Rural-Urban IMPACT Analysis Compares Special Crash Problems Associated with Rural and Urban Areas 2017-2021 Crash Data

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Table of Contents

Introduction

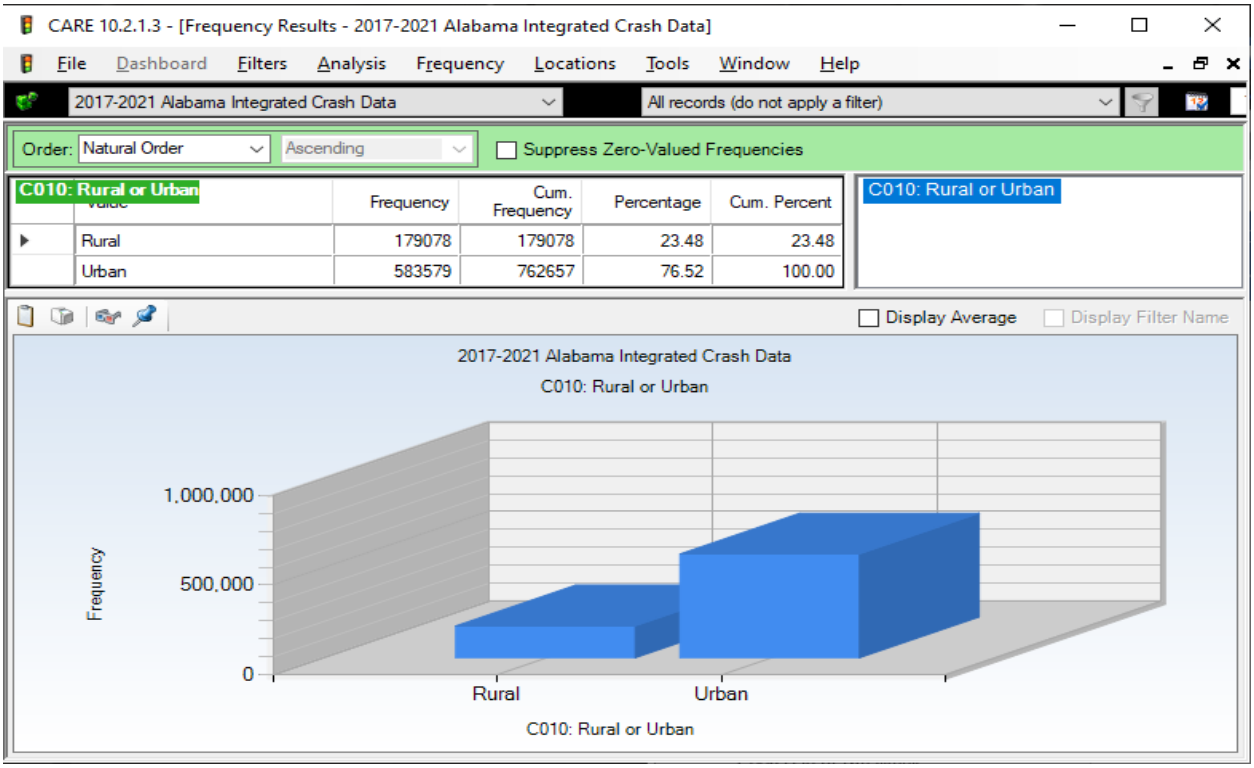
The purpose of this study was to produce as much information as possible to enable drivers to know what the crash records reveal to be the particular dangers or Rural and Urban driving. With this information it is not anticipated that drivers would seek out one of these environments rather than another, because they are usually fixed by each trip. However, it is expected that this information can better help them adjust their driving styles and habits as they recognize that they are transitioning from one roadway environment type to the other. As defined by the crash report, these two roadway environments are mutually exclusive.

The report is subdivided into the following parts to enable the presentation to evolve in a reasonable way:

1. As a continuation of this Introduction, a high level orientation of the Rural and Urban roads in Alabama will be given. This will be accomplished by presenting a frequency distribution that shows these roadway environments in Alabama. This is followed by a cross-tabulation of Rural/Urban by Crash Injury Severity to provide a feel for the different consequences of these crashes.
2. The Introduction will continue by providing a definition of IMPACT so that the IMPACT displays and their summaries can be better understood. This will use the C011 Highway Classification IMPACT output display to exemplify the terminology involved..
3. Driver advisories for each of the environments (Rural and Urban) will then be given to produce concise presentations so that drivers might have the information in a nutshell to adjust their driving strategies accordingly.
4. An Executive Summary for the much more detailed IMPACT outputs will be given to provide a quick reference to them.
5. The detailed IMPACT analysis referenced back to summaries above by the crash report numbers. This will enable readers to see the sources for the conclusions drawn.

The acronym Causal Unit (CU) is used to refer to the unit that the reporting officer felt had the highest chance of being the cause of the crash.

C010 Rural or Urban (Total Statewide Frequency Breakdown)



All crashes that occurred in calendar years 2017-2021 are included and being considered in this study. Generally, in IMPACT studies, we let the particular crash subject of concern (e.g. speed, distracted driving, DUI, etc.) to be the focus of the study, and all other crashes (e.g., non-speed) are compared to it within each IMPACT run. It should be obvious that if we compare crash attributes, for example of speed-caused crashes against those that are not speed causes, that this will give us insight into what is different between speed and non-speed for these crashes. This information is extremely valuable in developing crash countermeasures.

This study is different from the typical in that we will be looking at both the Rural and the Urban crashes simultaneously and drawing conclusion regarding both of them. We will focus on Rural crashes as a pseudo primary problem, however, because Rural crashes tend to be more severe. The cross-tabulation on the next page quantifies this difference. The frequency distribution above shows that 23.48% of the total crashes occurred in the Rural roads, whereas the rest (76.52%) occurred in the Urban roads. Crashes in city limits are determined to be Urban, all others are Rural.

Every crash report requires the entry of a city code (if one exists) to provide this information. Reporting officers will determine this from whether the crash occurred within the city limits, or sometimes within the police jurisdiction of an incorporated city. It should be understood that this is not a definitive statement of the area environments under consideration, and we will consider this in more detail when we address C033 Locale, which will be one of the first IMPACTs performed.

C010 by C025 CU Crash Severity by Rural or Urban

CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

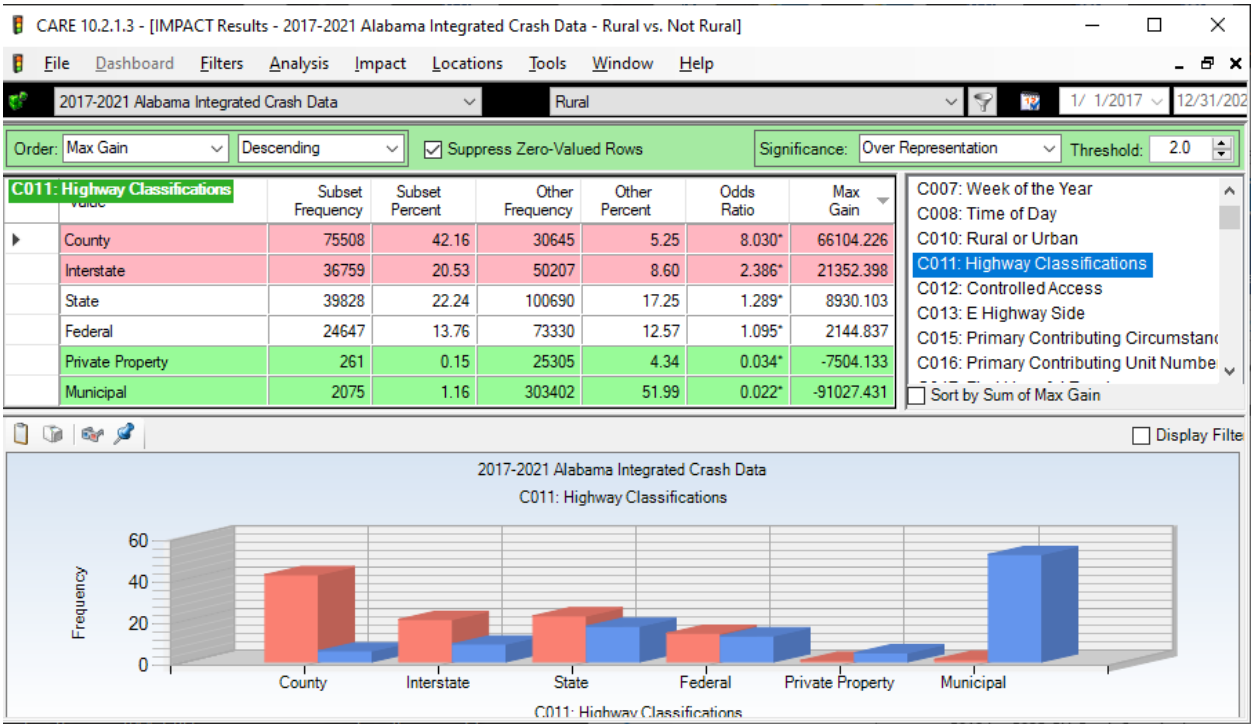
2017-2021 Alabama Integrated Crash Data | All records (do not apply a filter)

Suppress Zero Values: None | Select Cells: | Column: Rural or Urban ; Row: Crash Severity

	Rural	Urban	TOTAL
Fatal Injury	2597	1724	4321
	1.45%	0.30%	0.57%
Suspected Serious Injury	11680	10516	22196
	6.52%	1.80%	2.91%
Suspected Minor Injury	20985	39078	60063
	11.72%	6.70%	7.88%
Possible Injury	12304	56093	68397
	6.87%	9.61%	8.97%
Property Damage Only	126675	460496	587171
	70.74%	78.91%	76.99%
Unknown	4837	15672	20509
	2.70%	2.69%	2.69%
TOTAL	179078	583579	**762657**
	23.48%	76.52%	**100.00%**

Of the Fatal Injury crashes 1.45% occurred in the Rural areas, while only 0.30% occurred in the areas indicated to be Urban, so from just a percentage point of view, the rural areas had (4.833) -- close to five times – the fatal crashes. It is about the same ratio when we look at it as number of fatal crashes per crash. For Urban crashes, this is 1724/583579 = one for every 338.5 crashes, while the Rural fatal crash rate is 2597/179078 = one fatal crash for every 69.0 rural crashes, which also shows Rural roads have about five times the fatal crashes per crash more than on the Urban roads.

C011 Highway Classification IMPACT Example



General Discussion of IMPACT Output Terms Using Highway Classification for Example

IMPACT in this context stands for *Information Mining Performance Analysis Control Technique.* It is an analytics technique that can be applied to any database for which the cases are made up of a number of *attributes.* The attributes are used, not only to subdivide the data into two comparable subsets, but which enable these subsets to be compared for all pairs of these attributes.

To understand the details of how IMPACT is used to create information from the comparison of two datasets, please see *TECHNOLYTICS*, which is available on Safe Home Alabama at Technolytix - Home or https://technolytics.net. A brief summary of these details is given below.

General definitions for the IMPACT outputs. These are best understood in terms of a simple IMPACT output. We will use the Highway Classifications output given above to illustrate the concepts.

Ordering. A list of the attributes are found in the far right column of the IMPACT output. Generally, this ordering is maintained for the IMPACT report.. However, for the Rural/Urban application, exceptions were made where certain attributes were closely related to others. This grouping was done to give additional explanation for given attribute subjects. When this was done, the attribute name was indented in the various Word lists below the main subject. This is

for the IMPACT outputs in general, each of which is for a different attribute. The ordering of the lists within the IMPACT tables is discussed next.

General components of the IMPACT outputs. Each IMPACT output has two components: a table and a chart below the table. Each can have the results of the analysis listed in a variety of orders as specified in the Order box just above the table. However, in most cases only two orders are considered (1) Max Gain and (2) Natural Order, according to which ordering will make more sense to the reader. More details will be given on these below.

Max Gain. Generally, the ordering within the tables will be by largest Max Gain first, since this provides a metric by which attribute values can be compared against each other. The Max Gain for items that tend to cause problems is defined to be the reduction in crashes that would result if the percent by which the item is over-represented were reduced to one, indicating no over- or under-representation for that attribute. For example, in the example C011 Highway Classification output, the Max Gain for the attribute "County roads" is 66,104.226.

The over-representations are computed from the *Subset Percent* and *Other Percent* columns, which for the County roads example are 42.16% and 5.25%, respectively. These percentages represent the odds of any crash either occurring on a County road (42.16%), or not on a County Road (5.25%). This makes the ratio of these two percentages (or the *Odds Ratio*) to be 42.16%/5.25% = 8.030 (see it under the *Odds Ratio* heading). The Max Gain for County roads is a little over 66,104; so this is saying that if somehow we could change the odds so that County roads would have the same percent as <u>not</u> County roads, e.g., in this example, 5.25%, the number of crashes that would be reduced would be a little over 66,104. Those that have proportions that are more favorable (at the bottom of the table listing) will have negative Max Gains indicating that changing their under-representation to "1.00" would result in an increase in crashes.

Natural Order. When an expected natural ordering of the output will make more sense (for attributes such as time of day, day of the week, year and several others), the ordering can be changed to Natural Order as opposed to Max Gain order. See the Order specification box immediately above the tables.

Subset Frequency and Subset Percent. These are the frequencies and percentages of the corresponding attribute values for the subset, which for this application is Rural.

Other Frequency and Other Percent. These are the values to which the subset attribute values are compared for any given application (for this example, Urban. For example, if the Subset Frequency for the Day of the Week Rural subset was for Sunday, the Other Frequency would be the number of Urban crashes for Sunday. In this example, this column counts all Day-of-the-Week values that are not for Rural. The subset and other percentages are also called the Odds because they represent the probability (Odds) with which each of these events occur. The *Other Percent* serves as a control in that it tells us what the subset frequency would be if not Rural.

Odds Ratio. The Odds Ratio is the ratio between the *Subset* and *Other* percentages. This measures the degree to which the *Subset* is at variance with the *Other*. A large Odds Ratio indicates that there is a large disparity, and, if it is over 2, then the background is colored red. At

the other end of a Max Gain ordered listing, if the Odds Ratio is less than 0.50, then the background will be a green.

*. An Odds Ratio with an asterisk on it is an indication that the *Subset* and *Other* data are significantly different from each other from a statistical point of view. No analysis is performed in this regard if the frequency for either the Subset or the Other value of the given attribute is less than 20 cases, due to the requirements of the statistical test being applied.

Driver Advisories for Rural and Urban Driving

The purpose of this section is to answer the questions that drivers might have depending on whether they expect to be driving in Rural areas as opposed to Urban, or from transitioning from one to the other. Some issues apply to both, and it is recognized that most trips involve some combination of Rural and Urban driving. However, the primary focus will be on the particular area type that is expected in order to sharpen the knowledge of issues within each. This is to accommodate the changes in perception required when drivers move from Rural to Urban or vice versa.

The formal definition of Rural and Urban as used for crash reporting is determined by whether the crash occurred within the city limits of an incorporated city (Urban), or not (Rural). Thus, if there is an entry in the part of the report form that requires a city, the crash will be determined to be Urban. If no city is entered, then this crash will be recognized to be on a Rural road. This distinction is admittedly imperfect, and it is recognized that "open country" areas exist in some cities, just as some Rural areas might contain unincorporated Urban roads. It is expected that these two types of error will involve a relatively small number of crashes, and that they will generally "cancel each other out."

Issues of Driving in Predominately Rural Roadways

These "issues" will be arranged below in the order considered to be the most critical combination of frequency and severity that they cause (in the experience of the author). It is understood that drivers have very little choice to drive in Rural as opposed to Urban (or vice-versa), and the purpose here is not change their driving habits in this regard. The purpose in this section is just to alert drivers of what additional safety factors they need to apply when they are driving in predominantly Rural areas. Those for Urban areas are covered in the section following this one.

- C015 Primary Contributing Circumstances -- Speed. While speed limits are generally higher, there is nothing mandating greater speeds in Rural areas, except some Interstates with minimum speeds specified. For most drivers the actual speed chosen is a combination of what they consider to be (1) acceptably safe, and (2) not apt to get them a speeding ticket. The fact that you are traveling a safe speed is no guarantee that you will not fall victim to someone who is not, and we shall see that excessive speed is much more common on Rural than Urban roads.
    - C224 CU Estimated Speed at Impact. All collision speeds in excess of 40 MPH were very highly significantly over-represented (Odds Ratios between 2.004 and

7.086). The only exception was 96 to 100 MPH, which was over-represented with an Odds Ratio of 1.372.
    - C223 CU Speed Limit. With the exception of 60 MPH, all speed limits in excess of 50 MPH had over-representations in Rural areas with Odds Ratios ranging from 2.338 to 5.481. The typical county road speed limit of 45 MPH had 45,958 occurrences with an over-representation in rural areas of 1.207.
- C025 Crash (Injury) Severity. This is highly related to speed – an increase in impact speed of 10 MPH has been found (on average, above 40 MPH) to double the probability of a crash resulting in death. Other factors affecting injury severity include the following:
    - C323 Motorcycle Safety Equipment (Rural and Urban combined statistics). Helmet used 1 death in 26.5 crashes; no helmet 1 death in 9.7 crashes.
    - C323 Seatbelts (Rural and Urban Combined Statistics). With shoulder and lap belt: 1 death in 388.9 crashes; with no restraints: 1 death in 14.5 crashes.
    - C036 and C038 Police and Ambulance Delay. First responder time to the crash will be longer in Rural crashes for the obvious reasons that most police and EMS services are concentrated in urban areas. There is also a problem in Rural roads where the traffic volume is quite low, that the crash itself may not be discovered as quickly as on Urban roadways, especially in dark areas.
- C226 and C227 Vehicle Damage and Vehicle Towed (crash severity). Even if the safety equipment that is used (e.g. seatbelts) results in reduced injury severity, the downside of crashes with greater velocity on Rural roads is significantly more damage to the vehicles involved.
- C011 Highway Classification. Crash frequencies by Highway Classifications are highly significantly different for Rural than for Urban road crashes. Rural travelers are 8.030 times more likely to be on a County road and 2.386 more likely to be on an Interstate. There are also increased probabilities for State (1.289) and Federal roads (1.095). The construction (e.g., clear roadsides) of the various highway classifications can be highly related to both frequency and severity of crashes related to these roads.
- C412 CU Trafficway Lanes. The number of lanes is most often determined by the traffic density. While the additional lanes tend to inspire higher speeds, this might be countered by the increase ability of police and EMS to arrive at the scene in a shorter time. The probability of a fatality per crash on a two-lane Rural road is one in 40.2, while that same probability for four lane rural roads is one in 62.0.
- C052 Number of Vehicles. Single Vehicle crashes on Rural roads were over-represented by 3.513 times the probability of a Single Vehicle crash on Urban roads.
- C023 Manner of Crash. The following two crash types had the highest frequencies as well as the highest Odds Ratios (both given in parenthesis): Single Vehicle Crash – all types (82,486, 4.020), and Sideswipe – Opposite Direction (4,693, 1.612).
- C006 Day of the week. Weekends (Saturdays and Sundays) are over-represented both because the traffic mix is largely non-commuters on the road and issues with alcohol and other drugs. See C122 and C123 below.
- C019a Most Harmful Event (Rural Over-representations). The following rural results had a combination of a large frequency over 1000 crashes per year and an Odds Ratio of over 5.000. Both of these metrics are given in parenthesis: Overturn/Rollover (16,501,

9.726), Collision with Tree (16,290, 6.641), Collision with Ditch (11,266, 5.603), and Collision with Animal: Deer (6,939, 6.081).

- C008 Time of Day. The early morning hours from midnight until 7 AM are the most over-represented, with a second lower over-represented group occurring in the evening (7:00 PM through midnight), so these times might be avoided when driving on Rural roads.
- C031 Lighting Conditions. As indicated by the time of day, those hours without sunlight, and those areas without lighting are the largest problems for Rural roads.
- C004 Month. Rural crashes tend to occur during the winter months of December and January, and the summer months of June and July. The winter increase is typically linked to weather conditions, while the summer increase has more to do with increased vehicles on the Rural roads.
- C015 Primary Contributing Circumstances (PCCs) – Fatigued/Asleep. The longer driving times as well as the unchanging environment lead to about 4.516 times the probability of falling asleep at the wheel on Rural roads as opposed to Urban roads.
- C015 Primary Contributing Circumstances (PCCs) – DUI. Crashes due to driving impaired by alcohol or other intoxication drugs occur on Rural roads with a proportion that it 2.488 times that which occurs on Urban roads. One reason for this is the increased time spent on the roads when impaired driving occurs in the Rural areas. Just because you do not drink or take drugs is no reason to think this problem will not affect you – there are many innocent victims, so it is best to avoid Rural roads during the nighttime hours.
    - C122 Officer's Opinion Alcohol. The Rural roads are clearly those most apt to have crashes caused by DUI – Alcohol. The proportion of these crashes was 5.69% as compared to only 2.61% for those in the Urban areas (a highly significant Odds Ratio of 2.183).
    - C123 Officer's Opinion Non-Alcohol Drugs. While only about a third of the number, the proportions and Odds Ratios look very much the same as DUI – Alcohol given above. The proportion positive here was 1.94 for the Rural roads, but only 0.96 for the Urban roads, which results in an Odds Ratio of 2.025 (amazingly close to that of DUI alcohol above).
- C015 Primary Contributing Circumstances (PCCs) – Swerved to Avoid Animal. In over 90% of the cases the animal is a deer, but even large farm animals are several times more likely to wander out into a Rural as opposed to an Urban road.
    - C017 First Harmful Event. The following are the top four crash types, each of which had more than 5,000 (1,000 per year): Collision with Ditch (15,580), Collision with Tree (12,218), Collision with Animal: Deer (7,243), and Overturn/Rollover (5,656).
- C015 Primary Contributing Circumstances (PCCs) – Unseen Object /Person/Vehicle. This item is over-represented only by an Odds Ratio of 1.356, but its frequency in rural areas of 14.731 over the five years was the highest PCC, just below to the two combined speed indicators.
- C015 Primary Contributing Circumstances – other Rural PCCs with over 1,000 crashes per year: Defective Equipment (5,611), Swerved to Avoid Vehicle (6,930), Other Distraction Inside the Vehicle (5.950), and Ran off Road (5,360). Frequencies given are over the five years of the 2017-2021 data.

- C101 Causal Unit (CU) Type. The highest frequency causal units for Rural Crashes were: Pick-Up – Four-Tire Light Truck (37,707), Tractor/Semi-Trailer (6,996), Motorcycle (2,406), and Single-Unit Truck – 2-Axle/6-Tire (2,280).

Issues of Driving in Predominately Urban Roadways

These are arranged in the same ordering as those above for ease of reference. The following were found to be issues particularly associated with Urban driving:

- C015 Primary Contributing Circumstances -- Speed. While speed limits are generally lower in Urban areas, there is nothing keeping some violators from exceeding the speed limits. They will most often be weaving in and out trying to get ahead of slower vehicles. When identified, special care should be given not to conflict with their behavior. Once they get ahead they generally pose fewer problems. Despite being under-represented on the Urban roads, the combination of Over the Speed Limit and Driving too Fast for Conditions was a total of 18,342 crashes, so speed is an issue.
    - C223 CU Speed Limit. With the exception of 45 MPH, all speed limits below 55 MPH were over-representations for Urban roads. The most common speed limit for County roads (both Urban and Rural) is 45 MPH, and that is the reason that this speed is under-represented.
- C025 Crash (Injury) Severity. The two lowest injury severities, Property Damage Only and Possible Injury were over-represented for Urban roads. Despite this, there were still 1724 fatal crashes on Urban Roadways, and of there, 224 were pedestrian crashes. This was out of a total of 794 total pedestrian crashes, which is 30% of all pedestrian crashes.
    - C323 Motorcycle Safety Equipment (Rural and Urban combined statistics). Helmet used resulted in one death in 26.5 crashes; no helmet one death in 9.7 crashes.
    - C323 Seatbelts (Rural and Urban Combined Statistics). With shoulder and lap belt: one death in 388.9 crashes; with no restraints: one death in 14.5 crashes.
- C011 Highway Classification. Municipal and Private Property were the only two classifications over-represented for urban crashes. Municipal had an Odds Ratio of 44.869, since only 1.16% of Municipal crashes are recorded to occur on Rural roads. Federal, State, Interstate and County roads were all under-represented.
- C412 CU Trafficway Lanes. Two lanes is the only number of lanes that is under-represented, having only 37.39% of their proportion on Urban as opposed to 62.06% on Rural roads. Four lanes and 6 lanes (or more) account for about another 40% of Urban road crashes.
- C052 Number of Vehicles. By far, the largest frequency for number of vehicles on Urban roads is two-vehicle crashes (469,385), with 80.43% of the Urban crashes and an over-representation indicated by an Odds Ratio of 1.662. Four vehicles or above accounted for over 30,000 more crashes. Only about 13.56% of Urban crashes involve a single vehicle.
- C023 Manner of Crash. The largest number of Urban crashes were Rear End (front to rear). These are generally caused by what is known as “tailgating,” i.e., driving too close to another vehicle resulting is a crash when the car in front applies the brakes. The following are the top four Manner of Crash types (total five year frequencies in

parenthesis): Rear End – front to rear (223,657), Side Impact – angled (56,339), Side Impact – 90 degrees (58,813), and Sideswipe - Same Direction (60,421). All other types had frequencies less than 20,000 over the five years.

- C006 Day of the week. Weekend days (Saturday and Sunday) are under-represented in Urban crashes. All of the other ("work") days are under-represented.
- C019b Most Harmful Event (Urban Over-representations). The following Urban results had a large frequency over 5,000 crashes over the five years of the data (frequencies given in parenthesis): Collision with Vehicle in Traffic (446,181), Collision with Parked Motor Vehicle (32,938), and Collision with Vehicle in (or from) Other Roadway (15,552), and Ran Off Road Right (6,814). Ran Off Road Left was the next down on the list with 3,892 crashes.
- C008 Time of Day. The greatest Urban crash over-representations were from 11 AM through 5:59 PM. Later evening hours are under-represented from 7:00 PM through 7:59 AM. Rush hours, especially those in the afternoon are dramatically over-represented. Optimal time for shopping would be 8:00 AM through 11:00 AM.
- C031 Lighting Conditions. The favored time for travel is in natural daylight, and as a result the largest number of crashes occur during these times. Dark times, either with roadway lighting or not are the conditions that have the fewest Urban crashes. The following are the top 4 conditions with the largest number of crashes (frequency during the five-year reporting period): Daylight (430,604), Dark - Spot Illumination Both Sides of Roadway (44,797), Dark - Continuous Lighting Both Sides of Roadway (23,566), and. Dark - Spot Illumination One Side of Roadway (22,021).
- C004 Month. Urban crashes tend to occur in the early Spring months (February, March and April) along with others to the end of the year (August, September, October and November. None of these have dramatically high Odds Ratios, and so we conclude that the month of the year is not a major factor in Urban crashes, which generally follow the natural variations.
- C015 Primary Contributing Circumstances (PCCs) – Following too Close (86,549) and Misjudge Stopping Distance (54,591). These two PCCs point to the largest crash frequencies for Urban crashes. They account for most of the rear-end crashes. The connection between them is obvious, and it might be difficult for the reporting officers to distinguish between them.
- C015 Primary Contributing Circumstances (PCCs) – Failed to Yield. The following list demonstrates the various ways that Urban drivers: (1) Failed to Yield, (2) Ran Traffic Signals, and (3) Ran Stop Signs. All (except those noted otherwise) were over-represented for Urban crashes and the frequency over the five years of the data is given for each. Items are arranged by highest Max Gain first.
    - Failed to Yield Right-of-Way Making Left or U-Turn 27,443
    - Ran Traffic Signal 20,502
    - Failed to Yield Right-of-Way from Traffic Signal 11,871
    - Failed to Yield Right-of-Way from Driveway 12,314
    - Failed to Yield Right-of-Way from Stop Sign 28,456
    - Failed to Yield Right-of-Way Making Right Turn 2,727
    - Failed to Yield Right-of-Way from Yield Sign 3,199
    - Failed to Yield Right-of-Way from Parked Position 1,733
    - Other Failed to Yield 6,051

    - Failed to Yield Right-of-Way at Uncontrolled Intersection 2,710
    - Failed to Yield Right-of-Way Making Right Turn on Red Signal 495
    - Failed to Yield Right-of-Way to Pedestrian in Crosswalk 264
    - Ran Stop Sign (Urban Under-Represented) 5,600
    - Failed to Yield Right-of-Way (Urban Under-represented) 1,152
- C015 Primary Contributing Circumstances (PCCs) – Improper Lane Change. This fault had an Urban frequency over the five years of the data of 35,663 and an Odds Ratio of 1.231. The comparable Rural item had a frequency of 8,890.
- C101 Causal Unit (CU) Type. The highest frequency causal units (over the five years of the data) for Urban Crashes with Odds Ratios greater than 1.000 were: Passenger Car (185,448) and Sport Utility Vehicle – SUV (123,573). All others except for Mini-van (with 12,499) had less than 5000 crashes over the five years.

Executive Summary: Brief Results of IMPACT Findings

As a general description, IMPACT is a convenient and simple way of comparing data in two subsets in order to determine what the differences are between comparable attributes. In this example all Rural crash attributes were compared to the same attributes for all Urban collisions in the same subset. The *attributes* are characteristics that appear in both datasets, such as County, City, Year, Month, Day of the Week, Time of Day, etc. We will have over 40 such comparisons in the IMPACT Results section below. Unlike most other IMPACT studies, there is no single type of crash that is being analyzed for purposes of reducing it. In this study, the goal is to provide information on both Rural and Urban crashes so that they may both be reduced by taking the appropriate action for both. Thus, we elected to consider all attributes that could in any way change the frequency or severity of either the Rural or the Urban components of these crashes. Attributes that could have any effect on driver or passenger behavior for such crashes were included. More information is given on IMPACT details using Highway Classifications as an example presented above in a section called "General Discussion of IMPACT Output Terms Using Highway Classification for Example."

Brief Summary of IMPACT Findings for Rural and Urban Crash Reduction

This section will provide a very brief statement of the findings within each of the IMPACT analyses, which might be helpful in traversing the IMPACT studies. Some attributes are indented five columns to show a deviation from the normal CARE IMPACT ordering, and to indicate that these variables generally add information to the attribute above it (that is not indented).

Overall Geographical Attributes

C001 County Locations. County locations are somewhat surprising since we would expect the counties with the largest cities to appear on top. However, the counties of Jefferson, Mobile and Montgomery were at the bottom of the list because they were under-represented in comparison to Rural crashes in general (over-represented in Urban crashes). Notice that the filter being used is called Rural. The default subset for comparison is all of the crashes that were considered to be not Rural, or what we are calling Urban. So, unless otherwise stated, all of the IMPACT analyses compare both the Rural and Urban simultaneously in one IMPACT output.

C002 City Location. The virtual cities (Rural areas of counties), which are viewed as cities for comparative purposes, are the only areas of the roadway that are over-represented in Rural crashes.

C033 Locale. The only locale that is over-represented in Rural crashes is Open Country, which is a more specific description indicating the roadway environment than calling them Rural or Urban. As expected, its over-representation for the rural roads is very large, with an Odds Ratio of 6.449. All other items were significantly under-represented for Rural roads..

Time attributes

C003 Year. Years 2020, and 2021 are significantly higher in their proportions of Rural than Urban crashes. The pandemic-caused drop in 2020 included both Rural and Urban, but it had a larger effect on Urban crashes. Years 2017 and 2018 show a higher proportion of Urban crashes. The table and chart are in Max Gain order. All of the difference seen in the table or on the chart are significant, so this would indicate a turn-around in fewer Rural crashes, or it could equally be viewed as a relative increase in the Urban frequency.

C004 Month. December and January, the two months when weather could cause slippery roads and bridges that might account for the increased crashes. May, June and July probably have more traffic in the Rural areas because of vacation and recreational travel.

C006 Day of the Week. Rural crashes are significantly over-represented on the weekends, while Urban crashes are over-represented on the weekdays. See C122 and C123 for the effects of DUI may be having on weekend crash rates.

C007 Week of the Year. The first three weeks of the year and the last two weeks of the year are nearly identical in their over-representations of Rural. The other weeks are highly mixed so no patterns emerge.

C008 Time of Day. The early morning hours (12 Midnight through 6:59 AM) are over-represented for Rural crashes, as are the late evening hours (after 7 PM).

C031 Lighting Conditions. This confirms the time of day findings, and it also indicates the positive effects that roadway lighting can have. There are two attributes that are the most over-represented in the Rural dark hours (1) Dark—Roadway Not Lighted and (2) Dark – Roadway Lighted. While the second of these has a huge Odds Ratio (33.359), the number of Rural crashes in this category was only 2,078, as compared to 48,083 in the Dark – Roadway Not Lighted category.

Crash Severity and Severity Contributing Attributes

C025 Crash Severity. All of the Rural injury crashes are over-represented, demonstrating that Rural crashes are usually the more severe for injuries. The two most serious Rural injuries (with Frequency and Odds Ratios) are Fatal Injury (2,597, 4.909) and Suspected Serious Injury (11,680, 3.620).

C323 CU Driver/Non-Motorist Safety Equipment. The overall Rural-Urban comparison for Safety Equipment shows that Urban seatbelt use proportion (96.38%) is significantly higher than that in the Rural areas (90.19%). In several categories, however, motorcycle safety equipment is more predominant in the Rural areas. The following cross-tabulation display illustrates the value of this Safety Equipment.

C025 Severity by C323 Safety Equipment Cross Tabulation. This analysis was performed over both Rural and Urban records to see the effects of all of the listed safety equipment types.

Any use of a motor vehicle without the appropriate Safety Equipment multiplies the chance of a fatality or serious injury by several orders of magnitude. This cross-tabulation demonstrates this with combined Rural and Urban crash data. Please see the blurb under this cross tabulation for more details

C226 CU Vehicle Damage. Damage was major and disabling in 55.99% of all of the Rural cases. This should clearly reinforce the necessity to buckle up regardless of the duration or destination of the trip. It is also a further reminder that Rural crashes are generally of much higher severity than those occurring in Urban areas.

C227 Vehicle Towed. This is a further objective observation with regard to potential injury and death. The fact that 56.45% of the Rural crashes required towing because they were disabled, but only 27.59% of the Urban crashes required it shows the great disparity. Disabled Damage means that the vehicle cannot be safely driven away from the scene. Other reasons for towing could include the driver's inability to operate the vehicle because of such things as trauma or DUI.

C036 Police Arrival Delay. Arrival delays are the time of arrival minus the time of the crash. They relate to severity in that the sooner the responders get to the scene, the more they can do to address any injuries. For rural crashes, all items 15 minutes or less were significantly under-represented; all items from 21 to above 180 minutes were over-represented by at least factors of 2.000.

C038 Adjusted EMS Arrival Delay. A cross-tabulation between EMS and Police Arrival Times showed a strong correlation between them, and also that the EMS often arrived prior to the police. People might put off calling the police, but when an injury is involved, they recognize the need for immediate action.

C038 by C025 Adjusted EMS Arrival Delay by Crash Injury Severity. This cross-tabulation shows how much quicker a response is called for as a function of the crash severity. This cross-tabulation is for all roadways and crashes, not just rural as in the IMPACT runs. Generally, response time is longer for Rural than for Urban roads since police and EMS capabilities reside primarily in the cities. The next four items appear here (indented) because they might have an effect on arrival times.

C011 Highway Classification. County roads had the highest over-representation of Rural crashes with a very high Odds Ratio of 8.030. At the other end are under-represented Municipal roads with nearly the opposite Odds Ratio (0.022). Both were highly statistically significant. The table ordering for this was again Max Gain, as opposed to the natural ordering for the arrival delay items.

C412 CU Trafficway Lanes. Almost all county roads are two lanes, which explains their highest over-representation (1.660 Odds Ratio) of all categories. All other Odds Ratios were less than 1.000, indicating that the Urban proportion of crashes on these roads is higher than the Rural proportion.

C030 Functional Class. This attribute, which is displayed in Rural Max Gain order, shows the use of the various roadway Functional Classifications. Interstate, Major Collector and Minor Collector were the only three Classes that were over-represented for Rural roads.

C030 by C011 Cross-tabulation (Functional Class by Highway Classification). This was run because few people have a working knowledge of Functional Class categories. The correlations are obvious, but not perfect. This cross-tabulation includes both Rural and Urban crashes.

Driver Behavior

C015 Primary Contributing Circumstances. The major purpose for this attribute is in discovering those driver behavior causes that were instrumental in either causing or increasing the severity of the crashes. The displays for C015 are subdivided into (a) the Rural over-represented and (b) the Urban over-represented (which appear on the display as under-represented). The displays give the two ends of the distribution, and thus they present the most over- (and under-) represented items. Additional items within C015 are presented in separate discussions – see the additional C015 narratives within the "Issues of Driving in Predominantly Rural Areas" section above.

C224 Estimated Speed at Impact. Past repetitive research has determined and confirmed that for every increase in the impact speed or 10 MPH (above 40 MPH) there is a doubling of the probability that the crash will be fatal. It is obvious from this display the reason that so many more fatalities occur on the Rural roads.

C223 CU Speed Limit. This is quite useful for comparing against the estimate impact speed, C224, immediately above. It is important to realize that just being under some speed limit does not imply legality. For example, most County roads have speed limits of 45 MPH, but the roadway conditions (especially weather) can mandate speeds less than that. Drivers that obey all speed laws can also be victims of speeders on both Rural and Urban roads.

C052 Number of Vehicles. This is in Natural Order. It shows that Rural crashes are predominantly single-vehicle (47.62%), while Urban Crashes are much more likely to involve more than one vehicle (13.56% for single). The large majority of Urban crashes (80.43%) involve two vehicles.

C019a Most Harmful Event (Rural over-representations). We have divided this attribute into those that have Rural over-representations and those with Urban over-representations. This attribute is quite useful in providing information on what made the crash as severe as it turned out to be. The six with the highest Max Gains (with their frequencies) are as follow: Overturn/Rollover (16501), Collision with Tree (16290), Collision with Ditch (11266), Collision with Animal: Deer (6939), Collision with Other Non-Fixed Object (3768), and Collision with Cable Barrier (2566).

C019b Most Harmful Event (Urban over-representation). The following six items had the smallest negative Max Gains, indicating their Urban over-representations (given with their frequencies): Collision with Curb/Island/Raised Median (229), Ran Off Road Left (495), Ran Off Road Right (882), Collision with Vehicle in (or from) Other Roadway (1,510), Collision with Parked Motor Vehicle (2,604), and Collision with Vehicle in Traffic (84,732).

C023 Manner of Crash. Because it is correlated with potential severity, the manner of crash is a very useful attribute. There are only three of these over-represented items for Rural crashes: Single Vehicle (all types), Sideswipe, Opposite Direction, and Non-Collision. Bottom of the output the over-represented Urban crash types are given. The top four are: Rear End (from to rear), Side Impact (angled) and Side Impact (90 degrees), and Sideswipe – Same Direction. The following cross-tabulation shows the relationship with Crash Severity for all items.

C025 by C022, Cross-tabulation: Crash Injury Severity C025 by Manner of Crash C022. This cross-tabulation is for all crashes, both Rural and Urban. The highest four over-representations for fatal crashes are: Single Vehicle Crash (all types), Head On (front to front only), Angle Oncoming (frontal), and Side Impact 90 degrees.

C101 Causal Unit (CU) Type. The top four over-represented vehicle types (Passenger Car, Sport Utility Vehicle, Motorcycle and Mini-van) account for 83.93% of the Rural crashes. The two most over-represented Urban crash Causal Units are Passenger Cars and Sport Utility Vehicles (SUVs)

C080 Commercial Motor Vehicle (CMV) Involved. CMV crashes are over-represented on rural roads with a proportion of 8.47% as opposed to Urban roads where their presence is 4.57%, resulting in an Odds Ratio of 1.852, which is nearly twice that expected.

C104 CU Left Scene. When considering all crashes, it seems clear that leaving the scene of a crash is more of an Urban issue that that of Rural crashes. One thing that would contribute to this is the increased severity of the Rural crashes making fewer vehicles able to leave the scene even though there might be a high incentive to do so.

Driver Characteristics

C107 CU Driver Raw Age. Ages 16-18 are significantly over-represented compared to their crashes in general. However, the major Rural over-representation problem group seems to be in the 33 through 56 age groups, which are consistently over-represented as shown in the table and the chart. This age group probably consists of a large proportion of professional drivers, who are on Rural roads more than most other drivers. They should be particularly aware of their collective vulnerability to be involved in Rural road crashes that generally result in higher injury severities.

C108 CU Driver Race. White/Caucasian was significantly over-represented in Rural crashes (Odds Ratio 1.238). Hispanic and Black were significantly under-represented (Odds Ratios 0.956 and 0.788, respectively). All others were close to that expected from their proportions of crashes in general.

C109 CU Driver Gender. Reflecting their driving patterns, Males are over-represented on Rural roads, while Females are over-represented on Urban roads.

C110 CU Driver Residence Distance. "Greater than 25 Miles" is over-represented for Rural roads with an Odds Ratio of 1.570. "Less than 25 Miles" is over-represented for Urban roads with at a proportion of about 5% greater than expected.

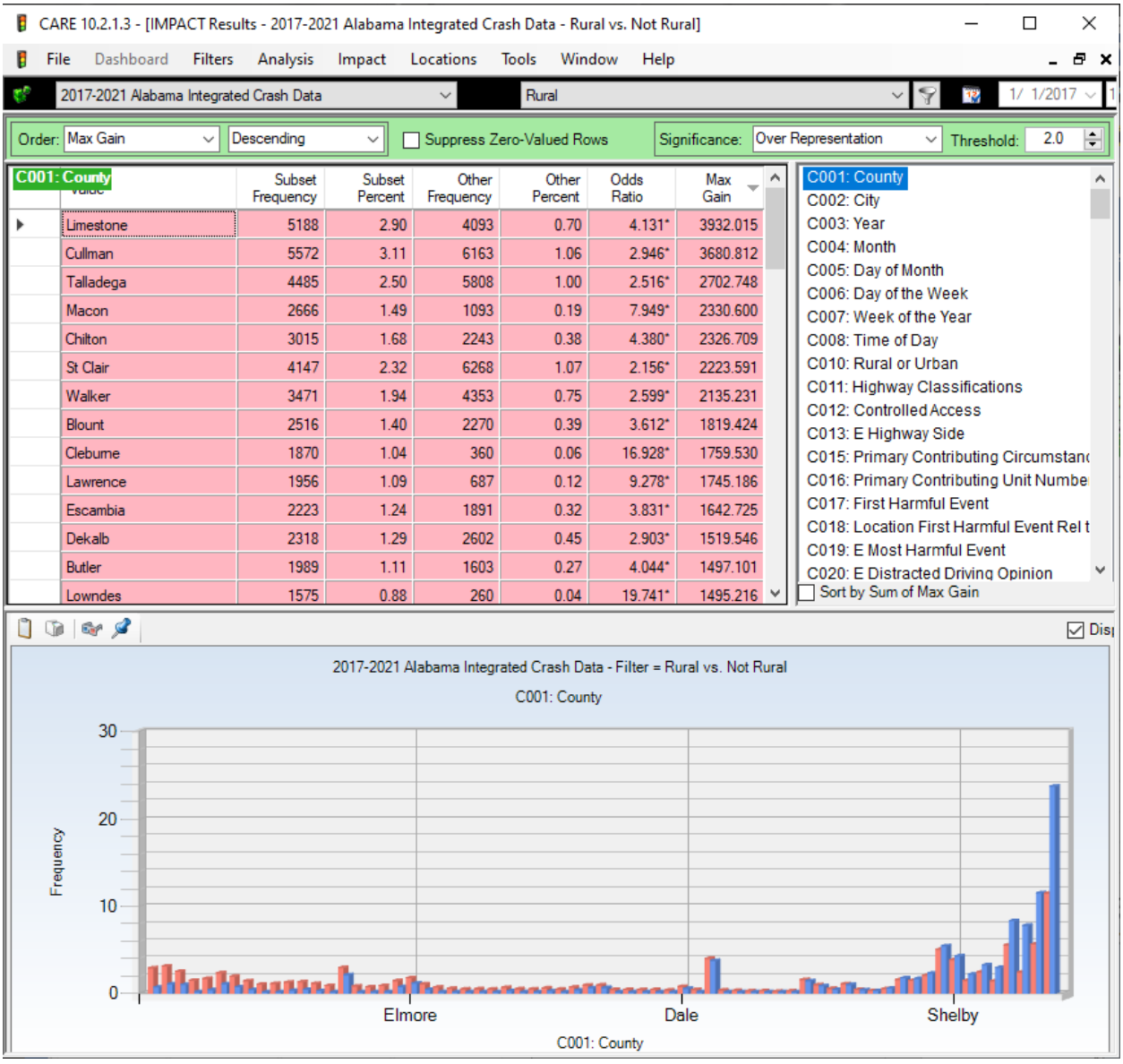
C111 Driver License State. As expected, except for Alabama-licensed drivers, those from states proximal to Alabama have the greatest numbers of Rural crashes in Alabama. Tennessee, Mississippi, and Georgia were the only three states that were significantly over-represented for Rural crashes. About 17 states were over-represented in Urban crashes, and about 36 states had no Rural crashes at all in Alabama.

C122 Officer's Opinion Alcohol. Rural roads are clearly those most apt to have crashes caused by DUI from Alcohol. The proportion of these crashes was 5.69 as compared to only 2.61 of those in the Urban areas (a highly significant Odds Ratio of 2.183). This could be caused, here and for drugs below, due to the increased driving required to get back from the Rural areas.

C123 Officer's Opinion Non-Alcohol Drugs. While only about a third of the number, the proportions and Odds Ratios look very much the same as was true of the DUI from Alcohol. The proportion positive here was 1.94 for the Rural roads, but only 0.96 for the Urban roads, which results in an Odds Ratio of 2.025 (amazingly close to that for DUI alcohol above).

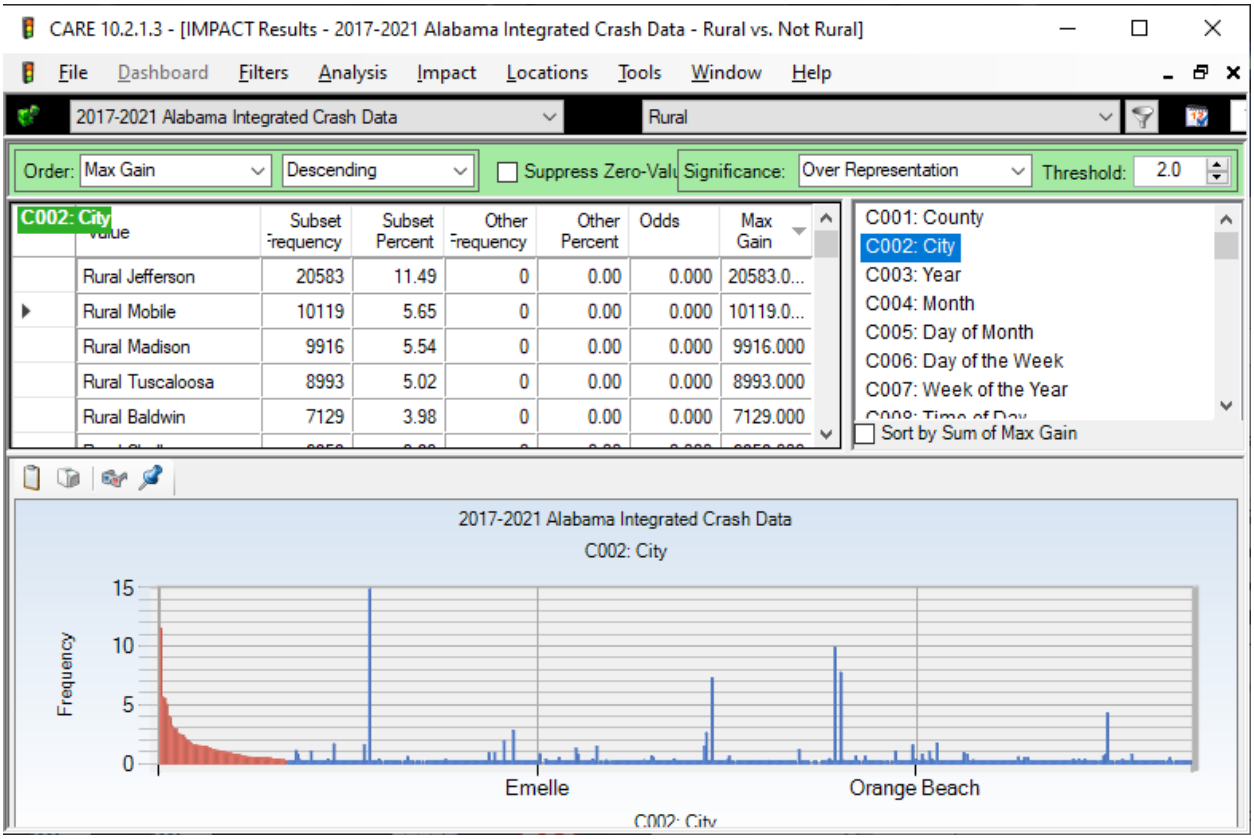
IMPACT Results

C001 County Locations



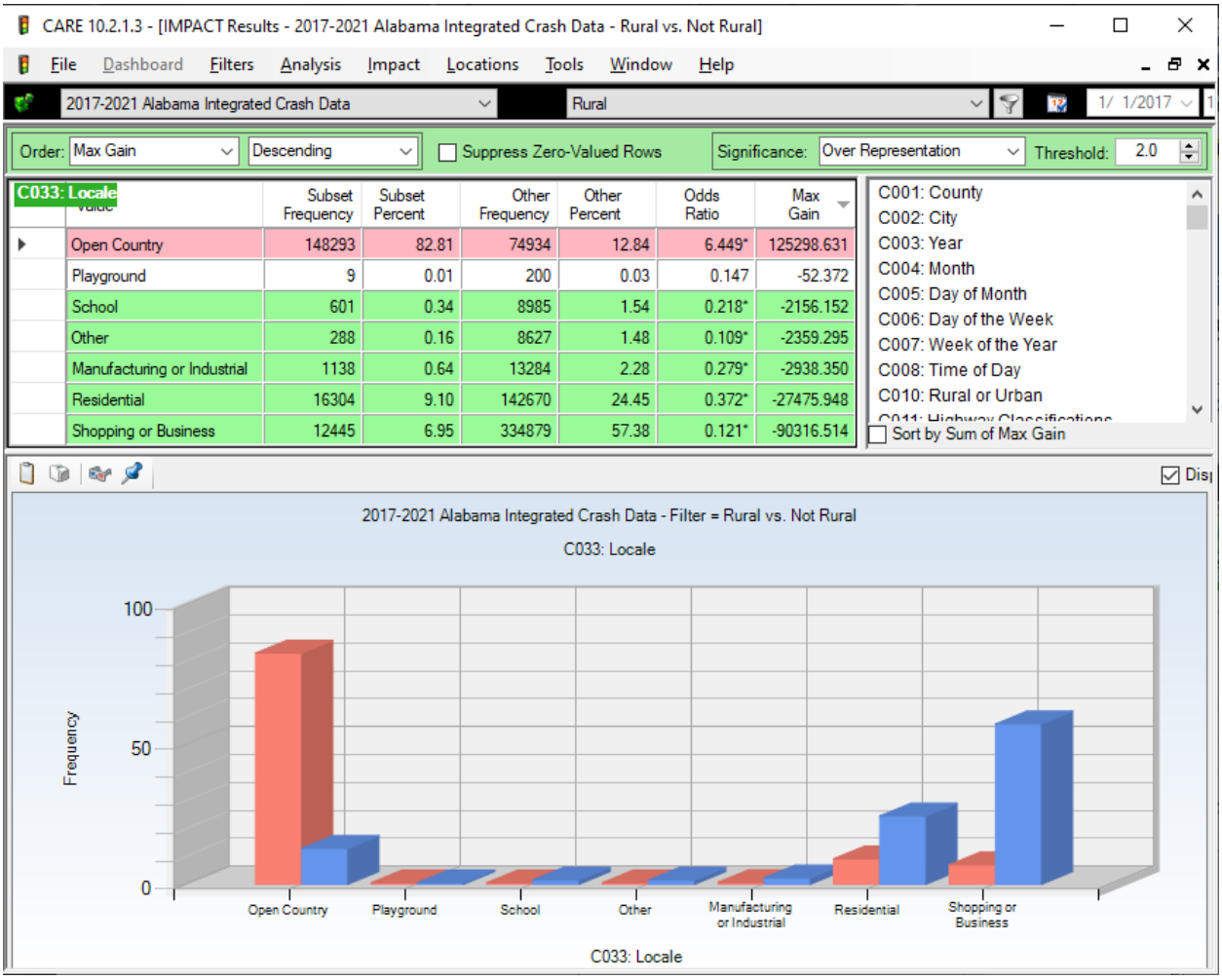
County locations are somewhat surprising since we would expect the counties with the largest cities to appear on top. However, the counties of Jefferson, Mobile and Montgomery were at the bottom of the list because they were under-represented in comparison to Rural crashes in general (over-represented in Urban crashes). Notice that the filter being used is called Rural. The default subset for comparison is all of the crashes that were considered to be not Rural, or what we are calling Urban. So, all of the IMPACT analyses compare both the Rural and Urban simultaneously in one IMPACT output.

C002 City Locations



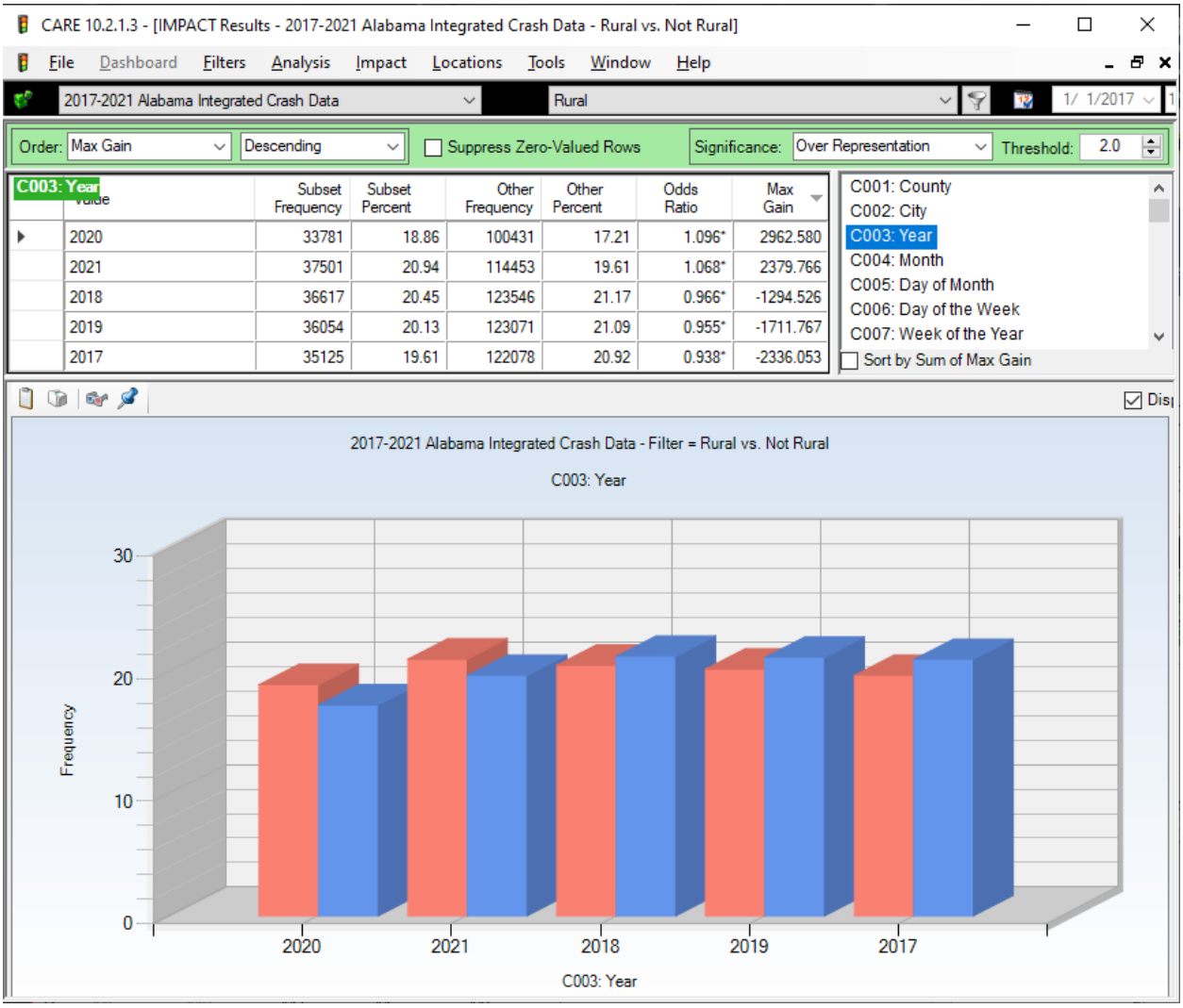
In Max Gain order, all of the over-represented cities will be the virtual areas of the county that are considered as cities for comparative purposes.

C033 Locale



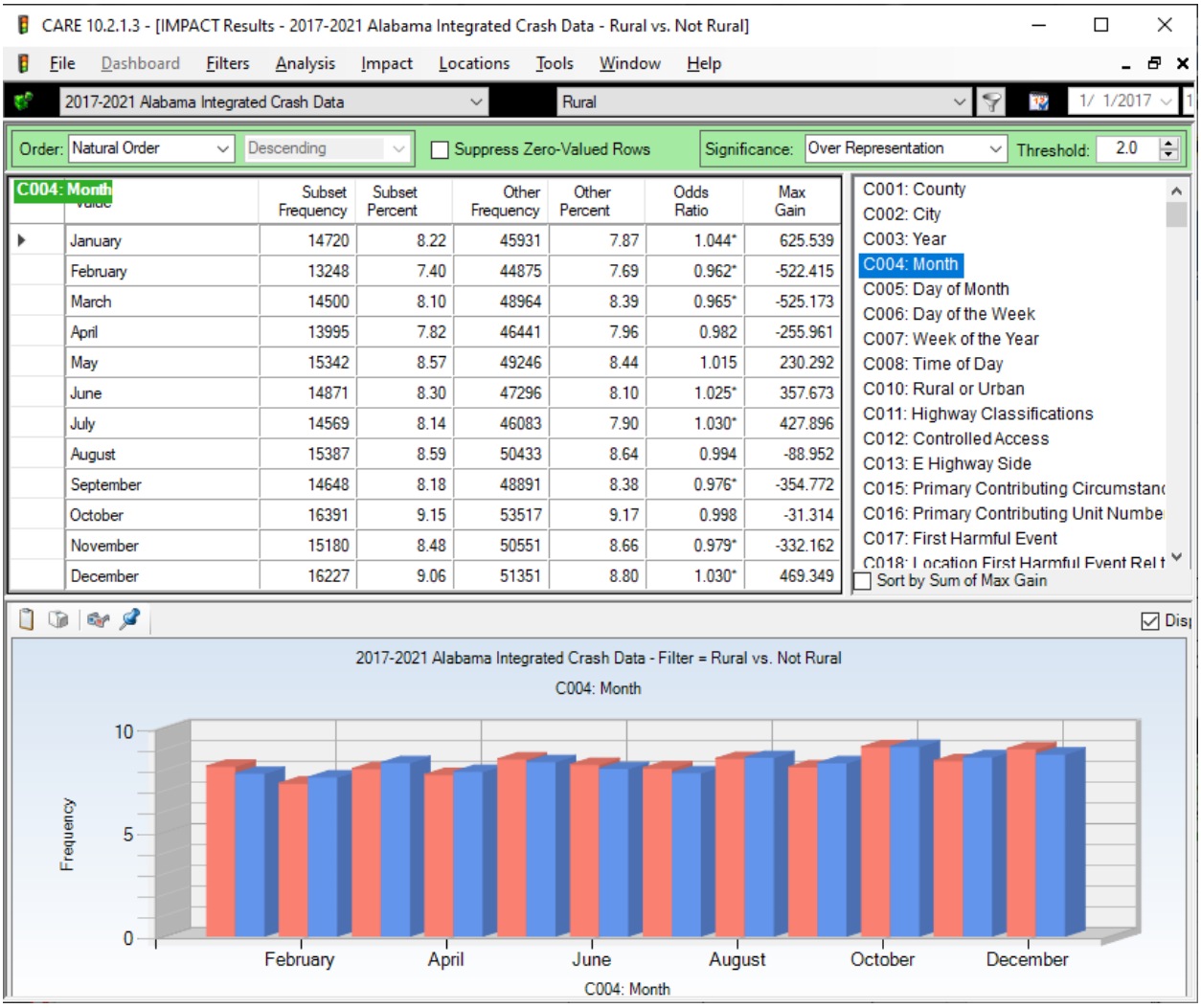
The locale of Open Country is generally thought to be consistent with Rural crashes. However, 74,934 Urban crashes were also classified as Open Country. This shows that approximately 12.84% of "Urban Crashes" are actually in Open country even though technically they are within the boundaries of city limits. This being the case, some of the attributes of Rural areas might apply to areas marked as Urban.

C003 Year



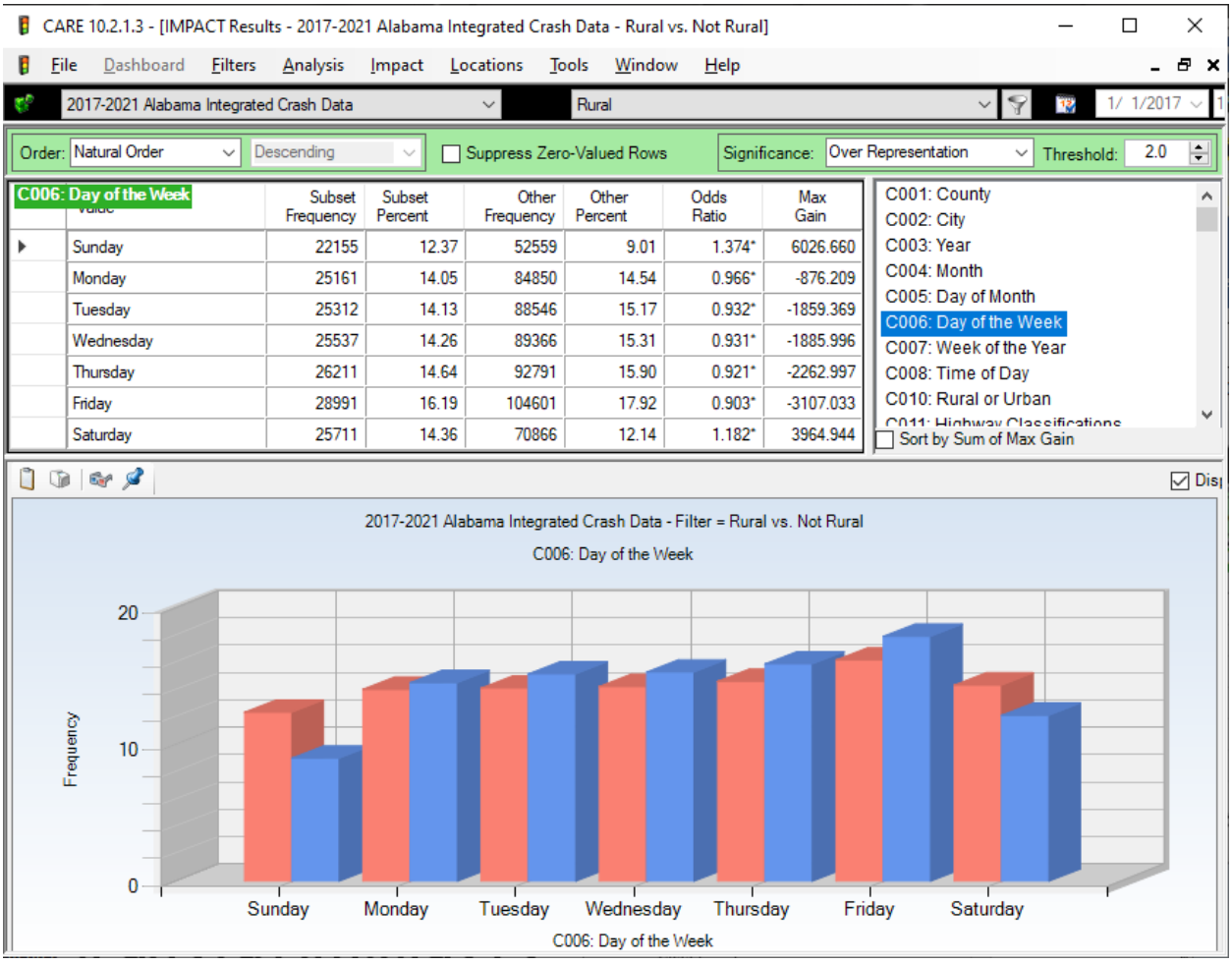
From a proportion point of view, the rural crashes started out higher than Urban, but in the past three years it has gotten significantly smaller. All of the difference seen in the table or on the chart are significant, so this would indicate a turn-around in fewer Rural crashes, or it could equally be viewed as a relative increase in the Urban frequency.

C004 Month



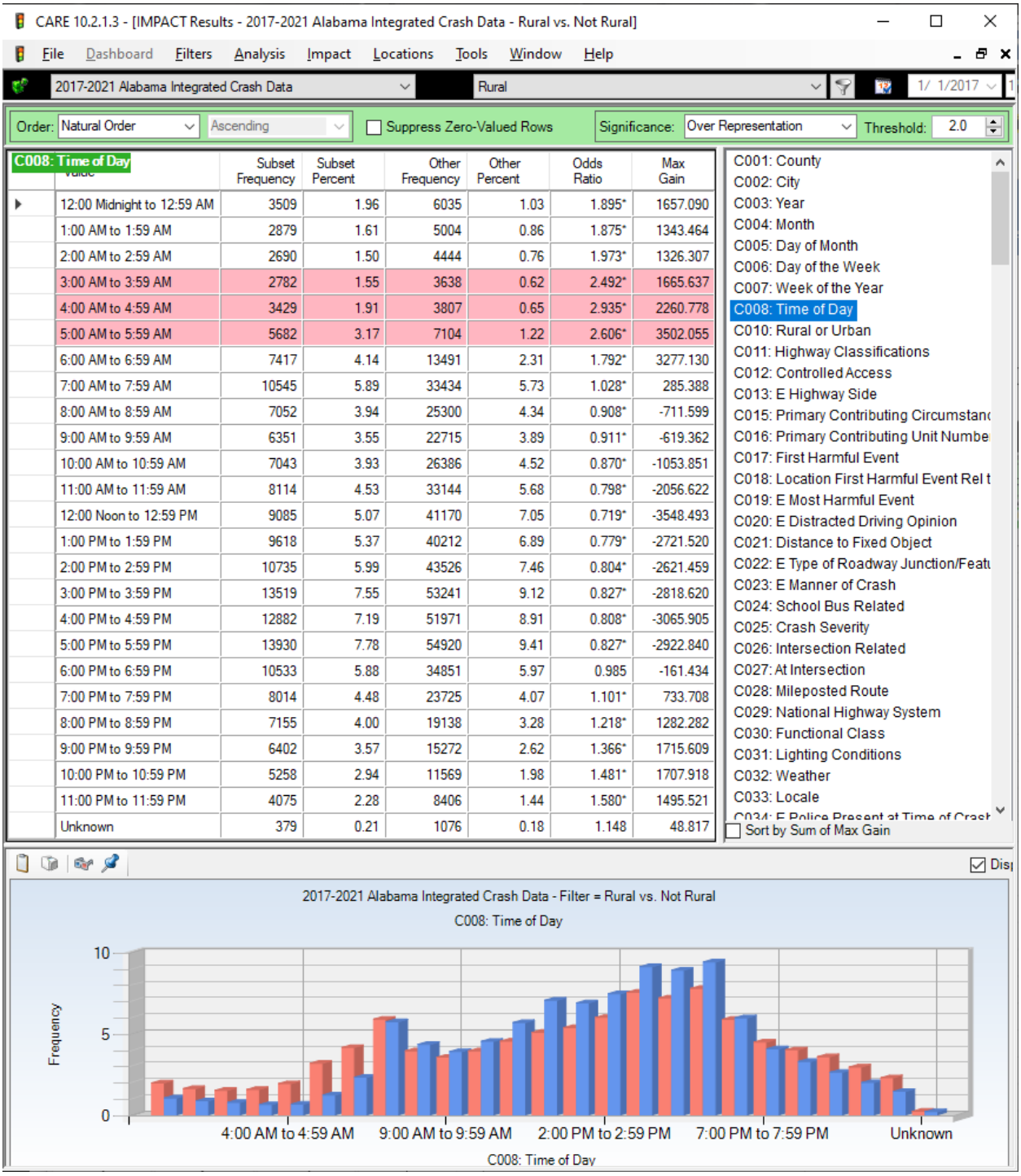
While there is considerable significant variation by month, there is no clear consistent pattern, so the differences appear to be random.

C006 Day of the Week



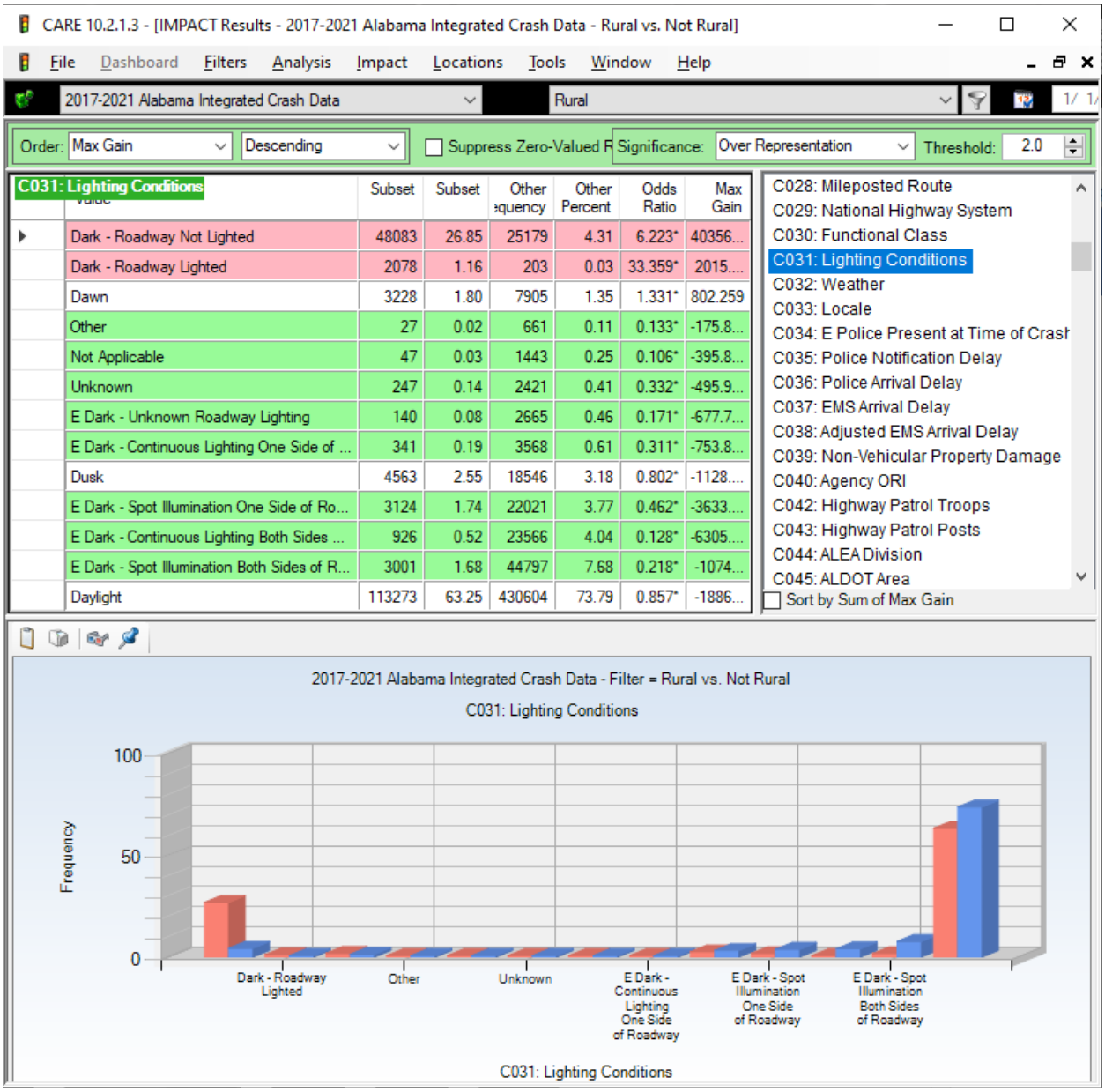
Clearly Saturday and Sunday are over-represented in Rural crashes, while the days during the week are all significantly over-represented with Urban crashes. The former would include some recreational travel while the latter would include many shopping trips.

C008 Time of Day



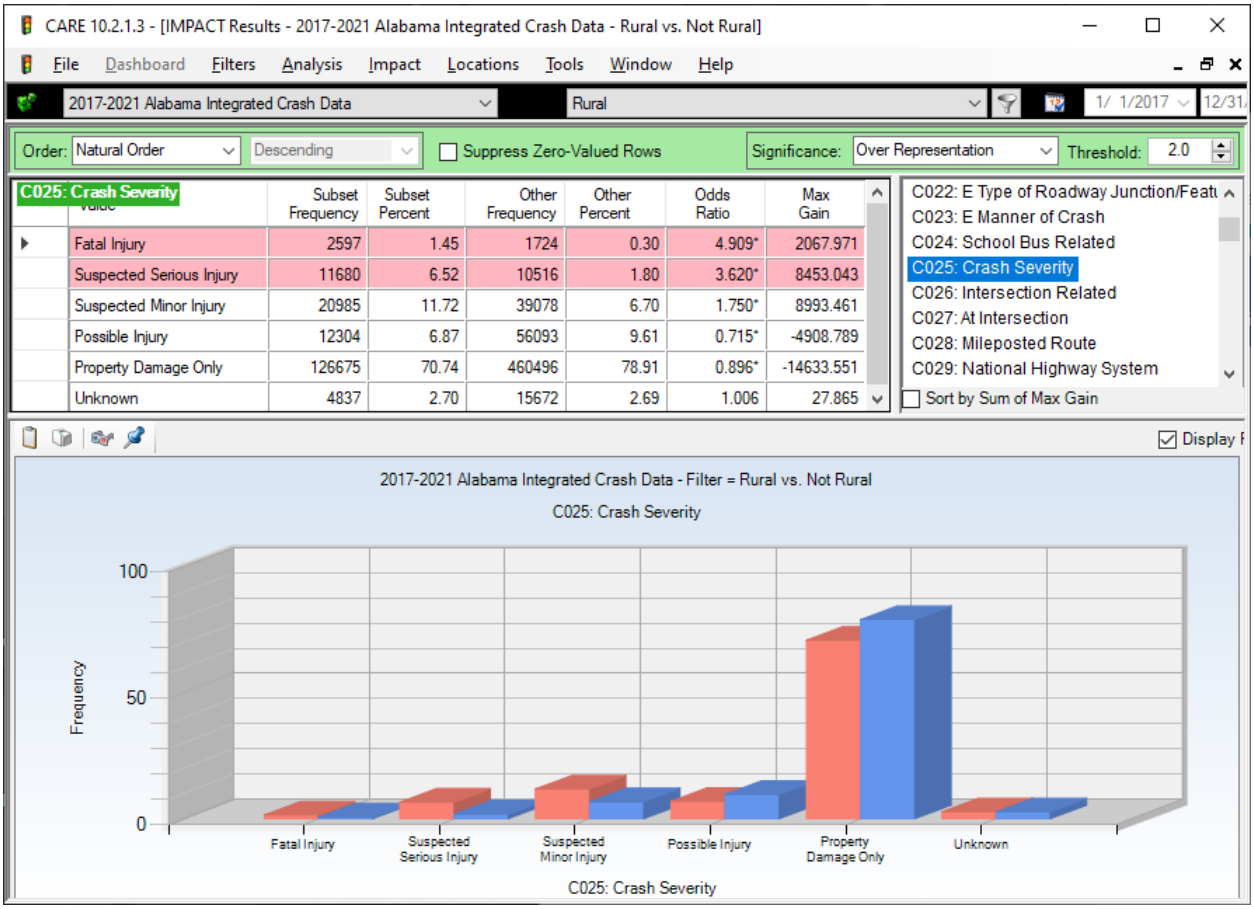
A very strong correlation is in the time of day. Most normal work hours from 8 AM through 6 PM are over-represented in Urban crashes, while most of the nighttime hours, and especially those after midnight are over-represented in rural crashes.

C031 Lighting Conditions



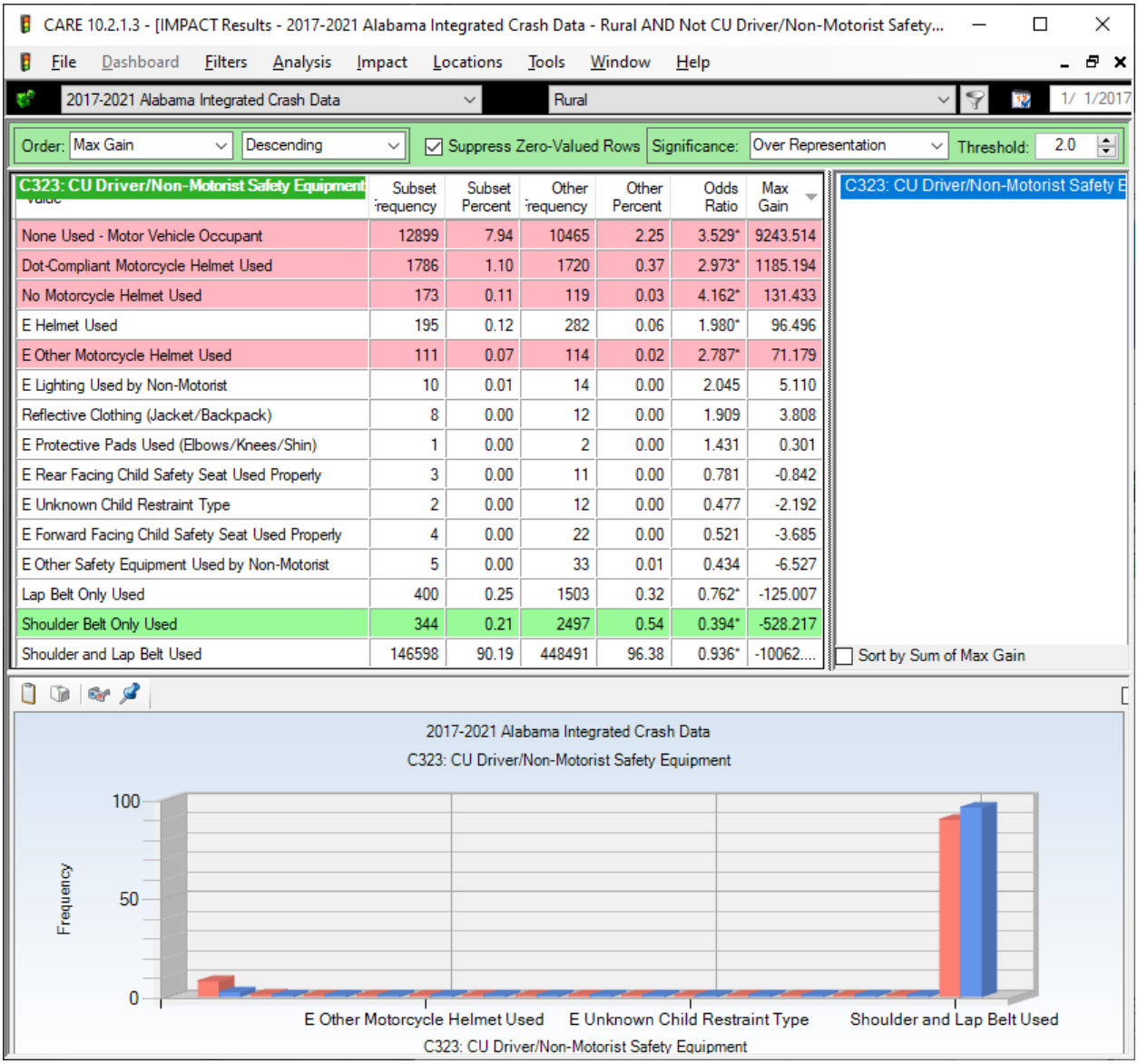
Dark-not lighted has the largest number, Percentage and Max Gain. Clearly most travel during darkness is in the rural areas. Dark-Roadway Lighted is also over-represented by a very large Odds Ratio, mainly because there are so few of these (only 203, 0.03%) in the Urban areas. Recognize that these results are not telling us what *ought* to be, they are telling us what the reality has been over the past five years.

C025 Crash Severity



The Crash Severity IMPACT results (in natural order) demonstrate how much more severe Rural crashes tend to be than those in the Urban areas. The top most severe Rural crashes are significantly over-represented. The primary cause for this is speed at impact.

C323 CU Driver/Non-Motorist Safety Equipment



The bottom line gives an overall comparison that shows that Urban seatbelt use proportion (96.38%) is significantly higher than that in the Rural areas (90.19%). On the other hand, results for motorcycles show proportionate the use of safety equipment for motorcycles to be twice as high in the rural areas as in the urban areas. Motorcycle riders and operators realize that the increased speeds in the rural areas can be lethal without this protection.

See the C025 vs C323 cross-tabulation – next item for an indication of the increased severity when safety equipment is not used.

C025 and C323 Cross-Tab of Severity by Safety Equipment

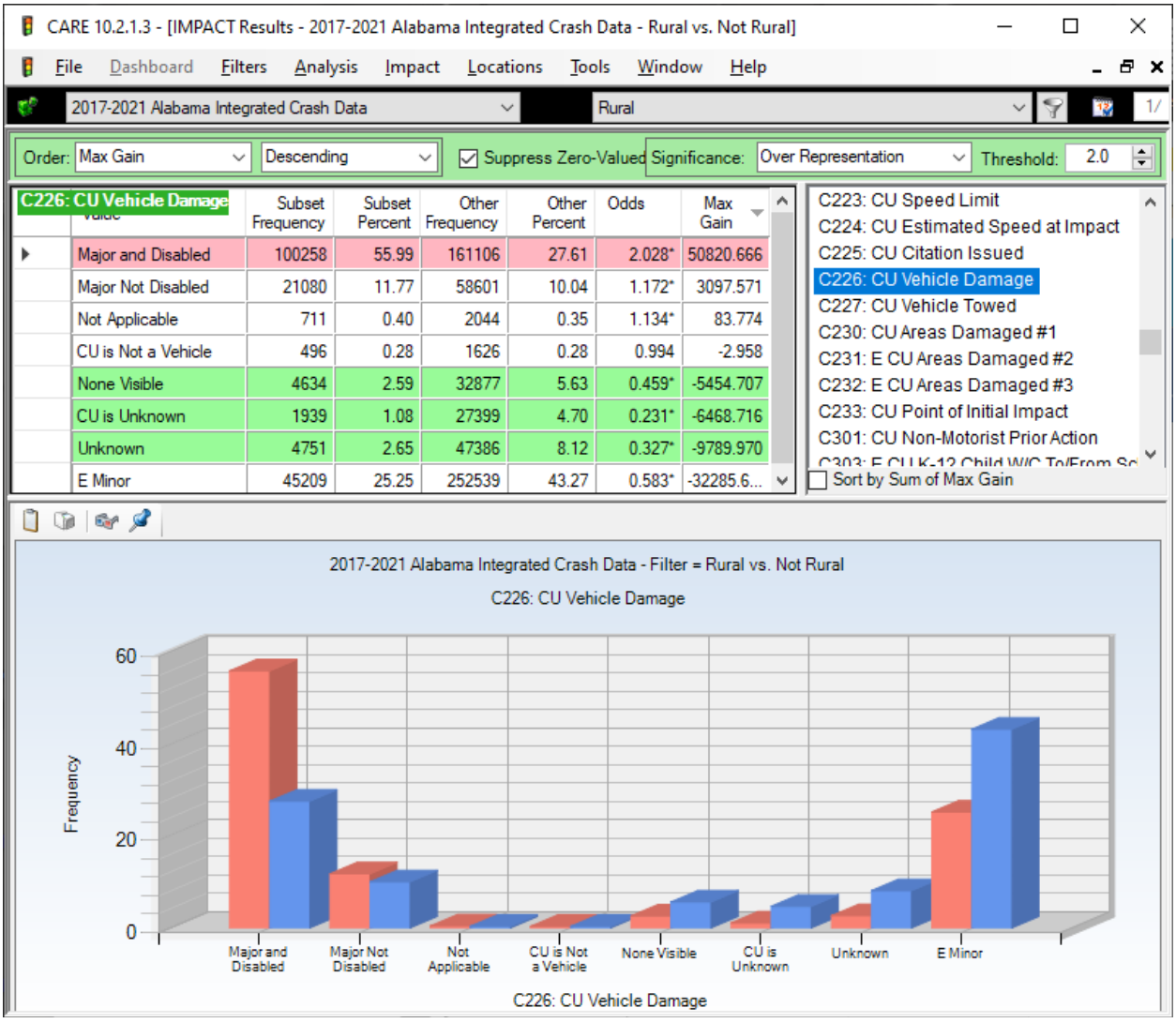
2017-2021 Alabama Integrated Crash Data | All records (do not apply a filter) | 1/ 1/2017 | 12/3

Suppress Zero Values: Rows and Columns | Select Cells: | Column: Crash Severity ; Row: CU Driver/Non-Motorist Safety Equipment

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
None Used - Motor Vehicle Occupant	1615	4529	5186	2479	8921	634	23364
Shoulder and Lap Belt Used	1530	13361	44988	55681	467346	12183	595089
Lap Belt Only Used	9	50	115	165	1478	86	1903
Shoulder Belt Only Used	6	37	152	214	2293	139	2841
E Forward Facing Child Safety Seat Used Properly	0	1	3	1	21	0	26
E Rear Facing Child Safety Seat Used Properly	0	0	0	3	10	1	14
E Child Booster Seat Used Properly	0	0	0	0	1	1	2
E Forward Facing Child Safety Seat Used Improperly	0	0	0	0	2	0	2
E Rear Facing Child Safety Seat Used Improperly	0	0	0	0	1	0	1
E Unknown Child Restraint Type	0	0	0	0	11	3	14
E Child in Arms of Restrained Adult	0	0	2	0	16	0	18
Dot-Compliant Motorcycle Helmet Used	197	954	1168	343	791	53	3506
E Helmet Used	18	97	159	48	117	38	477
E Protective Pads Used (Elbows/Knees/Shin)	0	1	0	1	1	0	3
Reflective Clothing (Jacket/Backpack)	2	8	8	0	1	1	20
E Lighting Used by Non-Motorist	2	4	4	3	11	0	24
E Other Safety Equipment Used by Non-Motorist	1	6	10	7	11	3	38
E Other Motorcycle Helmet Used	25	77	64	11	42	6	225
No Motorcycle Helmet Used	30	103	90	23	34	12	292
Other	9	24	63	36	268	**38**	438
Unknown	343	1636	4731	5699	69547	4538	86494
Not Applicable	390	678	1007	474	2912	337	5798
CU is Unknown	104	462	1887	2652	22975	1258	29338
E CU Driver Not Recorded	33	114	341	487	10279	1166	12420
E CU Non-Motorist Not Recorded	7	54	85	68	71	12	297
TOTAL	4321	22196	60063	68395	587160	20509	**762644**

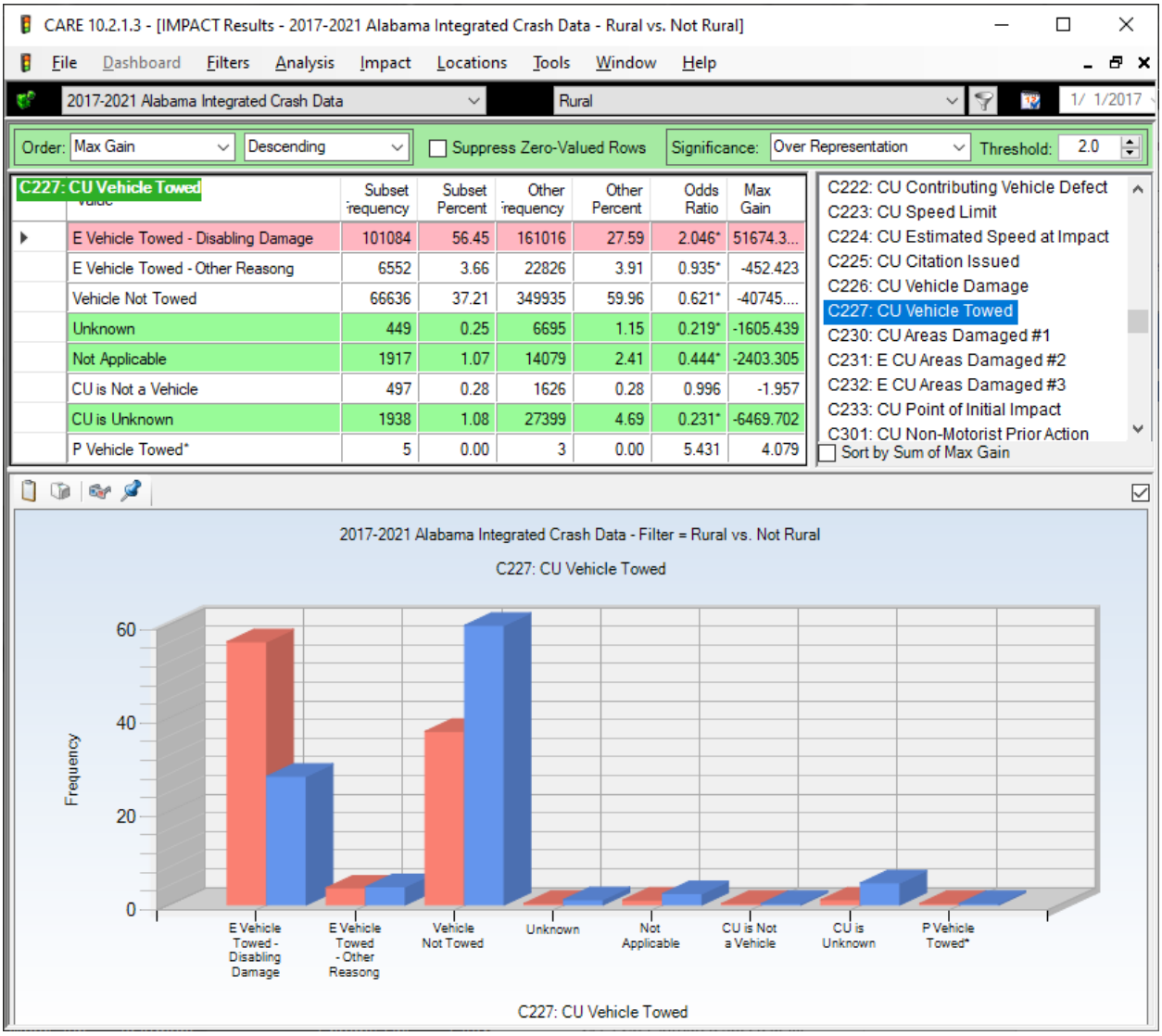
Any use of a motor vehicle without the appropriate Safety Equipment multiplies the chance of a fatality or serious injury by several orders of magnitude. The cross-tabulation above demonstrates this with real data for combined Rural and Urban roads. Comparing the results on the top two lines, the probability of the crash being a fatality when no safety equipment is used is 1,615/23,364 = one in 14.5 crashes, while if safety equipment is used, the fatality rate is 1,530/595,089 = one in 388.9 crashes (a survival rate that is 26.8 times greater).

C226 CU Vehicle Damage



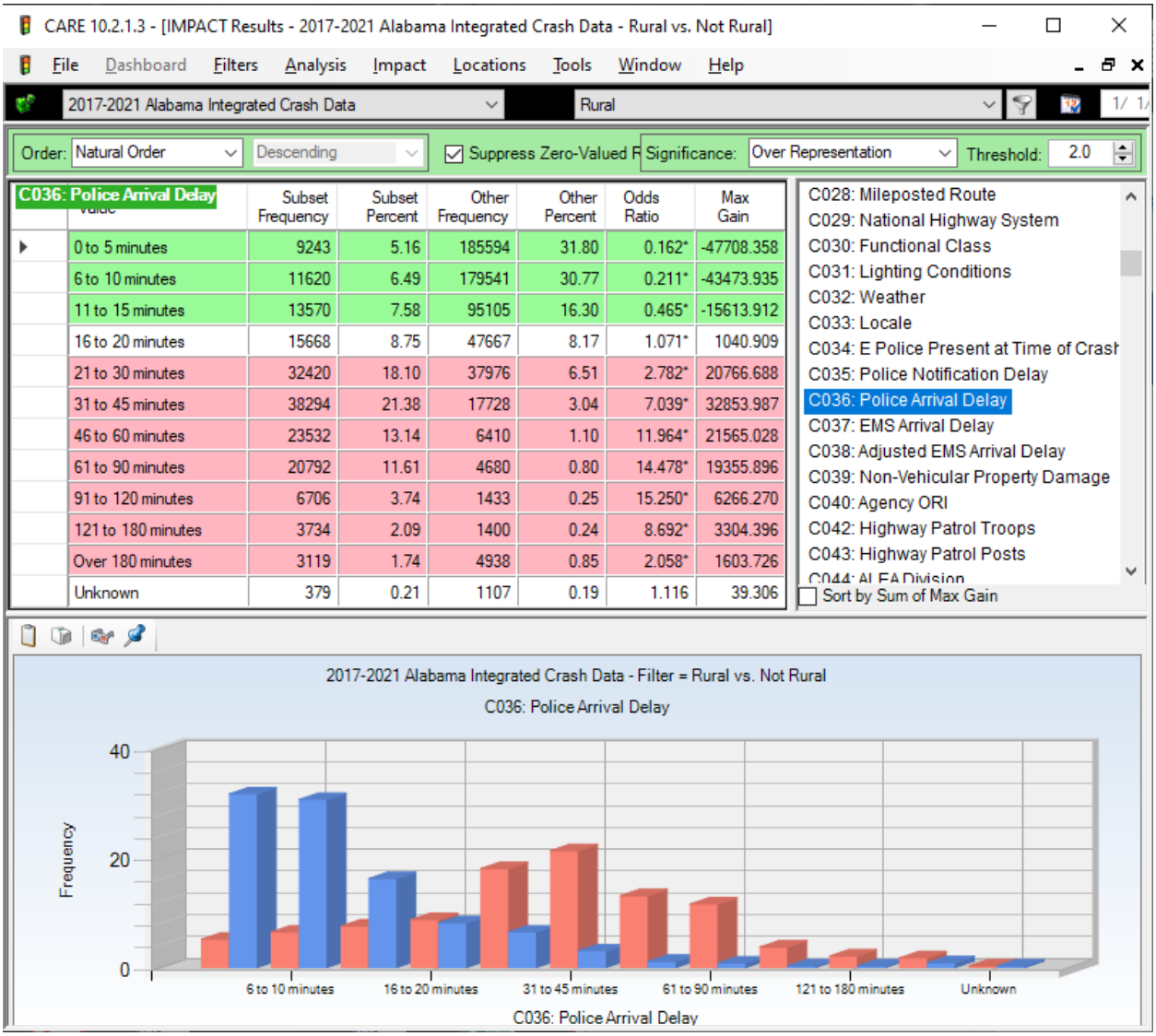
Rural had major damage in over two-thirds (67.76%), while urban crashes had only 27.61% with major damage. This is only considering the damage to the involved vehicles as opposed to injury severities, which were discussed above.

C227 Vehicle Towed



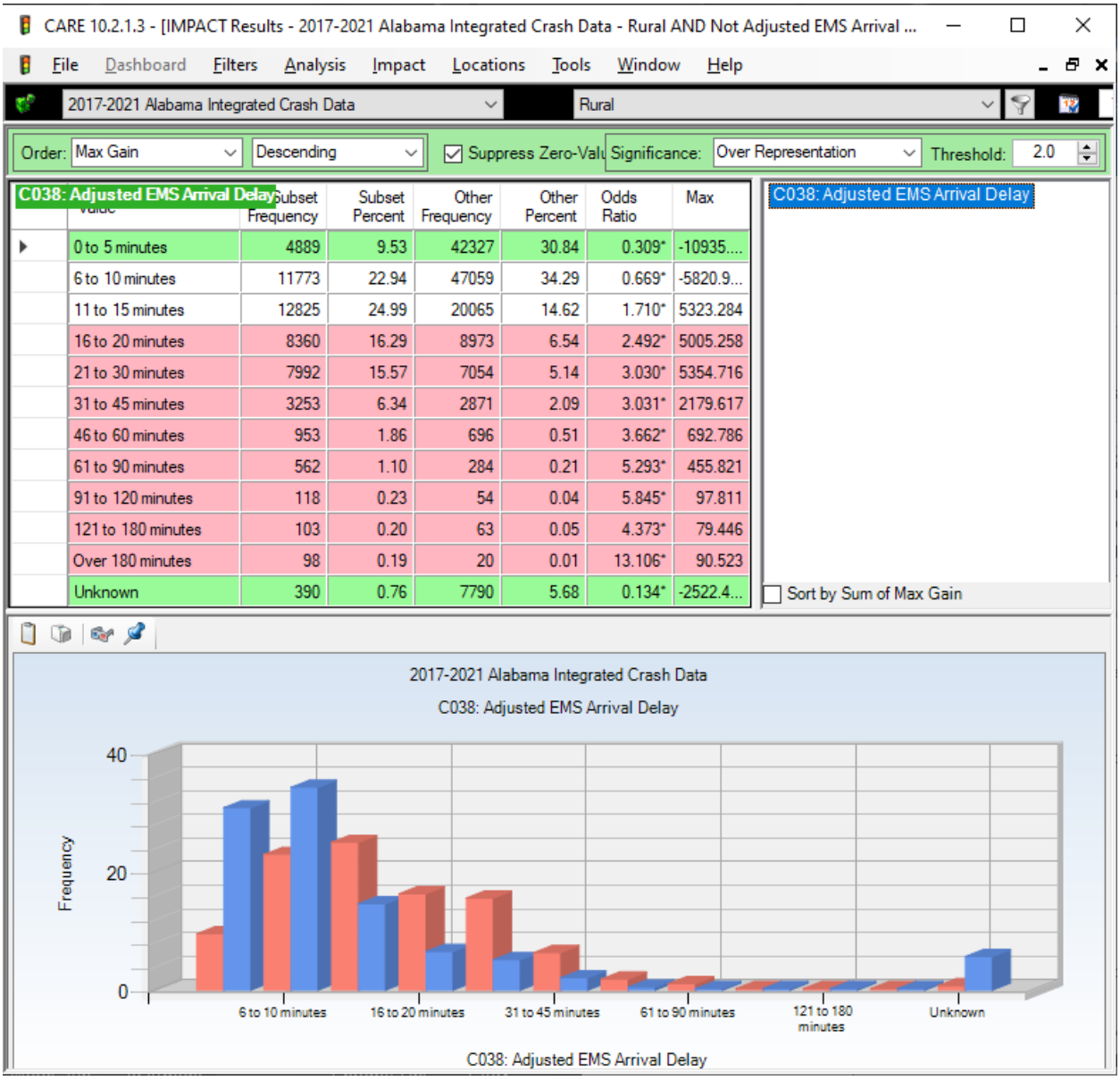
This is a further indicator that Rural crashes are more severe, mostly because of the speed at impact. Generally, the Rural crashes require a higher percentage of towing, although it is not as dramatic as some of the other indicators. "Vehicle Towed – Other Reason" would include if the driver were DUI or otherwise disabled to the point of not being able to safely remove the vehicle from the scene.

C036 Police Arrival Delay



Police arrival delay generally reflects how far out in the Rural area the crash took place. Zero to 20 minutes are significantly under-represented while the longer times are all significantly over-represented.

C038 Adjusted EMS Arrival Delay



C038: Adjusted EMS Arrival Delay	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max
0 to 5 minutes	4889	9.53	42327	30.84	0.309*	-10935....
6 to 10 minutes	11773	22.94	47059	34.29	0.669*	-5820.9...
11 to 15 minutes	12825	24.99	20065	14.62	1.710*	5323.284
16 to 20 minutes	8360	16.29	8973	6.54	2.492*	5005.258
21 to 30 minutes	7992	15.57	7054	5.14	3.030*	5354.716
31 to 45 minutes	3253	6.34	2871	2.09	3.031*	2179.617
46 to 60 minutes	953	1.86	696	0.51	3.662*	692.786
61 to 90 minutes	562	1.10	284	0.21	5.293*	455.821
91 to 120 minutes	118	0.23	54	0.04	5.845*	97.811
121 to 180 minutes	103	0.20	63	0.05	4.373*	79.446
Over 180 minutes	98	0.19	20	0.01	13.106*	90.523
Unknown	390	0.76	7790	5.68	0.134*	-2522.4...

Rural EMS Arrival Delay is generally longer than Urban for the same Rural reasons as the police arrival delay. In some cases, this is because of a delay in reporting the crash to the proper EMS authority. But this is more the case for police arrival than for EMS arrival. When people are injured there is an urgency that causes a more rapid response.

C038 by C025 Adjusted EMS Arrival Delay by Crash Severity

CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

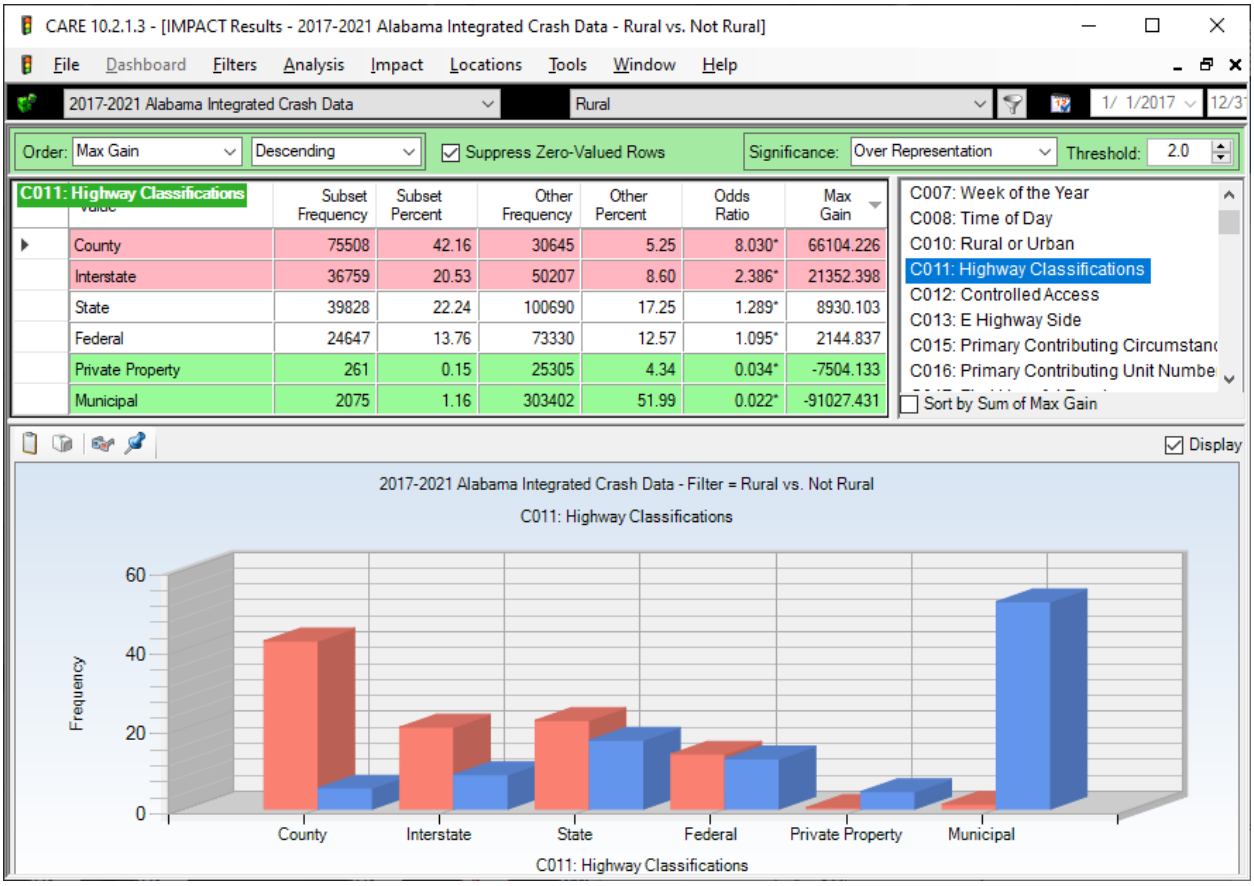
2017-2021 Alabama Integrated Crash Data | All records (do not apply a filter) | 1/ 1/2017

Suppress Zero Values: None | Select Cells: | Column: Crash Severity ; Row: Adjusted EMS Arrival Delay

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
0 to 5 minutes	653 15.34%	4037 18.35%	12219 20.48%	13757 20.21%	14631 2.49%	1919 9.41%	47216 6.20%
6 to 10 minutes	1223 28.74%	6166 28.03%	16466 27.60%	17392 25.56%	15726 2.68%	1859 9.11%	58832 7.73%
11 to 15 minutes	813 19.10%	4321 19.65%	9726 16.30%	9006 13.23%	8118 1.38%	906 4.44%	32890 4.32%
16 to 20 minutes	462 10.86%	2518 11.45%	5271 8.84%	4765 7.00%	3855 0.66%	462 2.27%	17333 2.28%
21 to 30 minutes	406 9.54%	2290 10.41%	4692 7.86%	4223 6.21%	3064 0.52%	371 1.82%	15046 1.98%
31 to 45 minutes	156 3.67%	793 3.61%	1820 3.05%	1902 2.79%	1290 0.22%	163 0.80%	6124 0.80%
46 to 60 minutes	43 1.01%	184 0.84%	488 0.82%	508 0.75%	378 0.06%	48 0.24%	1649 0.22%
61 to 90 minutes	22 0.52%	102 0.46%	276 0.46%	221 0.32%	199 0.03%	26 0.13%	846 0.11%
91 to 120 minutes	13 0.31%	25 0.11%	49 0.08%	47 0.07%	32 0.01%	6 0.03%	172 0.02%
121 to 180 minutes	11 0.26%	21 0.10%	57 0.10%	31 0.05%	45 0.01%	1 0.00%	166 0.02%
Over 180 minutes	34 0.80%	29 0.13%	17 0.03%	13 0.02%	23 0.00%	2 0.01%	118 0.02%
Unknown	30 0.70%	148 0.67%	632 1.06%	979 1.44%	5970 1.02%	421 2.06%	8180 1.07%
Not Applicable	390 9.16%	1361 6.19%	7944 13.32%	15211 22.35%	533359 90.91%	14211 69.68%	572476 75.22%
TOTAL	4256 0.56%	21995 2.89%	59657 7.84%	68055 8.94%	586690 77.09%	20395 2.68%	761048 100.00%

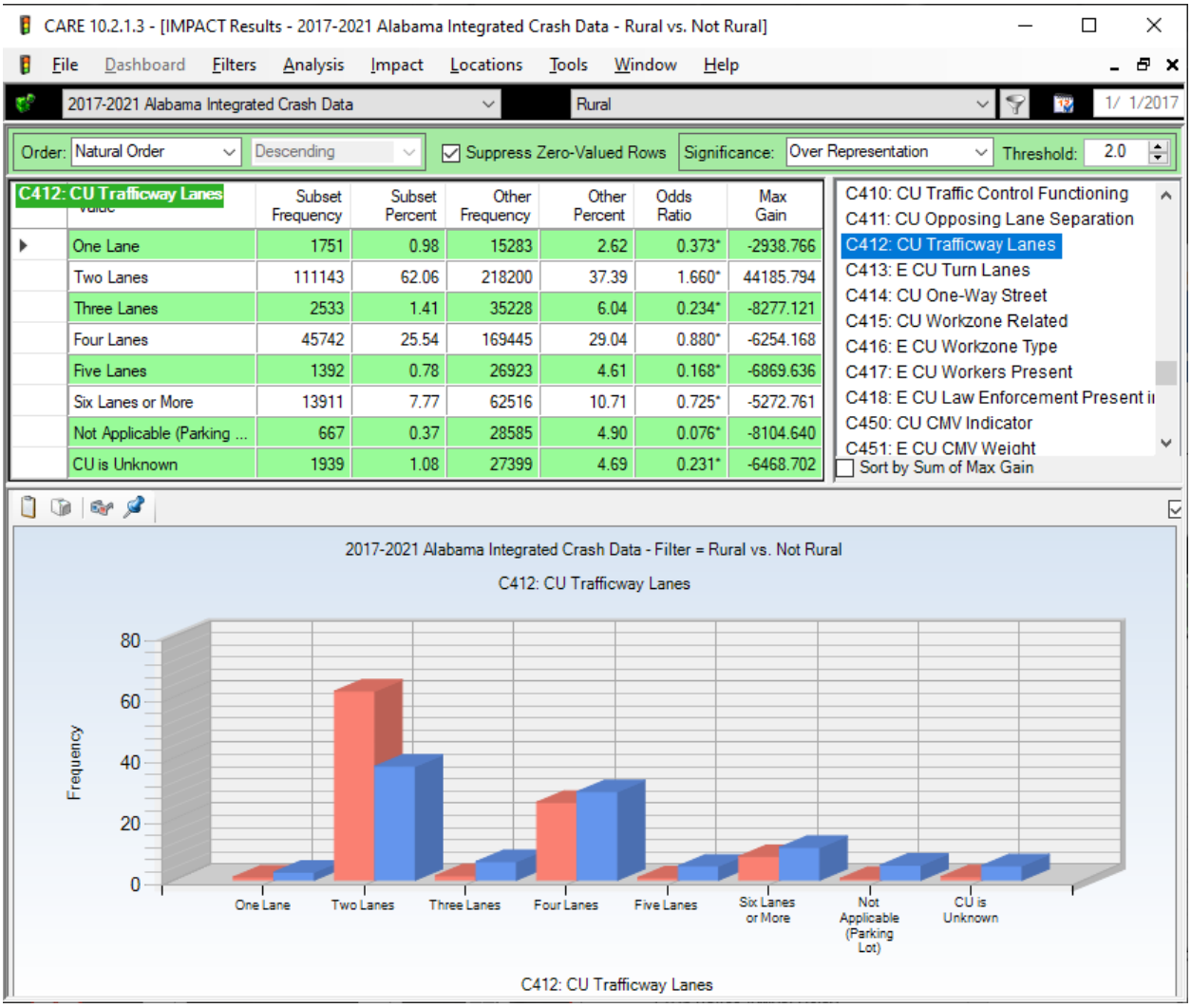
The above cross-tabulation shows how much quicker a response is called for as a function of the crash severity. This cross-tabulation is for all roadways and crashes, not just rural as in the IMPACT runs. Generally, response time is longer for Rural than for Urban roads since police and EMS capabilities reside primarily in the cities.

C011 Highway Classification



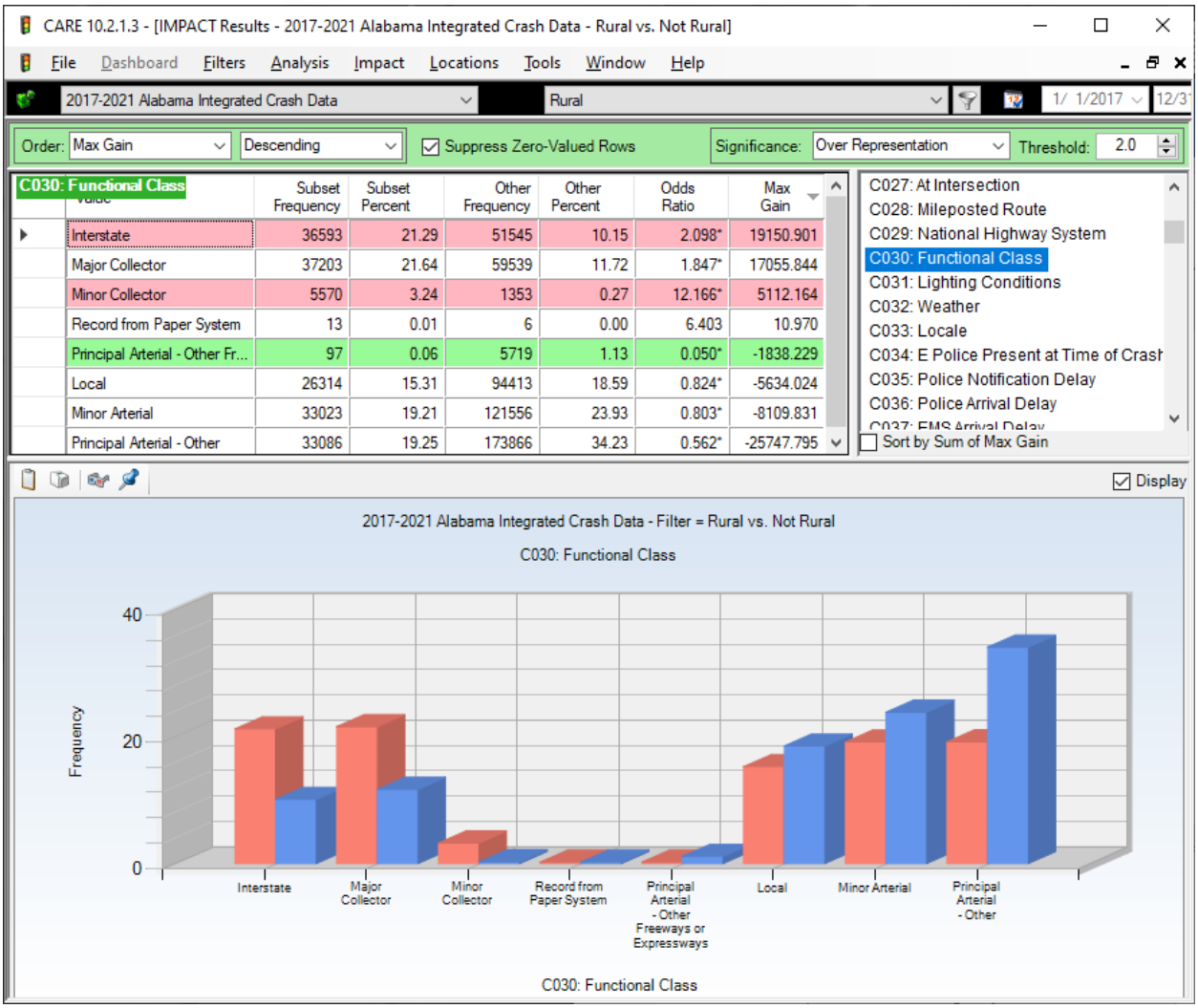
Generally, this display gives the proportion of the included roadways that are were designated as Rural and Urban. As expected, County roads and Interstates have the highest Rural crash over-representations.

C412 CU Trafficway Lanes



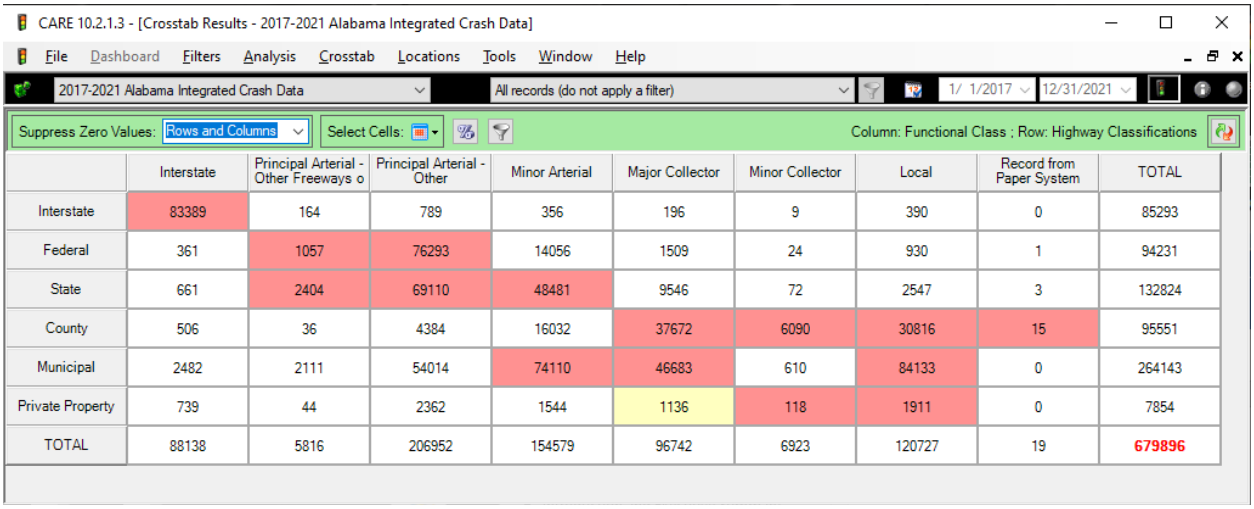
This shows that most Rural roads are two-lane, with the others fairly well distributed but primarily Urban. This accounts for some of the slower response times on rural roads.

C030 Functional Class



Since most people are not nearly as familiar with functional class as they are with roadway classification, the following cross-tabulation has been given to show their relationship in terms of crashes..

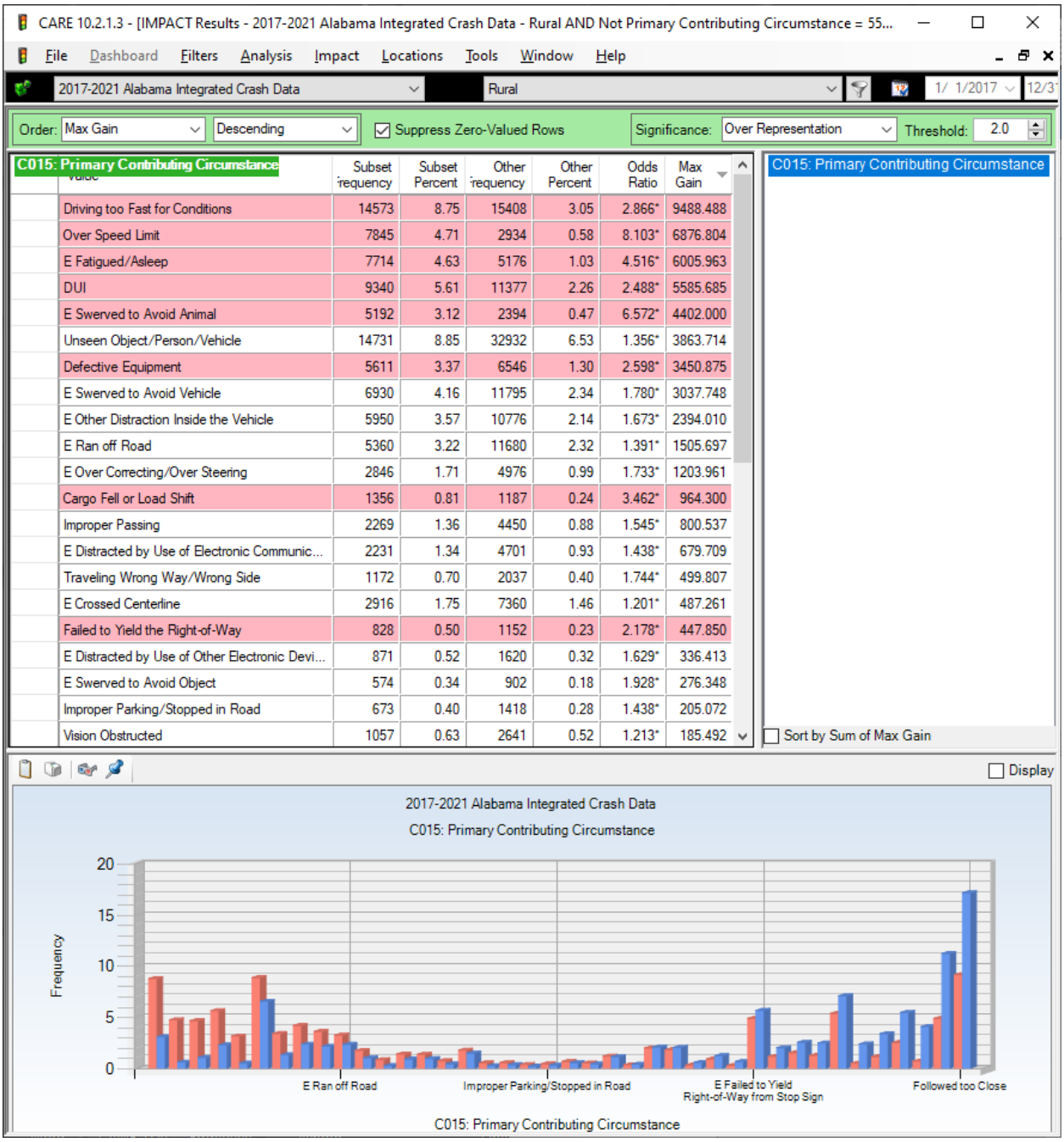
C030 by C011 Cross-tabulation – Functional Class by Highway Classification



	Interstate	Principal Arterial - Other Freeways o	Principal Arterial - Other	Minor Arterial	Major Collector	Minor Collector	Local	Record from Paper System	TOTAL
Interstate	83389	164	789	356	196	9	390	0	85293
Federal	361	1057	76293	14056	1509	24	930	1	94231
State	661	2404	69110	48481	9546	72	2547	3	132824
County	506	36	4384	16032	37672	6090	30816	15	95551
Municipal	2482	2111	54014	74110	46683	610	84133	0	264143
Private Property	739	44	2362	1544	1136	118	1911	0	7854
TOTAL	88138	5816	206952	154579	96742	6923	120727	19	679896

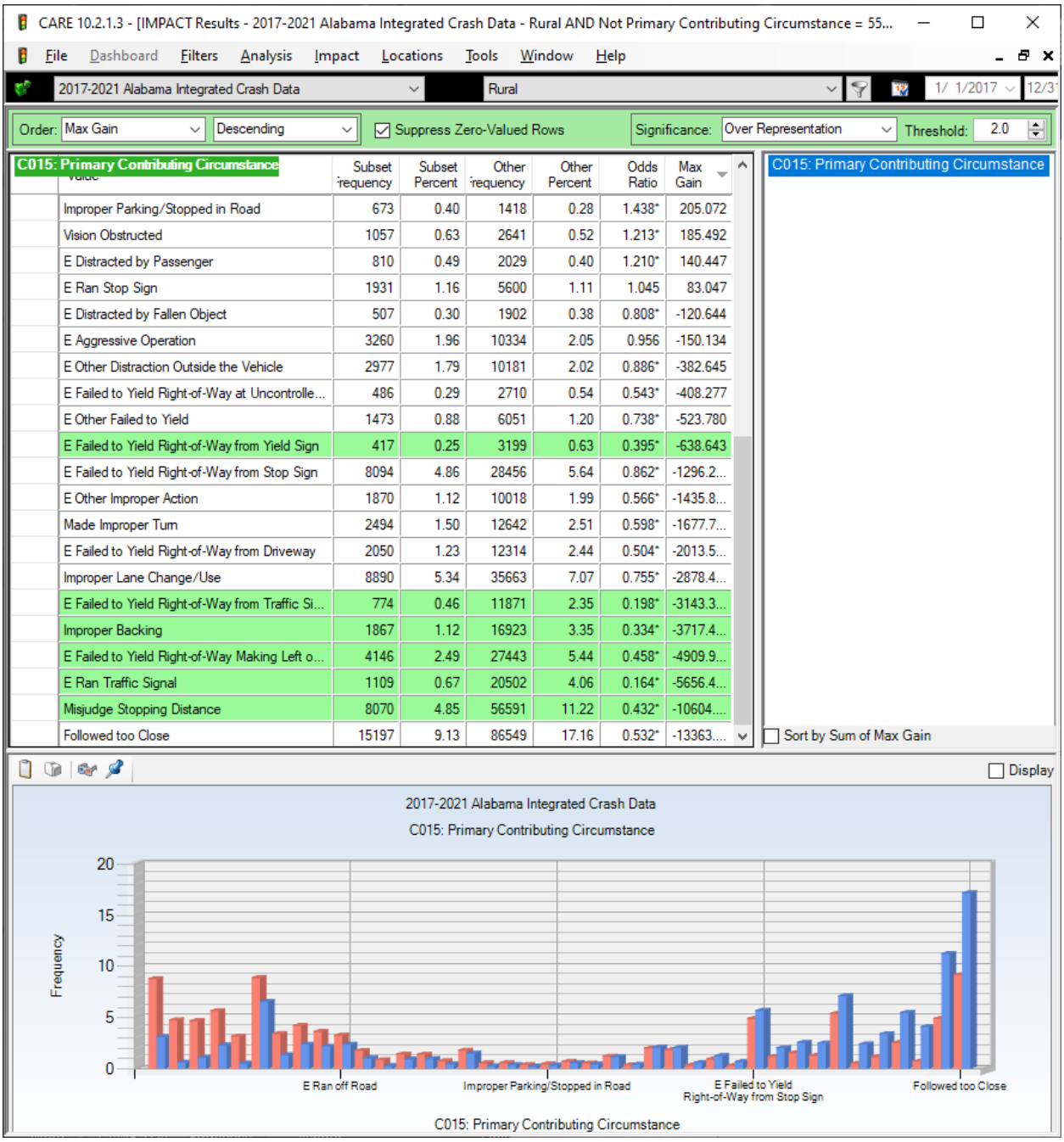
This cross-tabulation is for all roadways and crashes, not just Rural as in most of the IMPACT runs. This shows how the Functional Class is divided by the various Highway Classification for all roadways in the state.

C015a Primary Contributing Circumstances (Rural)
All items with less than 400 occurrences were removed



See C015c.

C015b Primary Contributing Circumstances (Urban)
All items with less than 400 occurrences were removed



SeeC015c

C015c Primary Contributing Circumstances (PCC Discussion)

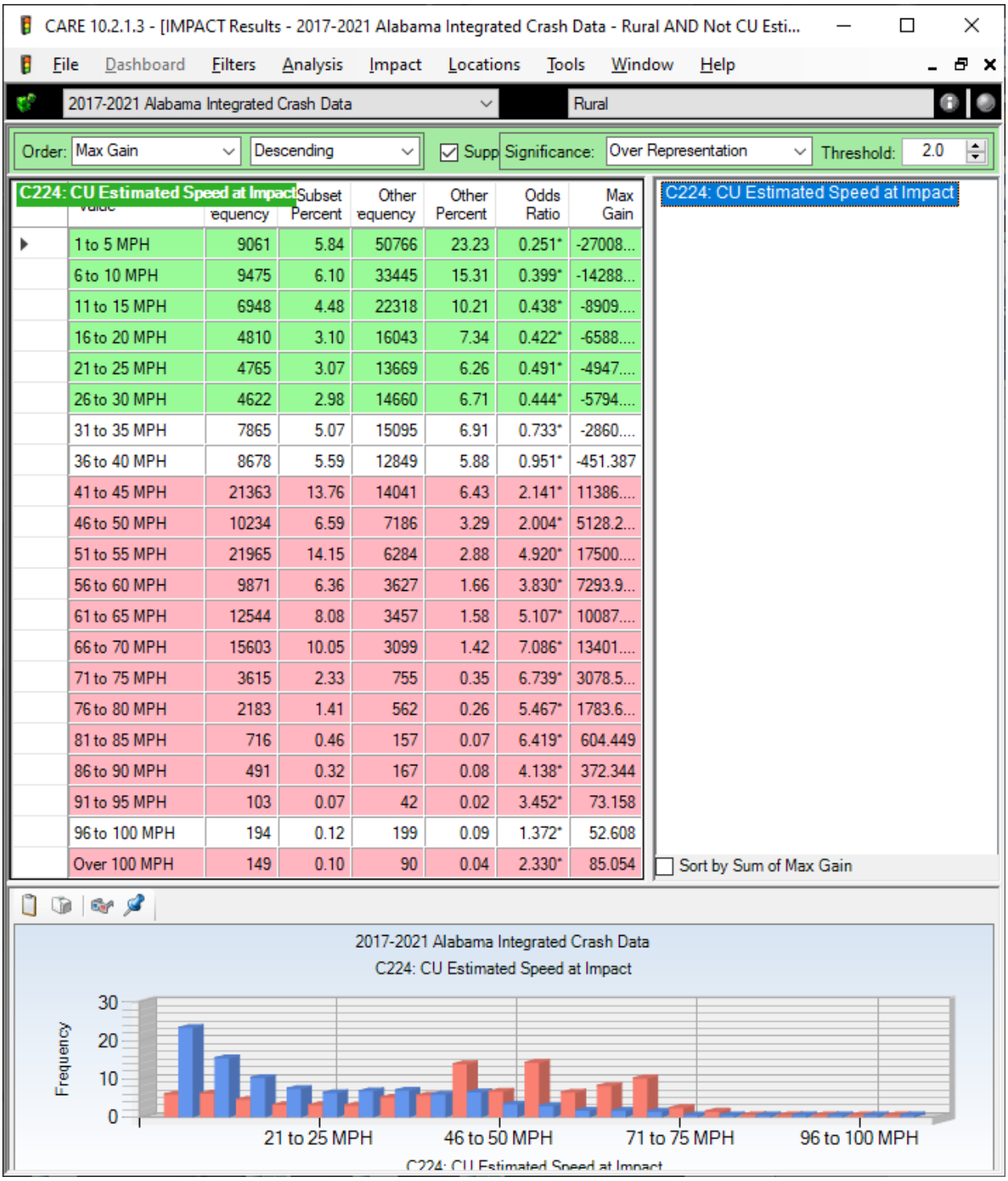
Because we will discuss this same IMPACT result separately for both the Rural and the Urban, we have split it into its rural and urban results in the two C015 sections above. The IMPACT results contain both the over-representations for the Rural areas at the top and those for the Urban areas at the bottom (technically they came out as significant under-representations). There are so many over- (and Under-) represented items that we felt it would be beneficial to separate the Rural and Urban results in the discussions below.

Rural C015a. All of the rural over-representations are in the top half of the table, and they are given by the red bars in the chart. Several of them have either a direct reference to excessive speed, or they have an obvious linkage to this root cause. Examples are: Driving too Fast for Conditions, Over Speed Limit, Swerved to Avoid Animal, Unseen Object/Person/Vehicle, Swerved to Avoid Vehicle, Ran off Road, Over Correcting/Over Steering, Improper Passing, Crossed Centerline, and Swerved to Avoid Object. Those directly connected with excessive speed are critical in that that they generally result in increased injury severity. Other high severity PCCs generally follow their ordering in the list. For example, Fatigued/Asleep and DUI are generally much more severe that most items lower on the list. Items with Odds Ratios greater than 2.00 are assigned a red background.

Urban C015b. Urban over-representations are given at the bottom of the IMPACT output, the largest ones are closest to the bottom. In these cases, the over-represented Urban Odds Ratios will be less than 1.00, and any that are 0.500 or less will be assigned a green background. While these are under-representations for Rural roads, they are over-representations for the Urban, since rural and urban are complementary. So, the largest over-representation for Urban roads (in terms of negative Max Gain caused by the high frequency) is Following too Close. Its Odds Ratio is not as low as some above it on the list, but frequency goes into the Max Gain calculations. Following too Close is closely related to Misjudge Stopping Distance, which is the next above it on the list. Many of the other PCCs toward the bottom of the list are related to urban traffic control, and the chance of finding most of them in a Rural area is relatively small. Note that the top 3 items on this list are actually rural over-representations. It is interesting that Aggressive Operation and several Distraction items are in the Urban over-representation listing, and thus more closely associated with Rural than Urban driving.

Other items of C015 are discussed individually under their displays.

C224 CU Estimated Speed at Impact



Speed is a factor not only in the crash cause but also in the crash severity. That being the case, we can see from this attribute why there are more fatal crashes in the rural areas.

C223 CU Speed Limit

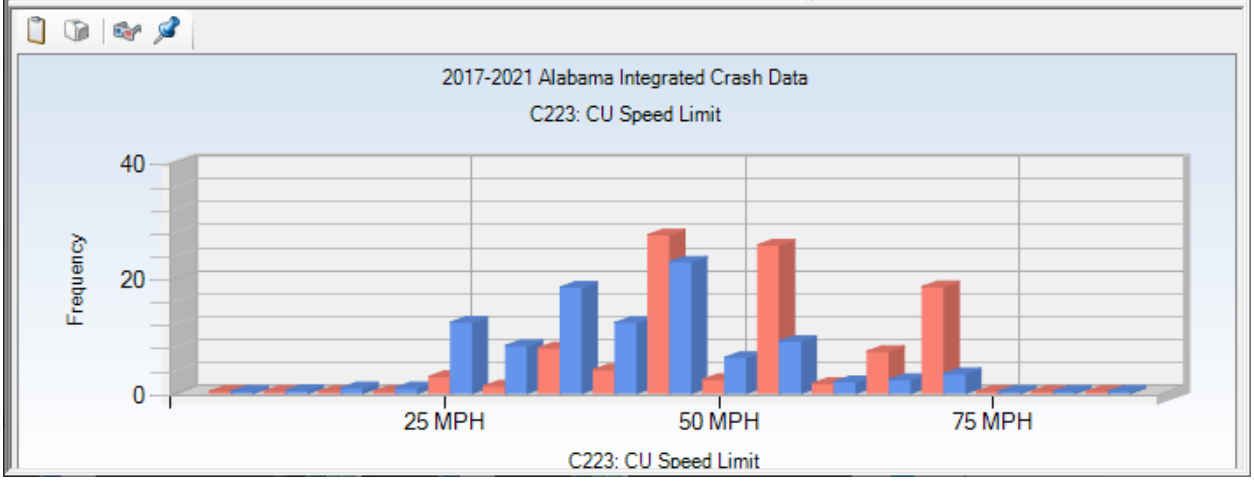
2017-2021 Alabama Integrated Crash Data | Rural

Order: Max Gain | Descending | Supp | Significance: Over Representation | Threshold: 2.0

C223: CU Speed Limit	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
5 MPH	60	0.04	1595	0.32	0.112*	-474.364
10 MPH	90	0.05	2548	0.51	0.105*	-763.643
15 MPH	411	0.25	4552	0.92	0.270*	-1114....
20 MPH	338	0.20	4812	0.97	0.210*	-1274....
25 MPH	4827	2.90	61434	12.36	0.235*	-15754...
30 MPH	2034	1.22	41227	8.29	0.147*	-11778...
35 MPH	13152	7.90	91823	18.47	0.428*	-17610...
40 MPH	6790	4.08	61059	12.28	0.332*	-13666...
45 MPH	45958	27.59	113658	22.86	1.207*	7879.7...
50 MPH	3990	2.40	30837	6.20	0.386*	-6341....
55 MPH	42996	25.81	45052	9.06	2.849*	27902....
60 MPH	2804	1.68	10002	2.01	0.837*	-546.917
65 MPH	12158	7.30	11749	2.36	3.089*	8221.7...
70 MPH	30869	18.53	16811	3.38	5.481*	25236....
75 MPH	47	0.03	60	0.01	2.338*	26.899
80 MPH	37	0.02	5	0.00	22.088	35.325
Over 80 MPH	25	0.02	11	0.00	6.784	21.315

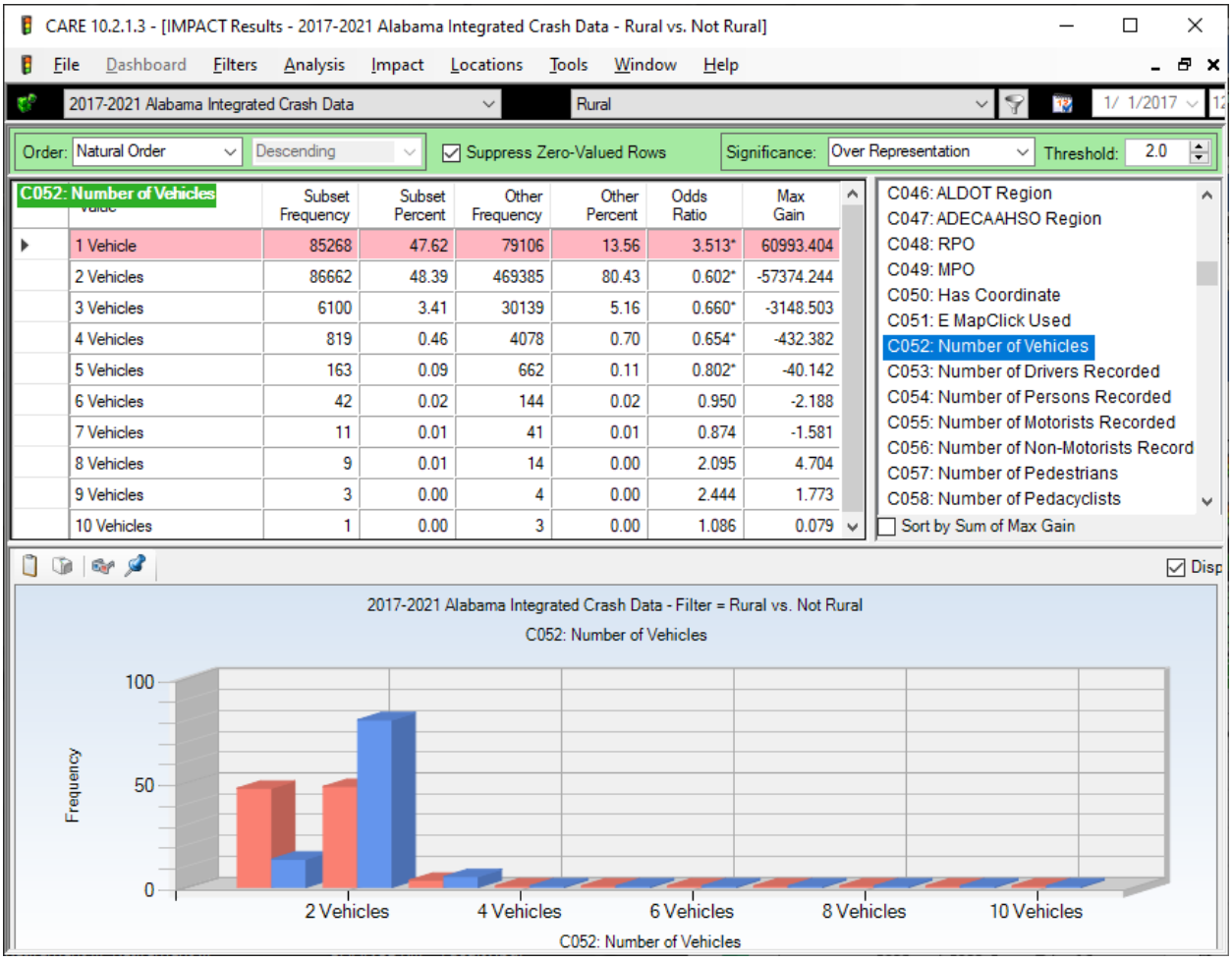
C223: CU Speed Limit

Sort by Sum of Max Gain



This is quite useful for comparing against the estimate impact speed, C224, immediately above. It is important to realize that just being under some speed limit does not imply legality. For example, most County roads have speed limits of 45 MPH, but the roadway conditions (especially weather) can mandate speeds less than that.

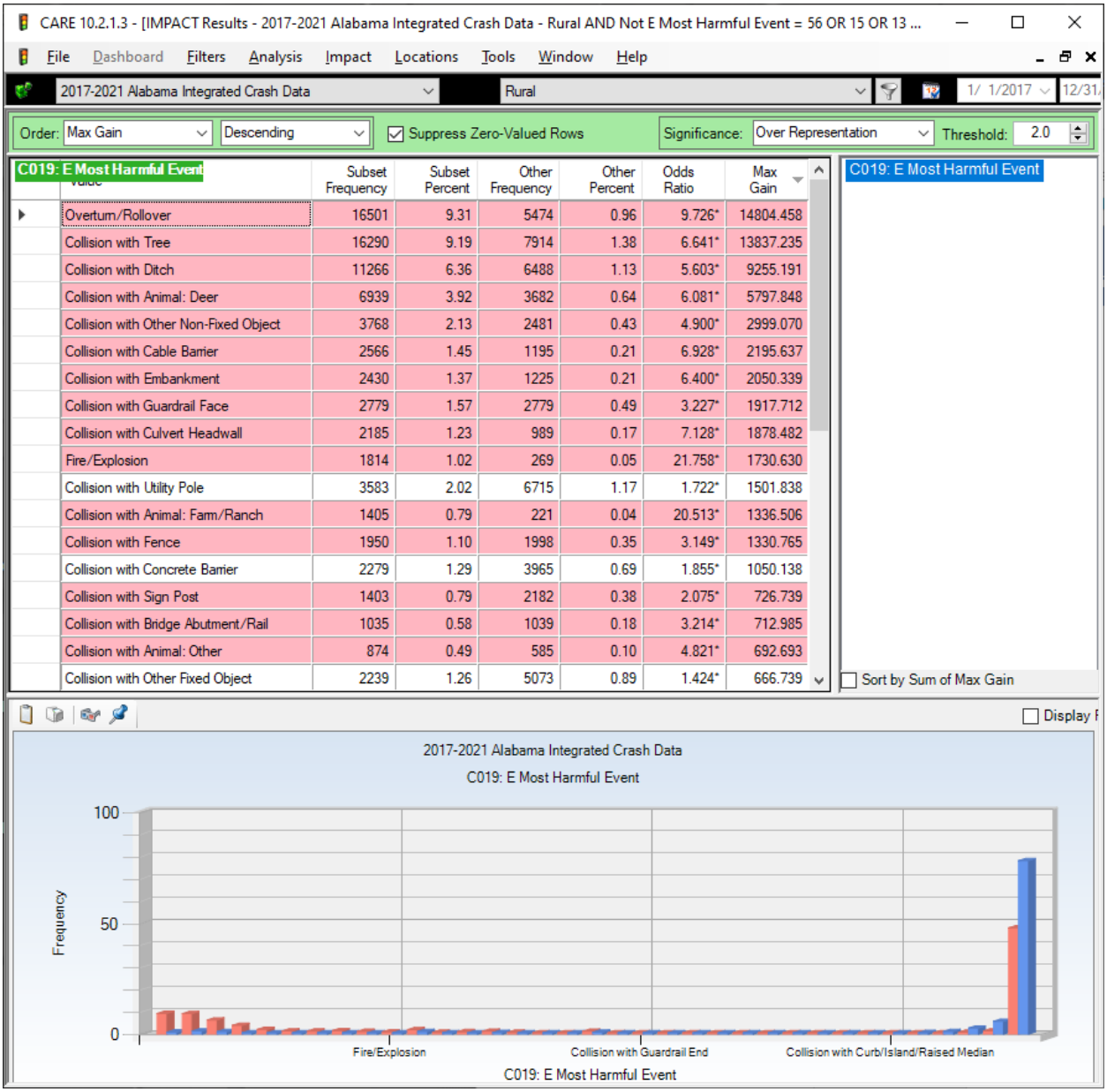
C052 Number of Vehicles



Note the natural ordering of the table. It is interesting that most multiple-vehicle crashes occur in the urban areas (blue bars). Think of it as a traffic concentration issue. Generally, these multiple crashes are not as severe in causing fatalities, but, of course, some of them are quite severe.

C019a Most Harmful Event (Rural Over-representations)

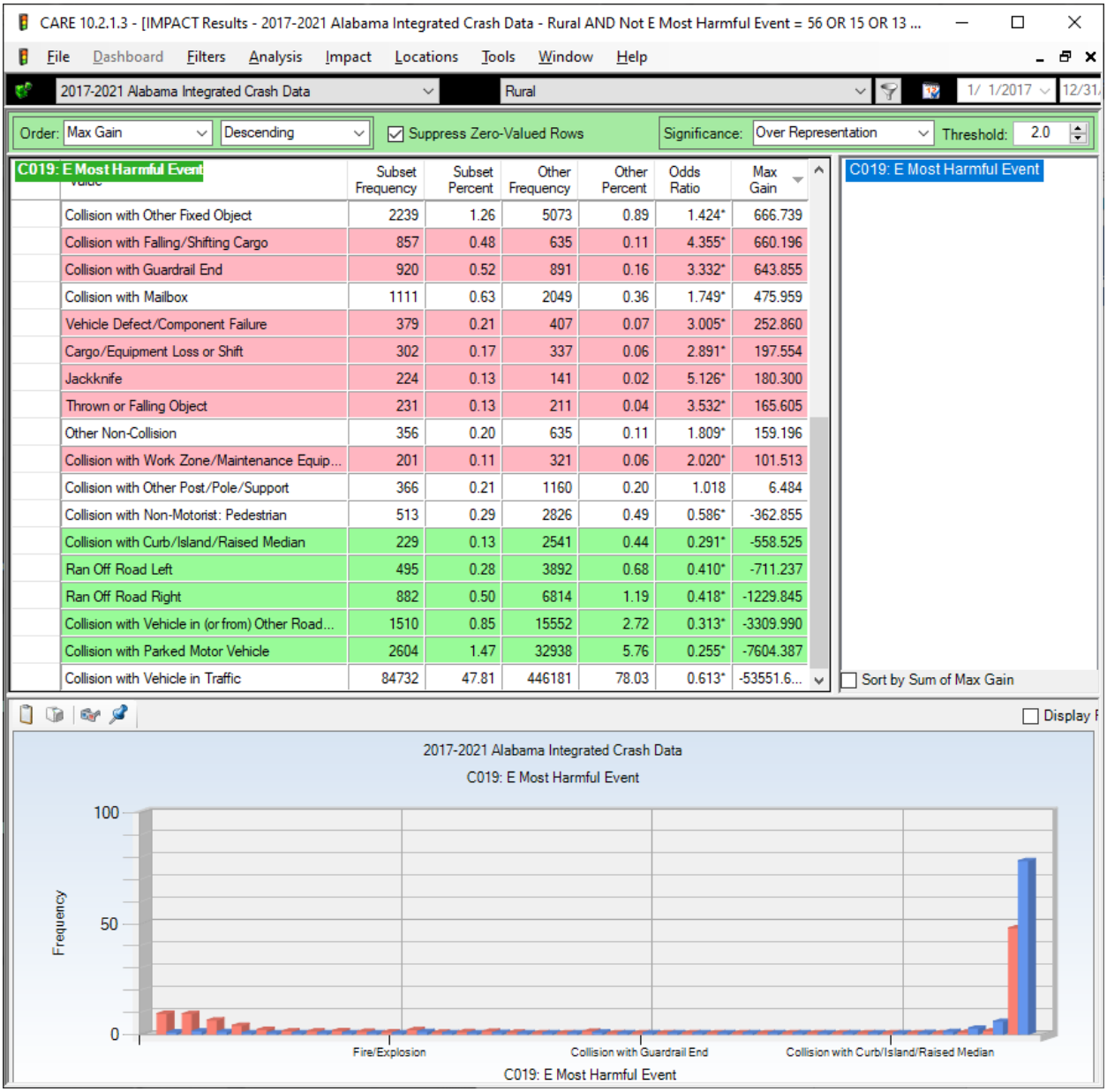
All items with less that 200 occurrences were removed



Almost all of these in the top half of the IMPACT output are Collision With … Exceptions here are the top items, Overturn/Rollover, and Fire/Explosion, plus there are several on the next page given below.

C019b Most Harmful Event (Urban Over-representations)

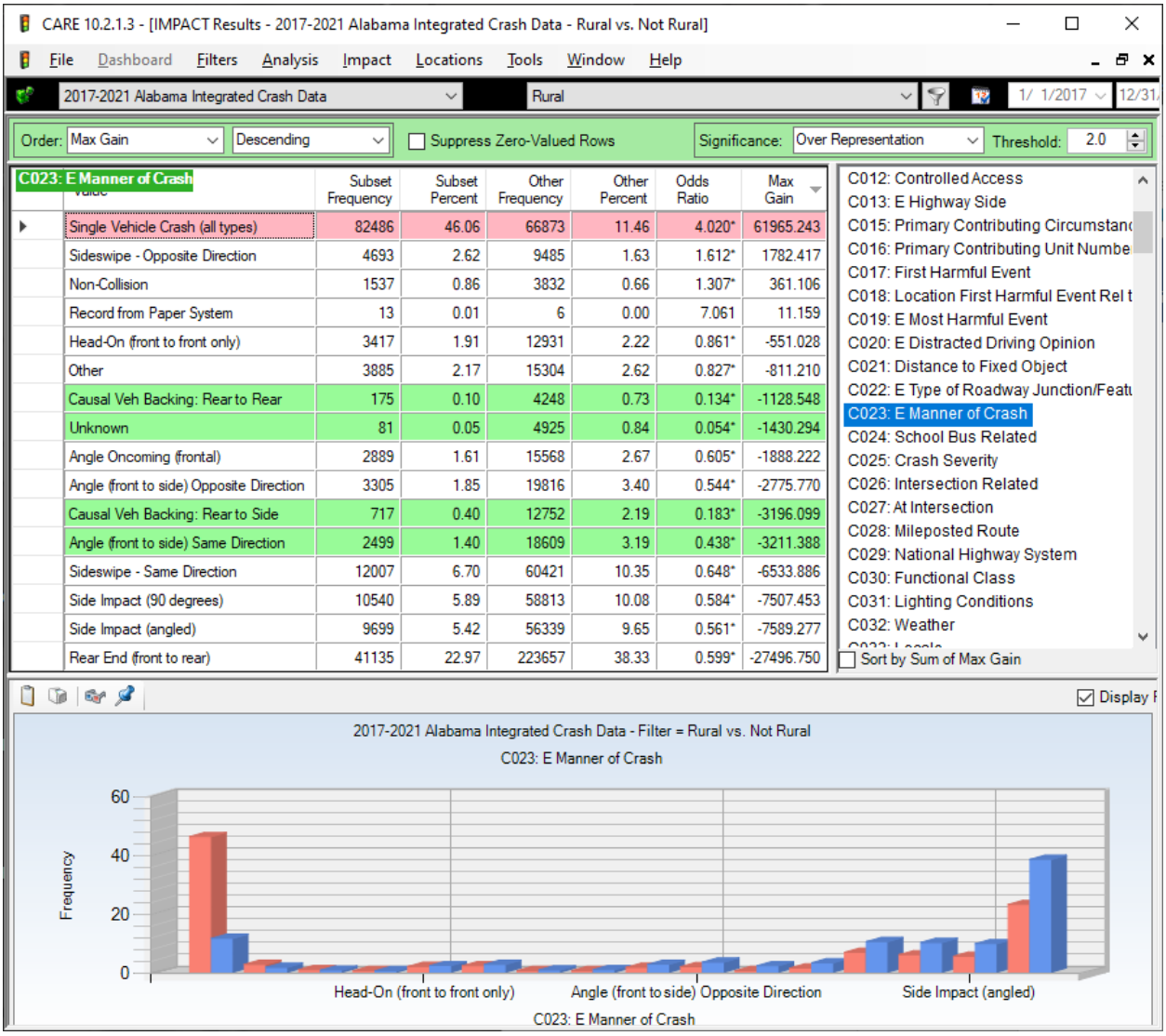
All items with less that 200 occurrences were removed



C019: E Most Harmful Event	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Collision with Other Fixed Object	2239	1.26	5073	0.89	1.424*	666.739
Collision with Falling/Shifting Cargo	857	0.48	635	0.11	4.355*	660.196
Collision with Guardrail End	920	0.52	891	0.16	3.332*	643.855
Collision with Mailbox	1111	0.63	2049	0.36	1.749*	475.959
Vehicle Defect/Component Failure	379	0.21	407	0.07	3.005*	252.860
Cargo/Equipment Loss or Shift	302	0.17	337	0.06	2.891*	197.554
Jackknife	224	0.13	141	0.02	5.126*	180.300
Thrown or Falling Object	231	0.13	211	0.04	3.532*	165.605
Other Non-Collision	356	0.20	635	0.11	1.809*	159.196
Collision with Work Zone/Maintenance Equip...	201	0.11	321	0.06	2.020*	101.513
Collision with Other Post/Pole/Support	366	0.21	1160	0.20	1.018	6.484
Collision with Non-Motorist: Pedestrian	513	0.29	2826	0.49	0.586*	-362.855
Collision with Curb/Island/Raised Median	229	0.13	2541	0.44	0.291*	-558.525
Ran Off Road Left	495	0.28	3892	0.68	0.410*	-711.237
Ran Off Road Right	882	0.50	6814	1.19	0.418*	-1229.845
Collision with Vehicle in (or from) Other Road...	1510	0.85	15552	2.72	0.313*	-3309.990
Collision with Parked Motor Vehicle	2604	1.47	32938	5.76	0.255*	-7604.387
Collision with Vehicle in Traffic	84732	47.81	446181	78.03	0.613*	-53551.6...

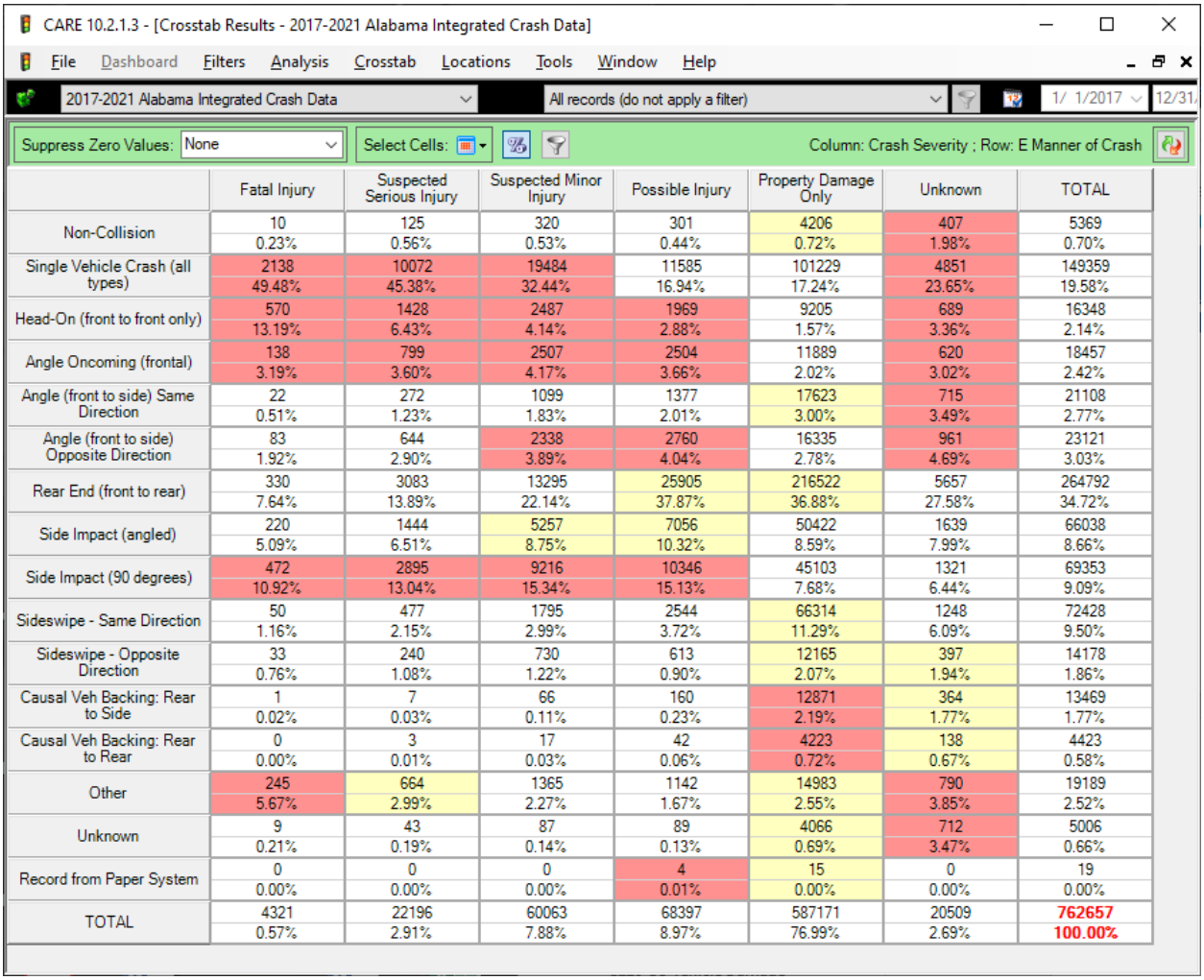
Urban over-representations start (and are below) Collision with a non-Motorist-Pedestrian. Most have a green background because their Odds Ratios are less than 0.500.

C023 Manner of Crash



Of these, the manner of crash that would seem to be the most significant is the Head On (Front to front only) crashes (3,417 Rural; 12,931 Urban). These are not as lethal as expected since they would generally be of lower speeds in the Urban areas. The cross-tabulation that follows shows the severity as a function of Manner of Crash for all crashes (both rural and urban combined).

Cross-tabulation: Severity C025 by Manner of Crash C022



CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

2017-2021 Alabama Integrated Crash Data | All records (do not apply a filter) | 1/ 1/2017 | 12/31/

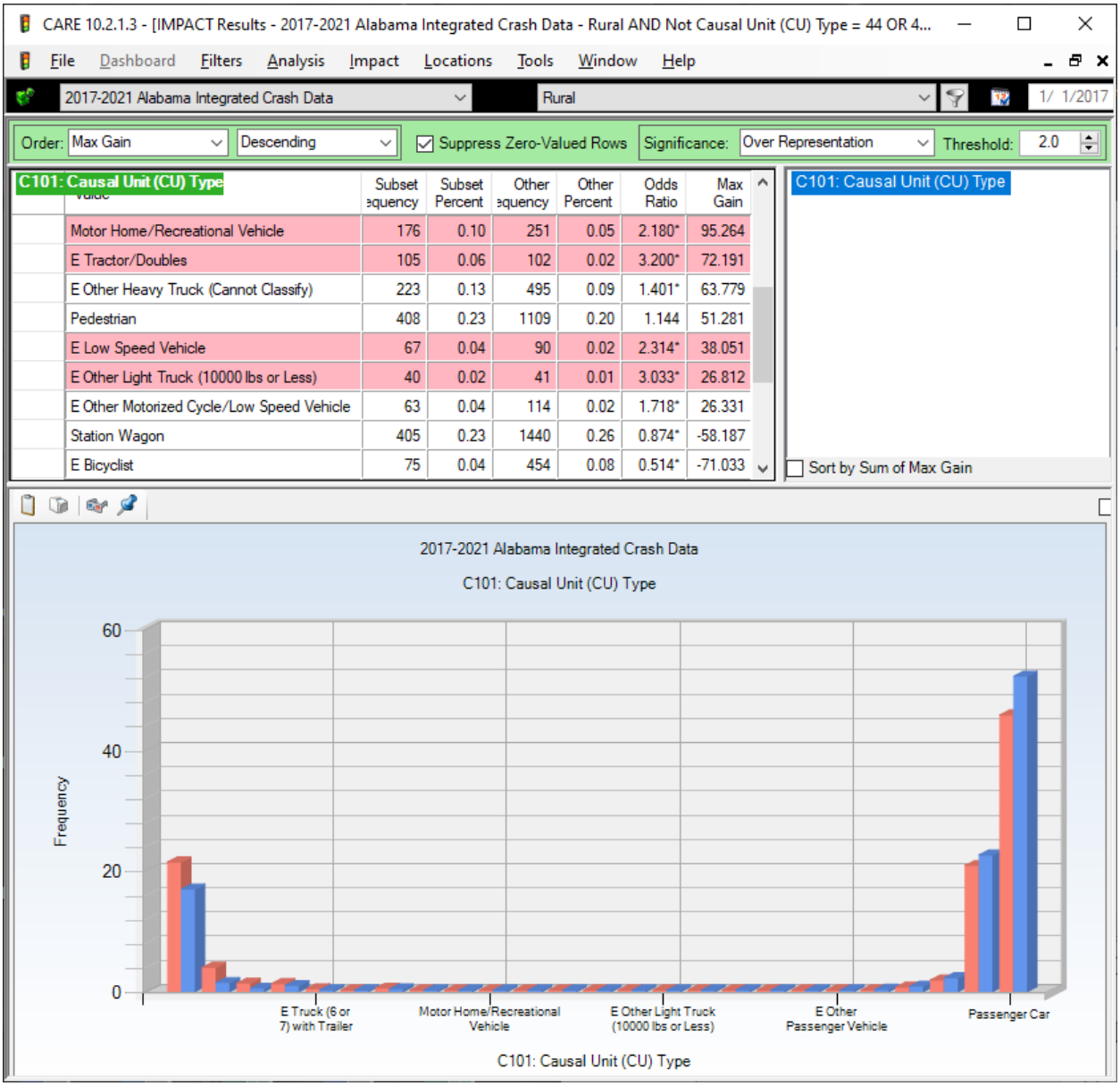
Suppress Zero Values: None | Select Cells: | Column: Crash Severity ; Row: E Manner of Crash

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
Non-Collision	10	125	320	301	4206	407	5369
	0.23%	0.56%	0.53%	0.44%	0.72%	1.98%	0.70%
Single Vehicle Crash (all types)	2138	10072	19484	11585	101229	4851	149359
	49.48%	45.38%	32.44%	16.94%	17.24%	23.65%	19.58%
Head-On (front to front only)	570	1428	2487	1969	9205	689	16348
	13.19%	6.43%	4.14%	2.88%	1.57%	3.36%	2.14%
Angle Oncoming (frontal)	138	799	2507	2504	11889	620	18457
	3.19%	3.60%	4.17%	3.66%	2.02%	3.02%	2.42%
Angle (front to side) Same Direction	22	272	1099	1377	17623	715	21108
	0.51%	1.23%	1.83%	2.01%	3.00%	3.49%	2.77%
Angle (front to side) Opposite Direction	83	644	2338	2760	16335	961	23121
	1.92%	2.90%	3.89%	4.04%	2.78%	4.69%	3.03%
Rear End (front to rear)	330	3083	13295	25905	216522	5657	264792
	7.64%	13.89%	22.14%	37.87%	36.88%	27.58%	34.72%
Side Impact (angled)	220	1444	5257	7056	50422	1639	66038
	5.09%	6.51%	8.75%	10.32%	8.59%	7.99%	8.66%
Side Impact (90 degrees)	472	2895	9216	10346	45103	1321	69353
	10.92%	13.04%	15.34%	15.13%	7.68%	6.44%	9.09%
Sideswipe - Same Direction	50	477	1795	2544	66314	1248	72428
	1.16%	2.15%	2.99%	3.72%	11.29%	6.09%	9.50%
Sideswipe - Opposite Direction	33	240	730	613	12165	397	14178
	0.76%	1.08%	1.22%	0.90%	2.07%	1.94%	1.86%
Causal Veh Backing: Rear to Side	1	7	66	160	12871	364	13469
	0.02%	0.03%	0.11%	0.23%	2.19%	1.77%	1.77%
Causal Veh Backing: Rear to Rear	0	3	17	42	4223	138	4423
	0.00%	0.01%	0.03%	0.06%	0.72%	0.67%	0.58%
Other	245	664	1365	1142	14983	790	19189
	5.67%	2.99%	2.27%	1.67%	2.55%	3.85%	2.52%
Unknown	9	43	87	89	4066	712	5006
	0.21%	0.19%	0.14%	0.13%	0.69%	3.47%	0.66%
Record from Paper System	0	0	0	4	15	0	19
	0.00%	0.00%	0.00%	0.01%	0.00%	0.00%	0.00%
TOTAL	4321	22196	60063	68397	587171	20509	762657
	0.57%	2.91%	7.88%	8.97%	76.99%	2.69%	100.00%

C025 by C022, Cross-tabulation: Crash Injury Severity C025 by Manner of Crash C022. This cross-tabulation is for all crashes, both Rural and Urban. The highest four over-representations for fatal crashes are: Single Vehicle Crash (all types), Head On (front to front only), Angle Oncoming (frontal), and Side Impact 90 degrees.

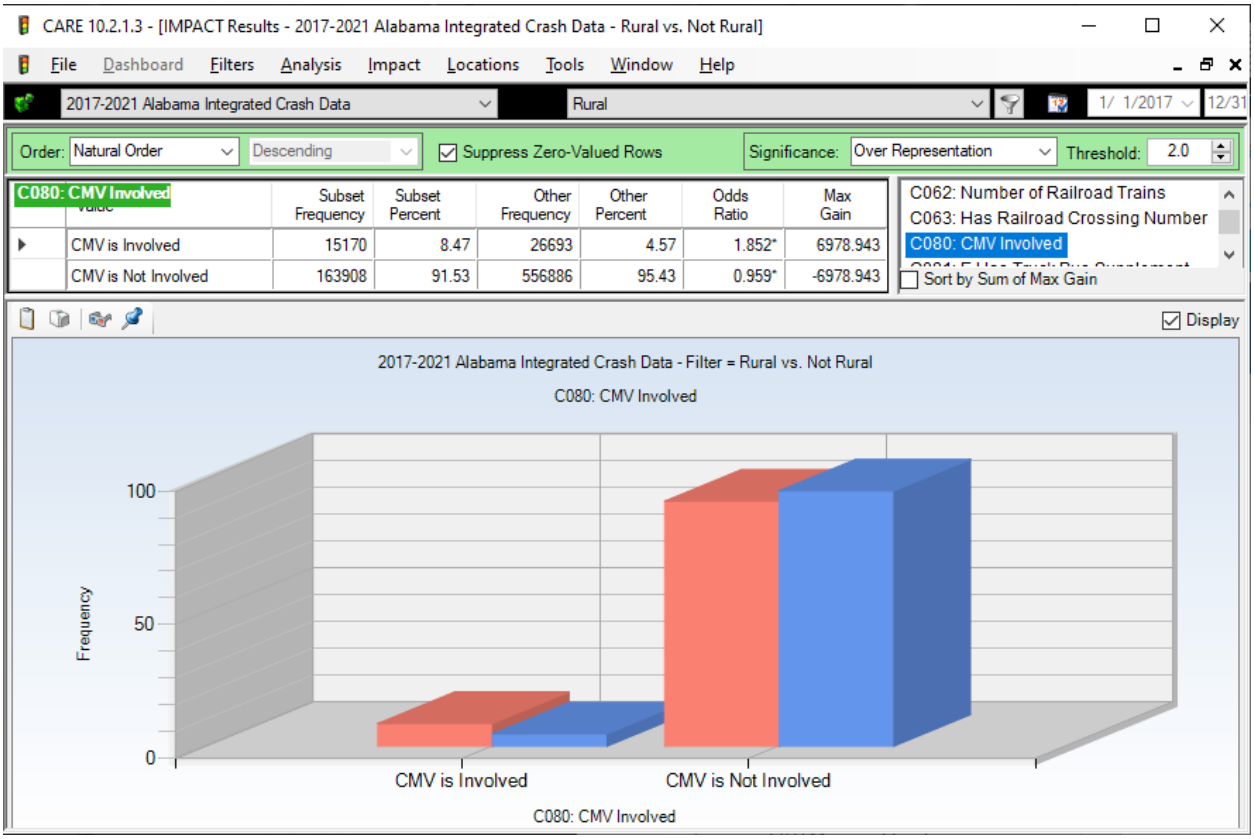
C101 Causal Unit (CU) Type

All items with fewer than 40 crashes have been removed



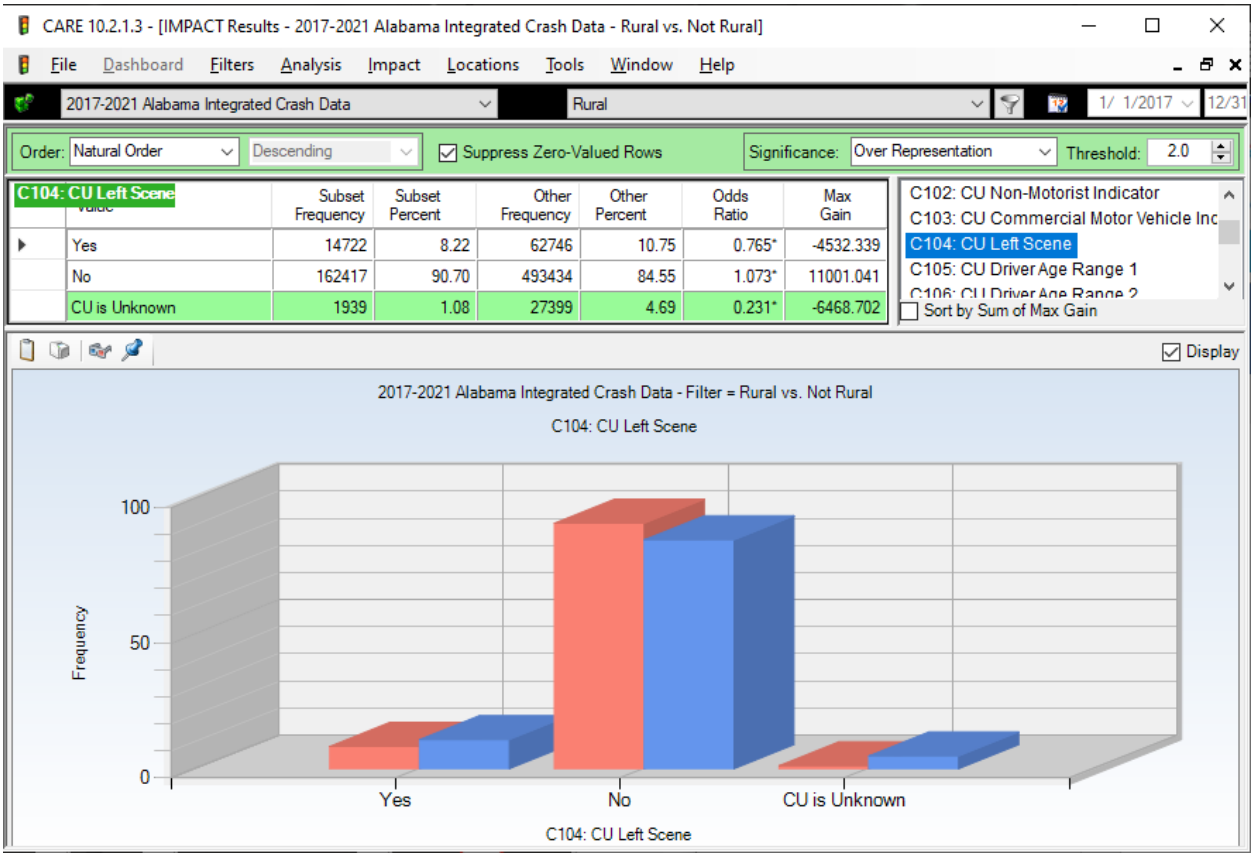
All other things being equal, we would expect the number of Rural crashes per vehicle type to be the same as their presence on rural roadways. Similarly with Urban. Passenger Cars and SUVs are over-represented on Urban roads, but not to a great degree (Odds Ratios are 0.886 and 0.932, respectively, see bottom two items in the table). Odds Ratios close to 1.000 show that there is little differences in the two proportions. Considerably larger Odds Ratios are at the other (Rural) end where Pickups, large trucks and Motorcycles seem to dominate. Large trucks, many of them CMVs, will be predominate on the Rural roads, as indicated by the next result.

C080 Commercial Motor Vehicle (CMV) Involved



CMV crashes are over-represented on rural roads with a proportion of 8.47% as opposed to Urban roads where their presence is 4.57%, resulting in an Odds Ratio of 1.852, which is nearly twice that expected.

C104 CU Left Scene



When considering all crashes, it seems clear that leaving the scene of a crash is more of an Urban issue that that of Rural crashes. One thing that would contribute to this is the increased severity of the Rural crashes making fewer vehicles able to leave the scene.

C107 CU Driver Raw Age

2017-2021 Alabama Integrated Crash Data | Rural | 1/ 1/2017 | 12/31

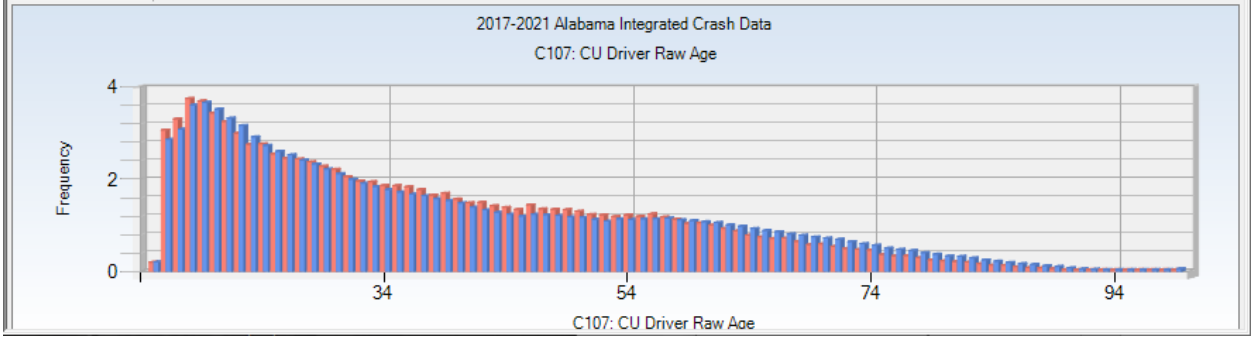
Order: Max Gain | Descending | Suppress Zero-Valued Rows | Significance: Over Representation | Threshold: 2.0

C107: CU Driver Raw Age	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
33	3199	1.95	9206	1.84	1.057*	171.288
34	3066	1.86	8870	1.77	1.051*	148.793
35	3060	1.86	8616	1.72	1.080*	226.329
36	3019	1.84	8374	1.67	1.096*	264.920
37	2920	1.78	8197	1.64	1.083*	224.132
38	2718	1.65	7887	1.58	1.048	124.086
39	2789	1.70	7682	1.54	1.104*	262.508
40	2577	1.57	7409	1.48	1.058*	140.293
41	2444	1.49	6963	1.39	1.067*	153.976
42	2465	1.50	6669	1.33	1.124*	271.668
43	2336	1.42	6395	1.28	1.111*	232.782
44	2282	1.39	6190	1.24	1.121*	246.204
45	2208	1.34	5985	1.20	1.122*	239.625
46	2373	1.44	6188	1.24	1.166*	337.862
47	2228	1.35	6135	1.23	1.104*	210.292
48	2215	1.35	6055	1.21	1.112*	223.603
49	2200	1.34	5904	1.18	1.133*	258.265
50	2142	1.30	5868	1.17	1.110*	212.105
51	2029	1.23	5645	1.13	1.093*	172.446
52	2012	1.22	5440	1.09	1.125*	222.867
53	1951	1.19	5695	1.14	1.042	78.002
54	2008	1.22	5615	1.12	1.087*	161.312
55	1962	1.19	5692	1.14	1.048	89.988
56	2045	1.24	5709	1.14	1.089*	167.397

C107: CU Driver Raw Age

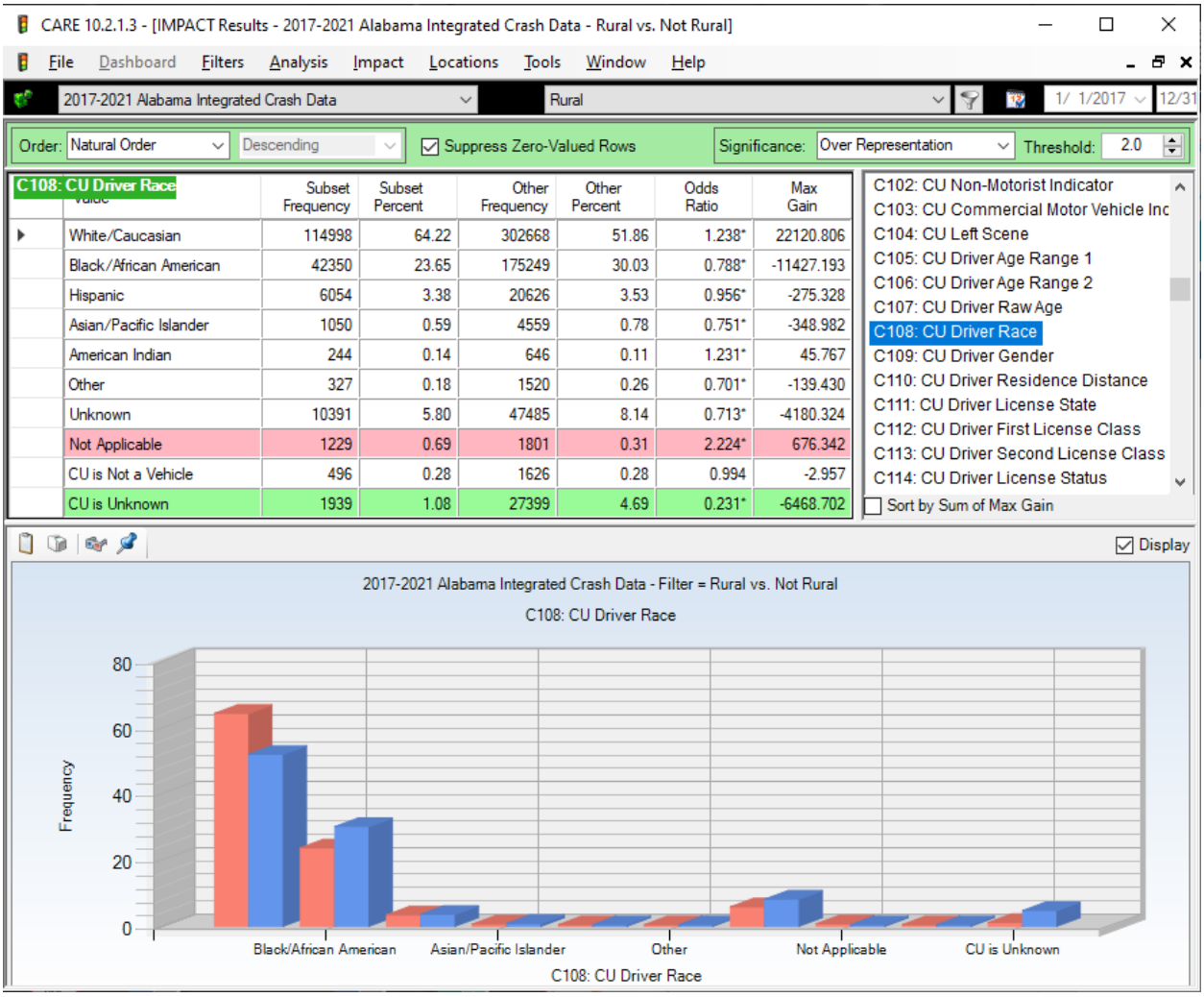
Sort by Sum of Max Gain

Display



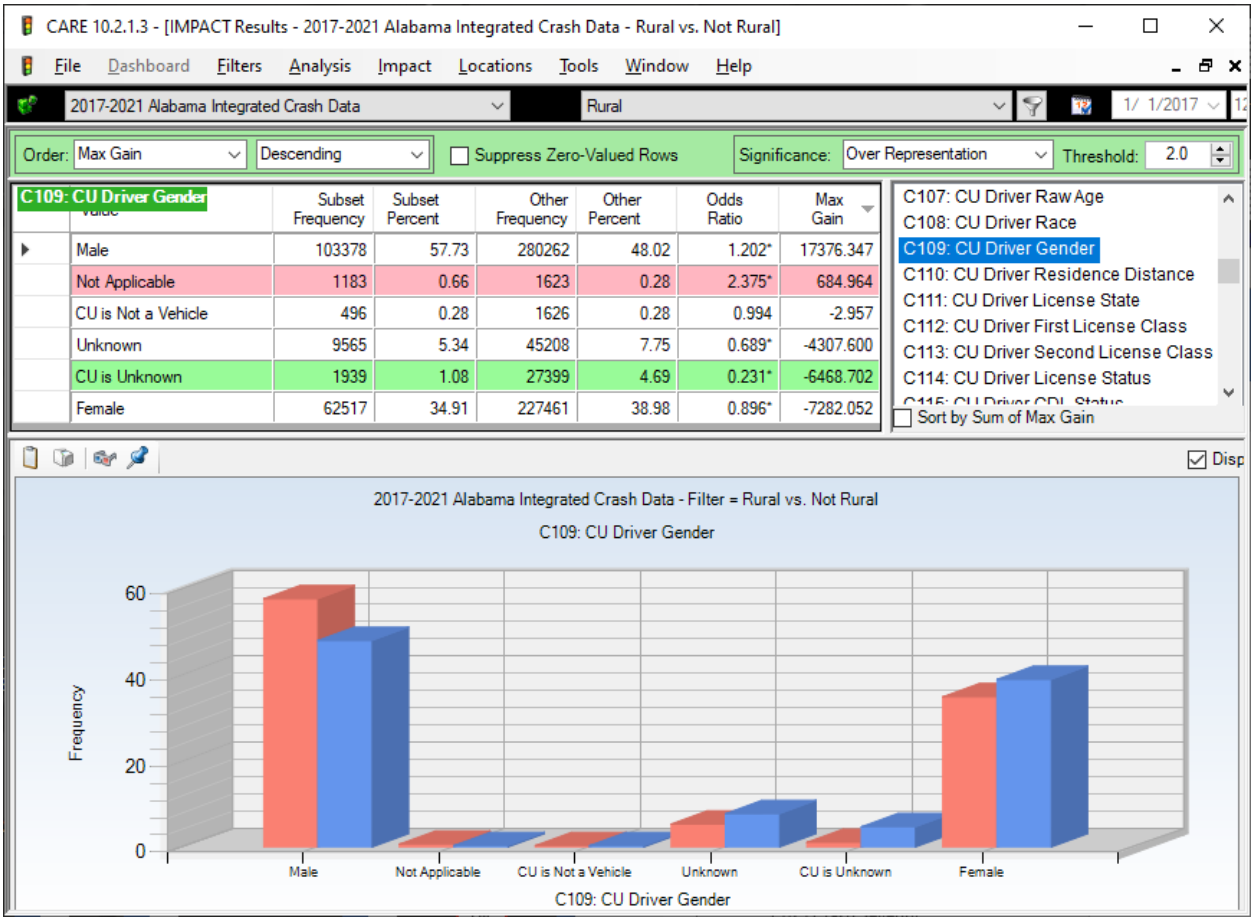
Ages 16-18 are significantly over-represented compared to their crashes in general. The over-representation problem seems to be in the 33 through 56 age groups, which are consistently over-represented as shown in the table and the chart. This age group probably consists of a large proportion of professional drivers, who are on the Rural roads more than most other drivers. They should be particularly aware of their collective vulnerability to be involved in Rural road crashes.

C108 CU Driver Race



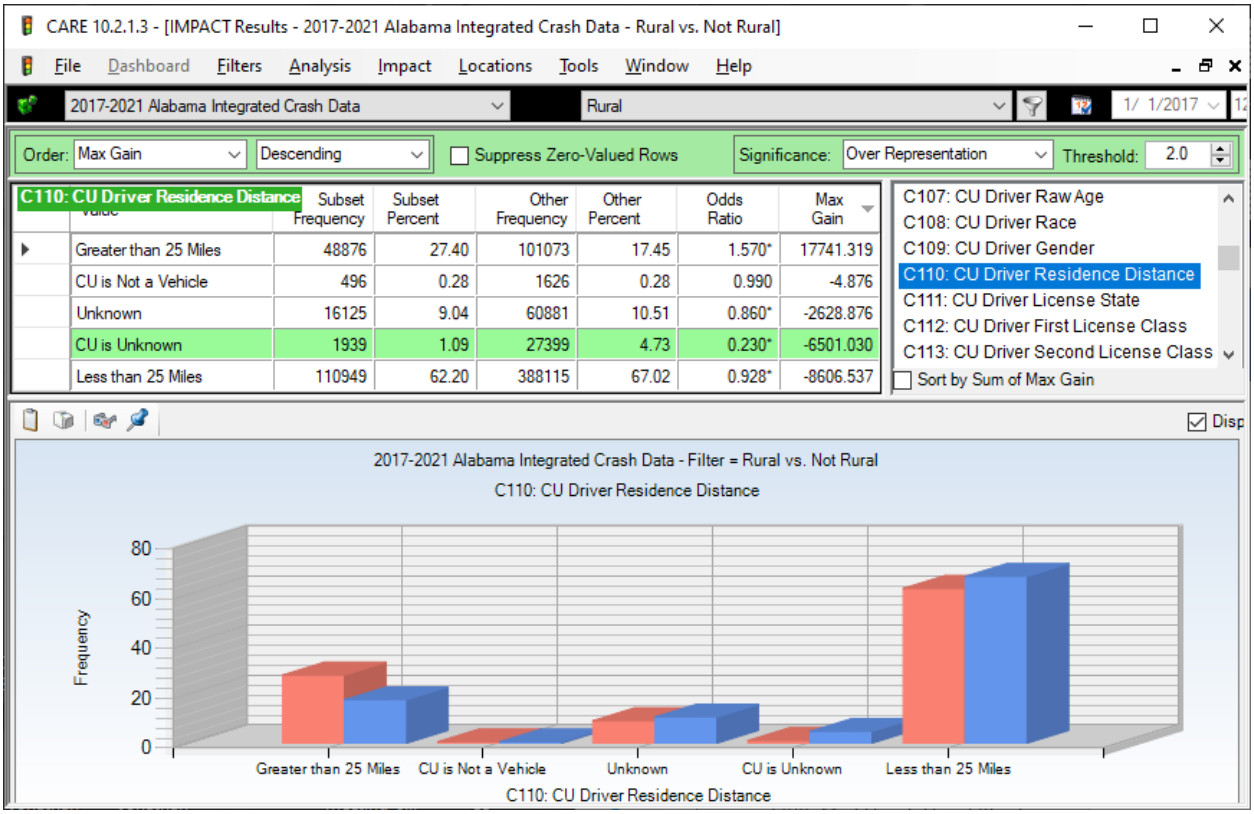
The racial distribution reflects the overall driver distribution, with the only significant under-representation being in the Hispanic classification (albeit quite small). White/Caucasian was over-represented by about 23.8% according to its Odds Ratio.

C109 CU Driver Gender



Men are typically over-represented in most crash types. Thus, it comes as no surprise to see them significantly over-represented in Rural crashes with about 20.2% more Rural crashes than would typically be expected. Females are shown to be significantly under-represented in Rural crashes, and thus, they are significantly over-represented in Urban crashes.

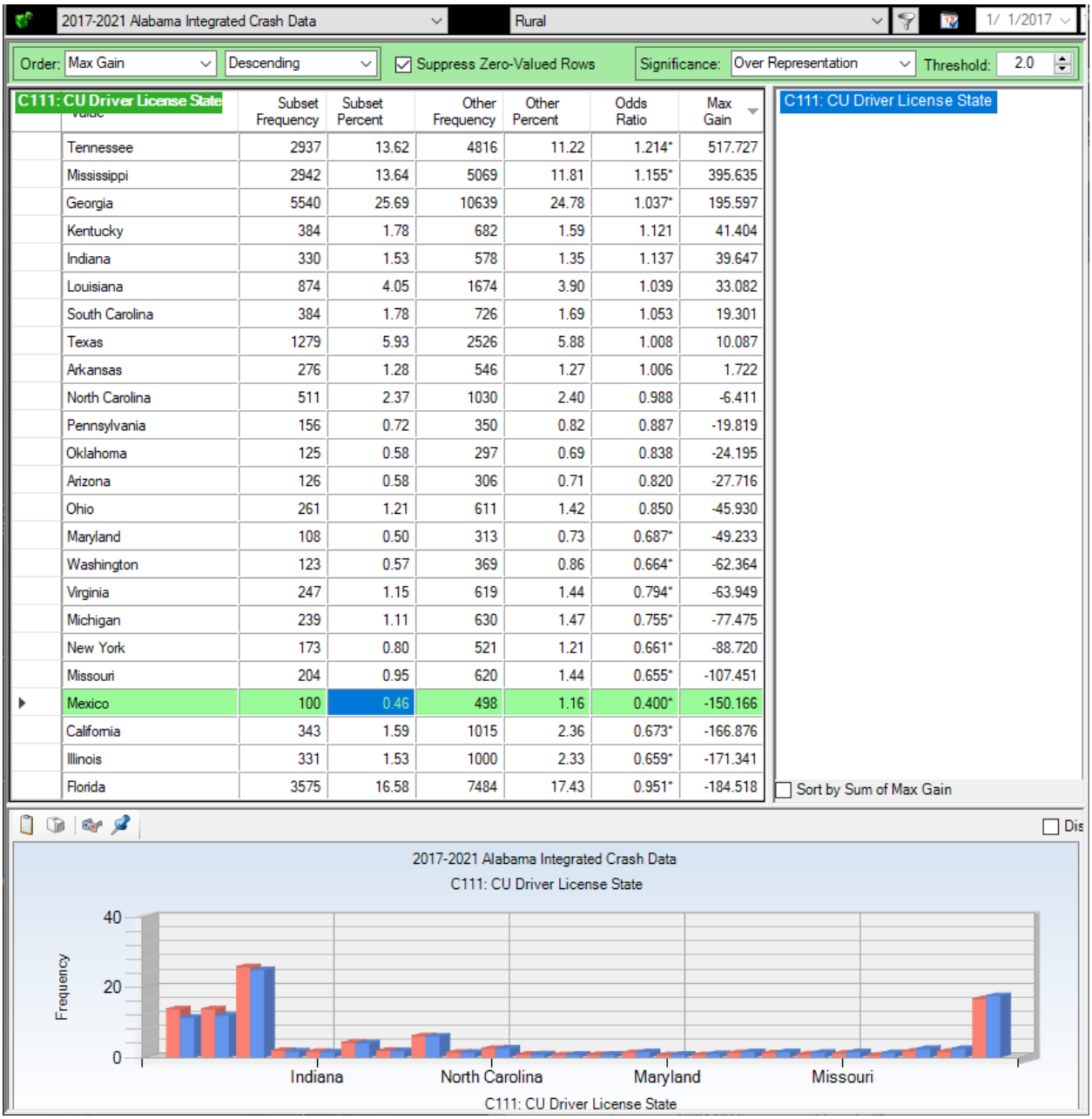
C110 CU Driver Residence Distance



This indicates that Rural travel and their accompanying crashes tend to be at distances greater than 25 miles from home. The Urban distances were also under-represented in being less than 25 miles, but with a relatively small differences in the proportions.

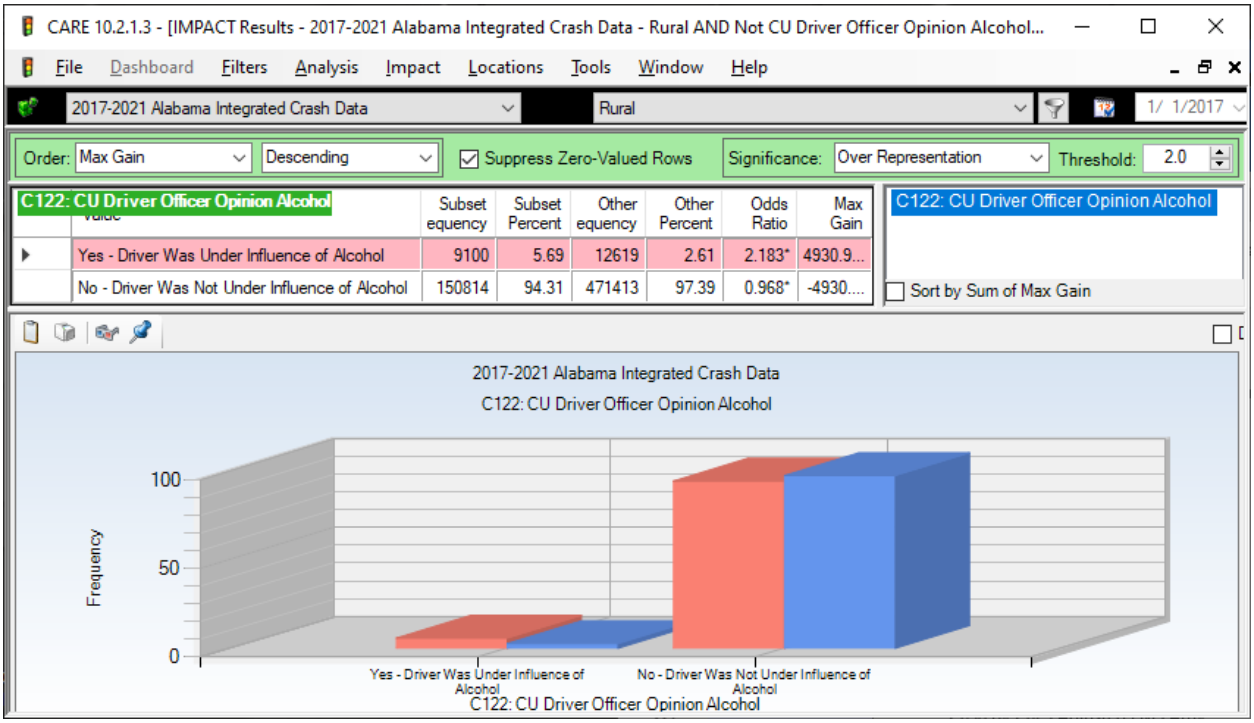
C111 Driver License State

All states with less than 100 crashes were removed as was Alabama in order to get better relative estimates of the Rural crashed occurring from out of state drivers.



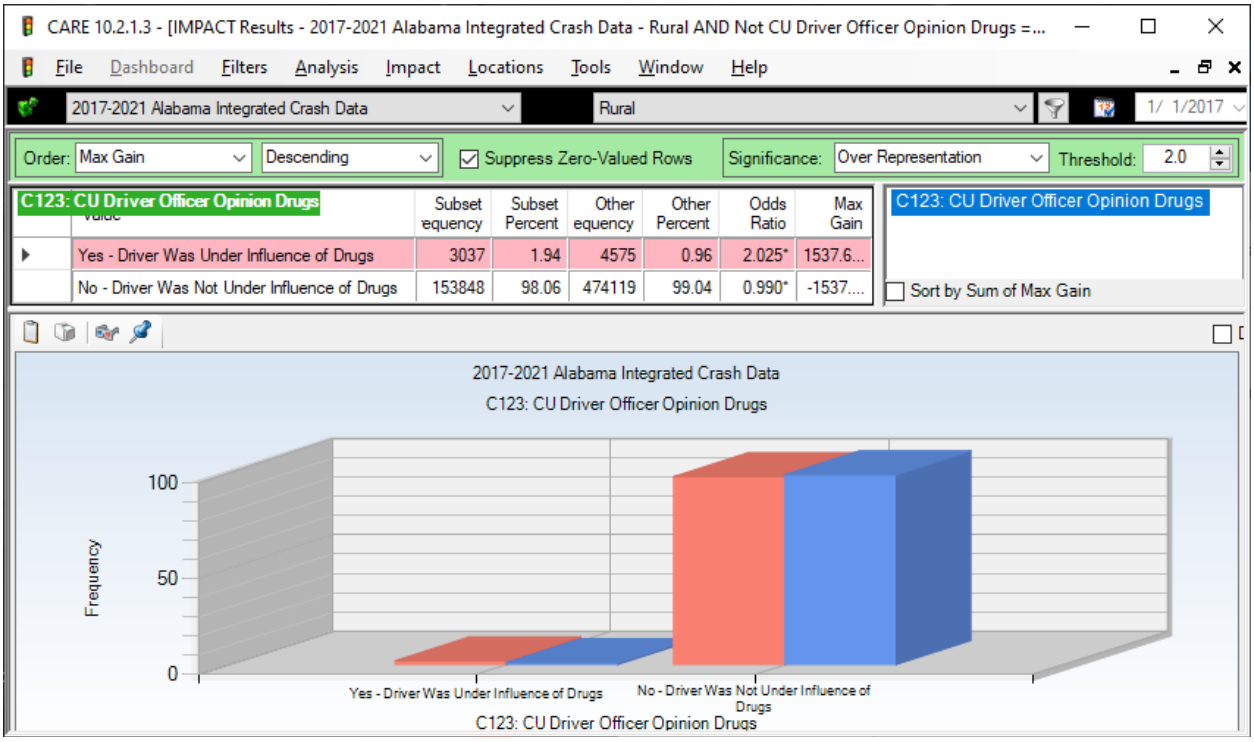
As expected, drivers from states proximal to Alabama have the greatest numbers of rural and Urban crashes in Alabama. Tennessee, Mississippi and Georgia were the only significantly over-represented in Rural crashes, while the over-representations in the urban areas were quite varied.

C122 Officer's Opinion Alcohol



The Rural roads are clearly those most apt to have crashes caused by DUI of Alcohol. The proportion of these crashes was 5.69 as compared to only 2.61 of those in the Urban areas (a highly significant Odds Ratio of 2.183).

C123 Officer's Opinion Non-Alcohol Drugs



While only about a third of the number, the proportions and Odds Ratios look very much the same as was true of the DUI of Alcohol given above. The proportion positive here was 1.94 for the Rural roads, but only 0.96 for the Urban roads, which results in an Odds Ratio of 2.025 (amazingly close to that of DUI alcohol above).