CARE IMPACT Study of Traffic Crashes Involving Aggressive Operation 2017-2021 Data

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1.0 Introduction and Summary of Findings

This introductory section consists of the following parts:

- Recommendations
- The definition of the broad categorization of Aggressive Driving (AD), which was the primary focus of a former study.
- The definition of the much narrower Aggressive Operation (AO), which meets the FMCSA specification for what is technically called "aggressive operation." It is important that the distinction between these two classifications is understood.
- A summary of findings section, which essentially serves as an executive summary for the findings of this study.

1.1 Recommendations

The following is a list of recommendations that resulted from this study of Aggressive Operation (AO):

- Refine and provide training on the definition of Aggressive Operation (AO).
- Eliminate Aggressive Driving (AD) as a competitive item so that there is no confusion as to the distinction between AO and AD.
 - Refine the definition of Aggressive Operation (AO) so that it is more effective in surfacing crashes in which true aggression is involved.
 - For purposes of crash records, eliminate AD and use the AO attribute "Officers' Opinion of Aggressive Operation." Rationale: the officer at the scene can best judge if either or both of the drivers have aggressive attitudes that could have affected their driving. This should be considered as an "officers' opinion" question like the current alcohol, drugs and distracted driving opinions in that there should be no inference that the officer will have to prove his opinion by any scientific means. While both false positives and negatives will occur, this attribute will still be extremely valuable in creating a subset of crashes in which driver aggression is likely, and using this subset to improve studies like the current one.
- Train officers on those crash characteristics that should most likely result in a positive AO finding. See Summary of Findings: Crash Characteristics.
- Recognize the difference between AO and alcohol/drugs problems (ID), and generally categorize in one or the other, with "ties" going to ID.
- Train officers on severity factors, but specifically to be aware that AO could be more of a factor in crashes with higher impact speeds.
- Inform officers in those counties where AO crashes were found to be over-represented, and train them on the results of the detailed analyses that were done for these counties.
- Officers should be particularly cognizant of the fact that AO increases on a relative basis in good weather, and in the absence of intersections.

Recommendations categorized by IMPACT analysis results:

- Crash Characteristics
 - C015-Primary Contributing Circumstance. Officers should recognize the high correlation of AO with DUI, Over Speed Limit, Improper Passing, Other Improper Action, Ran off Road, and Driving too Fast for Conditions. It may be impossible to determine if AO caused any of these items, or if these items may have caused the AO. However, being aware of the correlations could be helpful in designing AO crash countermeasures.
 - C202-CU Contributing Circumstances. This display provides additional correlative attributes that should be considered in addition to those above.

- C129-CU Vehicle Maneuvers. The largest contributors to creating AO were Overtaking/Passing and Leaving the Main Road. Officers should be cognizant of the areas where such actions frequently occur.
- C023-Manner of Crash. Manner of crash highest Max Gain and frequency was Single Vehicle Crash (2,224 Max Gain). Sideswipe-Same Direction was second with a Max Gain of close to 800. Single vehicle crashes would result when either the cause or the victim of AO distracts from safe operation. Sideswipe-Same Direction is an issue that could be related to where two vehicles are not seeing or perceiving of their position relative to each other.
- C017-First Harmful Event. Although under-represented, Collisions with Vehicle in Traffic (multi-vehicle crashes) are by far the greatest First Harmful Event, and the same recommendations as given above for Manner of Crash apply.
- C203-CU First Harmful Event Location. The most over-represented locations [Roadside, Shoulder, Outside of Right-of-Way, Off Roadway, Off Roadway - Location Unknown.] may be indicative of AO. However, there is little in the way of prevention that officers can do before these crashes occur.
- C051-Number of Vehicles. No recommendation.
- C056-Number of Pedestrians. No recommendation.
- Time Characteristics
 - C003-Year. The recorded increase in AO crashes of about 19% over the five-year period (from 2017 through 2021) should create a greater awareness of this potential problem. This needs to be watched carefully to see if it continues in to 2022 and beyond.
 - C004-Month. This was not a great enough differential to warrant any special activity.
 - C008 and C029-Time of Day. Officers should be looking for evidence of AO in the early and late night hours.
 - C006-Day of the Week. In addition to the time of day, over-representation on weekends (Saturday and Sunday) provide increased evidence to the correlation of AO with the use of drugs and alcohol.
- Driver Characteristics (Demographics and Behavior)
 - C020. Distracted Driving Officer's Opinion. There is little correlation of DD with AO. These should probably be treated as two separate offences.
 - C107-CU Driver Raw Age Frequency Distribution. The 19-31 age grouping is unlike most others where a fairly narrow target age group can be identified. It is good to recognize the relative younger ages (above ages 16-18), up until the early 40s, are those most susceptible to AO.
 - C121. CU Driver Condition. Usually the "Emotional (Depressed/Angry/Disturbed)" attribute would be assigned after AO is determined. The relationship between them is obvious. There is little that can be recommended here since this

characteristic cannot be assigned until the offender is apprehended. The relationship of alcohol and drugs is quite important, and it will be discussed immediately below.

- C122/C123-CU Driver Officer's Opinion Alcohol/Drugs. There is an excellent chance that, in any given crash, AO may have been brought on either but alcohol or some other drug. Officers should investigate both at the same time. We would expect that the influence of drugs/alcohol would come first and that AO would be one symptom of it. Important to realize that this is not talking about all cases of AO some are totally independent of Alcohol/Drugs. But the correlation between them is quite significant.
- C213. CU Vehicle Usage. No recommendations.
- C104-CU Left the Scene. AO should be suspected of anyone who leaves the scene of a crash due to the large over-representation of AO drivers leaving the scene. Potential cause: a desire to escape after recognition of fault.
- C109-CU Driver Gender. It is quite important that the major countermeasures be targeted at male drivers both because of their relative frequency and the severity of their crashes, when compared with female AO drivers. The male and female characteristics listed below will provide an initial basis for developing these countermeasures.
- Male vs. Female Characteristics. The following were the key items of difference between male driver caused AO crashes and the AO crashes where females were the causal drivers:
 - Male AO driver Locale is over-represented in open country and rural areas; about 25-30% higher than female. This was also reflected in male over-representations on County and Rural roads.
 - Male AO drivers are over-represented in DUI, Over Correcting/Over Steering, Ran Off Road, Ran Stop Sign, and Over Speed Limit.
 - The male driver AO crash has a First Harmful Event 1.754 times as likely to be a rollover than that of female AO drivers.
 - AO male drivers were dramatically over-represented driving pick-ups by an odds ratio of 3.127 times what would be expected in the comparison with female AO drivers.
 - Males were recorded to be in a condition that was Under the Influence of Alcohol or Drugs at a proportion 58.4% higher than AO Females.
 - Males tend to be driving older vehicles than female AO drivers.
 - In cars, males get more aggressive in two-door models (odds ratio 2.0) than their female counterparts.
 - Male caused Fatal Injury crashes were very significantly over-represented by a proportion 2.813 times that of females. Suspected Serious Injury was also significantly over-represented (32.3% higher proportion than females).
 - Most all of the severity differences listed above are heavily related to increased speed at impact.

- Failure to use seatbelts for men is about 1.701 times that of women, which further explains their relatively higher number of fatal crashes.
- Severity Characteristics
 - C025-Crash Severity. The higher severity of AO crashes warrants giving more resources to their countermeasure development and implementation.
 - C224-Estimated Speed at Impact. Effectively, this finding confirms the speed Selective Enforcement potential for reducing AO crashes. With the exception of failure to use restraints, the greater severities of AO crashes are rarely if ever caused by anything other than excessive speed. Often the two causes occur together since they are both the result of risk acceptance. See the next item.
 - C323-CU Driver Safety Equipment. A primary cause of fatal crashes (along with high impact speeds) is a failure to use restraints. The IMPACT analysis indicated that AO drivers are over six times (6.083) the proportion than non-AO for failure to be restrained. The probability of the unrestrained AO driver being killed is one in 10.6 crashes, while the rate of properly restrained AO drivers was found to be about one in 81 crashes. The increased probability of fatality is close to eight times (7.64) higher when not properly restrained. The recommendations for both restraints and speed are to further reinforce the programs currently in effect, perhaps demonstrating with them the issues with AO.
 - C122 and 123. Driver Officer Opinion Alcohol/Drugs. Past research has found that those driving under the influence of alcohol and/or drugs had dramatically less use of proper restraints
 - See Sections 4.4 and 4.5.
 - C227-CU Vehicle Towed. No recommendations.
 - C060-Number Killed. No recommendations.
 - C058-Number Injured (Non-Fatal). No recommendations.
 - C038-Adjusted EMS Arrival Delay. If there were some way for disabled vehicles to broadcast their locations, this would be of great value in decreasing the response time. This is a high-tech countermeasure that should be worked toward for all crashes.
- Geographical Characteristics
 - C010-Rural or Urban. See C038 (Section 5.7) above.
 - C031-Locale. See C038 (Section 5.7) above.
 - C011-Highway Classification. Countermeasures here are to make all of the roads, especially county roads, more crash resistant and more crash worthy. Programs to this effect are in place, but more resources are required to make any major differences.
 - C110-Driver Residence Distance. No Recommendations.
 - C001-County. See the next item for a list of attributes that might be helpful in developing countermeasures that address specific high-AO-crash county areas.

- Seven Highest Max-Gain Counties. These special IMPACT runs were performed to begin to answer the question "What is it about these seven counties that distinguish them from the others?" The following is a summary of those differences:
 - AO crashes were highly over-represented on the municipal roadways in these counties.
 - Urban areas were over-represented as well as "less than 25 miles from home" in these counties.
 - Intersections and collisions with vehicles in traffic and other characteristics that correlate with urban driving, including shorter EMS arrival times.
 - Typical urban primary contributing circumstances were found: following too close, improper lane changes, running traffic signals, and failure to yield.
 - Age seemed to be the largest disparity in AO driver demographics. Ages 16-23 were significantly over-represented in the bad counties, reflecting the overall comparison given for Driver Raw Age (C107). All other ages were either under-represented of not significantly over-represented.
 - Females were over-represented in the bad county AO crashes by a very small but significant 1% (Odds Ratio: 1.022).
 - More driving close to home was being done for the AO crashes in the bad counties (71.6%) as opposed to the control comparison (67.1%), which probably reflects the gender differences.
 - Unemployment of involved drivers was higher in the bad AO counties; it was 15.1% in the bad counties and 11.2% for the others, a significant difference.
 - Alcohol impairment was significantly higher in the bad AO counties, at a proportion about 32% higher than in the comparison counties. It was effectively the same in the proportion comparison for drug impairment, although, as usual the numbers for drug impairments were considerably smaller. In the AO bad counties, AO drivers had about 5,512 cases of Alcohol impairment, while the number impaired by drugs was just 1,928.
 - Most of the other attributes that were over-represented in this comparison were also those over-represented in the AO vs. non-AO comparisons.
- Vehicle Characteristics
 - C101-CU Vehicle Type. Officers working Selective Enforcement should be aware of the vehicle types that are typical of AO crashes so that they can give them special attention if they find them in violation of any laws.
 - C208-CU Model Year. Since drivers who cause AO crashes are typically driving older model vehicles, this is another factor that law enforcement involved with enforcement should be aware of and perhaps looking for.
- Roadway Environment/Pavement Characteristics

- C412-Traffic Lanes. This calls for additional enforcement on two-lane roadways; e.g., county roads were found to be over-represented.
- C408-CU Vision Obscured by. Perform high-crash analysis and determine for those hot-spot locations if there are engineering or signage countermeasures that can help to address these issues.
- C030-Weather. A public service message might be developed to commend those who improve their concern for safety in poor weather. While the AO driver should not be held up as an example, certain favorable characteristics might be reinforced that have reduced the AO crashes during inclement weather.
- o C403-CU Roadway Condition. See C030 above.
- C022-Type of Roadway Junction. No recommendations.
- o C027-At Intersection. No recommendations.
- C407-CU Roadway Curvature and Grade. Perform hot-spot analysis to find which of the curve configurations are causing the most crashes (AO or not). Address those that are significantly higher in frequency than others with engineering or signage countermeasures, including reduced speed limits.
- C409-CU Traffic Control. Effectively the same approach as C407 immediately above.
- C415-Workzone Related. No special countermeasures for AO; continue to improve the safety of workzone-related crash locations.

1.2 Definition of Aggressive Driving

Filter Used for Aggressive Driving in 2017 Analyses

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	-	ated Crash Data: Primary Contributing Circumstance is equal to E Ran Stop Sign
	-	ated Crash Data: Primary Contributing Circumstance is equal to E Disregarded Traffic Sign other than Stop Sign
	-	ated Crash Data: Primary Contributing Circumstance is equal to Over Speed Limit
	-	ated Crash Data: Primary Contributing Circumstance is equal to Driving too Fast for Conditions ated Crash Data: Primary Contributing Circumstance is equal to Made Improper Turn
	-	ated Crash Data: Frimary Contributing Circumstance is equal to Made improper or No Signal
	-	ated Crash Data: Frimary Contributing Circumstance is equal to Traveling Wrong Way/Wrong Side
	-	ated Crash Data: Primary Contributing Circumstance is equal to Followed too Close
: :	-	ated Crash Data: Primary Contributing Circumstance is equal to Improper Passing
	-	ated Crash Data: Primary Contributing Circumstance is equal to Improper Lane Change/Use
	-	ated Crash Data: Primary Contributing Circumstance is equal to Failed to Yield the Right-of-Way
	-	ated Crash Data: Primary Contributing Circumstance is equal to E Other Failed to Yield
: :	-	ated Crash Data: Primary Contributing Circumstance is equal to E Wrong Side of Road
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- One or mor	e of the following are	true (OR)
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··· 2013-2	017 Alabama Integra	ated Crash Data: CU Contributing Circumstance is equal to E Ran Traffic Signal
	-	ated Crash Data: CU Contributing Circumstance is equal to E Ran Stop Sign
	-	ated Crash Data: CU Contributing Circumstance is equal to E Disregarded Traffic Sign other than Stop Sign
	-	ated Crash Data: CU Contributing Circumstance is equal to Over Speed Limit
	-	ated Crash Data: CU Contributing Circumstance is equal to Driving too Fast for Conditions
	-	ated Crash Data: CU Contributing Circumstance is equal to Made Improper Tum
	-	ated Crash Data: CU Contributing Circumstance is equal to Improper or No Signal
	-	ated Crash Data: CU Contributing Circumstance is equal to Traveling Wrong Way/Wrong Side
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	e of the following are	
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		ated Crash Data: V2 Contributing Circumstance is equal to Followed too Close
	-	ated Crash Data: V2 Contributing Circumstance is equal to Improper Passing
		ated Crash Data: V2 Contributing Circumstance is equal to Improper Lane Change/Use
	-	ated Crash Data: V2 Contributing Circumstance is equal to Failed to Yield the Right-of-Way
	-	ated Crash Data: V2 Contributing Circumstance is equal to E Other Failed to Yield
	-	ated Crash Data: V2 Contributing Circumstance is equal to E Wrong Side of Road
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95 records sele	and her als to fille an	

The basis for the filter given above was proposed in the SHSP meetings of 2017. It was felt that any of these items would indicate Aggressive Driving (AD) if it appeared in any of the three contributing circumstance attributes indicated in the filter. There are 16 values listed within each of the attributes, one of which is Aggressive Operation (AO). Since any of these values could, by themselves, indicate driver aggressive behavior, this filter was used for purpose of the earlier (2017) analysis. *However, this broad definition will not be used in this study in favor of the Aggressive Operation definition approved by NHTSA*. The previous AD definition was so broad that it did not produce usable significant results in many of the IMPACT analyses.

An issue arises since few people, even in the traffic safety community, use the term Aggressive Operation. The term Aggressive Driving is far more predominant. It is not our intent to try to influence terminology being used. It would seem to be more practical to just abandon the technical definition of Aggressive Driving given above and to use the definition of Aggressive Operation to apply to both AO and AD. *Technically, in eCrash and on the crash report form, the term used is Aggressive Operation, and that is what we will continue to use here.*

1.3 Definition of Aggressive Operation (AO)

AO is not determined by filtering of other variables (e.g., contributing circumstances) as was true with AD. It is determined as an opinion of the reporting officer, and the criteria for the officer specifying AO as the contributing circumstance is as follows:

In all cases for which there are <u>multiple contributing circumstances</u> (i.e., no <u>one</u> value can be entered to adequately describe what contributed to the crash), reporting officers are to select the Aggressive Operation (AO) code. This is to hold true for Primary Contributing Circumstanced (C015), Causal Unit (CU) Contributing Circumstances (C202), and/or V2 Contributing Circumstance (C542).

This entry in eCrash will cause the "Aggressions Operation" value to be assigned to the attribute. The Aggressive Operation filter used for analyses will then include this crash in the AO datasets. The rationale for this is that typically contributing circumstance indicate faults on the part of the causal driver. *The decision-makers felt that if more than one contributing circumstance, then there would be a good chance that the driver was not just making a mistake, but was aggressively acting to break the rules.* The following is the formal logical filter definition of Aggressive Operation within CARE:

Filter Logic: Aggressive Operation	_		×
Logic Tree Logic Text			
- 2017-2021 Alabama Integrated ((OR) Crash Data: C015: Primary Contributing Circumstance is equal to E Aggressive (Crash Data: C202: CU Contributing Circumstance is equal to E Aggressive Ope Crash Data: C542: V2 Contributing Circumstance is equal to E Aggressive Oper	ration	
15510 records selected by this filter.			

The following gives the five-year (2017-2021) contribution to the total AO dataset from each of its constituent attributes:

Primary Contributing Circumstanced (C015)	13,594
Causal Unit (CU) Contributing Circumstances (C202)	11,411
V2 Contributing Circumstance (C542).	<u>831</u>
TOTAL	25,836

This total is 10,326 cash records *greater* than the actual total in the AO dataset, which is **15,510** crash records. This indicates that these 10,326 crash records were entered in at least two of the three attributes that accept the AO value.

1.4 Summary of Findings

The comparisons in this document are between those crashes that were indicated by the filter defined above to be AO involved crashes against those that were not found to be such (non-AO). The results of these analyses enable the characteristics for AO crashes to surface so that traffic safety professionals can determine their magnitude and optimize aggressive operation safety programs so that emphasis is placed on the most important factors.

The following summary is a list of conclusions that were obtained from the major focus that was defined as Aggressive Operation (AO) compared to non-AO crashes.

- Crash Characteristics
 - C015-Primary Contributing Circumstance. The removal of AO from this display enables those attributes that were most correlated with AO to be identified. Those with a Max Gain greater than 20 crashes included: DUI, Over Speed Limit, Improper Passing, Other Improper Action, Ran off Road, and Driving too Fast for Conditions.
 - C202-CU Contributing Circumstances. This analysis was similar to that given for C015. It is in frequency order for all items. It gives a good idea as to those items that are correlated with AO.

- C129-CU Vehicle Maneuvers. The largest Max Gains are in Overtaking/Passing (Odds Ratio =7.697) and Leaving Main Road (Odds Ratio 4.218).
- C023-Manner of Crash. Manner of crash highest Max Gain and frequency was Single Vehicle Crash (2,224 Max Gain). Sideswipe-Same Direction was second with a Max Gain of close to 800.
- C017-First Harmful Event. Collisions with vehicle in traffic (multi-vehicle crashes) are by far the greatest First Harmful Event, accounting for over 50% of the AO crashes, yet under-represented compared with 69.58% of the non-AO. The over-represented items clearly indicate a loss of control as a common element.
- C203-CU First Harmful Event Location. Reflecting the large number of "vehicle in traffic" the vast majority of crashes occur on the roadway as opposed to running off the road despite this item being the most under-represented. The following were the most over-represented: Roadside, Shoulder, Outside of Right-of-Way, Off Roadway, Off Roadway - Location Unknown.
- C052-Number of Vehicles. Single vehicle crashes are over-represented with an Odds Ratio of 1.708. Multiple vehicle crashes above two vehicles are generally all over-represented, although 2-vehicle crashes were under-represented.
- C057-Number of Pedestrians. AO crashes are very close to non-AO crashes in pedestrian involvement.
- Time Characteristics
 - C003-Year. Year is of interest because it shows that AO crashes are increasing while their non-AO counterparts are decreasing. The AO increase from 2017 to 2021 was about 19%. Crashes in general went down during this five-year period.
 - C004-Month. The cooler months of October through February are all under-represented. The warmer summer months tend to be over-represented, which could point to heat as a potential aggravating source.
 - C008-Time of Day. The clear pattern is for AO crashes to be over-represented in late night hours as opposed to during the day. This correlates very positively with the use of drugs and alcohol.
 - C029-Lighting Conditions. The results here are consistent and tend to reinforce those for C008 immediately above. AO had all of the darkness categories overrepresented.
 - C006-Day of the Week. Over-representation on weekends (Saturday and Sunday) add increased evidence to the correlation of AO with the use of drugs and alcohol.
 - Day of the Week by Time of Day. No hasty conclusions should be drawn from the color coding of this cross-tabulation. AO crashes showed the classic over-representations on weekends that is found for alcohol and drugs.
- Driver Characteristics (Demographics and Behavior)
 - C020. Distracted Driving Officer's Opinion. Distracted driving is involved in only about 10.4% of aggressive driving crashes, as compared to 27.7% of all non-

aggressive crashes. This is probably because the reporting officers in aggressive driving crashes consider other things of greater importance. Other distractions outside of the vehicle seem to be of greatest concern, and perhaps related to the presence of the aggression.

- C107-CU Driver Raw Age Frequency Distribution. Significant over-representations in ages 19-31. Over-representations continue until age 41, although not significant. This is above the younger age's group's normally high frequency when compared to all other ages.
- C121. CU Driver Condition. The "Emotional (Depressed/Angry/Disturbed)" value is significantly over-represented with over 12 times the proportion than what would be expected from non-AO crashes. However, it is out-numbered by Under the Influence of Alcohol/Drugs.
- C122-CU Driver Officer's Opinion Alcohol. AO cases had close 3.115 times their expected number of positives for alcohol, when compared to the non-AO subset. The alcohol drug is often said to have a calming effect, but there is no evidence of that here.
- C123-CU Driver Officer's Opinion Drugs. Although the number of positives here is about 58% of that of alcohol, the remaining information from this attribute is quite comparable to that for alcohol. For AO, drugs were indicated over 5 times (5.428) what would be expected for non-AO. The reasons here are quite the same as given for alcohol in the previous item.
- C213. CU Vehicle Usage. Overwhelmingly personal use (96.47% after removal of superfluous items), with the over-represented times indicating that the major personal usage is in commuting. Items with less than 10 AO occurrences were removed as were others that had no relevant meanings (e.g., Unknown, Other, etc.). The vast majority of those remaining (96.47%) were Personal Use. Generally, no vehicle usage other than Personal Use can be seen to cause AO.
- C104-CU Left the Scene. The over-representation found for AO was one of the largest of any crash cause, which might be expected of AO drivers who do not think they should be held accountable for these crashes. AO was about to be almost (3.689) times the expected proportion of left-the-scene crashes in the non-AO control subset.
- C109-CU Driver Gender. Males are significantly over-represented in their proportion of AO crashes, with over 30% more than expected (Odds Ratio 1.316). Provision must be made in countermeasure development to address not only the over-representation, but also the much higher proportion of males compared directly with females (74.55% as opposed to 24.45%).
- Driver Gender by Severity. Consistently with AO, this indicated a dramatic overrepresentation of male aggressive driving fatal crashes, which indicates that female aggressive driving is quite different from male aggressive driving. This is considered in more detail in the next item.
- Male vs. Female Characteristics. The following were the key items of difference between male driver AO crashes and the AO crashes where females were driving:

- Locale is over-represented in open country and rural areas; about 25-30% higher than female. This was also reflected in their over-representations on County and Rural roads.
- Male AO drivers are over-represented in DUI, Over Correcting/Over Steering, Ran Off Road, Ran Stop Sign, and Over Speed Limit.
- The male driver AO crash has a First Harmful Event 1.754 times as likely to be a rollover than that of female AO drivers.
- AO male drivers were dramatically over-represented driving pick-ups by an odds ratio of 3.127 times what would be expected.
- Males were recorded to be in a condition that was Under the Influence of Alcohol or Drugs at a proportion 58.4% higher than AO Females.
- Males tend to be driving older vehicles than female AO drivers.
- In cars, males get more aggressive in two-door models (odds ratio 2.0) than their female counterparts.
- Most all of the severity differences listed above are heavily related to increased speed at impact.
- Failure to use seatbelts for male AO drivers is about 1.701 times that of female AO drivers, which further explains their relatively higher number of fatal crashes.
- Severity Characteristics
 - C025-Crash Severity. There can be no doubt that AO crashes result in relatively more deaths and incapacitating injuries than do non-AO crashes. The fatality probability is almost three times (2.813) times higher for AO crashes than for non-AO, resulting in an additional of 223 fatal crashes over the five-year period. See the next item for speed at impact that is the major causal factor.
 - C224. Estimated Speed at Impact. This result confirms the speculation that impact speeds for AO crashes are significantly higher, on average, than their non-AO counterparts. Especially high over-representations occur at most speeds above 71 MPH.
 - C227-CU Vehicle Towed. With the results given above, it would be expected that the proportion towed would be much higher. For AO the over-representation because of disabled vehicle was about 32.5% higher, and it was close to three times (2.672)) being towed for other reasons (e.g., inebriated driver).
 - C060-Number Killed. Single fatality crashes were significantly under-represented (Odds Ratio=0.956), while all multiple fatality crashes were over-represented. This is highly correlated to the increased speed at impact proportion.
 - C058-Number Injured (Non-Fatal). Multiple injuries followed the same pattern as multiple fatalities; all but No Injuries were significantly over-represented. AO crashes had both single and multiple injury cases being significantly over-represented.
 - C038-Adjusted EMS Arrival Delay. All delay times over 15 minutes are overrepresented. This is probably due to the geographical distribution of the AO crashes, which will be considered next.

- Geographical Characteristics
 - C010-Rural or Urban. AO crashes are significantly over-represented on rural roads, which probably explains a part of the ambulance delay time findings. It also explains some of the higher speed conclusions.
 - C031-Locale. Residential, Open Country and Manufacturing or Industrial are over-represented. School and Shopping or Business are under-represented. This attribute tends to demonstrate the environment in which AO drivers are most lethal, as does the next.
 - C011-Highway Classification. AO crashes are over-represented on Municipal, County and Interstate roads, but not on any of the others. While all of these differences are significant, the largest differences are on the County, with a 28.4% higher proportion than expected. The frequency numbers tend to give us the idea of where AO drivers tend to allow their aggressiveness to get them into crashes. That ordering is Municipal County, State, Interstate, and Federal.
 - C110-Driver Residence Distance. It appears that drivers have more of a tendency toward AO when they are close to home. AO crashes are significantly over-represented in crashes located Less than 25 Miles.
 - C001-County. Those given in the display are only the significantly over-represented counties. It seems clear that there are certain counties that are over-represented in AO crashes. Further analyses were required to determine the common characteristics that would contribute to these over-representations. The results of that analysis is given in the next item for a sample of the highest Max-Gain Counties.
 - Seven Highest Max-Gain Counties. These special IMPACT runs were performed to begin to answer the question "What is it about these seven counties that distinguish them from the others?" The following is a summary of those differences:
 - AO crashes were highly over-represented on the municipal roadways in these counties.
 - Urban areas were over-represented as well as "less than 25 miles from home" in these counties.
 - Intersections and collisions with vehicles in traffic and other characteristics that correlate with urban driving, including shorter EMS arrival times.
 - Typical urban primary contributing circumstances were found: following too close, improper lane changes, running traffic signals, and failure to yield.
 - Age seemed to be the largest disparity in AO driver demographics. Ages 16-23 were significantly over-represented in the bad counties, reflecting the overall comparison given for Driver Raw Age (C107). All other ages were either under-represented of not significantly over-represented.
 - Females were over-represented in the bad county AO crashes by a very small but significant 1% (Odds Ratio: 1.022).

- More driving close to home was being done for the AO crashes in the bad counties (71.6%) as opposed to the control comparison (67.1%), which probably reflects the gender differences.
- Unemployment of involved drivers was higher in the bad AO counties; it was 15.1% in the bad counties and 11.2% for the others, a significant difference.
- Alcohol impairment was significantly higher in the bad AO counties, at a proportion about 32% higher than in the comparison counties. It was effectively the same in the proportion comparison for drug impairment, although, as usual the numbers for drug impairments were considerably smaller. In the AO bad counties, AO drivers had about 5,512 cases of Alcohol impairment, while the number impaired by drugs was just 1,928.
- Most of the other attributes that were over-represented in this comparison were also those over-represented in the AO vs. non-AO comparisons.
- Vehicle Characteristics
 - C101. CU Vehicle Type. The most over-represented AO vehicles tend to be passenger cars and motorcycles. The most under-represented are pick-ups, SUVs, trucks and mini-vans. Pick-ups were over-represented in the comparison of male and female drivers due to their lack or popularity among women.
 - C208-CU Model Year. The later model years are relatively under-represented in AO crashes. Drivers who cause AO crashes are typically driving older model vehicles.
- Roadway Environment/Pavement Characteristics
 - C412-Traffic Lanes. AO crashes are highly concentrated on two-lane roadways, with a relatively few on One Lane roads. Multiple lane roads above 2-lanes are all under-represented.
 - C408-CU Vision Obscured by. Vision obscurities that arise to the highest criticality seem to be items that might catch the AO driver by surprise, especially Trees/Crops, Hillcrest and Curves in the Road. See the next item for weather considerations.
 - C030-Weather. For AO crashes, clear weather was over-represented, and rain and other potential distractions were significantly under-represented. This tells us that drivers who tend to be AO respect weather conditions and tend to avoid conflicts when weather is a factor. When they are aggravated by the weather they tend not to get aggressive with other drivers.
 - C403-CU Roadway Condition. There is almost a 74.7% smaller proportion of AO crashes than non-AO, which confirms the rain finding above for AO.
 - C022-Type of Roadway Junction. No Special Feature has the highest Max Gain, which shows that AO-inclined drivers tend to avoid conflicts when confronted with complicated roadway configurations. Four-Way Intersections were the most significantly under-represented for AO.

- C027-At Intersection. Intersections were under-represented for AO, which is consistent with the findings above.
- C407-CU Roadway Curvature and Grade. Crashes on downgrades are expected when AO drivers are distracted by aggressiveness and do not realize that the braking distance may have increased by a factor as high as 2 compared to level roadway. Similarly, all of the curve categories were over-represented. This might indicate a greater tendency to conflict on (especially multi-lane) curves.
- C409-CU Traffic Control. The following are the most over-represented (Odds Ratios): No Controls Present (1.222), No Passing Zone (1.110), Lane Control Device (1.312), and Police Officer (2.317). The high over-representation of Police Officers could demonstrate that they are being effectively deployed.
- C415-Workzone Related. AO crashes are under-represented in workzones, their having 96.34% of their crashes there as opposed to 94.17% for the comparable non-AO crashes. Major construction projects are clearly the greatest problem in both the absolute and the relative senses.

The following sections present the IMPACT displays from which the above summary conclusions were drawn. Traffic safety professionals who are involved with aggressive operation countermeasures are urged to consider each of the IMPACT outputs carefully, and if there are any questions, please contact Dr. David Brown at <u>brown@cs.ua.edu</u>.

2.0 Crash Characteristics

2.1 C015 Primary Contributing Circumstance – Most Correlated Items

-	RE 10.2.1.3 - [IMPACT Results - 2017-2021 Alabam	-				tion AND N	Not Primary	-			
E E	le <u>D</u> ashboard <u>Filters</u> <u>A</u> nalysis <u>Impact</u> 2017-2021 Alabama Integrated Crash Data	Locations	_	Window				_			
					aduon						
Order	Max Gain ~ Descending ~	Suppre:	ss Zero-Va	lued Rows		Significa	nce: Over	Representation V Threshold: 2.0			
C015:	Primary Contributing Circumstance	Subset requency	Subset Percent	Other requency	Other Percent	Odds	Max Gain	C015: Primary Contributing Circumstance			
•	DUI	353	25.27	20364	4.13	6.121*	295.333				
	Over Speed Limit	138	9.88	10641	2.16	4.580*	107.867				
	Improper Passing	77	5.51	6642	1.35	4.094*	58.191				
	E Other Improper Action	59	4.22	11829	2.40	1.761*	25.502				
	E Ran off Road	70	5.01	16970	3.44	1.457*	21.944				
	Driving too Fast for Conditions	105	7.52	29876	6.06	1.241	20.396				
	E Swerved to Avoid Vehicle	66	4.72	18659	3.78	1.249	13.161				
	E Crossed Centerline	36	2.58	10240	2.08	1.241	7.002				
	Made Improper Turn	42	3.01	15094	3.06	0.983	-0.744				
	Improper Lane Change/Use	123	8.80	44430	9.01	0.978	-2.818				
	E Ran Traffic Signal	44	3.15	21567	4.37	0.720	-17.074				
	E Failed to Yield Right-of-Way Making Left or U-Turn	51	3.65	31538	6.39	0.571*	-38.310				
	E Failed to Yield Right-of-Way from Stop Sign	33	2.36	36517	7.40	0.319*	-70.410				
	Unseen Object/Person/Vehicle	30	2.15	47633	9.66	0.222*	-104.888				
	Misjudge Stopping Distance	45	3.22	64616	13.10	0.246*	-137.981				
	Followed too Close	125	8.95	101621	20.60	0.434*	-162.773	Sort by Sum of Max Gain			
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		2017	7-2021 Ala	bama Integra	ated Crash	Data					
		C01	15: Primary	Contributing	g Circumsta	ance					
	40										
	20										
	ER	an off Road	ł	Im	proper Lar	ne Change	e/Use	Misjudge Stopping Distance			
	C015: Primary Contributing Circumstance										

The Aggressive Operation (AO) value that appeared in 13,594 cases in this attribute were removed so that the other values that correlate with AO could be more easily visualized. Also, all items with less than 30 occurrences (< 6 per year) were also removed. The remaining items demonstrate the PCC values that the reporting officers felt were more important than AO in this attribute, while still marking AO in at least one of the other two attributes. Those with a Max Gain greater than 20 crashes included: DUI, Over Speed Limit, Improper Passing, Other Improper Action, Ran off Road, and Driving too Fast for Conditions. "Other" two column represent the non-PCC items.

2.2 C202 CU Contributing Circumstance – Most Correlated Items

The following are the PCCs that were not indicated as AO items for C015, but AO was indicated in either C202 (CU CC) or C542 (V2 CC). In other words, these would be C015 PCCs that are correlated with AO indicated by the other CC variables given in C202. In the display below they are being compared with the same values for non-AO but the ordering of the results is by frequency.

CA	RE 10.2.1.3 - [IMPACT Result	ts - 2017-2021	Alabama Inte	grated Crash	Data - Aggress	ive Operatio	on vs. Not Agg	ressive	Operation]	_		×
E Ei	ile <u>D</u> ashboard <u>F</u> ilters	<u>A</u> nalysis <u>I</u>	mpact <u>L</u> oc	ations <u>T</u> oo	ls <u>W</u> indow	<u>H</u> elp					-	ъ×
6 2	2017-2021 Alabama Integrated	l Crash Data		\sim	Aggressive Ope	ration			~ 9	1/	1/2017 ~	12/31/2
Order	Subset Frequency 🗸 De	escending	~	uppress Zero-	Valued Rows		Significance:	Over Re	epresentation	✓ Thres	hold: 2.	0 🖨
C202:	E Aggressive Operation	Frequency	Subset Percent 73.57	Other Frequency 0	Other Percent 0.00	Odds Ratio 0.000	Max Gain) 11411.000	Î	C128: CU Veh C129: CU Veh C130: E CU N	icle Maneuv	ers	
	Not Applicable Unknown Over Speed Limit	593 588 548	3.82 3.79 3.53	75426 45522 11434	10.10 6.09 1.53	0.379 0.622 2.309	-356.990		C201: CU Veh C202: CU Cor C203: CU Firs	ntributing Ci t Harmful E	cumstan /ent Locat	ce ion
	CU is Unknown Driving too Fast for Conditi	345 171 165	2.22 1.10 1.06	28993 24414 33651	3.88 3.27 4.50	0.573	-256.865 -335.809		C204: E CU S C205: E CU S C206: E CU S C207: E CU S	equence of equence of	Events #2 Events #3	
	Improper Lane Change/Use E Ran off Road Followed too Close	165 159 157	1.06	18023 84436	4.50 2.41 11.30	0.236 0.425 0.090	-215.139		C208: CU Mod C209: CU Mak C210: CU Bod	ke Iy (Passeng		nly)
	Improper Passing DUI Other	138 119 117	0.89	5368 15737 20718	0.72 2.11 2.77	1.238 0.364 0.272 0.487	-207.684 -313.084		C211: E CU O C212: CU Lice C213: CU Veh C214: E CU E	ense Tag St icle Usage mergency S	ate	*
0	E Over Correcting/Over St	98	0.63	9686	1.30	0.487	-103.071	<u> </u>	Sort by Sum o	of Max Gain		isplay Fi
			anal	C202: CU	Contributing Ci	rcumstance	E Fatigue					

🖡 CA	RE 10.2.1.3 - [IMPACT Results -	- 2017-2021 Ala	abama Integra	ted Crash Dat	a - Aggressive	Operation vs.	Not Aggressiv	e Operation] — 🗆 🗙				
E E	le <u>D</u> ashboard <u>F</u> ilters <u>A</u>	<u>A</u> nalysis <u>I</u> mp	oact <u>L</u> ocatio	ons <u>T</u> ools	Window I	Help		_ @ ×				
6	2017-2021 Alabama Integrated C	rash Data	~	Agg	ressive Operatio	n		✓ ♥ 1/ 1/2017 ∨ 12/31/2				
Order	Max Gain 🗸 Desc	ending	✓ ✓ Supp	ress Zero-Valu	ued Rows	Signif	icance: Over I	Representation V Threshold: 2.0 🚖				
C129	CU Vehicle Maneuvers	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 👻	C123: CU Driver Officer Opinion Drugs A C124: CU Driver Alcohol Test Type Given				
•	E Overtaking/Passing	1187	7.68	7430	1.00	7.697*	1032.791	C125: E CU Driver Drug Test Type Given				
	E Negotiating a Curve	1240	8.02	33731	4.53	1.771*	539.915	C126: CU Driver Alcohol Test Results C127: E CU Driver Drug Test Results				
	Other	555	3.59	6339	0.85	4.218*	423.435	C128: CU Vehicle Initial Travel Direction				
	Unknown	421	2.72	12913	1.73	1.571*	152.992	C129: CU Vehicle Maneuvers				
	Turning Right	906	5.86	37710	5.06	1.158*	123.332	C130: E CU Non-Motorist Maneuvers				
	E Changing Lanes	1015	6.56	43477	5.84	1.125*	112.638	C201: CU Vehicle Most Harmful Event				
	E Leaving Main Road	162	1.05	2559	0.34	3.050*	108.888	C202: CU Contributing Circumstance C203: CU First Harmful Event Location				
	Making U-Tum	111	0.72	4218	0.57	1.268*	23.456	C204: E CU Sequence of Events #1				
	Legally Parked	6	0.04	541	0.07	0.534	-5.228	C205: E CU Sequence of Events #2				
	Illegally Parked	2	0.01	1070	0.14	0.090	-20.208	C206: E CU Sequence of Events #3				
	E Stopped for Sign/Signal	26	0.17	3001	0.40	0.417*	-36.286	C207: E CU Sequence of Events #4 C208: CU Model Year				
	Stopped in Traffic	21	0.14	2775	0.37	0.365*	-36.595	C209: CU Make				
	CU is Not a Vehicle	5	0.03	2117	0.28	0.114	-38.938	C210: CU Body (Passenger Cars Only)				
	E Entering Main Road	243	1.57	18586	2.49	0.630*	-142.751	C211: E CU Owners State				
	CU is Unknown	345	2.23	28993	3.89	0.573*	-256.748	C212: CU License Tag State				
	Movement Essentially Straight	7603	49.17	379592	50.95	0.965*	-275.405	C213: CU Vehicle Usage C214: E CU Emergency Status				
	Backing	253	1.64	33150	4.45	0.368*	-435.026	C215: E CU Placard Required				
	Tuming Left	1173	7.59	86124	11.56	0.656*	-614.498	C216: E CU Placard Status 🗸				
	Slowing/Stopping	190	1.23	40748	5.47	0.225*	-655.722	Sort by Sum of Max Gain				
	Display Fit 2017-2021 Alabama Integrated Crash Data - Filter = Aggressive Operation vs. Not Aggressive Operation C129: CU Vehicle Maneuvers											
	60 බ 40											
	At 40											
	0	Turr	ning Right		Illegally Par	ked	CU is	Unknown				
				C12	9: CU Vehicle N	laneuvers						

2.3 C129 CU Vehicle Maneuvers

This attribute is quite handy in determining the action of the causal vehicle at the time of the crash. The following items were significantly over-represented in crashes: Overtaking/Passing, Negotiating a Curve, Turning Right, Changing Lanes, Leaving Main Road, and Making U-Turn.

2.4 C023 Manner of Crash

🔋 CA	ARE 10.2.1.3 - [IMPACT Results - 2017	7-2021 Ala	bama Int	egrated C	Crash Data	a - Aggres	sive Opera	ation vs. Not Aggres — 🗆 🗙			
E E	ile <u>D</u> ashboard <u>F</u> ilters <u>A</u> naly:	sis <u>I</u> mp	act <u>L</u> o	cations	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp	_ 8 ×			
¢?	2017-2021 Alabama Integrated Crash E)ata		\sim	Agg	ressive Op	eration	~ 💡			
Order	Max Gain 🗸 Descending	9	<u> </u>	Suppress	Zero-Val	Significan	ce: Over	Representation V Threshold: 2.0			
C023	: E Manner of Crash	Subset equency	Subset Percent	Other equency	Other Percent	Odds Ratio	Max Gain	C021: Distance to Fixed Object			
	Single Vehicle Crash (all types)	5217	33.64	144142	19.29	1.744*	2224	C023: E Manner of Crash			
	Sideswipe - Same Direction	2254	14.53	70174	9.39	1.547*	797.260	C024: School Bus Related			
	Head-On (front to front only)	558	3.60	15790	2.11	1.702*	230.216	C025: Crash Severity C026: Intersection Related			
	Angle (front to side) Same Direction	637	4.11	20471	2.74	1.499*	212.043	C027: At Intersection			
	Other	476	3.07	18713	2.50	1.225*	87.537	C028: Mileposted Route			
•	Sideswipe - Opposite Direction	335	2.16	13843	1.85	1.166*	47.634	C029: National Highway System			
	Non-Collision	148	0.95	5221	0.70	1.366*	39.617	C030: Functional Class			
	Angle Oncoming (frontal)	379	2.44	18078	2.42	1.010	3.719	C031: Lighting Conditions C032: Weather			
	Record from Paper System	0	0.00	19	0.00	0.000	0.000	C033: Locale			
	Causal Veh Backing: Rearto Rear	41	0.26	4382	0.59	0.451*	-49.966	C034: E Police Present at Time of Crash			
	Unknown	52	0.34	4954	0.66	0.506*	-50.840	C035: Police Notification Delay			
	Angle (front to side) Opposite Direc	410	2.64	22711	3.04	0.870*	-61.457	C036: Police Arrival Delay			
	Causal Veh Backing: Rear to Side	54	0.35	13415	1.80	0.194*	-224.4	C037: EMS Arrival Delay C038: Adjusted EMS Arrival Delay			
	Side Impact (angled)	1096	7.07	64942	8.69	0.813*	-252.1	C039: Non-Vehicular Property Damage			
	Side Impact (90 degrees)	641	4.13	68712	9.20	0.449*	-785.3	C040: Agency ORI			
	Rear End (front to rear)	3212	20.71	261580	35.01	0.592*	-2218	Sort by Sum of Max Gain			
) @r 🖉										
	2017-2021 Alabama Integrated Crash Data - Filter = Aggressive Operation vs. Not Aggressive Operation C023: E Manner of Crash										
	0 0 0 0 0 0 0 0 0 0 0 0 0 0										

AO crashes are most over-represented in Single Vehicle Crashes (1.744 times expected), Sideswipe – Same Direction (1.547), Head-On (front to front 1.702), and Angle (front to side) Same Direction (1.499).

1	2017-2021 Alabama Integrated Crash D	ata		\sim	Ag	gressive	Operation		~ 9 😨
Order:	Max Gain ~ Descending		~ 🗹	Supprese	s Zero-Va	l Signific	ance: 0	ver F	Representation V Threshold: 2.0
C017:	First Harmful Event	Subset	Subset	Other quency	Other Percent	Odds Ratio	Max Gain	^	C011: Highway Classifications C012: Controlled Access
•	E Ran Off Road Right	1091	7.03	21978	2.94	2.391*	634.7		C013: E Highway Side
	E Ran Off Road Left	714	4.60	12187	1.63	2.822*	461.0		C015: Primary Contributing Circumstance
	E Evasive Action (Swerve/Brake)	429	2.77	5875	0.79	3.518*	307.0		C016: Primary Contributing Unit Numbe
	Overtum/Rollover	424	2.73	6579	0.88	3.105*	287.4		C017: First Harmful Event C018: Location First Harmful Event Rel t
	Collision with Tree	516	3.33	14925	2.00	1.665*	206.1		C019: E Most Harmful Event
	E Collision with Curb/Island/Raised	253	1.63	3201	0.43	3.807*	186.5		C020: E Distracted Driving Opinion
	E Crossed Centerline	287	1.85	4841	0.65	2.856*	186.5		C021: Distance to Fixed Object
	Collision with Utility Pole	273	1.76	5798	0.78	2.268*	152.6		C022: E Type of Roadway Junction/Featu
	Collision with Ditch	528	3.40	18192	2.43	1.398*	150.3		C023: E Manner of Crash C024: School Bus Related
	E Ran Off Road Straight	182	1.17	2273	0.30	3.857*	134.8		C025: Crash Severity
	Collision with Other Fixed Object	234	1.51	5144	0.69	2.191*	127.2		C026: Intersection Related
	Collision with Fence	192	1.24	3156	0.42	2.931*	126.4		C027: At Intersection
	E Collision with Embankment	174	1.12	3749	0.50	2.236*	96,175		C028: Mileposted Route C029: National Highway System
	Collision with Parked Motor Vehicle	794	5.12	34649	4.64	1.104*	74,723		C029. National Algiway System
	Collision with Mailbox	150	0.97	3753	0.50	1.925*	72.092		C031: Lighting Conditions
	Collision with Sign Post	156	1.01	4118	0.55	1.825*	70.515		C032: Weather
	E Fell/Jumped from Motor Vehicle	59	0.38	316	0.04	8.994*	52,440		C033: Locale
	E Other Non-Collision	87	0.56	1684	0.23	2.489*	52.042		C034: E Police Present at Time of Crash C035: Police Notification Delay
	E Crossed Median	50	0.32	641	0.09	3.758*	36.694		C036: Police Arrival Delay
	Collision with Culvert Headwall	90	0.58	2946	0.39	1.472*	28.844		C037: EMS Arrival Delay
	E Collision with Non-Motorist: Pedes	84	0.54	2832	0.38	1.429*	25.211		C038: Adjusted EMS Arrival Delay
	E Collision with Other Post/Pole/Su	48	0.31	1183	0.16	1.955*	23.442		C039: Non-Vehicular Property Damage
	E Collision with Concrete Barrier	121	0.78	5034	0.67	1.158	16.499		C040: Agency ORI C042: Highway Patrol Troops
	Collision with Light Pole (Non-Break	30	0.19	714	0.10	2.024*	15.178		C042: Highway Patrol Posts
	Collision with Light Pole (Breakaway)	25	0.16	635	0.08	1.897*	11.818	~	Sort by Sum of Max Gain
] [) @ <i>g</i>								,

2.5 C017 First Harmful Event – Shown: All Items with over twice the non-AO proportions

Ordered by Max Gain, notice the extremely large number of items (15) that are over-represented by at least an Odds Ratio of two (red backdrop). All of these items demonstrate some loss of control of the vehicle, which would be expected with the emotion of AO.

CARE 10.2.1.3 - [IMPACT Results - 2017-2021 Alab Eile Dashboard Filters Analysis Impa		grated Cr ations	rash Data Tools	- Aggressi Window	ive Opera Help	ation vs. N	ot Aggressive ー ロ × _ 日ン
2017-2021 Alabama Integrated Crash Data		\sim	Aggre	essive Oper	ation		✓ ♥ 1/
Order: Max Gain V Descending	∕ ∕∕s	uppress Z	lero-Value	d F Signific	ance: C)ver Repres	entation V Threshold: 2.0
C203: CU First Harmful Event Location E Roadside E Shoulder	Subset	Subset	Other equency 58560	Other Percent 7.84	Odds Ratio 1.915*	Max Gain 1112 459.259	C127: E CU Driver Drug Test Resu C128: CU Vehicle Initial Travel Dire C129: CU Vehicle Maneuvers C130: E CU Non-Motorist Maneuve
E Shoulder E Outside of Right-of-Way Off Roadway	962 255 268 194	6.20 1.64 1.73 1.25	24218 4946 6331 2792	3.24 0.66 0.85 0.37	1.914* 2.484* 2.039* 3.347*	459.259 152.326 136.575 136.041	C201: CU Vehicle Most Harmful Ev C202: CU Contributing Circumstar C203: CU First Harmful Event Loca C204: E CU Sequence of Events #
E Off Roadway - Location Unknown Other E Other Non-Intersection	249 81 8	1.23 1.61 0.52 0.05	2732 5936 2435 136	0.37	2.021* 1.602* 2.834	125.775 30.452 5.177	C209. E CU Sequence of Events # C205: E CU Sequence of Events # C206: E CU Sequence of Events # C207: E CU Sequence of Events # C208: CU Model Year
E Sidewalk E Gore E Driveway Access Crosswalk	8 6 6	0.05	181 96 99	0.02 0.01 0.01	2.129 3.011 2.920	4.243 4.007 3.945	C209: CU Make C210: CU Body (Passenger Cars (C211: E CU Owners State
E Separator E Not Applicable Because Unit is Railroad Train Median	6 1 164	0.04 0.01 1.06	154 40 8166	0.02 0.01 1.09	1.877 1.204 0.967	2.803 0.170 -5.518	C212: CU License Tag State C213: CU Vehicle Usage C214: E CU Emergency Status C215: E CU Placard Required
E Intersection with Crosswalk and Pedestrian Signal Not Applicable E Intersection with Crosswalk no Pedestrian Signal	26 15 12	0.17 0.10 0.08	1526 1055 1130	0.20 0.14 0.15	0.821 0.685 0.512	-5.678 -6.901 -11.458	C216: E CU Placard Status C217: CU Hazardous Cargo C218: E CU Hazardous Released C219: CU Attachment
E In Parking Lane or Zone E At Intersection no Crosswalk CU is Unknown	332 107 345	2.14 0.69 2.22	16748 9434 28993	2.24 1.26 3.88	0.955 0.546* 0.573*	-15.672 -88.840 -256.8	C220: CU Oversized Load Requirir C221: CU Had Oversized Load Per C222: CU Contributing Vehicle Def
On Roadway	10137	65.36	574060	76.83	0.851*	-1779	Sort by Sum of Max Gain
2017-2021 Alabama Integrate				ssive Oper vent Locat		Not Aggres	sive Operation
Sum 50					E laterar		
Unknown		C203: CU	E Gore First Har	mful Event	and Pe	tion with Cros destrian Sign	

2.6 C203 CU First Harmful Location

These results support the findings of the two attributes given above.

2.7 C052 Number of Vehicles

P	CARE 10.	2.1.3 - [IMP/	ACT Resi	ults - 2017	-2021 Alaba	ma Integrated	Crash Data -	Aggressive (Operation vs. N	Not Aggressive — 🗆 🗙
Ø	<u>F</u> ile [<u>D</u> ashboard	<u>F</u> ilters	<u>A</u> naly:	is <u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>\</u>	<u>W</u> indow <u>H</u>	lelp	_ & ×
¢.	2017-2	2021 Alabama	a Integrat	ed Crash D)ata	\sim	Aggres	sive Operation	ı	✓ ♥ 1/1
0	rder: Natur	ral Order	~ [Descendin) v	Suppres	s Zero-Value	d F Significanc	e: Over Repre	esentation V Threshold: 2.0
C	052: Numl	ber of Vehicl		Subset requency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C048: RPO C049: MPO
	1 Vehicle			5630	36.30	158744	21.25	1.708*	2334.639	C050: Has Coordinate
	2 Vehicles	1		8821	56.87	547226	73.24	0.777*	-2538.847	C051: E MapClick Used
	3 Vehicles	;		853	5.50	35386	4.74	1.161*	118.423	C052: Number of Vehicles C053: Number of Drivers Recorder
	4 Vehicles	3		151	0.97	4746	0.64	1.533*	52.478	C054: Number of Persons Record
	5 Vehicles	•		35	0.23	790	0.11	2.134*	18.600	C055: Number of Motorists Recorc
	6 Vehicles	•		13	0.08	173	0.02	3.620	9.409	C056: Number of Non-Motorists R
	7 Vehicles	;		6	0.04	46	0.01	6.283	5.045	C057: Number of Pedestrians C058: Number of Pedacvclists
	8 Vehicles	•		1	0.01	22	0.00	2.190	0.543	Sort by Sum of Max Gain
Ĉ	()	n 💉								~
			2017-2	021 Alaba	ma Integrated		ilter = Aggres Number of Ve		n vs. Not Aggre	ssive Operation
	Frequency	100 50 0								
			1 Ve	ehicle 2	Vehicles 3		Vehicles 5 052:Number o		Vehicles 7	Vehicles 8 Vehicles
Ш						CI	USZ: WUMDER C	venicies		

This attribute explains many of the other attributes. It demonstrates that AO is dramatically under-represented in two-vehicle crashes (77.7% of the proportion expected). On the other hand 3or more vehicle crashes are all over-represented. This might indicate that aggressive operators tend to have a negative impact on other drivers coercing their involvement.

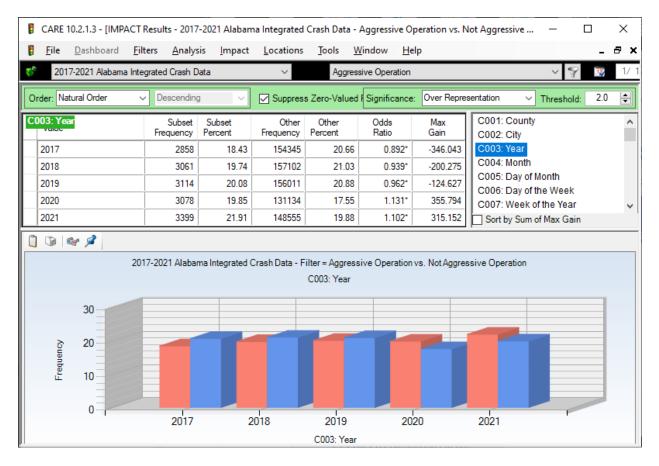
2.8 C057 Number of Pedestrians	
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F	CARE 10.2.1.	3 - [IMPACT R	lesults - 2017	-2021 Alaban	na Integrated	Crash Data -	Aggressive O	peration vs. N	Not Aggressive	_		×
F	<u>F</u> ile <u>D</u> asl	hboard <u>F</u> ilt	ers <u>A</u> nalys	is <u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>V</u>	<u>V</u> indow <u>H</u> e	lp			-	đΧ
¢?	2017-202	1 Alabama Integ	grated Crash D	ata	~	Aggres	sive Operation			~ 9	12	1/1
0	rder: Natural C)rder v) ×	Suppres	s Zero-Valued	Significance	Over Repre	sentation ~	Threshold	i: 2.0	•
C)57: Number	of Pedestrians	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C054: Number C055: Number			
	No Pedestrian	s Involved	15407	99.34	743260	99.48	0.999*	-22.310	C056: Number	of Non-I	Notorist	s Ri
	1 Pedestrian I	nvolved	94	0.61	3753	0.50	1.207	16.092	C057: Number			
	2 Pedestrians	Involved	6	0.04	112	0.01	2.581	3.675	C058: Number C059: Number			(lete
	3 Pedestrians	Involved	2	0.01	16	0.00	6.021	1.668	C060: Number	-		· ·
	5 Pedestrians	Involved	1	0.01	0	0.00	0.000	1.000	Sort by Sum of	f Max Gai	n	
1	1 a a	8										
		201	7-2021 Alabar	na Integrated (ilter = Aggress umber of Pede		vs. Not Aggree	ssive Operation			
	AD IN	50										
		0	No Pedest		Pedestrian	2 Pedestrians			5 Pedestrians	P		
			Involve		nvolved C057	Involved Number of Pe		lved	Involved			

AO crashes are over-represented in single pedestrian involvement by an Odds Ratio of 1.207. Two and three multiple pedestrian crashes are also over-represented.

3.0 Time Characteristics

3.1 C003 Year



The display above shows fairly definitively that Aggressive Operation crashes are on the increase. With the one exception of 2020, both the frequency and the proportions of AO crashes increased. This takes into consideration the 2020 COVID issues, but the reduction in the AO crashes was minimal. The AO increase from 2017 to 2021 was about 19%. Crashes in general went down during this five year period.

F	CARE 10.2.1.3 - [IMPACT Re	sults - 2017-202	21 Alabama In	tegrated Crash	Data - Aggress	ive Operation	vs. Not Aggressiv	ve Operation] — 🗆 🗙
P	<u>F</u> ile <u>D</u> ashboard <u>F</u> ilter	rs <u>A</u> nalysis	<u>I</u> mpact <u>L</u>	ocations <u>T</u> oo	ols <u>W</u> indow	<u>H</u> elp		_ @ ×
¢,	2017-2021 Alabama Integra	ated Crash Data		~	Aggressive Ope	ration		✓ ♥ 〒 1/ 1/2017 ∨ 1.
0	rder: Natural Order 🗸 🗸	Descending	Y	Suppress Zero	-Valued Rows	Significa	nce: Over Repres	entation V Threshold: 2.0
С	004: Month	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max ^ Gain	C001: County C002: City
	January	1160	7.48	59491	7.96	0.939	-74.972	C003: Year
	February	1077	6.94	57046	7.64	0.909*	-107.216	C004: Month
	March	1366	8.81	62098	8.31	1.060	76.910	C005: Day of Month C006: Day of the Week
	April	1382	8.91	59054	7.90	1.127*	156.100	C007: Week of the Year
	May	1405	9.06	63183	8.46	1.071*	93.386	C008: Time of Day
	June	1345	8.67	60822	8.14	1.065*	82.398	C010: Rural or Urban
	July	1341	8.65	59311	7.94	1.089*	109.765	C011: Highway Classifications C012: Controlled Access
	August	1358	8.76	64462	8.63	1.015	19.835	C012: Controlled Access C013: E Highway Side
	September	1329	8.57	62210	8.33	1.029	37.585	C015: Primary Contributing Circurr
	October	1303	8.40	68605	9.18	0.915*	-121.169	C016: Primary Contributing Unit Nu
	November	1219	7.86	64512	8.63	0.910*	-120.202	C017: First Harmful Event
	December	1225	7.90	66353	8.88	0.889*	-152.420 🗸	Sort by Sum of Max Gain
C	🕼 🞯 🖉							🗹 Disp
		2017-2021 Alab	ama Integrated			e Operation vs	. Not Aggressive C	peration
					C004: Month			
	10 5 United and the second sec							
	•	February	Ap	oril	June C004: Mont	August	Octo	ber December
1					C004. MOIII	0		1

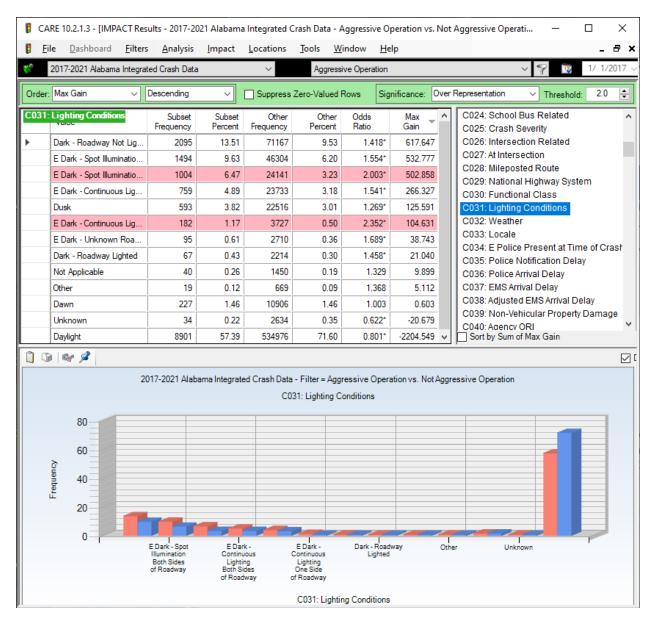
The above shows the possibility of weather affecting aggressive attitudes. The cooler months of October through February are all under-represented. The warmer summer months tend to be over-represented, which could point to heat as a potential aggravating source. See Section 8.3 below for direct effects of weather.

3.3 C008 Time of Day

¢?	2017-2021 Alabama Integrate	ed Crash Data		\sim	Aggressive	Operation		✓ Y Y 1/ 1/2017 ∨
Order	Max Gain 🗸 [Descending	~ [Suppress Ze	ero-Valued Rov	vs Signifi	cance: Over	Representation V Threshold: 2.0
C008	Time of Day	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C001: County C002: City
•	12:00 Midnight to 12:59	465	3.00	9079	1.22	2.467*	276.529	C003: Year
	1:00 AM to 1:59 AM	378	2.44	7505	1.00	2.426*	222.204	C004: Month
	2:00 AM to 2:59 AM	336	2.17	6798	0.91	2.381*	194.881	C005: Day of Month C006: Day of the Week
	3:00 AM to 3:59 AM	256	1.65	6164	0.83	2.001*	128.042	C007: Week of the Year
	4:00 AM to 4:59 AM	208	1.34	7028	0.94	1.426*	62.106	C008: Time of Day
	5:00 AM to 5:59 AM	228	1.47	12558	1.68	0.875	-32.691	C010: Rural or Urban
	6:00 AM to 6:59 AM	317	2.04	20591	2.76	0.742*	-110.448	C011: Highway Classifications
	7:00 AM to 7:59 AM	459	2.96	43520	5.82	0.508*	-444.430	C012: Controlled Access C013: E Highway Side
	8:00 AM to 8:59 AM	456	2.94	31896	4.27	0.689*	-206.128	C015: Primary Contributing Circumstance
	9:00 AM to 9:59 AM	409	2.64	28657	3.84	0.688*	-185.890	C016: Primary Contributing Unit Numbe
	10:00 AM to 10:59 AM	480	3.09	32949	4.41	0.702*	-203.987	C017: First Harmful Event
	11:00 AM to 11:59 AM	595	3.84	40663	5.44	0.705*	-249.122	C018: Location First Harmful Event Rel t C019: E Most Harmful Event
	12:00 Noon to 12:59 PM	743	4.79	49512	6.63	0.723*	-284.818	C020: E Distracted Driving Opinion
	1:00 PM to 1:59 PM	755	4.87	49075	6.57	0.741*	-263.746	C021: Distance to Fixed Object
	2:00 PM to 2:59 PM	896	5.78	53365	7.14	0.809*	-211.802	C022: E Type of Roadway Junction/Featu
	3:00 PM to 3:59 PM	1190	7.67	65570	8.78	0.874*	-171.165	C023: E Manner of Crash
	4:00 PM to 4:59 PM	1122	7.23	63731	8.53	0.848*	-200.990	C024: School Bus Related C025: Crash Severity
	5:00 PM to 5:59 PM	1247	8.04	67603	9.05	0.889*	-156.368	C026: Intersection Related
	6:00 PM to 6:59 PM	1032	6.65	44352	5.94	1.121*	111.298	C027: At Intersection
	7:00 PM to 7:59 PM	905	5.83	30834	4.13	1.414*	264.918	C028: Mileposted Route
	8:00 PM to 8:59 PM	834	5.38	25459	3.41	1.578*	305.497	C029: National Highway System C030: Functional Class
	9:00 PM to 9:59 PM	801	5.16	20873	2.79	1.849*	367.698	C031: Lighting Conditions
	10:00 PM to 10:59 PM	735	4.74	16092	2.15	2.200*	400.947	C032: Weather
	11:00 PM to 11:59 PM	632	4.07	11849	1.59	2.569*	386.027	C033: Locale
	Unknown	31	0.20	1424	0.19	1.049	1.439	Sort by Sum of Max Gain
00) 🗞 🖉							,
	20	17-2021 Alabar	na Integrated	Crash Data -	Filter = Aggres	sive Operatio	on vs. Not Aggre	essive Operation
				С	008: Time of Da	ву		
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		4:00 AM to 4:	59 AM	9:00 AM to 9	:59 AM 2: C008: Time	00 PM to 2:5	59 PM 7:0	00 PM to 7:59 PM Unknown
					COUO. TIME			

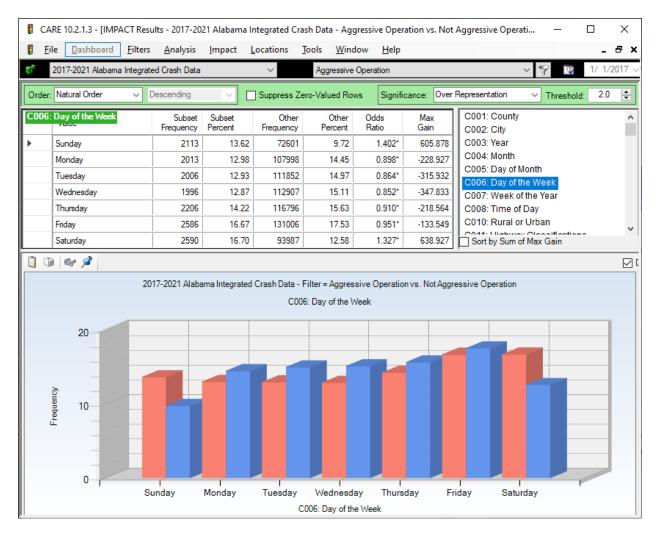
The clear pattern is for AO crashes to be over-represented in late night hours as opposed to during the day. This correlates very positively with the use of drugs and alcohol. See Sections 4.3-4.5 for the aggravating effects of alcohol and drugs.

3.4 C031 Lighting Conditions



Reinforcing the conclusions above, the daylight times are the only ones that are under-represented.

3.5 C006 Day of the Week



Over-representation on weekends (Saturday and Sunday) add increased evidence to the correlation of AO with the use of drugs and alcohol.

Image: constraint of the synthet Cash Data Aggressix Operation Image: constraint of the synthet Cash Data Aggressix Operation Image: constraint of the synthet Cash Data Image: constraint of the synt	CARE 10.2.1.3 -	[Crosstab Results	- 2017-2021 Alabar	ma Integrated Crasł	n Data - Filter = Agg	gressive Operation]		_	
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Sunday Monday Tueaday Wednesday Tuuraday Friday Saturday TOTAL 12 00 Mark 155 133 3.3 4.2 5.4 112 45.5 100 AM 155 103 3.4 3.7 4.2 4.5 3.8 1.81 3.73 200 AM 255 103 2.23 3.33 3.5 2.7 3.80 7.70 3.85 300 AM 255 700 2.60 2.3 3.55 2.44 2.9 4.9 2.26 400 AM 555 4.40 2.9 3.2 2.65 6.60 3.2 3.17 500 AM 55 2.9 4.3 4.65 5.65 9.4 8.0 4.2 4.59 500 AM 55 3.31 8.00 7.0 6.65 9.4 8.0 4.2 4.59 9.00 AM 55 3.31 8.0 7.0 6.65 9.4 8.0 4.2 4.59 9.00 AM 55 3.13 8.0 7.0 6.60 7.7 <th>2017-2021 A</th> <th>labama Integrated C</th> <th>rash Data</th> <th></th> <th></th> <th>1</th> <th>~</th> <th>Y 1/ 1</th> <th>/2017 ~ 12/31/2</th>	2017-2021 A	labama Integrated C	rash Data			1	~	Y 1/ 1	/2017 ~ 12/31/2
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AM 1000 134 34' 42' 42' 45' 36' 81' 37's 200 AMb 259 103 23 33 35 27' 38's 77' 38's 300 AMb 359 70 26 23 35's 24's 29's 49's 26's 500 AMb 559 40 29's 32's 26's 36's 28's 37's 22's 600 AMb 559 40 29's 32's 65's 94's 80's 42's 45's 600 AMb 559 29's 43's 46's 52's 56's 80's 42's 45's 800 AMb 58's 31's 80's 70's 66's 94's 80's 42's 45's 900 AMb 59's 43's 68's 49's 50's 60's 73's 76's 44's 100 AMb 15's 65's 80's 82's's 76's 94's 99's 11's's 11's's 11's's 11's's	12:59 AM	135	51	38	33	42	54	112	465
AM 103 2.3 3.3 3.5 2.7 3.8 77 3.55 300 AM(5.55) 70 2.6 2.3 3.5 2.4 2.9 4.9 2.56 500 AM(5.55) 4.0 2.9 3.2 3.6 3.6 2.8 3.7 2.28 500 AM(5.59) 2.9 4.3 4.65 5.2 5.6 5.60 3.2 3.17 700 AM(5.75) 3.2 81 5.5 6.5 9.4 8.0 4.2 4.59 800 AM(5.85) 3.1 800 700 6.6 7.9 7.6 5.4 4.56 900 AM(5.95) 4.3 6.8 4.9 5.0 6.0 6.7 7.2 4.09 100 AM(5.95) 5.8 6.1 7.4 6.9 6.90 7.3 7.6 4.80 11.00 AM(5.155) 5.8 6.1 7.4 6.9 6.9 7.3 7.6 4.80 11.00 AM(5.155) 7.9 9.7	AM	103	34	37	42	45	36	81	378
AM 70 25 23 35 24 29 49 255 400 AMt 459 500 23 17 18 23 34 43 208 500 AMt 659 400 29 32 26 36 28 37 228 600 AMt 659 29 43 46 52 55 60 32 317 700 AMt 659 32 81 655 65 94 80 42 459 800 AMt 659 31 80 70 66 79 76 54 456 900 AMt 959 43 68 49 50 60 67 72 409 100 AMt 9159 43 68 61 74 69 69 73 76 440 1100 AMt 9159 120 94 100 97 95 115 134 75 200 PMt 959 112 133 123 130 119	AM	103	23	33	35	27	38	77	336
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TOTAL 2112 2012 2006 1996 2206 2566 2560 15510	Unknown	7	1	4	9	4	3	3	31
	TOTAL	2113	2013	2006	1996	2206	2586	2590	15510

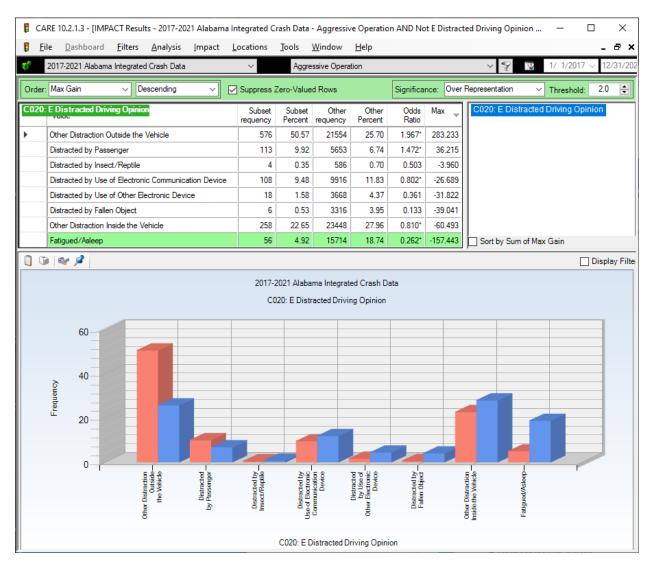
3.6 Day of the Week by Time of Day

This further demonstrates that the alcohol- and drug-use times are over-represented. Note how closely the numbers on Friday and Saturday late night match up.

4.0 Driver Characteristics (Demographics and Behavior)

4.1 C020 E Distracted Driving Opinion

Distracted driving accounts for only about 7.54% of aggressive operation crashes, as compared to 11.67% of all non-AO crashes. This is probably because the reporting officers in aggressive operation crashes consider other things of greater importance. However, the possibility that aggressive drivers tend to be distracted by things other than their aggression should not be marginalized. The IMPACT below was run suppressing the cases where distracted driving was not a factor in both the aggressive and non-aggressive situations. Thus the comparisons are in the proportions where there was a report of distracted driving. Other distractions outside of the vehicle seem to be of greatest concern, and perhaps related to the presence of aggression.



CAF	RE 10.2.1.3 - [IMPACT	Results - 201	7-2021 A	labama Integ	rated Crash Da	ita - Aggressiv	e Operation	AND Not CU [Driver	Raw Age = 104	OR	· [C
🖳 <u>F</u> il	e <u>D</u> ashboard <u>F</u> i	ilters <u>A</u> naly	ysis <u>I</u> n	npact <u>L</u> ocat	tions <u>T</u> ools	<u>W</u> indow	<u>H</u> elp						- 8
(?	2017-2021 Alabama Int	egrated Crash	Data	`	 Ag 	gressive Opera	tion			~ Y 💡	1/ 1	1/2017	~ 12/31/
Order:	Max Gain	 Descendir 	ng	✓ ✓ Sut	opress Zero-Va	lued Rows		Significance:	Over F	Representation	✓ Three	eshold:	2.0
C107:	CU Driver Raw Age	Fre	Subset quency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	^	C107: CU Dr	river Raw Ag	je	
•	16		325	2.97	19053	2.98	0.997	-0.966					
	17		369	3.37	20528	3.21	1.051	17.799					
	18		437	3.99	23812	3.72	1.073	29.615					
	19		470	4.29	23970	3.74	1.146*	59.912	-				
	20		500	4.56	22786	3.56	1.283*	110.168	-				
	21		469	4.28	21522	3.36	1.274*	-	-				
	22		444	4.05	20331	3.17	1.276*	96.169	-				
	23		431	3.93	18710	2.92	1.346*	110.902	-				
	24		436	3.98	17797	2.78	1.432*	131.522	-				
	25 26		388 361	3.54 3.29	16843 16333	2.63	1.346*	99.843 81.568	-				
	20		360	3.29	15724	2.55	1.232	90.987	- 11				
	28		339	3.09	15724	2.46	1.336	78.507	- 11				
	29		300	2.74	14556	2.30	1.205*	50.970	- 11				
	30		342	3.12	13908	2.17	1.437*	104.056	- 11				
	31		320	2.92	13044	2.04	1.434*	96.838	- 11				
	32		271	2.47	12518	1.95	1.265*		- 11				
	33		255	2.33	12150	1.90	1.227*	47.133	- 11				
	34		236	2.15	11700	1.83	1.179*	35.832					
	35		228	2.08	11448	1.79	1.164	32.143					
Í	36		223	2.04	11170	1.74	1.167	31.899					
Í	37		233	2.13	10884	1.70	1.251*	46.792					
	38		205	1.87	10400	1.62	1.152	27.073					
	39		197	1.80	10274	1.60	1.121	21.228					
	40		204	1.86	9782	1.53	1.219*	36.646					
	41		166	1.52	9241	1.44	1.050	7.901	_				
	42		153	1.40	8981	1.40	0.996	-0.651	~	Sort by Sum	of Max Gair	ı	
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				55		C107: CU Driv					/5		

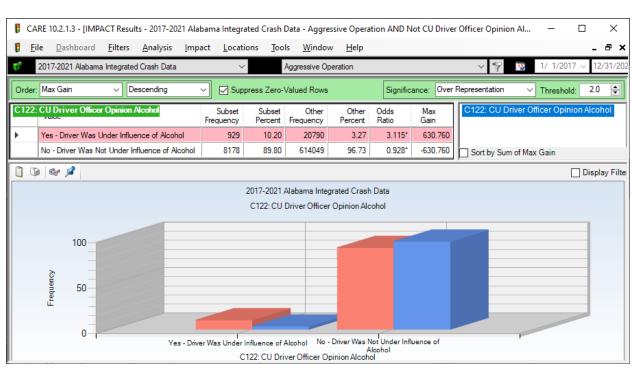
4.2 C107 CU Driver Raw Age Frequency Distribution

Significant over-representations in ages 19-31; over-representations continue until age 41.

4.3 C121 CU Driver Condition

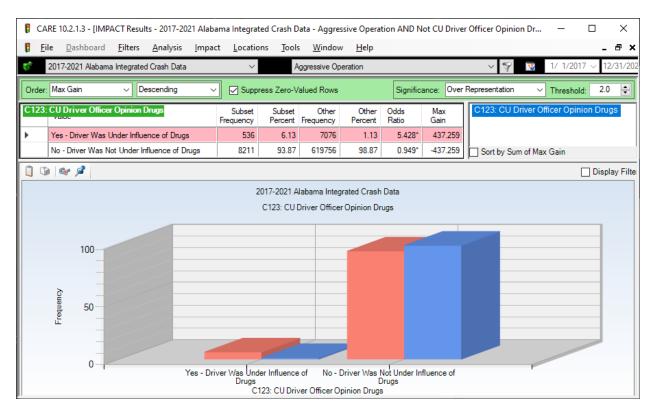
	ARE 10.2.1.3 - [IMPACT Results		-	-	· ·	ration vs. No	ot Aggressive	Operation] — 🗆 🗙
6 E			ocations]	fools <u>W</u> ind	dow <u>H</u> elp			×
<u></u>	2017-2021 Alabama Integrated C	irash Data	~	Aggressive	Operation			✓ ♥ 1/ 1/2017 ∨ 12/31/20
Orde	r: Max Gain 🗸 Desc	ending 🗸 🗸	Suppress Ze	ro-Valued Ro	WS	Signific	cance: Over	Representation V Threshold: 2.0 🜩
C121	1: CU Driver Condition	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C117: CU DL Restriction Violations #2 C118: CU Endorsement Violations #1
	Unknown	5671	36.94	72210	9.72	3.800*	4178.636	C119: E CU Endorsement Violations #2
	E Under the Influence of Alcoho	l/Drugs 978	6.37	22548	3.04	2.099*	512.000	C120: E CU Driver Employment Status C121: CU Driver Condition
	E Emotional (Depressed/Angry/	Disturbed) 489	3.19	1956	0.26	12.097*	448.575	C122: CU Driver Officer Opinion Alcohol
	Other	88	0.57	1455	0.20	2.926*	57.930	C123: CU Driver Officer Opinion Drugs
	E Physical Impaiment	81	0.53	1966	0.26	1.994*	40.369	C124: CU Driver Alcohol Test Type Given
	Illness	36	0.23	2783	0.37	0.626*	-21.516	C125: E CU Driver Drug Test Type Given
	CU is Not a Vehicle	5	0.03	2117	0.28	0.114	-38.752	C126: CU Driver Alcohol Test Results C127: E CU Driver Drug Test Results
	E Asleep/Fainted/Fatigued	54	0.35	11593	1.56	0.225*	-185.593	C128: CU Vehicle Initial Travel Direction
	CU is Unknown	345	2.25	28993	3.90	0.576*	-254.198	C129: CU Vehicle Maneuvers
	Apparently Normal	7606	49.54	597254	80.40	0.616*	-4737.450	Sort by Sum of Max Gain
	D 🐼 🖉							🗹 Display Filte
	:	2017-2021 Alabama Integr			Aggressive Opver Condition	peration vs. N	lot Aggressive	• Operation
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	U	E Under the Influence of Alcohol/Drugs	Other		Illness		Asleep/Fainted/I	Fatigued Apparently Normal
				C121: CU	Driver Condi	tion		

The "Emotional (Depressed/Angry/Disturbed)" value is the most striking with over 12 times the proportion as is in the non-AO subset. Under the influence of Alcohol/Drugs is also over double its expected proportion, and the evidence above has been showing. Alcohol/drugs obviously play a major part in AO – they will be considered next.



4.4 C122 CU Driver Officer Opinion Alcohol

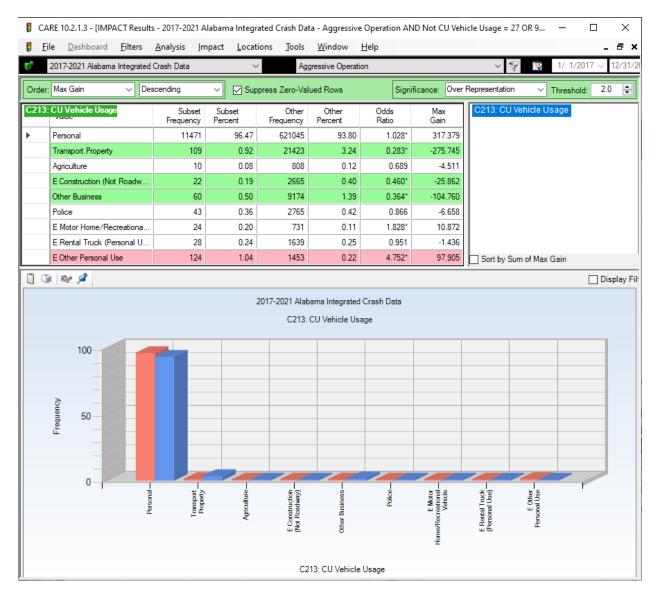
The amount of alcohol involvement in AO crashes is over three times the proportion as it is in the non-AO crashes. There can be little doubt that alcohol plays a major part in causing AO crashes. Drugs seem to play even a larger role as we see in the next attribute.



4.5 C123 CU Driver Officer Opinion Drugs

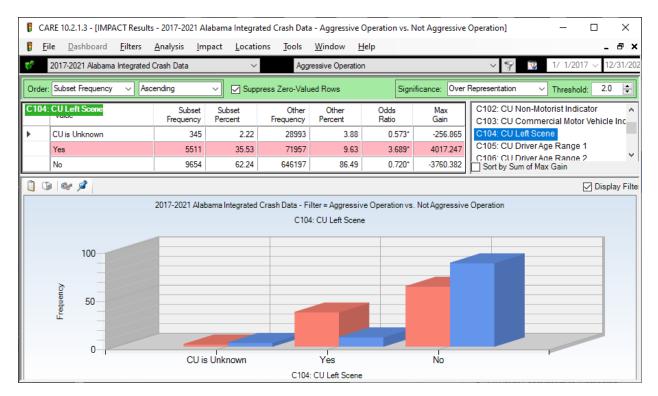
While the numbers of alcohol-related AO cases (929 out of 8,178 cases) is greater than that of those caused by drugs (536 out of 8,211 cases), the Odds Ratio of 5.428 shows that non-alcohol drug-use is as serious a problem in causing AO crashes as is alcohol. Both should be considered together in the development of AO countermeasures.

4.6 C213 CU Vehicle Usage



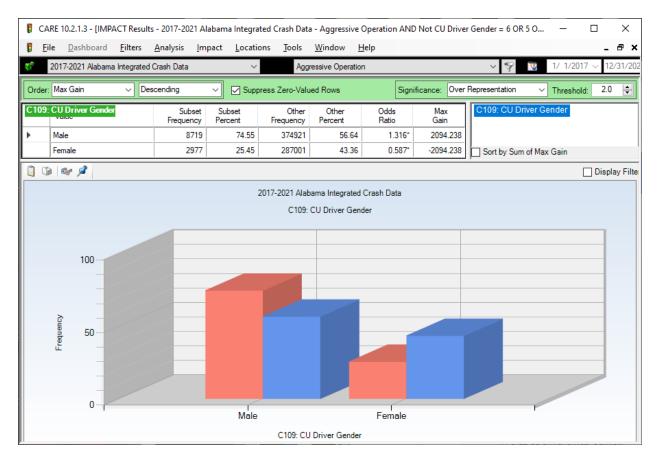
Items with less than 10 AO crashes were removed as were those that had no relevant meanings (e.g., Unknown). The vast majority of those remaining (96.47%) were Personal Use. Generally, no vehicle usage other than Personal Use can be seen to cause AO.

4.7 C104 CU Left the Scene



This over-representation might be expected of those AO drivers who do not feel that they should be held responsible for the crash. Over a third (35.53%) of AO drivers were guilty of this of-fense, which had a proportion that was 3.689 times that of the non-AQ control subset.

4.8 C109 CU Driver Gender



Males have a proportion of the AO crashes (74.55%) that is about three times that of females (24.45%). While some of this has to do with the proportion of drivers in general, there can be little doubt that AO is predominantely a male problem.

4.9 Driver Gender by Severity

2017-2021 A	Nabama Integrated C	irash Data	~	Aggressive Operatio	n	~	S 1/ 1	1/2017 ~ 12/3
Suppress Zero Val	ues: None	 ✓ Select 	Cells: 🔳 🗸 🔣	9		Column: Crash S	Severity ; Row: CU [Driver Gender
	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury Possible Injury		Property Damage Only	Unknown	TOTAL	
Male	346	930	1214	788	5121	320	8719	
Maic	87.59%	75.36%	68.78%	59.38%	51.03%	42.50%	56.22%	
Female	42	240	384	365	1803	143	2977	
- Cinare	10.63%	19.45%	21.76%	27.51%	17.97%	18.99%	19.19%	
Unknown	4	52	142	143	2775	237	3353	
Unitionin	1.01%	4.21%	8.05%	10.78%	27.65%	31.47%	21.62%	
Not Applicable	0	0	3	5	65	38	111	
Not Applicable	0.00%	0.00%	0.17%	0.38%	0.65%	5.05%	0.72%	
CU is Not a	0	0	2	2	1	0	5	
Vehicle	0.00%	0.00%	0.11%	0.15%	0.01%	0.00%	0.03%	
CU is Unknown	3	12	20	24	271	15	345	1
CO IS UNKNOWN	0.76%	0.97%	1.13%	1.81%	2.70%	1.99%	2.22%	
TOTAL	395	1234	1765	1327	10036	753	15510	1
TOTAL	2.55%	7.96%	11.38%	8.56%	64.71%	4.85%	100.00%	

This indicates a dramatic over-representation of male aggressive operation fatal crashes, which indicates that female aggressive driving is quite different from male aggressive driving. This will be considered in more detail in a separate section below.

4.10 AO Male vs AO Female Characteristics

Because there were such dramatic differences in the frequencies and proportions of male and female AO drivers, and especially in the consideration of fatal crashes, it was felt that additional study along these lines was warranted. Notable over-representations found in AO Males as opposed to AO Females:

- C010-11. Males AO drivers had a proportion on Rural roadways that we 36.9% higher than AO Female drivers. This was very close to their proportion over-representation on County roads (35.7%).
- C015. Male AO drivers are over-represented in DUI, Over Correcting/Over Steering, Ran Off Road, Ran Stop Sign, and Over Speed Limit.
- C017. Male AO drivers had a proportion of Overturn/Rollover that was 75.4% higher than that or Female AO drivers.
- C025. Male AO drivers causes 346 fatal crashes as opposed to only 42 for females (Odds Ratio 2.813). Males were also over-represented in Suspected Serious Injury and Suspected Minor Injury crashes. Females were only over-represented in Possible Injury and Property Damage Only crashes.
- C033. Locale is over-represented in open country, about 25.5% higher than female.
- C101. AO male drivers were dramatically over-represented driving pick-ups by an odds ratio of 3.127 times what would be expected from the AO Female subset. Seems that there is a strong correlation between driving a pick-up and aggressive driving. A second correlation that was even stronger involved motorcycles, where AO males had 19.325 times the proportion as AO Females. Females are most dramatically over-represented in Passenger Cars.
- C121. Males were recorded to be in a condition that was Under the Influence of Alcohol or Drugs at a proportion 58.4% higher than AO Females.
- C208. Males tend to be driving older vehicles (prior to 2006). See display below.
- C210. In cars, males are more aggressive than females in two-door models (odds ratio 2.076).
- C224. Speed at impact is dramatically higher for Males. See display below.
- C323. Male failure to use seatbelts is about 70.1% higher than that of women, which further explains the relatively higher number of fatal crashes.

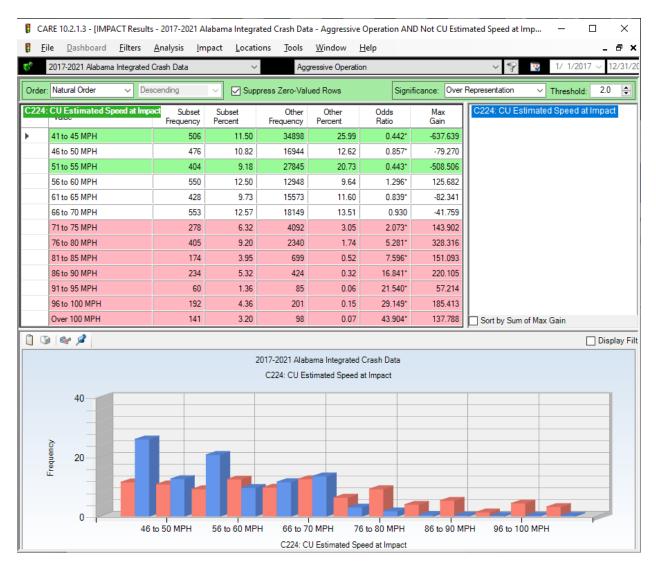
The above along with many other factors demonstrate clearly that the countermeasure approach toward Male AO drivers requires different approaches that those of Female AO Drivers.

5.0 Severity Characteristics

5.1 C025 Crash Severity

🔋 C/	ARE 10.2	2.1.3 - [IMPACT Res	ults - 2017-2021 A	labama Integra	ated Crash Dat	ta - Aggressive	Operation vs.	Not Aggressive	e Operation] —		×
B E	ile <u>D</u>	ashboard <u>F</u> ilters	<u>A</u> nalysis <u>I</u> m	npact <u>L</u> ocati	ions <u>T</u> ools	<u>W</u> indow	<u>H</u> elp			- é	7 ×
6 2	2017-2	021 Alabama Integrat	ed Crash Data	~	Agg	gressive Operation	on		✓ ♥ 1/ 1/2	2017 ~ 12/	31/20
Order	r: Max G	iain 🗸 [Descending	✓ □ Sup	press Zero-Val	ued Rows	Signi	ificance: Over	Representation V Thresh	old: 2.0	÷
C025	: Crash	Severity	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C021: Distance to Fixed Ob C022: E Type of Roadway J		ıtı ^
▶	Fatal I	njury	395	2.55	3926	0.53	4.847*	313.500	C023: E Manner of Crash		
	Suspe	cted Serious Injury	1234	7.96	20962	2.81	2.836*	798.851	C024: School Bus Related		
	Suspe	cted Minor Injury	1765	11.38	58298	7.80	1.458*	554.794	C025: Crash Severity C026: Intersection Related		
	Possib	le Injury	1327	8.56	67070	8.98	0.953	-65.304	C027: At Intersection		
	Proper	ty Damage Only	10036	64.71	577135	77.25	0.838*	-1944.726	C028: Mileposted Route		~
	Unkno	own	753	4.85	19756	2.64	1.836*	342.886	Sort by Sum of Max Gain		
	0	1								🗹 Displa	ıy Filt
			2017-2021 Alab	ama Integrated		ilter = Aggressiv 5: Crash Severit		. Not Aggressive	e Operation		
		100									
	Frequency	50									
		0	Fatal Injury	Suspected Serious Injury	Suspec Minor In		sible Injury	Property Damage Only	Unknown		
					CC)25: Crash Seve	erity				

There can be no doubt that AO crashes result in more deaths and incapacitating injuries than do non-AO crashes. The fatality probability is close to five times (4.847) higher for AO crashes than for non-AO, resulting in an increase of over 313 fatal crashes over the five year period. Suspected Serious Injury is also over twice (2.836) the proportion for AO than for non-AO crashes. This section gives some of the reasons for this in addition to speed, lack of restraint use and some of the other factors identified in Section 4 immediately above.



5.2 C224 CU Estimated Speed at Impact

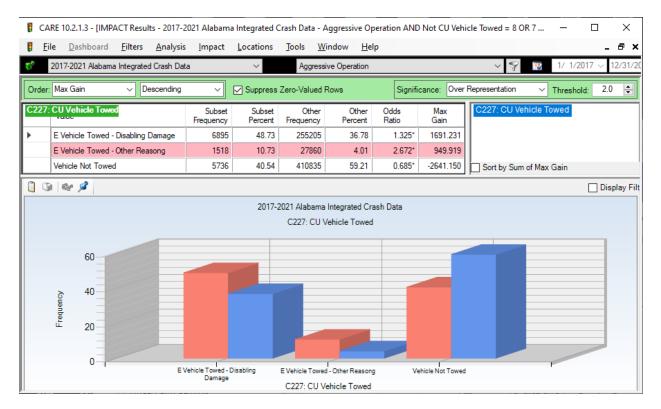
This result confirms the speculation that impact speeds for AO crashes are significantly higher, on average, than their non-AO counterparts. Especially high over-representations occur at most speeds above 71 MPH. The higher impact speeds are the primary cause of fatalities, and they also tend to show the emotional results of an AO attitude.

5.3 C323 CU Driver Safety Equipment

2017: Order: Max C323: CU I C323:	Dashboard Eilters Analy 7-2021 Alabama Integrated Crash Casin ✓ Descending x Gain ✓ Descending Descending Driver/Non-Motorist Safety Edit ✓ Descending Driver/Non-Motorist Safety Edit ✓ Descending re Used - Motor Vehicle Occupant ✓ Motorcycle Helmet Used Motorcycle Helmet Used ✓ ✓ elmet Used ✓ ✓ ther Motorcycle Helmet Used ✓ ✓ ulder Belt Only Used ✓ ✓ Belt Only Used ✓ ✓ ulder and Lap Belt Used ✓ ✓	Data ng V V Frequency t 1930 ed 383 80 37 26 62 48	~	Tools Wind Aggressive ero-Valued Rov Other Frequency 21434 3123 212 440 199 2779	Operation	Signific Odds Ratio 6.083* 8.285* 25.492* 5.681* 8.826*	Max Gain 1612.708 336.770 76.862 30.487		_ 6 1/ 1/2017 ∨ 12/31/ Threshold: 2.0 ♀ n-Motorist Safety Equi					
Order: Max CB223:CUI Volt Volt No N E He E Ott Shou Lap	k Gain Descendir Driver/Non-Motorist Safety Ed Driver/Non-Motorist Safety Ed Driver/Non-Motorist Safety Ed Descendir the Used - Motorcycle Helmet Used Helmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	ng V V pipment Subset Frequency tt 1930 ed 383 80 37 26 62 48	Suppress Z Subset Percent 21.07 4.18 0.87 0.40 0.28 0.68	Other Frequency 21434 3123 212 440 199	Other Percent 3.46 0.50 0.03 0.07	Odds Ratio 6.083* 8.285* 25.492* 5.681*	Max Gain 1612.708 336.770 76.862	Representation ~	Threshold: 2.0 🚖					
C323: CU I Voic Dot-4 No N E He E Ott Shou Lap	Driver/Non-Motorist Safety Er we Used - Motor Vehicle Occupan Compliant Motorcycle Helmet Used Motorcycle Helmet Used elmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	Lipment Subset Frequency 1930 ed 383 80 37 26 62 48 48	Subset Percent 21.07 4.18 0.87 0.40 0.28 0.68	Other Frequency 21434 3123 212 440 199	Other Percent 3.46 0.50 0.03 0.07	Odds Ratio 6.083* 8.285* 25.492* 5.681*	Max Gain 1612.708 336.770 76.862							
None Dot- No M E He E Ott Shou Lap	the Used - Motor Vehicle Occupan Compliant Motorcycle Helmet Used Motorcycle Helmet Used elmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	Frequency t 1930 ed 383 80 37 26 62 48 48	Percent 21.07 4.18 0.87 0.40 0.28 0.68	Frequency 21434 3123 212 440 199	Percent 3.46 0.50 0.03 0.07	Ratio 6.083* 8.285* 25.492* 5.681*	Gain 1612.708 336.770 76.862	C323: CU Driver/Nor	n-Motorist Safety Equi					
Dot-1 No M E He E Ott Shou Lap	Compliant Motorcycle Helmet Used Motorcycle Helmet Used elmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	ed 383 80 37 26 62 48	4.18 0.87 0.40 0.28 0.68	3123 212 440 199	0.50 0.03 0.07	8.285* 25.492* 5.681*	336.770 76.862							
No M E He E Ot Shou Lap	Motorcycle Helmet Used elmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	80 37 26 62 48	0.87 0.40 0.28 0.68	212 440 199	0.03 0.07	25.492* 5.681*	76.862							
E He E Oti Shou Lap	elmet Used ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	37 26 62 48	0.40 0.28 0.68	440 199	0.07	5.681*								
E Ot Shou Lap	ther Motorcycle Helmet Used ulder Belt Only Used Belt Only Used	26 62 48	0.28	199			30.487							
Shou Lap	ulder Belt Only Used Belt Only Used	62 48	0.68		0.03	8 836*								
Lap	Belt Only Used	48		2779		0.020	23.054							
	•		0.52		0.45	1.507*	20.862							
Shou	ulder and Lap Belt Used			1855	0.30	1.748*	20.540							
		6592	71.98	588497	95.13	0.757*	-2119.653	Sort by Sum of Max	Gain					
📋 🕼 🚳	Display Fil													
Frequency	100			21 Alabama Int	-									
Fre	0 None Used - Motor Vehicle Occupant	Dot-Compliant Motorcycle Helmet Used	I No Motorcycle Helmet Used	E Helmet Used	Motorcyc Helmet Us	sed Only	Used Or	ap Belt Shoulder and hy Used Lap Belt Used						

A primary cause of fatal crashes (along with high impact speeds) is a failure to use restraints. The above indicates that AO drivers are over six times (6.083) the proportion than non-AO for failure to be restrained. The probability of the unrestrained AO driver being killed is one in 10.6 crashes, while the rate of properly restrained AO drivers was found to be about one in 81 crashes.

5.4 C227 CU Vehicle Towed



Given the attributes before this one, which indicated higher speeds and greater injury per crash, this result would seem to be obvious. "Other Reasons" would include AO driver DUI or other reasons that the driver is no longer able to drive the vehicle. This result generally shows that the damage is generally higher in AO than in non-AO crashes. It also shows the law enforcement judgment that the AO driver should not be permitted to continue driving after the crash.

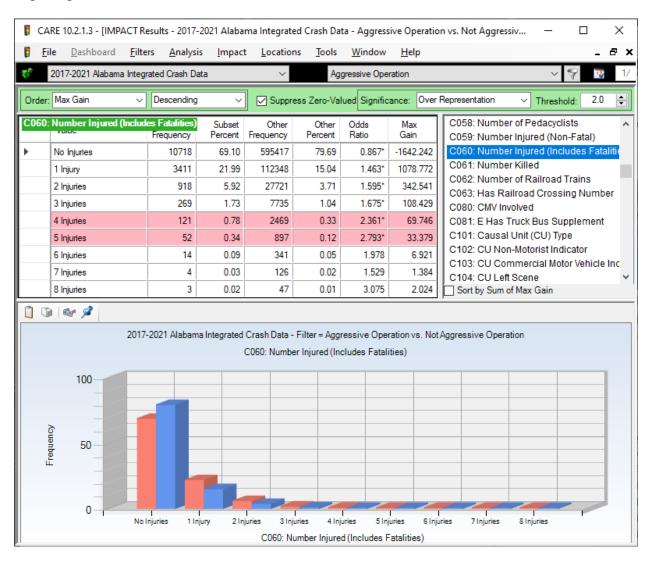
5.5 C060 Number Killed

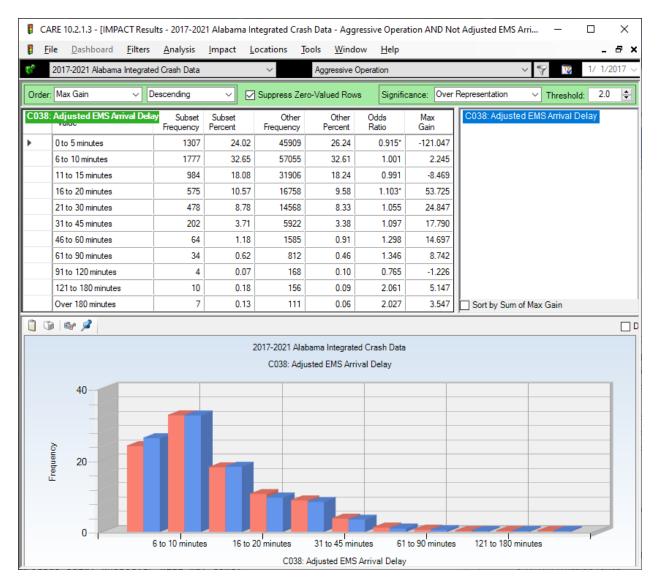
The following is a comparison for those crashes that resulted in at least one fatality. This makes it clear that the AO is over-represented in multiple fatality crashes. We would suspect that both the increased fatal crashes and the increase in multiple fatalities must be caused by speed. The underlying cause has to do with the attitude of the AO drivers.

_	ARE 10.1.0.19							ash Data - A	Aggressive	Driv —	
	<u>File D</u> ashboard		<u>A</u> nalysis <u>I</u> mpa	_	_	Window <u>H</u> el	р			4 4 4 400 40	- 🗗 ×
	2013-2017 Alabama	Integrated (Crash Data	~	Aggres	ssive Driving			¥ 💡 😨	1/ 1/2013	√ 12/31/2017
Orde	er: Max Gain	✓ Desc	cending	V V Suppre	ess Zero-Valueo	d Rows	Sig	nificance: Over	Representation	✓ Threshol	d: 2.0 🚔
C06	0: Number Killed		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C060: Numbe	r Killed	
	1 Fatality		1647	89.80	2197	93.89	0.956*	-74.922			
	2 Fatalities		152	8.29	114	4.87	1.701*	62.651			
	3 Fatalities		25	1.36	23	0.98	1.387	6.974			
	4 Fatalities		8	0.44	4	0.17	2.552				
	5 Fatalities		2	0.11	2	0.09	1.276	0.432	Sort by Sum of	of Max Gain	
	۵ 🗞 🕼				0013-2017 Alahi	ama Integrated C	`rash Data				Display Filter N
						: Number Killed	addin Data				
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	-										
	è –										_
	Leedneucy 50 —										
	ιĔ										
	0		1 Fatality	2 Fatal	ities	3 Fatalities	4 Fat	l alities	5 Fatalities		
					C06	60: Number Kille	d				

5.6 C060 Number Injured (Non-Fatal)

The following shows that multiple injuries follow the same basic pattern as multiple fatalities. The 4 and 5 fatalities are particularly highly over-represented, probably because of the increased impact speeds of AO crashes (see Section 5.2).



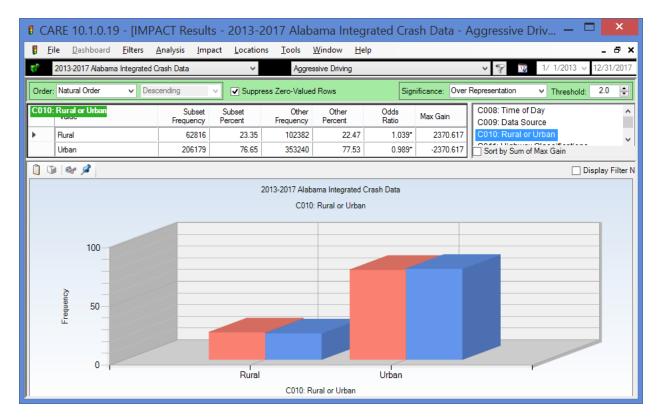


5.7 C038 Adjusted EMS Arrival Delay

All times with more than 4 occurrences with delay times in excess of 15 minutes were over-represented. This is probably due to the geographical distribution of AO crashes, which will be considered in the next major section. Extended ambulance delay times add to the accounting for AO crashes having higher crash severities.

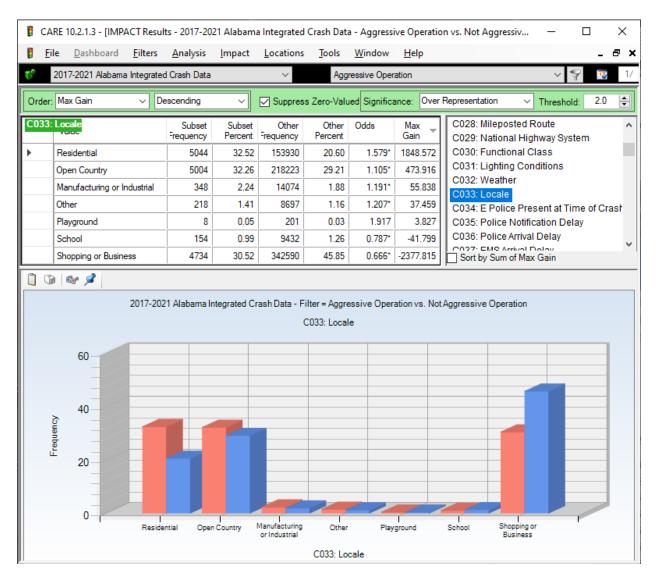
6.0 Geographical Characteristics

6.1 C010 Rural or Urban



AO crashes are significantly over-represented on rural roads, which typically allow higher speeds, and which also may account for some of the increased ambulance delay. This is a small but significant percentage (1.039 Odds Ration, or about 3.9% more than expected.

6.2 C033 Locale



Residential, Open Country and Manufacturing or Industrial are over-represented. School and Shopping or Business are under-represented. This attribute tends to demonstrate the environment in which AO driver are most lethal, as does the next.

6.3 C011 Highway Classifications

🚦 CA	RE 10.2.1.3 - [IMPAC	T Results - 2017-2	2021 Alabar	ma Integrated	d Crash Da	ta - Aggress	ive Operatio	n vs. Not Aggressiv — 🗆 🗙
🔋 Ei	le <u>D</u> ashboard	<u>F</u> ilters <u>A</u> nalysis	; <u>I</u> mpact	<u>L</u> ocation	s <u>T</u> ools	<u>W</u> indow	<u>H</u> elp	_ @ ×
6	2017-2021 Alabama Ir	ntegrated Crash Da	ta	~	Ag	gressive Oper	ation	✓ ♥ 1/
Order:	Max Gain	 ✓ Descending 	~	Suppres	ss Zero-Val	lued Significa	ance: Over	Representation V Threshold: 2.0
C011:	Highway Classificat	ions Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain 🚽	C008: Time of Day C010: Rural or Urban
•	Municipal	6967	44.92	298510	39.95	1.124*	770.241	C011: Highway Classifications
	County	2757	17.78	103396	13.84	1.284*	610.606	C012: Controlled Access
	Interstate	1890	12.19	85076	11.39	1.070*	123.910	C013: E Highway Side C015: Primary Contributing Circumstan
	Private Property	492	3.17	25074	3.36	0.945	-28.510	C016: Primary Contributing Unit Numbe
	State	2207	14.23	138311	18.51	0.769*	-664.194	C017: First Harmful Event 🗸
	Federal	1197	7.72	96780	12.95	0.596*	-812.053	Sort by Sum of Max Gain
	2	017-2021 Alabama	Integrated			ressive Oper ssifications	ation vs. Not.	Aggressive Operation
	60 40							
	Leduency							
	E 20			T				
	- 1	Municipal	County	Inte	rstate F	Private Proper	ty Stat	te Federal
				C011:	Highway C	lassifications	3	

AO crashes are over-represented on Municipal, County and Interstate roads, but not on any of the others. While all of these differences are significant, the largest differences are on the County, with a 28.4% higher proportion than expected. The frequency numbers tend to give us the idea of where AO drivers tend to allow their aggressiveness to get them into crashes.

6.4 C110 CU Driver Residence Distance



It appears that some AO drivers have more of a tendency toward AO when they are closer to home.

	RE 10.2.1.3 - [IMPACT F	Poculte - 201	7-2021 Alak	ana latear	ated Crach	Data - Aggr	essive Oper	ration	vs. Not Aggressiv — 🗆 X
Fi Fi									
_	2017-2021 Alabama Integ			ct <u>c</u> ocat	-				- · · ~
	2017-2021 Alabama Integ	grated Crash t	Jata			Aggressive C	peration		 A. A. IA.
Order:	Max Gain 🗸 🗸	Descendin	g `	🖉 🗹 Sup	press Zero-	Valued Sign	ificance: 0)ver R	Representation V Threshold: 2.0
C001:	County	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds	Max Gain 👻	^	C001: County C002: City
•	Mobile	2657	17.13	74575	9.98	1.716*	1108.900		C003: Year
	Jefferson	3483	22.46	155554	20.82	1.079*	253.860		C004: Month
	Madison	1276	8.23	57180	7.65	1.075*	89.002		C005: Day of Month C006: Day of the Week
	Dallas	175	1.13	4314	0.58	1.954*	85.446		C007: Week of the Year
	Etowah	387	2.50	14959	2.00	1.246*	76.467		C008: Time of Day
	Talladega	274	1.77	10019	1.34	1.317*	66.016		C010: Rural or Urban
	Blount	158	1.02	4628	0.62	1.645*	61.928		C011: Highway Classifications
	Covington	107	0.69	3206	0.43	1.608*	40.447		C012: Controlled Access C013: E Highway Side
	Randolph	72	0.46	1557	0.21	2.228*	39.678		C015: Primary Contributing Circumstan
	Geneva	84	0.54	2175	0.29	1.860*	38.849		C016: Primary Contributing Unit Numbe
	Clarke	83	0.54	2165	0.29	1.847*	38.057		C017: First Harmful Event
	Chambers	121	0.78	4196	0.56	1.389*	33.895		C018: Location First Harmful Event Rel t C019: E Most Harmful Event
	Barbour	91	0.59	2850	0.38	1.538*	31.837		C020: E Distracted Driving Opinion
	Conecuh	66	0.43	1977	0.26	1.608*	24.960		C021: Distance to Fixed Object
	Clebume	65	0.42	2165	0.29	1.446*	20.057		C022: E Type of Roadway Junction/Feat
	Bibb	53	0.34	1655	0.22	1.543*	18.644		C023: E Manner of Crash
	Tallapoosa	85	0.55	3354	0.45	1.221	15.374	~	C024: School Bus Related Sort by Sum of Max Gain
10) 😪 🖉								
	201	7-2021 Alaba	ma Integrate	d Crash Dat	a - Filter = A	aaressive O	peration vs.	Not A	Aggressive Operation
					C001: C				
	30								
è	20								
Frequency									
Ē	10								
	o la	-						-	and the state of t
			M	acon			Fayette		Baldwin
					C	001: Countv			

6.5 C001 County - Over-Represented

Those listed in the display above are all counties that were significantly over-represented in AO crashes. In order of Max Gain, these were Mobile, Jefferson, Madison, Dallas, Etowah, Talladega, Blount, Covington, Randolph, Geneva, Clarke, Chambers, Barbour, Conecuh, and Cleburne.

7.0 Vehicle Characteristics

7.1 C101 Causal Unit (CU) Type

The following were for AO causal units with ,10 or more occurrences.

ß	CARE	10.2.1.3 - [IMP/	ACT Resul	ts - 2017-202	1 Alabama	Integrated	Crash Data	a - Aggressi	ive Operati	ion AND No	ot Causal Unit (C	U) T —		×
l	<u>F</u> ile	<u>D</u> ashboard	<u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp				_ é	5 ×
6 2	201	17-2021 Alabama	a Integrated	d Crash Data		\sim	Agg	ressive Oper	ation			~ 💡 🌃	1/ 1/20	17 ~
Orc	der: Ma	ax Gain	∼ De	escending	~	Suppres	s Zero-Valu	ied Rows	Significa	ance: Over	Representation	✓ Threshole	d: 2.0	-
C1	01: Ca	usal Unit (CU)	Туре		Subset requency		Other requency	Other Percent	Odds Ratio	Max Gain 👻	C101: Causa	l Unit (CU) Type		
•	Pa	assenger Car			8677	7 58.18	357299	50.74	1.147*	1109.043				
	Mo	otorcycle			608	4.08	4722	0.67	6.079*	507.983				
	E	4-Wheel Off Roa	od ATV		163	3 1.09	430	0.06	17.897*	153.892				
	E	Other Motorized	Cycle/Low	Speed Veh	12	2 0.08	165	0.02	3.434	8.505				
	Sta	ation Wagon			42	2 0.28	1803	0.26	1.100	3.811				
	E	Other Passenger	Vehicle		22	2 0.15	949	0.13	1.094	1.899				
		Van or Mini-Van			10		767	0.11	0.616	-6.246				
I		Passenger Van			30		2272	0.32	0.623*	-18.123				
		Truck (6 or 7) wit			15		2170	0.31	0.326	-30.963				
I		Single-Unit Truck			24		3134	0.45	0.362*	-42.381				
I		Cargo Van (1000			51		5879	0.83	0.410*	-73.523				
 		Single-Unit Truck	k (2-Axle/6	-Tire)	56		7540	1.07	0.351*	-103.705				
<u> </u>		Mini-van			206		15634	2.22	0.622*	-125.144				
<u> </u>		Tractor/Semi-Tra			103		14949	2.12	0.325*	-213.635				
		ck-Up (Four-Tire	-	k)	2427		127988	18.18	0.895*	-283.916	L			
	E	Sport Utility Vehi	cle (SUV)		2468	3 16.55	157781	22.41	0.738*	-873.962	Sort by Sum	of Max Gain		
		er 🖉												
								ntegrated Ci Unit (CU) Ty						
	Frequency	60 40 20											Ļ	
					Station	Wagon		Single-Unit usal Unit (C		xles or Less) Pick-Up (F	our-Tire Light Tru	ıck)	

Much can be learned from the above just by considering the extremes. The most over-represented AO driven vehicles tend to be passenger cars, motorcycles and ATVs. The most underrepresented are SUVs, Pick-ups, Tractor-Trailer Trucks and Mini-vans. Pick-ups were highly over-represented for Male AO drivers, but in the general comparison they are significantly under-represented.

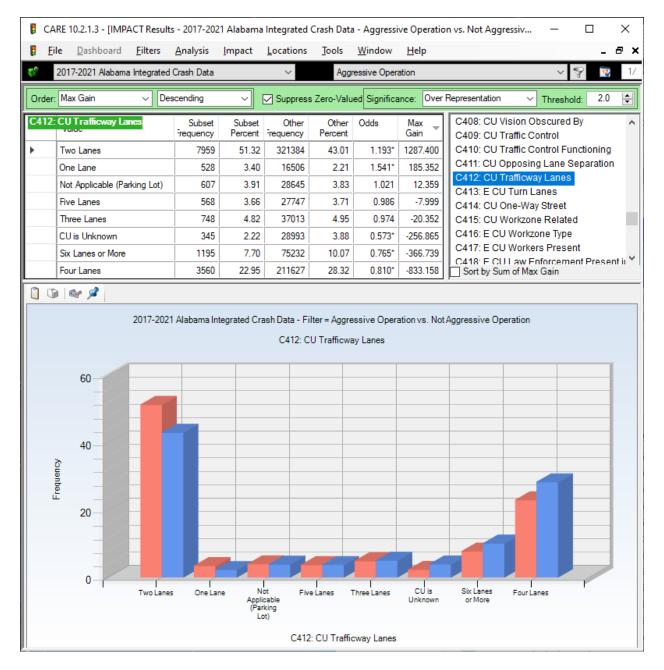
7.2 C208 CU Model Year

6	2017-2021 Alabama Integ	rated Crash Dat	ta	~	Agg	ressive Oper	ation		~ 9	12	1/
Order:	Max Gain 🗸 🗸	Descending	~	Suppre	ess Zero-Val	ued Significa	nce: Over	Representation	✓ Threshold:	2.0	-
C208:	CU Model Year	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C208: CU Mo	del Year		
•	2000	425	3.93	17801	2.92	1.344*	108.672				
	2001	463	4.28	19103	3.14	1.364*	123.535				
	2002	518	4.79	22675	3.72	1.286*	115.060				
	2003	613	5.66	27257	4.47	1.266*	128.636				
	2004	654	6.04	31017	5.09	1.187*	102.820				
	2005	690	6.37	33699	5.53	1.152*	91.160				
	2006	766	7.08	36165	5.94	1.192*	123.339				
	2007	790	7.30	39470	6.48	1.126*	88.608				
	2008	677	6.25	34605	5.68	1.101*	62.061				
	2009	370	3.42	22735	3.73	0.916	-34.007				
	2010	459	4.24	26847	4.41	0.962	-18.078				
	2011	449	4.15	30158	4.95	0.838*	-86.915				
	2012	486	4.49	33876	5.56	0.807*	-115.985				
	2013	536	4.95	36560	6.00	0.825*	-113.680				
	2014	522	4.82	36759	6.03	0.799*	-131.217				
	2015	546	5.04	39688	6.52	0.774*	-159.266				
	2016	534	4.93	37160	6.10	0.809*	-126.342				
	2017	463	4.28	32988	5.42	0.790*	-123.205				
	2018	349	3.22	22530	3.70	0.872*	-51.364				
	2019	288	2.66	15637	2.57	1.036	10.127				
	2020	156	1.44	8693	1.43	1.010	1.523				
	2021	66	0.61	3348	0.55	1.109	6.505				
	2022	4	0.04	270	0.04	0.834	-0.798	Sort by Sum	of Max Gain		
1	I 😪 🖉										
			:	2017-2021 A	labama Integr	ated Crash [)ata				
				C2	08: CU Mode	l Year					
	8—									_	
			-1	L							
5	6	_ 1 [. 6 (- 1					
Frequency	4	1.61								_	
ы Ц										_	
	2										
	0	2004	1	2	009		2014	2()19		
		200-		2	C208: CU N	lodel Year	2011	20			
					0200.001						

The later model years (after 2008) are relatively under-represented in AO crashes.

8.0 Roadway Environment and Pavement Characteristics

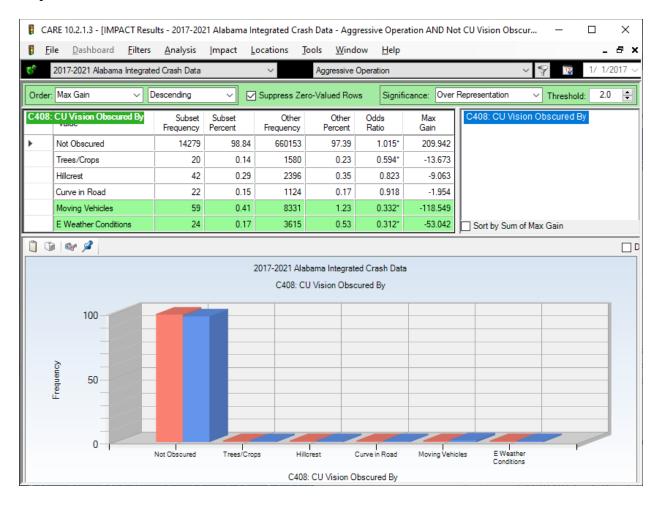
8.1 C412 CU Traffic Lanes



Two-lane roads have the greatest relative inclination toward AO crashes.

8.2 C408 CU Vision Obscured By

Vision obscurity seems not to be a major problem in AO crashes, with 98.84% falling into the Not Obscured category, as opposed to 97.39% for the non-AO crashes. However, there are some significant differences that occur that might shed some light on AO. In the following items with less than 10 AO occurrences were suppressed. Things that arise to the highest criticality seem to be items that might catch the AO driver by surprise, especially Hillcrests, Curves in the Road and crops. See the next item for weather considerations.



8.3 C032 Weather

-	RE 10.2.1.3 - [IMPACT Result			-				n vs. Not Aggressiv — 🗆 🗙					
E Ei			<u>I</u> mpact	Locations	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp	_ 8 ×					
¢.	2017-2021 Alabama Integrated	l Crash Data		~	Aggr	ressive Opera	ation	Y Y 1 1 1					
Order	Max Gain 🗸 De	escending	~	Suppress	s Zero-Valu	ed Significa	ance: Over l	Representation V Threshold: 2.0 🛓					
C032:	Weather	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds	Max 🚽 Gain	C025: Crash Severity C026: Intersection Related					
•	Clear	11286	72.77	500936	67.05	1.085*	887.086	C027: At Intersection					
	Severe Winds	3	0.02	300	0.04	0.482	-3.228	C028: Mileposted Route					
	Other	1	0.01	233	0.03	0.207	-3.837	C029: National Highway System C030: Functional Class					
	Sleet/Hail/Freezing Rain	10	0.06	819	0.11	0.588	-7.002	C031: Lighting Conditions					
	Unknown	40	0.26	2373	0.32	0.812	-9.261	C032: Weather					
	Snow	7	0.05	857	0.11	0.393	-10.790	C033: Locale					
	Fog	68	0.44	4296	0.57	0.762	-21.181	C034: E Police Present at Time of Crast C035: Police Notification Delay					
	E Mist	315	2.03	17804	2.38	0.852*	-54.593	C036: Police Arrival Delay					
	Cloudy	2647	17.07	132456	17.73	0.963	-102.650	C037: EMS Arrival Delay					
	Rain	1133	7.30	87028	11.65	0.627*	-673.611	Sort by Sum of Max Gain					
		Source Winds		et/Hai/Freezin		Same States							
		Severe Winds	Sle	Rain	g	Snow		E Mist Rain					
					C032: W	/eather							

AO drivers do not seem to be deterred by bad weather. However, their percentage is reduced significantly during the rain. This indicates that those inclined to be AO recognize, to their credit, their increased danger during inclement weather, and seem to avoid AO situations under these circumstances.

🖡 CA	RE 10.2.1.3 - [IMPACT Res	ults - 2017-20)21 Alabam	na Integrated	d Crash Dat	a - Aggressi	ive Operatio	n vs. Not Aggressiv — 🗆 🗙					
Ei Ei	ile <u>D</u> ashboard <u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpact	<u>L</u> ocations	s <u>T</u> ools	<u>W</u> indow	<u>H</u> elp	_ & ×					
6 °	2017-2021 Alabama Integrat	ed Crash Data	1	~	Agg	ressive Oper	ation	✓					
Order	: Max Gain 🗸 🗸	Descending	~	Suppres	ss Zero-Valı	ued Significa	ance: Over	Representation V Threshold: 2.0 主					
C403:	CU Roadway Condition	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C402: E CU Road Surface Type					
•	Dry	12541	80.86	556204	74.44	1.086*	994.779	C404: E CU Environmental Contributing					
	Muddy Sand/Dirt/Gravel	24	0.15	373	0.05	3.100*	16.257	C405: CU Contributing Material in Road C406: CU Contributing Material Source					
	Unknown	21	0.14	889	0.12	1.138	2.545	C406. CO Contributing Material Source C407: CU Roadway Curvature and Grad					
	Other	4	0.03	155	0.02	1.243	0.782	C408: CU Vision Obscured By					
	E Snow	2	0.01	376	0.05	0.256	-5.805	C409: CU Traffic Control					
	E Water Buildup	7	0.05	735	0.10	0.459	-8.258	C410: CU Traffic Control Functioning					
	Not Applicable	490	3.16	24093	3.22	0.980	-10.146	C411: CU Opposing Lane Separation C412: CU Trafficway Lanes					
	Ice	14	0.09	2218	0.30	0.304	-32.043	C413: E CU Turn Lanes					
	CU is Unknown	345	2.22	28993	3.88	0.573*	-256.865	C414: CU One-Way Street 🗸					
	Construction 343 2.22 2833 3.66 0.573 220.065 C414: C0 One-Way Street Wet 2062 13.29 132909 17.79 0.747* -697.054 Sort by Sum of Max Gain												
	Image: Second and Second												
	2017-2021 Alabama Integrated Crash Data - Filter = Aggressive Operation vs. Not Aggressive Operation C403: CU Roadway Condition												
		Sand/Dirt/Gra	iver	C4(03: CU Road	dway Conditi	on						

8.4 C403 CU Roadway Condition

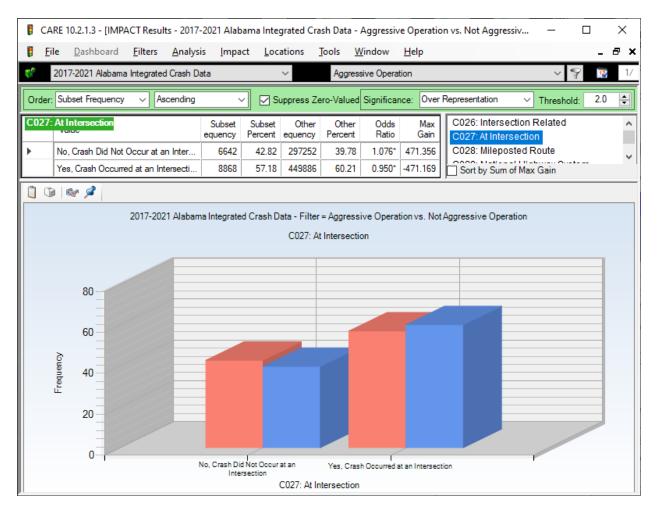
This further confirms the weather findings above. There seems to be a beneficial concern for extreme slippery conditions, which may cause concern for factors other than aggressiveness that are usually directed toward other drivers.

8.5 C022 E Type of Roadway Junction Feature

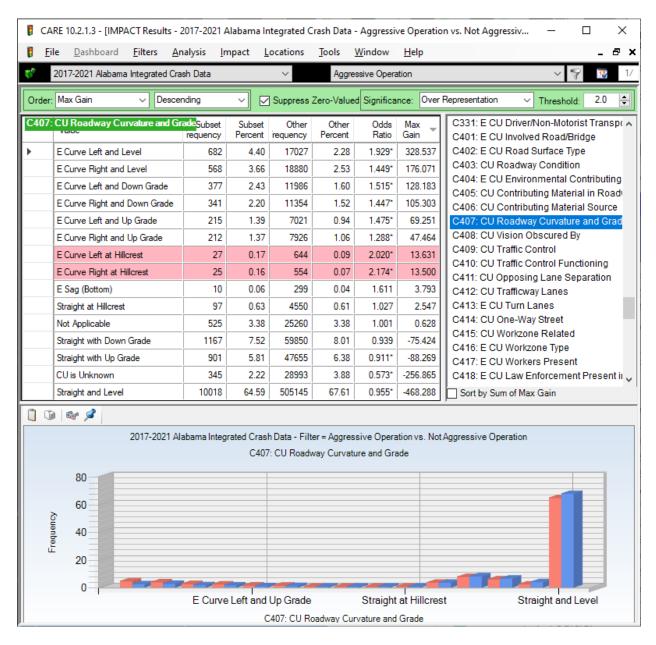
The following display suppressed all items with less than 30 AO crashes. They are ordered by Max Gain with all items less than 30 AO crashes removed. We also felt that a consideration according to the frequency might be as helpful. From the highest frequency items (and their frequencies) first: Four-Way Intersection (1,259), T-Intersection (1,034), Bridge/Overpass/Underpass (299), Entrance or Exit Ramp (282), and On Segment but Intersection Related (254). While Frontage Road has the highest Odds Ratio, its frequency (32) is one of the lowest in this list.

🖡 CA	RE 10.2.1.3 - [IMP/	ACT Res	ults - 2017-2	2021 Alaba	ma Integ	rated Cra	sh Data - /	Aggressiv	e Operatio	n AND Not E Ty	/pe o —		×
🔋 <u>E</u> i	le <u>D</u> ashboard	<u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpac	t <u>L</u> oca	tions]	[ools <u>W</u>	/indow	<u>H</u> elp			-	₽×
6	2017-2021 Alabama	Integrat	ted Crash Dat	a		~	Aggress	ive Operat	tion		~ <	?	1/
Order	Max Gain	~	Descending	~	🛛 🖂 Su	ppress Ze	ro-Valued	Significar	ice: Over	Representation	✓ Threshole	J: 2.0	×
C022:	EType of Roadw	ay Juno	tion/Feature	Subset equency	Subset Percent	Other equency	Other Percent	Odds Ratio	Max Gain	C022: E Type	e of Roadway Ju	nction/F	eature
	No Special Feature	;		11569	75.36	513685	69.42	1.086*	912.078				
	Entrance or Exit Ra	amp		282	1.84	9983	1.35	1.362*	74.892				
	Y-Intersection			86	0.56	2860	0.39	1.449*	26.666				
	Other (than 1-12) N	lon-Inter	section	59	0.38	1884	0.25	1.510*	19.914				
	Frontage Road			32	0.21	657	0.09	2.348*	18.370				
•	Bridge/Overpass/U	Inderpas	35	299	1.95	13762	1.86	1.047	13.493				
	On Ramp Merge Area 44 0.29 1537 0.21 1.380 12.113 Defined Courses 25 0.23 1.345 0.10 1.354 7.003												
	Railroad Crossing 35 0.23 1345 0.18 1.254 7.097												
	Intersection with Ra	amp		40	0.26	2214	0.30	0.871	-5.932				
	Off Ramp			53	0.35	3174	0.43	0.805	-12.848				
	Other Intersection			35	0.23	2384	0.32	0.708	-14.459				
	On Segment but Int	tersectio	n Related	254	1.65	12974	1.75	0.944	-15.159				
	At Intersection, Inte	ersection	Related	47	0.31	3371	0.46	0.672*	-22.935				
	Crossover in Media	n		41	0.27	3456	0.47	0.572*	-30.698				
	T-Intersection			1034	6.74	51677	6.98	0.964	-38.092				
	Business Drive			65	0.42	5067	0.68	0.618*	-40.120				
	Driveway Access In	ntersecti	on	117	0.76	7977	1.08	0.707*	-48.491				
	Four-Way Intersect	ion		1259	8.20	101903	13.77	0.596*	-855.0	Sort by Sur	n of Max Gain		
00) 😪 🖉												
					2017-202	1 Alabama	Integrated	d Crash Da	ata				
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8.6 C027 At Intersection



The over-representation at non-intersections for AO crashes is significant, but it is not a large over-representation. We might expect some aggressive responses resulting from traffic at intersections. However, this does not appear to be a major factor, and it could well be reducing the AO inclinations.

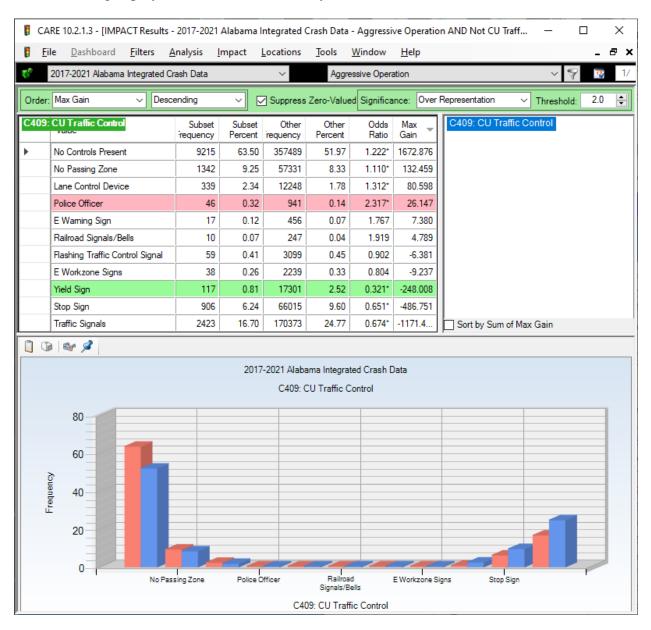


8.7 C407 CU Roadway Curvature and Grade

This is a very interesting display to attempt to fathom the reason that AO crashes occur more at certain curvature and grade types. Some of the items, such as the level curves, might occur more frequently on the roadway, and that could account for their higher frequencies. However, this is generally compensated for by the comparison with the non-AO proportions. In this regard, Curve Left (or right) at Hillcrest has the highest Odds Ratios, although they are one of the most infrequent occurrences.

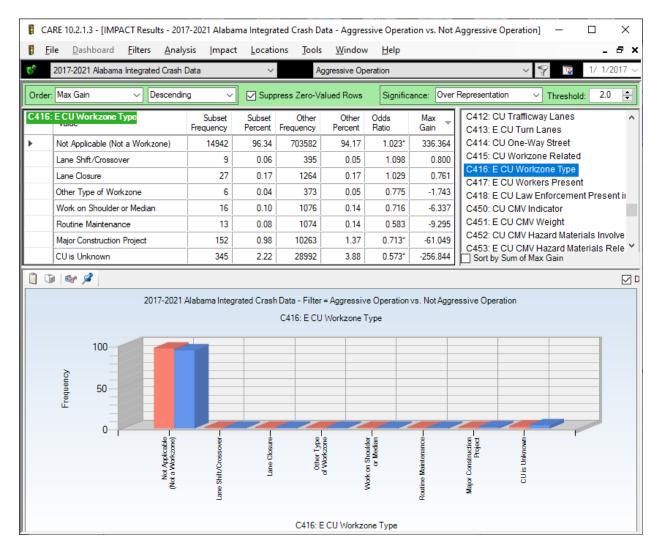
8.8 C409 CU Traffic Control

All items that had frequencies less than 10 AO crashes were removed. The most significant over-representation involved the presence of a police officer, which demonstrates that police officers are being deployed to locations where they are most needed.



8.9 C416 CU Workzone Type

AO crashes are under-represented in workzones, their having 96.34% of their crashes outside of the Workzone as opposed to 94.17% for non-AO crashes. The comparison below is for those crashes that were recorded to have occurred within workzones. Major construction projects are clearly the greatest problem in the absolute frequency sense, although they are under-represented. Lane closures fall a distant second. Interestingly, lane shifts are even fewer, but they do show a significantly higher proportion than for the non-AO crashes. None of the differences in the proportions are significant, in most cases because no statistical significance is determined for items with less than 20 occurrences.



For general information on aggressive driving from NHTSA and other sources, please see: <u>http://www.safehomealabama.gov/tag/aggressive-driving/</u>

or <u>http://www.safehomealabama.gov/tag/aggressive-operation/</u>