

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

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July 6, 2022

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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 relative 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 or 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.

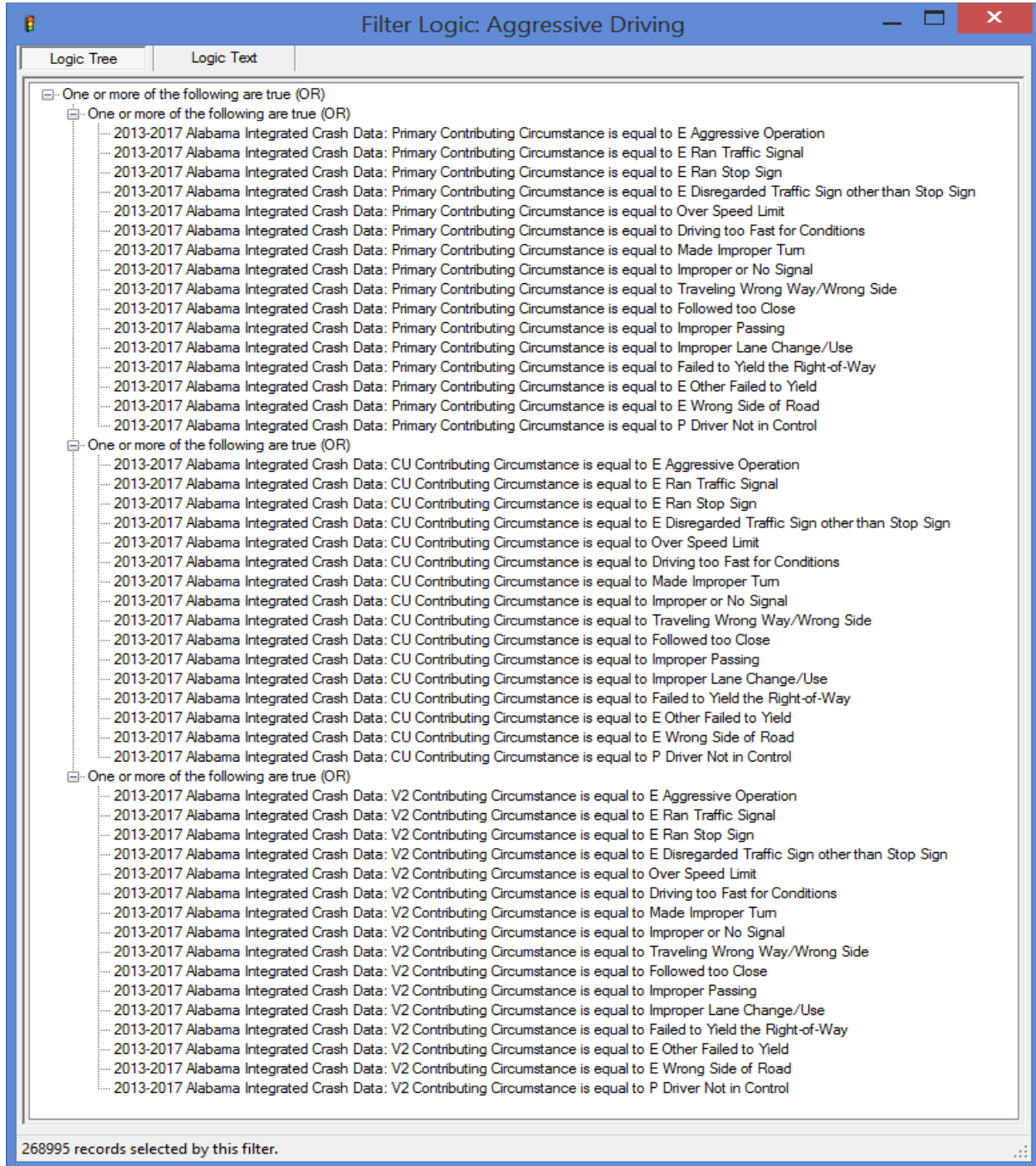
- Vehicle Characteristics
 - C101-CU Vehicle Type. Officers working Selective Enforcement should be aware of the vehicle types that are typical of AO crashes so that they can give them special attention if they find them in violation of any laws.
 - C208-CU Model Year. Since drivers who cause AO crashes 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.
- C403-CU Roadway Condition. See C030 above.
- C022-Type of Roadway Junction. No recommendations.
- 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



Filter Logic: Aggressive Driving

Logic Tree Logic Text

- [-] One or more of the following are true (OR)
 - [-] One or more of the following are true (OR)
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Aggressive Operation
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Ran Traffic Signal
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Ran Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Disregarded Traffic Sign other than Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Over Speed Limit
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Driving too Fast for Conditions
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Made Improper Turn
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Improper or No Signal
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Traveling Wrong Way/Wrong Side
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Followed too Close
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Improper Passing
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Improper Lane Change/Use
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to Failed to Yield the Right-of-Way
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Other Failed to Yield
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to E Wrong Side of Road
 - 2013-2017 Alabama Integrated Crash Data: Primary Contributing Circumstance is equal to P Driver Not in Control
 - [-] One or more of the following are true (OR)
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Aggressive Operation
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Ran Traffic Signal
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Ran Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Disregarded Traffic Sign other than Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Over Speed Limit
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Driving too Fast for Conditions
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Made Improper Turn
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Improper or No Signal
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Traveling Wrong Way/Wrong Side
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Followed too Close
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Improper Passing
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Improper Lane Change/Use
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to Failed to Yield the Right-of-Way
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Other Failed to Yield
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to E Wrong Side of Road
 - 2013-2017 Alabama Integrated Crash Data: CU Contributing Circumstance is equal to P Driver Not in Control
 - [-] One or more of the following are true (OR)
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Aggressive Operation
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Ran Traffic Signal
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Ran Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Disregarded Traffic Sign other than Stop Sign
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Over Speed Limit
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Driving too Fast for Conditions
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Made Improper Turn
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Improper or No Signal
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Traveling Wrong Way/Wrong Side
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Followed too Close
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Improper Passing
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Improper Lane Change/Use
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to Failed to Yield the Right-of-Way
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Other Failed to Yield
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to E Wrong Side of Road
 - 2013-2017 Alabama Integrated Crash Data: V2 Contributing Circumstance is equal to P Driver Not in Control

268995 records selected by this filter.

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.

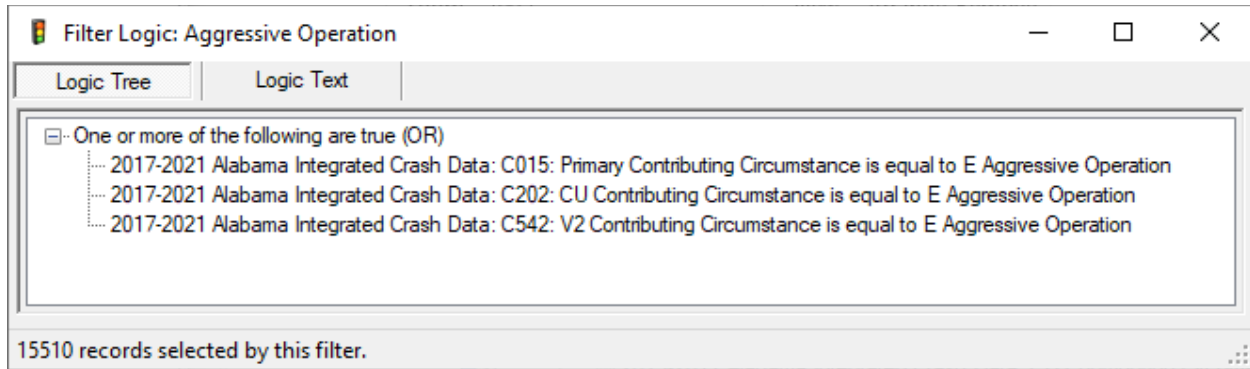
An issue arises since few people, even in the traffic safety community, use the term Aggressive Operation. The term Aggressive Driving is far more predominant. It is not our intent to try to influence terminology being used. It would seem to be more practical to just abandon the technical definition 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 multiple contributing circumstances (i.e., no one 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 Circumstances (C015), Causal Unit (CU) Contributing Circumstances (C202), and/or V2 Contributing Circumstance (C542).

This entry in eCrash will cause the “Aggressive 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:



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 over-represented.
 - 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 over-representation 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 over-represented. 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 or 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).

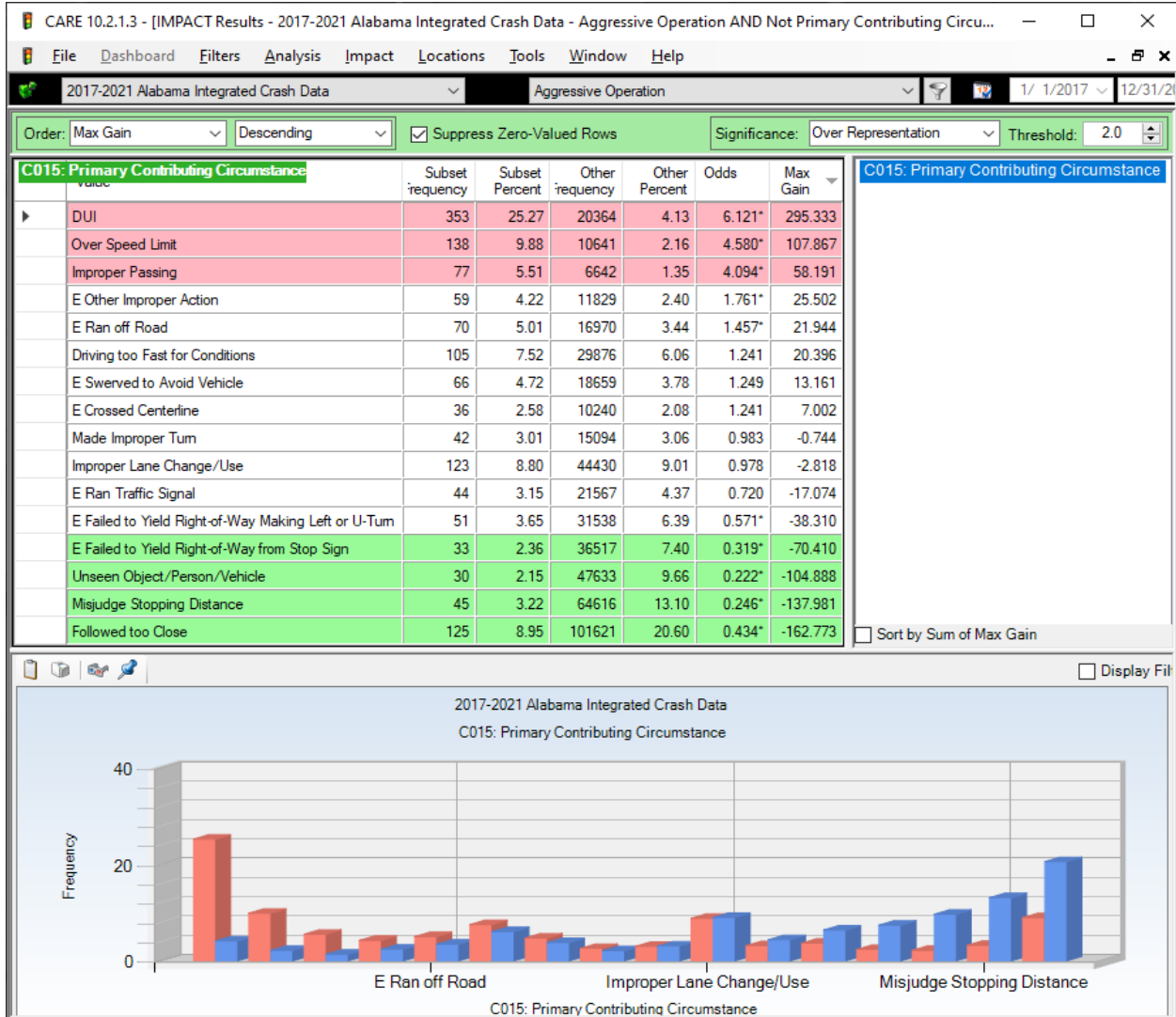
- More driving close to home was being done for the AO crashes in the bad counties (71.6%) as opposed to the control comparison (67.1%), which probably reflects the gender differences.
 - Unemployment of involved drivers was higher in the bad AO counties; it was 15.1% in the bad counties and 11.2% for 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 of 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 brown@cs.ua.edu.

2.0 Crash Characteristics

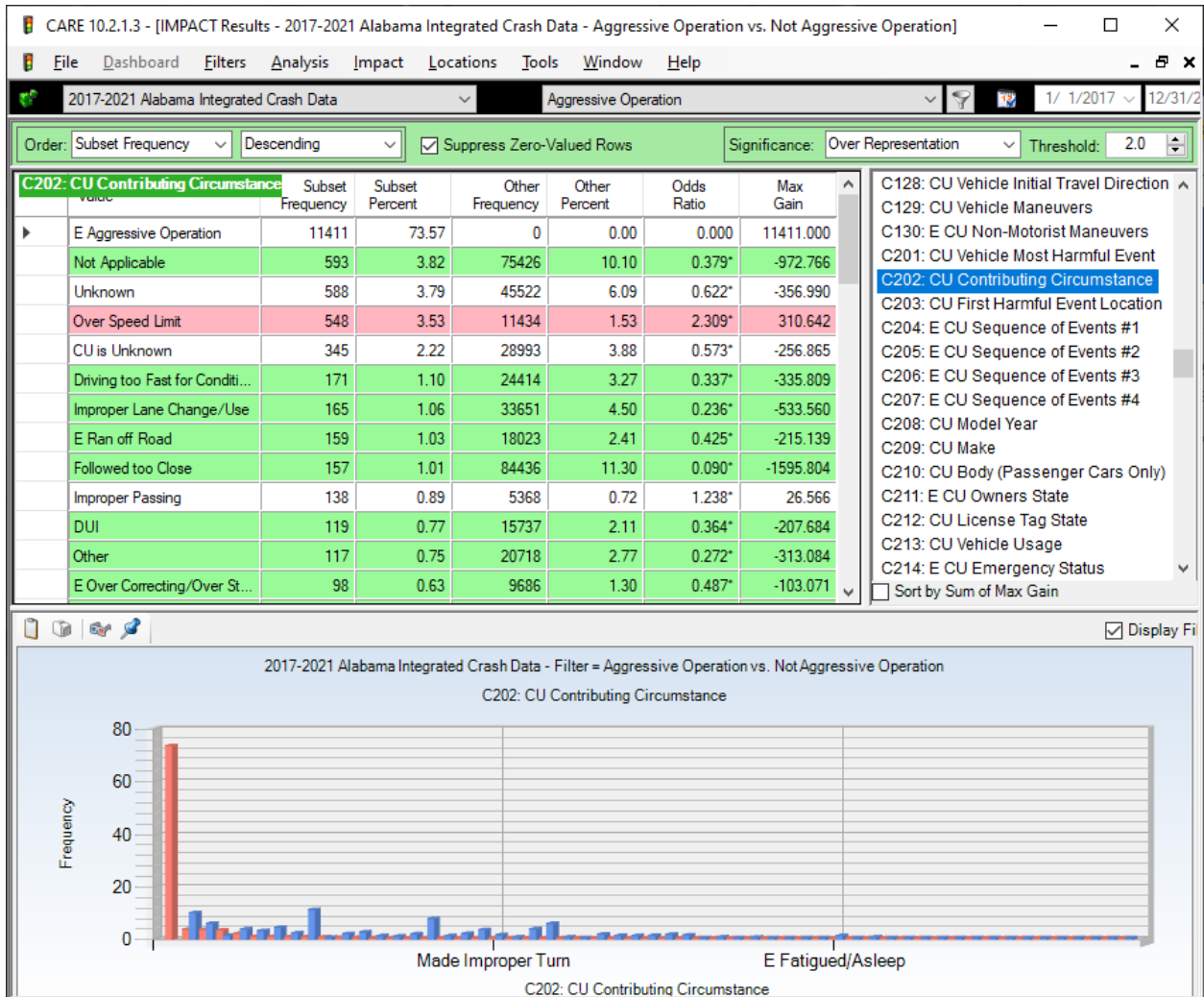
2.1 C015 Primary Contributing Circumstance – Most Correlated Items



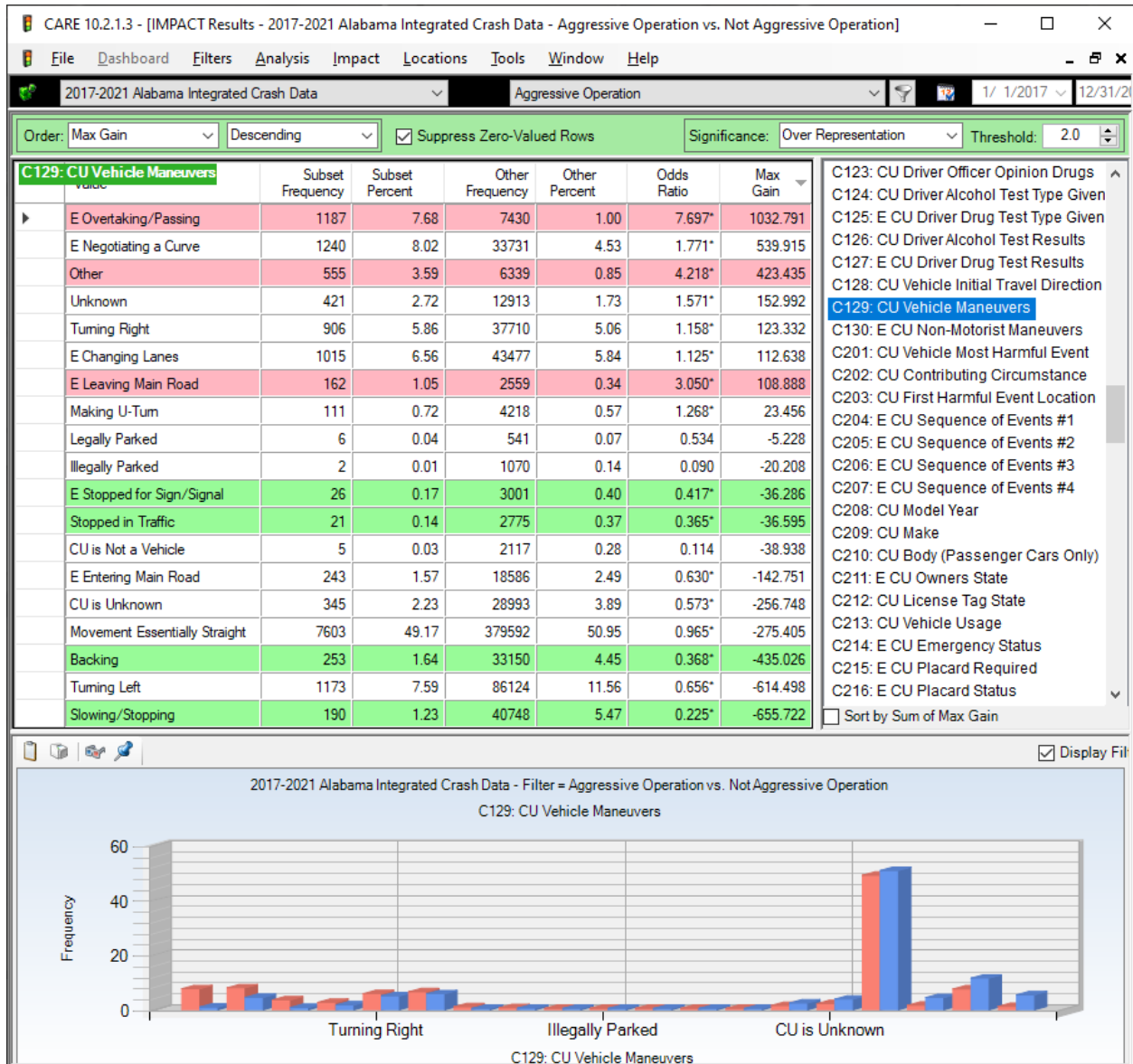
The Aggressive Operation (AO) value that appeared in 13,594 cases in this attribute were removed so that the other values that correlate with AO could be more easily visualized. Also, all items with less than 30 occurrences (< 6 per year) were also removed. The remaining items demonstrate the PCC values 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.

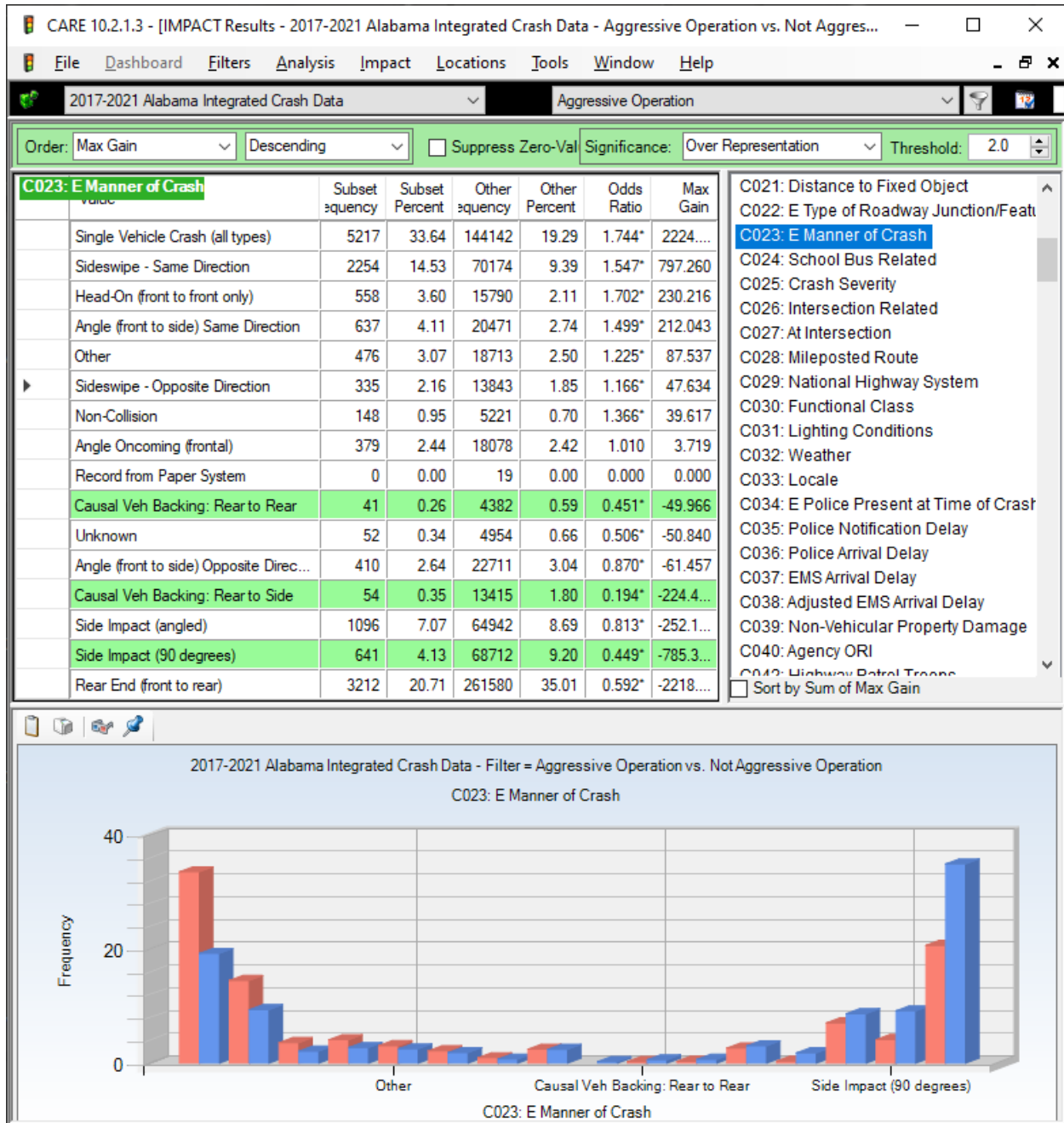


2.3 C129 CU Vehicle Maneuvers



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



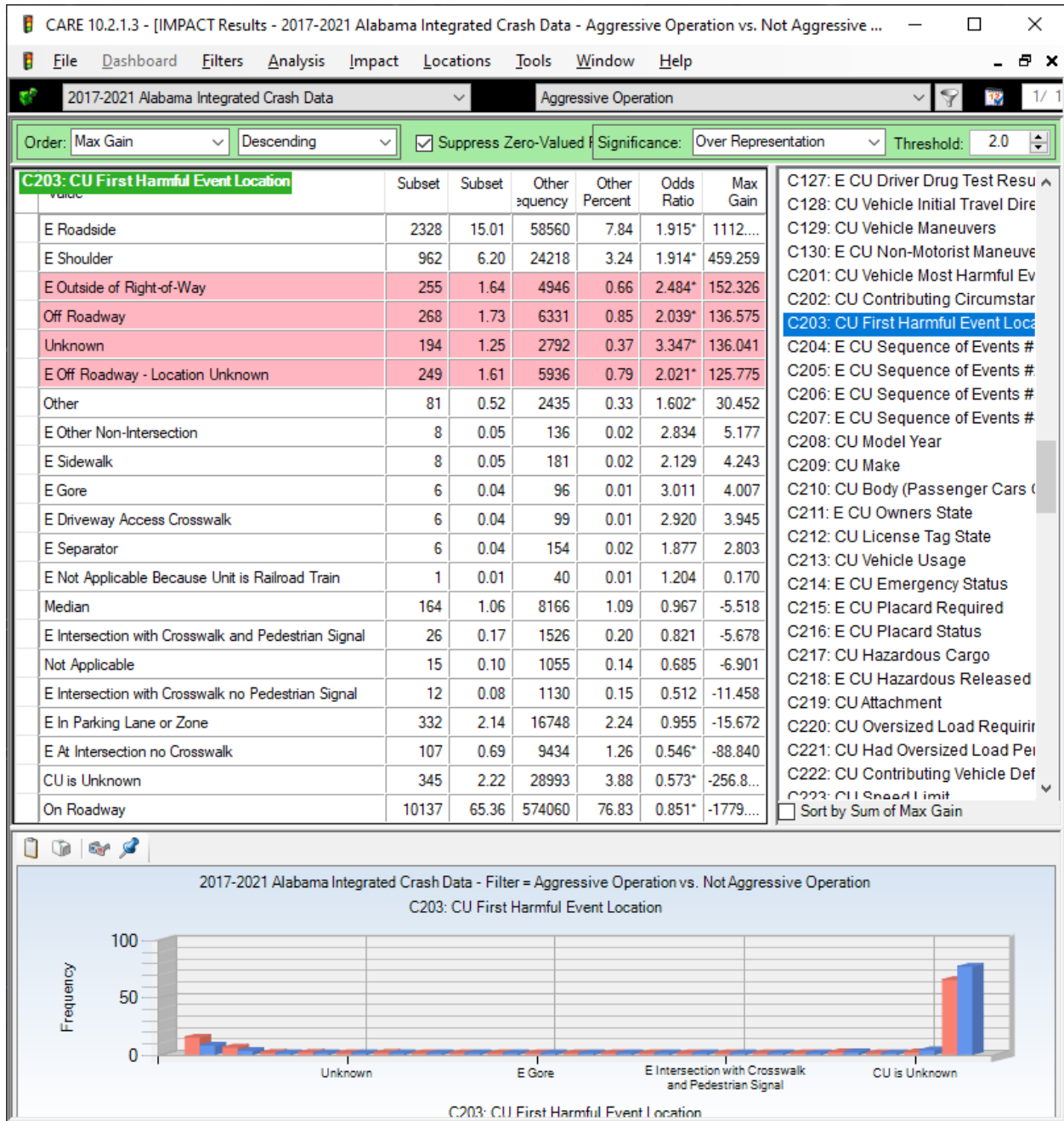
AO crashes are most over-represented in Single Vehicle Crashes (1.744 times expected), Sideswipe – Same Direction (1.547), Head-On (front to front 1.702), and Angle (front to side) Same Direction (1.499).

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

Event	Subset	Subset	Other frequency	Other Percent	Odds Ratio	Max Gain
E Ran Off Road Right	1091	7.03	21978	2.94	2.391*	634.7...
E Ran Off Road Left	714	4.60	12187	1.63	2.822*	461.0...
E Evasive Action (Swerve/Brake)	429	2.77	5875	0.79	3.518*	307.0...
Overtum/Rollover	424	2.73	6579	0.88	3.105*	287.4...
Collision with Tree	516	3.33	14925	2.00	1.665*	206.1...
E Collision with Curb/Island/Raised ...	253	1.63	3201	0.43	3.807*	186.5...
E Crossed Centerline	287	1.85	4841	0.65	2.856*	186.5...
Collision with Utility Pole	273	1.76	5798	0.78	2.268*	152.6...
Collision with Ditch	528	3.40	18192	2.43	1.398*	150.3...
E Ran Off Road Straight	182	1.17	2273	0.30	3.857*	134.8...
Collision with Other Fixed Object	234	1.51	5144	0.69	2.191*	127.2...
Collision with Fence	192	1.24	3156	0.42	2.931*	126.4...
E Collision with Embankment	174	1.12	3749	0.50	2.236*	96.175
Collision with Parked Motor Vehicle	794	5.12	34649	4.64	1.104*	74.723
Collision with Mailbox	150	0.97	3753	0.50	1.925*	72.092
Collision with Sign Post	156	1.01	4118	0.55	1.825*	70.515
E Fell/Jumped from Motor Vehicle	59	0.38	316	0.04	8.994*	52.440
E Other Non-Collision	87	0.56	1684	0.23	2.489*	52.042
E Crossed Median	50	0.32	641	0.09	3.758*	36.694
Collision with Culvert Headwall	90	0.58	2946	0.39	1.472*	28.844
E Collision with Non-Motorist: Pedes...	84	0.54	2832	0.38	1.429*	25.211
E Collision with Other Post/Pole/Su...	48	0.31	1183	0.16	1.955*	23.442
E Collision with Concrete Barrier	121	0.78	5034	0.67	1.158	16.499
Collision with Light Pole (Non-Break...	30	0.19	714	0.10	2.024*	15.178
Collision with Light Pole (Breakaway)	25	0.16	635	0.08	1.897*	11.818

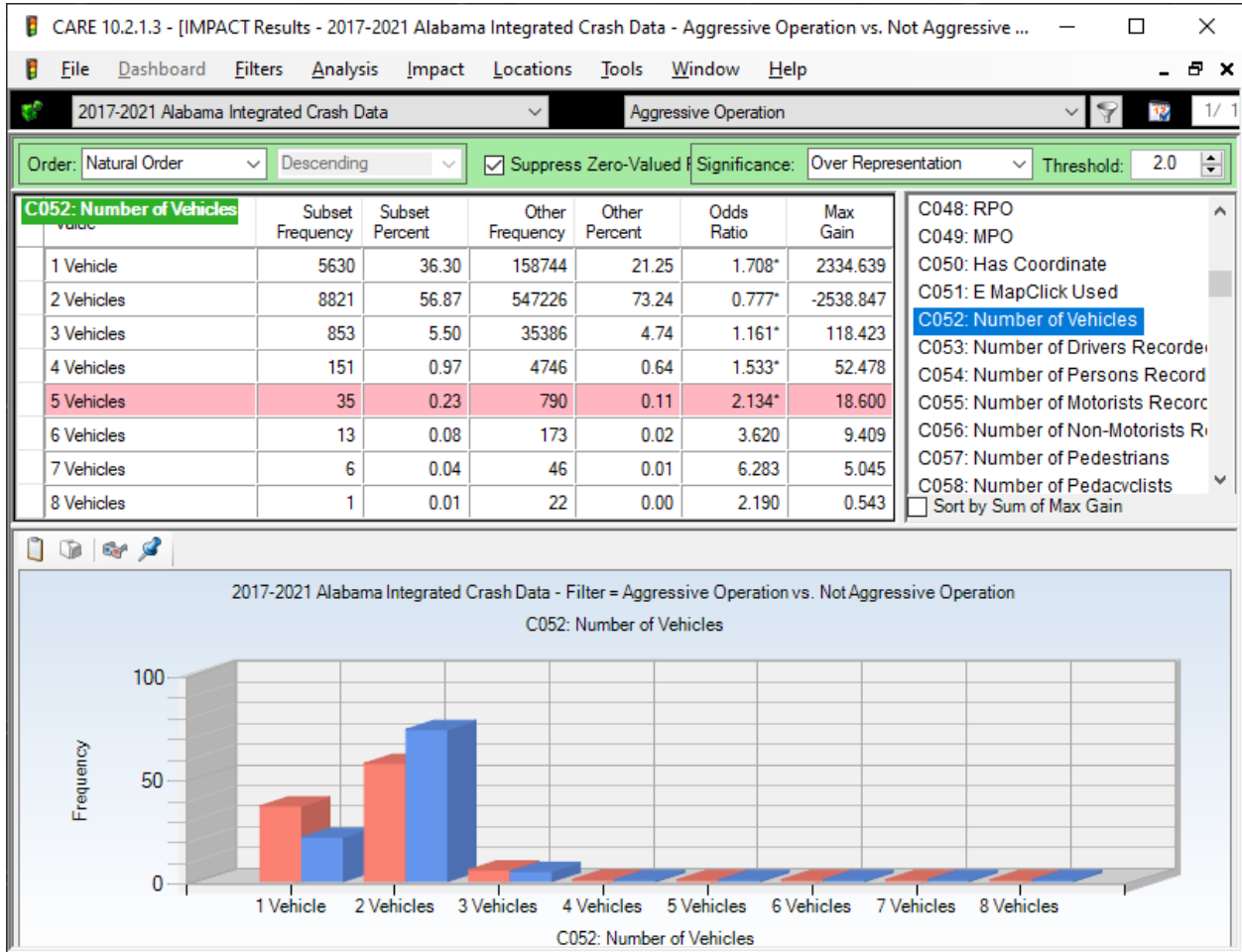
Ordered by Max Gain, notice the extremely large number of items (15) that are over-represented by at least an Odds Ratio of two (red backdrop). All of these items demonstrate some loss of control of the vehicle, which would be expected with the emotion of AO.

2.6 C203 CU First Harmful Location



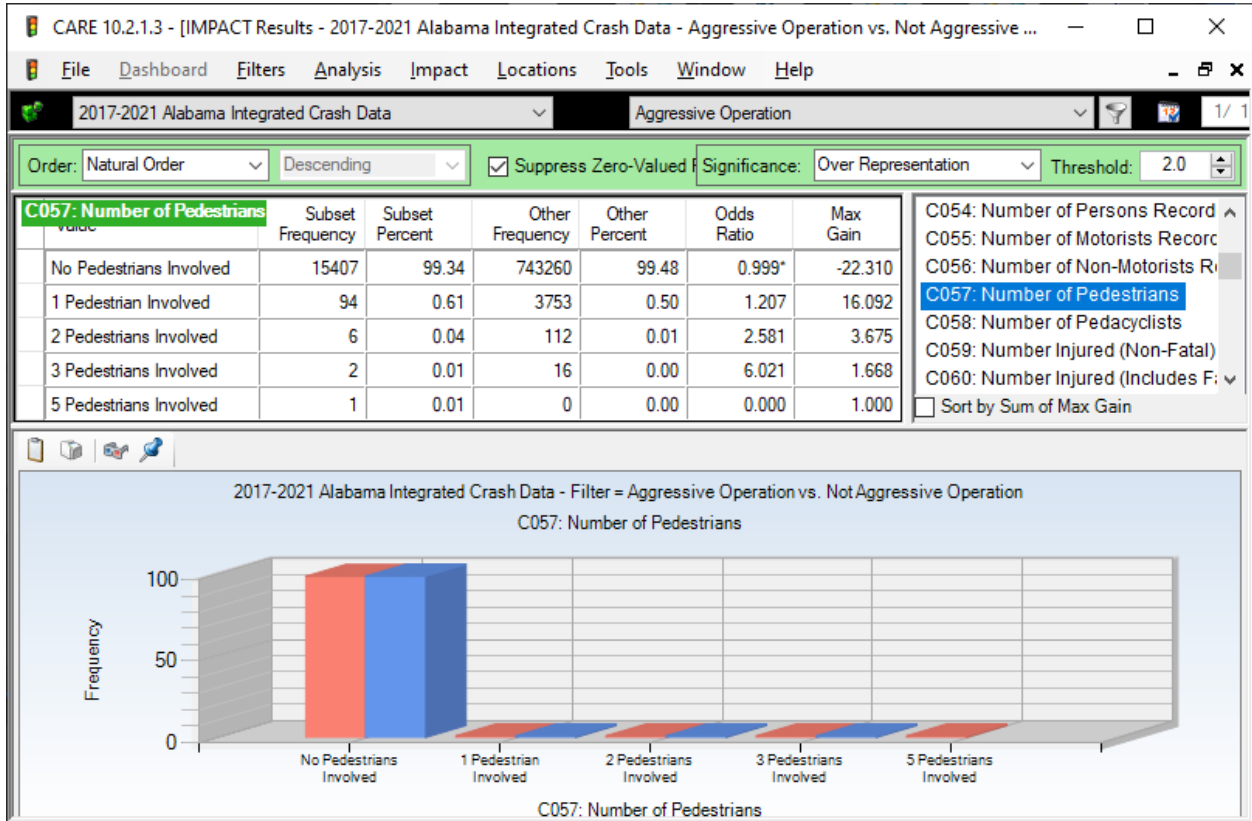
These results support the findings of the two attributes given above.

2.7 C052 Number of Vehicles



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 3- or 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.

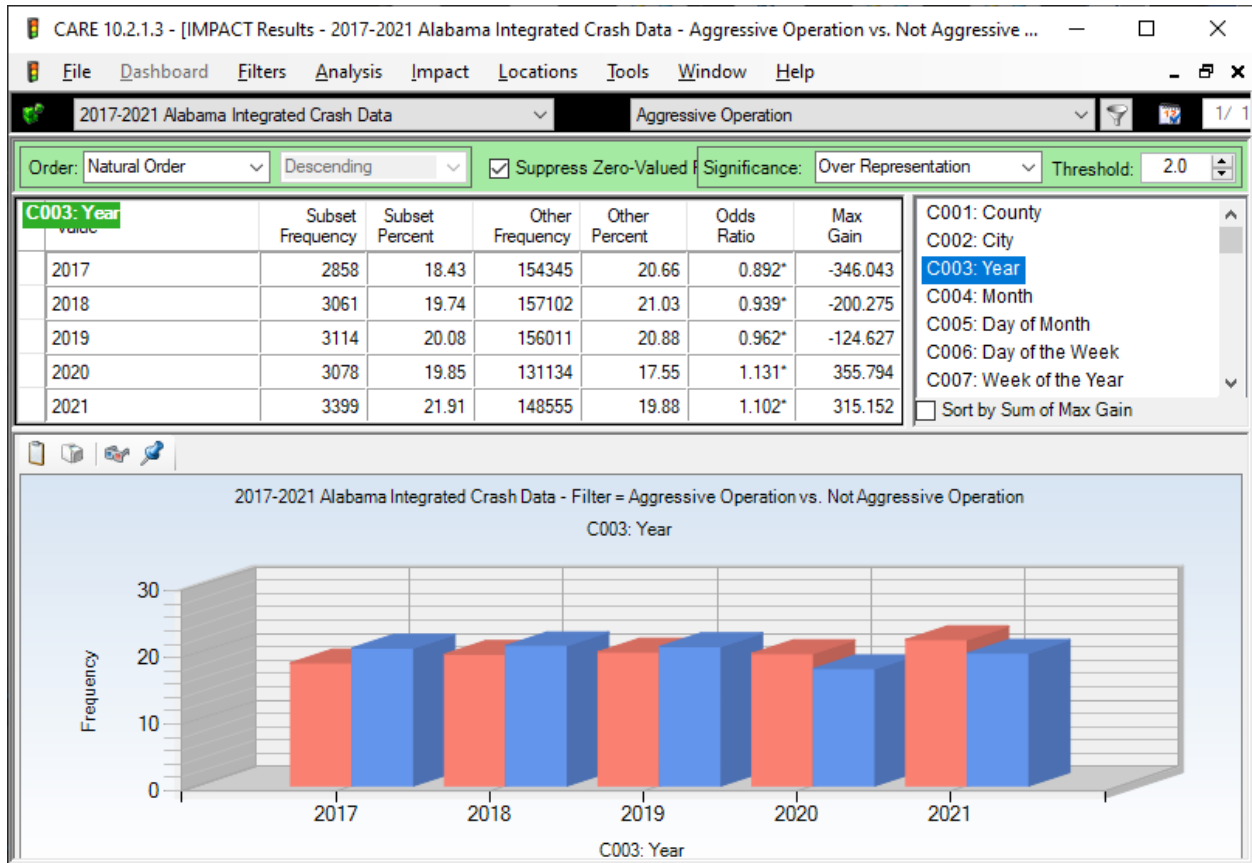
2.8 C057 Number of Pedestrians



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.

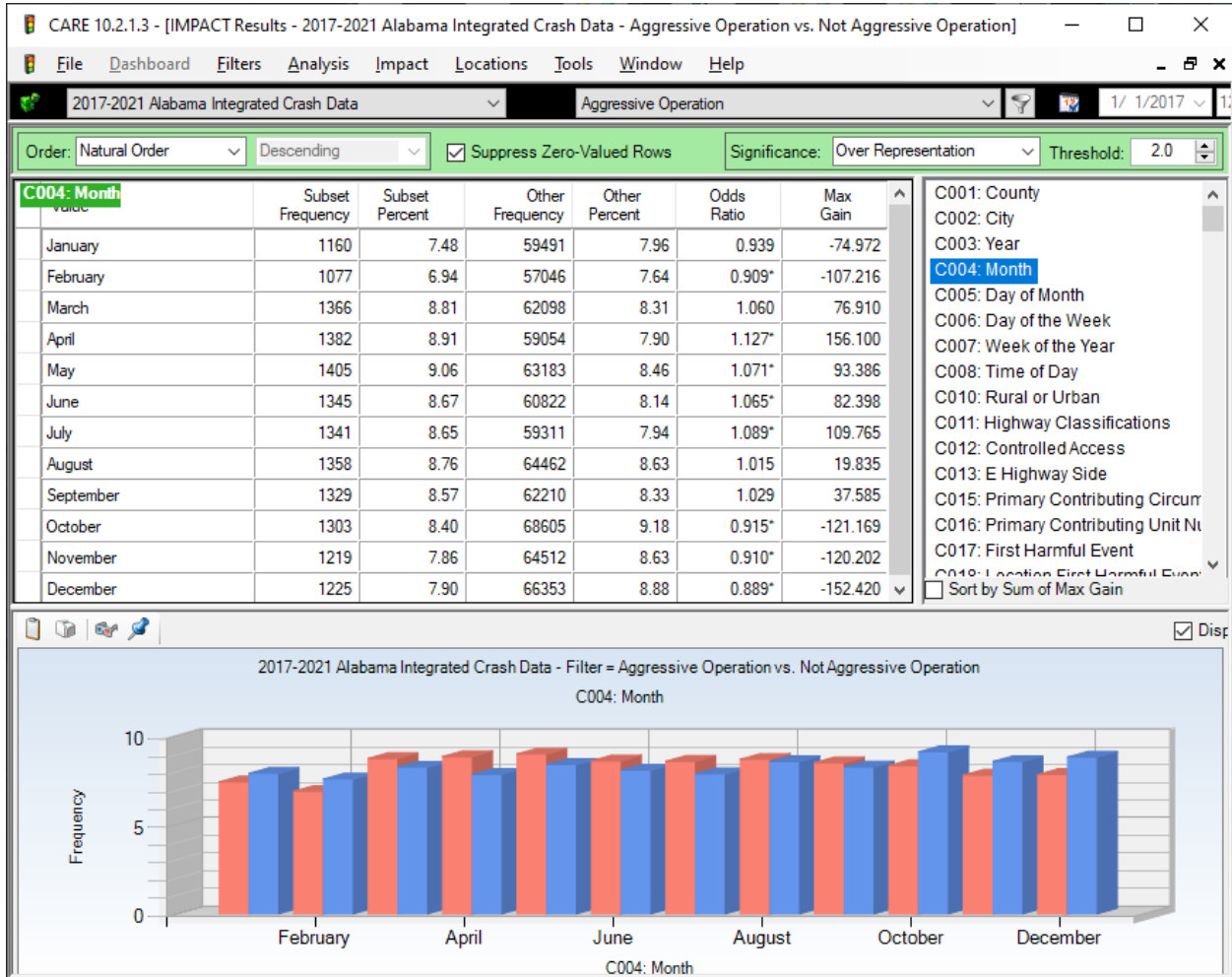
3.0 Time Characteristics

3.1 C003 Year



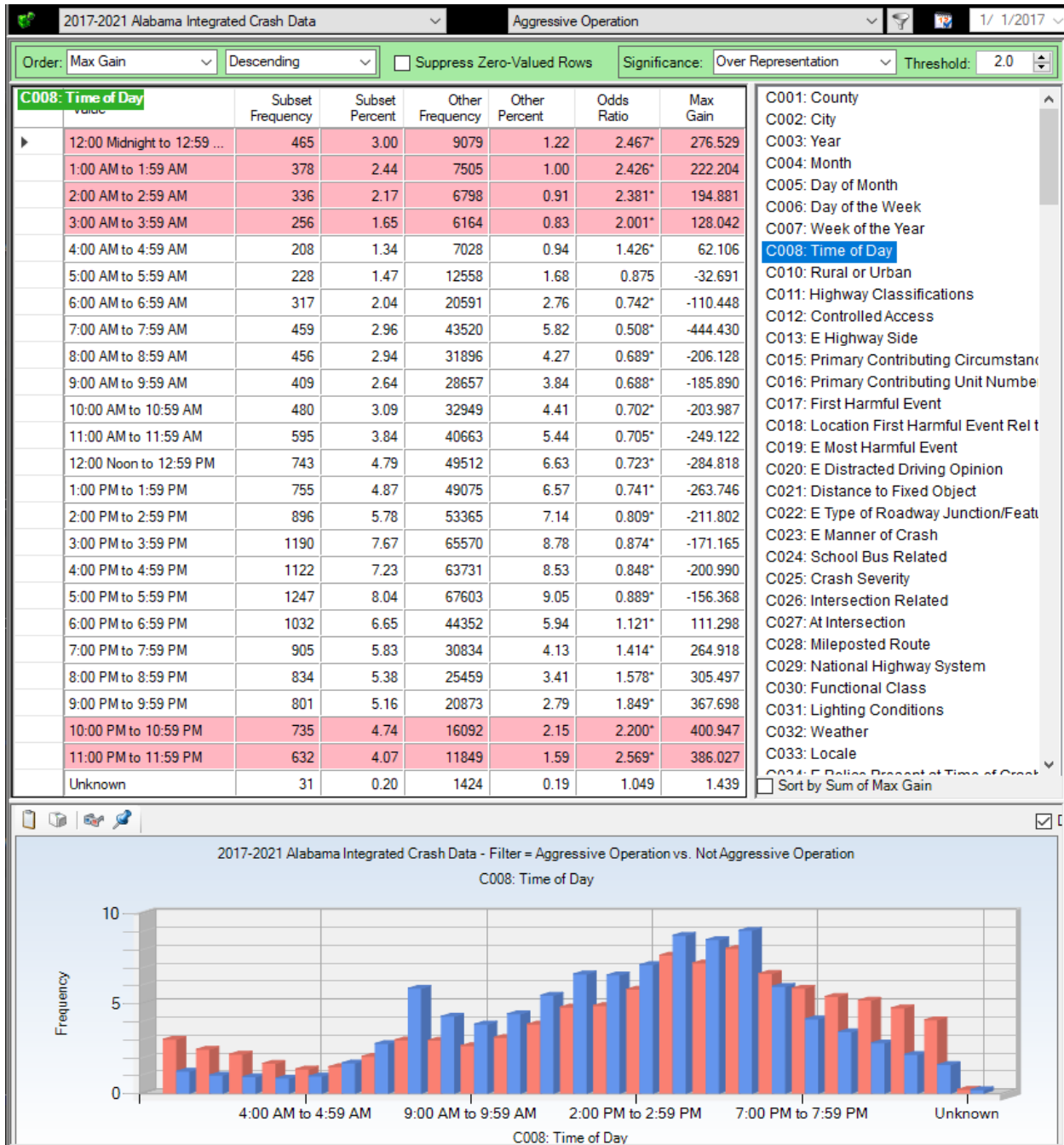
The display above shows fairly definitively that Aggressive Operation crashes are on the increase. With the one exception of 2020, both the frequency and the proportions of AO crashes increased. This takes into consideration the 2020 COVID issues, but the reduction in the AO crashes was minimal. The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

3.2 C004 Month



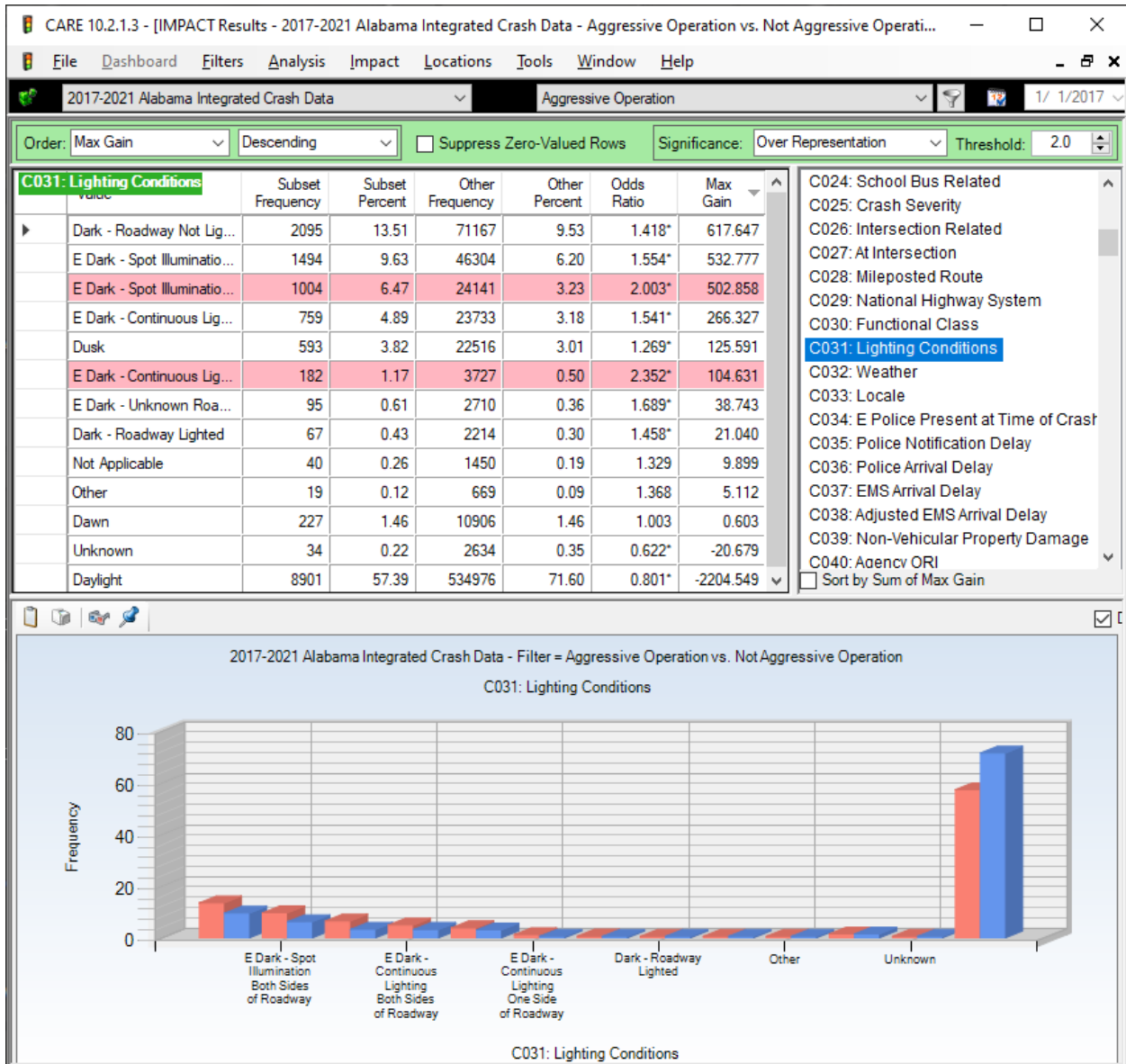
The above shows the possibility of weather affecting aggressive attitudes. The cooler months of October through February are all under-represented. The warmer summer months tend to be over-represented, which could point to heat as a potential aggravating source. See Section 8.3 below for direct effects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

3.3 C008 Time of Day



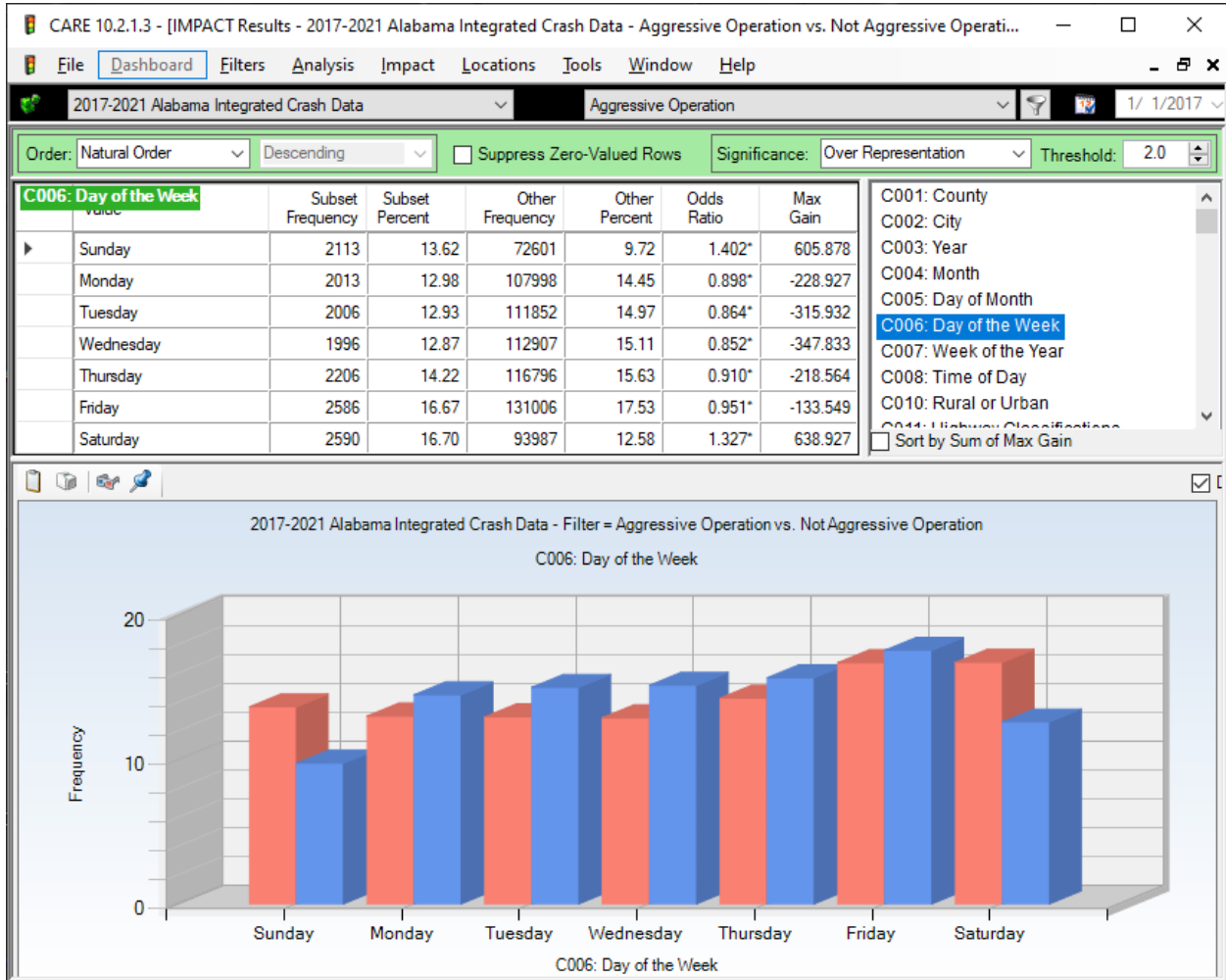
The clear pattern is for AO crashes to be over-represented in late night hours as opposed to during the day. This correlates very positively with the use of drugs and alcohol. See Sections 4.3-4.5 for the aggravating effects of alcohol and drugs.

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.

3.6 Day of the Week by Time of Day

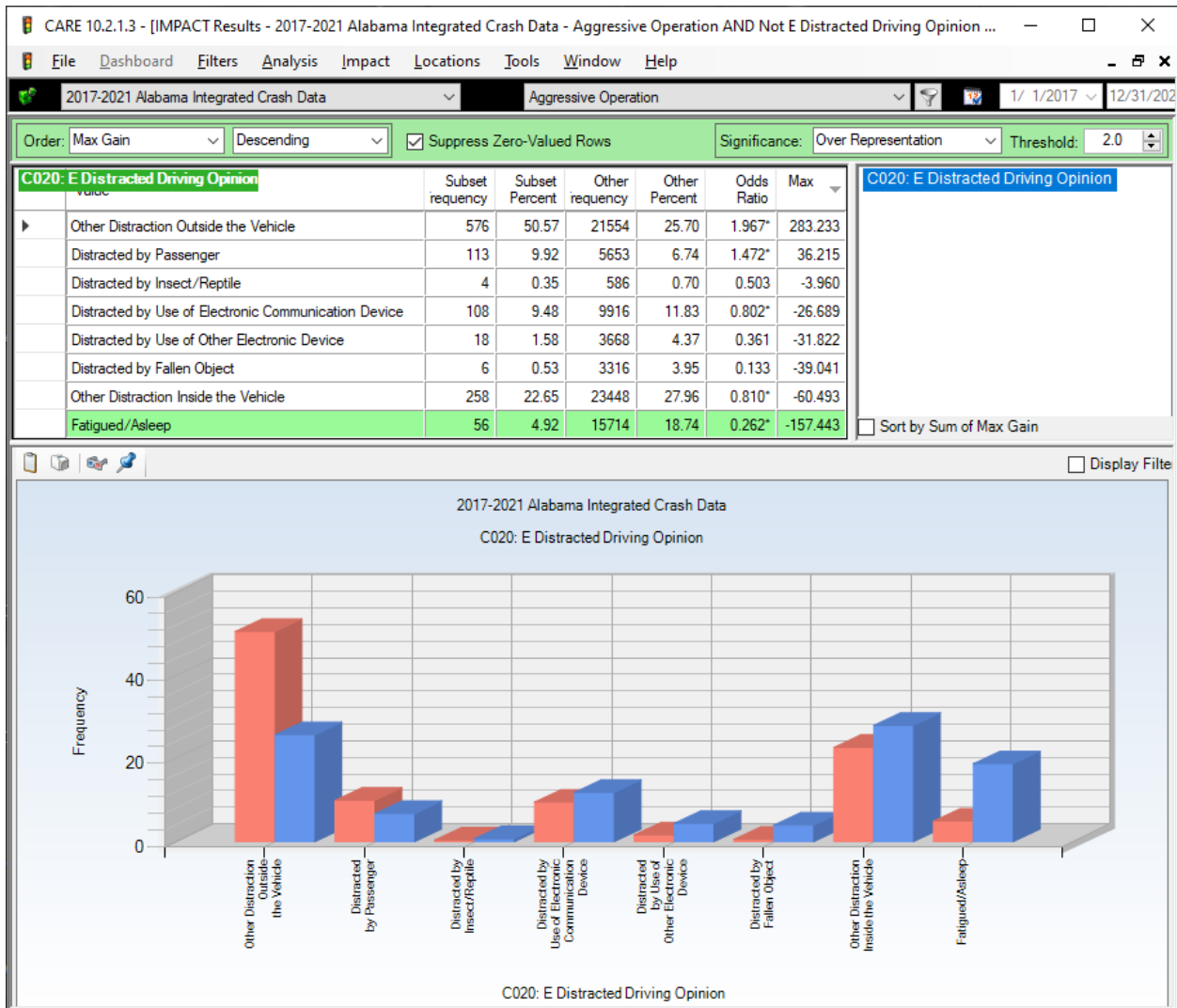
CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data - Filter = Aggressive Operation]								
2017-2021 Alabama Integrated Crash Data Aggressive Operation 1/1/2017 12/31/2021								
Suppress Zero Values: None Select Cells: [Color] [Format] [Filter] Column: Day of the Week ; Row: Time of Day								
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL
12:00 Midnight to 12:59 AM	135	51	38	33	42	54	112	465
1:00 AM to 1:59 AM	103	34	37	42	45	36	81	378
2:00 AM to 2:59 AM	103	23	33	35	27	38	77	336
3:00 AM to 3:59 AM	70	26	23	35	24	29	49	256
4:00 AM to 4:59 AM	50	23	17	18	23	34	43	208
5:00 AM to 5:59 AM	40	29	32	26	36	28	37	228
6:00 AM to 6:59 AM	29	43	46	52	55	60	32	317
7:00 AM to 7:59 AM	32	81	65	65	94	80	42	459
8:00 AM to 8:59 AM	31	80	70	66	79	76	54	456
9:00 AM to 9:59 AM	43	68	49	50	60	67	72	409
10:00 AM to 10:59 AM	58	61	74	69	69	73	76	480
11:00 AM to 11:59 AM	65	80	82	76	94	99	99	595
12:00 Noon to 12:59 PM	79	97	109	99	111	138	110	743
1:00 PM to 1:59 PM	120	94	100	97	95	115	134	755
2:00 PM to 2:59 PM	112	133	123	130	119	133	146	896
3:00 PM to 3:59 PM	121	193	168	139	191	206	172	1190
4:00 PM to 4:59 PM	126	152	176	156	158	190	164	1122
5:00 PM to 5:59 PM	140	177	183	188	202	214	143	1247
6:00 PM to 6:59 PM	133	146	131	160	130	168	164	1032
7:00 PM to 7:59 PM	120	94	110	117	134	171	159	905
8:00 PM to 8:59 PM	104	97	110	116	115	142	150	834
9:00 PM to 9:59 PM	115	84	100	83	118	142	159	801
10:00 PM to 10:59 PM	100	87	70	64	102	153	159	735
11:00 PM to 11:59 PM	77	59	56	71	79	137	153	632
Unknown	7	1	4	9	4	3	3	31
TOTAL	2113	2013	2006	1996	2206	2586	2590	15510

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.

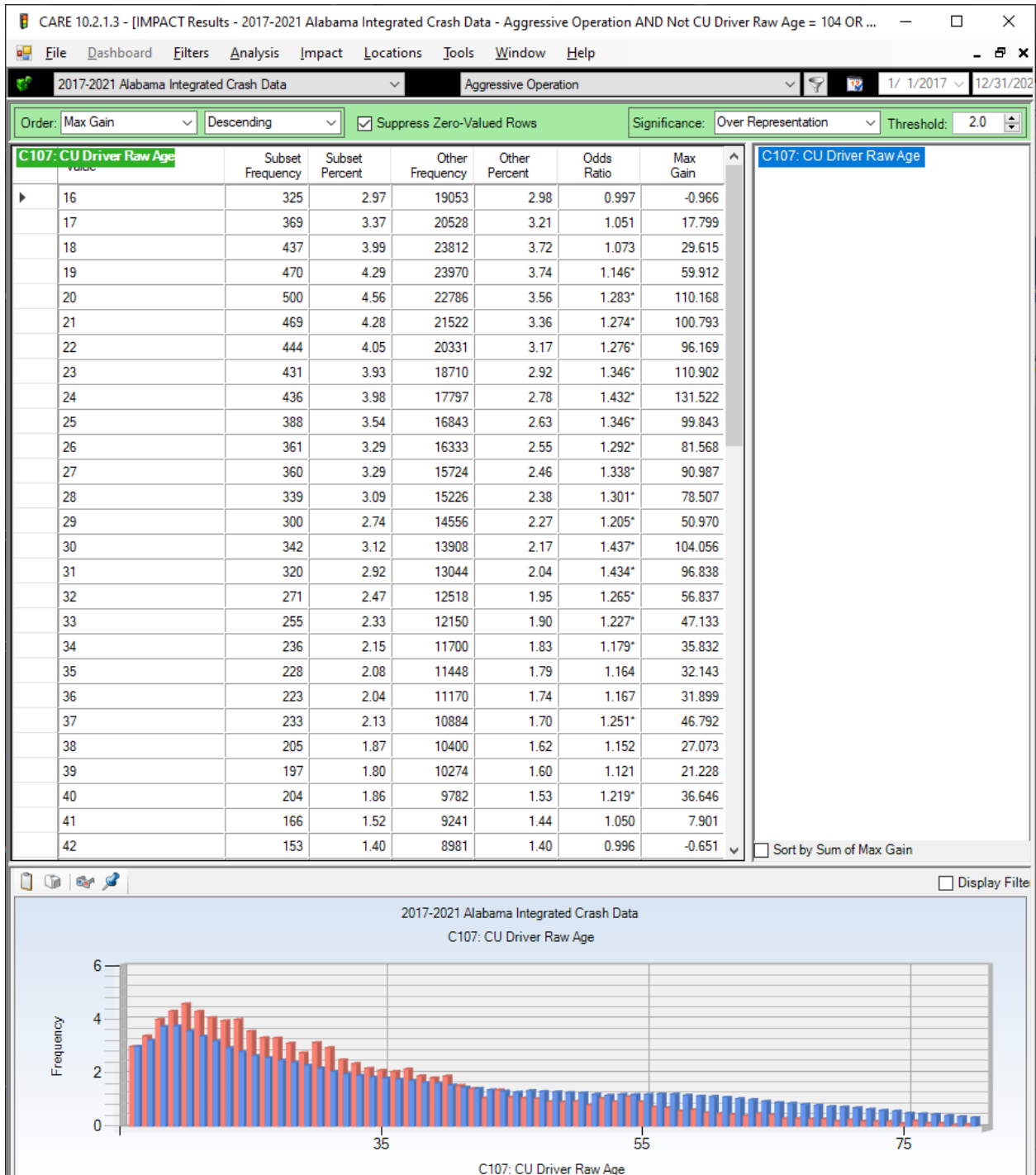
4.0 Driver Characteristics (Demographics and Behavior)

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.

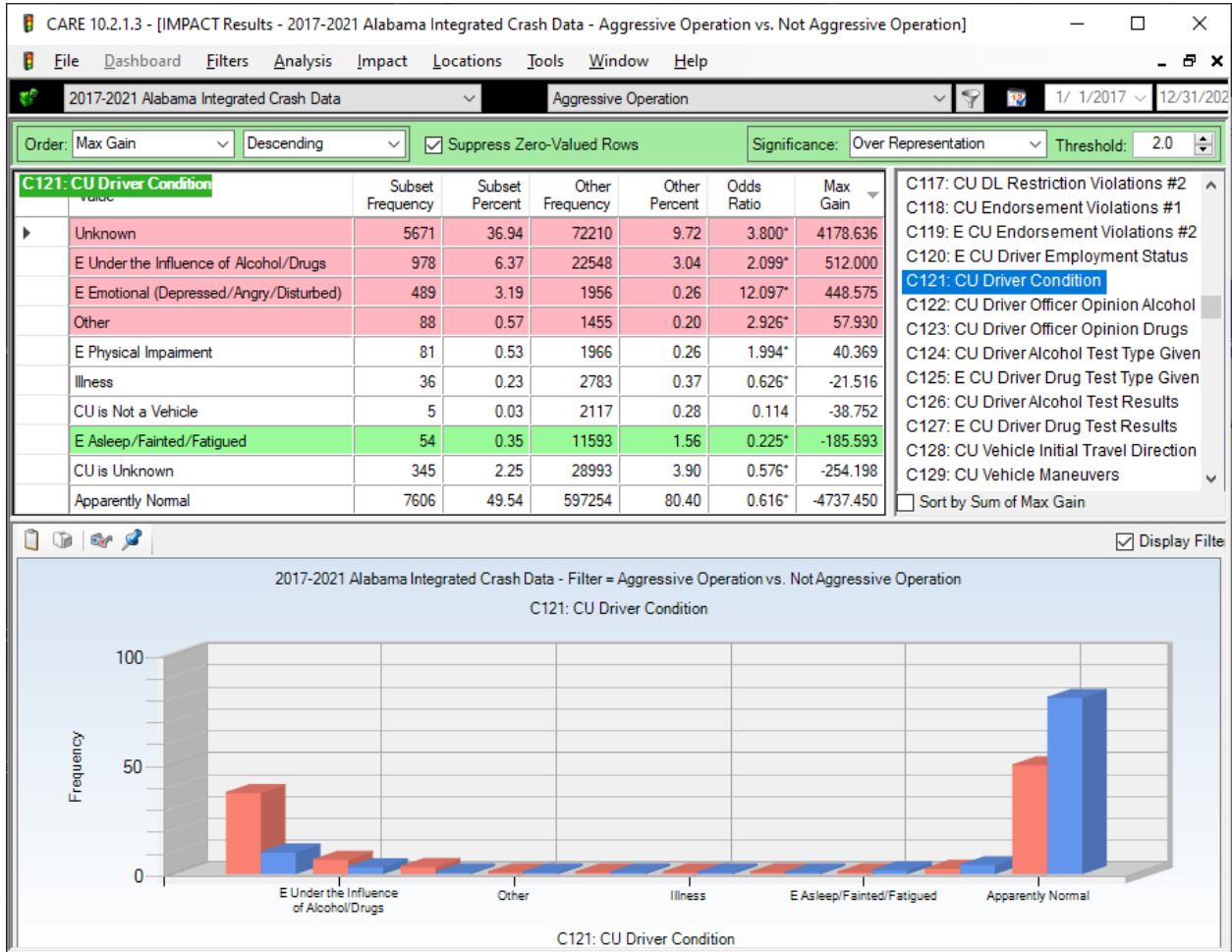


4.2 C107 CU Driver Raw Age Frequency Distribution



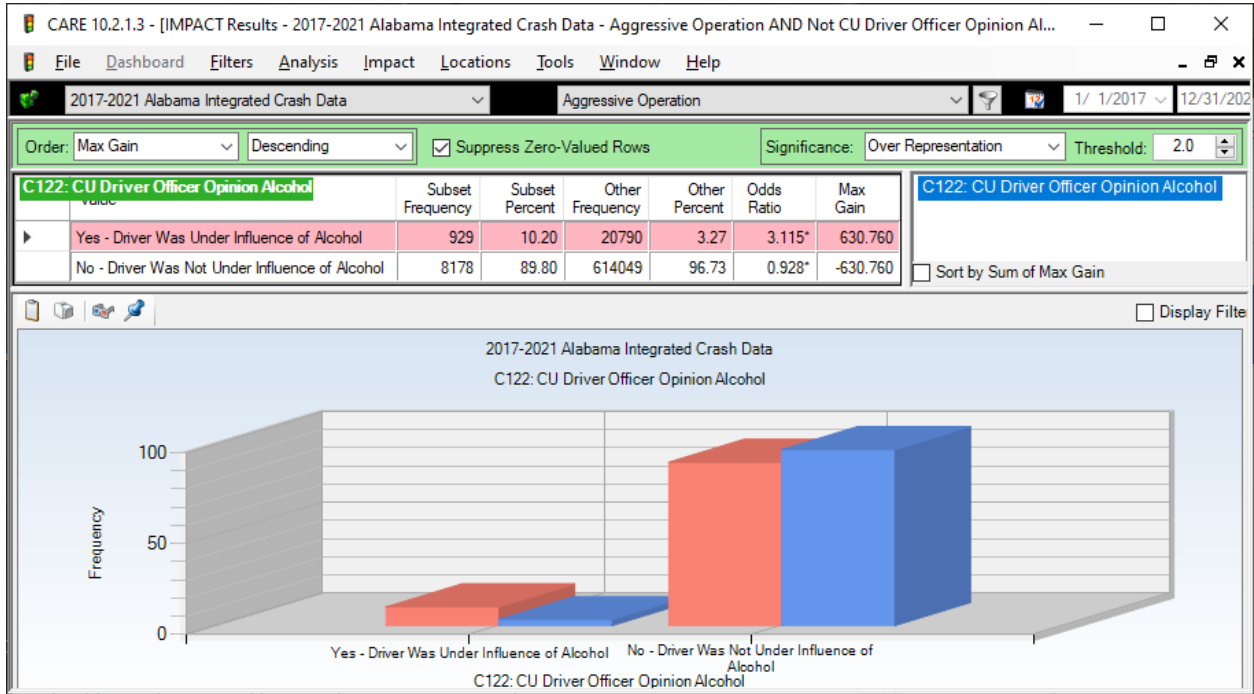
Significant over-representations in ages 19-31; over-representations continue until age 41.

4.3 C121 CU Driver Condition



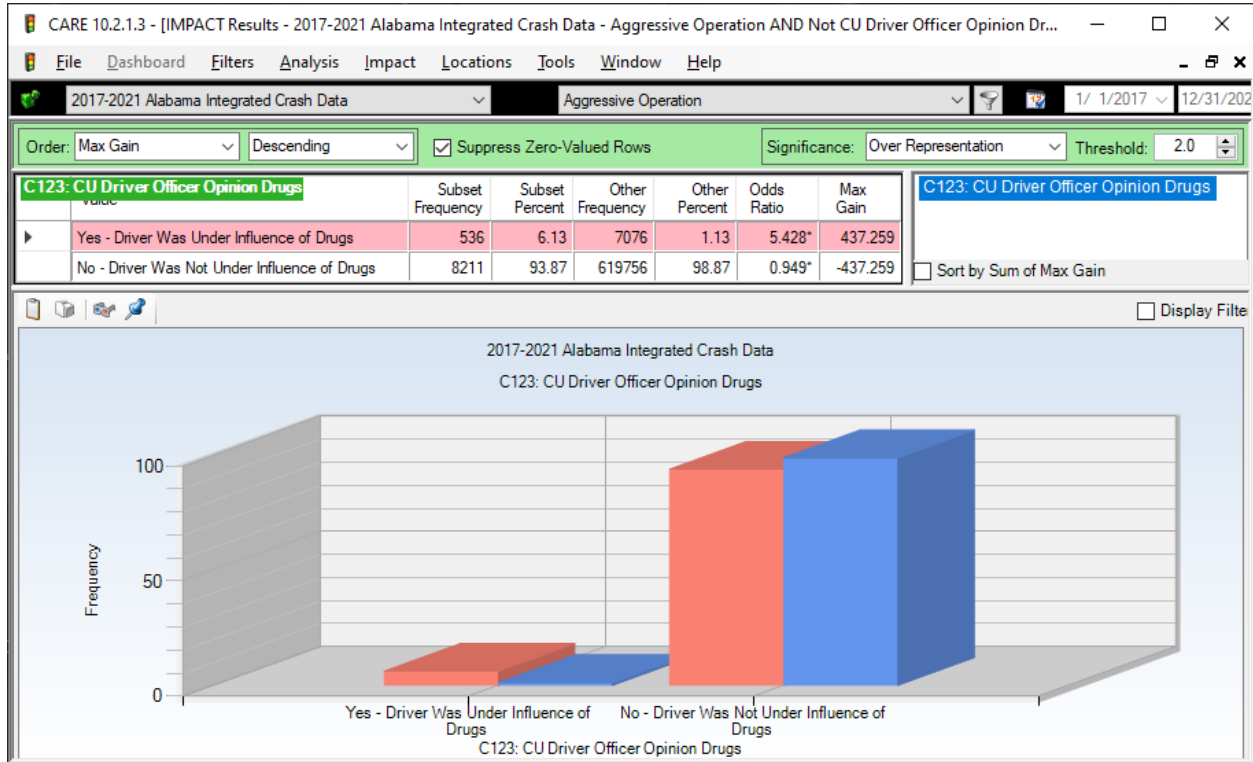
The “Emotional (Depressed/Angry/Disturbed)” value is the most striking with over 12 times the proportion as is in the non-AO subset. Under the influence of Alcohol/Drugs is also over double its expected proportion, and the evidence above has been showing. Alcohol/drugs obviously play a major part in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

4.4 C122 CU Driver Officer Opinion Alcohol



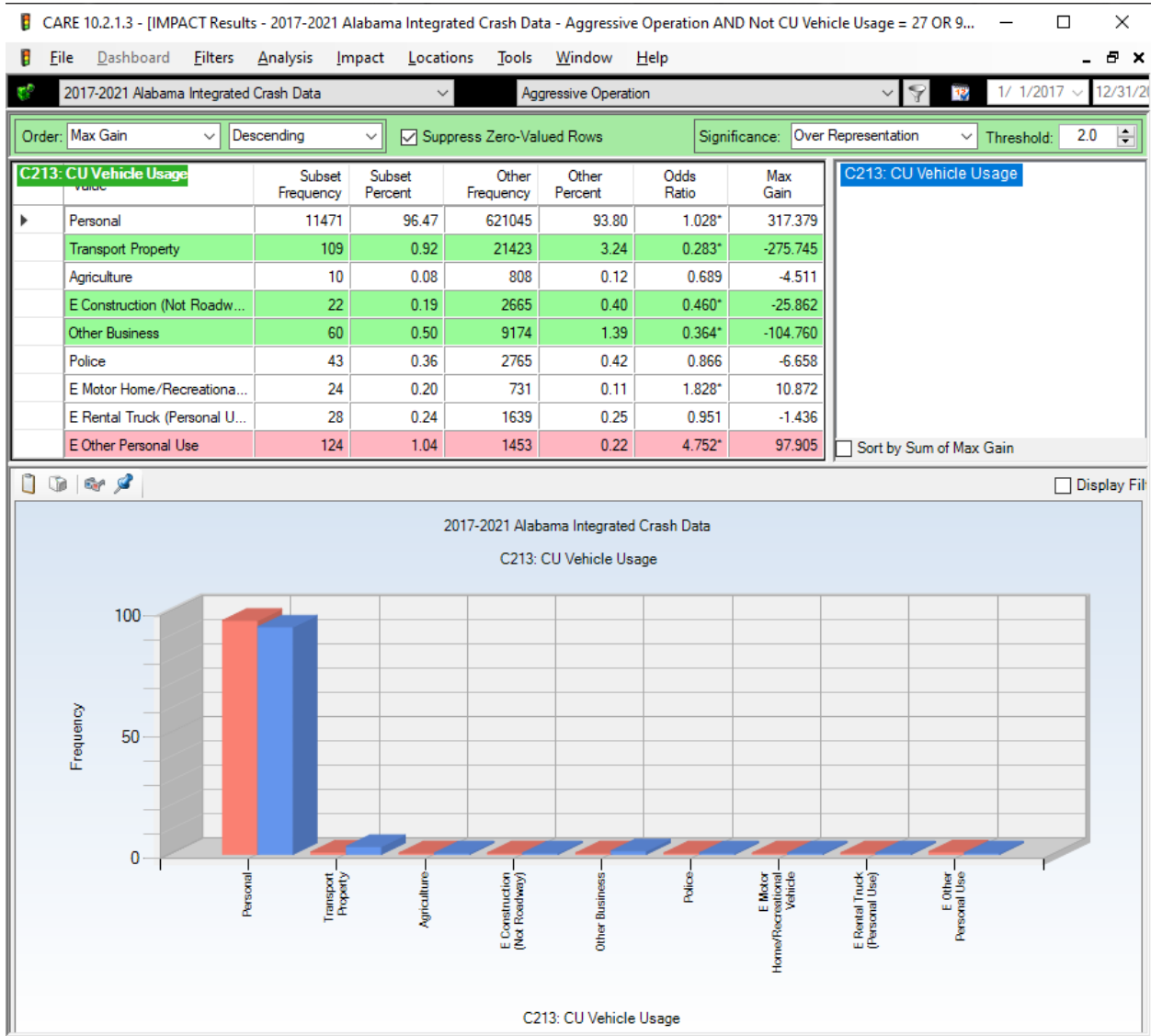
The amount of alcohol involvement in AO crashes is over three times the proportion as it is in the non-AO crashes. There can be little doubt that alcohol plays a major part in causing AO crashes. Drugs seem to play even a larger role as we see in the next attribute.

4.5 C123 CU Driver Officer Opinion Drugs



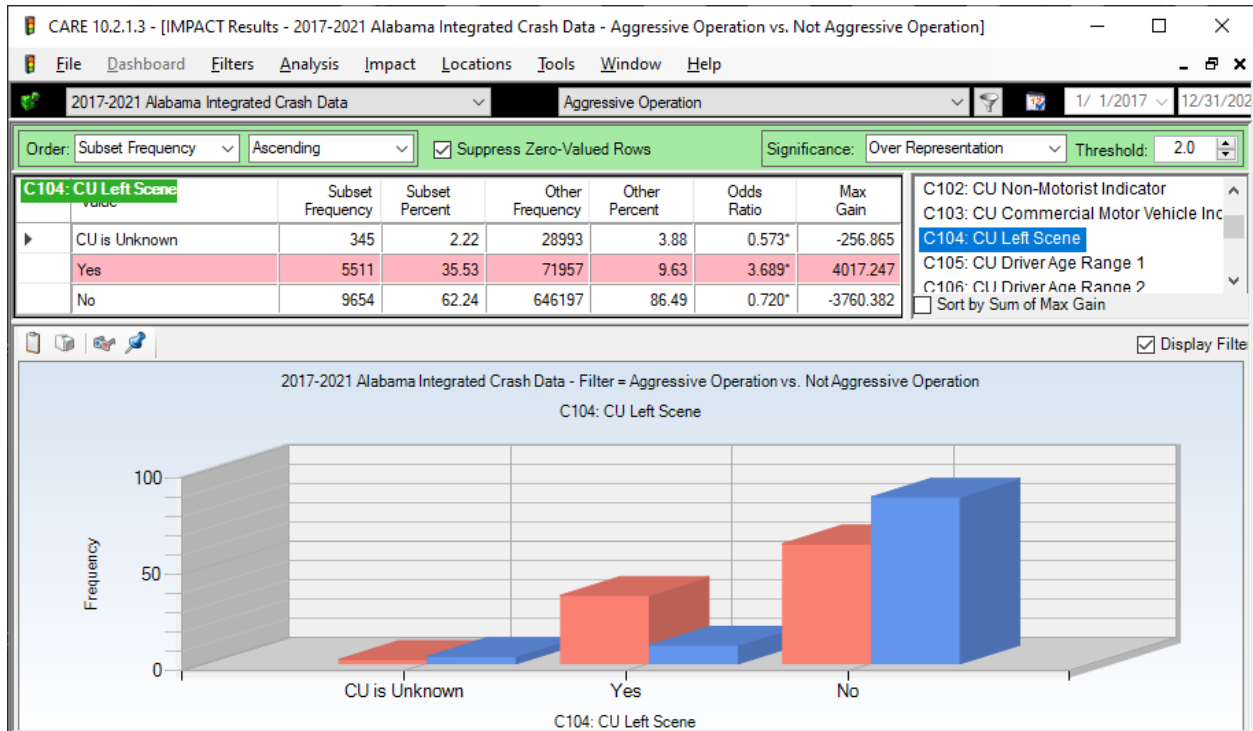
While the numbers of alcohol-related AO cases (929 out of 8,178 cases) is greater than that of those caused by drugs (536 out of 8,211 cases), the Odds Ratio of 5.428 shows that non-alcohol drug-use is as serious a problem in causing AO crashes as is alcohol. Both should be considered together in the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

4.6 C213 CU Vehicle Usage



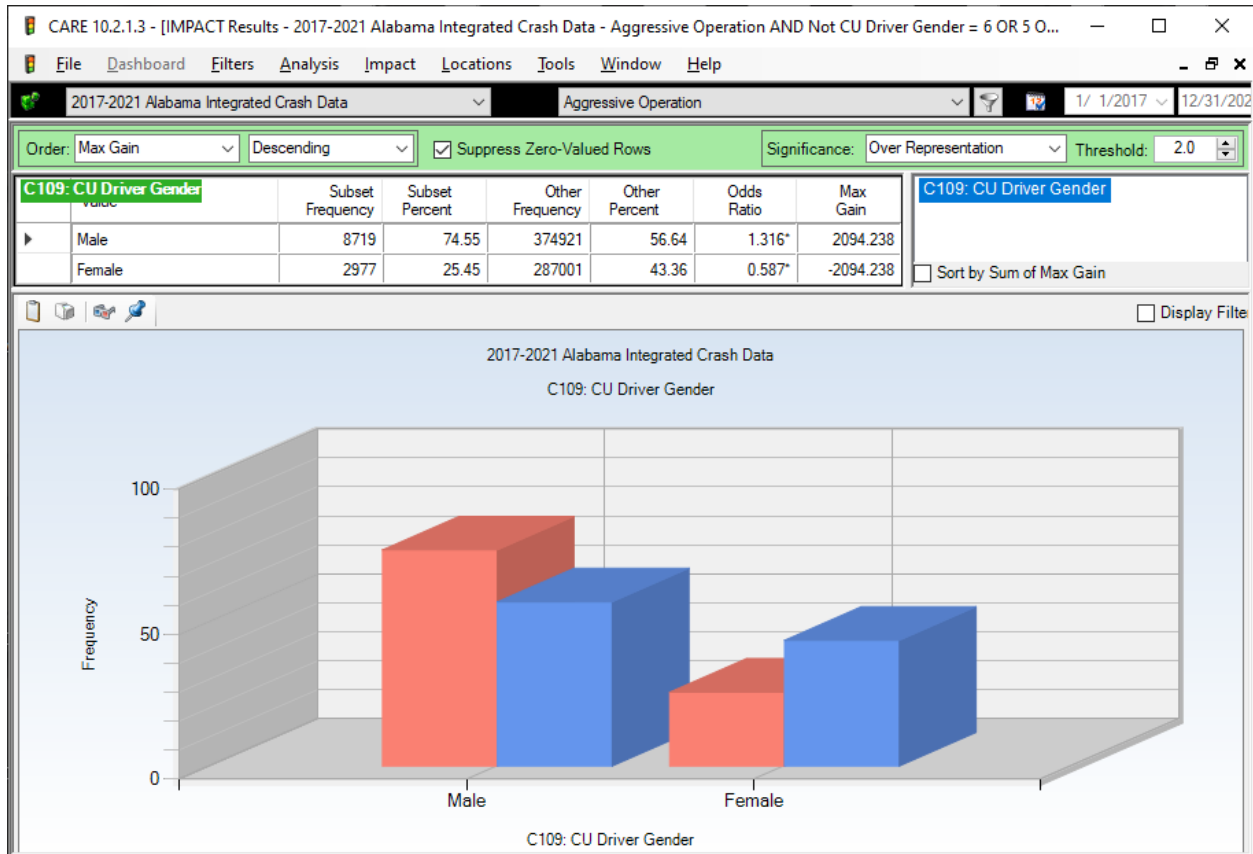
Items with less than 10 AO crashes were removed as were those that had no relevant meanings (e.g., Unknown). The vast majority of those remaining (96.47%) were Personal Use. Generally, no vehicle usage other than Personal Use can be seen to cause AO.

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 offense, 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 predominately a male problem.

4.9 Driver Gender by Severity

CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data - Filter = Aggressive Operation]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

2017-2021 Alabama Integrated Crash Data Aggressive Operation 1/ 1/2017 12/31/2021

Suppress Zero Values: None Select Cells: Column: Crash Severity ; Row: CU Driver Gender

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
Male	346 87.59%	930 75.36%	1214 68.78%	788 59.38%	5121 51.03%	320 42.50%	8719 56.22%
Female	42 10.63%	240 19.45%	384 21.76%	365 27.51%	1803 17.97%	143 18.99%	2977 19.19%
Unknown	4 1.01%	52 4.21%	142 8.05%	143 10.78%	2775 27.65%	237 31.47%	3353 21.62%
Not Applicable	0 0.00%	0 0.00%	3 0.17%	5 0.38%	65 0.65%	38 5.05%	111 0.72%
CU is Not a Vehicle	0 0.00%	0 0.00%	2 0.11%	2 0.15%	1 0.01%	0 0.00%	5 0.03%
CU is Unknown	3 0.76%	12 0.97%	20 1.13%	24 1.81%	271 2.70%	15 1.99%	345 2.22%
TOTAL	395 2.55%	1234 7.96%	1765 11.38%	1327 8.56%	10036 64.71%	753 4.85%	15510 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

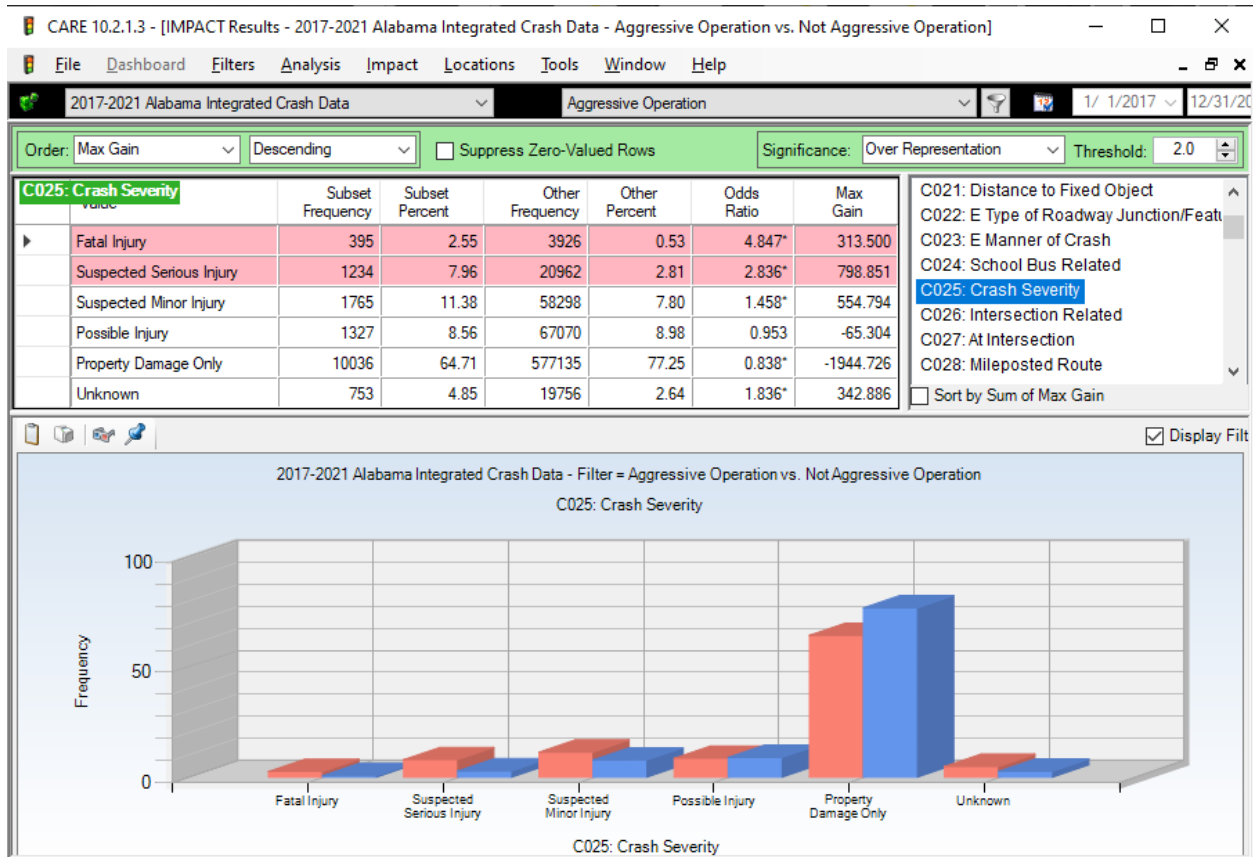
Because there were such dramatic differences in the frequencies and proportions of male and female AO drivers, and especially in the consideration of fatal crashes, it was felt that additional study along these lines was warranted. Notable over-representations found in AO Males as opposed to AO Females:

- C010-11. Males AO drivers had a proportion on Rural roadways that was 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 of 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 than those of Female AO Drivers.

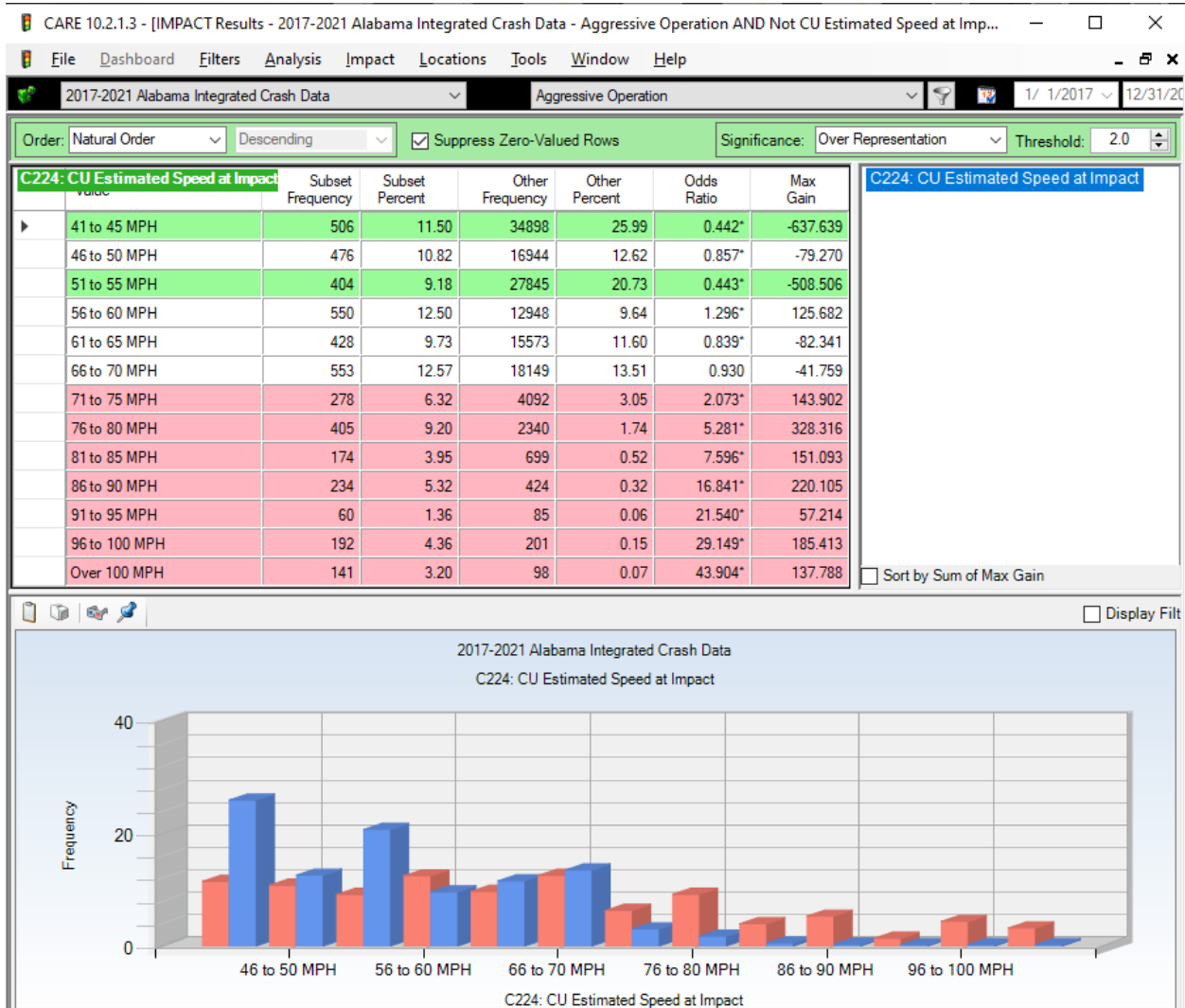
5.0 Severity Characteristics

5.1 C025 Crash Severity



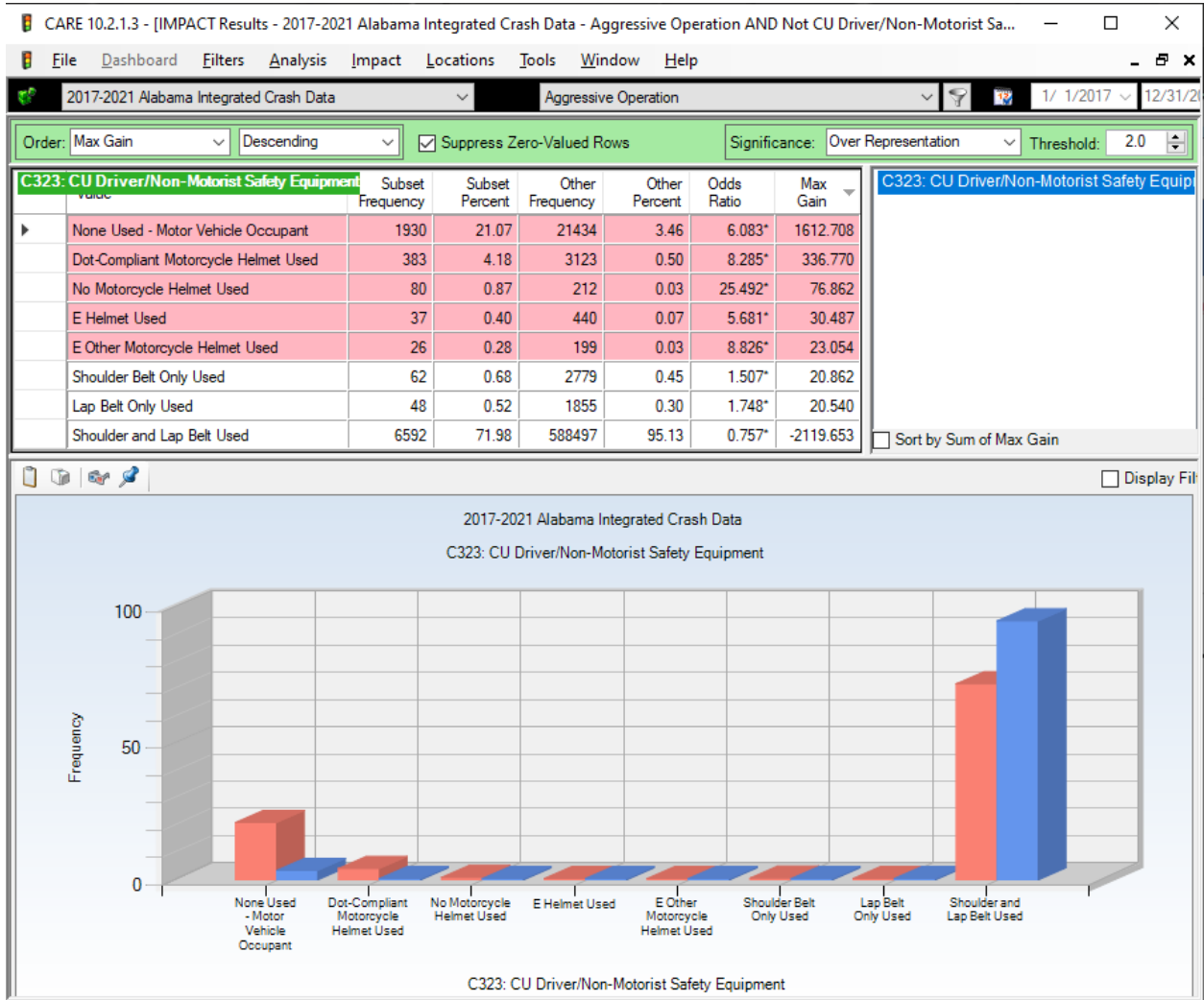
There can be no doubt that AO crashes result in more deaths and incapacitating injuries than do non-AO crashes. The fatality probability is close to five times (4.847) higher for AO crashes than for non-AO, resulting in an increase of over 313 fatal crashes over the five year period. Suspected Serious 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



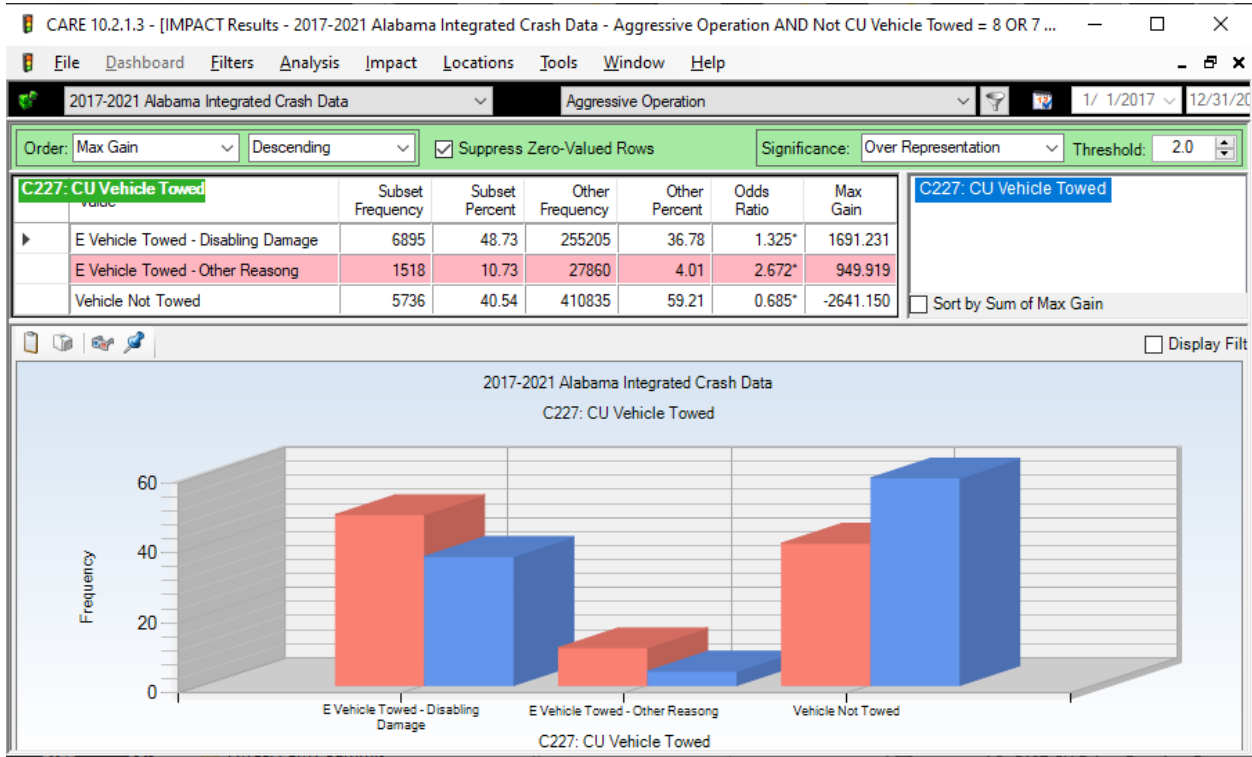
This result confirms the speculation that impact speeds for AO crashes are significantly higher, on average, than their non-AO counterparts. Especially high over-representations occur at most speeds above 71 MPH. The higher impact speeds are the primary cause of fatalities, and they also tend to show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

5.3 C323 CU Driver Safety Equipment



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.

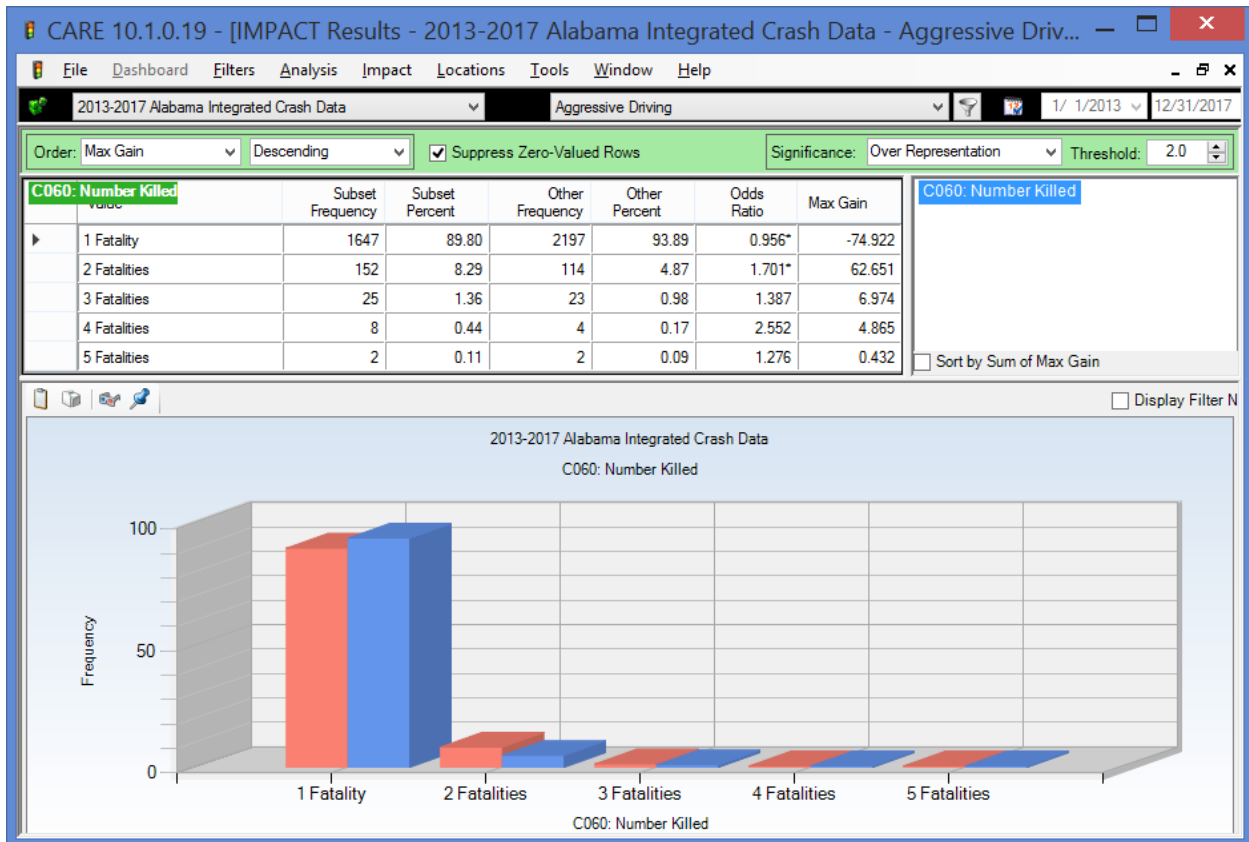
5.4 C227 CU Vehicle Towed



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.

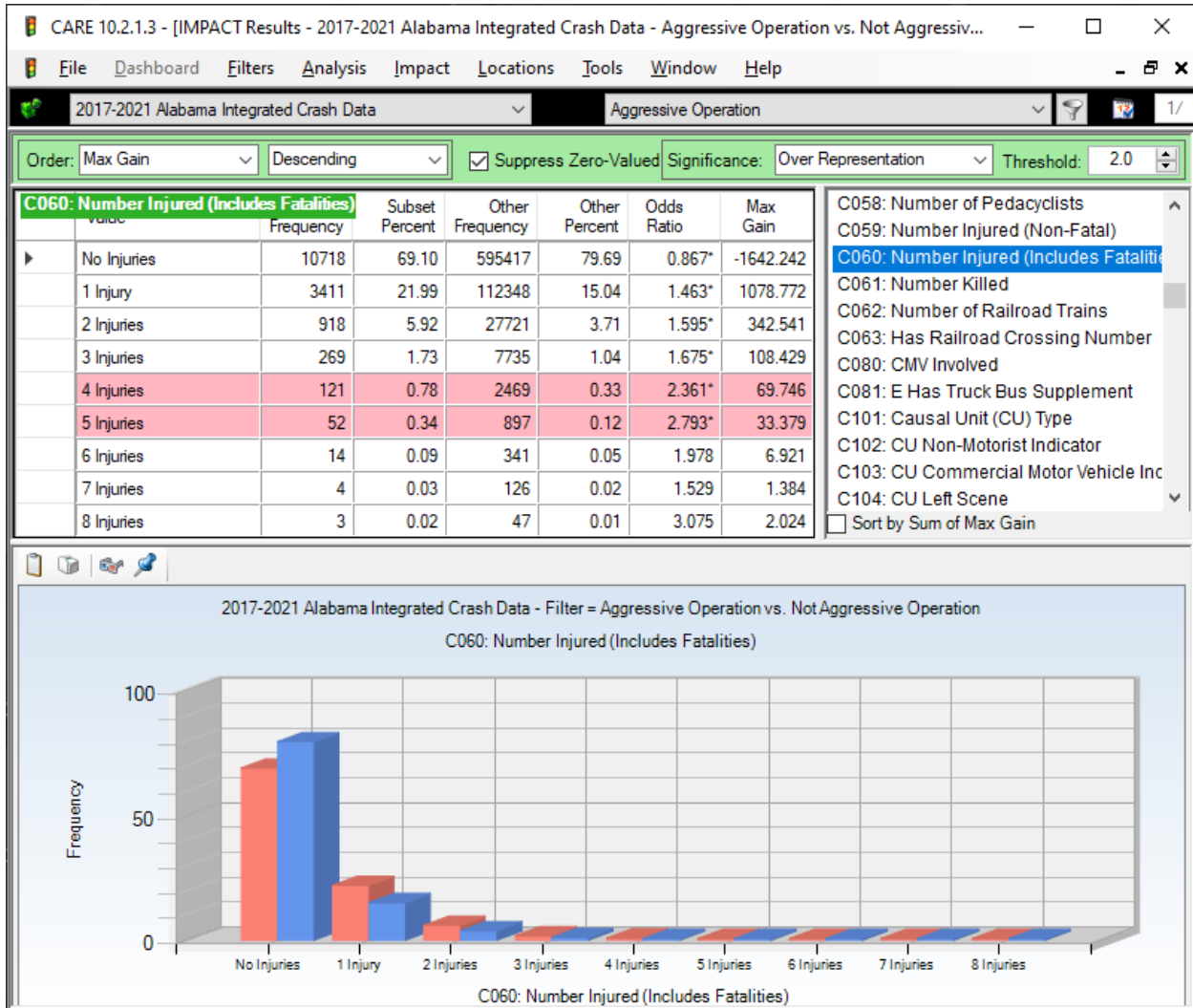
5.5 C060 Number Killed

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.

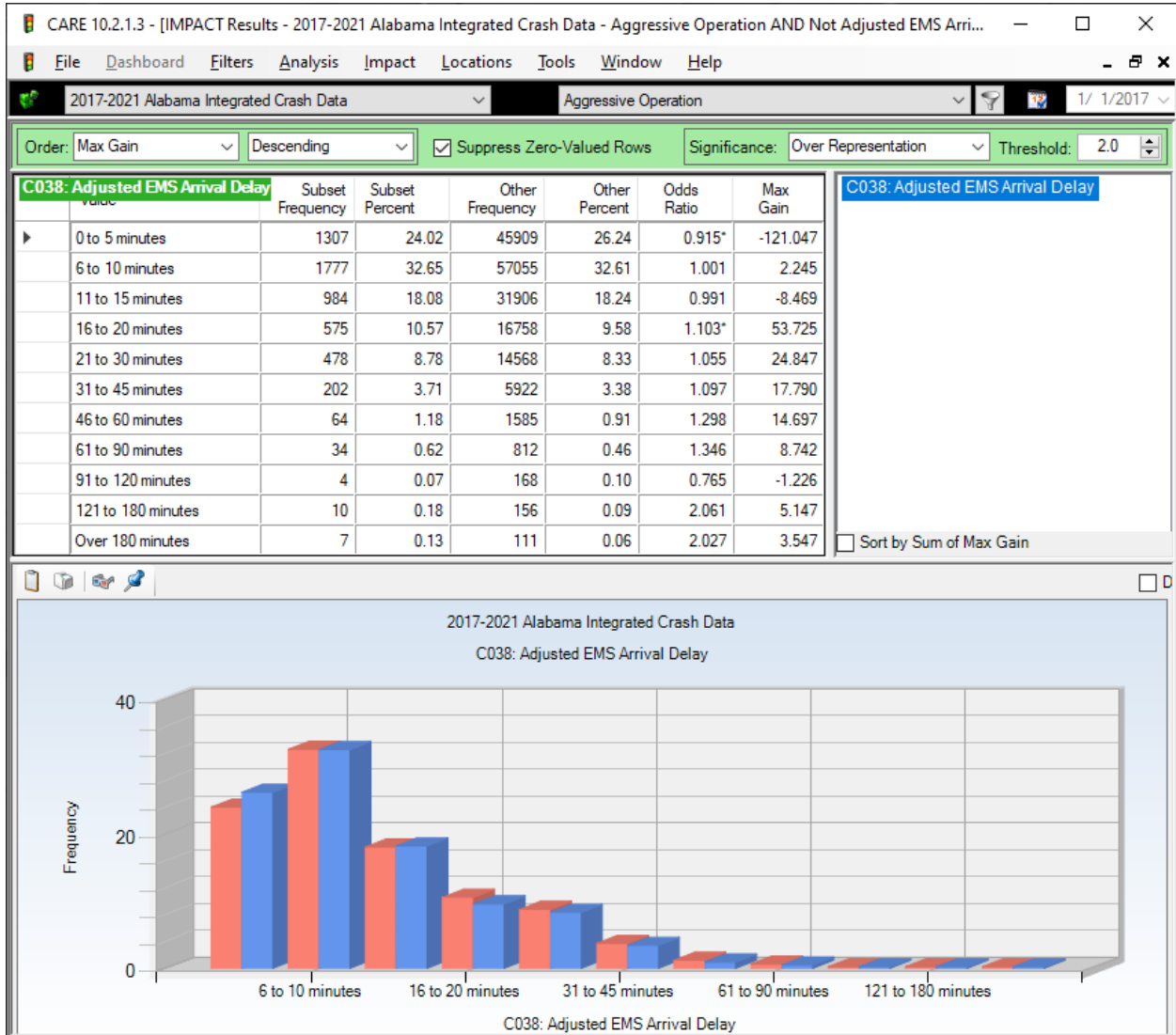


5.6 C060 Number Injured (Non-Fatal)

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).



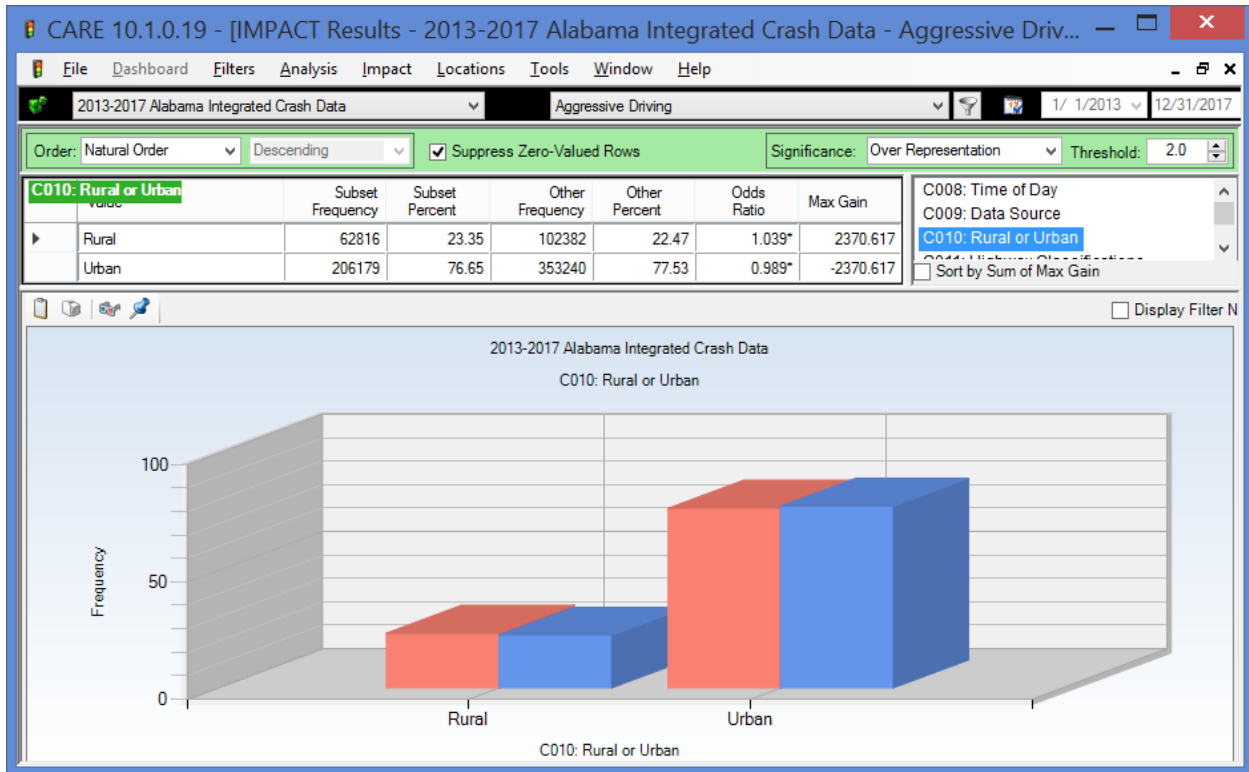
5.7 C038 Adjusted EMS Arrival Delay



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.

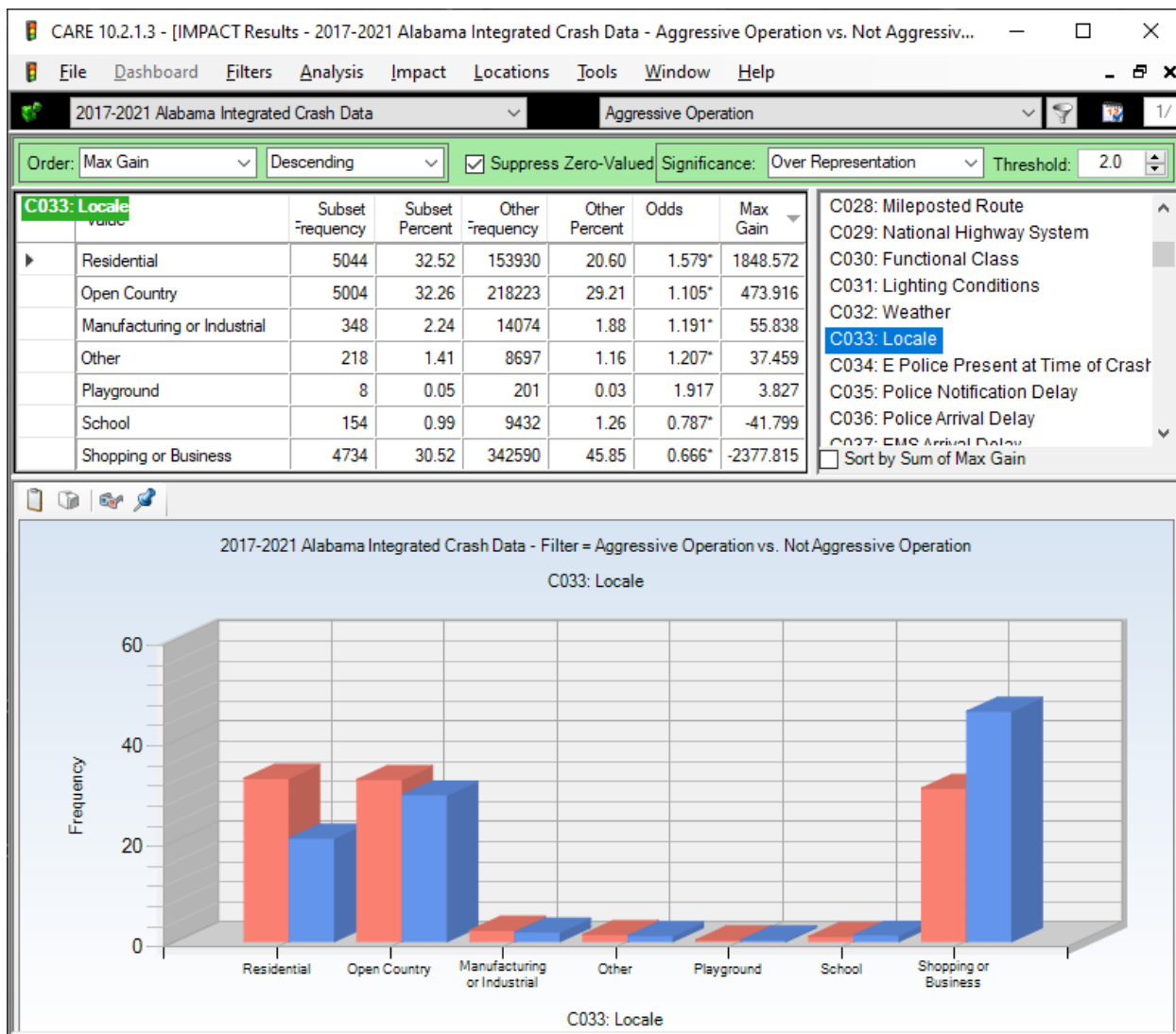
6.0 Geographical Characteristics

6.1 C010 Rural or Urban



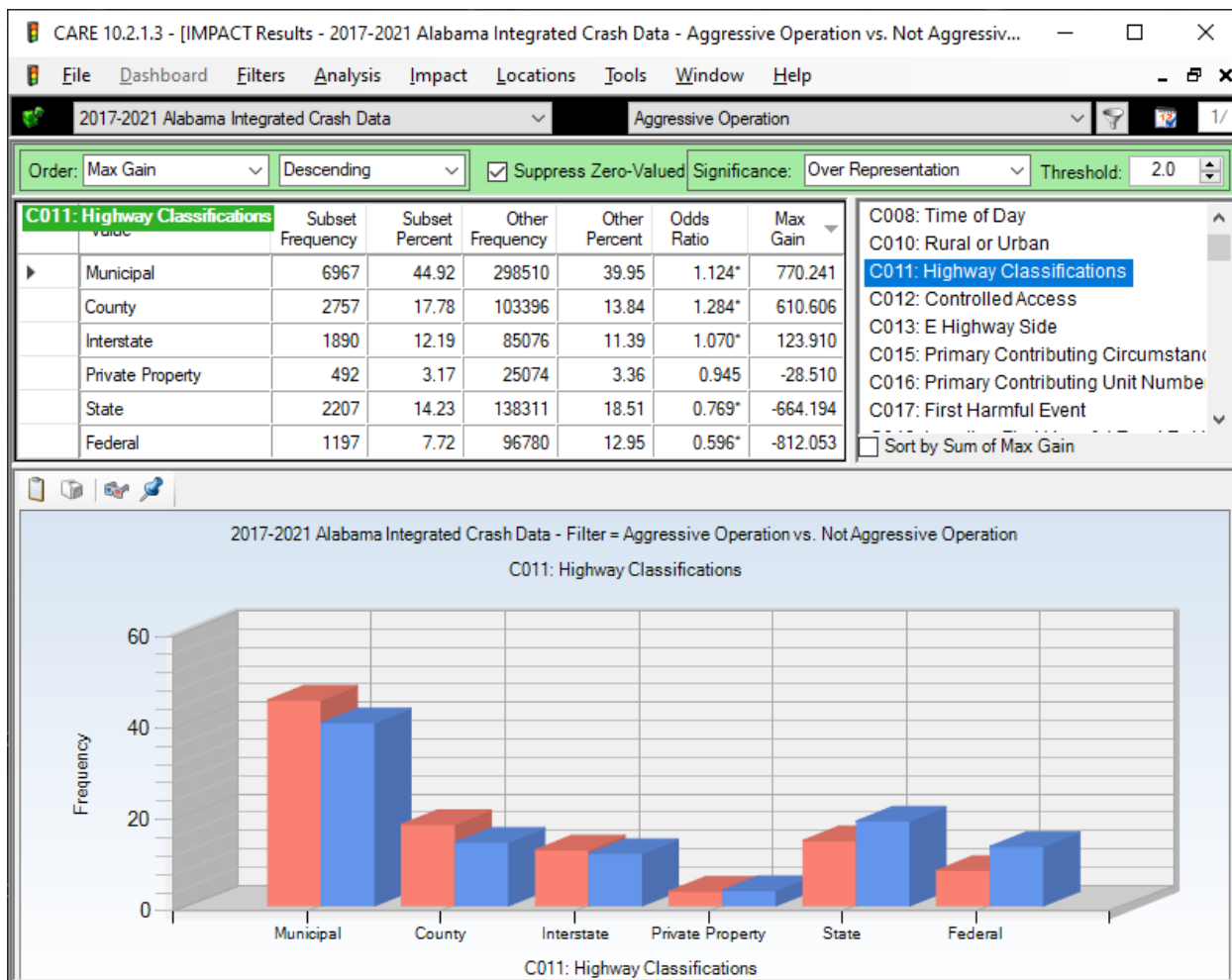
AO crashes are significantly over-represented on rural roads, which typically allow higher speeds, and which also may account for some of the increased ambulance delay. This is a small but significant percentage (1.039 Odds Ratio, or about 3.9% more than expected).

6.2 C033 Locale



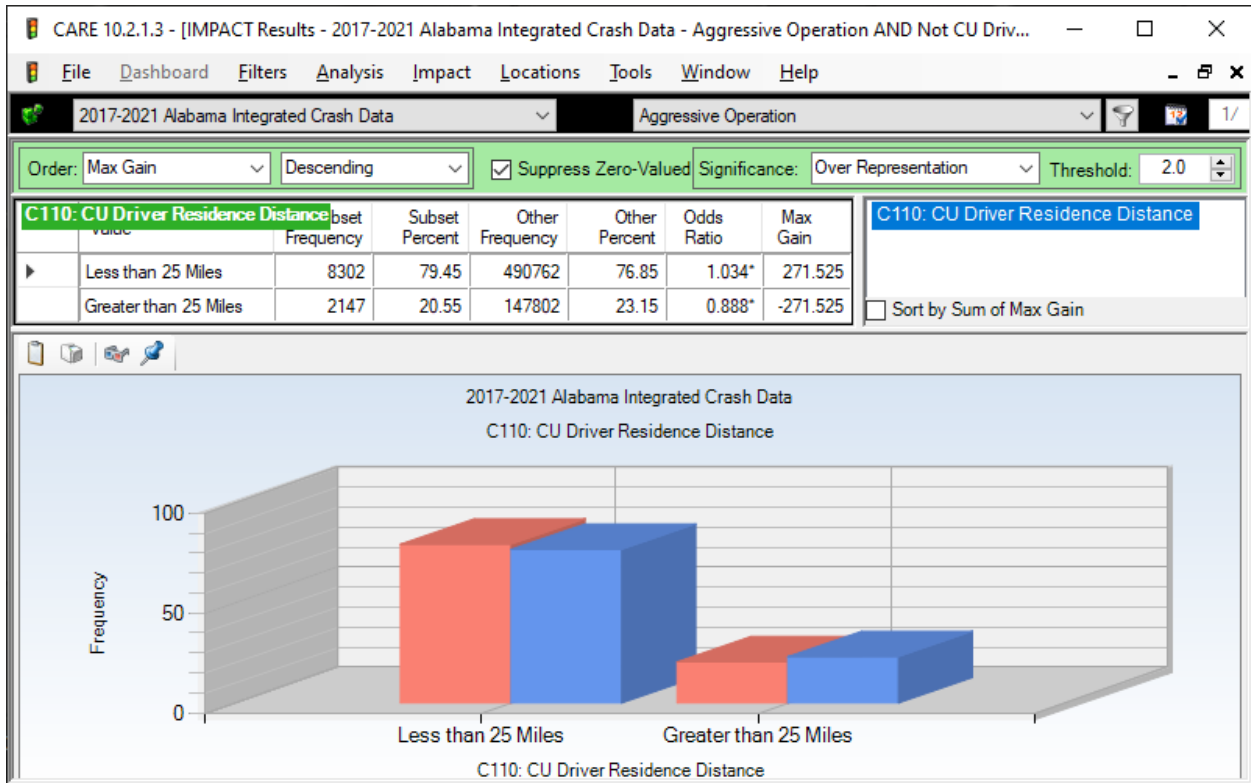
Residential, Open Country and Manufacturing or Industrial are over-represented. School and Shopping or Business are under-represented. This attribute tends to demonstrate the environment in which AO driver are most lethal, as does the next.

6.3 C011 Highway Classifications



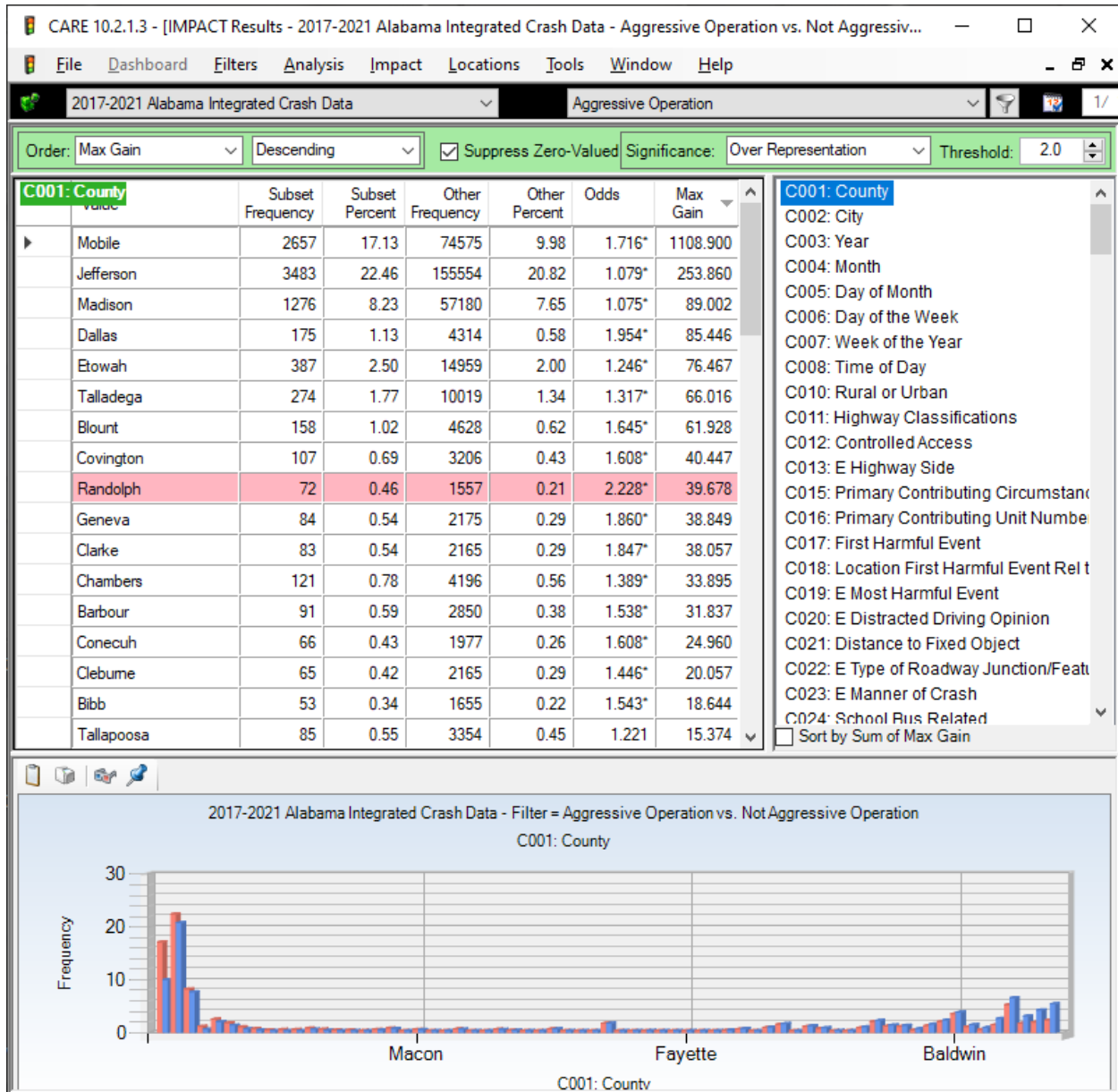
AO crashes are over-represented on Municipal, County and Interstate roads, but not on any of the others. While all of these differences are significant, the largest differences are on the County, with a 28.4% higher proportion than expected. The frequency numbers tend to give us the idea of where AO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

6.5 C001 County – Over-Represented

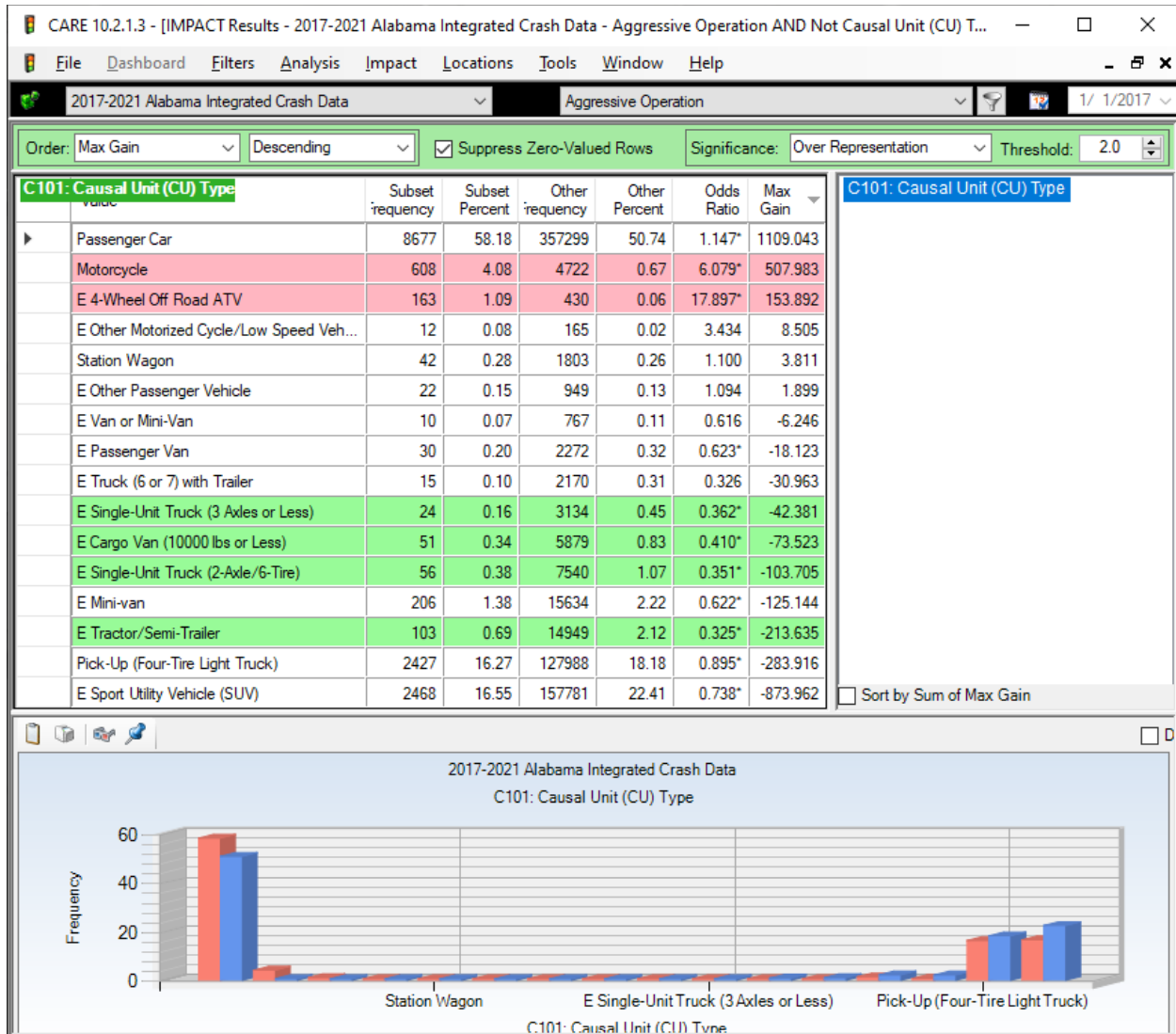


Those listed in the display above are all counties that were significantly over-represented in AO crashes. In order of Max Gain, these were Mobile, Jefferson, Madison, Dallas, Etowah, Talladega, Blount, Covington, Randolph, Geneva, Clarke, Chambers, Barbour, Conecuh, and Cleburne.

7.0 Vehicle Characteristics

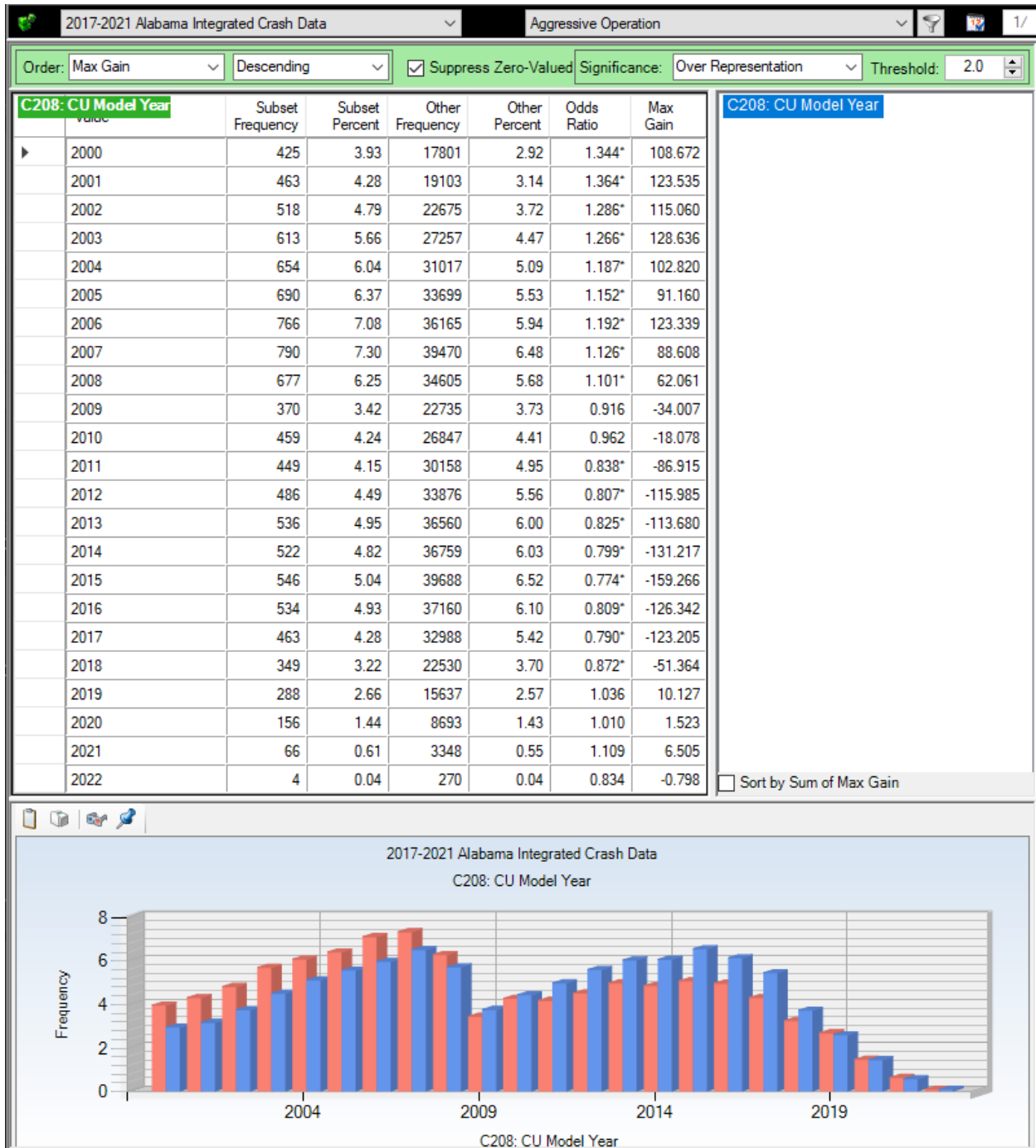
7.1 C101 Causal Unit (CU) Type

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



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 under-represented 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.

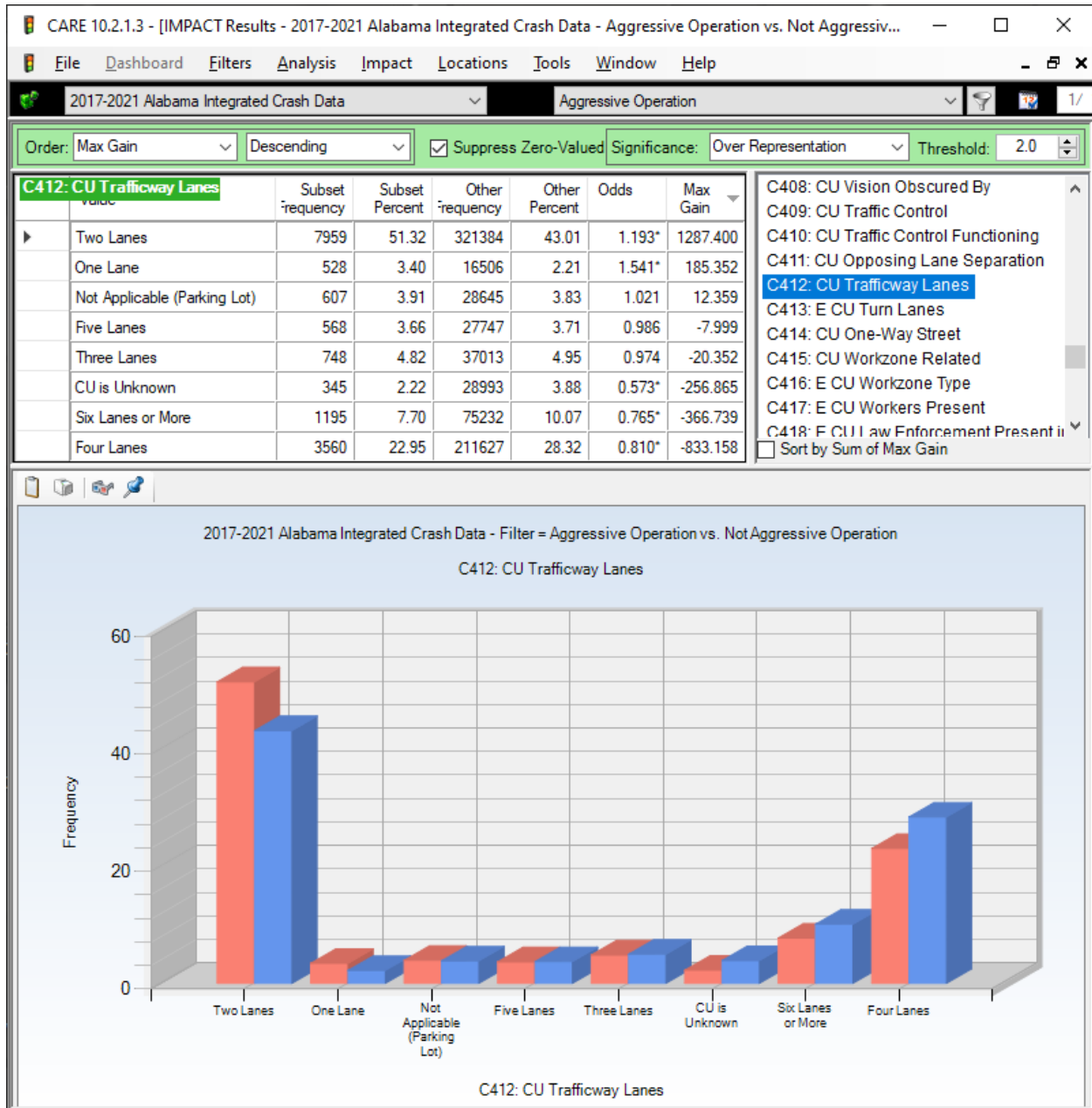
7.2 C208 CU Model Year



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

8.0 Roadway Environment and Pavement Characteristics

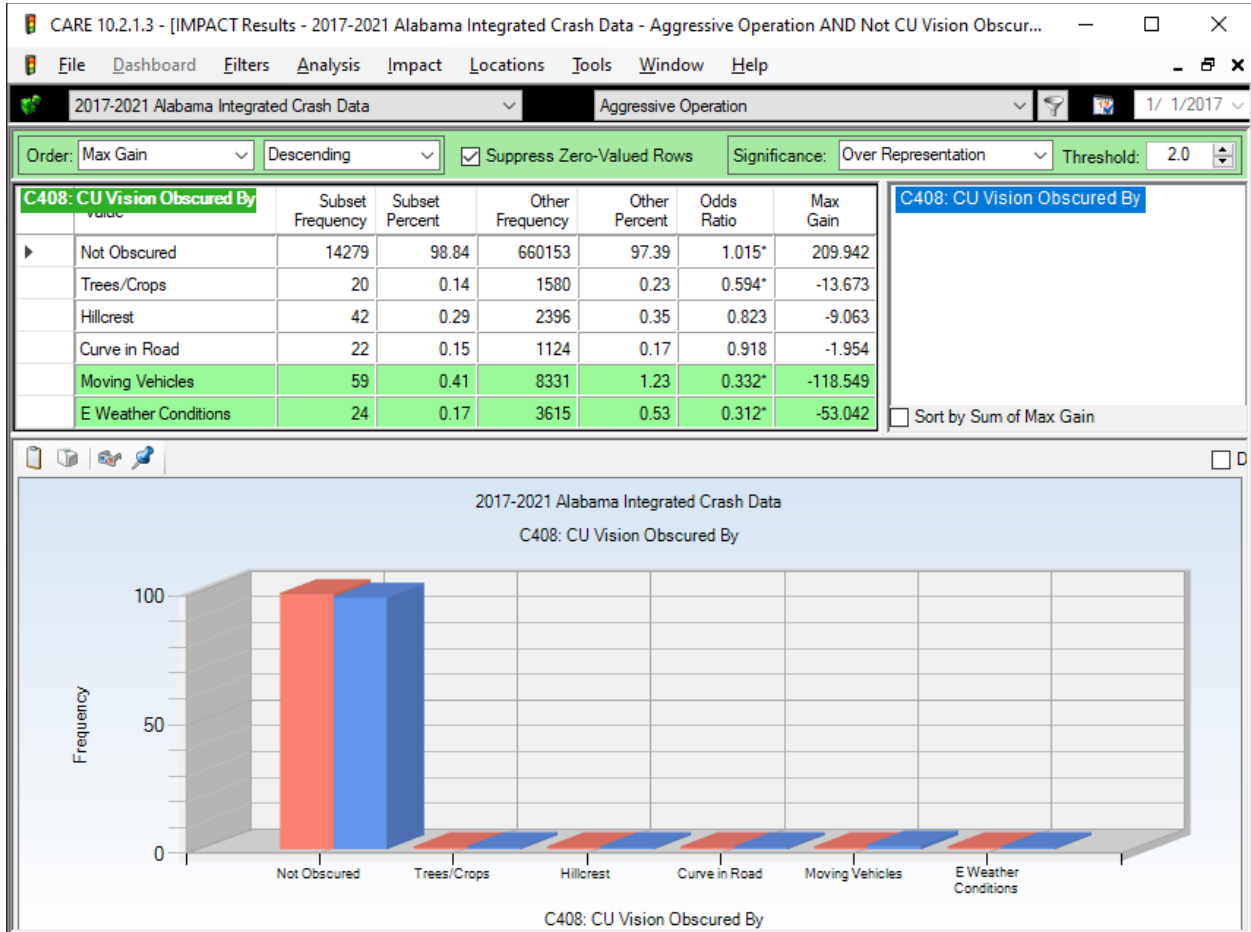
8.1 C412 CU Traffic Lanes



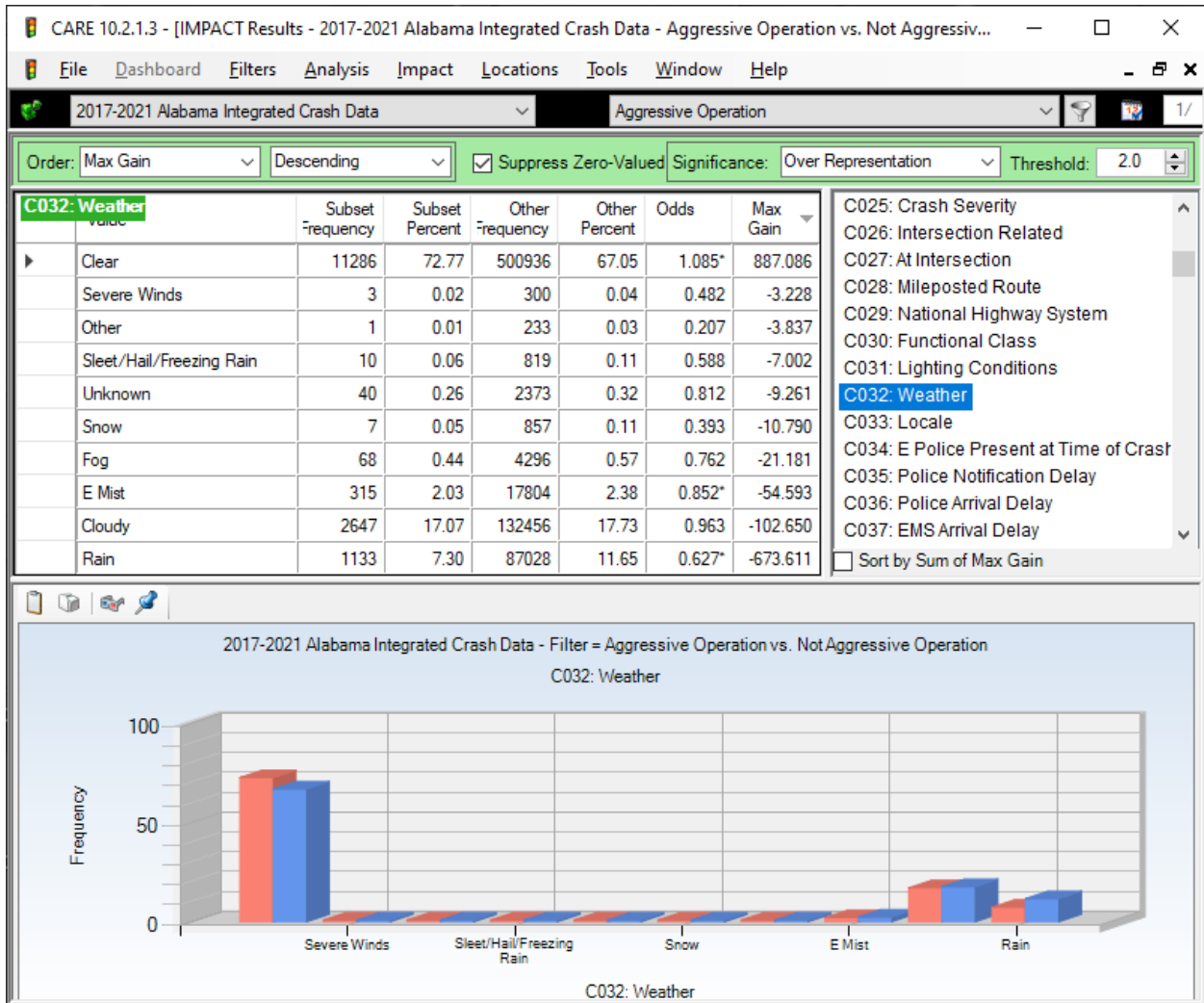
Two-lane roads have the greatest relative inclination toward AO crashes.

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.

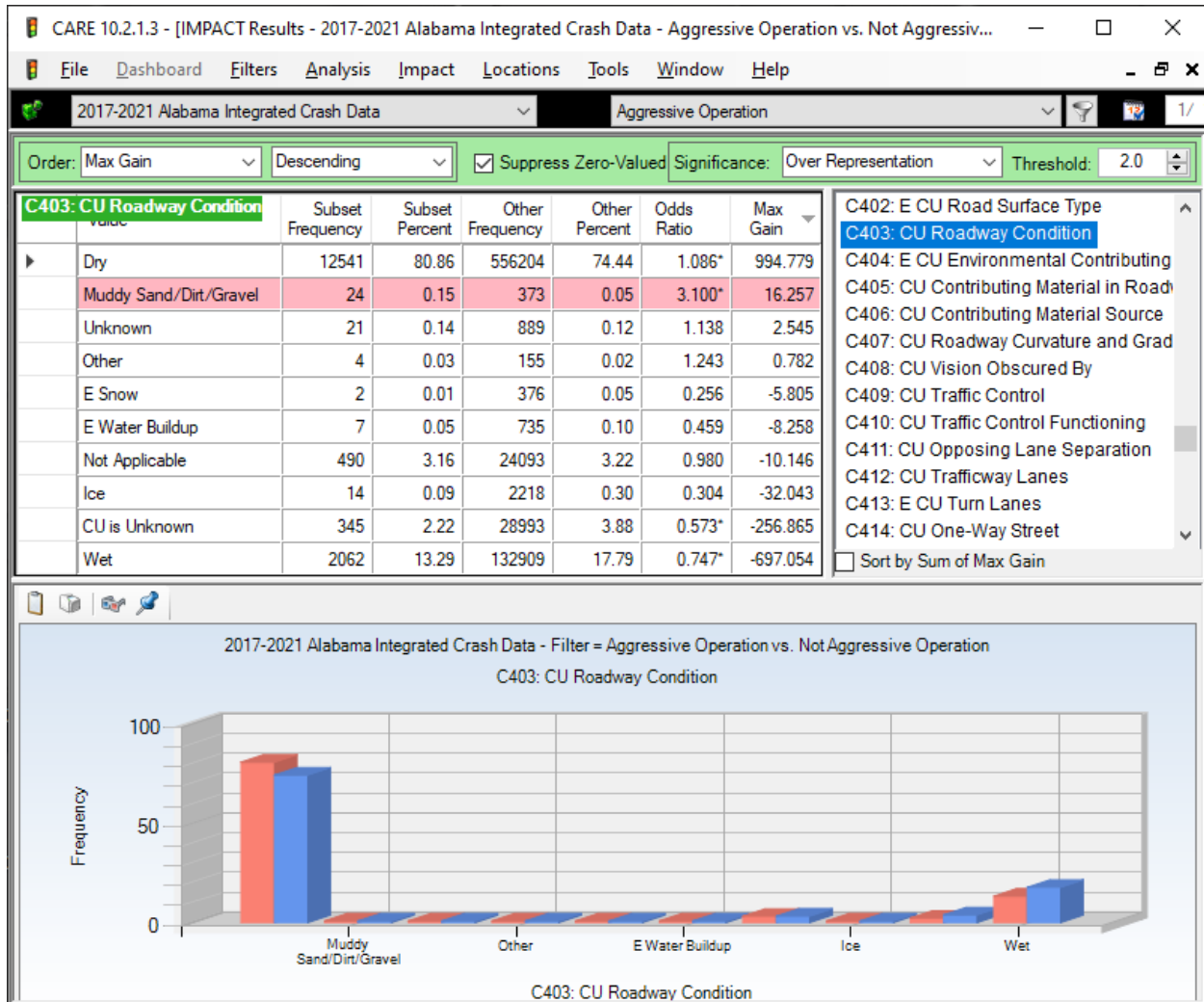


8.3 C032 Weather



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.

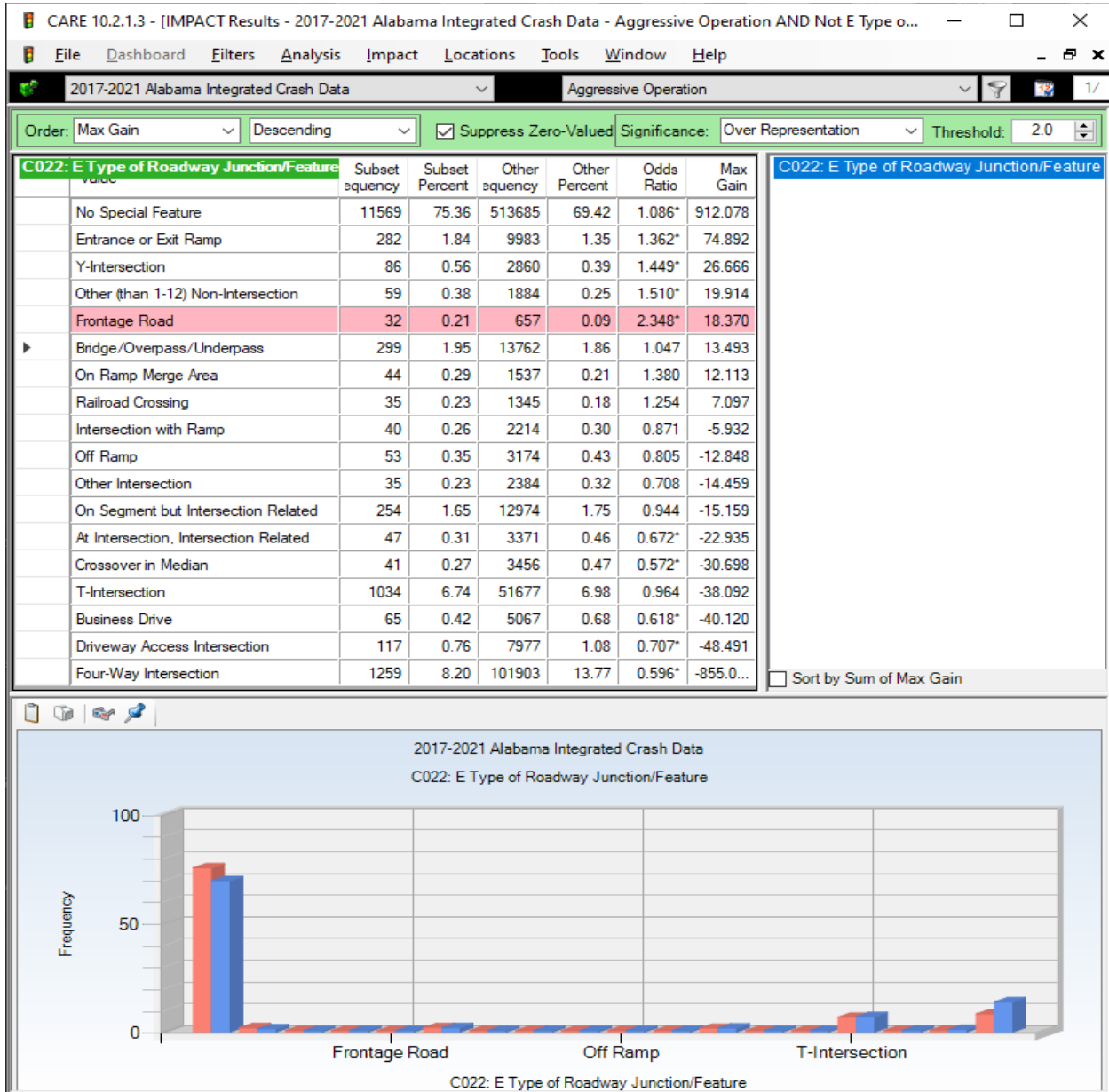
8.4 C403 CU Roadway Condition



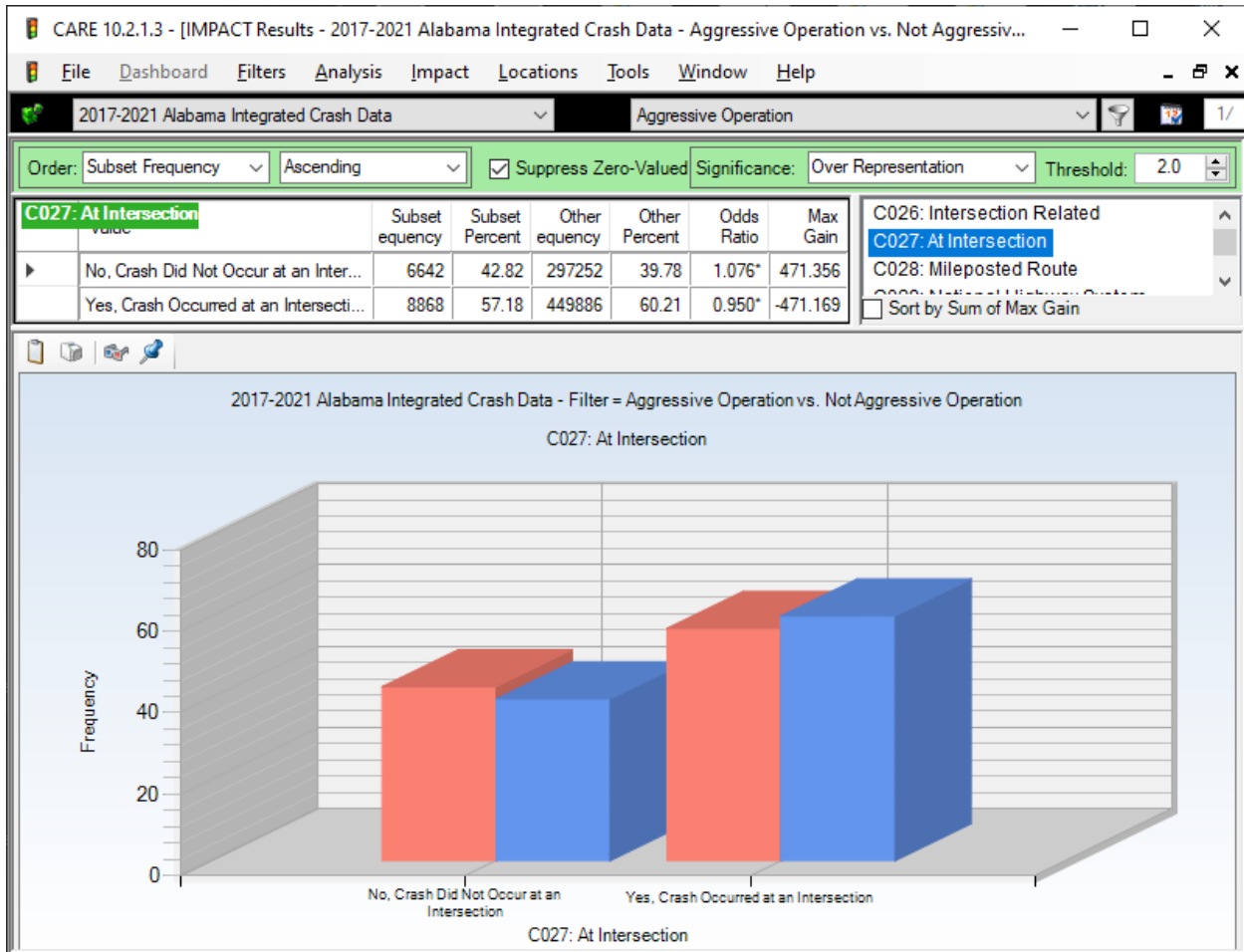
This further confirms the weather findings above. There seems to be a beneficial concern for extreme slippery conditions, which may cause concern for factors other than aggressiveness that are usually directed toward other drivers.

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.

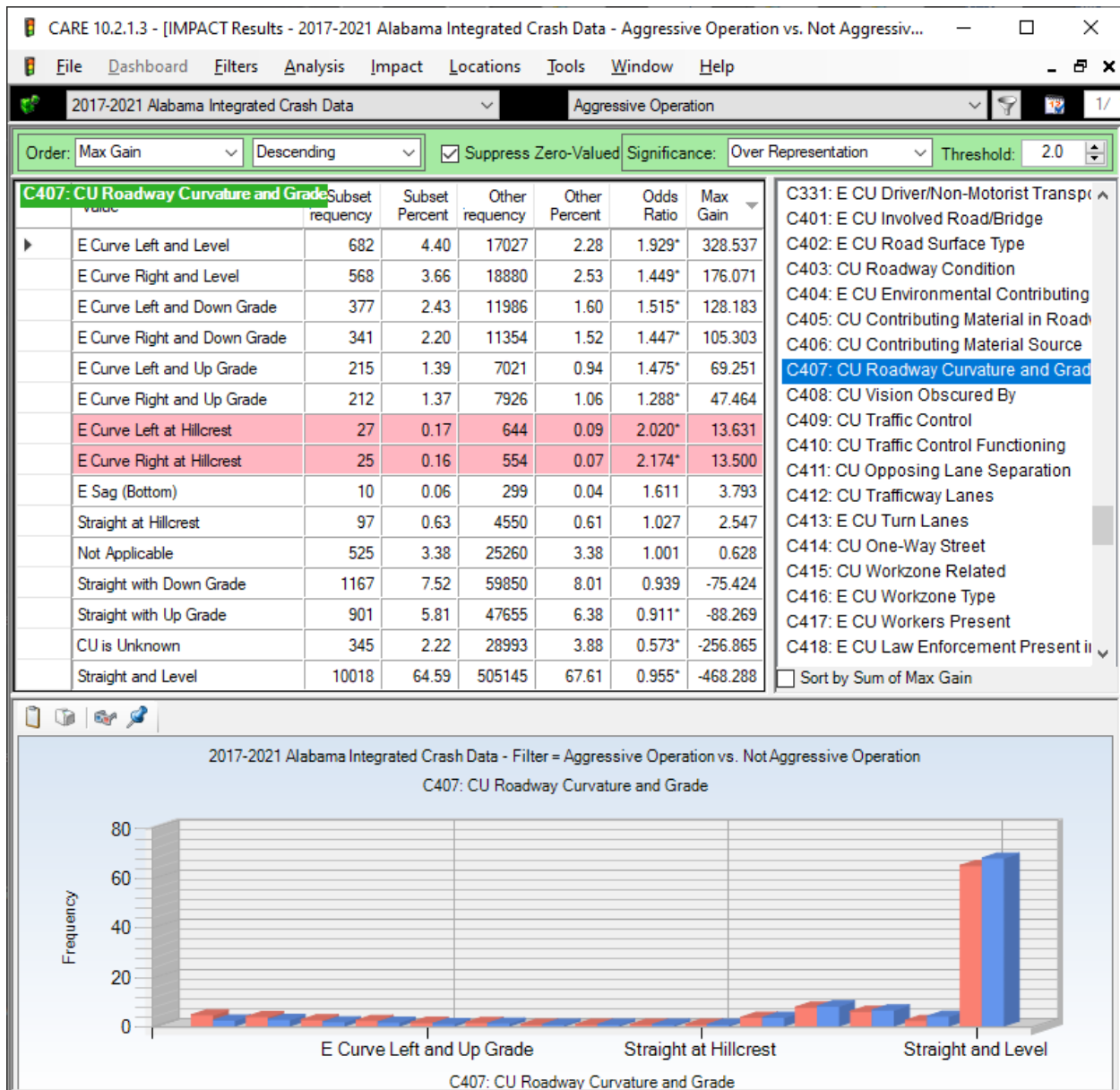


8.6 C027 At Intersection



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.

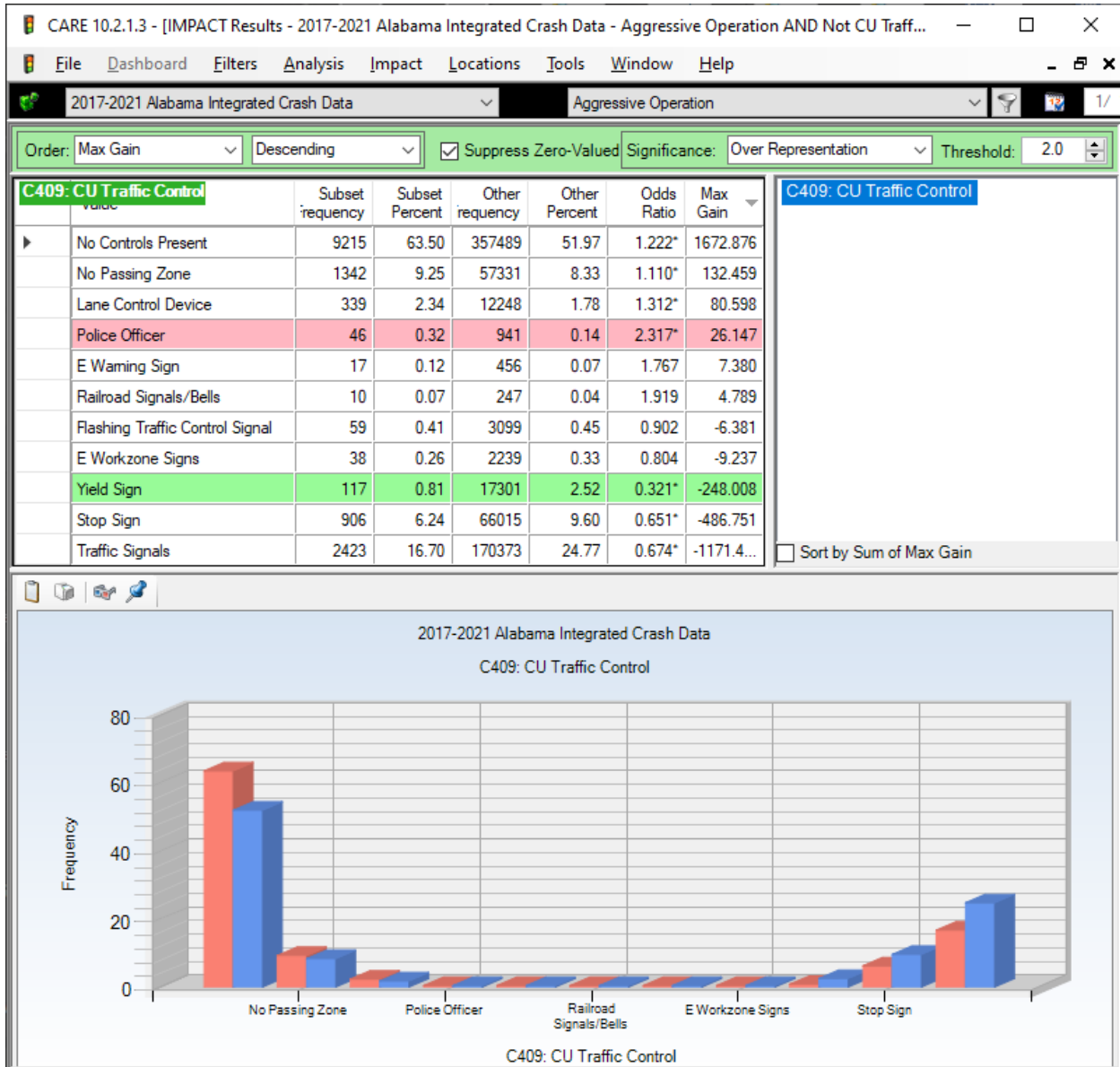
8.7 C407 CU Roadway Curvature and Grade



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.

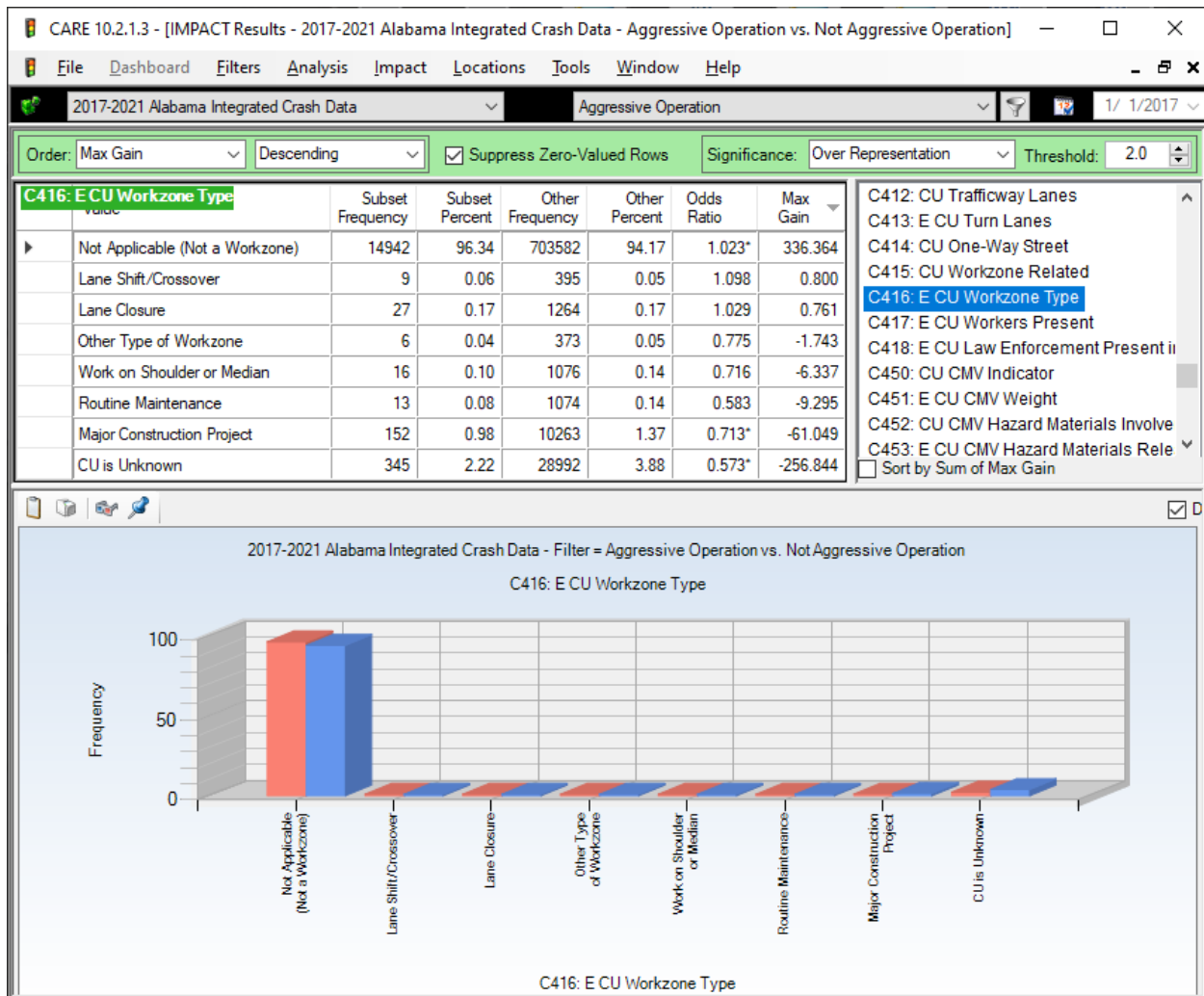
8.8 C409 CU Traffic Control

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:

<http://www.safehomealabama.gov/tag/aggressive-driving/>

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