Fatal Collision Highway Classifications IMPACT Special Study
Fatal County Crashes (FCCs) vs Fatal Federal or State Crashes (FFSCs)

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See http://www.safehomealabama.gov/caps-special-studies/ for all CAPS Special Studies.

0.0 Introduction – review and revise

The analytical technique employed to generate most of the displays in Sections 4-8 is a component within the Critical Analysis Reporting Environment (CARE) called Information Mining Performance Analysis Control Technique (IMPACT). For a detailed description of the meaning of each element of the IMPACT outputs, please see:
http://www.caps.ua.edu/software/care/

Sections 4-8 present the results of a number of IMPACT evaluations of Fatal County Crashes (FCCs) compared to Fatal Federal or State Crashes (FFSCs) over a recent five-year period (CY2018-2022). The purpose of these comparisons is to determine the causes of fatal crashes that might distinguish those that occur on County roads from those that occur on Federal or State roads. This is different from most of the special IMPACT studies that have been performed, which have had the goal of reducing all of a particular type of crash regardless of severity, and not just those that were fatal.

IMPACT works by surfacing "over-representations." An *over-represented* attribute is found when that attribute has a greater share of Fatal County Crashes (FCCs) than would be expected if its proportion were the same as that for Fatal Federal or State Crashes (FFSCs). That is, the FFSC crashes are serving as a *control* to which the FCCs are being compared to determine over-representations that indicate causes. For this particular study, since the test and the control crash subsets are both fatal crashes, the FFSCs may be viewed as the test subset and the FCCs as the control. In other words, it is possible to find over-representations simultaneously in either of these subsets of crashes. This will become clear as we get into the IMPACT comparisons.

As a first example, over the five years of the crash data studied (CY2018-2022), we found that FCCs for the Day-of-the-Week attribute value of Sunday had a 37.6% higher proportion of crashes than did the Sunday FFSCs (details in Section 2.3). When such differences are statistically significant (as in this case), this surfaces characteristics that should be given additional attention, and in some cases, further analyses are performed for countermeasure development. For **example, additional selective enforcement for FCCs causes (e.g., excessive speed and Impaired Driving**) might be performed on Sunday and other days that have the highest over-representations. The Time of Day attribute (Section 5.5) is also used to focus optimal times for enforcement implementation.

Unless otherwise stated, the tables given above the charts in the IMPACT displays are ordered by *Max Gain*. *Max Gain* is the improvement in FDC reduction that could be obtained if a countermeasure could be applied to reduce the proportion of the Fatal County Crashes (FCCs) to the proportion of Fatal Federal or State Crashes (FFSCs) for the particular attribute under consideration (i.e., reduce the 17.28 to 12.55 in the Sunday example in Section 2.3). The Max Gain for each attribute value can be found in the extreme right column of the table.

This report continues with three sections that provide a high-level summary of the IMPACT results and a more detailed explanation of their specifics. These are called: (1.0) Summary of Findings and Recommendations, (2.0) Filter and IMPACT Set-ups, and (3.0) Fatal Crash Comparison by Year. Section 3 is also introductory in that it provides another IMPACT example, a comparison for the Year attribute. After Section 3, the IMPACT comparisons between FCCs and FFSCs are presented under the following headings, given here with their section numbers:

- 4.0 Geographic Factors,
- 5.0 Time Factors,
- 6.0 Factors Affecting Severity,
- 7.0 Driver and Vehicle Demographics, and
- 8.0 Driver Behavior.

See the Table of Contents above for a guide to sections of interest.

1.0 Summary of Findings and Recommendations

We present a summary of findings and recommendations here for two reasons (1) for those who do not have time to go through all of the IMPACT analyses, and/or (2) as an introduction to the more detailed IMPACT studies. These summaries are referenced to the more detailed analyses so that any questions regarding their sources can be accessed easily. Section numbers (1.1), (1.2), and (1.3) in this section have been omitted to maintain consistency with the analytical sections (Sections 4-8).

Findings and recommendations are organized into the areas of: (1.4) Geographical Factors, (1.5) Time Factors, (1.6) Severity Factors, (1.7) Driver and Vehicle Demographics, and (1.8) Driver Behavior. The ordering of these recommendations, either generally or within their respective categories, is not meant to imply priority. However, the more detailed information given should be quite useful in the further prioritization and allocation of traffic safety resources. This process of optimization should consider all of the recommendations, which should be validated against the information presented in the IMPACT Sections 4.0-8.0 (source section references for these summaries are given in parenthesis). Recommendations are given for the reduction of frequency and/or severity of Fatal Crashes (both FCCs and FFSCs) in Alabama. They are in the same ordering as the IMPACT displays to facilitate references to Sections 4.0-8.0.

Terminology: *Expected proportions* (AKA *expectations*) of either the FCCs or FFSCs below are obtained from the comparison of their proportions with the proportions for their corresponding control classifications. The IMPACT analyses in this study enabled the determination of over-representations in either the FCCs or the FFSCs.

Note: subsection numbers 1.1, 1.2 and 1.3 have been omitted below in order to keep the numbering system in this Section consistent with that of the IMPACT displays that follow.
Findings are from the IMPACT analysis in Sections 4-8 that compare FCCs vs FFSCs over the

five years of the study (CY2018-2022). Recommendations will be given for each of the Findings. They are given in the bullet lists below:

- **1.4 Geographical Factors (4.0)**
  - County (4.1, C001) - Generally, the over-represented counties are rural with (or near) large population centers. The large population centers increase the traffic and thus the crashes, while rural generally make a larger proportion of these crashes fatal. Placed in Max Gain order, the FCC-over-represented counties with the highest potential for fatality reduction are (with their frequencies): Talladega 42, Mobile 87, Lee 33, Madison 56, Jefferson 60, and Baldwin 48. The FFSC-over-represented counties with the highest potential for fatality reduction with their frequencies are: Jackson 52, Russell 52, Tuscaloosa 79, Coffee 40, and Houston 50 (from the bottom of the entire table list). It is recommended that these and other over-represented counties be given special attention for fatality reduction. Generally, the countermeasures recommended to be applied to specific geographical areas, determined by hotspot analysis, are selective enforcement for Speed and Impaired Driving, since these two violations have the highest correlation with fatal crashes.
  - City Comparisons of FCCs to FFSCs, viewing rural areas of counties as separate virtual cities (4.2, C002). There is little surprise in the number of rural areas in this output. City (and rural virtual city) comparisons are presented in the IMPACT tables for all areas that had Max Gains greater than 22. The top 5 FDC-over-represented Cities (with very high statistically significant Odds Ratios) are: Rural Mobile 81, Rural Madison 54, Rural Talladega 40, Rural Jefferson 47, and Rural Baldwin 38. The top 5 FFSC-over-represented Cities with their expected numbers are: Mobile 46, Huntsville, 33, Tuscaloosa 20, Rural Jackson 26, and Rural Dallas 36. Those cities with a high frequency of fatal crashes should be given special guidance, and perhaps additional funding. Many such large city areas have a considerable amount of Open Country that tends to increase their fatality count (see Locale, Section 4.6).
  - Rural/Urban (4.3, C010) Fatal County Crash (FCC) Proportion – FCCs occurred in 90.49% rural and 9.51% urban areas. For FFSCs, these proportions came out to be 62.34% Rural and 37.66% Urban. The rural areas for both were significantly higher than their urban area numbers. Concentration for fatality reduction is recommended in Rural areas where hotspot analyses determines that there are concentrations of fatal crashes. Recommendations to reduce fatalities within any of these areas include:
    - Whatever can be done to reduce the need for rural motor vehicle travel;
    - Promote shorter distances per trip;
    - Implement a larger police presence in the more critical areas; and
    - Lower the speed limits in frequent crash areas.

Anyone wishing analysis of additional cities, counties, or other areas, please contact CAPS – email brown@cs.ua.edu.

- Locale (4.4, C033) – Open Country shows a high level of over-representation in both the FCCs (982) and the FFSCs (1319). Those countermeasures recommended to rural areas would be applicable to Open Country areas within city limits, which are effectively rural areas, as illustrated in the next display in Section 4.5.
- Cross-tabulation of Locale (4.5, C033) by Rural/Urban (C010) for FCCs. This illustrates that the Locale attribute is more definitive in specifying the surrounding areas of crashes that is the Rural/Urban attribute. Those recommendations for rural areas apply equally to Open Country Locales.
- Highway Classifications (4.6, C011) – This attribute was used to determine the filters to be applied in this study (see Section 2.2).
- Most Harmful Event (4.7, C019) – ordered by Max Gain. The following items had the largest number of fatality occurrences in the five years (listed with their frequencies):

  COUNTY (FCC) OVER-REPRESENTED

Collision with Tree	317
Overturned/Rollover	251
Fire/Explosion	34
Collision with Ditch	29
Collision with Utility Pole	23

  FEDERAL/STATE (FFSC) OVER-REPRESENTED

Collision with Vehicle in Traffic	1032
Collision with Non-Motorist Pedestrian	133

  Pedestrian training needs to be increased to include the advantages of walking against traffic, wearing of reflective clothing at night, and all the other rules for pedestrian safety, including a strong prohibition of walking while intoxicated with either alcohol or other drugs.
- Roadway Curvature and Grade (4.8, C407). The following items were the most over-represented (given with frequencies):

  COUNTY OVER-REPRESENTED

Curve Left and Level	136
Curve Left and Down Grade	109
Curve Right and Level	98
Curve Right and Down Grade	90
Curve Left and Up Grade	52

  FFSCS OVER-REPRESENTED

Straight and Level	1016
Straight with Up Grade	185
Curve Right and Up Grade	216

Recommendations include selective enforcement and speed-limit-reduction (e.g., advisory speed and curve warning signs) concentrating first on left curves. The application of Advisory Speed Limits for Curves might be improved by considering the recent release of GDOT_16-31 (trb.org) entitled: *An Enhanced Network-Level Curve Safety Assessment and Monitoring Using Mobile Devices*; GDOT_16-31 (trb.org). This report appears on:
http://www.safehomealbama.gov/tag/road-improvements
Other engineering recommendations should evaluate all curves on county roads, especially left curves.

- **1.5 Time Factors (5.0)**
  - Year (3.1, C003) – no recommendations are made to address any FDC or FNC annual variations since the differences found were not statistically significant.
  - Month (5.2, C004) – The number of FCCs and FFSCs correlated very closely in all months (no significant over-representations). July, September, and October, which had the highest Odds Ratios, might be given special selective enforcement concentration, with specific locations determined by hotspot analyses.
  - Day of the Week (2.3, 5.7 C006) – Friday, Saturday and Sunday were the only over-represented days of the week. Since the day of the week distribution is quite comparable to that of Impaired Driving (ID, DUI), the countermeasures for ID should be emphasized in the times and places indicated by hotspot analysis. Consideration might be given to using Fatal County Crashes (FCCs) as a proxy measure to improve ID countermeasure decisions. See Sections 8.3 and 8.4.
  - Time of Day (5.5-5.6, C008) – In *Natural Time Order*. In addition to Impaired Driving (ID). some of the late-night crashes will be due to drowsiness, causing among other things a diminished ability to see road edge lines. See Day of the Week (2.3, 5.7, C006) above for the similarity of this distribution with that of Impaired Driving (ID, DUI). The ID recommendations effectively apply to these over-represented times. For more ID information, See Sections 8.3 and 8.4.
  - Time of Day by Day of the Week (5.7, C008 x C006) – *For all fatal crashes.* This quantifies the extent of the fatal crash concentrations on Fridays, Saturday mornings and nights, and Sunday mornings and Sunday Evenings. This is a very useful summary for deploying selective enforcement details, especially during the weekend hours. Recommendations here are to adjust the selective enforcement times to the day of the week using this cross-tabulation.

1.6 Factors Affecting Severity (6.0)

- Severity for All Highway Classifications (6.1, C025, C011) – This Cross-tabulation was performed for all records so that the various severities on the different Highway Classifications could be seen. Note the fatal over-representations on Federal, State and County roads.
- Speed at Impact (6.2, C224) – Impact speeds from 26 MPH to 70 MPH are generally over-represented for FCCs. FFSCs are over-represented at speeds 71-75, 81-90 and over 100 MPH. So it is clear that speed is a larger problem in the FFSCs than in the FCCs. Several analyses have found the general rule of thumb that for every 10 MPH increase in impact speeds, the probability of the crash being fatal doubles. This was validated in the discussion below of the cross-tabulation of impact speeds by severity (6.4a and b). The recommendation here is to perform selective enforcement along with the various PI&E programs that go with it – in other words, use whatever resources are available to bring about an overall speed reduction, and especially those speeds that are violating speed laws.
- Highway Classifications by Impact Speed (6.3, C224) for different Highway Classifications (C011). *For all fatal crashes.* This cross-tabulation gives an idea of the risks on the various highway classifications. The red backgrounds indicate those that had a relatively higher number of fatal crashes. If drivers have the option, this chart will be helpful in assisting them in choosing the safest routes for their trips.
- Severity by Impact Speed (6.4a and b. C025, C244). The speed to death relationship was further validated in the discussion of this cross-tabulation. This discussion was given elaboration in the Section 6.4b, which is a discussion of the Probability of Being Killed by Speed at Impact. The recommendation here is that the information of Section 6.4a and b be an essential part of the training in all traffic safety educational programs.
- Restraint Use by Drivers in Fatal Collisions (6.5, C323) – Restraint use programs have been quite successful in Alabama. Consideration should be given to increasing financial support to these programs to assure that their effectiveness will continue. In particular, special concentration needs to be given to those drivers (identified in this report) who use County roads, since county road restraint use was found to be significantly less than that on Federal/State routes. See Section 6.6 for more information on the effectiveness of restraints.
- Cross tabulation: Crash Severity (6.6, C025) by Restraint Use (C323) for All Injury Crashes. A comparison of the probability of a fatal crash indicates that a fatality in an injury crash is on average 8.0 times more likely if the involved occupants are not using proper restraints (see text under the cross-tabulation in Section 6.6). This multiplier would increase as speeds of impact increase. Because current restraint-use programs are quite effective, consideration should

be given to increase their funding to make them even more universal and effective. Restraint effectiveness information should be part of all traffic safety educational programs, and consideration should be given to increasing the fines of being unrestrained.

- Number of Vehicles Involved (6.7, C052) – the number of single vehicle fatal crashes is over-represented for FCCs by an Odds Ratio of 1.666, indicating that its proportion was two thirds more than expected. Over half (72.16%) of the FCCs were single vehicle crashes. This is consistent with the other findings of causality. It is recommended that PI&E efforts give top priority to single vehicle crashes. The following is potentially useful information from a list of the highest Primary Contributing Circumstances *for all single vehicle crashes* with more than five occurrences in 2018-2022: DUI (34); Aggressive Operation (23); Over the Speed Limit (37), Ran Off Road (24); Unseen Object/Person/Vehicle (12); and Improper Crossing (20 pedestrian crashes). This reflects the "unforced errors" of single vehicle crashes, and it provides additional reasons that they are over-represented in the FCC hours.
- Police Arrival Delay (6.8, C036) – Generally, the police response times to FCCs were greater than expected, with delays greater than 10 minutes being over-represented, most of which were significant. There can be little doubt that this has to do with so many of the FCCs occurring in rural areas (see Section 4.3) and at night. The 0 to 10 minute delays were over-represented for the FFSCs by more than double that which was expected. Delays of 91 to 120 minutes and Over 180 minutes were highly statistically significant for FCCs.
- EMS Arrival Delay (6.9, C039) – Probably because of (1) the severity of the crashes (all being fatal in this study), (2) the swiftness/urgency in getting called, and (3) the urgency in getting to the scene, much shorter delay times were recorded than that of the police delays. Generally, we can conclude that very few of the fatalities were caused by excessive EMS delays, since the frequencies drop off rapidly after 30 minutes. It is recognized that first responders are currently doing an excellent job in getting to the scene of the crash as quickly as possible without jeopardizing safety. Delays, if any, are usually caused be a failure to report the crash immediately, and encouraging quicker notification should be worked into the appropriate PI&E efforts.

- **1.7 Driver and Vehicle Demographics (7.0)**
  - Driver Age Range 2 (7.1, C106) –A comparison of FCC causal driver age with the FFSCs shows the most over-represented in the FCCs are in 16-25 years of age, while the most over-represented Federal/State are 61-85 years of age. Clearly, from the chart it can be seen that the FFSCs have higher age proportions than do those in the County in 61-70 and the 76-Over 95 pattern of over-

representations for FFSCs. It is recommended that, to the extent possible, that PI&E efforts focus on these age concentrations.

- Crash Driver Gender (7.2, C109) – the breakdown in FCC causal drivers is 73.39% male and 20.33% female. For FFSC cashes, the percentage is 65.87 male and 23.29 female. These gender differences certainly indicate that males are a greater cause of the fatal crashes, and the recommendation is that, if there are countermeasures that can be directed toward males, this would be much more cost-effective than those directed equally toward all drivers.
- Cross-tabulation of Driver Gender (7.2, C109) by Speed at Impact (7.3, C224) for *All Fatal Crashes*. To get better insight into the reason for male drivers causing more fatal crashes, this analysis shows that males had impact speeds in excess of the 70 MPH (speed limit on most Interstates) in 20.5% of their fatal crashes, while comparable speeds for females was only at 10.7%. Thus, all of the recommendations for speed reduction apply doubly to males over females.
- Causal Unit (Vehicle) Type (7.4, C101) – This analysis was based on a comparison of FCC Causal Unit Type against the same for FFSCs. It is recommended that countermeasure programs that are currently in effect be continued and augmented so that part of it will emphasize the special issues during the nighttime hours. Pedestrian programs should include warnings against Impaired Walking (walking along the roadway after drinking), and the many other errors addressed in most pedestrian safety programs. Pedestrian fatalities are statistically significantly over-represented in the FFSCs, indicating that more emphasis might be warranted for divided and four-lane roadways. Additional pedestrian fatality study is warranted; see Section 7.5 below.
- Number of Pedestrians (7.5, C058) – Fatal Federal and State pedestrian crashes occur about 61.5% times greater than their County counterparts. This is consistent with what has been found in most pedestrian studies. Both ID and Impaired Walking, contribute to this, as well as pedestrians not taking the maximum means for being seen at night. Wearing reflective clothing, and carrying (and using) a flashlight to be seen of vehicle drivers are two of the most important recommendations in that lack of visibility was cited for several fatal crashes. Pedestrian programs need to be emphasized in the lower school grades and continue to be emphasized through the young adult years.
- Driver License Status (7.6, C114) – FCCs were slightly over-represented in their causal drivers having legitimate licenses. Expired, Revoked and Suspended licenses were also over-represented for FCCs to a greater degree. Essentially, this indicates that those who most often travel the county roads are less apt to have valid driver's licenses. This warrants more concern for enforcement at the County road level.

- Driver Employment Status (7.7, C120) – This analysis indicated that the unemployment rate for the FCCs was about 21.20%, while that for FFSCs was 14.37%. Higher than average unemployment rates are not surprising because of the underlying drug/alcohol root cause of many fatal crashes (see Sections 8.3-8.4). The correlation between not having a job and being involved in a fatal crash should be watched carefully going forward in that it could affect the type and location of countermeasures. It is also recommended that research be performed to determine if there are some incentives that could be implemented in conjunction with unemployment payments.

- **1.8 Driver Behavior (8.0)**
  - Primary Contributing Circumstances – PCC (8.1 and 8.2, C015) Driver behaviors that are correlated with Fatal County crashes might provide alternatives for countermeasure development. Those behaviors that involve pedestrians or had over 50 fatal crashes are:

	FCCs	FFSCs
▪ Over Speed Limit	233	168
▪ DUI	194	176
▪ Aggressive Operation	103	121
▪ Improper Lane Change/Use	36	37
▪ Ran off Road	72	99
▪ Lying or Sitting in Roadway (pedestrian)	10	6
▪ Driving too Fast for Conditions	50	75
▪ Ran Stop Sign	28	40
▪ Not Visible (possible pedestrian)	14	28
▪ Unseen Object/Person/Vehicle (possible pedestrian)	22	60
▪ Failed to Yield Right-of-Way Making Left or U-Turn	21	77
▪ Traveling Wrong Way/Wrong Side	21	88
▪ Improper Crossing (probable pedestrians)	15	80
▪ Crossed Centerline	48	147
▪ Failed to Yield Right-of-Way from Stop Sign	31	131

    * Statistically significant

    No additional recommendations are given for these behaviors since most of them are covered by Speed, ID, Pedestrian and other countermeasures.
  - CU Officer's Opinion Impaired Driving – CU Officer's Opinion Impaired Driving – Alcohol (8.3-8.4, C122-C123). We saw ample evidence for fatal crashes being caused by Impaired Driving (ID) in the time of day and day of the week attributes. The two ID attributes (C122 and C123) indicate the degree that ID was involved in fatal crashes. For alcohol, the proportion of ID fatal crashes was 1.724 times as many for FCCs as for FFSCs. For drugs this multiplier was 1.145. Recommended countermeasures to reduce ID are:
    - Additional ID enforcement is warranted on County roads.
    - Mandate breath-alcohol ignition interlock devices for all convicted of ID.

- Perform an in-depth study to determine if problems exist within the current programs, e.g., how the use of interlock devices can be expanded to be made more generally effective.
- Since the presence of drugs/alcohol often do not reach the reporting threshold, especially in cases involving prescription drugs, continued officer training to produce more complete reporting, especially for non-alcohol drugs.
- Drug/Alcohol Diversion Programs should continue (or new programs adopted) that concentrate on keeping the age 25 through 35 (typically *social users*) from becoming habitual to the point where they become part of the 36-55-year-old over-representation of predominantly *problem users* (see 7.1).
- Combinations of recreational or medical drugs and alcohol can be particularly lethal, and medical practitioners should warn against such problems and discourage all alcohol and additional drug use for their patients who have indicated either of these combinations, or who are taking other prescription drugs.
- Legalized recreational drugs are not a good alternative to alcohol use and the advertising as such should be outlawed. PI&E programs should take the opposite approach to warn drivers that legalization does not relax their responsibilities.

2.0 Filter and IMPACT Set-ups

Generally, the analyses performed in this study used IMPACT (See Section 2.1) to compare Fatal County Crashes (FCCs) against Fatal Federal or State Crashes (FFSCs) over the same 5-year time period (FY2018-2022). The objective was to determine all significant differences between attributes within these two subsets of data in order to get an improved understanding as to the fatality crash causes (who, what, where, when, how, causal driver demographics, etc.). This is accomplished by pinpointing common factors to assess strategies that could be used to address any major inconsistencies between these two subsets of crash data. The findings that are presented should be taken into consideration when planning the large variety of countermeasures that exist to reduce both the crash frequency and severity.

Sections 2 and 3 of this report contain information that will be useful in obtaining an overall orientation toward the IMPACT results that will follow (in Sections 4-8). This introduction will consist of: (2.1) Introduction to IMPACT, (2.2) Definitions of Filters Used, (2.3) Example IMPACT: Day of the Week, and (2.4) Overall Fatal Crashes by Severity. Section 3 presents another IMPACT example (Fatal Crash Comparison by Year of FCCs vs FFSCs) for purposes of further orientation.

2.1 Introduction to IMPACT

The findings of Sections 4.0-8.0 are in displays of comparisons for the various attributes that might have an influence on crash, and especially fatal crash, countermeasure development. The CARE analytical technique employed to generate these comparisons is called Information Mining Performance Analysis Control Technique (IMPACT). Unless otherwise indicated in the IMPACT "Order" box, the outputs will be listed in the order of highest *Max Gain* first. *Max Gain* is a term that CARE users have assigned to indicate the number of crashes that would be reduced if the respective attribute proportion was not over-represented (i.e., had an Odds Ratio of 1.000). An *over-represented* value of an attribute is a situation found where that attribute has a greater share (proportion) of crashes in the County (FCCs) than would be expected from that given in the FFSCs. Similarly, an *under-represented* value of an attribute is a situation found where that attribute has a smaller share of crashes than what would be expected. Significant under-representation for FCCs indicate significant over-representation for FFSCs, since they are the comparisons being performed in the IMPACT analyses.

IMPACT will display comparisons of FCCs against their FFSC counterparts. In summary, the FFSC Crashes are serving as a control to which the FCCs are being compared. In this way any inconsistencies related to the FCCs surfaces and can be subjected to further analyses. For a detailed description of the meaning of each element of the IMPACT outputs, see:

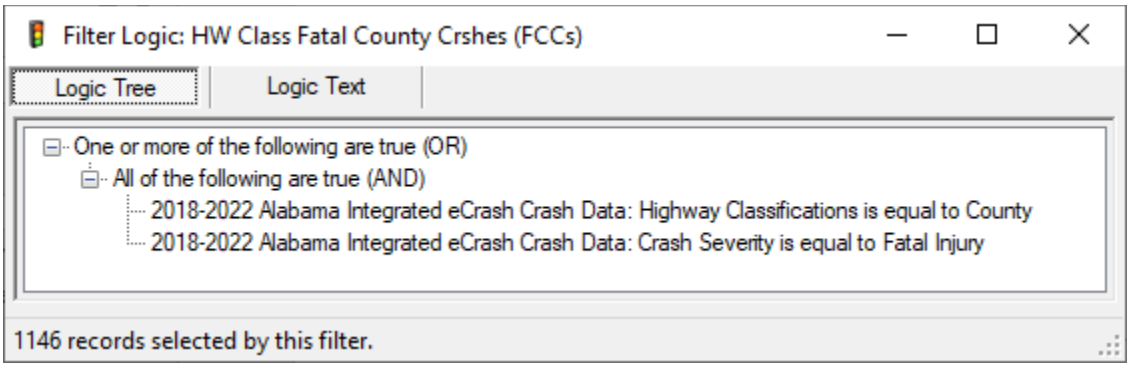
http://www.caps.ua.edu/software/care/

The IMPACT analses will be grouped by five general attribute categories as follow in Sections: 4. Geographical and Harmful Events, 5. Time, 6. Severity, 7. Demographics, and 8. Driver Behavior.

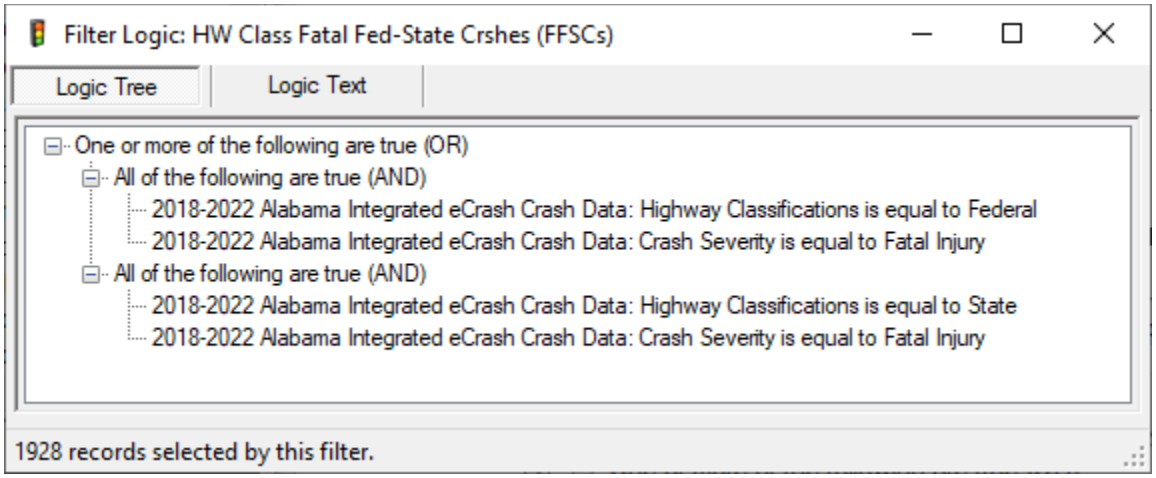
2.2 Filter Definitions for the IMPACT Analyses

The IMPACT analyses will compare Fatal County Crashes (FCCs) vs Fatal Federal and State Crashes (FFSCs). The standard filter for all fatal crashes based on C025 Crash Severity was applied, and separate filters for the FCCs and FFSCs were obtained, as exemplified in the IMPACT displays in the next few pages. The formal definitions for these two filters are given below:

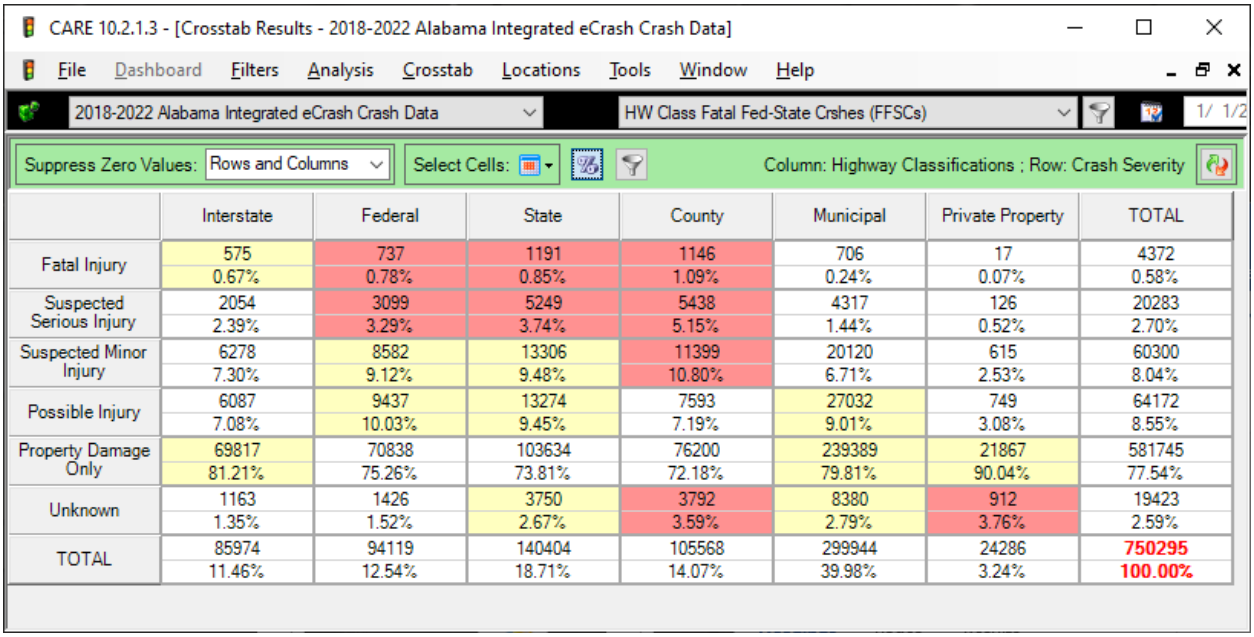
Formal Definition of Fatal County Crashes (FCCs)



Formal Definition of Fatal Federal and State Crashes (FFSCs)



Why compare these two subsets of the five-year crash records? The following cross-tabulation provides the basis for the answer to this question:



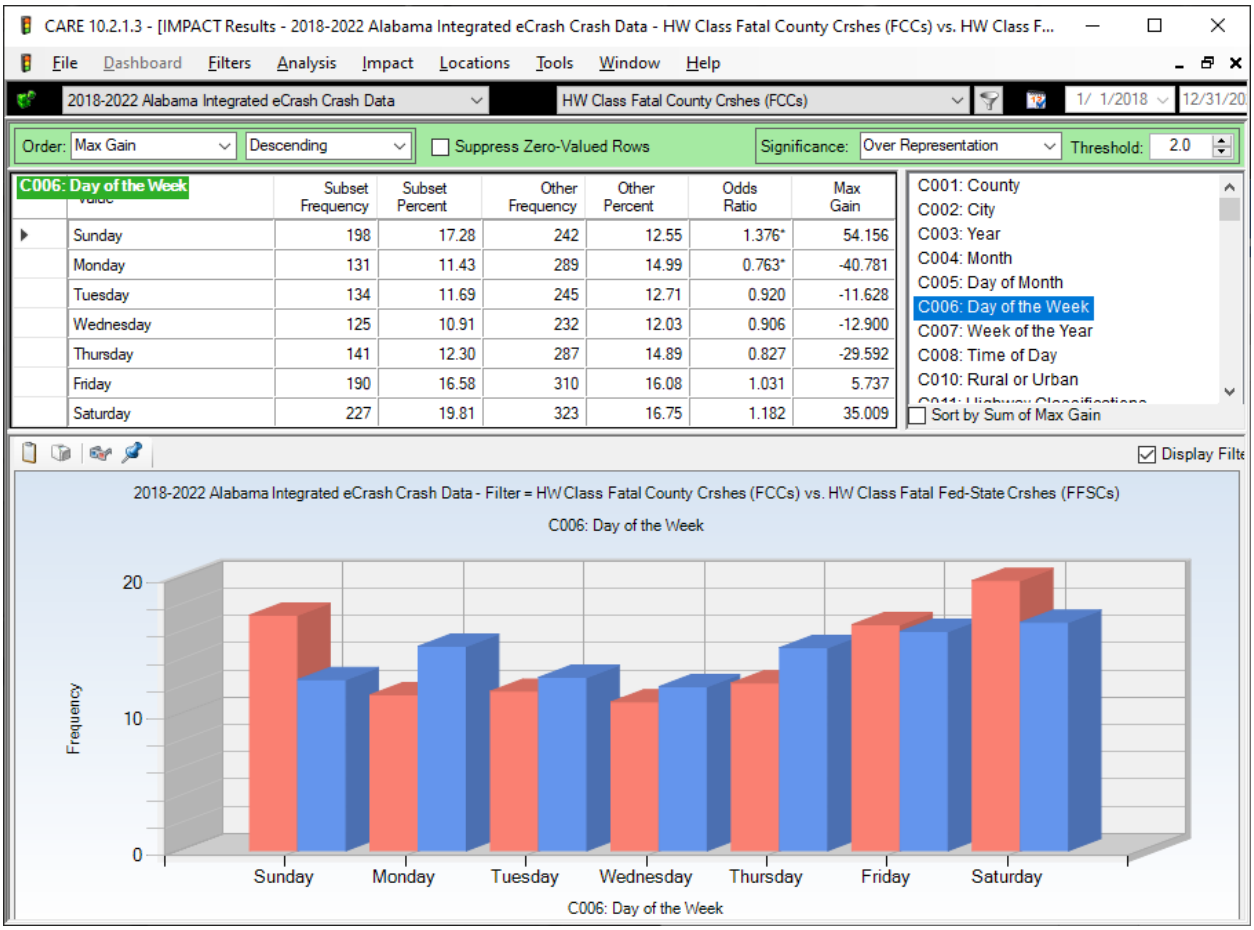
	Interstate	Federal	State	County	Municipal	Private Property	TOTAL
Fatal Injury	575 0.67%	737 0.78%	1191 0.85%	1146 1.09%	706 0.24%	17 0.07%	4372 0.58%
Suspected Serious Injury	2054 2.39%	3099 3.29%	5249 3.74%	5438 5.15%	4317 1.44%	126 0.52%	20283 2.70%
Suspected Minor Injury	6278 7.30%	8582 9.12%	13306 9.48%	11399 10.80%	20120 6.71%	615 2.53%	60300 8.04%
Possible Injury	6087 7.08%	9437 10.03%	13274 9.45%	7593 7.19%	27032 9.01%	749 3.08%	64172 8.55%
Property Damage Only	69817 81.21%	70838 75.26%	103634 73.81%	76200 72.18%	239389 79.81%	21867 90.04%	581745 77.54%
Unknown	1163 1.35%	1426 1.52%	3750 2.67%	3792 3.59%	8380 2.79%	912 3.76%	19423 2.59%
TOTAL	85974 11.46%	94119 12.54%	140404 18.71%	105568 14.07%	299944 39.98%	24286 3.24%	**750295** **100.00%**

The following provide reasons for selecting FCCs as the test subset and FFSCs as the control subset (called "Other" in the IMPACTs):

- Interstate highways were eliminated first because it is well established that on a per-mile basis, they are the State's safest roadways, and their use is to be encouraged without qualification.
- Second, in many attributes, Interstate highways will not be comparable to the other classifications that are being compared, and some of the differences found may be misleading.
- Similarly, Municipal and Private Property classifications were also eliminated from these comparisons.
- Fatal County [road] Crashes (FCCs) were chosen as the test subset in that they are known to have a per-mile fatal crash frequency that is generally larger than that of the other highway classifications. We will assume the word "[road]" can be excluded from the County acronym in the remainder of this report.
- Fatal Federal and State Crashes (FFSCs) were chosen to be the control dataset as follows: (1) they were considered to be the most comparable to the County roads, and (2) they were combined to form a larger dataset because of their similarity of Federal and State routes to each other, and (3) the increased sample size increased the statistical reliability of the results.
- Fatal crashes were chosen for the comparison in order to focus on this worst crash severity, recognizing that if it is reduced there will be a comparable reduction in other high severity crashes.

Note the filter of this IMPACT is FCCs and the comparative "Other" subset it FFSCs. These comparisons are different from most IMPACT analyses we have done in the past, because here both the Subset crashes and the "Other" crashes consist only of fatal crashes. Thus, they are comparable to each other. This is illustrated by the example in Section 2.3, immediately below.

2.3 Day of the Week (C006); Comparison of FCCs and FFSCs

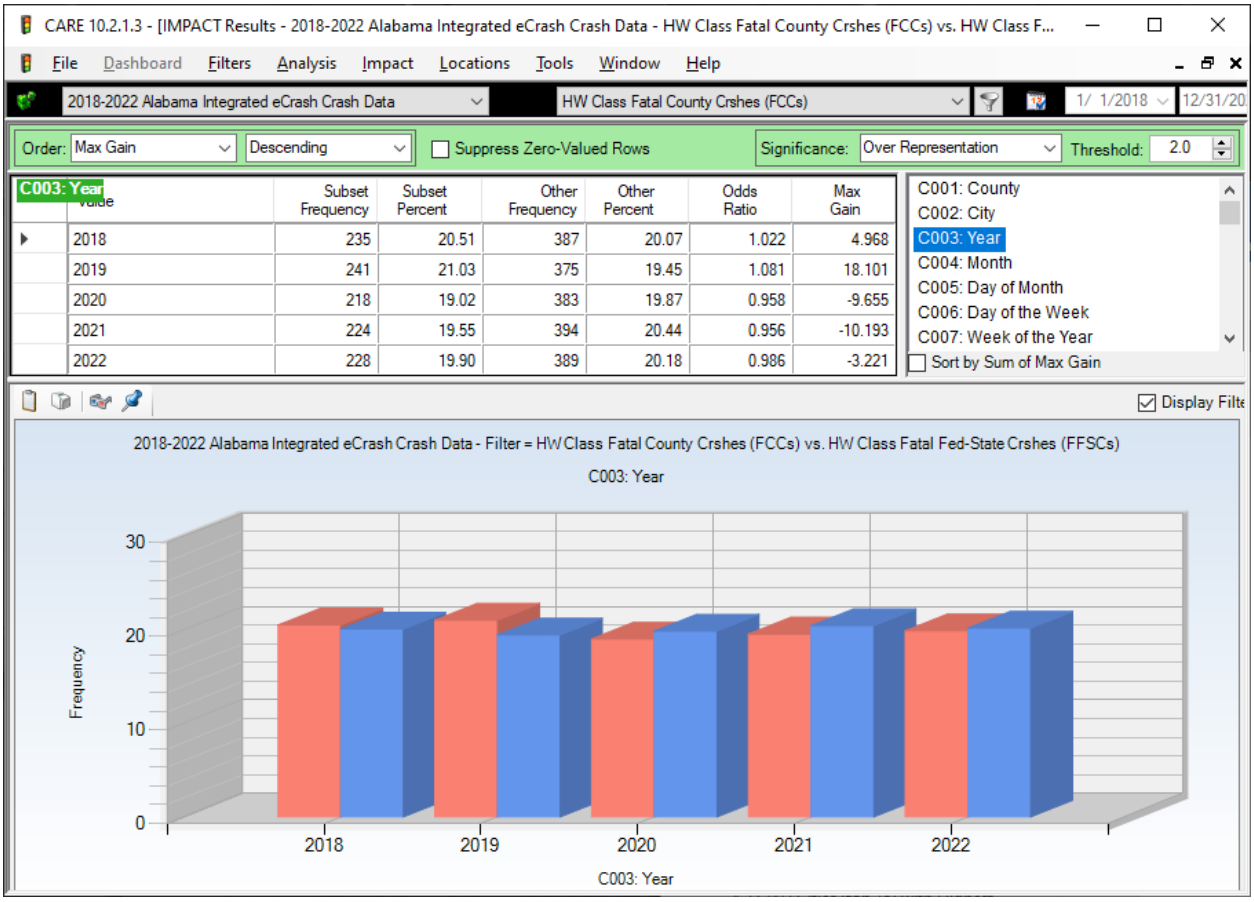


Quick reminder: FCCs=County=**Red bars**; FFSCs=Federal and State=**Blue bars**.

In this IMPACT display, as well of those in Sections 4-8, the Subset (given by the red bars) is the Fatal County Crashes (FCCs). The "Other" crashes are those that occurred on Federal and State routes (FFSCs). This IMPACT (and those below) will use both of the filters defined above to compare the FCCs directly with the FFSCs. The above shows that Saturday, Sunday, and to a lesser extent Friday, are over-represented in FCCs. Weekdays (with the exception of Friday) are over-represented in FFSCs. FCCs will be used to define the "Subset," while FFSCs will define the "Other."

3.0 Fatal Crash Comparison by Year

Fatal County Crashes (FCCs) vs Fatal Federal or State Crashes (FFSCs) by Year

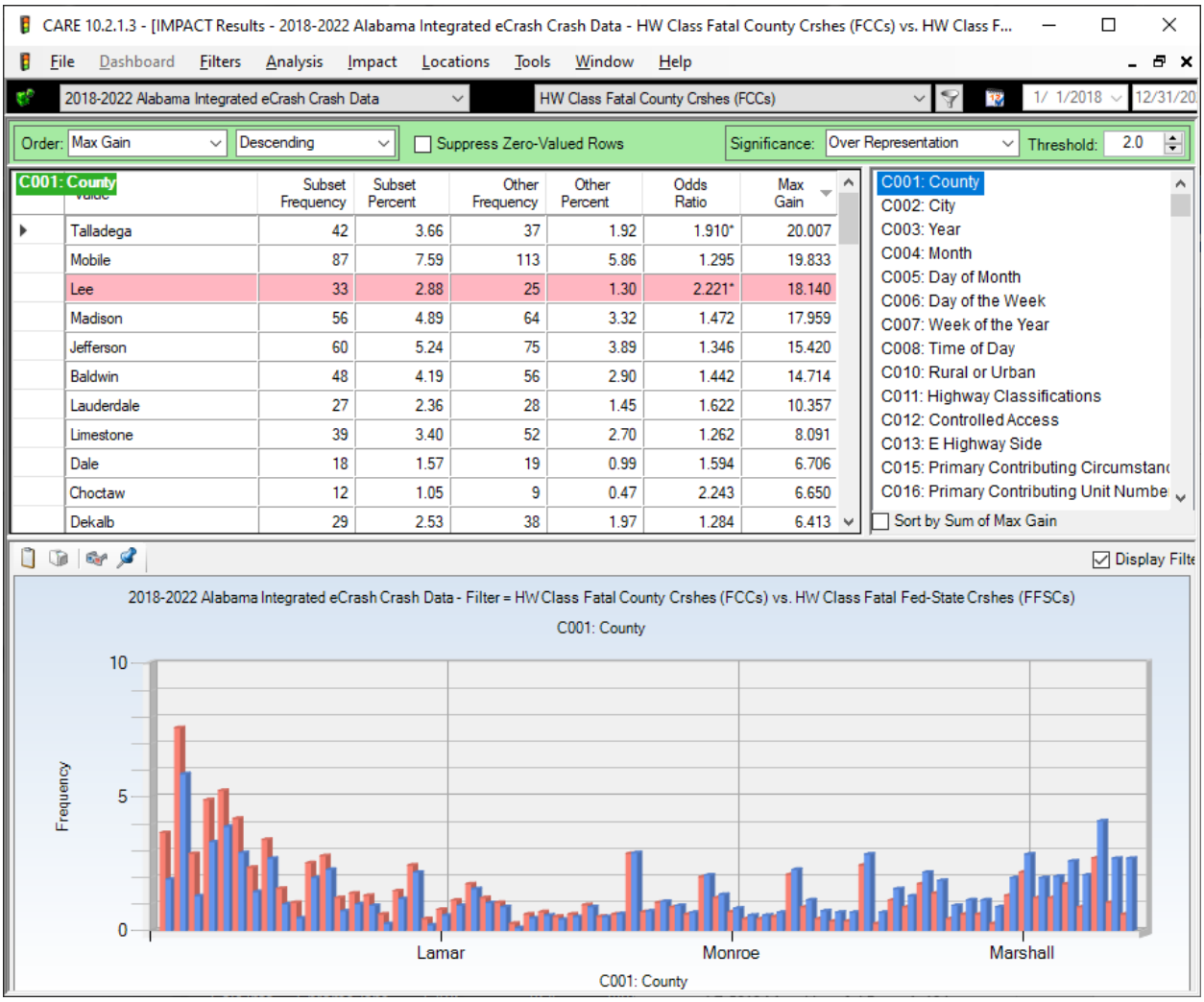


Quick reminder: FCCs=County roads=**Red bars**; FFSCs=Federal and State routes=**Blue bars**.

This is an example that further demonstrate the IMPACT displays. As shown in the Fatal County Crashes (FCCs) were slightly over-represented in 2018 and 2019, but the statistical analysis did not find any of the years' differences to be significant in the proportion of either FCCs or FFSCs. Statistically significant results are indicated by an asterisk (*) that will appear on the Odds Ratio for the attribute value under consideration.

4.0 Geographic and Harmful Event Factors

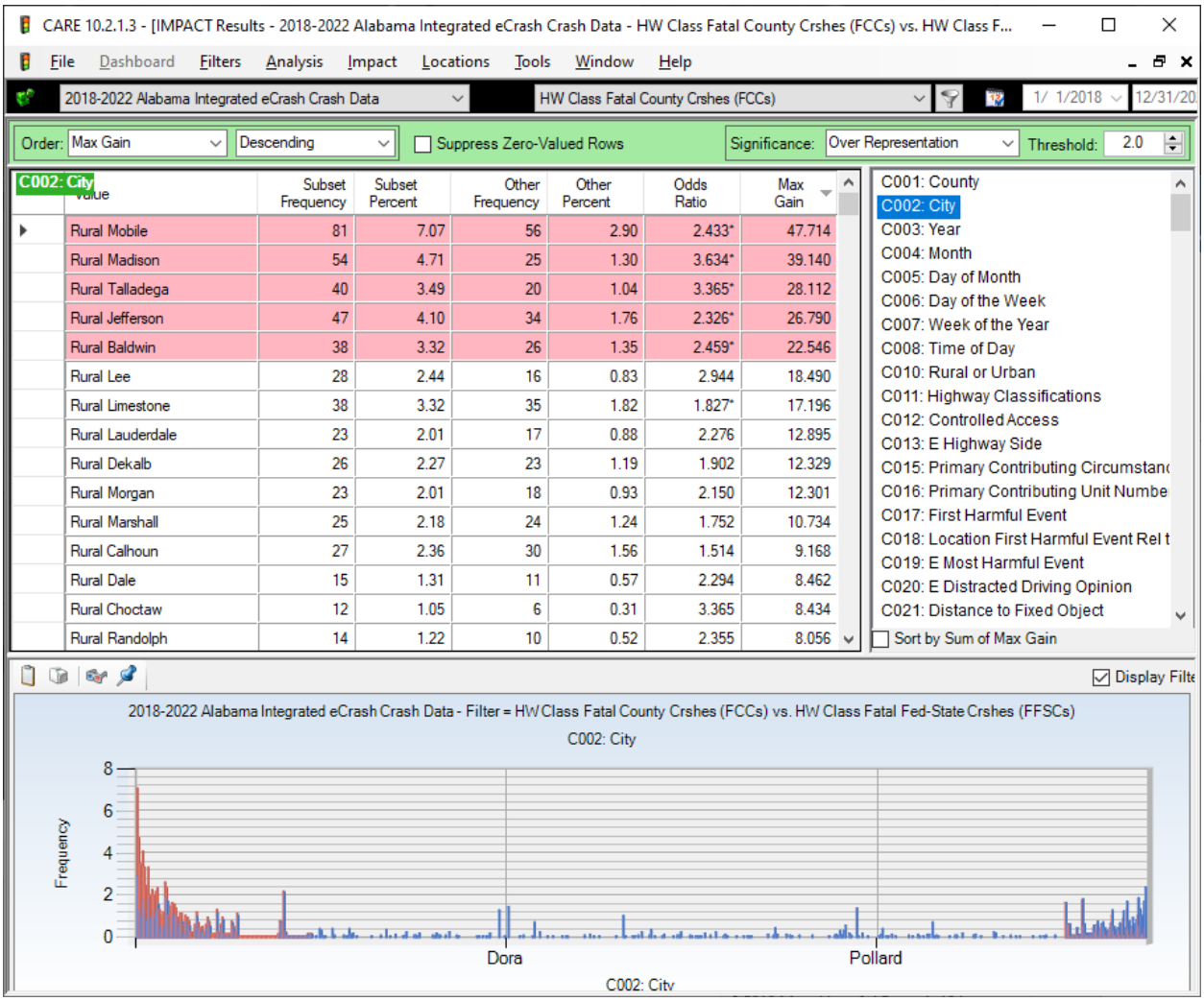
4.1 C001 County (top 11 counties) ordered by Max Gain; FCCs vs FFSCs



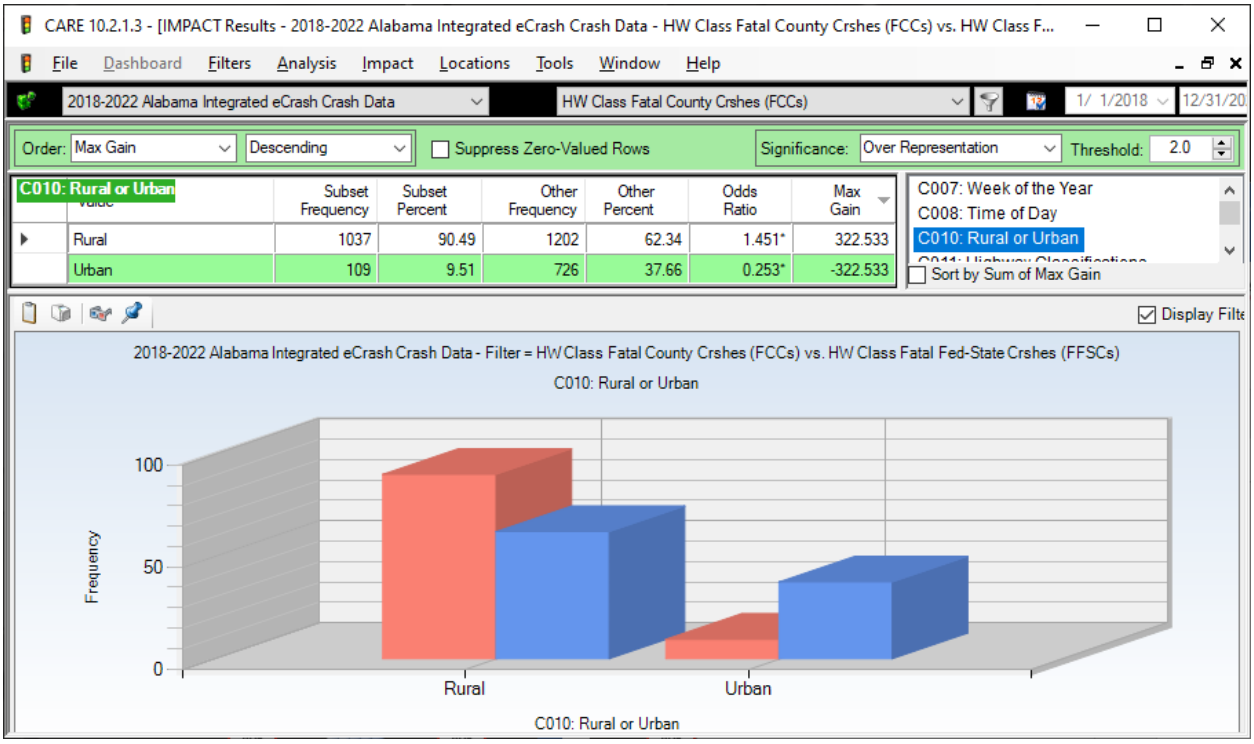
Again, recognize that each line of table above gives both FCC and FFSC fatal crashes. So, Talladega County at the top had 42 Fatal County Crashes and 37 Fatal Federal and State crashes. The respective proportions (3.66 and 1.92) are compared to obtain the Odds Ratio of 1.910. These proportions are calculated from the attribute (Talladega) frequency divided by the total number of fatal crashes (in either the Subset or the Other). The Max Gain (20.007) is the number of Fatal County Crashes (FCCs) that would be reduced if somehow the 3.66 was reduced to 1.92. The above display has been arranged in highest Max Gain order to indicate the counties that have the highest potential for gain in reducing their FCC proportions as opposed to their FFSC proportions. The display above contains all of the counties with Max Gains greater than 5.000.

4.2 C002 Cities (top 15) with Highest Max Gains (Rural Areas = Virtual Cities)

For comparison purposes, the rural area of a county is considered to be a "virtual city" and crashes that occur there are listed as "Rural [County Name] Crashes" so that these crashes can be effectively accounted for and compared. The high rural areas are generally adjacent to (or partially contain) significant urban areas that have a higher traffic density. This display is in Max Gain ordering to put those (possibly virtual) cities that have the highest potential for Fatal County [road] Crash (FCC) reduction at the top. The display below is for all Max Gains > 7.

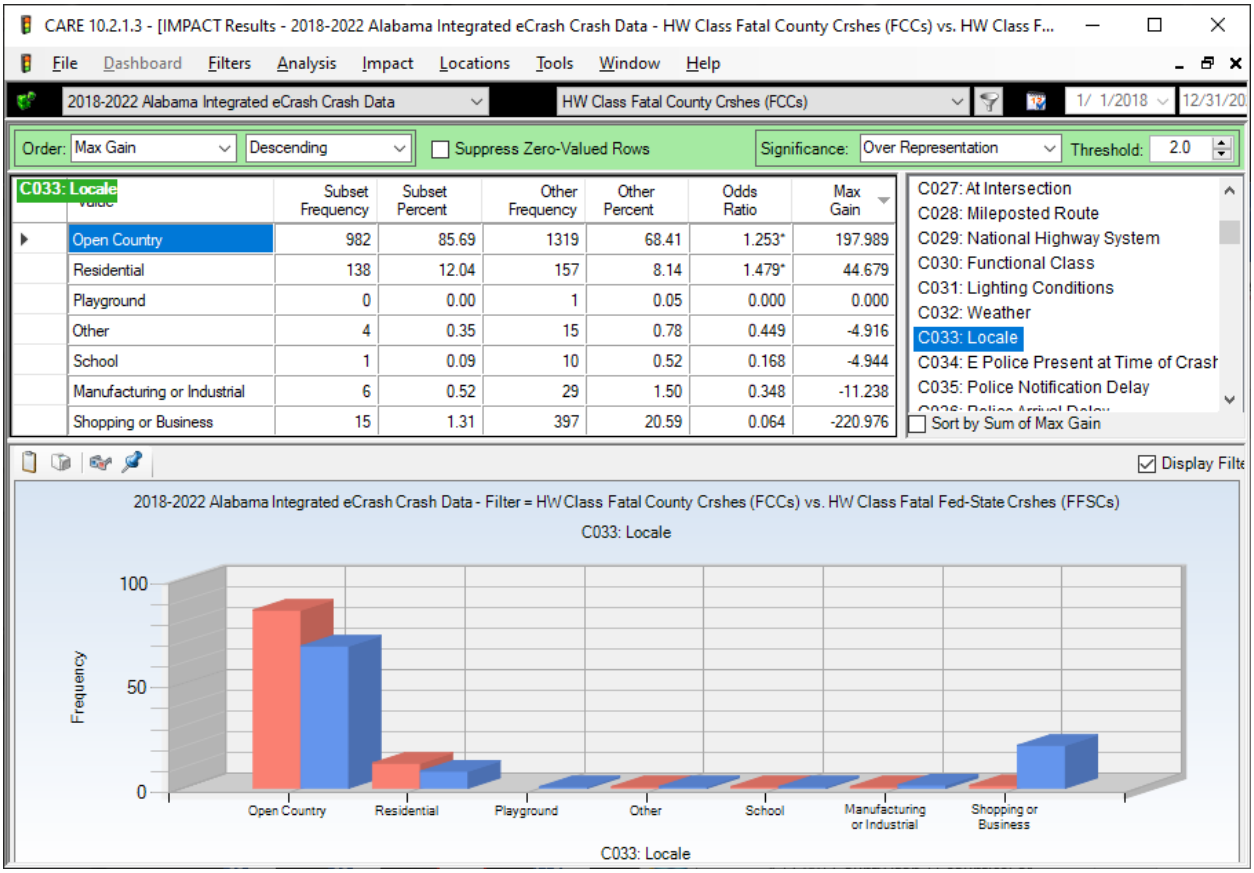


4.3 C010 Rural or Urban



The County crashes had 90.49% of the FCCs in rural areas, while this percentage was 9.51% for Urban FCCs. The FFSCs were also predominately rural, with 62.34 in the rural areas. Both results illustrate how much more lethal rural crashes are then those on urban roadways. This is attributed to the comparative speed at impact on the rural roads, both in FCCs and FFSCs. Speed will be considered again in Section 6.2, C224 Speed at Impact. Speed not only can cause a crash, but it also dramatically increases its severity (see Section 4.4 below). Significant differences were found between the County and Fatal Federal and State Crashes in both the rural and urban differences.

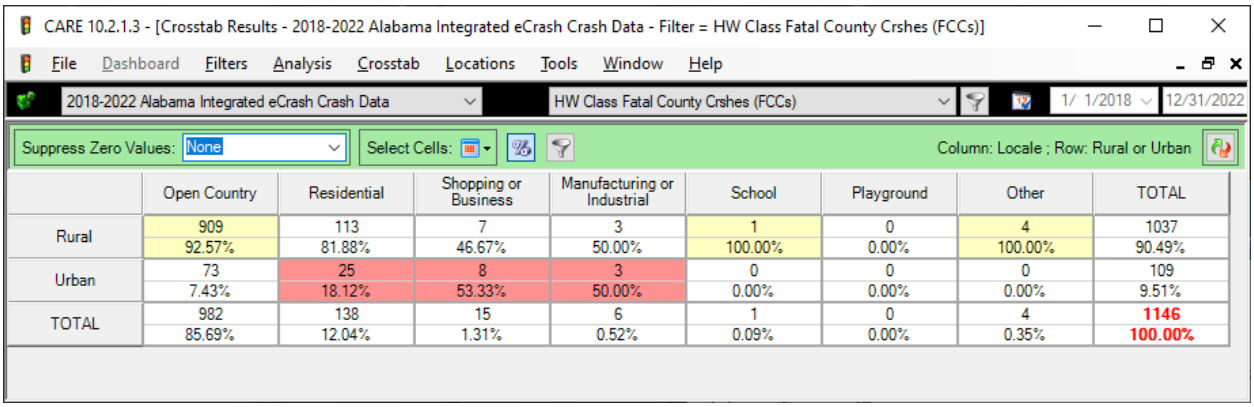
4.4 C033 Locale



Open Country and Residential Locales both showed significant differences between FCCs and FFSCs. The FCC proportion for Open Country was 85.69, and its Odds Ratio was 1.253. Residential had only 12.04 in the FCC category, but the Odds Ratio of Residential was 1.479 (both Odds Ratios were statistically significant. This demonstrates a significantly larger proportion of Open Country and Residential in the County roadway system, which may account for a proportionately larger number of fatal crashes.

4.5 C033 Locale by C010 Rural-Urban for FCCs

It is obvious in the above outputs that both FCCs and FFSCs are greatly over-represented in the rural areas. It is interesting to perform a cross-tabulation for Locale over the Rural and Urban areas to further define this relationship. The following, *which is only for FCCs*, gives one such analysis.

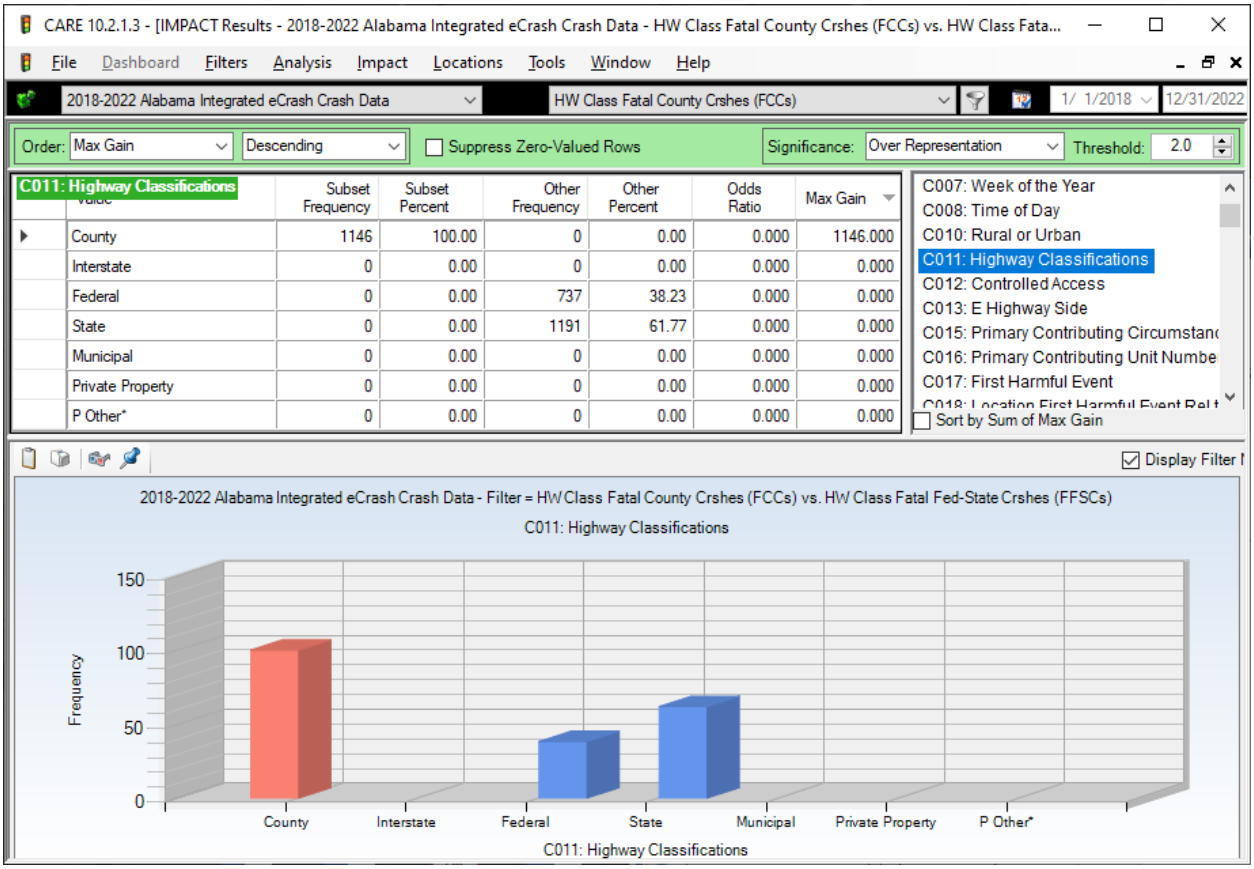


	Open Country	Residential	Shopping or Business	Manufacturing or Industrial	School	Playground	Other	TOTAL
Rural	909 92.57%	113 81.88%	7 46.67%	3 50.00%	1 100.00%	0 0.00%	4 100.00%	1037 90.49%
Urban	73 7.43%	25 18.12%	8 53.33%	3 50.00%	0 0.00%	0 0.00%	0 0.00%	109 9.51%
TOTAL	982 85.69%	138 12.04%	15 1.31%	6 0.52%	1 0.09%	0 0.00%	4 0.35%	1146 100.00%

The red-backed cells in the cross-tabulation above indicate over-representation by more than 10%. Those that are over-represented, but by less than 10% have a yellow background. If under-represented, there will be a white background. For example, while 9.51% of all FCCs were Urban, 18.12% (25) occurred in Residential Locale. Since this is greater than a 10% difference, it has a red background.

This shows that the Rural/Urban attribute may not be as definitive as Locale in classifying crash locations.

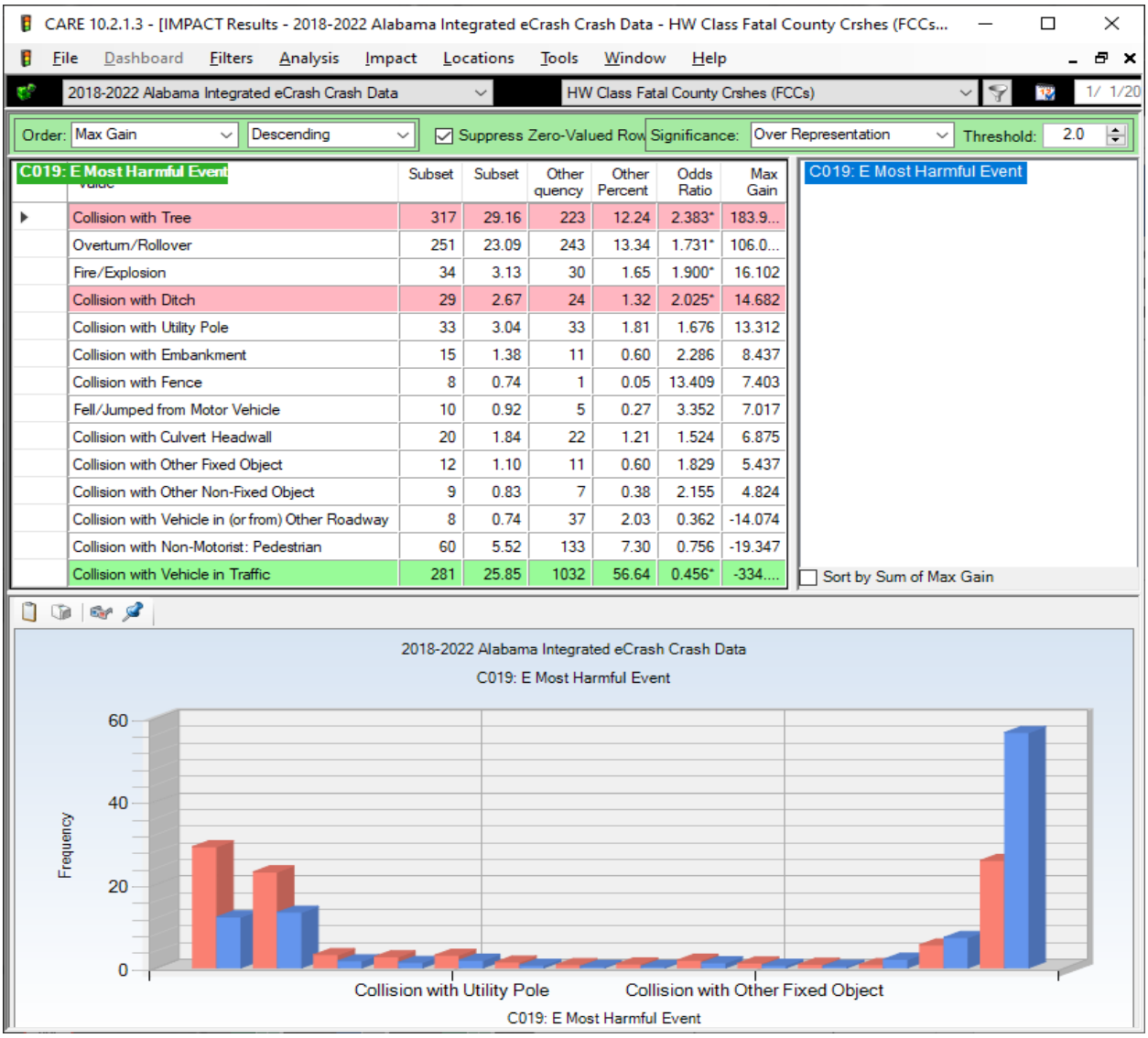
4.6 C011 Highway Classifications



Because highway classifications were used to define the filters of the two crash types being compared, this display shows that any given crash is classified as either County (FCC) or Federal and State (FFSC).

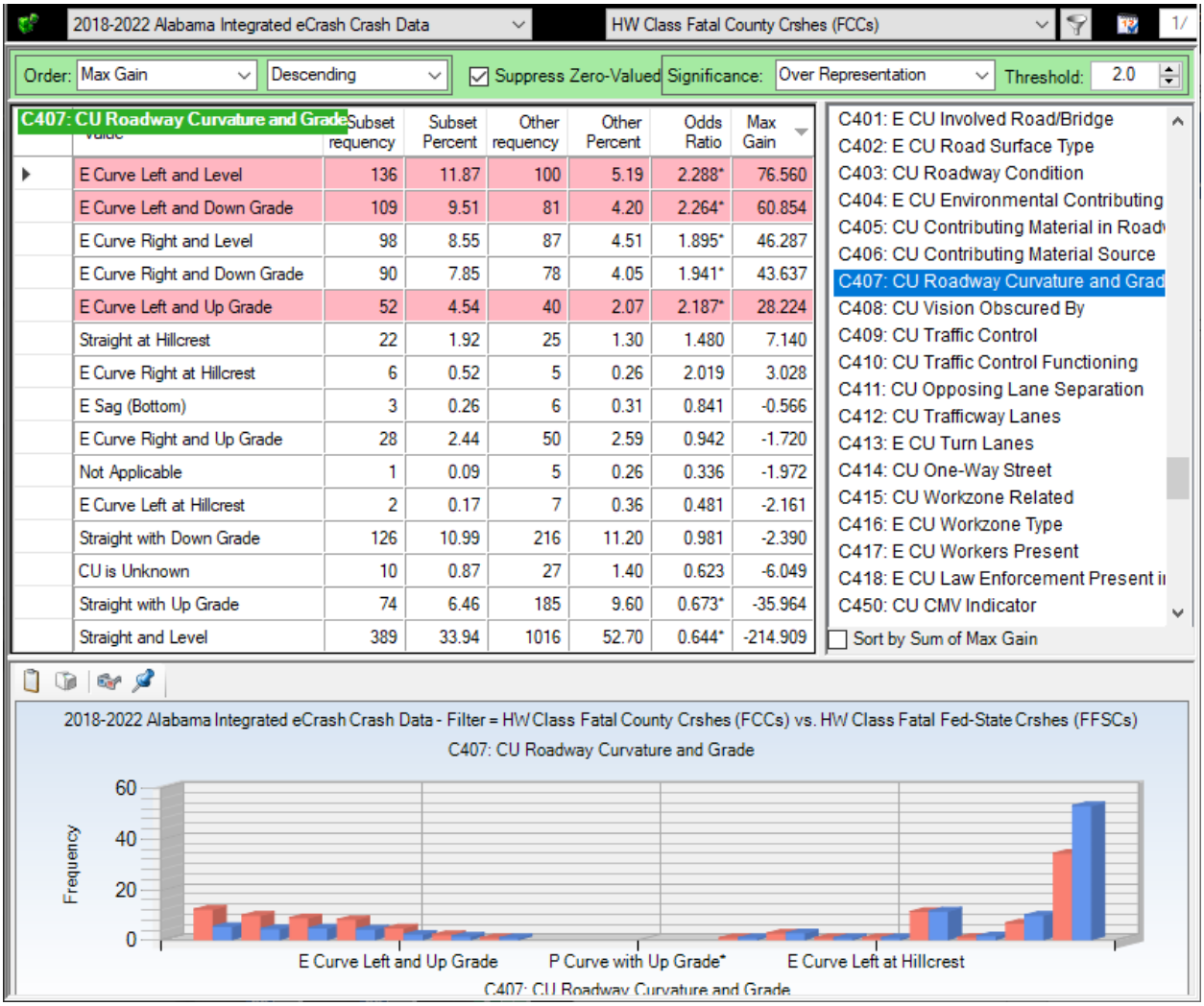
4.7 C019 Most Harmful Event (>7 in MaxGain order)

The following display is intended to show safety engineers obstacles that are being hit most often in Fatal Crashes, with a differential between Fatal County and Fatal Federal and State crashes. The most over-represented FDC is Collision with Tree (317 County as opposed to 223 Federal and State). The statistical algorithm does not consider items with frequencies less than 20, so there could be other significant differences in the list. At the bottom of the table it can be seen that for FFSCover-representations, Pedestrian collisions (60 FCCs; 133 FFSC s), and Collisions with Vehicle in Traffic (281 FCCs; 1,032 FFSCs) have the highest over-representations.



C019: E Most Harmful Event	Subset	Subset	Other quency	Other Percent	Odds Ratio	Max Gain
Collision with Tree	317	29.16	223	12.24	2.383*	183.9...
Overturn/Rollover	251	23.09	243	13.34	1.731*	106.0...
Fire/Explosion	34	3.13	30	1.65	1.900*	16.102
Collision with Ditch	29	2.67	24	1.32	2.025*	14.682
Collision with Utility Pole	33	3.04	33	1.81	1.676	13.312
Collision with Embankment	15	1.38	11	0.60	2.286	8.437
Collision with Fence	8	0.74	1	0.05	13.409	7.403
Fell/Jumped from Motor Vehicle	10	0.92	5	0.27	3.352	7.017
Collision with Culvert Headwall	20	1.84	22	1.21	1.524	6.875
Collision with Other Fixed Object	12	1.10	11	0.60	1.829	5.437
Collision with Other Non-Fixed Object	9	0.83	7	0.38	2.155	4.824
Collision with Vehicle in (or from) Other Roadway	8	0.74	37	2.03	0.362	-14.074
Collision with Non-Motorist: Pedestrian	60	5.52	133	7.30	0.756	-19.347
Collision with Vehicle in Traffic	281	25.85	1032	56.64	0.456*	-334....

4.8 C407 CU Roadway Curvature and Grade



FCCs are over-represented about half of the curve types. Their difference from FFSCs were seen to be significant higher (see the top five in the table).

OVER-REPRESENTED FCCs: Curve Left and Level 136, Curve Left and Down Grade 109, Curve Right and Level 98. Curve Right and Down Grade 90, and Curve Left and Up Grade 52.

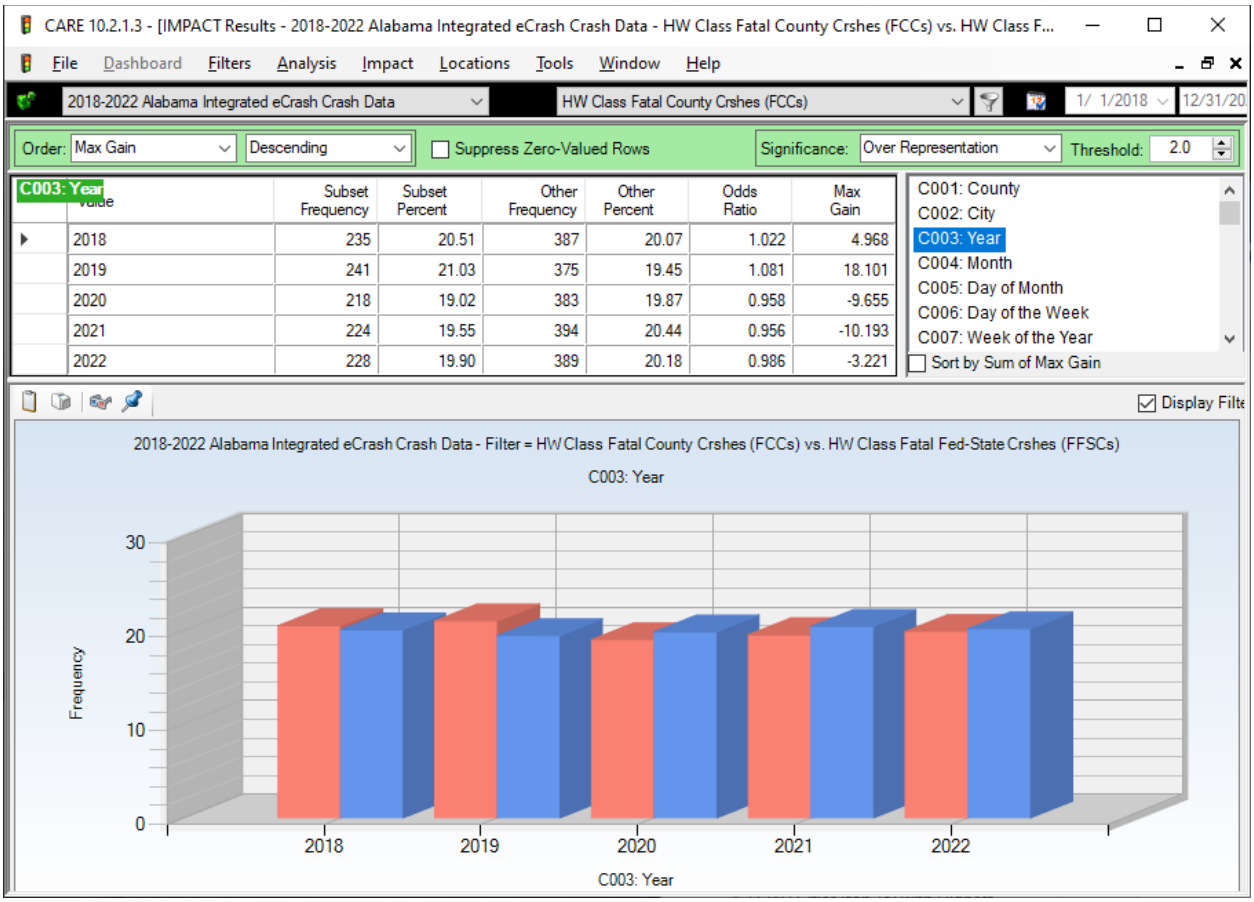
OVER-REPRESENTED FFSCs:, Straight and Level 1,016, Straight with Up Grade 185, and Straight with Down Grade 216.

Curves, especially left curves seem t be a much larger problem on County Roads then on Federal and State Roads.

5.0 Time Factors

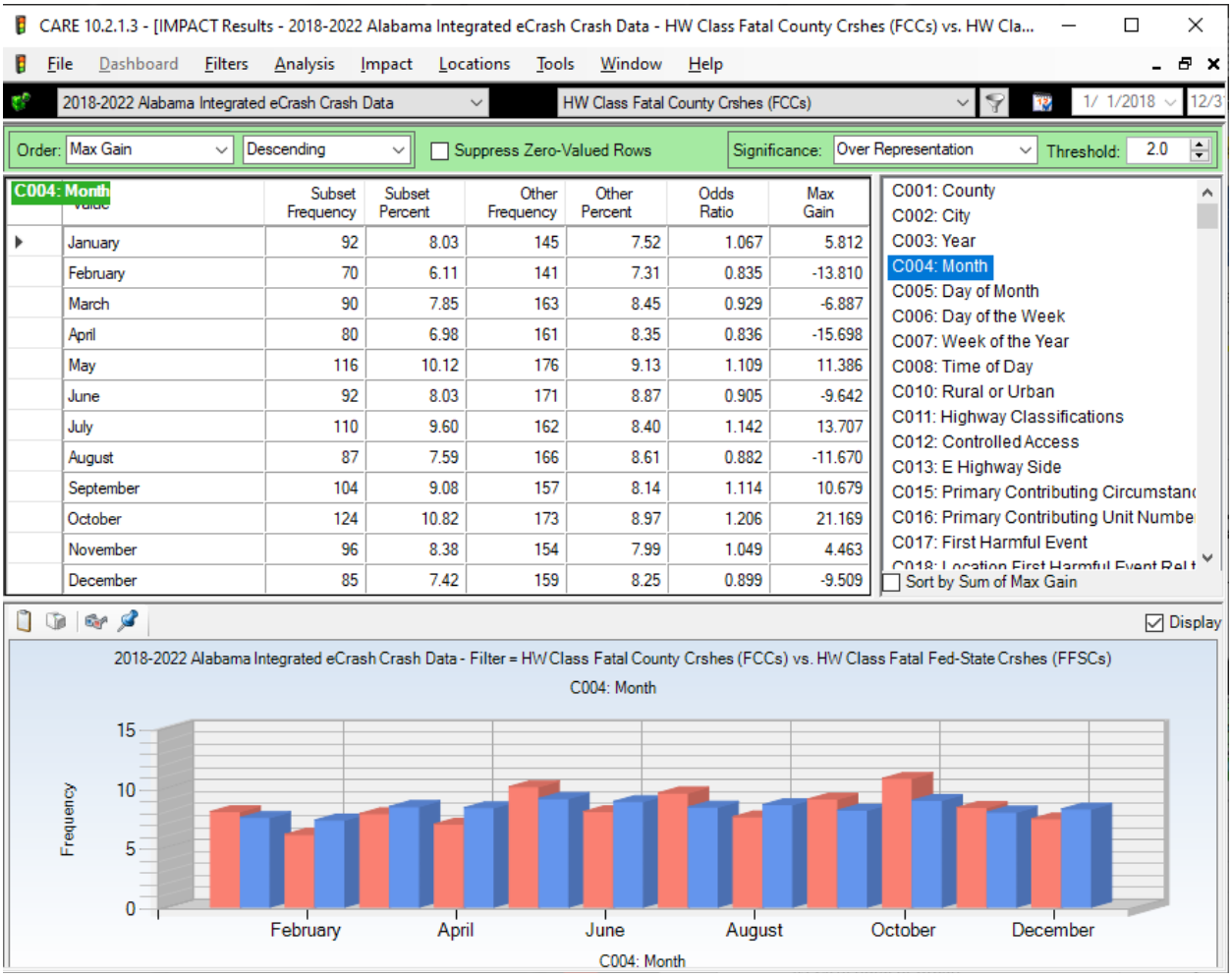
5.1 C003 Year – copied from Section 3.0 for ease of reference

Fatal County Crashes (FCCs) vs Fatal Federal or State Crashes (FFSCs) by Year



Variations from year to year were not determined to be significant. With the possible exception of 2019, the yearly variation of the FCCs are quite comparable to those of the FFSCs. No year was determined to have a statistically significant difference between the FCCs and FFSCs.

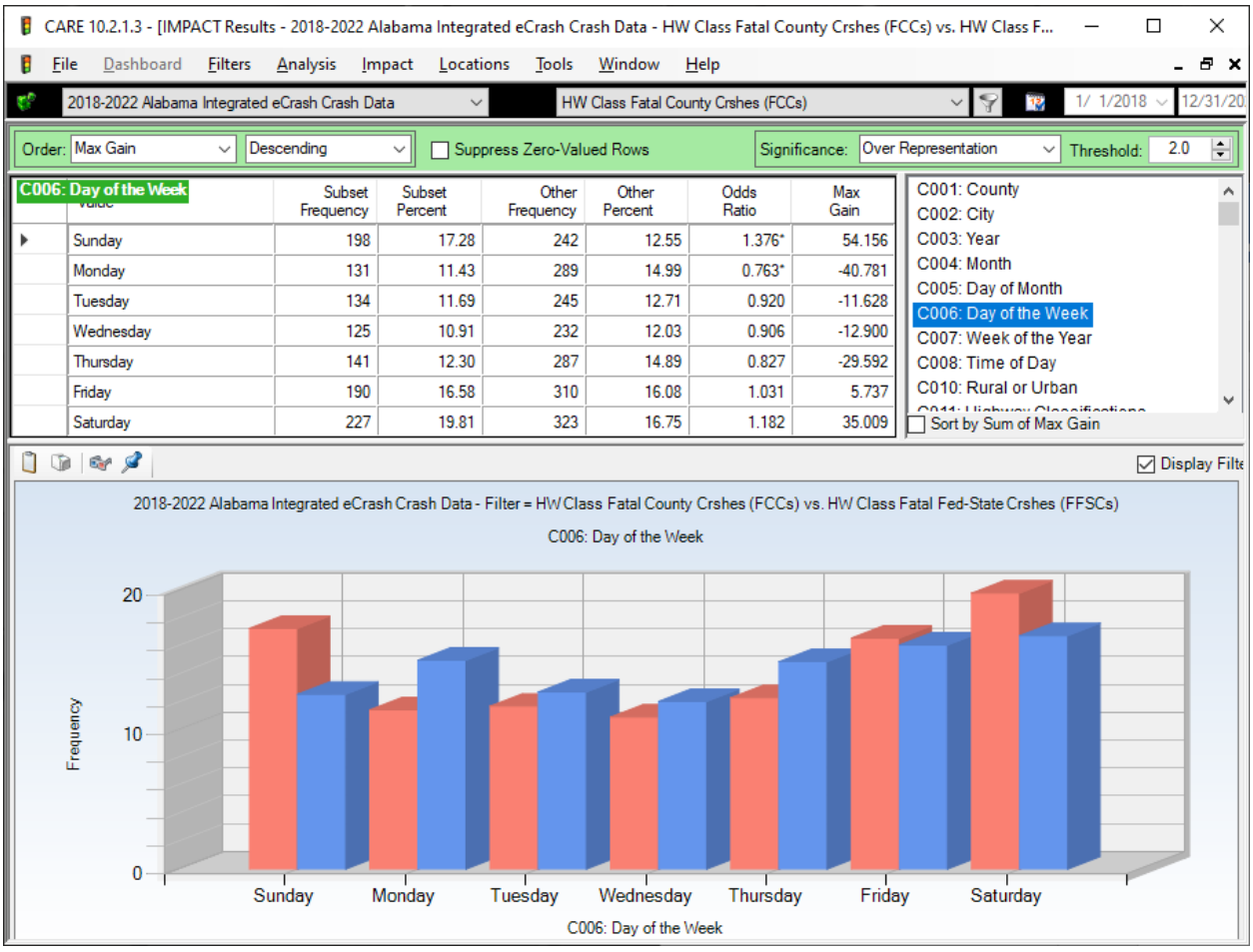
5.2 C004 Month



The ordering of the displays above is according to the natural ordering of months. No months had any statistically significant over-representations. FCC months generally fell in line with their FFSC counterparts. The following presents the Odds Ratios for all months with more than 10% over-representations.

Over-represented County		Over-represented Federal and State	
May	1.109	February	0.835
July	1.142	April	0.836
September	1.114	August	0.882
October	1.206	December	0.899

5.3 C006 Day of the Week Comparison FCCs and FFSCs (same as Section 2.3)



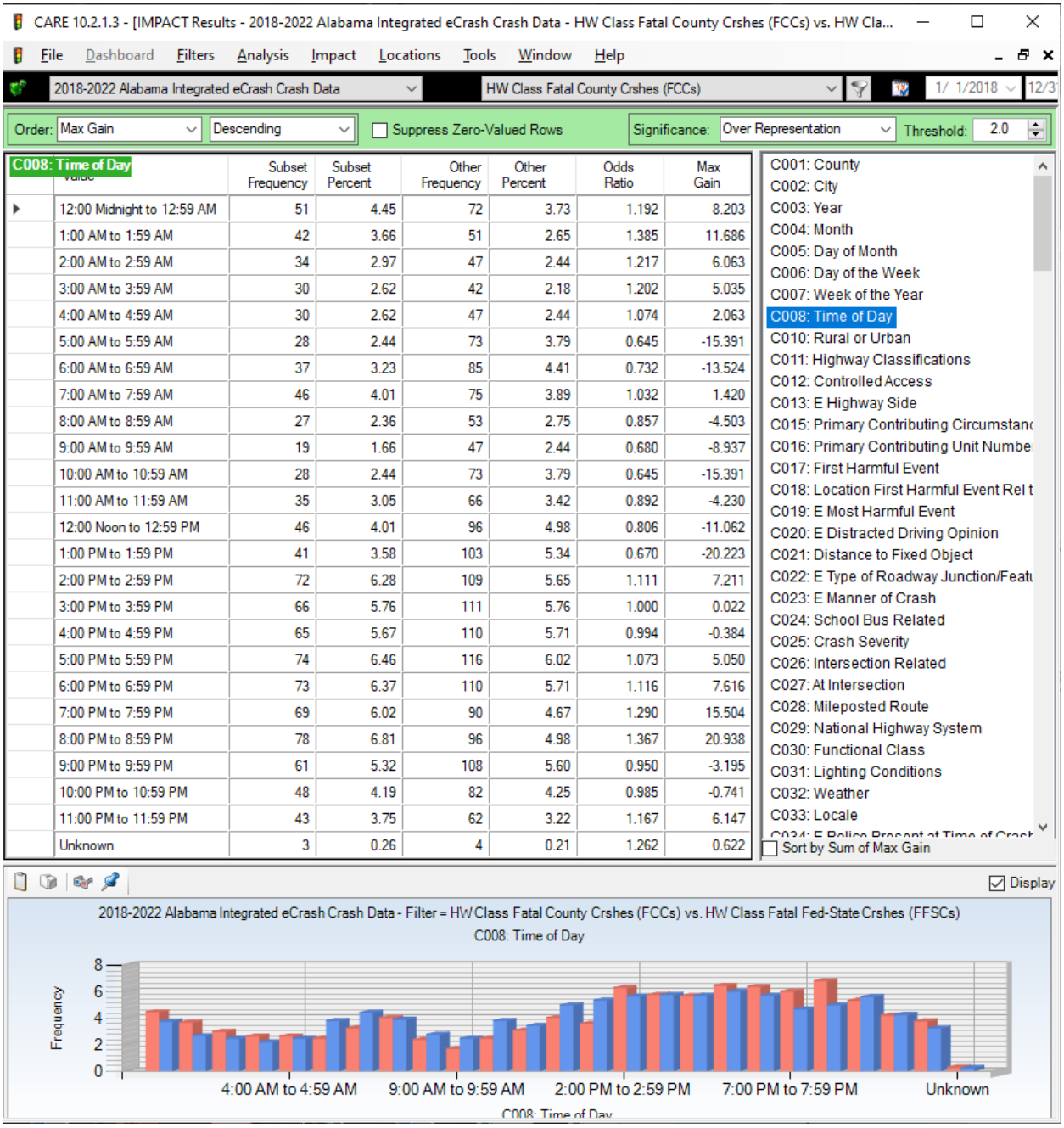
The following presents Days of the Week with over-representations displayed.

Over-represented County	Over-represented Federal and State
Sunday 1.376*	Monday 0.763*
Friday 1.031	Tuesday 0.920
Saturday 1.182	Wednesday 0.906
	Thursday 0.827
*Statistically Significant	

5.4 Day of the Week Discussion [Omitted to Maintain IMPACT Ordering]

Also, all relevant Day of the Week information is given above.

5.5 C008 Time of Day



The relatively low sample sizes for this attribute has kept any of the hours from being statistically significant (technically). There is a high correlation in the times of the FCCs and the FFSCs. See the next section for more information on Time of Day and Day of the Week.

5.6 C008 Discussion on Time of Day

Refer to the Day of the Week by Time of Day cross-tabulation *for all fatal crashes* given immediately below in Section 5.7.

It is no surprise to find Fatal Crashes over-represented during the late night/early morning hours, since their other correlations with aspects of Impaired Driving (ID) are clear. The following narrative was developed with regard to a special study that was done for ID. We include it here because of its relevance to the comparison of FCCs to FFSCs.

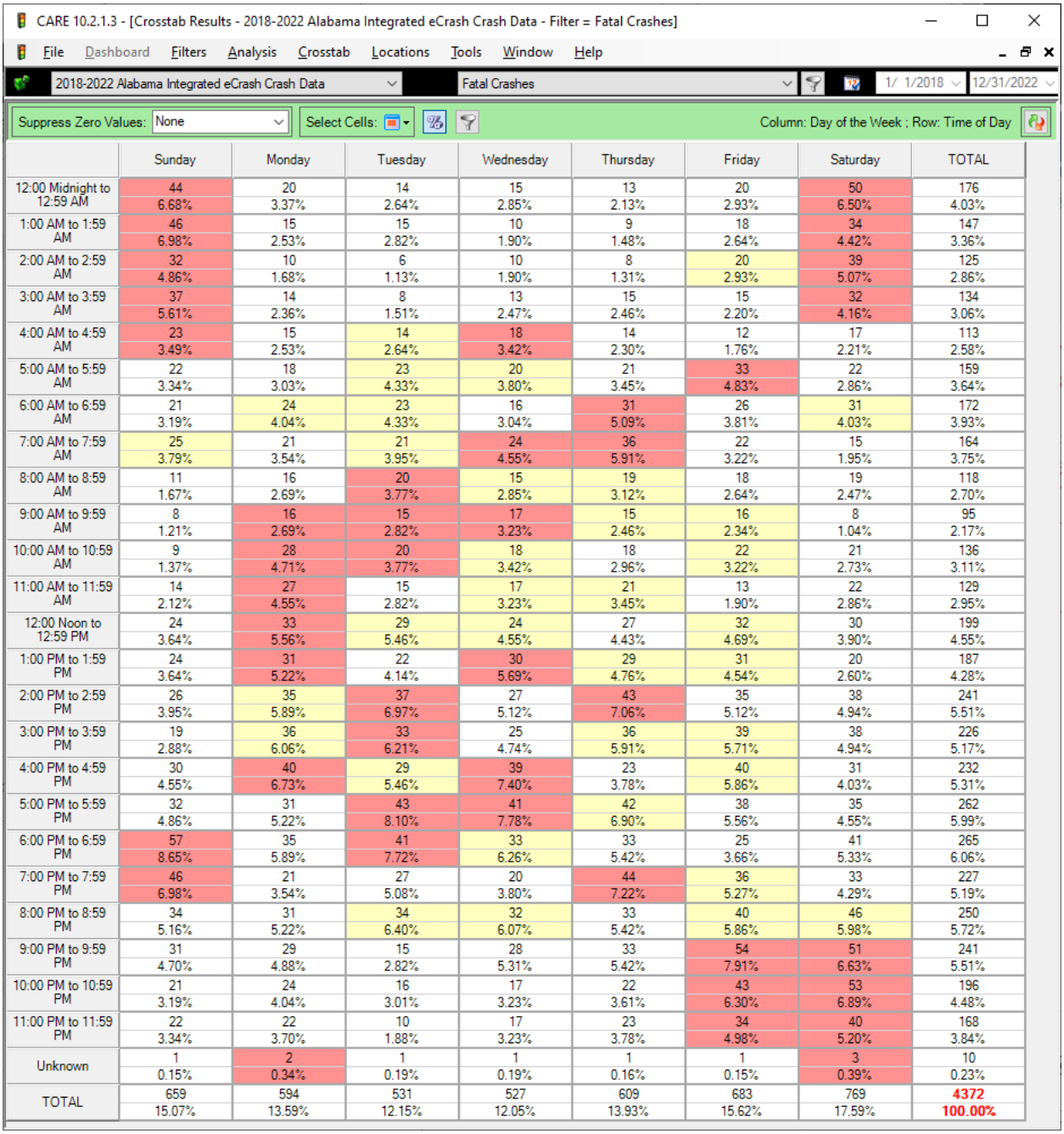
Typical traffic patterns of high traffic results on more crashes in the morning and afternoon rush hours. However, IDs, and especially the IDs that occur at night, are just getting started in the afternoon rush hours, and they continue to grow through midnight and the early morning hours, often not tapering off until about 7:00 AM the next day. It is clear that if selective enforcement is going to have an effect on Fatal Crashes, it would have to be conducted at the times when these crashes are most occurring. Optimal times that start with Friday enforcement would continue immediately following any rush hour details, and would continue through at least 8:00 AM the following Saturday or Sunday.

The *Time of Day by Day of the Week* cross-tabulation (given in the next section *for all fatal crashes* (not subdivided by FCCs and FFSCs) shows the optimal times for selective enforcement on all roadways. Generally, the highest proportion of times in any day are given in red for that day. Notice that this works well for Friday Nights, Saturday mornings, Saturday nights, and Sunday mornings.

The expected proportion for all cells in a given row is given at the extreme right in the total row percentage column for each row. If there were absolutely no over-representations across the columns (days), then all of the proportions for those cells would be identical to the one for the total. Notice for example, the 2 AM to 2:59 AM row has a total percentage value of 2.86% for these fatal crashes. The red cells to the left have percentages of 4.86% and 5.07%. The one yellow cell has a percentage of 2.93%, only slightly higher than the average. All the rest of the cells have white background indicating that their percentages are less than 2.86%.

Cells that are lower than the average value (given in the TOTAL column) have a neutral (white) background. Those that are higher, but not more than 10% of the proportion are yellow; and those above 10% more than that expected from the TOTAL (right column) are red.

5.7 C008 Time of Day x C005 Day of the Week (all fatal crashes)



CARE 10.2.1.3 - [Crosstab Results - 2018-2022 Alabama Integrated eCrash Crash Data - Filter = Fatal Crashes]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

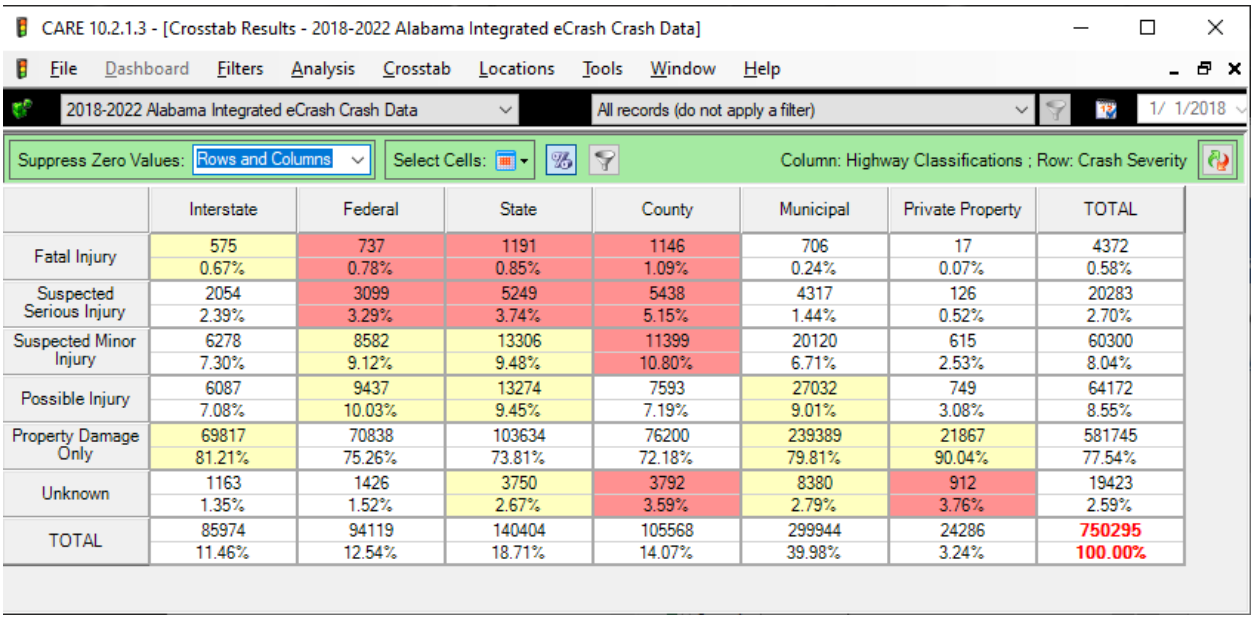
2018-2022 Alabama Integrated eCrash Crash Data | Fatal Crashes | 1/ 1/2018 | 12/31/2022

Suppress Zero Values: None | Select Cells: | Column: Day of the Week ; Row: Time of Day

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	TOTAL
12:00 Midnight to 12:59 AM	44 6.68%	20 3.37%	14 2.64%	15 2.85%	13 2.13%	20 2.93%	50 6.50%	176 4.03%
1:00 AM to 1:59 AM	46 6.98%	15 2.53%	15 2.82%	10 1.90%	9 1.48%	18 2.64%	34 4.42%	147 3.36%
2:00 AM to 2:59 AM	32 4.86%	10 1.68%	6 1.13%	10 1.90%	8 1.31%	20 2.93%	39 5.07%	125 2.86%
3:00 AM to 3:59 AM	37 5.61%	14 2.36%	8 1.51%	13 2.47%	15 2.46%	15 2.20%	32 4.16%	134 3.06%
4:00 AM to 4:59 AM	23 3.49%	15 2.53%	14 2.64%	18 3.42%	14 2.30%	12 1.76%	17 2.21%	113 2.58%
5:00 AM to 5:59 AM	22 3.34%	18 3.03%	23 4.33%	20 3.80%	21 3.45%	33 4.83%	22 2.86%	159 3.64%
6:00 AM to 6:59 AM	21 3.19%	24 4.04%	23 4.33%	16 3.04%	31 5.09%	26 3.81%	31 4.03%	172 3.93%
7:00 AM to 7:59 AM	25 3.79%	21 3.54%	21 3.95%	24 4.55%	36 5.91%	22 3.22%	15 1.95%	164 3.75%
8:00 AM to 8:59 AM	11 1.67%	16 2.69%	20 3.77%	15 2.85%	19 3.12%	18 2.64%	19 2.47%	118 2.70%
9:00 AM to 9:59 AM	8 1.21%	16 2.69%	15 2.82%	17 3.23%	15 2.46%	16 2.34%	8 1.04%	95 2.17%
10:00 AM to 10:59 AM	9 1.37%	28 4.71%	20 3.77%	18 3.42%	18 2.96%	22 3.22%	21 2.73%	136 3.11%
11:00 AM to 11:59 AM	14 2.12%	27 4.55%	15 2.82%	17 3.23%	21 3.45%	13 1.90%	22 2.86%	129 2.95%
12:00 Noon to 12:59 PM	24 3.64%	33 5.56%	29 5.46%	24 4.55%	27 4.43%	32 4.69%	30 3.90%	199 4.55%
1:00 PM to 1:59 PM	24 3.64%	31 5.22%	22 4.14%	30 5.69%	29 4.76%	31 4.54%	20 2.60%	187 4.28%
2:00 PM to 2:59 PM	26 3.95%	35 5.89%	37 6.97%	27 5.12%	43 7.06%	35 5.12%	38 4.94%	241 5.51%
3:00 PM to 3:59 PM	19 2.88%	36 6.06%	33 6.21%	25 4.74%	36 5.91%	39 5.71%	38 4.94%	226 5.17%
4:00 PM to 4:59 PM	30 4.55%	40 6.73%	29 5.46%	39 7.40%	23 3.78%	40 5.86%	31 4.03%	232 5.31%
5:00 PM to 5:59 PM	32 4.86%	31 5.22%	43 8.10%	41 7.78%	42 6.90%	38 5.56%	35 4.55%	262 5.99%
6:00 PM to 6:59 PM	57 8.65%	35 5.89%	41 7.72%	33 6.26%	33 5.42%	25 3.66%	41 5.33%	265 6.06%
7:00 PM to 7:59 PM	46 6.98%	21 3.54%	27 5.08%	20 3.80%	44 7.22%	36 5.27%	33 4.29%	227 5.19%
8:00 PM to 8:59 PM	34 5.16%	31 5.22%	34 6.40%	32 6.07%	33 5.42%	40 5.86%	46 5.98%	250 5.72%
9:00 PM to 9:59 PM	31 4.70%	29 4.88%	15 2.82%	28 5.31%	33 5.42%	54 7.91%	51 6.63%	241 5.51%
10:00 PM to 10:59 PM	21 3.19%	24 4.04%	16 3.01%	17 3.23%	22 3.61%	43 6.30%	53 6.89%	196 4.48%
11:00 PM to 11:59 PM	22 3.34%	22 3.70%	10 1.88%	17 3.23%	23 3.78%	34 4.98%	40 5.20%	168 3.84%
Unknown	1 0.15%	2 0.34%	1 0.19%	1 0.19%	1 0.16%	1 0.15%	3 0.39%	10 0.23%
TOTAL	659 15.07%	594 13.59%	531 12.15%	527 12.05%	609 13.93%	683 15.62%	769 17.59%	4372 100.00%

6.0 Factors Affecting Severity

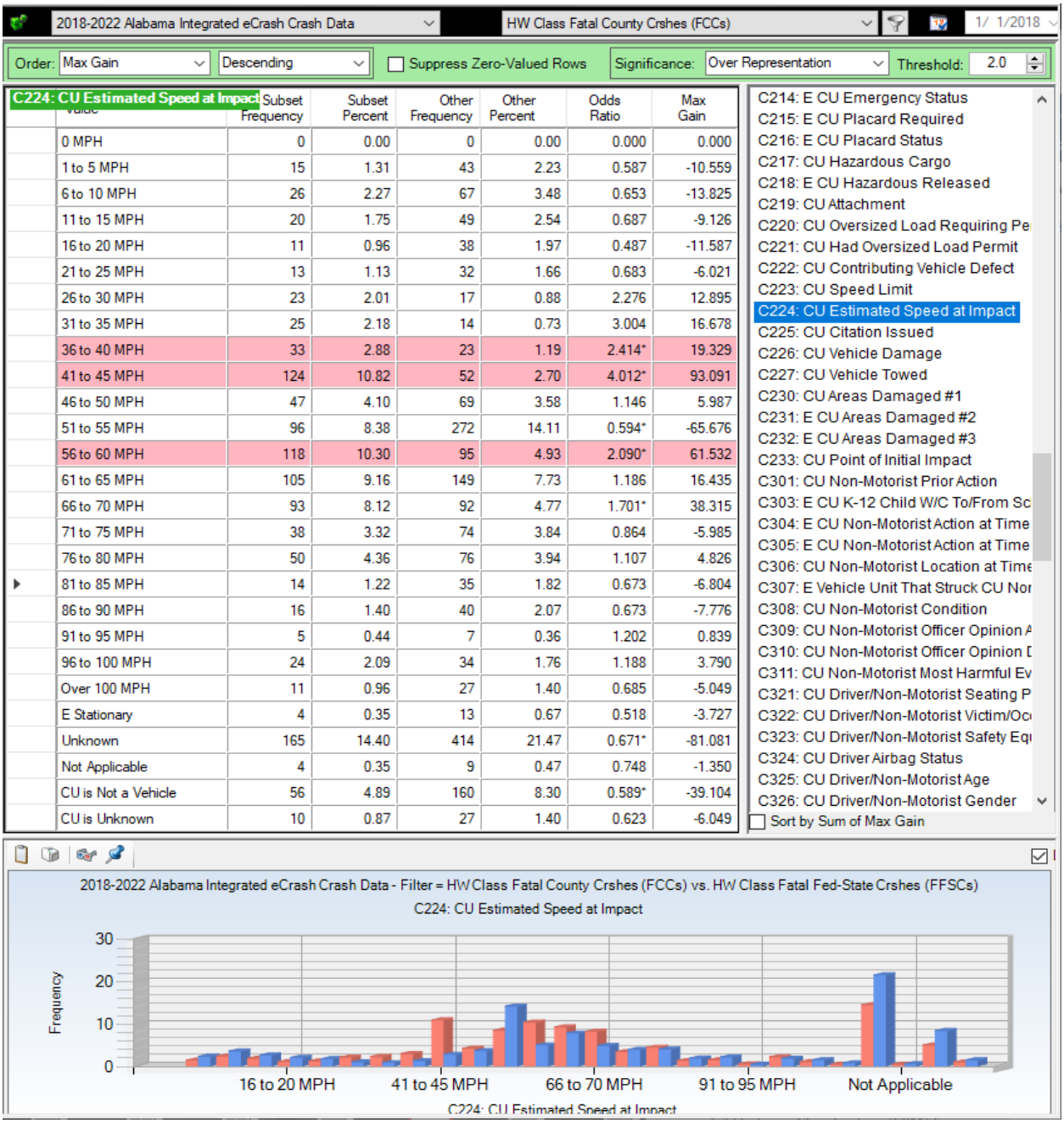
6.1 Severity for County, Federal, and State Routes (all crashes)



	Interstate	Federal	State	County	Municipal	Private Property	TOTAL
Fatal Injury	575 0.67%	737 0.78%	1191 0.85%	1146 1.09%	706 0.24%	17 0.07%	4372 0.58%
Suspected Serious Injury	2054 2.39%	3099 3.29%	5249 3.74%	5438 5.15%	4317 1.44%	126 0.52%	20283 2.70%
Suspected Minor Injury	6278 7.30%	8582 9.12%	13306 9.48%	11399 10.80%	20120 6.71%	615 2.53%	60300 8.04%
Possible Injury	6087 7.08%	9437 10.03%	13274 9.45%	7593 7.19%	27032 9.01%	749 3.08%	64172 8.55%
Property Damage Only	69817 81.21%	70838 75.26%	103634 73.81%	76200 72.18%	239389 79.81%	21867 90.04%	581745 77.54%
Unknown	1163 1.35%	1426 1.52%	3750 2.67%	3792 3.59%	8380 2.79%	912 3.76%	19423 2.59%
TOTAL	85974 11.46%	94119 12.54%	140404 18.71%	105568 14.07%	299944 39.98%	24286 3.24%	750295 100.00%

This cross-tabulation was introduced in Section 2.2 to illustrate the reason for selecting the comparison of County fatal crashes with those that occur on Federal and State routes. It is repeated here to assist in understanding the subsections remaining in this section. Notice that the basis for this cross-tabulation is all crashes and not just fatal crashes.

6.2 IMPACT: FCCs vs FFSCs for C224 Speed at Impact (fatal crashes only)



Generally, the County road speeds of 26-70 MPH are significantly over-represented. The FFSCs are over-represented at speeds of 71-75, 81-90 and over 100 MPH. The speed limit on County roads is generally 45 MPH, so slower speeds should be expected to accommodate the adverse safety conditions.

6.3 Highway Classification (C011) by Speed at Impact (C224) All Fatal Crashes

2018-2022 Alabama Integrated eCrash Crash Data | Fatal Crashes | 1/ 1/2018 | 12/31/2022

Suppress Zero Values: Rows and Columns | Select Cells: | Column: Highway Classifications ; Row: CU Estimated Speed at Impact

	Interstate	Federal	State	County	Municipal	Private Property	TOTAL
1 to 5 MPH	3 0.52%	16 2.17%	27 2.27%	15 1.31%	3 0.42%	1 5.88%	65 1.49%
6 to 10 MPH	1 0.17%	28 3.80%	39 3.27%	26 2.27%	7 0.99%	1 5.88%	102 2.33%
11 to 15 MPH	2 0.35%	22 2.99%	27 2.27%	20 1.75%	5 0.71%	0 0.00%	76 1.74%
16 to 20 MPH	1 0.17%	17 2.31%	21 1.76%	11 0.96%	3 0.42%	0 0.00%	53 1.21%
21 to 25 MPH	0 0.00%	10 1.36%	22 1.85%	13 1.13%	5 0.71%	0 0.00%	50 1.14%
26 to 30 MPH	1 0.17%	5 0.68%	12 1.01%	23 2.01%	8 1.13%	0 0.00%	49 1.12%
31 to 35 MPH	1 0.17%	5 0.68%	9 0.76%	25 2.18%	8 1.13%	0 0.00%	48 1.10%
36 to 40 MPH	1 0.17%	10 1.36%	13 1.09%	33 2.88%	8 1.13%	1 5.88%	66 1.51%
41 to 45 MPH	2 0.35%	14 1.90%	38 3.19%	124 10.82%	11 1.56%	0 0.00%	189 4.32%
46 to 50 MPH	5 0.87%	23 3.12%	46 3.86%	47 4.10%	14 1.98%	0 0.00%	135 3.09%
51 to 55 MPH	4 0.70%	86 11.67%	186 15.62%	96 8.38%	7 0.99%	0 0.00%	379 8.67%
56 to 60 MPH	16 2.78%	34 4.61%	61 5.12%	118 10.30%	11 1.56%	0 0.00%	240 5.49%
61 to 65 MPH	33 5.74%	66 8.96%	83 6.97%	105 9.16%	4 0.57%	0 0.00%	291 6.66%
66 to 70 MPH	114 19.83%	29 3.93%	63 5.29%	93 8.12%	13 1.84%	0 0.00%	312 7.14%
71 to 75 MPH	20 3.48%	30 4.07%	44 3.69%	38 3.32%	10 1.42%	0 0.00%	142 3.25%
76 to 80 MPH	44 7.65%	23 3.12%	53 4.45%	50 4.36%	5 0.71%	0 0.00%	175 4.00%
81 to 85 MPH	18 3.13%	13 1.76%	22 1.85%	14 1.22%	4 0.57%	0 0.00%	71 1.62%
86 to 90 MPH	21 3.65%	11 1.49%	29 2.43%	16 1.40%	3 0.42%	0 0.00%	80 1.83%
91 to 95 MPH	14 2.43%	6 0.81%	1 0.08%	5 0.44%	3 0.42%	0 0.00%	29 0.66%
96 to 100 MPH	15 2.61%	13 1.76%	21 1.76%	24 2.09%	4 0.57%	0 0.00%	77 1.76%
Over 100 MPH	12 2.09%	11 1.49%	16 1.34%	11 0.96%	5 0.71%	0 0.00%	55 1.26%
E Stationary	26 4.52%	8 1.09%	5 0.42%	4 0.35%	5 0.71%	1 5.88%	49 1.12%
Unknown	136 23.65%	157 21.30%	257 21.58%	165 14.40%	389 55.10%	10 58.82%	1114 25.48%
Not Applicable	3 0.52%	4 0.54%	5 0.42%	4 0.35%	30 4.25%	1 5.88%	47 1.08%
CU is Not a Vehicle	60 10.43%	83 11.26%	77 6.47%	56 4.89%	86 12.18%	0 0.00%	362 8.28%
CU is Unknown	22 3.83%	13 1.76%	14 1.18%	10 0.87%	55 7.79%	2 11.76%	116 2.65%
TOTAL	575 13.15%	737 16.86%	1191 27.24%	1146 26.21%	706 16.15%	17 0.39%	4372 100.00%

All Fatal Crashes. This shows how fatal crashes are caused by combinations of higher speeds, Impaired Driving (ID), and causal vehicles pulling out on the roadway at slow speeds.

6.4a Cross-tabulation: C025 Severity by C224 Speed at Impact (all crashes)

2018-2022 Alabama Integrated eCrash Crash Data | All records (do not apply a filter) | 1/ 1/2018

Suppress Zero Values: | Select Cells: | Column: Crash Severity ; Row: CU Estimated Speed at Impact

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
1 to 5 MPH	65 1.49%	524 2.58%	2241 3.72%	3645 5.68%	49446 8.50%	836 4.30%	56757 7.56%
6 to 10 MPH	102 2.33%	729 3.59%	2943 4.88%	3498 5.45%	33991 5.84%	518 2.67%	41781 5.57%
11 to 15 MPH	76 1.74%	636 3.14%	2294 3.80%	2651 4.13%	22655 3.89%	351 1.81%	28663 3.82%
16 to 20 MPH	53 1.21%	398 1.96%	1581 2.62%	1839 2.87%	16005 2.75%	263 1.35%	20139 2.68%
21 to 25 MPH	50 1.14%	371 1.83%	1422 2.36%	1667 2.60%	13901 2.39%	296 1.52%	17707 2.36%
26 to 30 MPH	49 1.12%	340 1.68%	1577 2.62%	1825 2.84%	14131 2.43%	252 1.30%	18174 2.42%
31 to 35 MPH	48 1.10%	564 2.78%	2151 3.57%	2172 3.38%	16511 2.84%	378 1.95%	21824 2.91%
36 to 40 MPH	66 1.51%	660 3.25%	2284 3.79%	2161 3.37%	15169 2.61%	307 1.58%	20647 2.75%
41 to 45 MPH	189 4.32%	1710 8.43%	4547 7.54%	3181 4.96%	24518 4.21%	459 2.36%	34604 4.61%
46 to 50 MPH	135 3.09%	934 4.60%	2350 3.90%	1639 2.55%	11883 2.04%	220 1.13%	17161 2.29%
51 to 55 MPH	379 8.67%	2111 10.41%	4061 6.73%	2333 3.64%	18413 3.17%	291 1.50%	27588 3.68%
56 to 60 MPH	240 5.49%	1168 5.76%	1994 3.31%	1127 1.76%	8707 1.50%	173 0.89%	13409 1.79%
61 to 65 MPH	291 6.66%	1259 6.21%	2069 3.43%	1123 1.75%	10958 1.88%	154 0.79%	15854 2.11%
66 to 70 MPH	312 7.14%	1208 5.96%	1968 3.26%	1217 1.90%	13973 2.40%	108 0.56%	18786 2.50%
71 to 75 MPH	142 3.25%	375 1.85%	563 0.93%	304 0.47%	3147 0.54%	31 0.16%	4562 0.61%
76 to 80 MPH	175 4.00%	343 1.69%	426 0.71%	231 0.36%	1645 0.28%	31 0.16%	2851 0.38%
81 to 85 MPH	71 1.62%	138 0.68%	151 0.25%	86 0.13%	455 0.08%	3 0.02%	904 0.12%
86 to 90 MPH	80 1.83%	148 0.73%	118 0.20%	58 0.09%	289 0.05%	7 0.04%	700 0.09%
91 to 95 MPH	29 0.66%	38 0.19%	22 0.04%	10 0.02%	51 0.01%	4 0.02%	154 0.02%
96 to 100 MPH	77 1.76%	93 0.46%	58 0.10%	30 0.05%	148 0.03%	12 0.06%	418 0.06%
Over 100 MPH	55 1.26%	45 0.22%	35 0.06%	24 0.04%	83 0.01%	4 0.02%	246 0.03%
E Stationary	49 1.12%	146 0.72%	425 0.70%	392 0.61%	4533 0.78%	157 0.81%	5702 0.76%
Unknown	1114 25.48%	5095 25.12%	21062 34.93%	28798 44.88%	257736 44.30%	11824 60.88%	325629 43.40%
Not Applicable	47 1.08%	273 1.35%	1340 2.22%	1302 2.03%	19553 3.36%	1486 7.65%	24001 3.20%
CU is Not a Vehicle	362 8.28%	540 2.66%	670 1.11%	305 0.48%	175 0.03%	60 0.31%	2112 0.28%
CU is Unknown	116 2.65%	437 2.15%	1948 3.23%	2554 3.98%	23669 4.07%	1198 6.17%	29922 3.99%
TOTAL	4372 0.58%	20283 2.70%	60300 8.04%	64172 8.55%	581745 77.54%	19423 2.59%	750295 100.00%

6.4b Dicussion: C025 Probability of being killed x C224 Speed at Impact

The display above presents information on the effect of increased impact speed on the severity of all crashes. Notice the red in the Fatality and Serious Injury cells as speeds increase. What is more interesting is the probability that an injury crash results in a fatality as a function of impact speed. This is given in the following table using 31-35 MPH as the base speed for the third column, which is the fatality probability multiplier from this base as the speeds increase.

Speed at Impact	Fatality Odds (1 in …)	Increase Probability above 31-35
31 to 35 MPH	102.8	1
36 to 40 MPH	78.3	1.3
41 to 45 MPH	50.9	2.0
46 to 50 MPH	37.5	2.7
51 to 55 MPH	23.4	4.4
56 to 60 MPH	18.9	5.4
61 to 65 MPH	16.3	6.3
66 to 70 MPH	15.1	6.8
71 to 75 MPH	9.7	10.5
76 to 80 MPH	6.7	15.3
81 to 85 MPH	6.3	16.4
86 to 90 MPH	5.1	20.4
91 to 95 MPH	3.4	30.1
96 to 100 MPH	3.4	30.7
Over 100 MPH	2.9	35.6

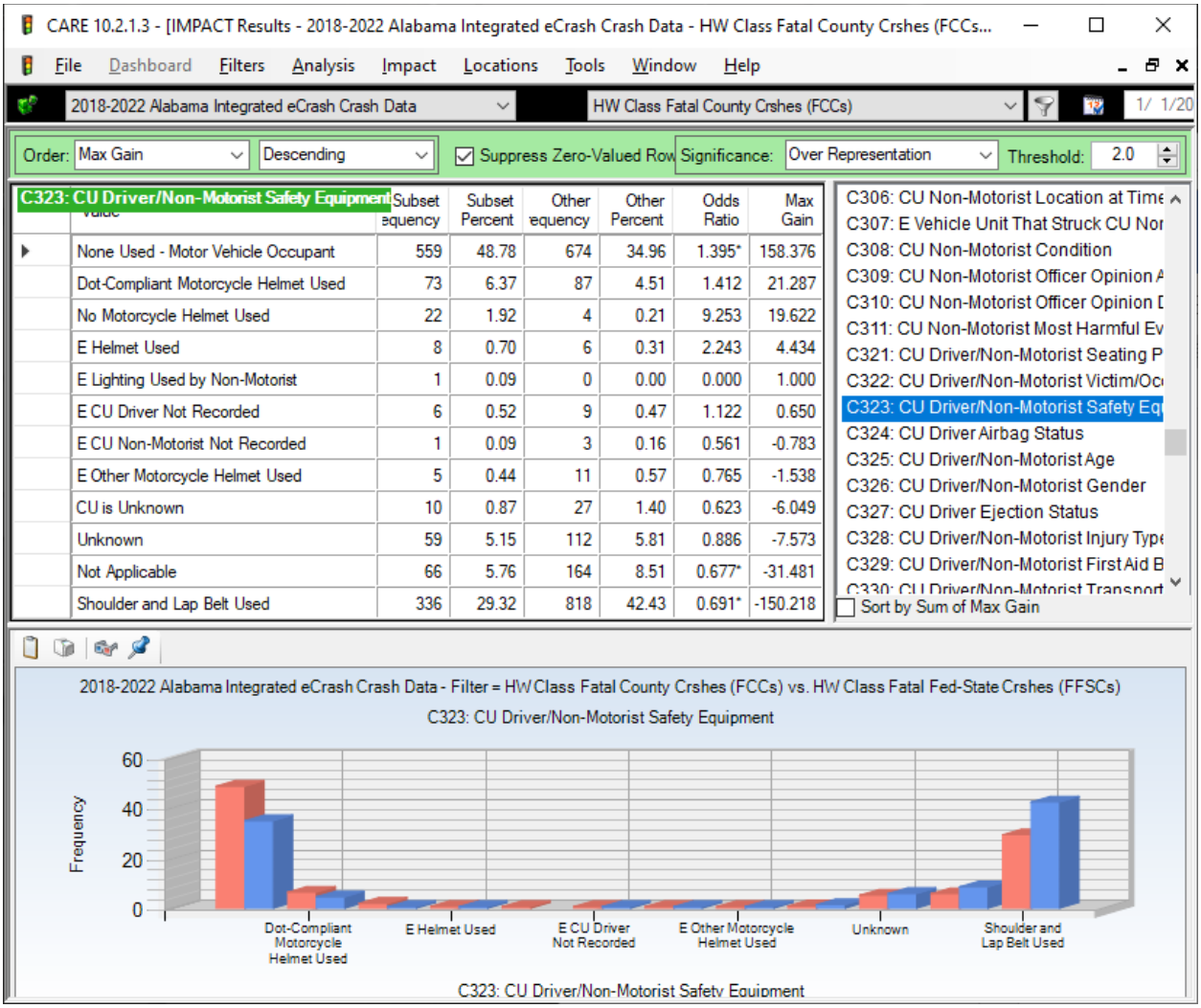
The last column of the above table gives the fatality probability multiplier based on the lowest probability (31-35 MPH), to which was assigned a relative value of 1.0 (not a probability). The probabilities in the form of "**1 in X"** are given in the middle column. For example, the probability of a crash at 46-55 MPH being fatal is one in 37.5. This is 2.7 times that probability if the impact speed were in the 31 to 35 range.

Obviously, speed kills, and a reduction in speed at impact by as little as 5 MPH can have a major effect on whether or not that crash is fatal. On average, the reduction in impact speeds by 10 MPH cut the number of fatal crashes in half. This is one reason that selective enforcement is effective – even officer presence generally causes some speed reduction.

However, there is another major factor in effect here as well – the failure of FDC and FNC drivers to be properly restrained, which will be covered in the next separate attribute below (6.5; Restraint Use by Causal Drivers in Fatal Collisions). This is also correlated with Impaired Driving because Impaired Drivers have been found to have a much lower restraint use than those not impaired.

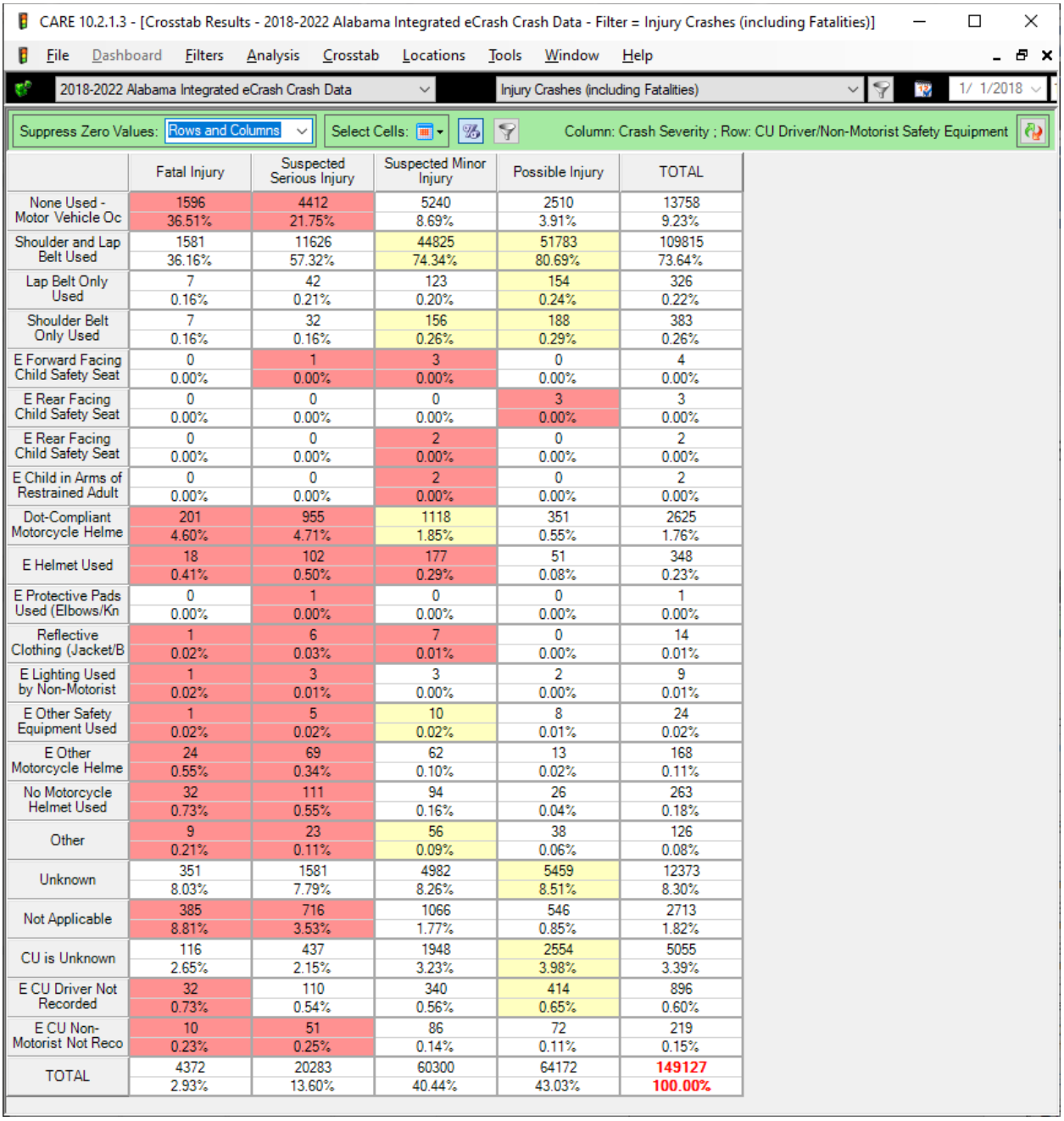
6.5 C323 Restraint Use by Drivers in Fatal Collisions (FCCs vs FFSCs)

The following display presents a restraint-use comparison of FDCs driver safety belt use compared that for all FFSCs, over the same five-year time period.



The proportion of failure to use proper restraints is 39.5% (Odds Ratio = 1.395) higher for County roads than for Federal and State routes according the comparable fatal crash statistics. Shoulder and Lap Belt used is over-represented in FFSCs by about 45% (Odds Ratio 1/0.691 = 1.45 times the expected use in comparison to County seatbelt usage).

6.6 Crosstabulation: C025 Crash Severity x C323 Restraint Use (all injury)

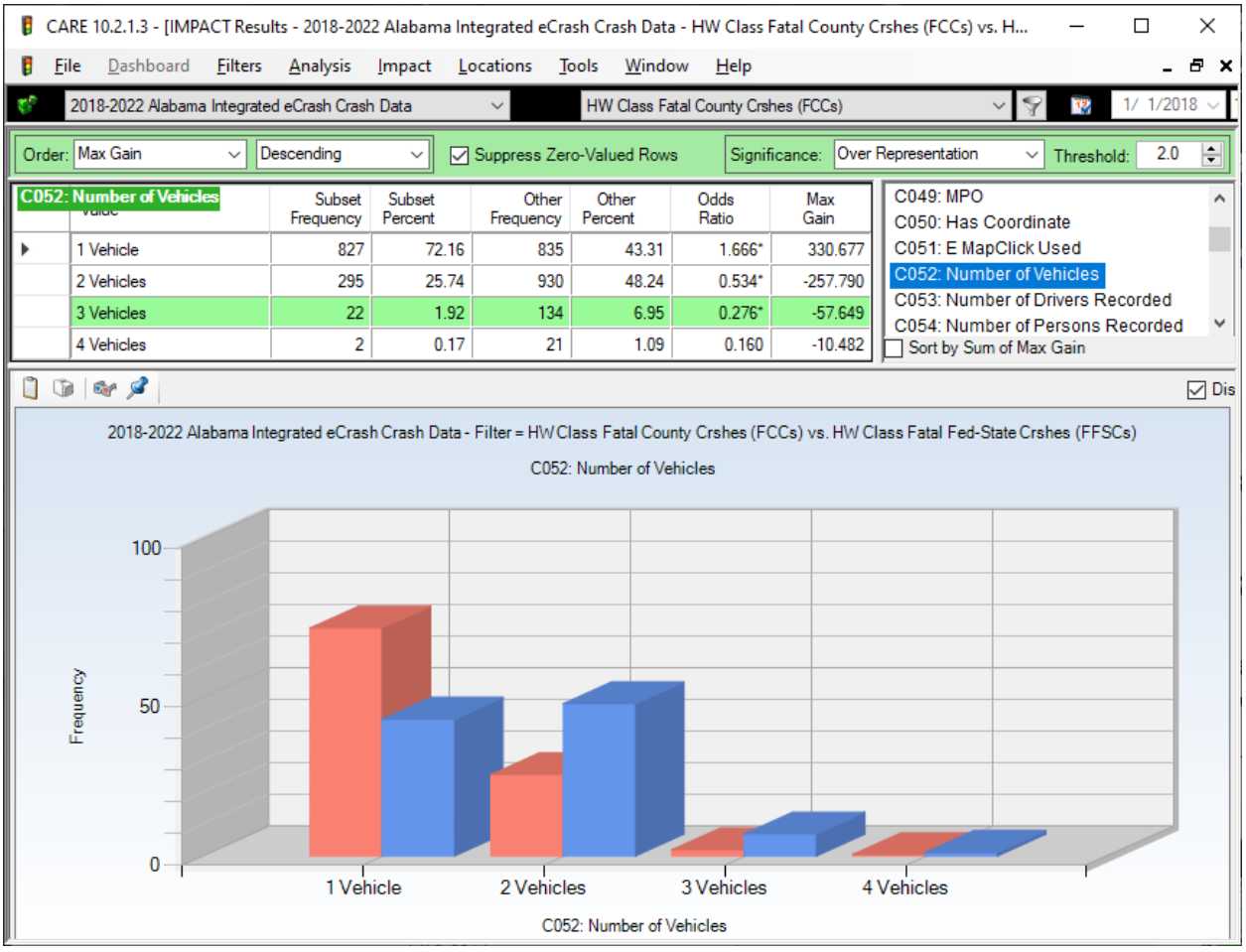


	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	TOTAL
None Used - Motor Vehicle Oc	1596 36.51%	4412 21.75%	5240 8.69%	2510 3.91%	13758 9.23%
Shoulder and Lap Belt Used	1581 36.16%	11626 57.32%	44825 74.34%	51783 80.69%	109815 73.64%
Lap Belt Only Used	7 0.16%	42 0.21%	123 0.20%	154 0.24%	326 0.22%
Shoulder Belt Only Used	7 0.16%	32 0.16%	156 0.26%	188 0.29%	383 0.26%
E Forward Facing Child Safety Seat	0 0.00%	1 0.00%	3 0.00%	0 0.00%	4 0.00%
E Rear Facing Child Safety Seat	0 0.00%	0 0.00%	0 0.00%	3 0.00%	3 0.00%
E Rear Facing Child Safety Seat	0 0.00%	0 0.00%	2 0.00%	0 0.00%	2 0.00%
E Child in Arms of Restrained Adult	0 0.00%	0 0.00%	2 0.00%	0 0.00%	2 0.00%
Dot-Compliant Motorcycle Helme	201 4.60%	955 4.71%	1118 1.85%	351 0.55%	2625 1.76%
E Helmet Used	18 0.41%	102 0.50%	177 0.29%	51 0.08%	348 0.23%
E Protective Pads Used (Elbows/Kn	0 0.00%	1 0.00%	0 0.00%	0 0.00%	1 0.00%
Reflective Clothing (Jacket/B	1 0.02%	6 0.03%	7 0.01%	0 0.00%	14 0.01%
E Lighting Used by Non-Motorist	1 0.02%	3 0.01%	3 0.00%	2 0.00%	9 0.01%
E Other Safety Equipment Used	1 0.02%	5 0.02%	10 0.02%	8 0.01%	24 0.02%
E Other Motorcycle Helme	24 0.55%	69 0.34%	62 0.10%	13 0.02%	168 0.11%
No Motorcycle Helmet Used	32 0.73%	111 0.55%	94 0.16%	26 0.04%	263 0.18%
Other	9 0.21%	23 0.11%	56 0.09%	38 0.06%	126 0.08%
Unknown	351 8.03%	1581 7.79%	4982 8.26%	5459 8.51%	12373 8.30%
Not Applicable	385 8.81%	716 3.53%	1066 1.77%	546 0.85%	2713 1.82%
CU is Unknown	116 2.65%	437 2.15%	1948 3.23%	2554 3.98%	5055 3.39%
E CU Driver Not Recorded	32 0.73%	110 0.54%	340 0.56%	414 0.65%	896 0.60%
E CU Non-Motorist Not Reco	10 0.23%	51 0.25%	86 0.14%	72 0.11%	219 0.15%
TOTAL	4372 2.93%	20283 13.60%	60300 40.44%	64172 43.03%	149127 100.00%

Calculations are based on all injury (including fatal) crashes.
Odds of death not using restraints = 13,758 fatal crashes/1,596 deaths = one in 8.6 injury crashes.
Odds of death using restraints = 109,815 fatal crashes/1,581 deaths = one in 68.8 injury crashes.
Risk of death is increased by an average factor of 8.0 when not using proper restraints.

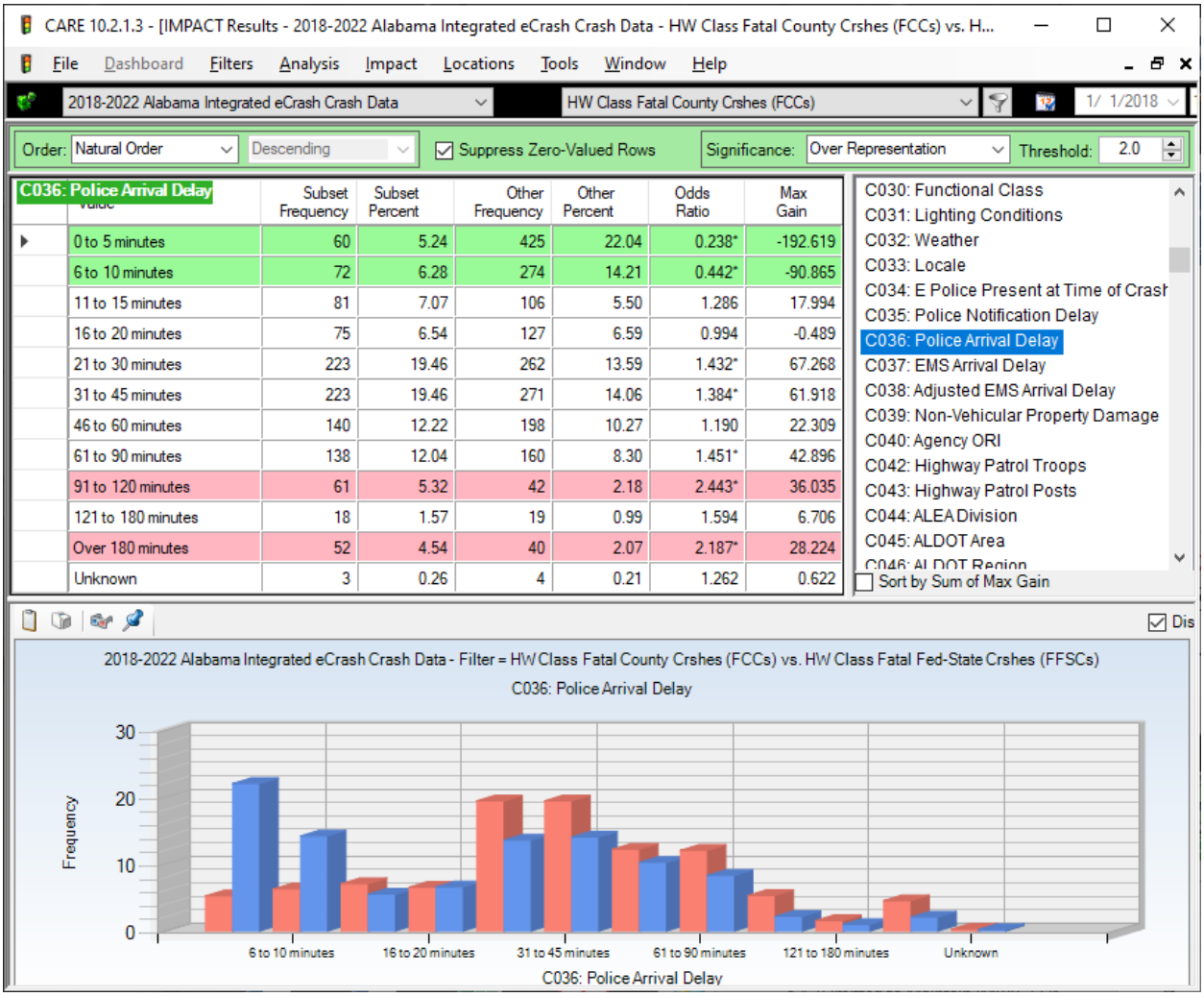
6.7 C052 Number of Vehicles Involved (FCCs vs FFSCs)

The following display presents a comparison of the number of vehicles in FCCs against number of vehicles FFSCs over the five-year time period of the study.



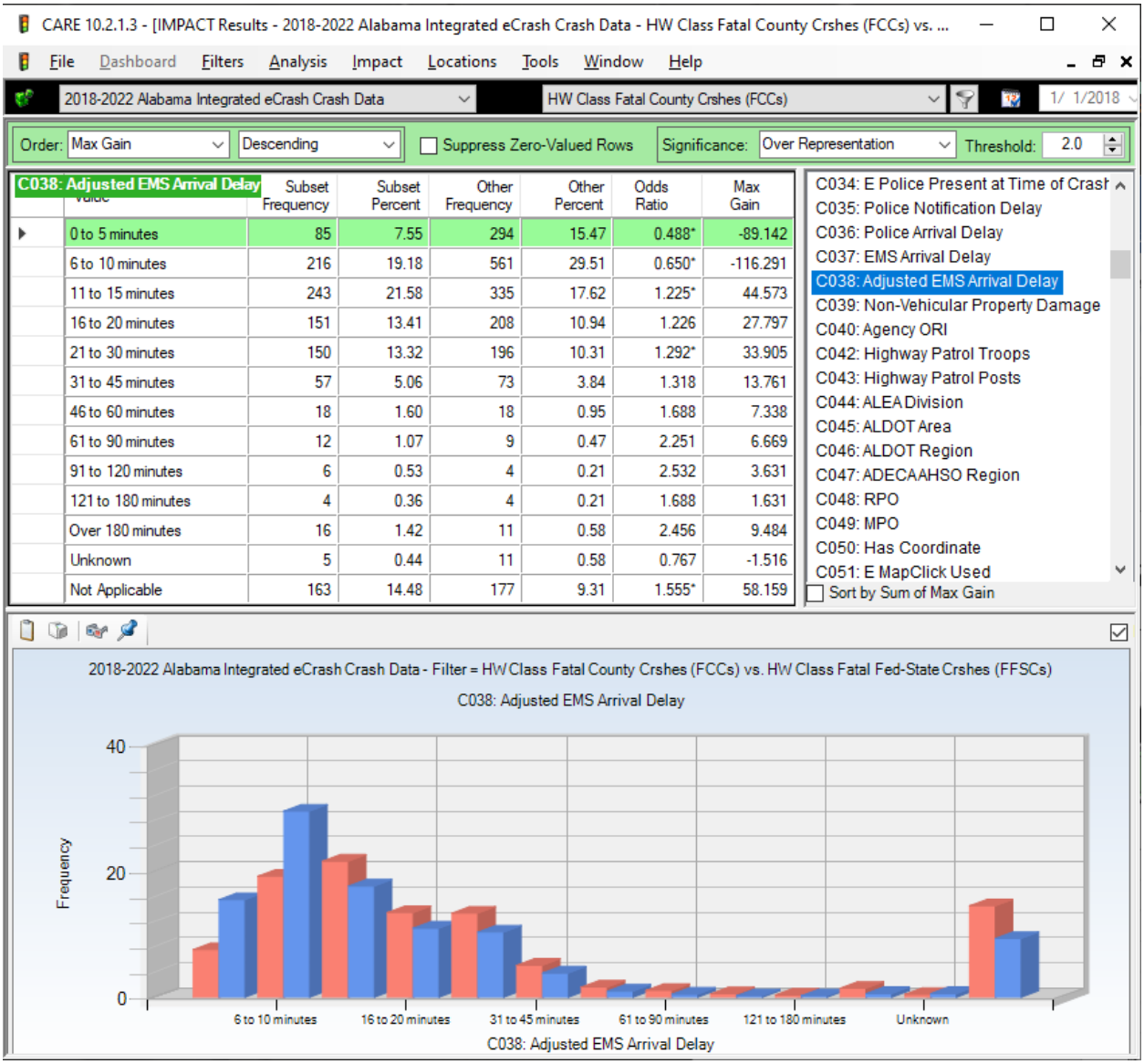
Single vehicle FCCs are over-represented by a factor of 1.666, or about two/thirds higher than expected. The two- and three-vehicle crashes are significantly over-represented in FFSCs by factors of 0.540 and 0.276, respectively (= 85.2% and 362.3% respectively, increases above expectation from County roads). This illustrates that unforced errors (i.e., single vehicle crashes) are much more prevalent in causing FCCs than FFSCs, while the denser traffic on the Federal and State routes leads to more two- and three-vehicle crashes.

6.8 C036 Police Arrival Delay (FCCs vs FFSCs)



FNC police arrival delays reflect the issues in finding out about the crash and getting to the scene at night. All delay times above 21 minutes were over-represented for FCCs with high Odds Ratios. Four of the high seven times were statistically significant. The analysis below shows how this correlates with EMS arrival times.

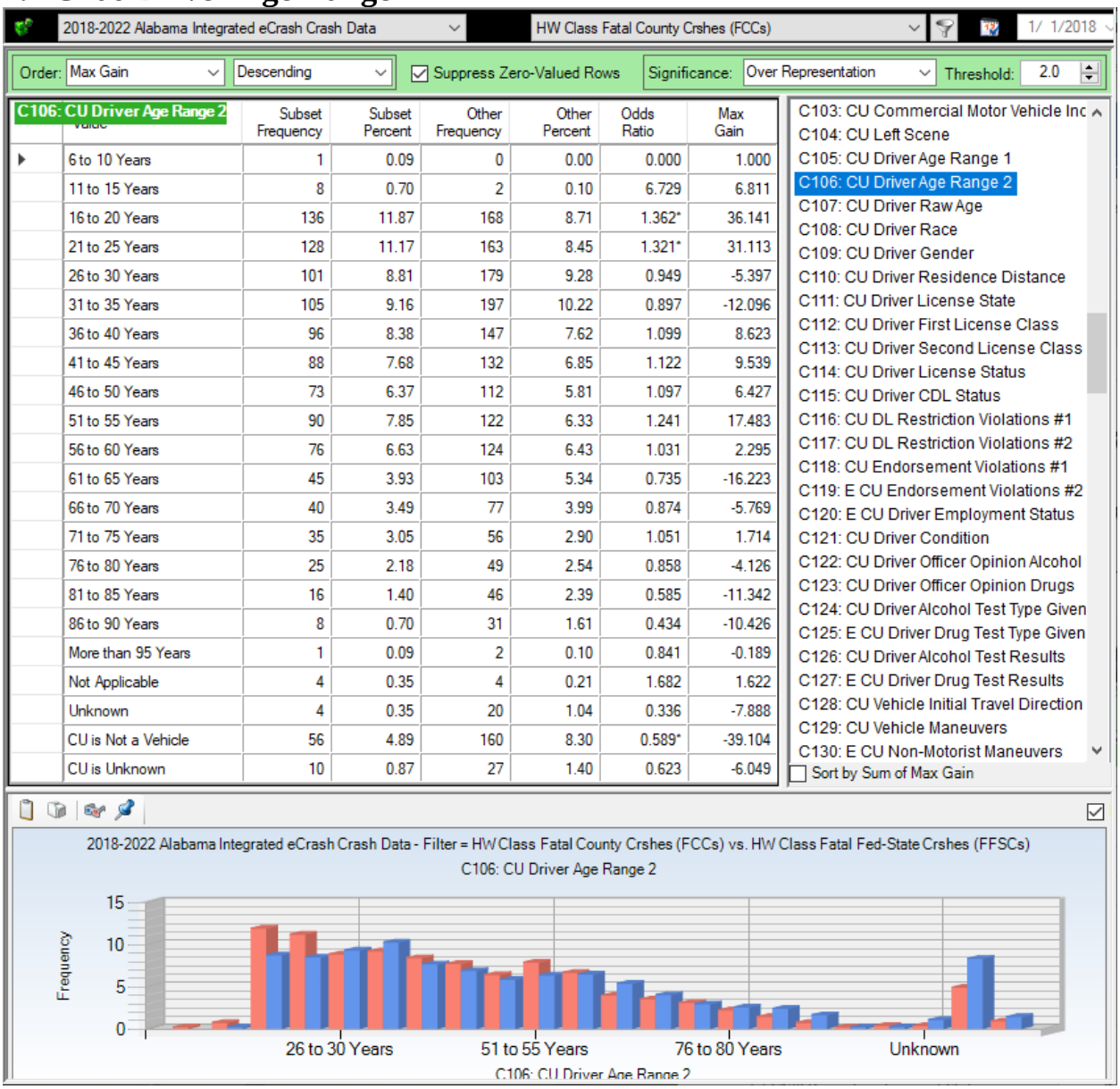
6.9 C038 Adjusted EMS Arrival Delay



Federal and State roads are significantly over-represented in the 0 to 10-minute response. County roads are significantly over-represented in the 11 to 15, and 21 to 30 categories. All the times above 30 minutes are over-represented for County roads.

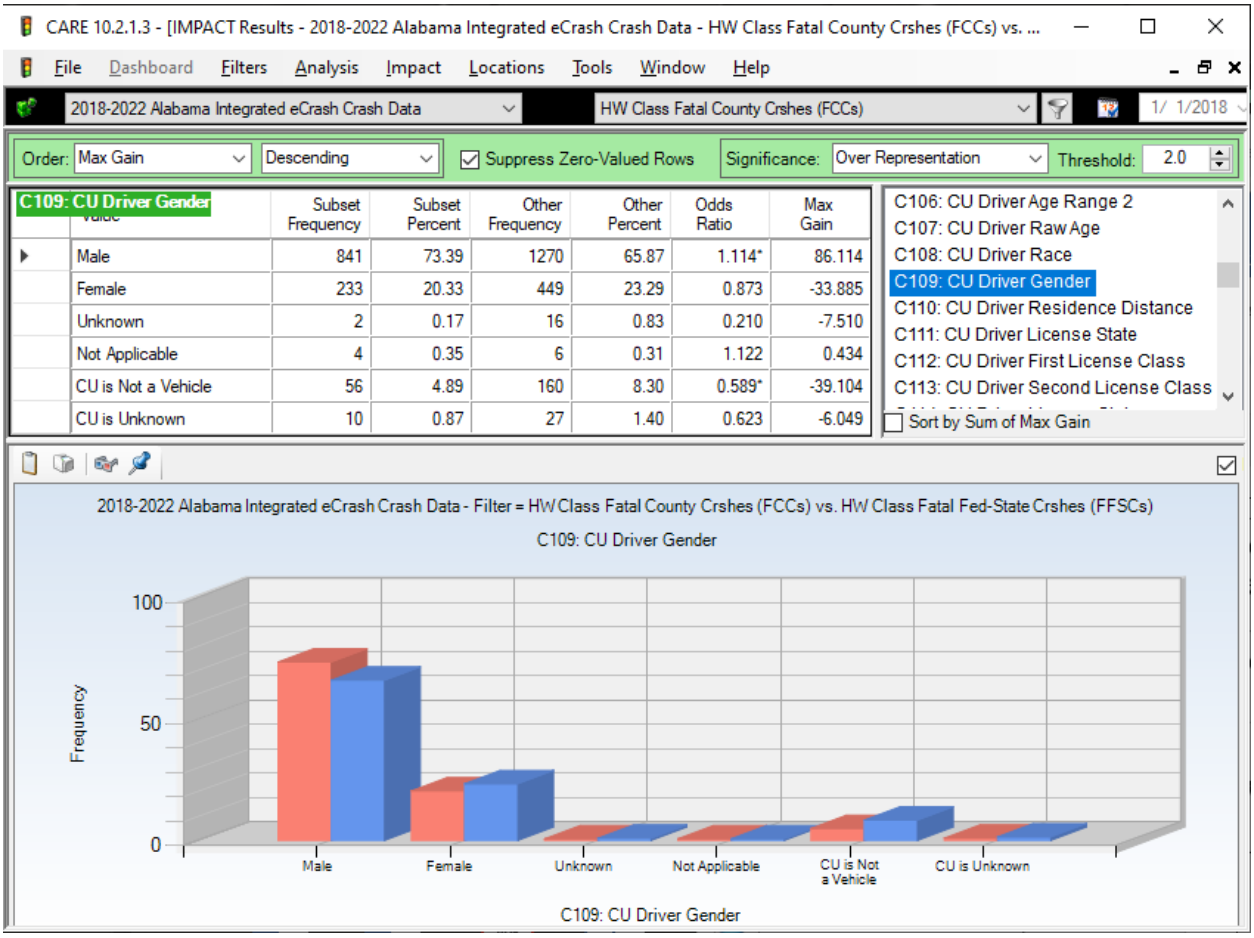
7.0 Driver and Vehicle Demographics

7.1 C106 Driver Age Range 2



The table display above presents FCCs compared to FFSCs given in 5-year age increments. The blue (FFSC) bars illustrate the problems that 16- to 25-year-old drivers have on County roads, at least partially due to ID (see Sections 8.3 and 8.4). The widest age interval is in ages from 56-90 (blue bars), for the Federal and State routes. Older drivers tend to drive more on the well-established roads for safety reasons.

7.2 C109 Driver Gender FCCs vs FFSCs

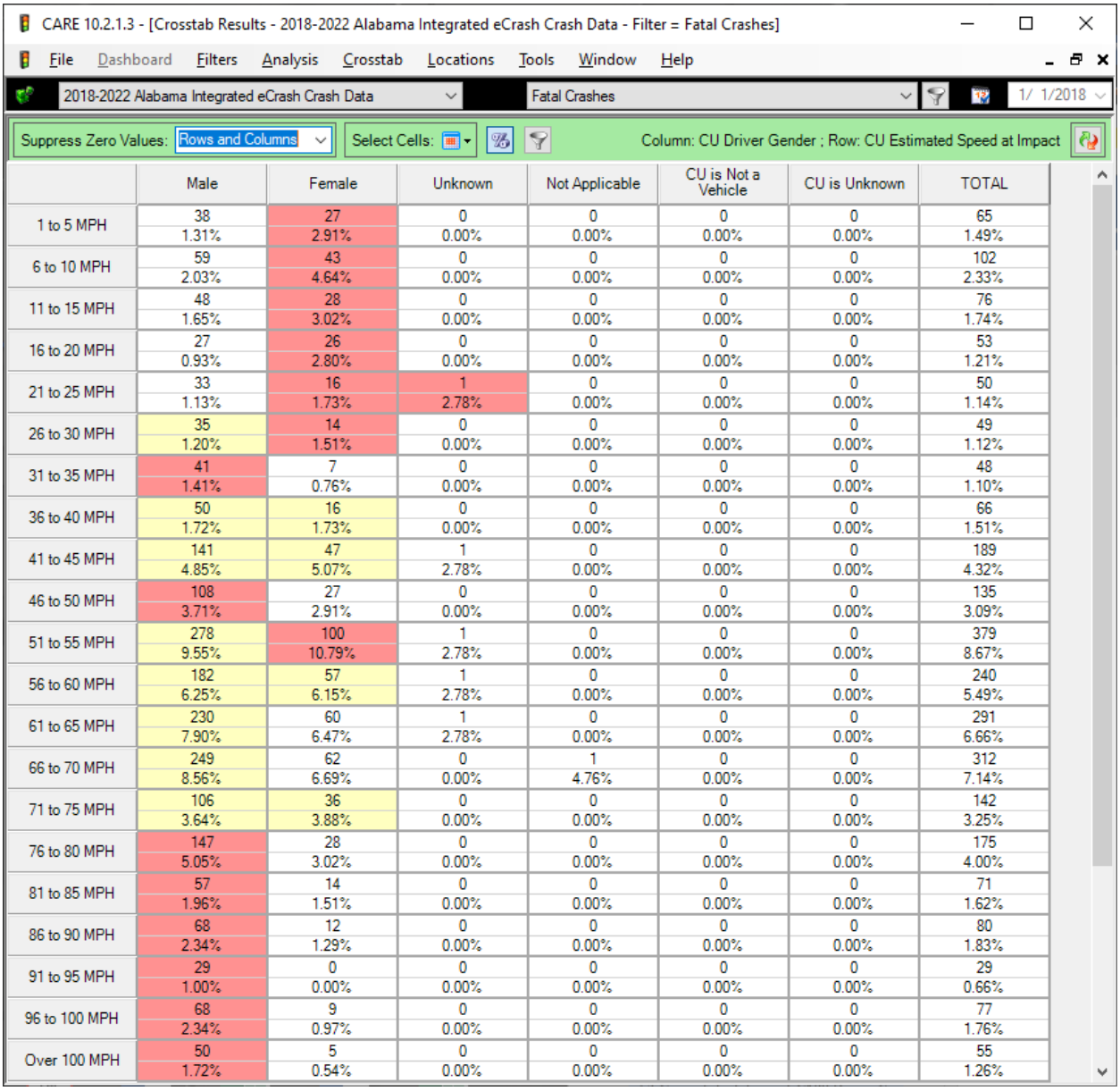


The male and female red and blue bars each individually sum to 100%. So the breakdown in FCCs causal drivers is 73.39% male and 20.333% female. For "Other," FFSCs, the percentage is 65.87% male and 23.29% female. These differences in proportions certainly indicate that males are a greater cause of fatal crashes both County and Federal/State. If there are countermeasures that can be directed toward males, doing so would be much more cost-effective than those directed toward all drivers.

The significant over-representation in "CU is Not a Vehicle" is largely due to pedestrians being coded in this category. For more definitive specifications, see Sections 7.4 and 7.5.

What makes women drivers so much safer in fatal crash comparisons? No doubt it has something to do with speed. See Section 7.3 immediately below.

7.3 Cross-tabulation of C109 Driver Gender x C224 Speed at Impact (all fatals)


CARE 10.2.1.3 - [Crosstab Results - 2018-2022 Alabama Integrated eCrash Crash Data - Filter = Fatal Crashes]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

2018-2022 Alabama Integrated eCrash Crash Data | Fatal Crashes | 1/ 1/2018

Suppress Zero Values: Rows and Columns | Select Cells: | Column: CU Driver Gender ; Row: CU Estimated Speed at Impact

	Male	Female	Unknown	Not Applicable	CU is Not a Vehicle	CU is Unknown	TOTAL
1 to 5 MPH	38 1.31%	27 2.91%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	65 1.49%
6 to 10 MPH	59 2.03%	43 4.64%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	102 2.33%
11 to 15 MPH	48 1.65%	28 3.02%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	76 1.74%
16 to 20 MPH	27 0.93%	26 2.80%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	53 1.21%
21 to 25 MPH	33 1.13%	16 1.73%	1 2.78%	0 0.00%	0 0.00%	0 0.00%	50 1.14%
26 to 30 MPH	35 1.20%	14 1.51%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	49 1.12%
31 to 35 MPH	41 1.41%	7 0.76%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	48 1.10%
36 to 40 MPH	50 1.72%	16 1.73%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	66 1.51%
41 to 45 MPH	141 4.85%	47 5.07%	1 2.78%	0 0.00%	0 0.00%	0 0.00%	189 4.32%
46 to 50 MPH	108 3.71%	27 2.91%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	135 3.09%
51 to 55 MPH	278 9.55%	100 10.79%	1 2.78%	0 0.00%	0 0.00%	0 0.00%	379 8.67%
56 to 60 MPH	182 6.25%	57 6.15%	1 2.78%	0 0.00%	0 0.00%	0 0.00%	240 5.49%
61 to 65 MPH	230 7.90%	60 6.47%	1 2.78%	0 0.00%	0 0.00%	0 0.00%	291 6.66%
66 to 70 MPH	249 8.56%	62 6.69%	0 0.00%	1 4.76%	0 0.00%	0 0.00%	312 7.14%
71 to 75 MPH	106 3.64%	36 3.88%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	142 3.25%
76 to 80 MPH	147 5.05%	28 3.02%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	175 4.00%
81 to 85 MPH	57 1.96%	14 1.51%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	71 1.62%
86 to 90 MPH	68 2.34%	12 1.29%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	80 1.83%
91 to 95 MPH	29 1.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	29 0.66%
96 to 100 MPH	68 2.34%	9 0.97%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	77 1.76%
Over 100 MPH	50 1.72%	5 0.54%	0 0.00%	0 0.00%	0 0.00%	0 0.00%	55 1.26%

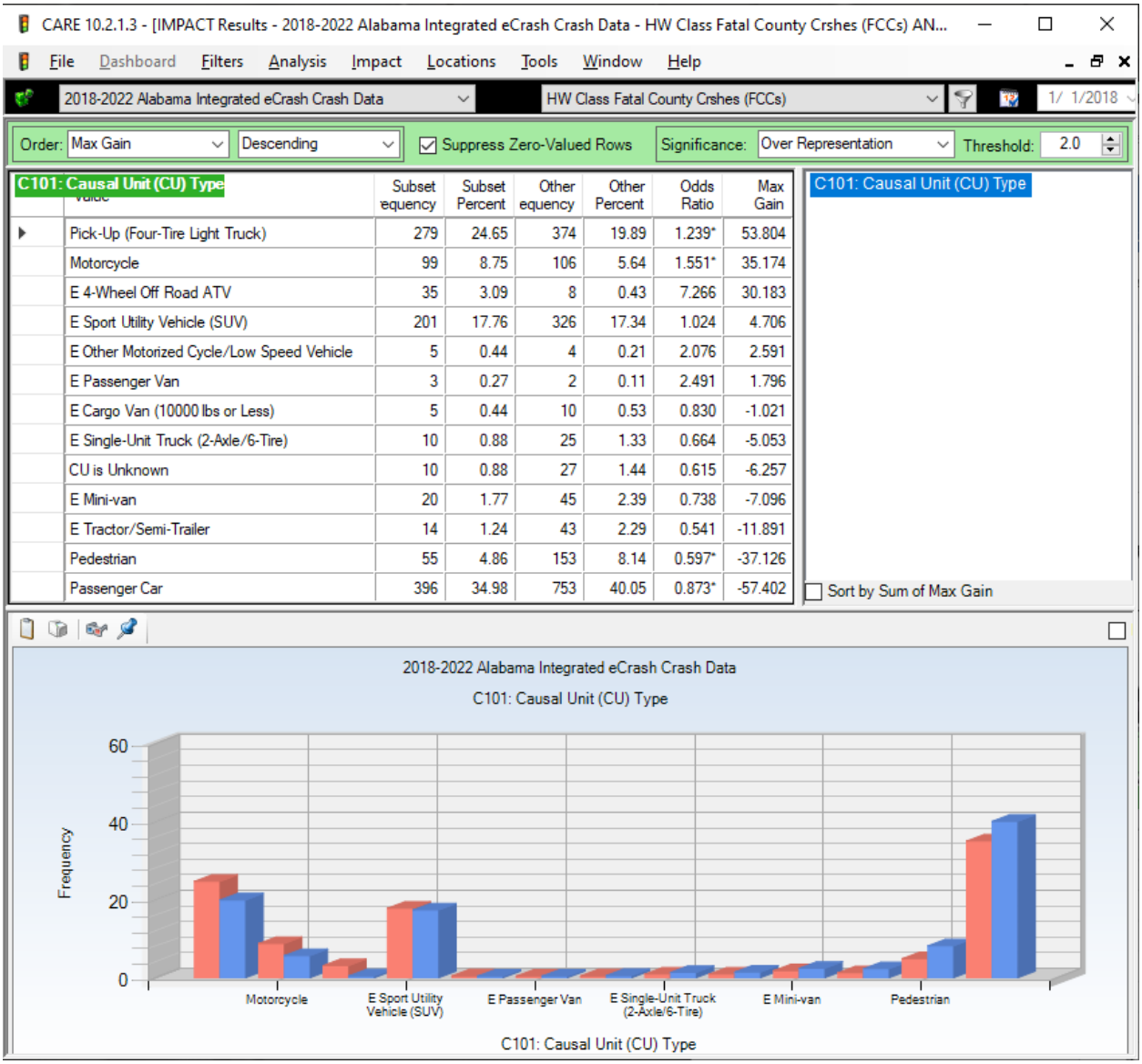
Number and Percent males and females involved in fatal crashes over 75 MPH:

419 Male = 419/2044 20.5%

68 Female = 68/633 10.7%.

The proportion of male fatal crashes over 75 MPH is practically double that of the female.

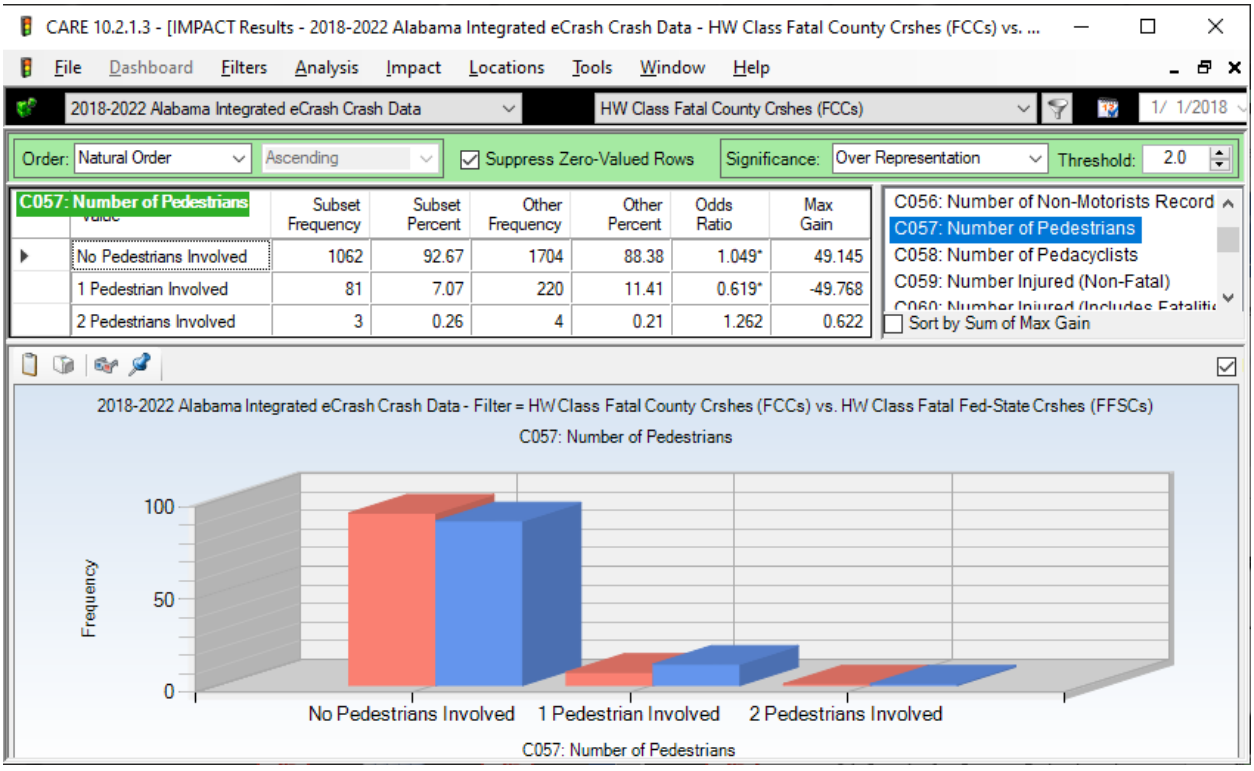
7.4 C101 Causal Vehicle Type (> 2 or more crashes) FCCs vs FFSCs



C101: Causal Unit (CU) Type	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Pick-Up (Four-Tire Light Truck)	279	24.65	374	19.89	1.239*	53.804
Motorcycle	99	8.75	106	5.64	1.551*	35.174
E 4-Wheel Off Road ATV	35	3.09	8	0.43	7.266	30.183
E Sport Utility Vehicle (SUV)	201	17.76	326	17.34	1.024	4.706
E Other Motorized Cycle/Low Speed Vehicle	5	0.44	4	0.21	2.076	2.591
E Passenger Van	3	0.27	2	0.11	2.491	1.796
E Cargo Van (10000 lbs or Less)	5	0.44	10	0.53	0.830	-1.021
E Single-Unit Truck (2-Axle/6-Tire)	10	0.88	25	1.33	0.664	-5.053
CU is Unknown	10	0.88	27	1.44	0.615	-6.257
E Mini-van	20	1.77	45	2.39	0.738	-7.096
E Tractor/Semi-Trailer	14	1.24	43	2.29	0.541	-11.891
Pedestrian	55	4.86	153	8.14	0.597*	-37.126
Passenger Car	396	34.98	753	40.05	0.873*	-57.402

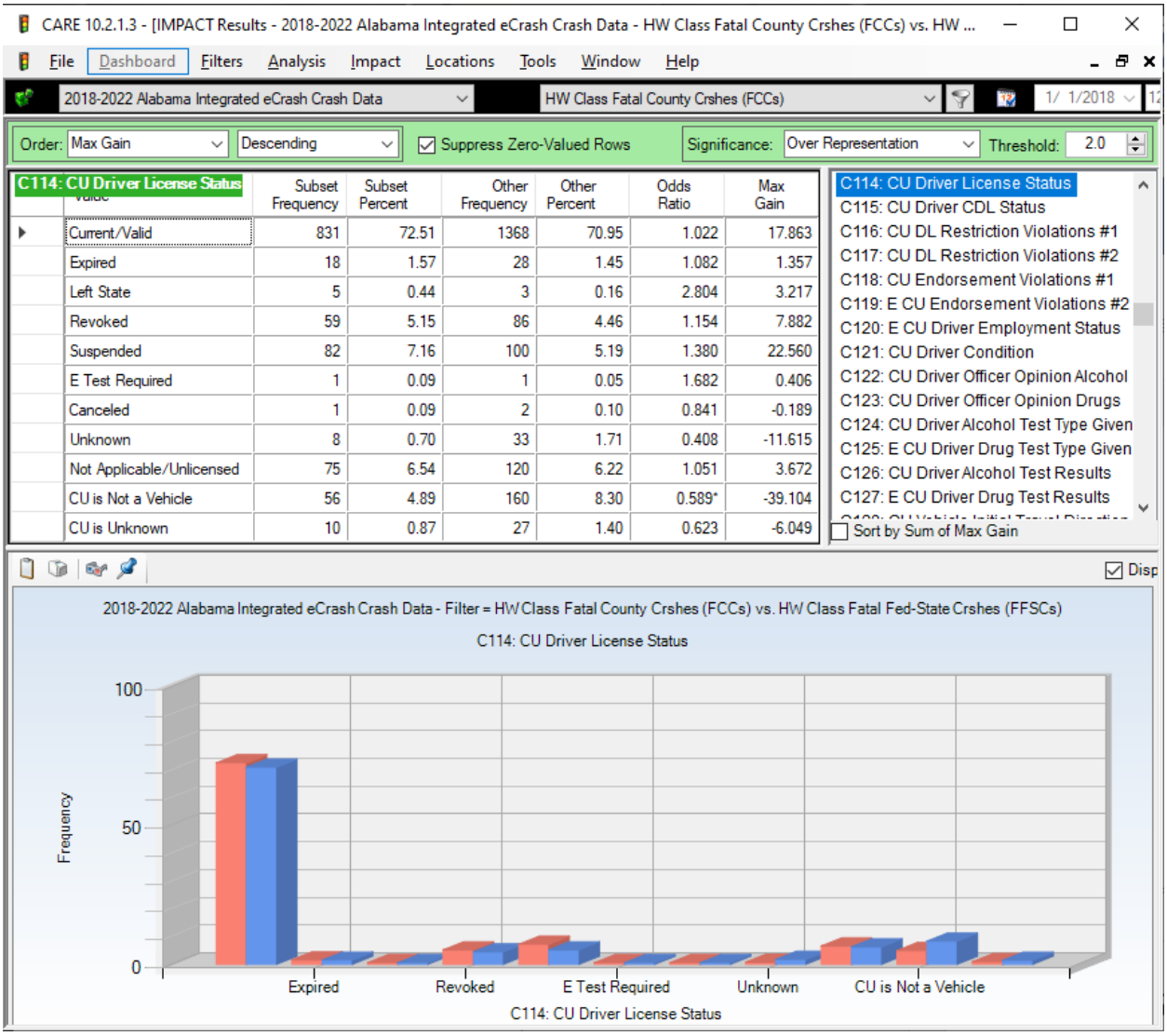
Pickups 279 and Motorcycles 99 were significantly over-represented on County roads. The proportion of Sport Utility Vehicles was approximately equal on both roadway classifications, with the third largest frequencies (201 for FCCs, and 326 for on FFSCs). Pedestrians (55 and 153) and Passenger Cars (396 and 753) were significantly over-represented on Federal/State routes. See Section 7.5 for more information on Pedestrians.

7.5 C058 Number of Pedestrians



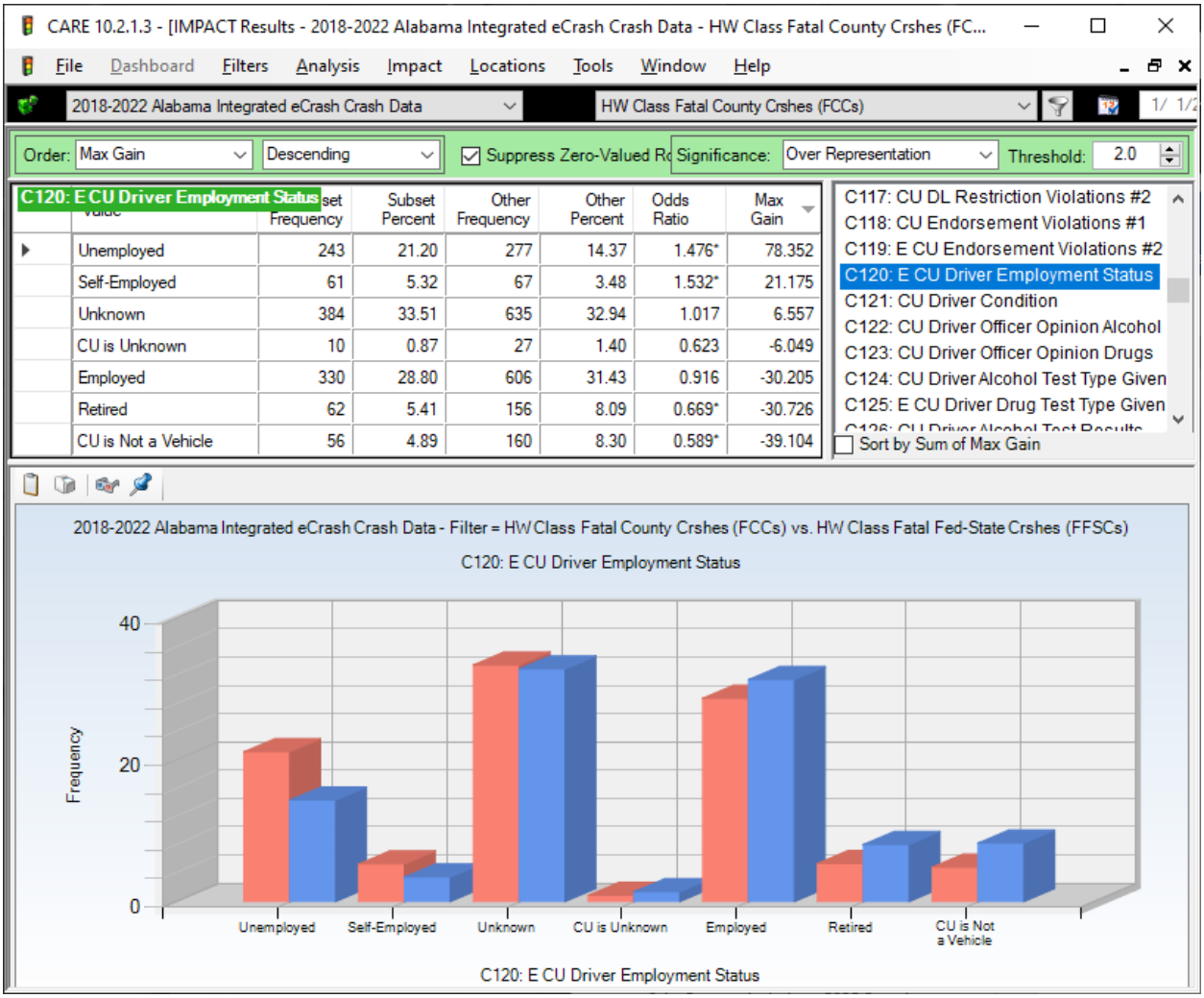
Single Fatal Federal and State Pedestrian crashes occur in about 61.9% greater proportion than their County counterparts. This is consistent with what has been found in most pedestrian studies. Both ID and Impaired Walking, contribute to this, as well as pedestrians not taking the maximum provisions for being seen at night.

7.6 C114 Driver License Status



FCCs were over-represented in their causal drivers having legitimate licenses. Expired, Revoked and Suspended were also over-represented for FCCs. This indicates that a greater degree of enforcement may be warranted on County roads

7.7 C120 Driver Employment Status



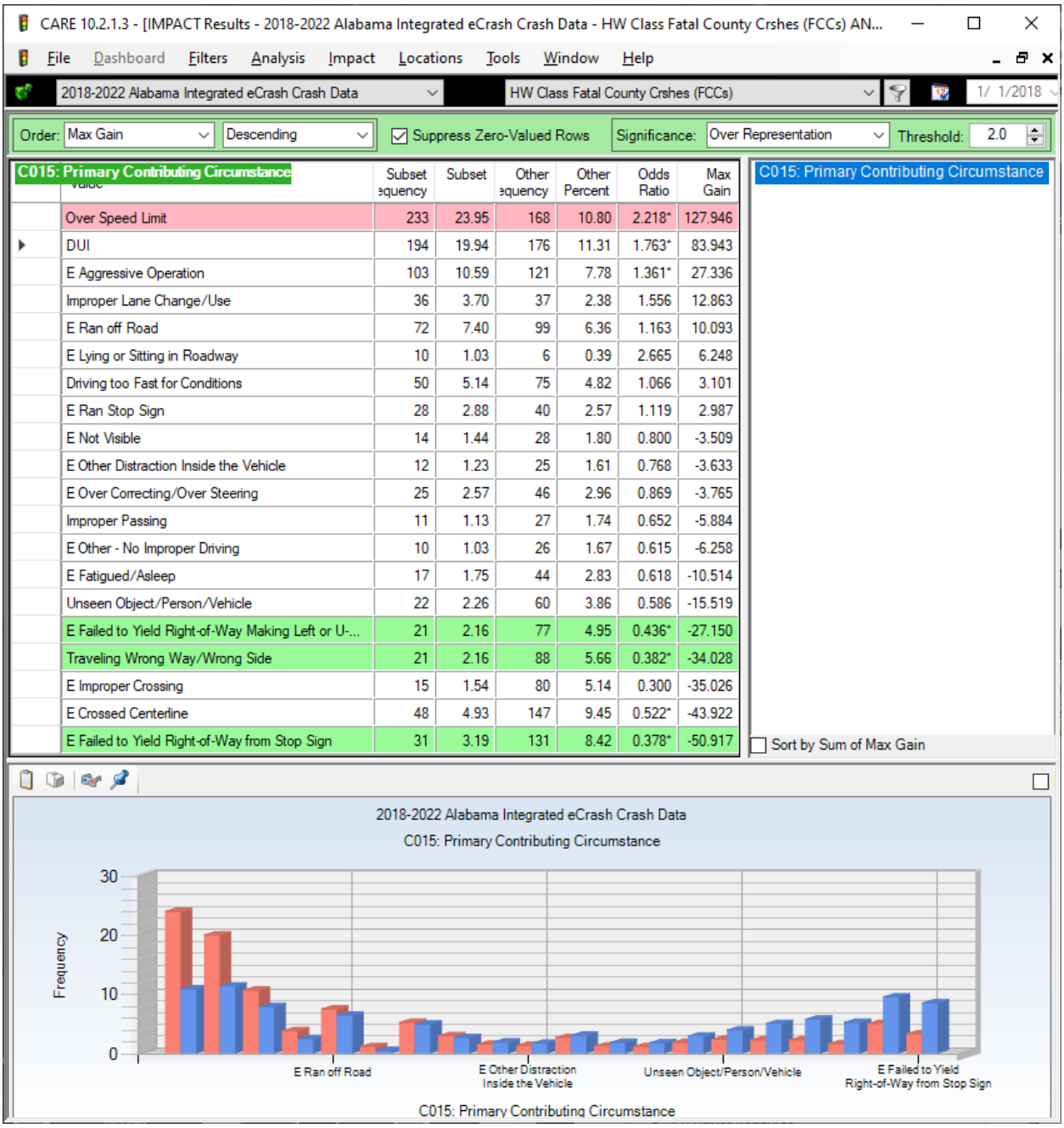
This analysis indicated that the unemployment rate for the FCCs was about 21.20%, while that for FFSCs was 14.37%. Higher than average unemployment rates are not surprising because of the underlying drug/alcohol root cause of many fatal crashes (see Sections 8.3-8.4). The following givens the frequency comparisons for FCCs and FFSCs, with an over-representation indication (*):

Status	**FCCs**	**FFSCs**
Retired	62	156*
Unemployed	243*	277
Self-Employed	61*	67
Employed	330	606

* Statistically significant higher proportion.

8.0 Driver Behavior

8.1 C015 Primary Contributing Circumstances (Items < 10 Crashes Removed)



C015: Primary Contributing Circumstance	Subset Frequency	Subset	Other Frequency	Other Percent	Odds Ratio	Max Gain
Over Speed Limit	233	23.95	168	10.80	2.218*	127.946
DUI	194	19.94	176	11.31	1.763*	83.943
E Aggressive Operation	103	10.59	121	7.78	1.361*	27.336
Improper Lane Change/Use	36	3.70	37	2.38	1.556	12.863
E Ran off Road	72	7.40	99	6.36	1.163	10.093
E Lying or Sitting in Roadway	10	1.03	6	0.39	2.665	6.248
Driving too Fast for Conditions	50	5.14	75	4.82	1.066	3.101
E Ran Stop Sign	28	2.88	40	2.57	1.119	2.987
E Not Visible	14	1.44	28	1.80	0.800	-3.509
E Other Distraction Inside the Vehicle	12	1.23	25	1.61	0.768	-3.633
E Over Correcting/Over Steering	25	2.57	46	2.96	0.869	-3.765
Improper Passing	11	1.13	27	1.74	0.652	-5.884
E Other - No Improper Driving	10	1.03	26	1.67	0.615	-6.258
E Fatigued/Asleep	17	1.75	44	2.83	0.618	-10.514
Unseen Object/Person/Vehicle	22	2.26	60	3.86	0.586	-15.519
E Failed to Yield Right-of-Way Making Left or U-...	21	2.16	77	4.95	0.436*	-27.150
Traveling Wrong Way/Wrong Side	21	2.16	88	5.66	0.382*	-34.028
E Improper Crossing	15	1.54	80	5.14	0.300	-35.026
E Crossed Centerline	48	4.93	147	9.45	0.522*	-43.922
E Failed to Yield Right-of-Way from Stop Sign	31	3.19	131	8.42	0.378*	-50.917

8.2 Discussion of Primary Contributing Circumstances (PCC) Results Above

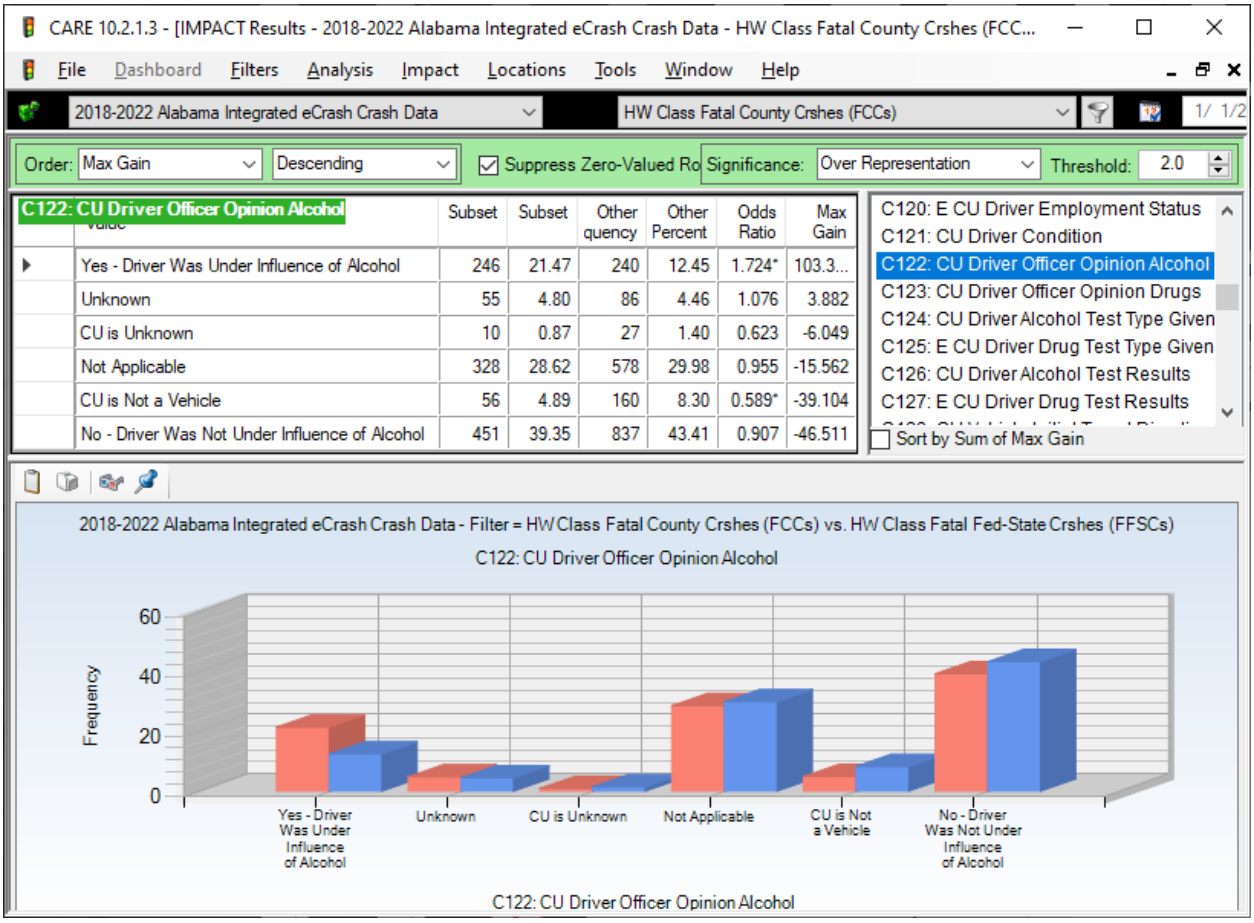
These results demonstrate the driver behaviors as they were defined by the C015, Primary Contributing Circumstances (PCCs), which accompanied FCCs and FFSCs. Items over-represented in their expected proportion (when compared to their controls) are as follows, with frequencies:

	FCCs PCC Overrepresented	**FCCs**	**FFSCs**
o	Over Speed Limit	233*	168
o	ID/DUI (Impaired Driving)	194*	176
o	Aggressive Operation	103*	121
o	Improper Lane Change/Use	36	37
o	Ran Off Road	72	99
o	Lying or Sitting in Roadway (pedestrian)	10	6
o	Driving too Fast for Conditions	50	75
o	Ran STOP Sign	28	40

	Federal/State Overrepresented	**FCCs**	**FFSCs**
o	Failed to Yield ROW at STOP Sign	31	131*
o	Crossed Centerline	48	147*
o	Improper Crossing (pedestrian)	15	80
o	Traveling Wrong Way/Wrong Side	21	88*
o	Failed to Yield ROW Left or U Turn	21	77*
o	Unseen Object/Persons/Vehicle (probable pedestrian)	22	60
o	Not Visible (probable pedestrian)	14	28
o	Fatigued/Asleep	17	44

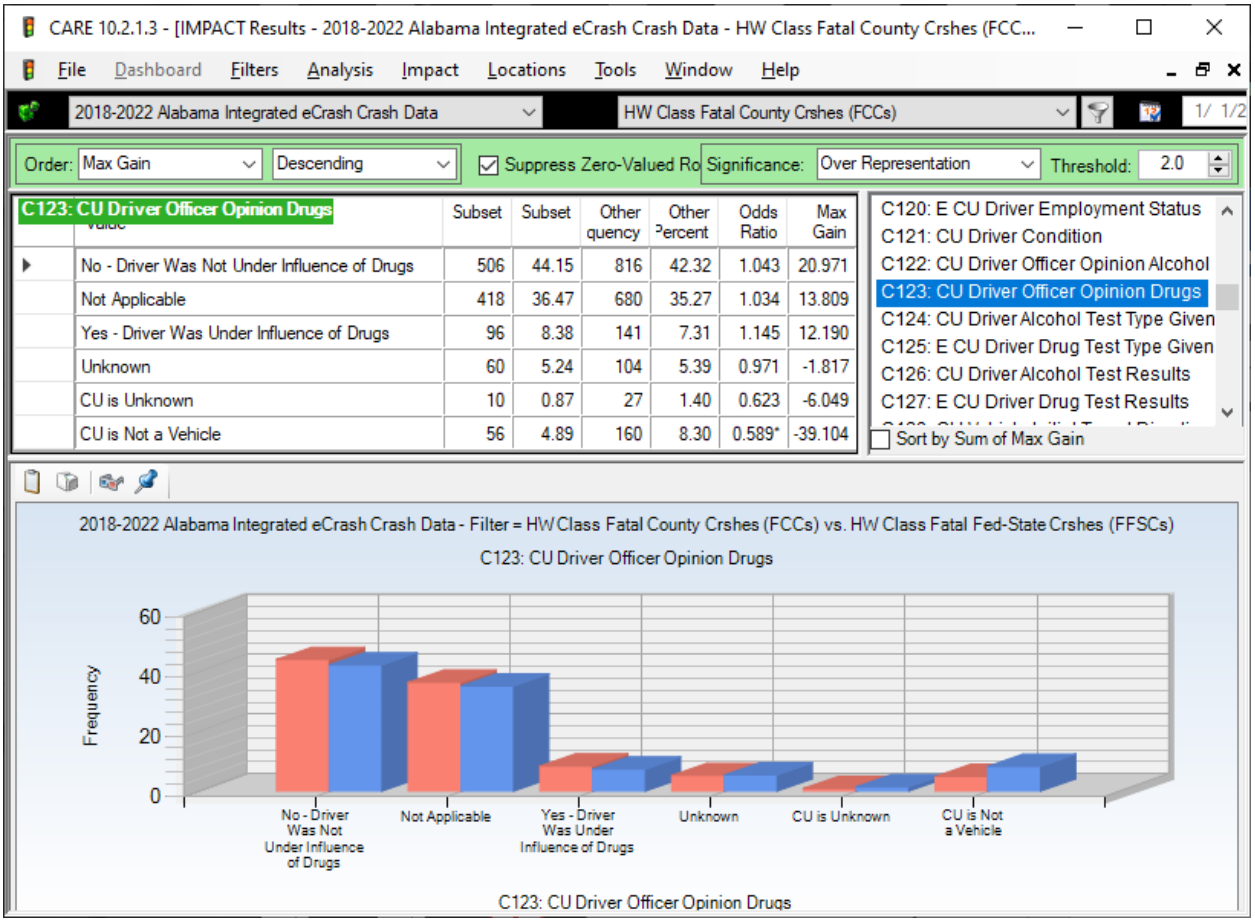
None of the items listed here or in the IMPACT table are necessarily mutually exclusive from the others. Each should be viewed in terms of their relative positions in the table as opposed to any one of them being the absolute cause.

8.3 C122 CU Driver Officer's Opinion Alcohol



Impaired Driving/Alcohol was indicated as one cause of the crash for 21.47% of the FCCs, and 12.45% of the FFSCs. This gives an ID Odds Ratio of 1.724. ID/DUI tends to be under-reported, and there is no doubt that its reduction would have a major impact on reducing the number of fatal crashes, both day and night.

8.4 C123 CU Driver Officer's Opinion Drugs (other than alcohol)



The reported non-alcohol drug use in FCCs is about 39% (8.38/21.47) of that for alcohol. In both cases (FCCs and FFSCs), drug use is difficult to detect compared to alcohol, which has well-established tests for the blood-alcohol level that are much easier to administer. Our conclusion is that both alcohol and non-alcohol drug use are major contributors to increasing the frequency of fatal crashes, and their use is further compounded if they choose to avoid detection by using county roads, or they choose to speed or fail to use proper restraints.