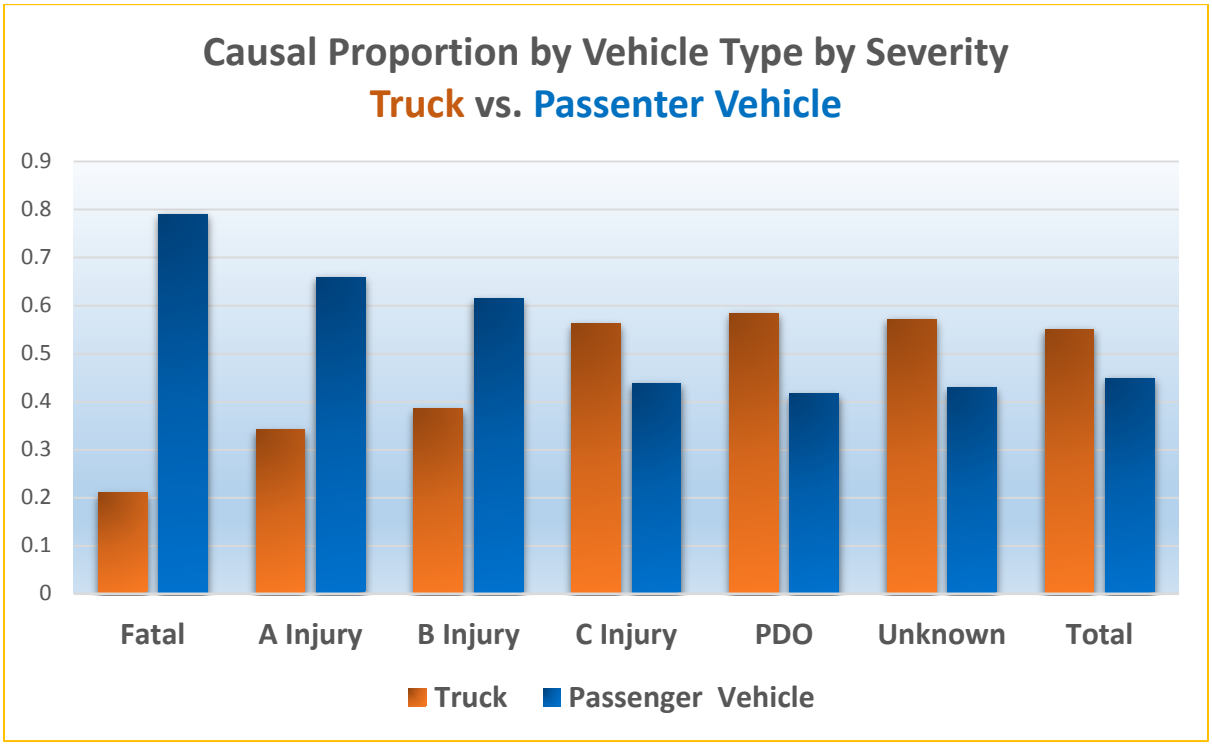
The charts given only indicate causation, not crash frequency, so they are not useful for comparing between or among the various crash types. See the final section of this report (Frequency of Crashes by Severity) for a comparison between crash types.

Please note the norm. *All other things being equal we should expect half of the crashes to be caused by one type of vehicle/driver and 50% to be caused by the other. This is only reasonable, since this assumes equal skill and integrity on both classes of drivers, and if this is true, the cause becomes a matter of chance. Obviously, it is not expected that any vehicle/driver type will cause all of the crashes.*

With the large sample sizes that are under consideration, any deviation from 50% by more than about 5% is highly statistically significant, and this would warrant addition analysis to determine the most effective countermeasures that should be applied. This guidance as to who caused the majority of the crashes is a first step toward more effective countermeasure development. It is not just the binary result that is important, but the degree of causation and how this causation varies with crash severity.

Cars or Trucks?

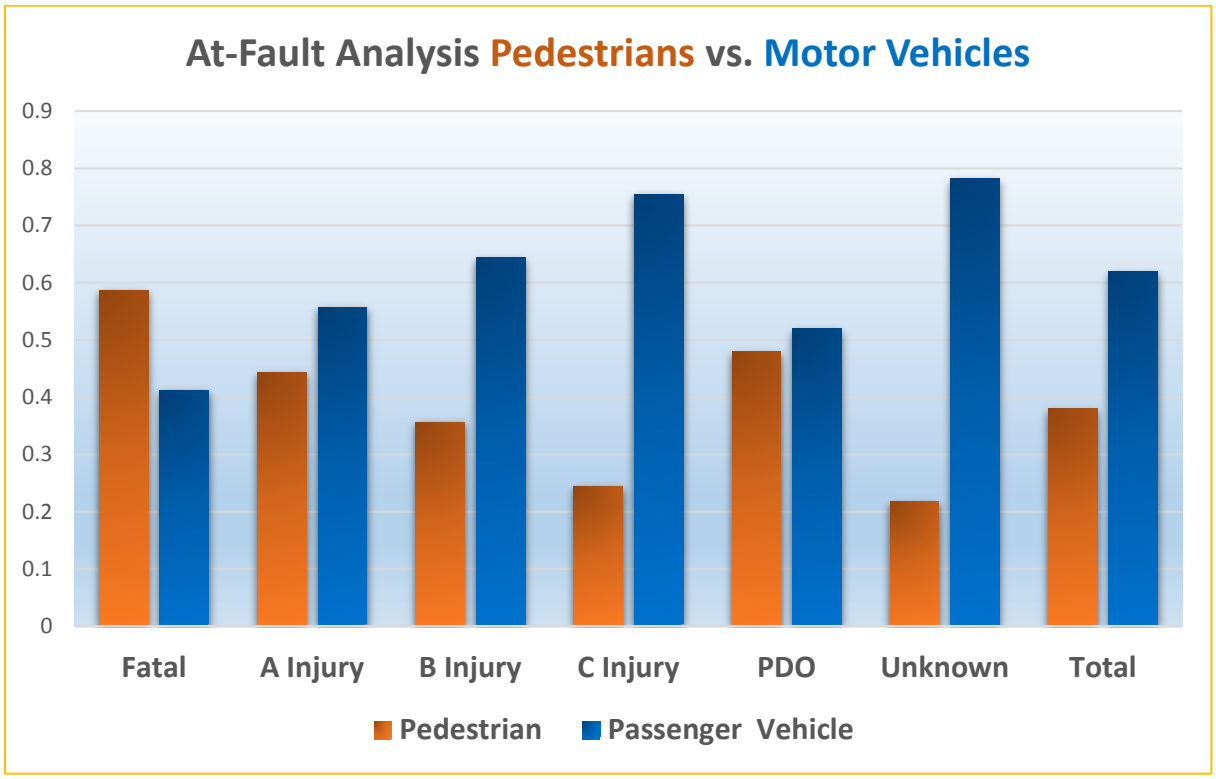
True or False? *In fatal crashes between cars and trucks, it is the truck that is most often at fault?* The chart below shows that this is false. Heavy trucks only caused about 21% of the fatal crashes in which they were involved. The general driving public has a sense that the truck causes the crash because of its size. No doubt the disparity in size between trucks and cars accounts for a higher fatality rate than what occurs in crashes between two vehicles of equivalent weight. However, this analysis was of who caused the crash in terms of driver errors (not what caused the severity to be so high). It is reasonable that professional drivers would have a higher driving skill level due to their experience. However, in the lower severity classification the large truck drivers are over-represented in causation. Perhaps this is due to their skill in mitigating the crash so that it will not cause a fatality. Or it is possible that greater analysis is given by reporting officers when a fatality is involved. Clearly large trucks are much more difficult to control, and so there might be the natural expectation that they would cause more two-vehicle crashes.



The above analysis indicates strongly how fault can vary significantly by severity. This is the main reason that we have subdivide the results by severity. Typically the vehicle that is "of concern" will have the bar to the left (orange bar), while the one on the right will apply to all other vehicles or drivers. Note that the total for all severity classifications (and those of Unknown severity is given at the right. *Important: no inference should be made about the relative severity of the different types of crashes below by the heights of the bars in the graph.* The orange and the blue bars within every severity classification sum to 1.00 (100%). Thus it is impossible to derive any conclusions with regard to how many truck related fatalities (either absolutely or relatively) from these charts. See the final section of this report (Frequency of Crashes by Severity) for this information.

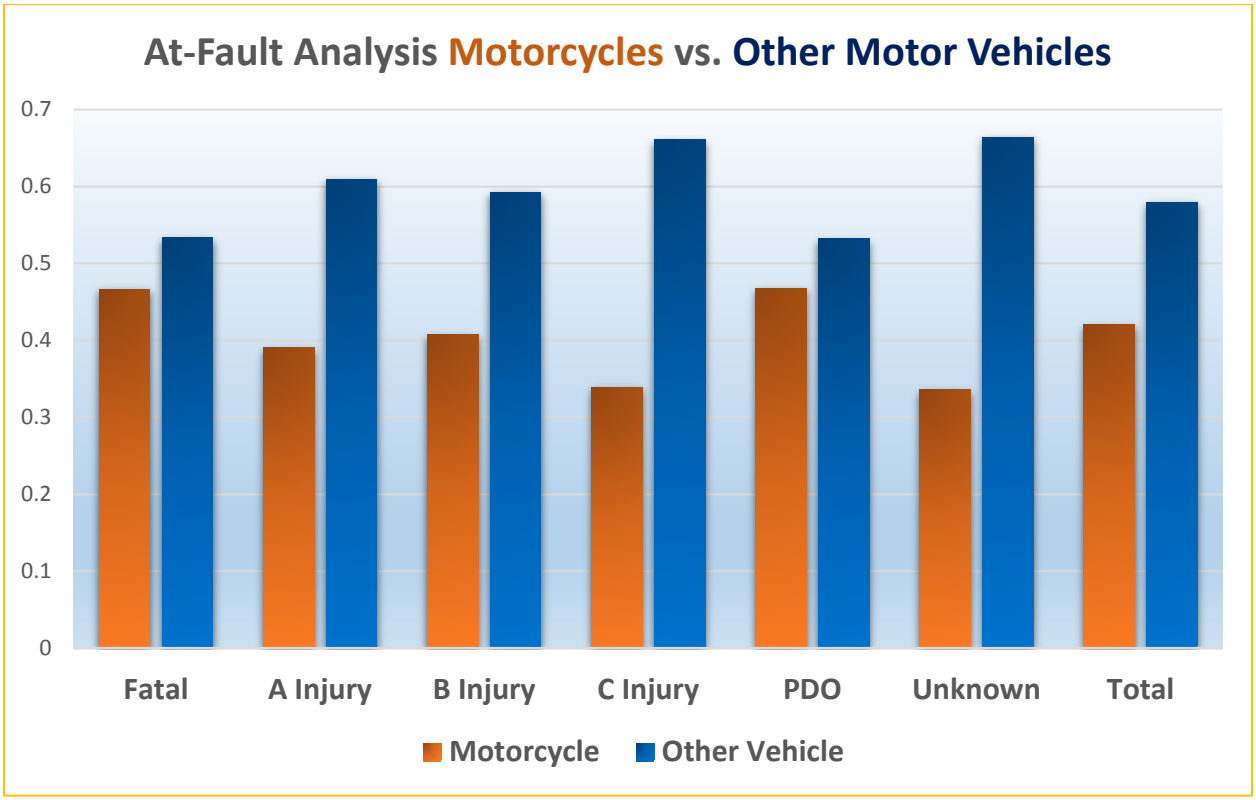
Pedestrians or Vehicles?

True or False? *Pedestrians cause most pedestrian fatalities?* This is true – the chart below shows that they are responsible for almost 30% more crashes than are the vehicles that strike them. However, this is only true for fatalities. For all other severities, and for pedestrian crashes in general, it is the vehicle that is the cause. Whether a pedestrian crash is fatal or not depends heavily on other causes, such as pedestrian age, health, and the response time of EMS. Thus countermeasures might best be addressed toward all vehicle drivers. On the other hand, while the pedestrian might not be technically at fault, there are few pedestrian involvements that could not be avoided by pedestrian precautions. Most assuredly pedestrian use of alcohol/drugs and distractions of cell phone use and texting should be totally avoided near busy highways while walking. These pedestrian distractions and impairments are found far more often in pedestrian fatalities than non-fatal pedestrian incidents, indicating the failure of the pedestrian to take last-second preventative actions could dramatically impact whether the crash is fatal or not.



Motorcycles or Other Vehicles?

True or False? *Motorcycles cause the majority of crashes regardless of severity classification.* This is totally false at all severity classifications. It seems quite clear that a large number of motorcycle countermeasures should be directed toward the non-motorcycle drivers. This could well be caused by the fact that other vehicle drivers are often looking for cars and trucks as opposed to motorcycles. Motorcyclists should be urged to keep their lights on at all times. The need for defensive driving on the part of motorcyclists is also quite clear. Do not take for granted that another vehicle will yield the right-of-way.

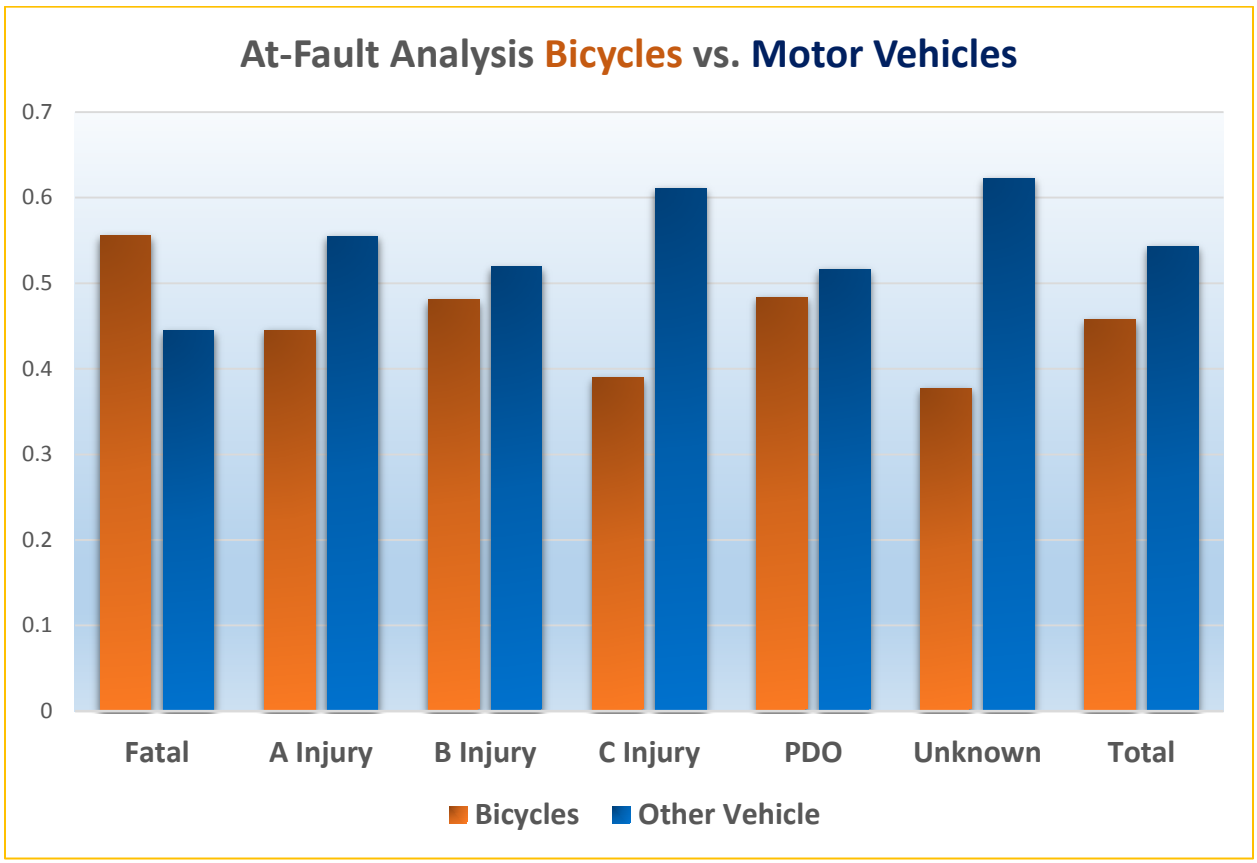


Bicycles or Motor Vehicles?

True or False? *Bicycle riders are more at fault only for their fatal crashes.* The chart below shows that the only time that the orange bar (bicycle at-fault) exceeds the blue one is for fatal crashes. For the lessor injury types they seem to all be less than their expected 50%. Bicycle crashes are much like those involving motorcycles in that motor vehicle drivers often fail to see them because they are looking for cars and trucks. So, while they are below 50% in all other categories, it appears that they are causing 55% of their fatality crashes. It is clear that they share

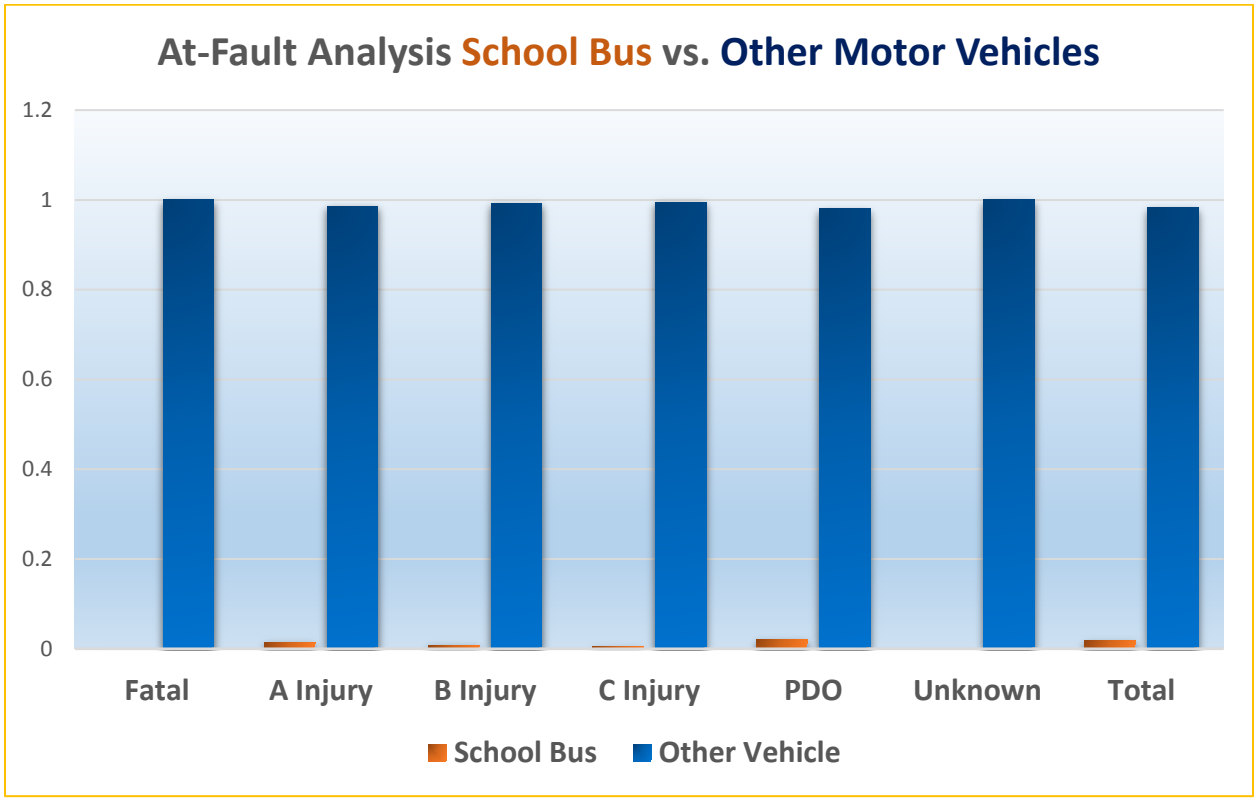
the blame here and countermeasures need to be applied to both drivers and bicyclists probably in about the same proportion.

As with motorcycles, most drivers do not look for bicyclists – they are looking for motor vehicles. Often the excuse is given: "I never saw the bicyclist." They were looking in that direction but because they did not see a car or truck, they proceeded as if there was nothing there. Or perhaps their perception is that it is the bicycle's responsibility to stop. This is a problem with motorcycles as well; however, it is far more pronounced with bicycles, which typically do not have a significant headlight capability. Also, motor vehicle drivers need to look well ahead for the presence of bicyclists, and slow down appropriately since they know that bicyclists rarely approach 20 MPH. It should not be taken for granted that there will be room to pass the bicyclists. On the other hand, bicyclists should stay as far to the right as possible and in single file.



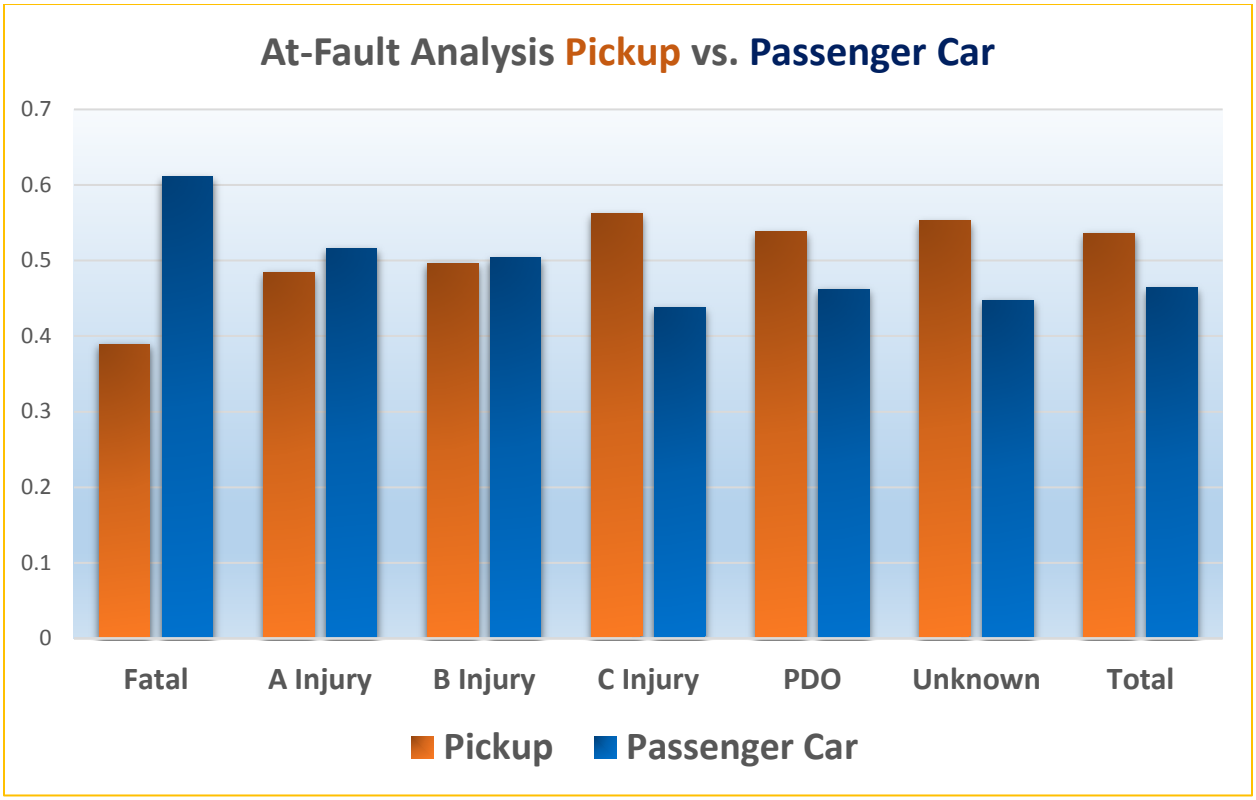
School Bus or Other Vehicle?

True or False? *School bus drivers are very seldom responsible when involved in a two-vehicle crash.* The following chart shows that this is true. This is a tribute to our school bus drivers in that the equipment that they are driving is certainly much more difficult to control than the ordinary car. We would look toward countermeasures involving the other vehicles in attacking the problem of school bus crashes.



Pickup or Passenger Car?

True or False? *Cars have about a 60-40 chance of being at fault in a pickup-car fatal crash.* The following chart shows that this is true. In all other cases the fault is either not significantly different or is that of the pickup driver.

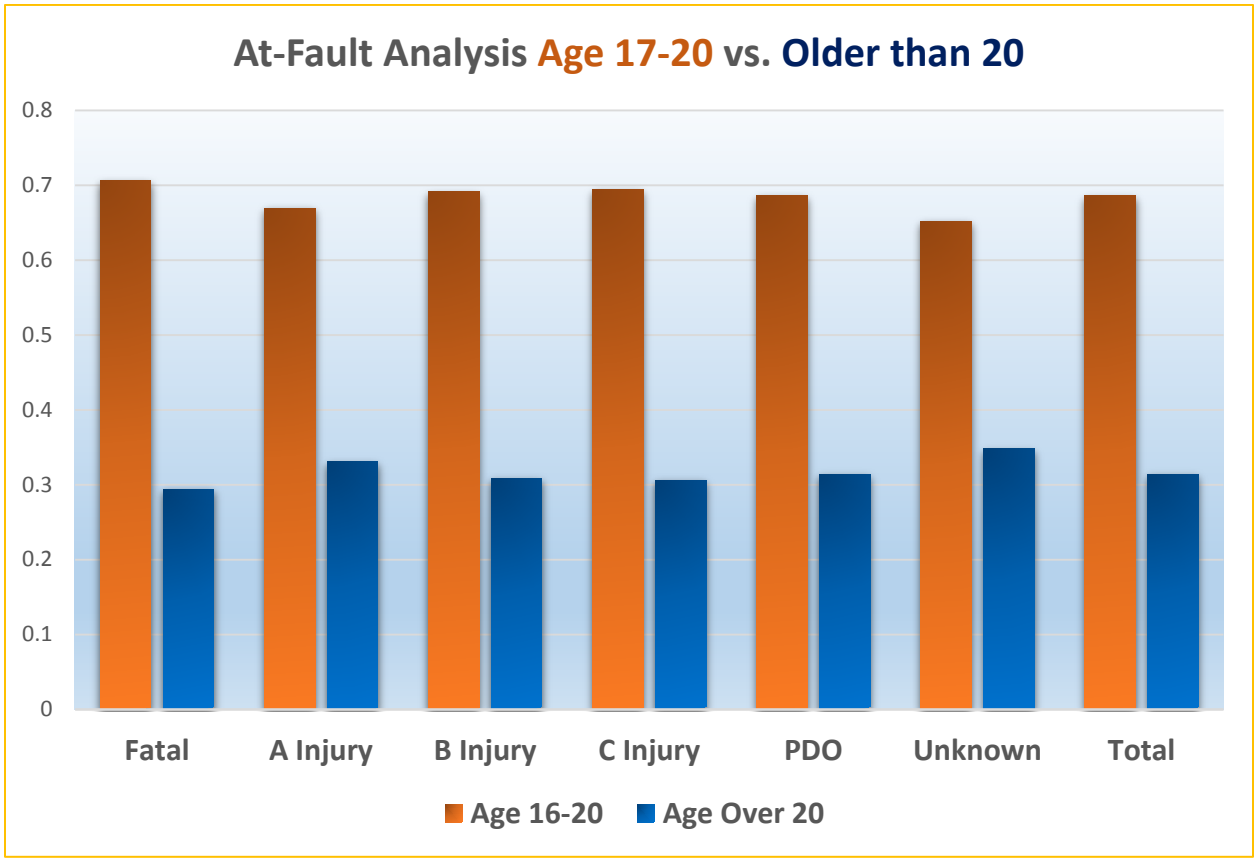


Young (16-20) or Older (21+) Drivers?

True or False? *Age 16-20 (what we are calling "young") drivers cause over twice the proportion of crashes than what over-20 aged drivers cause?* The chart below shows that this is true for all severity classifications. "Older drivers" in our section heading refer to those who are older than 20 who were involved in a crash with a younger driver. It is a well-established fact that the young driver age group is over-represented in crashes in general, and the inference that they are causing a large proportion of the crashes in which they are involved is unavoidable. The

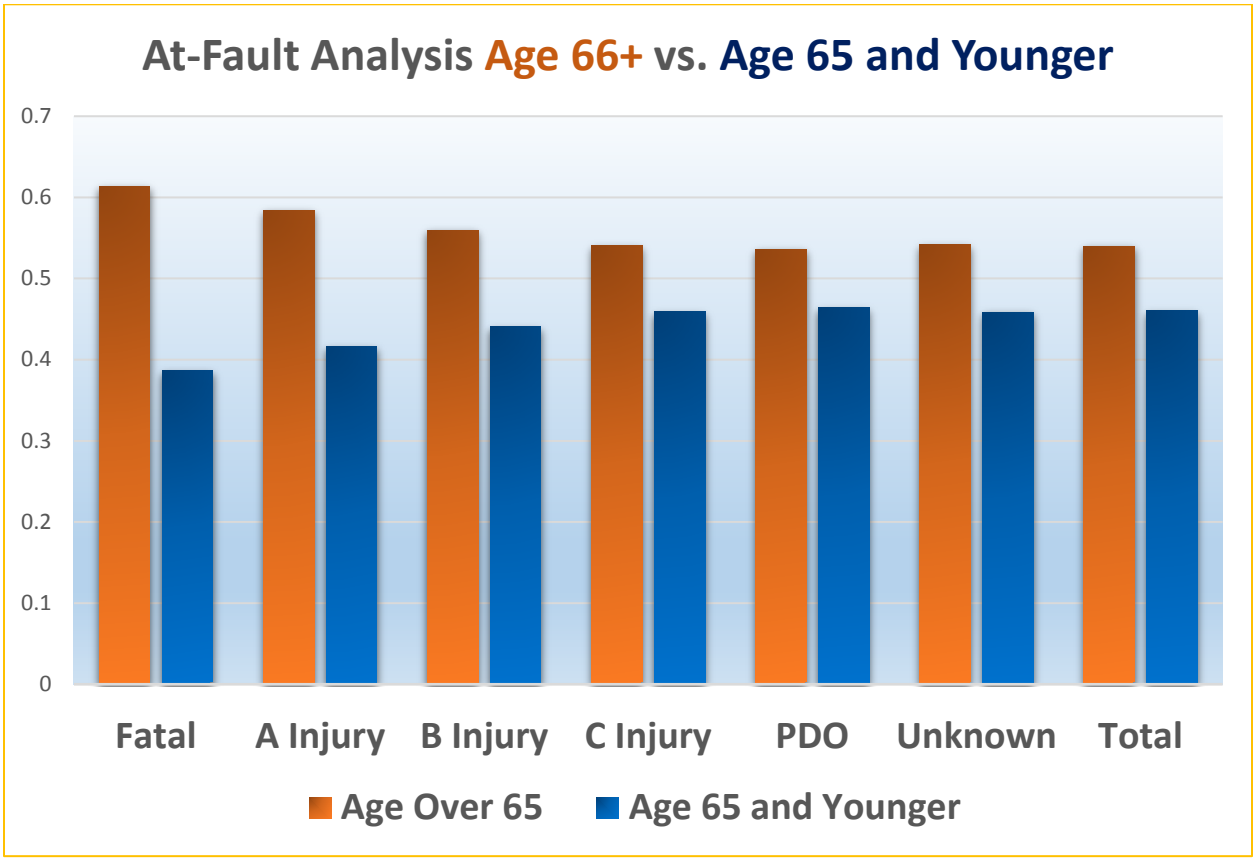
chart below is one of the few charts in this report that is severity independent, showing the young drivers being responsible for about 70% of two-vehicle crashes in which they are involve for all severity levels.

The major issue with young drivers is their inexperience coupled with their inability to comprehend risk, a brain development issue that is only resolved by maturity to the age of about 25 years. Clearly countermeasures for this age group are one of the greatest challenges within the field of traffic safety. Those who are inclined to want to take risks are hardly dissuaded by stating that a given action is risky – in fact that could encourage them to do it. This makes no sense at all to older drivers; in fact we see the older drivers to be just the opposite, extremely risk averse by any metric (e.g., speed, weather, time of day, etc.), and quite amenable to taking advice that avoids risk. We will consider these older categories next.



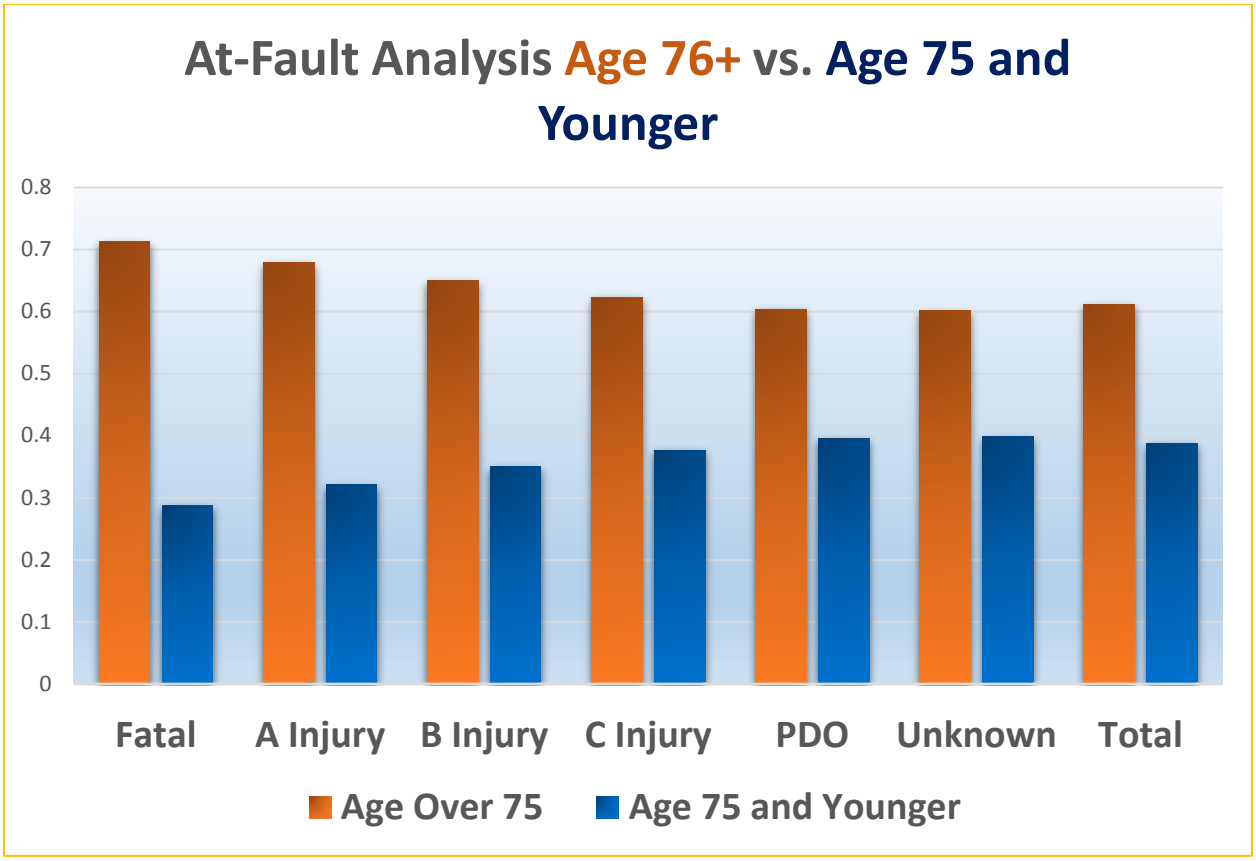
Older (66+) or Younger (65 or younger)?

True or False? *Age 66+ drivers cause well over half of the two vehicle fatality crashes in which they are involved?* True. The chart below shows that for the the older drivers tend to be more responsible than their yonger counterparts for all severity levels, but their at fault percentage drops almost linearly for the lower severity classificaitons.



Oldest Drivers (76+) or Younger (75 of Younger)

True or False? *Age 75+ drivers cause over twice the fatalities than those younger drivers (under 75) involved in these crashes.* True. The chart below compared to the one able shows how causation increases with age. Certainly we would expect that any factor caused by age (e.g., visual impairments) would be further exacerbated by further age increases.

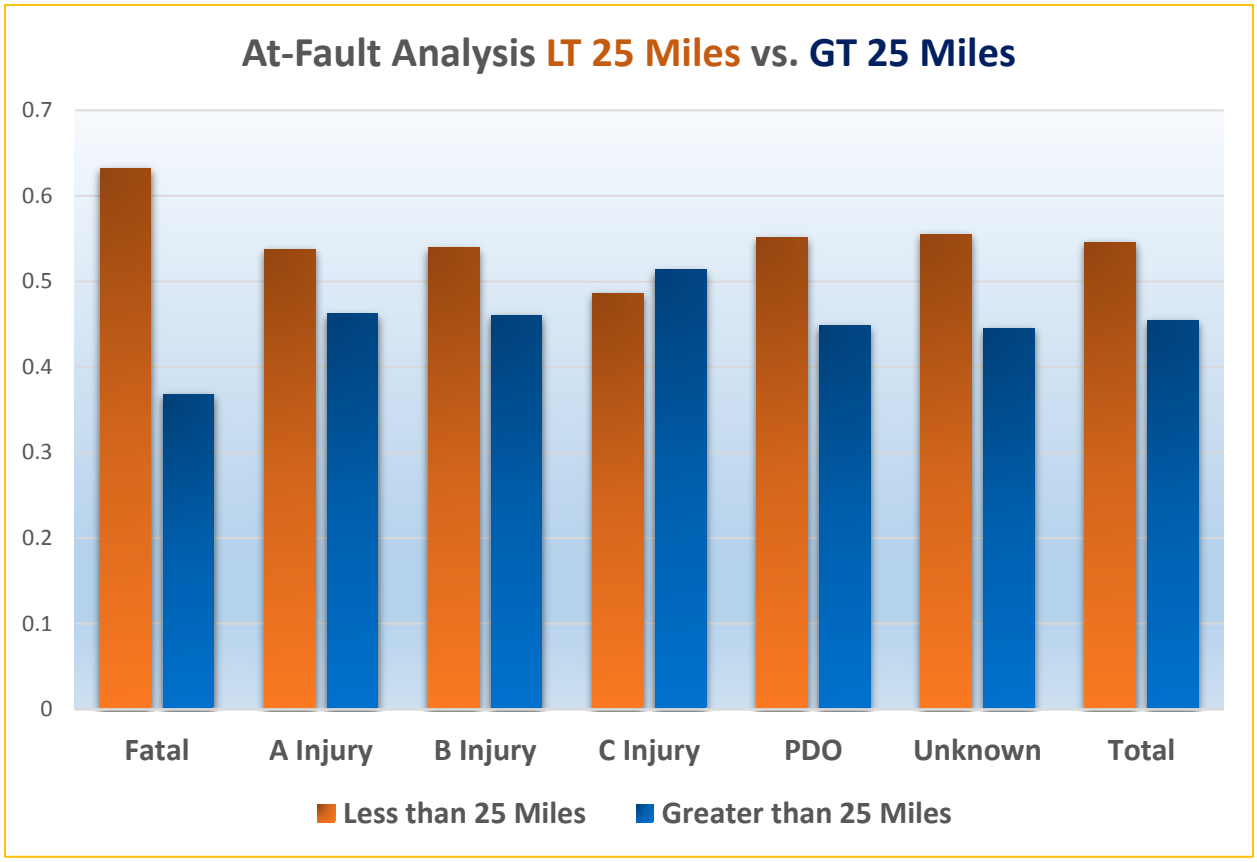


Local (<25 Miles) or Away From Home?

True or False? *Fatality crashes are most often caused by the driver furthest away from home? This is clearly false from the chart below.* Recent issues with distractions (e.g., cell phones and texting) could be the cause in that they are more apt to be used close to home. However, this does not hold up consistently for A Injury, B Injury or PDO crashes. The following Primary Contributing Circumstances had the highest over-representations for the Less than 25 Miles fatal crashes, which had a total of 297 fatal crashes over the five year period:

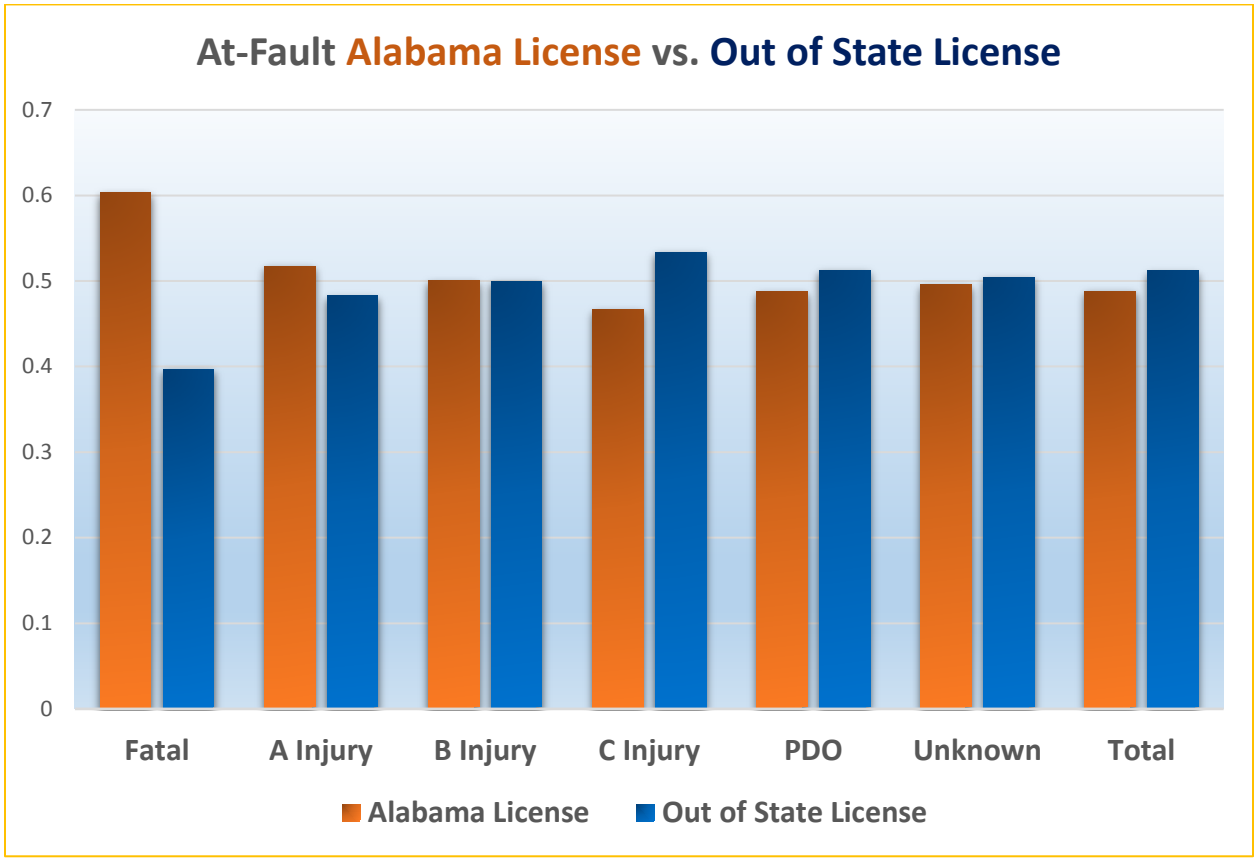
PRIMARY CONTRIB CIRC	NUMBER	PERCENT
E Failed to Yield or Ran Stop Sign	41	17.17
Traveling Wrong Way/Wrong Side	27	9.09
DUI (Alcohol or other Drugs)	50	16.95
E Crossed Centerline	24	8.08
E Aggressive Operation	20	6.73

All impact speeds above 51 MPH over-represented, and 34 crashes were recorded to be speed related. Seatbelt deficiencies were noted in 36.49% of these crashes. State and Federal highways had about twice their expected proportion as did rural areas in general; Interstates were as expected but County and Municipal roads were under-represented. Driver ages of 26-30 were generally over-represented, which would indicate social drinking correlation; however, contrasted with this, almost all of the ages above age 57 years were significant in their over-representation, suggesting that these are the drivers who are most apt to be driving close to home.



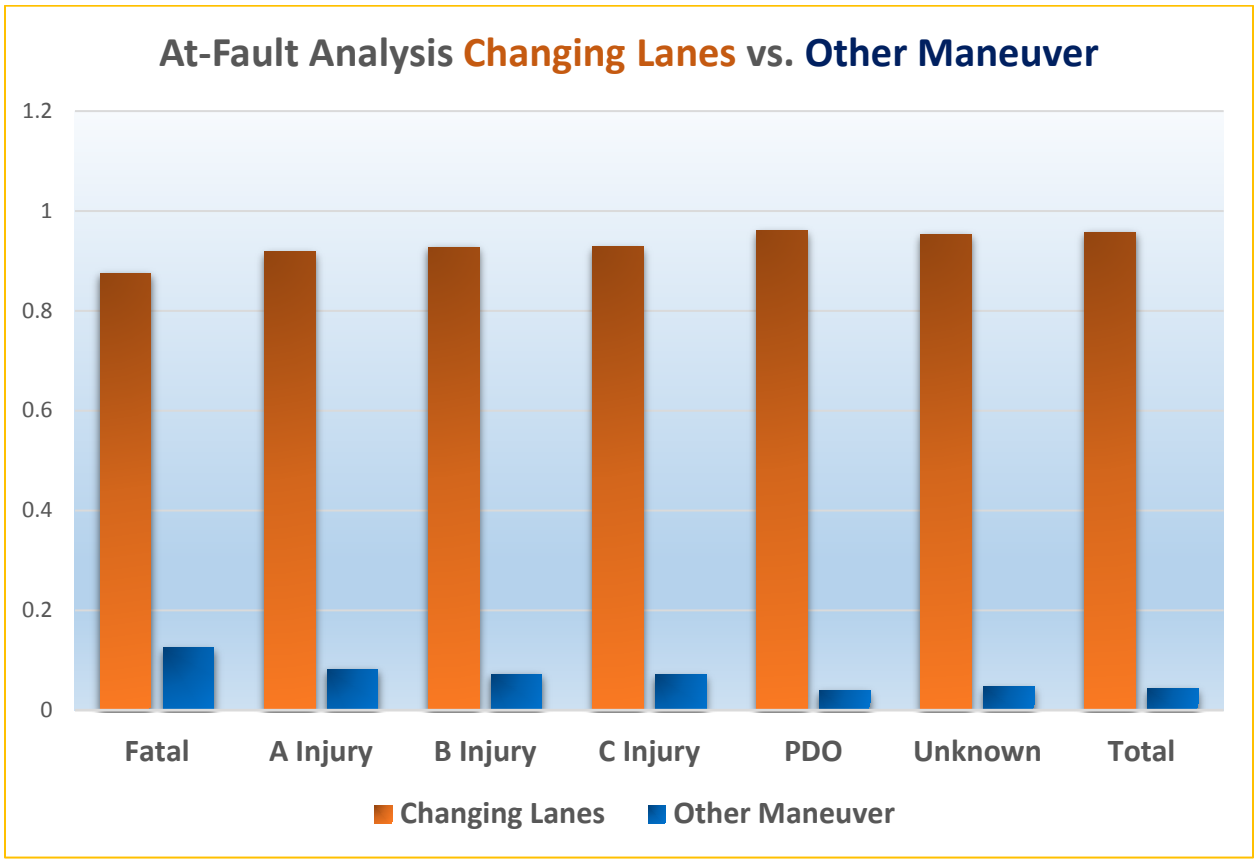
In State or Out of State?

True or False? *These results are practically identical to those for greater than or less than 25 miles from home.* False; some results are close, but there are some notable inconsistencies. Fatal and A Injury results are quite comparable for the two comparisons, for much the same reasons as were stated above for the "less than 25 miles" subset. Unlike the distance comparison, B Injury causes are essentially the same for Alabama and out-of-state drivers. C Injuries are about the same for the two comparisons, while there is quite a bit of difference in the PDO and the total.



Making Lane Change or Not?

True or False? *If you are involved in a crash while changing lanes, your chance of being the at-fault driver is over 90%.* If the chart below does not make us wary of making lane changes, nothing will. Officers assign fault to the driver changing lanes in over 90% of all such crashes. The only exception was fatal crashes, which had fault assigned 87.5% of the time. It seems clear that the old adage "if you are the vehicle behind you are automatically at fault" no longer applies, since rarely would this vehicle be making a lane change (although it is possible). We are not questioning the officers' opinions, since this conclusion seems to be quite intuitive. If there is any doubt at all about someone in your blind spot or the vehicle coming up on you from behind, just do not make the lane change. Also, on three lanes, don't just look for clearance in the middle lane. Look for someone two lanes over trying to occupy the same space as you are moving into. Let's not try to defy basic physics, which tells us that two objects cannot occupy the same space at the same time.



Frequency of Crashes by Severity

The table below shows most the crash types considered above and how they compare with regard to overall crash frequency and severity. It is sorted so that the crash type category with the highest number of fatal crashes is listed first, descending to the crash type category with the lowest number of fatal crashes listed last. Categories were defined by a group of traffic safety professionals within Alabama who developed the State's Strategic Highway Safety Plan (SHSP). Each crash type category lists the crashes that happened for that particular category during calendar year 2016. *The categories given in this table are not mutually exclusive (e.g., you could have an impaired driving crash that also involved speeding).* However, they still tend to demonstrate the relative criticality of that particular category.

The severity classifications in the table are quite significant, and the arrangement is generally by fatal crashes. The percentages given are for the respective severity classification only; thus, these percentages represent the relative severity of the crash category, and this can be used to compare the crash categories by severity. For example, it might be noticed that the severities of pedestrian, motorcycle and railroad crashes are significantly higher than most other categories, as is also true for those crashes in which the driver was not properly restrained.

Table 1: Top Fatality Causes Alabama CY2016 Data

	Crash Type (Causal Driver)	Fatal	Fatal %	Injuries	Injury %	PDO	PDO %	Total
1.	Restraint Deficient*	464	4.38%	4,304	40.66%	5,818	54.96%	10,586
2.	Impaired Driving	232	3.91%	2,342	39.51%	3,353	56.57%	5,927
3.	Speeding	207	5.47%	1,720	45.48%	1,855	49.05%	3,782
4.	Obstacle Removal	169	2.69%	2,136	34.05%	3,969	63.26%	6,274
5.	Ped., Bicycle, School Bus	124	7.44%	957	57.44%	585	35.11%	1,666
6.	Pedestrian	120	14.69%	658	80.54%	39	4.77%	817
7.	License Status Deficiency	115	1.69%	2,216	32.54%	4,479	65.77%	6,810
8.	Mature – Age > 64	115	0.81%	3,126	22.12%	10,893	77.07%	14,134
9.	Motorcycle	108	6.41%	1,109	65.82%	468	27.77%	1,685
10.	Youth – Age 16-20	107	0.45%	5,405	22.78%	18,219	76.77%	23,731
11.	Distracted Driving	92	0.51%	4,742	26.43%	13,109	73.06%	17,943
12.	Non-pickup Truck Involved	56	1.09%	865	16.80%	4,228	82.11%	5,149
13.	Utility Pole	46	1.82%	937	37.15%	1,539	61.02%	2,522
14.	Fail to Conform to S/Y Sign	32	0.42%	2,187	28.88%	5,355	70.70%	7,574
15.	Vehicle Defects – All	21	0.54%	884	22.77%	2,978	76.69%	3,883

16.	Construction Zone	18	0.61%	653	22.26%	2,263	77.13%	2,934
17.	Vision Obscured – Env.	14	0.89%	428	27.14%	1,135	71.97%	1,577
18.	Fail to Conform to Signal	10	0.21%	1,455	31.18%	3,202	68.61%	4,667
19	Child Restraint Deficient*	5	0.18%	348	12.26%	2,485	87.56%	2,838
20.	Railroad Trains	5	7.81%	33	51.56%	26	40.63%	64
21.	Bicycle	4	0.84%	207	43.49%	265	55.67%	476
22.	School Bus	0	0.00%	96	16.33%	492	83.67%	588
23.	Roadway Defects – All	0	0.00%	28	24.14%	88	75.86%	116

* All categories list number of crashes except for the “Restraint Deficient” and “Child Restraint Deficient” categories. The restraint categories cannot accurately be measured by number of crashes so they list number of unrestrained persons for each severity classification.