CARE IMPACT Study of
Traffic Crashes Involving Pedestrians
2013-2017 Data

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August 1, 2018

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Introduction and Summary of Findings

Recommendations

The major goal of these recommendations is the reduction in pedestrian fatalities. To some extent the reduction in all pedestrian crashes will reduce fatalities. However, in Alabama there are many significant differences between the aspects of fatal and non-fatal pedestrian crashes. So if there is a trade-off between two factors, one of which will reduce all pedestrian crashes, and the other that will reduce pedestrian fatalities, we would lean toward the one that reduces the fatalities.

At the outset it should be recognized that there are potentially two human causes to a pedestrian crash: the pedestrian and the driver. These recommendations will be divided accordingly. The pedestrian will be considered first, since they have a greater potential for behavioral changes.

Recommended Pedestrian Countermeasures

The following is a prioritized list of actions that the traffic safety community in Alabama should take that are directed toward pedestrian crashes:

- Initiate a PI&E or other behavioral modification program that will instill within those of all ages who are going to be walking along and across the roadways to see the dangers of impaired walking and distracted walking. This should be expressed, not only in terms of impairment and distraction causing the crash itself, but also in its increasing the severity to its being fatal. Both of these factors, and especially the combination of both of them, prevents the pedestrian from taking the normal preventative and protective response behaviors, which results in a larger number of pedestrian fatalities.
- Training should start at the earliest possible ages, recognizing the over-representation of pedestrian crashes in general in school zones. K-9 training also has effects that could be life-long in duration. This should include intensive behavioral training with regard to actions going to or from school buses.
- Include in these efforts training on protection, preemption before involvement in a crash is imminent, and response when it is no longer preventable. A large majority of pedestrian fatalities are caused by the pedestrian as opposed to the driver. The normal rules for walking and crossing need to be emphasized by the information on the recent fatality increases. For details on the most over-represented negative actions see C015 and C304 within the Pedestrian Fatality Analysis section, both of which show the greatest problem to be Improper Crossing, which is greatly multiplied when the crossing is not done at an intersection.
- Impress upon those who will be pedestrians the fact that the great majority of fatal pedestrian crashes are the fault of the pedestrian, and so it is their responsibility to protect themselves at all times if they are going to avoid injury.

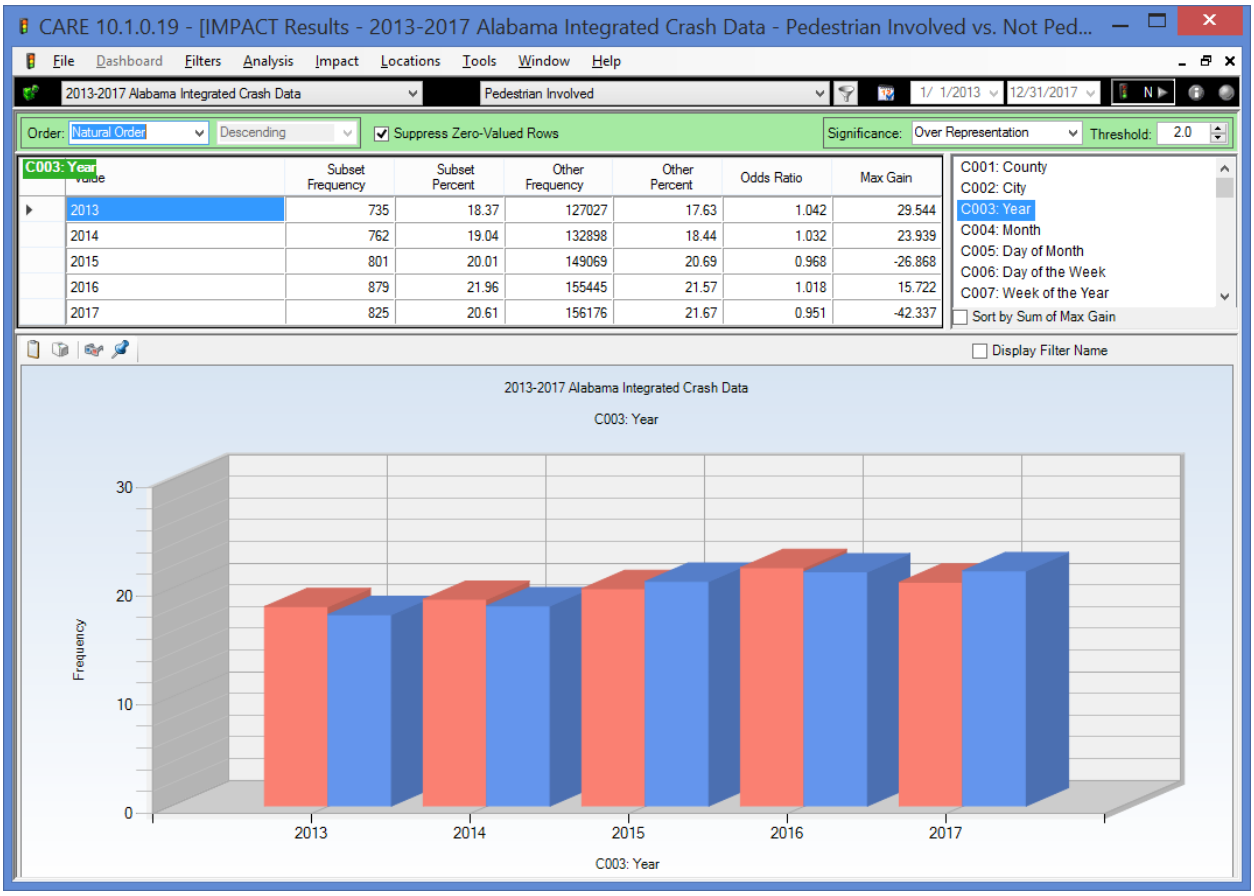
- Protection and preemption information should concentrate on the subject of making yourself visible to the driver, since a major problem in pedestrian fatalities is the driver either not seeing the pedestrian at all, or seeing them too late to take effective preventive actions. Walking against traffic and wearing reflective clothing in the darkness are critical. If at all possible, avoid walking at night, and if that is necessary, be sure to wear reflective clothing. Avoid being out late Friday or Saturday nights, since these are the heaviest DUI times, and these drivers often do not see pedestrians because of impairment. Walking with others could help, but it is not the ultimate solution in that close to 10% of fatal pedestrian crashes involved two or more pedestrians.
- Rural, non-intersection locations where site distance is limited (e.g., no-passing zones) should be given special emphasis in enforcement, engineering and education, since these are the location types where most of the fatalities take place.
- Cities and counties that have more than their expected share of pedestrian fatalities should be targeted for these programs.

The following is a prioritized list of actions that the traffic safety community in Alabama should take that are directed toward drivers:

- While there are over-representations seen throughout the range of driver age, younger drivers (aged 16-20) have about 20% more pedestrian crashes than older drivers, and thus are the logical target group for training if it is to be limited to a narrow age group. Training them early also might have life-long effects. Another target would be male drivers and those who will be driving in rural areas. A final target group would be pickup truck drivers of all ages.
- All countermeasures to reduce impaired driving or distracted driving will reduce pedestrian fatalities. However, we recommend that such training be extended to include emphasis upon the extent to which pedestrians are particularly vulnerable to these driver errors.
- Drivers should be trained to always assume the worse behavior from pedestrians and never take anything for granted. This is especially relevant in light of the high number of pedestrian fatalities caused by impaired walking and distracted walking. It might seem reasonable to expect certain rational behaviors on the part of pedestrians, but typically these are not the pedestrians who are going to be involved.
- Since the location for the most lethal pedestrian crashes are on rural, relatively high speed roadways, drivers should be particularly aware of the vulnerability of pedestrians near these roadway types. It is essential that drivers actually look further ahead than many usually do in identifying their presence. Upon seeing a pedestrian, reduce speed and be ready to take whatever action is necessary to avoid a collision.
- Pedestrian problems occur where there is restricted sight distance for whatever reason. Drivers in these situations are concentrating on the roadway, and thus, not thinking about the possibility of pedestrians appearing, especially in the more remote areas. All of the warning signs for hills and curves, and especially no passing zones should trigger the driver to increase awareness of the potential pedestrian problems.

Introduction

The following shows the proportion by year of Alabama pedestrian crashes compared to all other crashes. Typically we would expect there two subsets to rise and fall together, and this is basically what occurred in the 2013-2017 time frame, since there are no significant over-representations four (note absence of asterisks * in the Odds Ratio column).



The total number of pedestrian crashes over the five year period is 4002, or about 800 per year.

None of the years had significant differences, but the overall total differences in proportionate increase is significant. Non-pedestrian crashes in general have increased from 127,027 to 156,176, which is about 23%. Pedestrian crashes have increase from 735 to 825, which is only about 12%, which is about half the overall percentage difference. This would indicate that pedestrian crashes are not totally dependent on the overall traffic volume for a given year. Alabama's increases in pedestrian crashes and fatalities are also studied in the Time Characteristics section. These changes reflect the National picture, as given in a document entitled, "Pedestrian Traffic Fatalities by State: 2017 Preliminary Data," produced by the Governors' Highway Safety Association (GHSA); https://www.ghsa.org/resources/spotlight-pedestrians18

This document will continue by providing a summary of the detailed findings that are given in subsequent sections. It is important to recognize that the IMPACT displays are not all consistently comparing the same thing. To properly interpret them it is important to determine what the red and blue bars mean as well as what the "Subset" and the "Other" subsets of the data represent. This will be given in the narrative and in the title of the sections.

Statistical significance is indicated by an asterisk on the odds ratio table entries. If a significance was determined at the 0.999 level of significance or greater, an asterisk will appear. However, statistical tests are only performed when there is a sample size of at least 20 in both subsets being compared. Thus, the absence of an asterisk in some cases should not be interpreted as the proportion of the two subsets not being significantly different,

Summary of Findings

The following summary is a list of conclusions that were summarized from the corresponding named sections that follow. Concentration is given on those findings that are counter to the general expectations or which could otherwise be useful in countermeasure development. It is important for optimization that the IMPACT outputs be examined to determine not only if an over-representation exists, but its size and the number of crashes that are affected by it.

- Crash Characteristics
  - C015. Primary Contributing Circumstances (PCC). The PCCs that had at least 100 occurrences and were most over-represented were Improper Crossing, Unseen Object/Person/Vehicle, Failed to Yield the Right-of-Way, Failed to Yield Right-of-Way to Pedestrian in Crosswalk, Pedestrian Under the Influence, and Not Visible. Looking at just fatal pedestrian crashes, Pedestrian Under the Influence has a higher Max Gain position, as did Not Visible and DUI.
  - C129. CU Vehicle Maneuvers. Significant over-representations for pedestrian crashes occur in the Backing, Turning Left and Movement Essentially Straight, with Right Turns also over-represented by not significantly so. Repeating this analysis for just fatal pedestrian crashes found Movement Essentially Straight to be the only category significantly over-represented, which is indicative of the predominantly rural nature of pedestrian fatalities.
  - C023. Manner of Crash. The major use of this attribute is in evaluating types of pedestrian crashes in which there are more than one vehicle involved. As expected, crashes with only one motor vehicle were significantly over-represented.
  - Cross-Tabulation of C023 and Number of Vehicles. This was performed to get better insight into interpreting C023. It was found that many of the codes that might be thought to apply to two vehicles were being applied to single vehicle pedestrian crashes.
  - C051. Number of Vehicles. Two or more motor vehicles are involved in less than 8% of pedestrian crashes.
  - C056. Number of Pedestrians. Multiple pedestrians are involved in only about 4% of pedestrian crashes; however, this percentage doubles when the crash involves one or more fatalities.
  - C203. CU First Harmful Event Location. Over-representations were found in the following (number of pedestrian crashes): In Parking Lane or Zone (209), Intersection with Crosswalk and Pedestrian Signal (86), Other Non-Intersection (51), Off Roadway (93), Shoulder (134, but under-represented), Intersection with Crosswalk no Pedestrian Signal (39), Non-Intersection Crosswalk (22), Sidewalk (15). While these last two have relatively few crashes, they were still highly over-represented.

- Time Characteristics
    - C003. Year of Crash. Year is of interest because it shows if pedestrian crashes are increasing or decreasing over time. Over the 2013-2017 five years of the study, non-pedestrian crashes in general increased from 127,027 to 156,176, which is about 23%. Pedestrian crashes increased from 735 to 825, which is only about 12%, or about half the overall percentage difference. The pedestrian fatality distribution over the years is considerably different from overall pedestrian crashes. The low was in 2013, which was a very good year compared to those that followed. Years 2014 and 2015 were close to double 2013, and 2016 was much worse. Thus, the pedestrian fatality count increased by about 100% (i.e., it doubled). This alarming fact gave rise to the need for this study.
    - C004. Month. September and October clearly have the highest over-representations for pedestrian crashes, and they were the only two months that were significantly over-represented. June was the only month that had a significant under-representation, perhaps because of the heat and rain. July and August are also under-represented, but not significantly. For fatal pedestrian crashes, the most over-represented months were also September and October.
    - C008. Time of Day. There is a great similarity of this distribution with that of alcohol and other drugs, which might lead us to suspect that they are instrumental in causing pedestrian crashes. Other attributes will confirm this, but it is not the only reason for these times to be high. An exception to the above, the earlier night/late evening (5 PM through 8 PM) hours are some of the highest, and this is probably just the convenient time to be out as opposed to any alcohol/drug involvement. Rush hours are high, but under-represented. Fatal pedestrian crashes are significantly over-represented from 7 PM through 6 AM, with the night-time hours being more pronounced.
    - C029. Lighting Conditions. The results here are consistent and tend to reinforce those for C008 immediately above. However, no doubt the inability to see pedestrians as well in darkness is a major cause of these over-representations.
    - C006. Day of the Week. Saturday is significantly over-represented and Monday is significantly under-represented. The rest are as expected compared to all non-pedestrian crashes. Although not totally, this follows the typical alcohol/drugs day-of-the-week distribution, the main exception being Sunday, which is slightly under-represented for pedestrians.
    - Day of the Week by Time of Day Cross-Tabulation. Night-time hours are clearly over-represented on Friday night, Saturday morning and night and Sunday morning. This is typical of crashes caused by alcohol/drugs, and the fault for such could either be on the impaired walking (IW) pedestrian or the impaired driving (ID) driver. The weekend over-representations become more pronounced for fatal pedestrian crashes, with both Saturday and Sunday have significant over-representations.

- Driver Characteristics
    - C107. CU Driver Raw Age Frequency Distribution. Youngest drivers (16-30) have about the same average of pedestrian crashes as older drivers, but they are indicated to be under-represented because of their larger numbers in crashes in general. The most over-represented subset if the 45-66 year old group. Drivers older than this seem to continue to have problems with pedestrian crashes at about the same rate as the younger drivers. This indicates that age is not the causal factor that it is in some types of crashes (e.g., speed caused). As an example of how diversified the numbers are, the highest over-representation are at the ages of 27 through 61.
    - P107 (P indicates that the information came from the Person as opposed to the Crash subset). Pedestrian Raw Age. This analysis compared pedestrians against the persons involved in non-pedestrian crashes. Over-representations occur at the youngest ages (3-15) and middle-aged (50-70). Two outputs are given: one for all pedestrians involved in crashes, and the other for those pedestrians that caused the crashes. The general conclusion reached was that there is very little inherent in age that makes pedestrians more apt to cause crashes, of conversely, more apt to avoid causing them.
    - C109. CU Driver Gender. Driver gender for pedestrian crashes is about the same as for non-pedestrian crashes – there are no significant differences. However, the male over-representation becomes significant for fatal pedestrian crashes, being over-represented by about 20% greater proportion than would be expected. This might be attributed to more rural driving by males, and thus the higher speeds.
    - C121. CU Driver Condition. Driver abnormal conditions do not appear to be significant in causing pedestrian crashes. The only item showing a frequency greater than 20 is Under the Influence of Alcohol or Other Drugs, with a frequency of 102 (3.32%). While the distribution for fatal pedestrian crashes is the same in most respects, the Under the Influence rises in significance, accounting for 23 fatalities and being over-represented by an Odds Ratio of 1.445 (about 45% higher than expected).
    - C122 CU Driver Officer Opinion Alcohol. This indicates that Driver Under the Influence of Alcohol had an over-representation of 57.8% times the expected proportion. When looking at the same results for fatalities, the ratio of yes to no goes from its value above of 6.13% to 17.65%, an over-representation odds ratio of 4.542 greater proportion than expected. There is no doubt that driver impairment is a major cause of pedestrian fatalities.
    - C123 CU Driver Officer Opinion Drugs. Although not as high in frequency (only about a third as many), the over-representation indicator (odds ratio) is about the same for drugs as for alcohol. When looking at the same results for fatalities, the ratio of yes to no goes from its value for all pedestrian crashes of 2.14% to 13.10%, an over-representation odds ratio of 10.357. There is no doubt that driver impairment is a major cause of pedestrian fatalities. Recent reports indicate that drugs have already overtaken alcohol as the source of impairment in

crashes. The reason that they are under-reported here is the extreme difficulty in identifying drug impairment, as well as the relative ease with which alcohol impairment can be proven.

- C104. CU Left the Scene. This attribute is quite important, and it can make the difference between life and death in relatively high severity cases such as pedestrian involved. The Left-Scene rate is almost twice that which occurs in non-pedestrian crashes. This probably tracks ID and night-time hours. However, for crashes that are fatal, the proportion of leaving the scene drops down to under 10%, which is about the same rate that it has in crashes in general.
- C020. Distracted Driving Officer's Opinion. Relatively speaking, DD does not seem to be a major factor in pedestrian crashes. Recognize that this is only referring to the driver, not to the pedestrian, since there is no Walking Distracted entry at all in the crash report. No practical differences were found in the pedestrian fatality analysis.

- Severity Characteristics
  - C025. Crash Severity. As would be expected, all of injury categories are significantly over-represented with the odds ratio increasing exponentially with the severity. Possible Injury has an odds ratio 2.129 times the expected proportion from all non-pedestrian crash types. This increases exponentially to 23.587 for fatal crashes.
  - C058. Number Killed. This attribute indicates that the chances of a pedestrian crash being fatal is about 25 times that of other crashes, and two fatalities result about 8 times the expected proportion of other crashes having two fatalities.
  - C101. Causal Unit Type – Fatality Causal Comparison. This attribute becomes important because of the recent research that has indicated that SUVs are more apt to cause fatal pedestrian crashes than are other passenger vehicle types. The analysis for this particular item was different from the other fatal pedestrian analyses in that this comparison is between fatal pedestrian crashes and non-fatal pedestrian crashes. This was performed in order to determine vehicle types that may be causing more than their share of fatalities. Both SUVs and Passenger Cars were found to be under-represented. It is true that Passenger Cars are significantly under-represented and have a much lower odds ratio than SUVs, and this could be interpreted that Passenger Cars are not causing as many fatalities (proportionately speaking) as SUVs. As can be seen, however, SUVs have almost identically their proportion of fatal crashes as their proportion of non-fatal crashes, so it is difficult to prove from these numbers that they are prone to cause more fatalities.
  - C224. Estimated Speed at Impact for Pedestrian Fatal Crashes. Generally pedestrian crashes occur at lower speeds than other crashes due to their being highly concentrated in urban areas. However, the same is not true of fatal pedestrian crashes as given above, which illustrates that speed is a major factor in causing these fatalities.

- C036. Adjusted EMS Arrival Delay. Over 70% of pedestrian crashes have an EMS arrival delay of 10 minutes or less. The delay is longer for fatal pedestrian crashes, with only 57.6% having arrivals less than 10 minutes, and 31.6% falling in the 11 to 30 minute ranges.

- Pedestrian Fatality Analysis – The comparisons in this section are not like most of those above (with the exception of C101 Causal Unit Type). As with C101 above, *the comparisons in this section are between pedestrian fatal crashes and pedestrian non-fatal crashes.* The purpose of these analyses was to focus on those factors that turn a non-fatal pedestrian crash into one that is fatal. Generally attributes that are not considered in this section do not show any new significant factors not already established in the other analyses.
  - C015. Primary Contributing Circumstance. Improper Crossing (126) is the most over-represented. Pedestrian under the Influence (46) is over 18 times its expected proportion, creating situations where pedestrians do not take defensive protective action. Not Visible (37) at all, as opposed to unseen is significantly over-represented. DUI (24) of the causal driver is over five times expected. Lying or Sitting in Roadway (16) proved to be fatal 100% of the time. The other items should not be dismissed because they are under-represented.
  - C304 CU Non-Motorist Action at time of Crash #1. These findings tended to reinforce those for C015, immediately above. However, there were a few new items that appear in this attribute. The most over-represented were (number of fatal crashes): In Roadway – Standing, On Knees/Lying (71); Improper Crossing (105); Not Visible – Dark Clothing (32); and Darting (21).
  - C308 CU Non-Motorist Condition. This attribute further confirms the problem of impairment on the part of pedestrians. Impairment may lead them to be careless while walking in or near roadways. It is interesting to compare this with the same driver distribution, C121 CU Driver Condition. The following shows that the over-representation of drivers is not that different for the pedestrian. For drivers, it is over 7 times the expected proportion of fatal crashes when compared to the proportion for non-fatal pedestrian crashes. For pedestrians, it is over 11 times its expected proportion for fatal pedestrian crashes as it is for those that are non-fatal.
  - C309 and C310 CU Non-Motorist Officer Opinion Alcohol and Drugs. The problem of pedestrian impairment is further qualified by these attributes. Pedestrian crashes involving death have a proportion of drug use of 66.521 times the proportion of those pedestrians who survive their crashes. (This may be caused by the requirement to do a blood test on fatal victims that is not otherwise required.) The multiplier for alcohol is not as great at 8.564, but alcohol is recorded to be affecting twice as many pedestrians being killed as drugs.
  - C322 CU Driver/Non-Motorist Victim/Occupant. This attribute demonstrated a striking contrast. If at-fault were just due to chance, then there would be a 50-50% chance for the driver and the pedestrian, and their proportions would thus be the same (i.e., the ratio of the two would be 1.00). But here, for non-fatal pedestrian crashes, the driver is at fault 63.1% of the time. But for fatal pedestrian

crashes just the opposite is true – the pedestrian is at fault 64.9% of the time. This shows that severity is highly dependent on fault. If a pedestrian cause a crash, the probability that s/he will be killed is close to twice what it would be than if they were strictly the victim. The at-fault and impaired pedestrian would reasonably be well correlated, since an officer would be more prone to indicate the pedestrian to be at fault if they were impaired.

- C409 CU Traffic Control. No Passing Zone and Lane Control Device both have significant over-representation of over four and close to six times, respectively. Traffic Signals have a high number but are under-represented, probably because the high volume make these locations very prone to pedestrian crashes in general, and the slower speeds would lead to relatively fewer fatalities.
- C031 Locale. Open country is by far the most lethal locale, having 198 fatal crashes and an odds ratio of 3.415 times its expected proportion. Rural fatal crashes also have an odds ratio of 3.291, almost reflecting the locale result perfectly. C224 Estimated Speed at Impact further reinforces that the increased speed of impact on the rural roadways is a major cause of pedestrian fatalities on these roadway classifications.

- <u>Geographical Characteristics</u>
  - C010. Rural or Urban. Pedestrian crashes are significantly over-represented in the urban areas (odds ratio of 1.078), which pedestrian fatal crashes are over-represented in the rural areas (odds ratio of 1.624). This obviously correlates with speed (see C224).
  - C001. County (all pedestrian crashes). The urban counties, where there are large volumes of both vehicles and pedestrians, have the greatest proportions, although not necessarily the greatest numbers of fatalities. The highest over-represented (all with Max Gains greater than 10), ordered by largest Max Gain first, are Mobile, Jefferson, Montgomery, Madison, Dallas, Calhoun, Russell and Barbour.
  - C001. County (fatal pedestrian crashes). When comparing fatal pedestrian crashes to all other crashes, the over-represented counties change to those that have more rural areas, with the exception of Mobile County. The most over-represented counties, all with Max Gains greater than 5, are: Mobile, Russell, Houston, Dallas and Marion. The most under-represented counties are: Etowah, Montgomery, Cullman, Lee, Madison, Shelby and Jefferson, so Mobile county is certainly a notable exception.
  - C002. City Over-Represented All Pedestrian Crashes. The following cities had Max Gains greater than 20 (worst first): Birmingham, Mobile, Montgomery, Huntsville, Rural Mobile, Anniston and Selma.
  - C002. City Over-Represented in Fatal Pedestrian Crashes. The following cities had Max Gains greater than 4 (worst first): Rural Mobile, Dothan, Rural Russell, Rural Baldwin, Rural Macon, Rural Autauga, Rural Tuscaloosa, and Selma.
  - C031. Locale. Of greatest concern is the great over-representation of pedestrian crashes in school zones. Fortunately, this locale is much further down on the list when it comes to fatal pedestrian crashes (see below). For all pedestrian crashes

the significantly over-represented are: Residential, and School. For fatal pedestrian crashes, the only significantly over-represented locale was Open Country. School has five (one per year), and was under-represented by an odds ratio 0.637 of its expected proportion when compared to all other crashes.

- C011. Highway Classification. The typical pattern holds for the majority of pedestrian crashes to be on the urban roads, while the majority of fatalities are on the higher speed roadways. Significant over-representations for all pedestrian crashes were on Private Property (would including parking lots), and Municipal roadways. For fatal pedestrian crashes the significant over-representations were on Federal, and State.
- C110. CU Driver Residence Distance. No distance from home is recorded for the pedestrian – this attribute is strictly for the driver. For all pedestrian crashes Less Than 25 Miles was over-represented with an odds ratio of 1.058 times its expected proportion compared to all non-pedestrian crashes. The opposite is true for fatal pedestrian crashes with the odds ratio being 1.071 for Greater Than 25 Miles. This reflects the rural nature of fatal pedestrian crashes.

- Vehicle Characteristics
  - C101. CU Vehicle Type. This was considered for both all pedestrian crashes and fatal pedestrian crashes in the major section on Crash Severity.
  - C201. CU Body (Passenger Cars Only). This is presented for comparison with the C101 analysis that was performed. The only item found to have statistically significant difference was the under-representation of Two-Door vehicle bodies for all pedestrian crashes. Four Door with Rear Entry had the highest Max Gain for fatal pedestrian crashes, but it was still not found to be a significant difference.
  - C208. Model Year. The years 2003-2012, collectively, were over-represented. There was no obvious difference in the distribution for fatal pedestrian crashes.
  - C024. School Bus Related. School bus involvement in pedestrian crashes are less than 1% of the pedestrian crashes. However, they are over-represented in both of the "Involved" categories, and "Directly Involved" accounted for the two fatalities within this attribute.
  - C061. Train Involved. Trains were only involved in one pedestrian crash over the five years of the study. This particular crash did prove to be fatal.

- Roadway Environment/Pavement Characteristics
  - C412 CU Traffic Lanes. For fatal pedestrian crashes there was the expected shift to the higher speed roadways, with the two lane roads becoming significantly under-represented (0.870 odds ratio), and the four-lane roads becoming significantly over-represented (1.168).
  - C408. CU Vision Obscured By. Vision obstructions play a part in some pedestrian crash causes, with about 8.55% of the crashes involving some vision obstructions (it is about 4.54% for non-pedestrian crashes). Parked Vehicles are an obvious over-representation in that many vulnerable pedestrians probably emerge

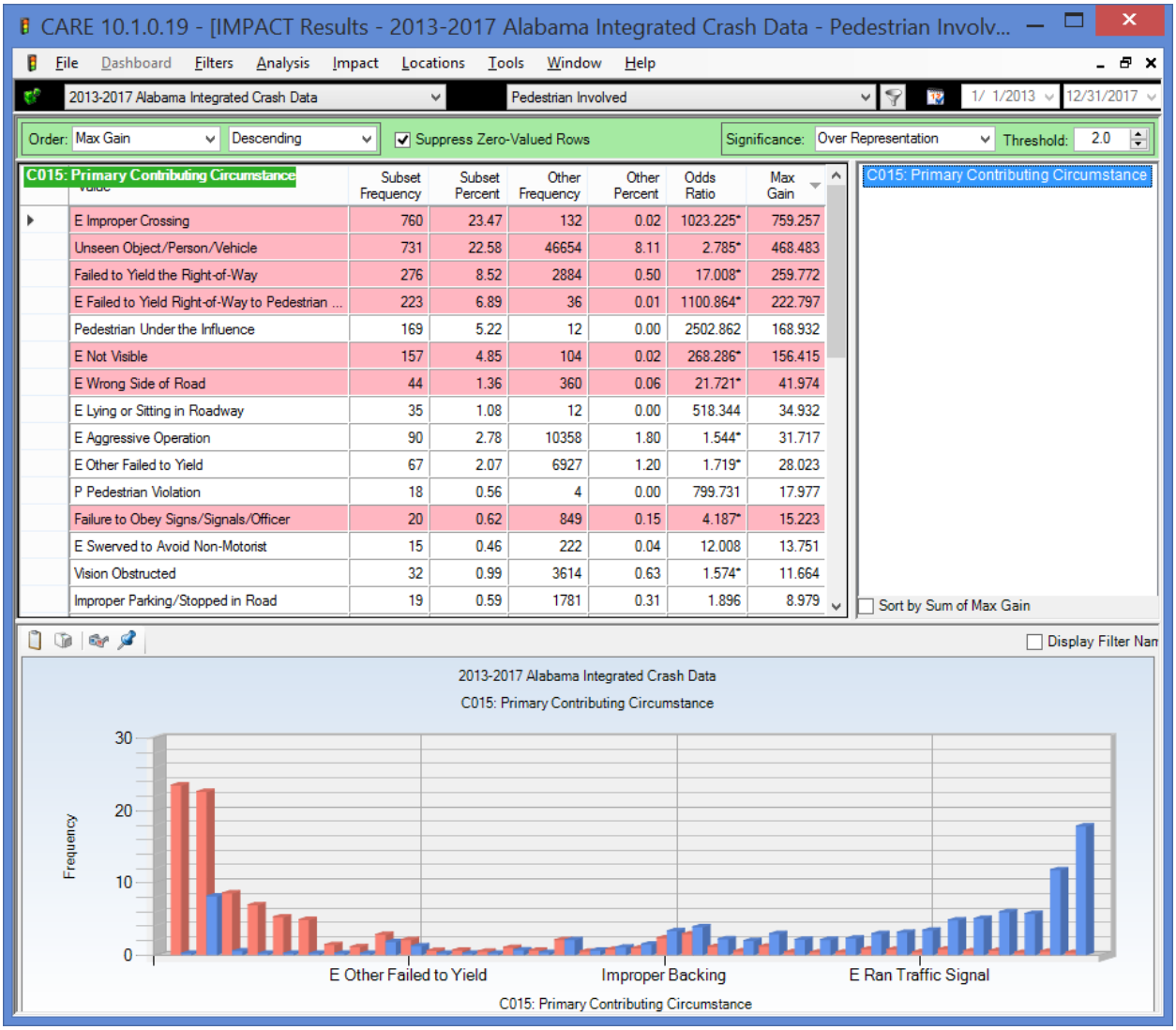
from parked vehicles. The next three – Driver Blinded by Sun, Lights Glare (Roadside), and Driver Blinded by Headlights – are indicative of the difficulty that it is to see pedestrians in night-time or other situations in which they are not wearing contrasting clothing. The distribution for fatal pedestrian crashes showed no significant differences from the more general analysis.

- C026 Intersection Related. Pedestrian crashes are clearly over-represented away from intersections, and this becomes even more pronounced for fatal pedestrian crashes. For pedestrian crashes in general, the odds ratio is 1.068 times the proportion of crashes in general not being at intersections. For fatal crashes this ratio increases to 1.159 times the proportion of all other crashes not at intersections. This is an indication that drivers have more of a tendency to be looking for pedestrians at intersections.
- C022. Type of Roadway Junction. Are some intersection types worse than others? The four way intersection category was not found to be significantly over-represented; nevertheless, because of the large number of pedestrian crashes that occur in this type of intersections, it should definitely get priority as far as countermeasures are concerned. The fatal pedestrian analysis did not vary much from the more general analysis; however Bridge/Overpass/Underpass was found to have a much larger over-represented with 12 fatalities over the five year period of the study.
- C407 CU Roadway Curvature and Grade. The general pedestrian analysis would seem to show that roadway curvature and grade has little to do with causing pedestrian crashes. However, the contrast with the fatal pedestrian indicates that the interactions with other roadway differences (e.g., Roadway Classifications, Rural-Urban, and other differences in location types), should be considered in conjunction with curvature and grade. The differences seen might be due to the necessary differences between urban and rural roadways.
- C409. CU Traffic Control. This is an interesting distribution to assist in determining where pedestrian countermeasures might be more effective. The only major difference in the fatal pedestrian distribution is the elevation of No Passing Zone to the third position down with 52 fatal crashes and a significant over-representation factor of 1.420 (42% higher than what would be expected from crashes in general).
- C030. Weather. Rain works in favor of preventing pedestrian crashes. While visibility may be reduced, the fewer pedestrians greatly overcomes this factor. The under-representation factor is a significant 0.676 for all pedestrian crashes, and an amazingly close 0.653 for fatal pedestrian crashes. C403 Roadway Condition heavily reflects these findings.
- C415. CU Workzone Related. This result will be of interest to those who are implementing work zone countermeasures. Of the 77 pedestrian crashes in work zones, 22 (28.6%) were fatal, which is much higher than the overall fatality rate (see severity section) of 12.02%.

If there are any questions, please contact Dr. David Brown at brown@cs.ua.edu.

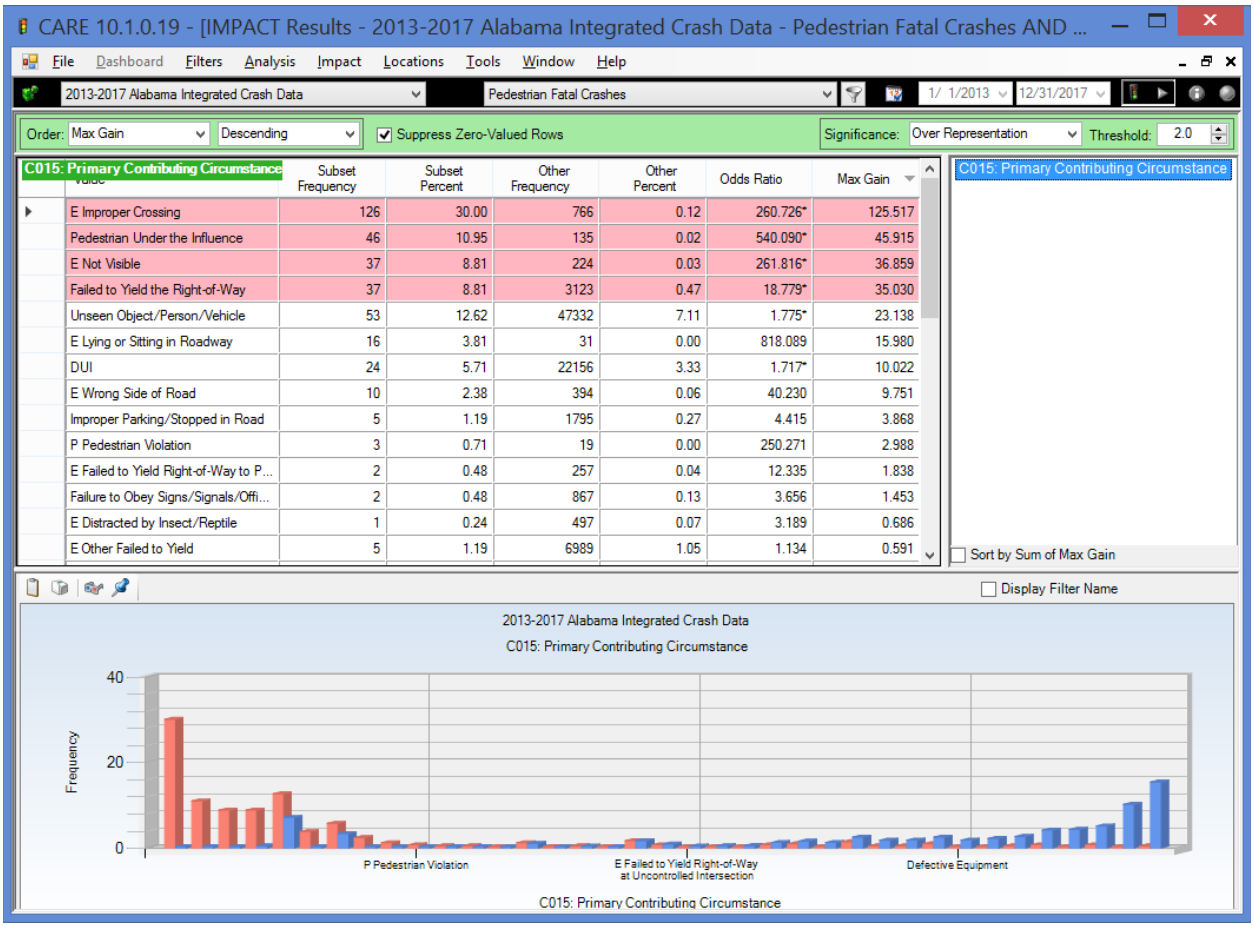
Crash Characteristics

C015 Primary Contributing Circumstance – Most Overrepresented



All values with less than 10 occurrences were pruned from the displays above and below. The most over-represented were: Improper Crossing, Unseen Object/Person/Vehicle, Failed to Yield the Right-of-Way, Failed to Yield Right-of-Way to Pedestrian in Crosswalk, Pedestrian Under the Influence, Not Visible, Wrong Side of Road, Lying or Sitting in Roadway, Aggressive Operation, Other Failed to Yield, Pedestrian Violation, and Failure to Obey Signs/Signals/Officer.

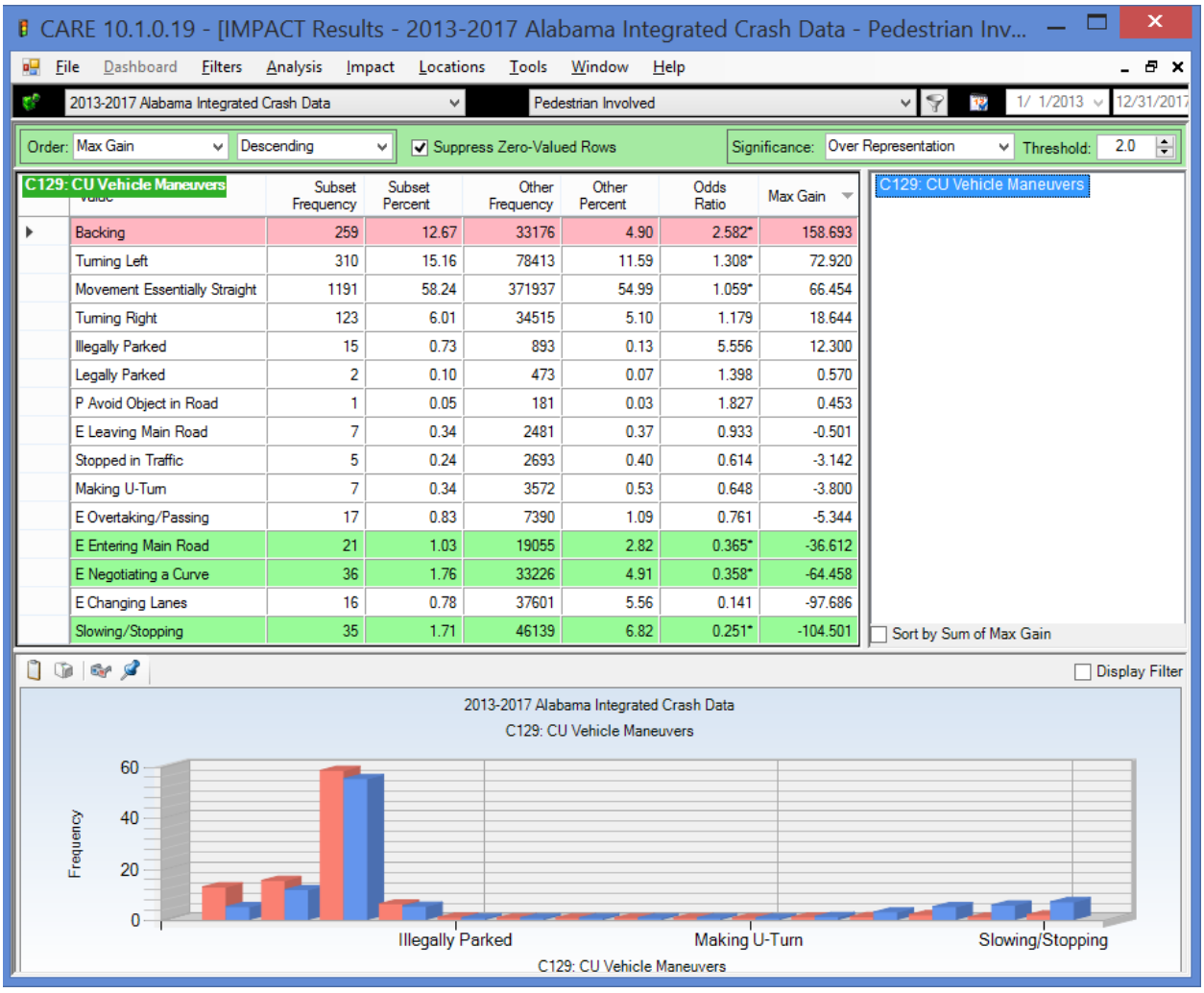
C015 Primary Contributing Circumstance – Fatal Crashes; Most Overrepresented



Major differences between the fatal pedestrian distribution and the overall distribution:

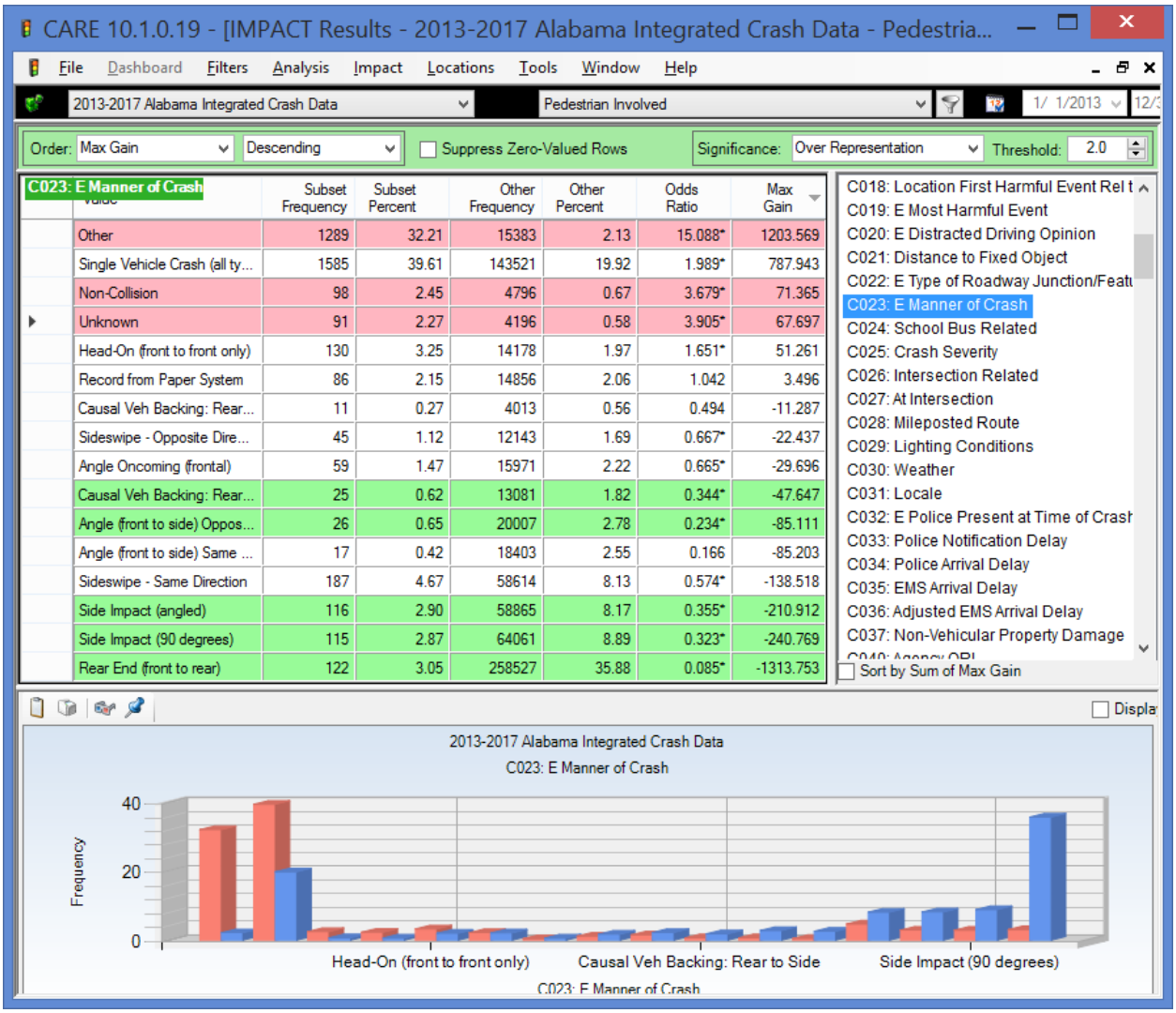
- Pedestrian Under the Influence has a higher Max Gain position in the fatal crashes, although the comparison number in both cases is for non-pedestrian crashes, so should not be considered valid. Additional analysis will be performed for the Pedestrian Under the Influence subset.
- Not Visible also moves up in its Max Gain position.
- DUI becomes over-represented, which it was not in the overall pedestrian analysis.

C129 CU Vehicle Maneuvers



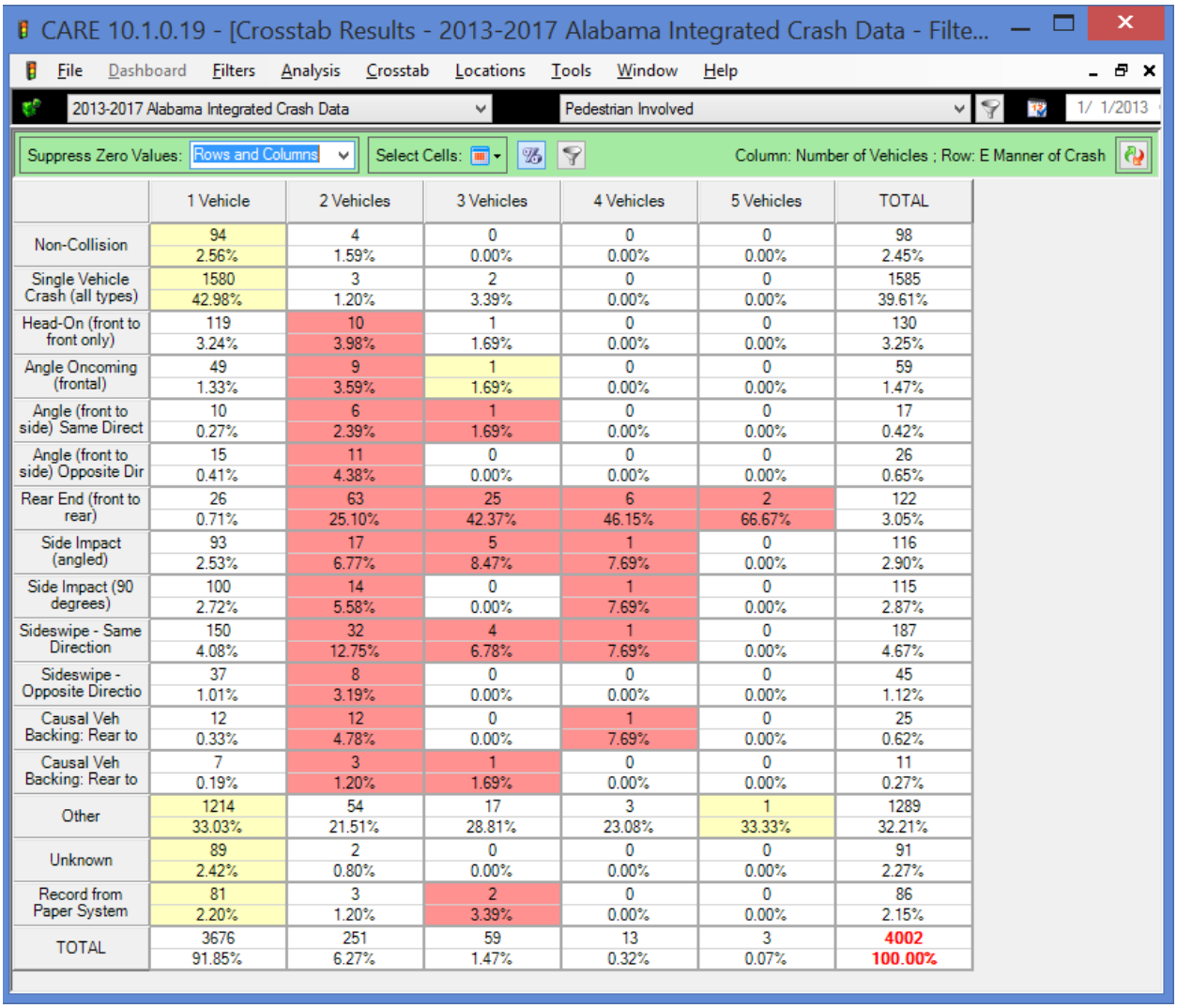
Significant over-representations for pedestrian crashes occur in the Backing, Turning Left and Movement Essentially Straight, with Right turns also over-represented by not significantly so. Repeating this analysis for just fatal pedestrian crashes found Movement Essentially Straight to be the only category significantly over-represented, which is indicative of the predominantly rural nature of pedestrian fatalities.

C023 Manner of Crash



We would expected a larger proportion than 65.0% to be single vehicle crashes. A cross-tabulation between the variable and the number of vehicles involved in the crashes is given on the next page. This indicates that 3676/4002=91.9% involved only a single vehicle, which seems far more reasonable. This still leaves 326 pedestrian crashes that involved more than one vehicle, and the distribution above might be useful in determining how these crashes occurred. The distribution for fatal pedestrian crashes was essentially the same.

Cross-tabulation of C023 (manner of crash) by C051 (number of vehicles)

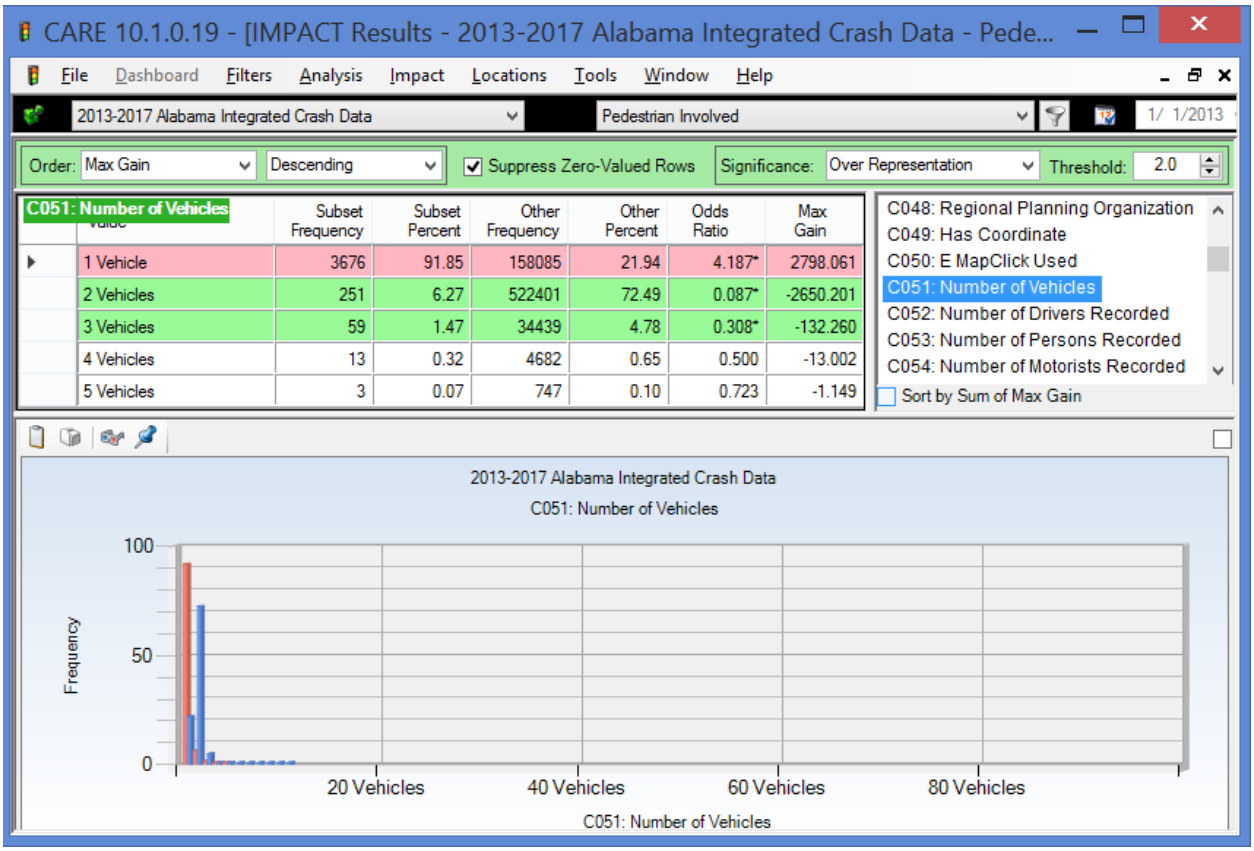


	1 Vehicle	2 Vehicles	3 Vehicles	4 Vehicles	5 Vehicles	TOTAL
Non-Collision	94 2.56%	4 1.59%	0 0.00%	0 0.00%	0 0.00%	98 2.45%
Single Vehicle Crash (all types)	1580 42.98%	3 1.20%	2 3.39%	0 0.00%	0 0.00%	1585 39.61%
Head-On (front to front only)	119 3.24%	10 3.98%	1 1.69%	0 0.00%	0 0.00%	130 3.25%
Angle Oncoming (frontal)	49 1.33%	9 3.59%	1 1.69%	0 0.00%	0 0.00%	59 1.47%
Angle (front to side) Same Direct	10 0.27%	6 2.39%	1 1.69%	0 0.00%	0 0.00%	17 0.42%
Angle (front to side) Opposite Dir	15 0.41%	11 4.38%	0 0.00%	0 0.00%	0 0.00%	26 0.65%
Rear End (front to rear)	26 0.71%	63 25.10%	25 42.37%	6 46.15%	2 66.67%	122 3.05%
Side Impact (angled)	93 2.53%	17 6.77%	5 8.47%	1 7.69%	0 0.00%	116 2.90%
Side Impact (90 degrees)	100 2.72%	14 5.58%	0 0.00%	1 7.69%	0 0.00%	115 2.87%
Sideswipe - Same Direction	150 4.08%	32 12.75%	4 6.78%	1 7.69%	0 0.00%	187 4.67%
Sideswipe - Opposite Directio	37 1.01%	8 3.19%	0 0.00%	0 0.00%	0 0.00%	45 1.12%
Causal Veh Backing: Rear to	12 0.33%	12 4.78%	0 0.00%	1 7.69%	0 0.00%	25 0.62%
Causal Veh Backing: Rear to	7 0.19%	3 1.20%	1 1.69%	0 0.00%	0 0.00%	11 0.27%
Other	1214 33.03%	54 21.51%	17 28.81%	3 23.08%	1 33.33%	1289 32.21%
Unknown	89 2.42%	2 0.80%	0 0.00%	0 0.00%	0 0.00%	91 2.27%
Record from Paper System	81 2.20%	3 1.20%	2 3.39%	0 0.00%	0 0.00%	86 2.15%
TOTAL	3676 91.85%	251 6.27%	59 1.47%	13 0.32%	3 0.07%	4002 100.00%

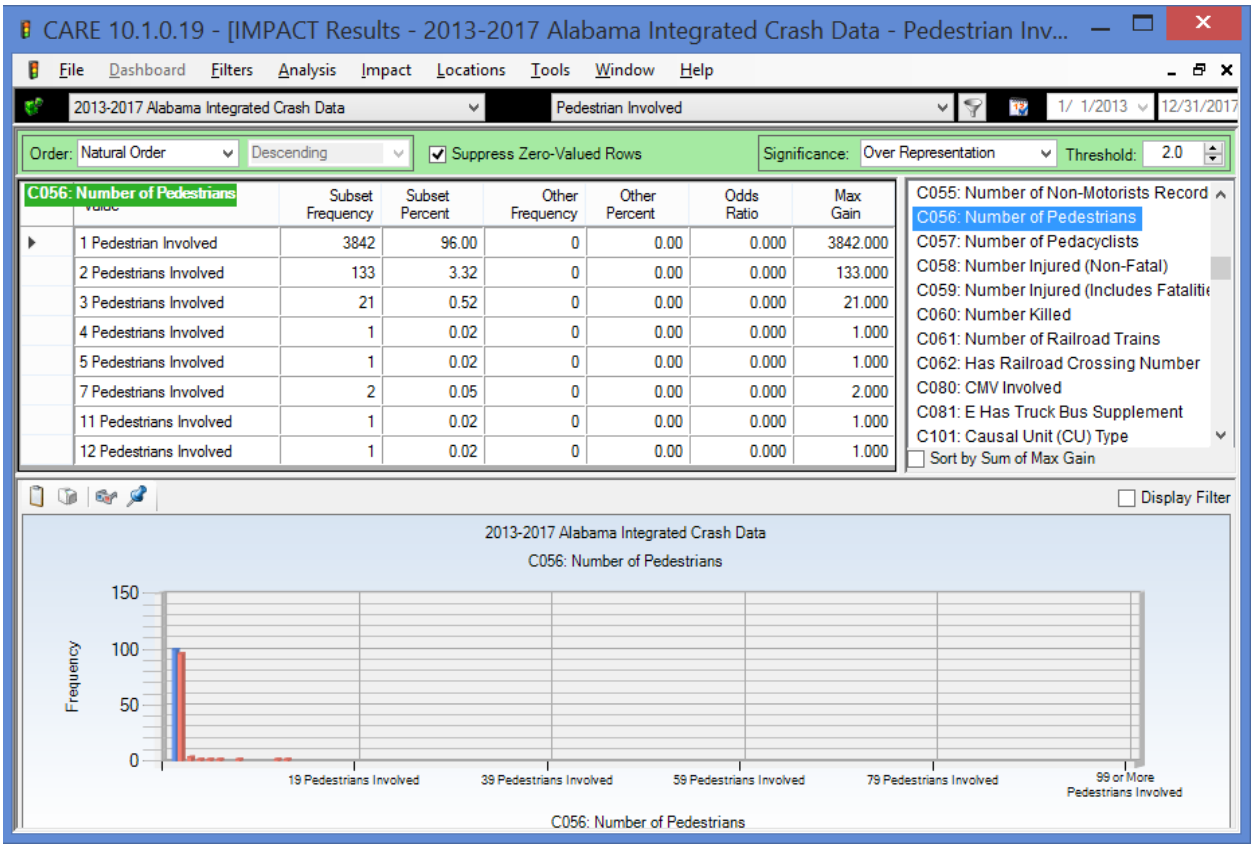
This display was generated to get a feel for the Manner of Crash that would appear to require multiple vehicles. This is confirmed in some cases, e.g., Rear End (front to rear), but even here 15 of the single vehicle crashes were marked as such. We conclude that reporting officers in many cases regard the pedestrian as a quasi-vehicle.

C051 Number of Vehicles

Presented here to complement the findings given above. As expected, pedestrians are involved in over four times the proportion of single vehicle crashes as non-pedestrian crashes.

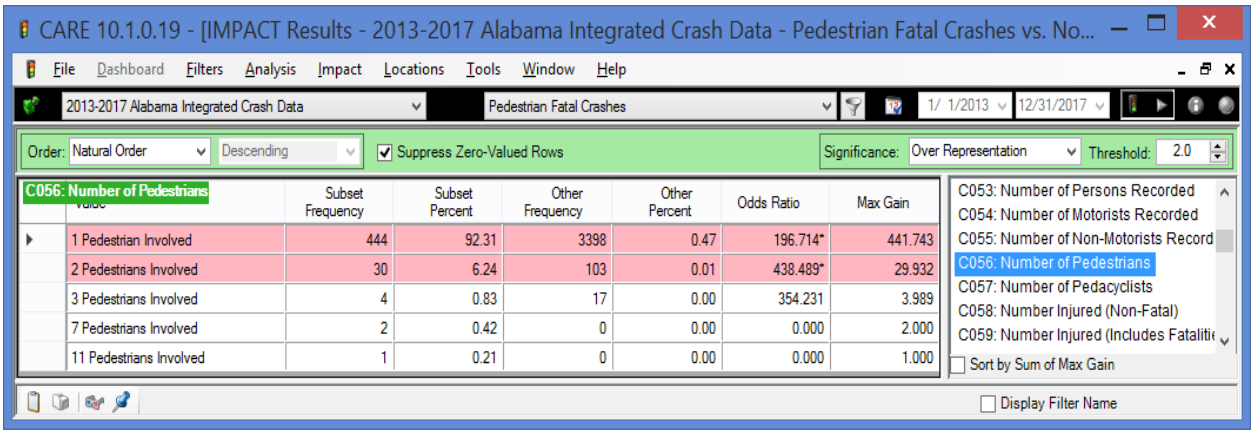


C056 Number of Pedestrians – All Pedestrian Crashes

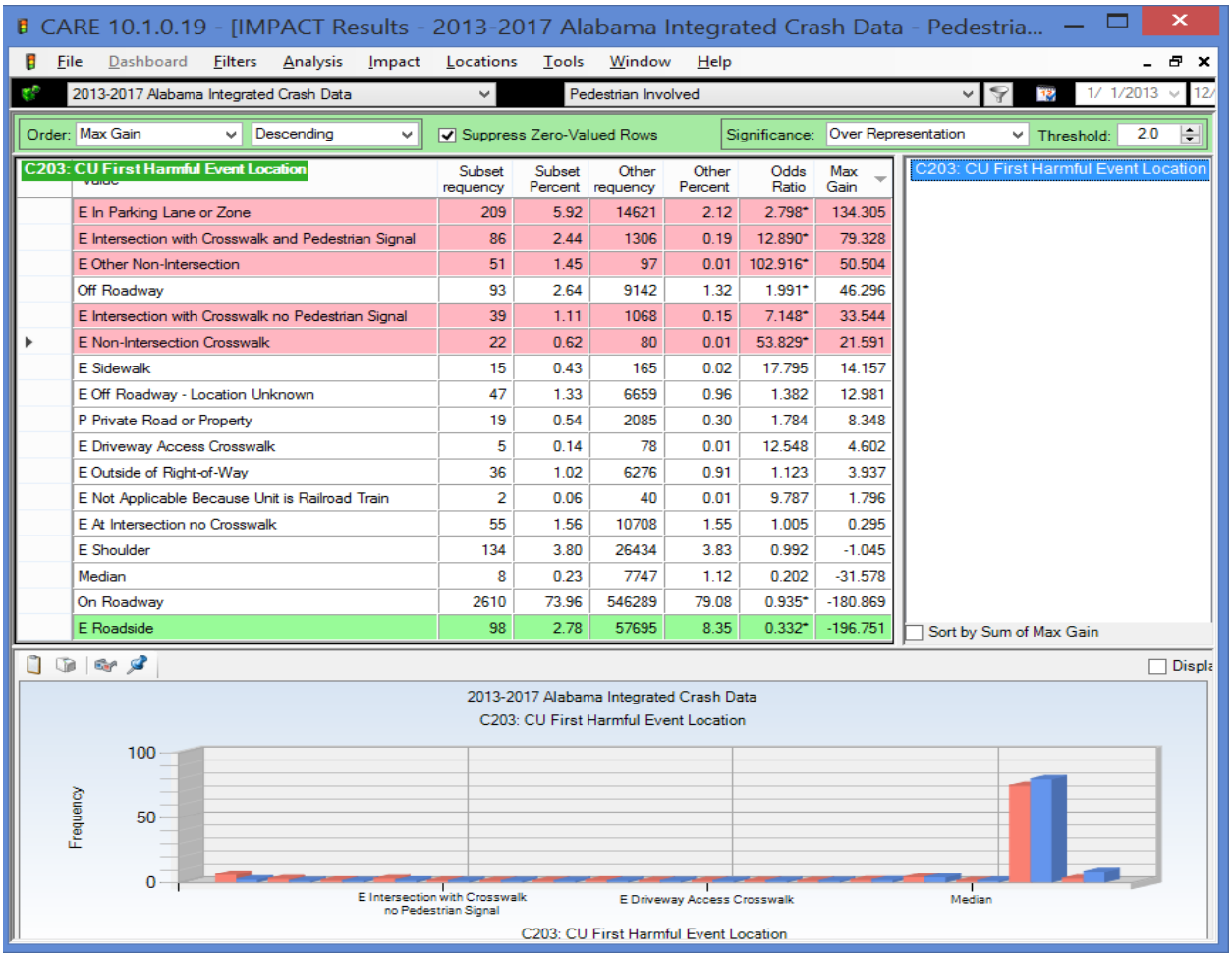


The fatal pedestrian crashes below are the number of crashes when there was a fatality recorded; it is not the number of fatalities.

C056 Number of Pedestrians – Fatal Pedestrian Crashes



C203 CU First Harmful Location



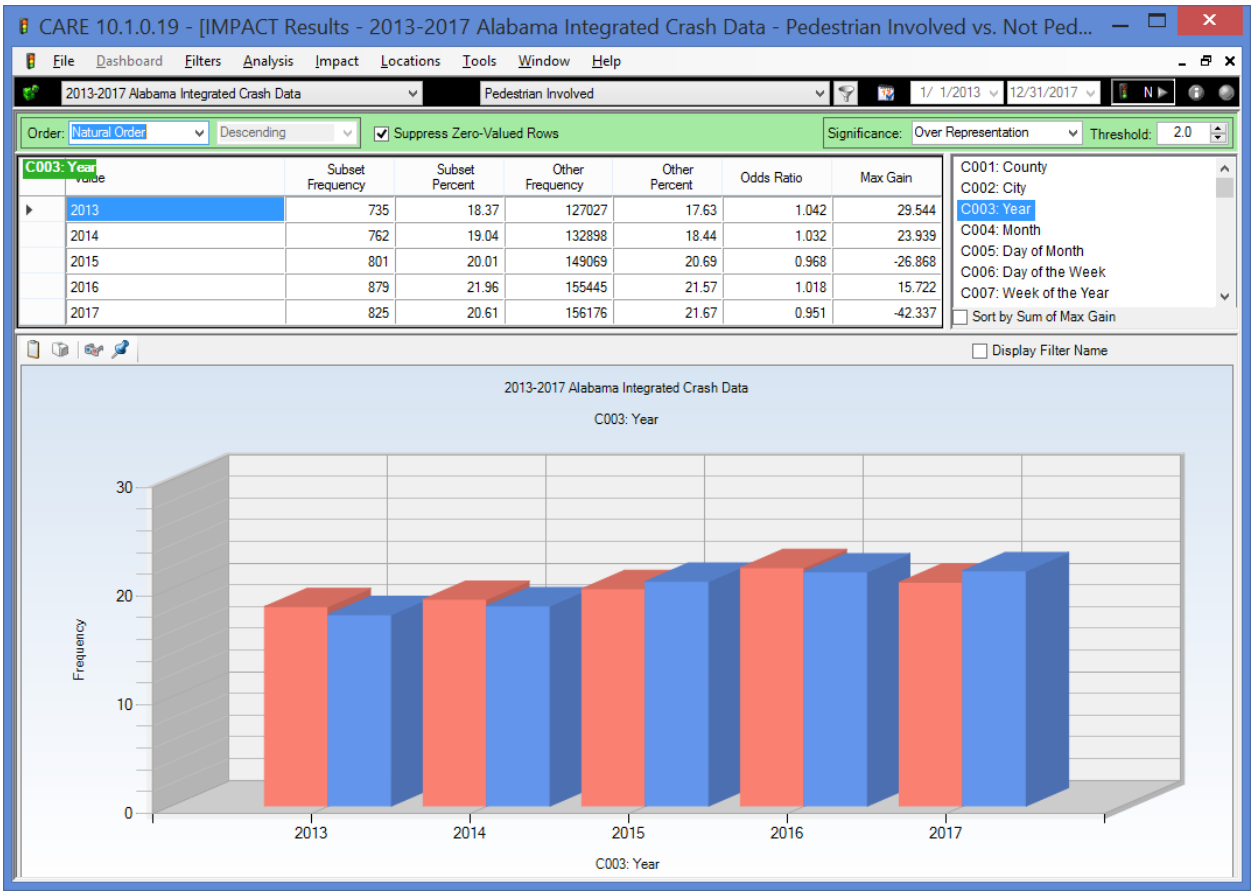
In order of Max Gain, the following had over-representations greater than ten times (frequency):

- In Parking Lane or Zone (209) – heavy vehicle and pedestrian traffic.
- Intersection with Crosswalk and Pedestrian Signal (86) – more than twice the number as when there is not a signal; however, signals are usually installed in particularly heavy interactions of pedestrians and motor vehicles, so the raw frequencies cannot be used to gauge effectiveness. This can only be done by comparing the rates, which must take into account both the ADT (or entry vehicles to an intersection) and the number of pedestrians exposed.
- Other Non-Intersection (51) – this would include J-walking.
- Off Roadway (93) – not including shoulder (134), which was under under-represented.
- Intersection with Crosswalk no Pedestrian Signal (39) – see above.
- Non-Intersection Crosswalk (22) – relatively few, but still highly over-represented.
- Sidewalk (15) – relatively few, but still highly over-represented.

The major difference found for fatal pedestrian crashes was the over-representation of those where the First Harmful Event Location was On Roadway; this included 382 fatal crashes over the five year period, and it was over-represented by about 5%. On Roadway would tend to infer pedestrian cause, and this will be investigated further in terms of walking under the influence.

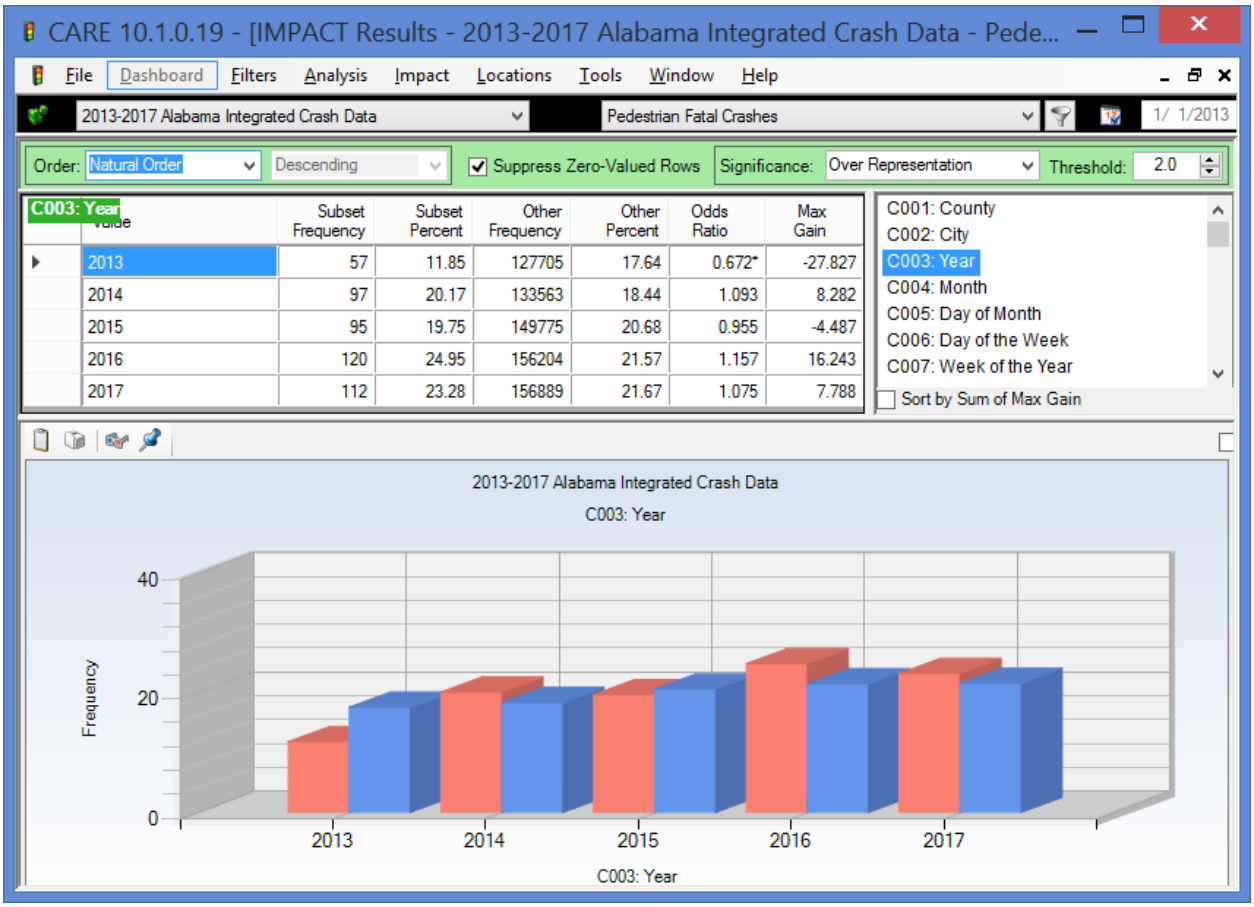
Time Characteristics

C003 Year – All Pedestrian Crashess



This display was discussed in the Introduction; repeated here for completeness.

C003 Year – Fatal Pedestrian Crashess



The pedestrian fatality distribution over the years is considerably different from overall pedestrian crashes. The low was in 2013, which was a very good year compared to those that followed. Years 2014 and 2015 were close to double 2013, and 2016 was much worse. It does not look like there was much of a regression to the mean in 2017. Hopefully this will be seen with a dramatic reduction in 2018.

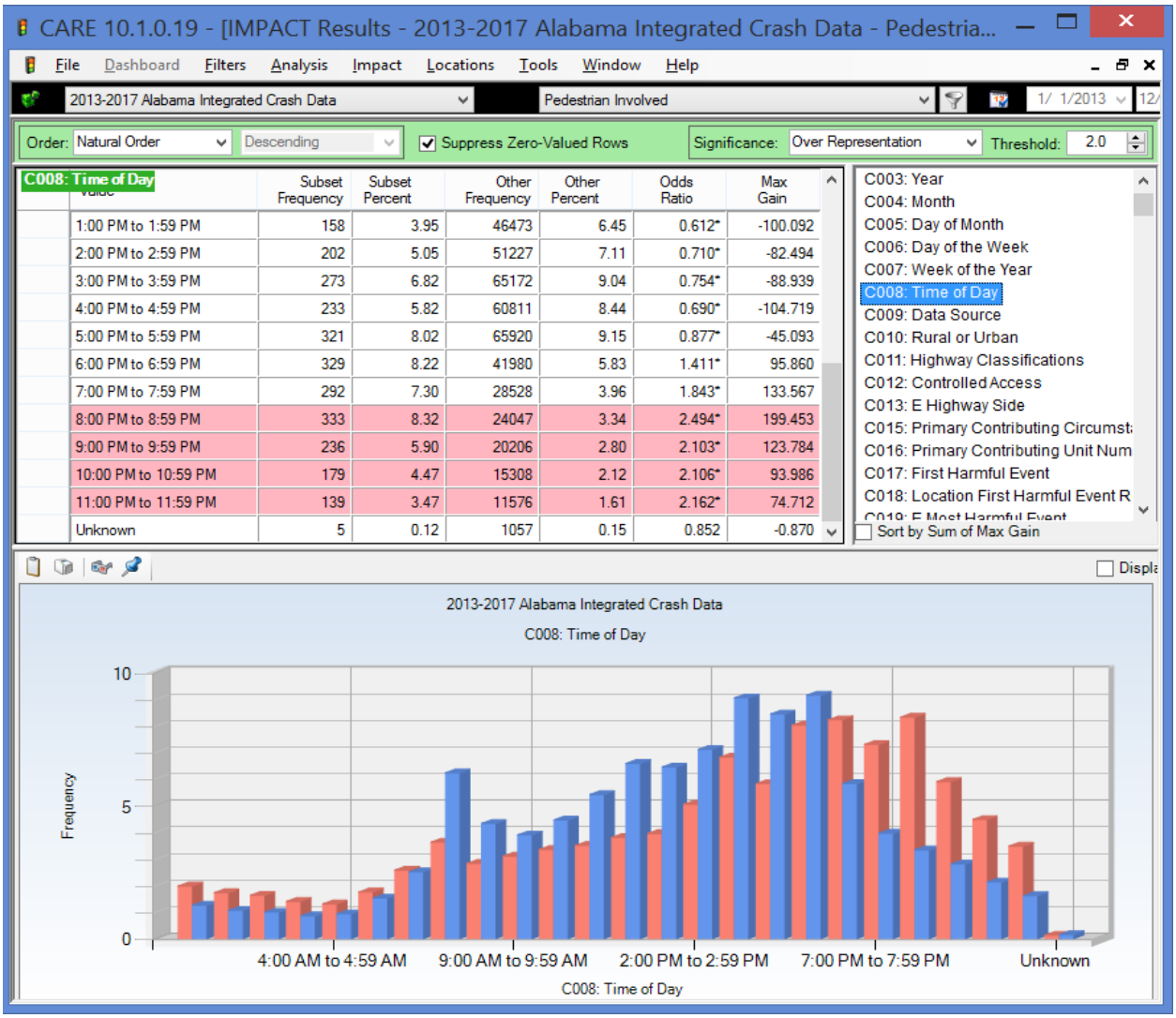
C004 Month

September and October clearly have the highest over-representations, and are the only two months significantly over-represented. The reason for this could be:

- Back-to-school times,
- Break in the heat,
- Typically relatively dry months.

June is the only month that is significantly under-represented, perhaps because of the heat and rain. Note that July and August are also under-represented, but not significantly. For fatal pedestrian crashes, the most over-represented months were also September and October.

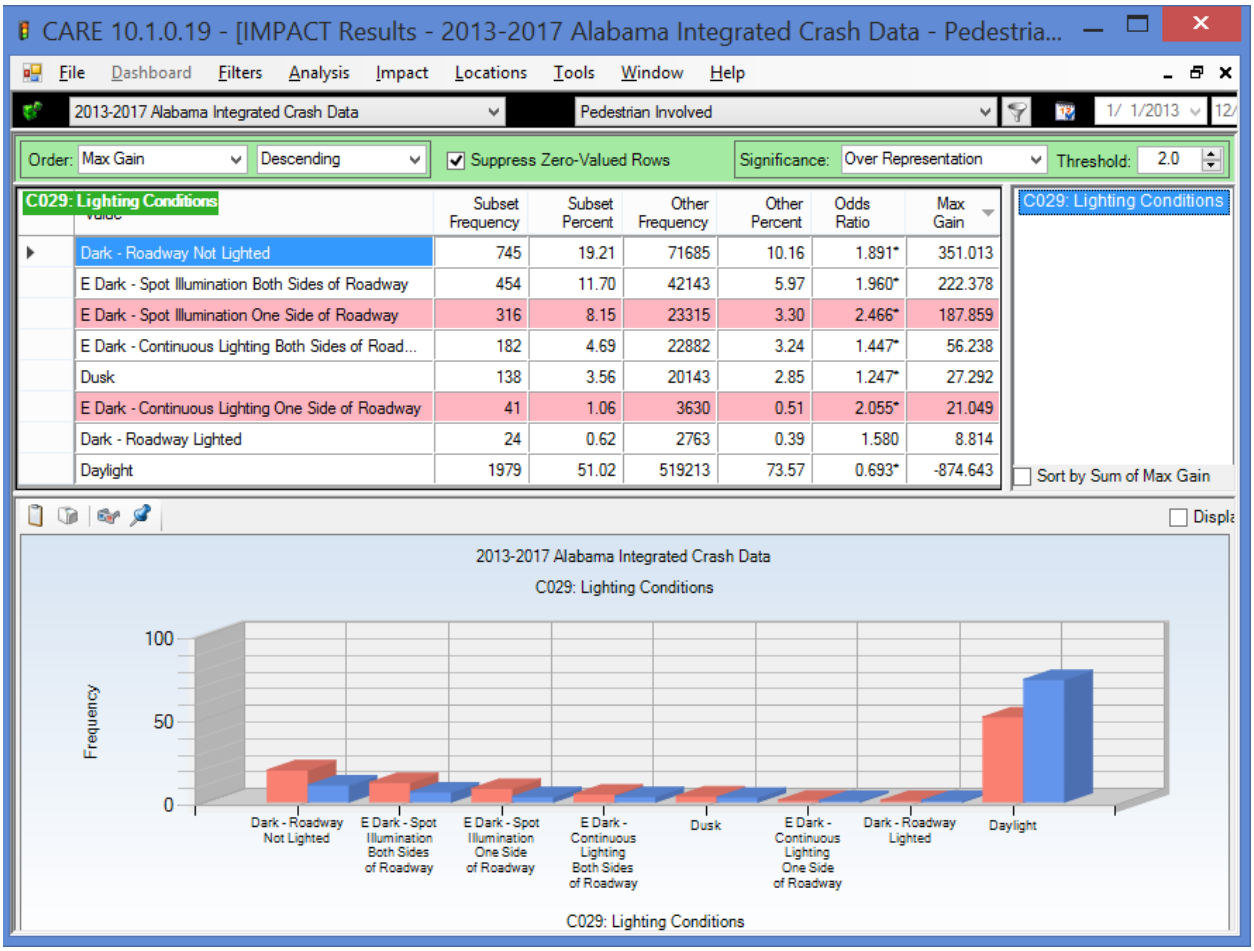
C008 Time of Day



This display contains considerable information to provide insight into the pedestrian crash problem:

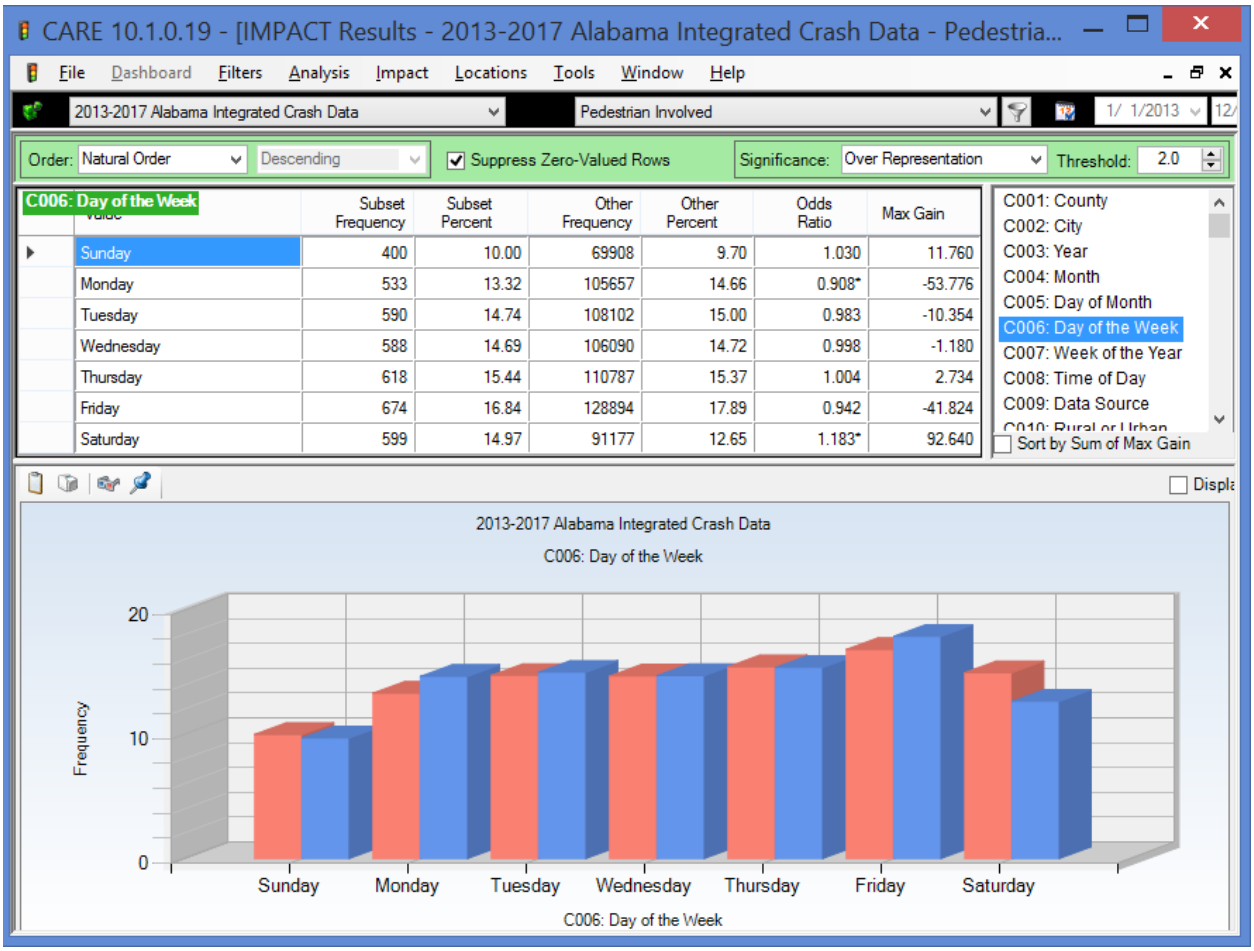
- First note the similarity of this distribution with that of alcohol and other drugs, which leads us to suspect that they are quite instrumental in causing pedestrian crashes. This is especially true late night.
- As an exception to the above, the earlier night/late evening (5 PM through 8 PM) hours are some of the highest, and we propose that this is just the convenient time to be out as opposed to any alcohol/drug involvement.
- Rush hours are high, but under-represented.
- Fatal pedestrian crashes are significantly over-represented from 7 PM through 6 AM.

C029 Lighting Conditions



This demonstrates the enemy that darkness is to pedestrians, and that countermeasures for their crashes need to be focused on the nighttime hours. About half of pedestrian crashes occur in darkness, as opposed to about 25% of all crashes. As indicated above, the darkness problem is even more pronounced for fatal pedestrian crashes.

C006 Day of the Week

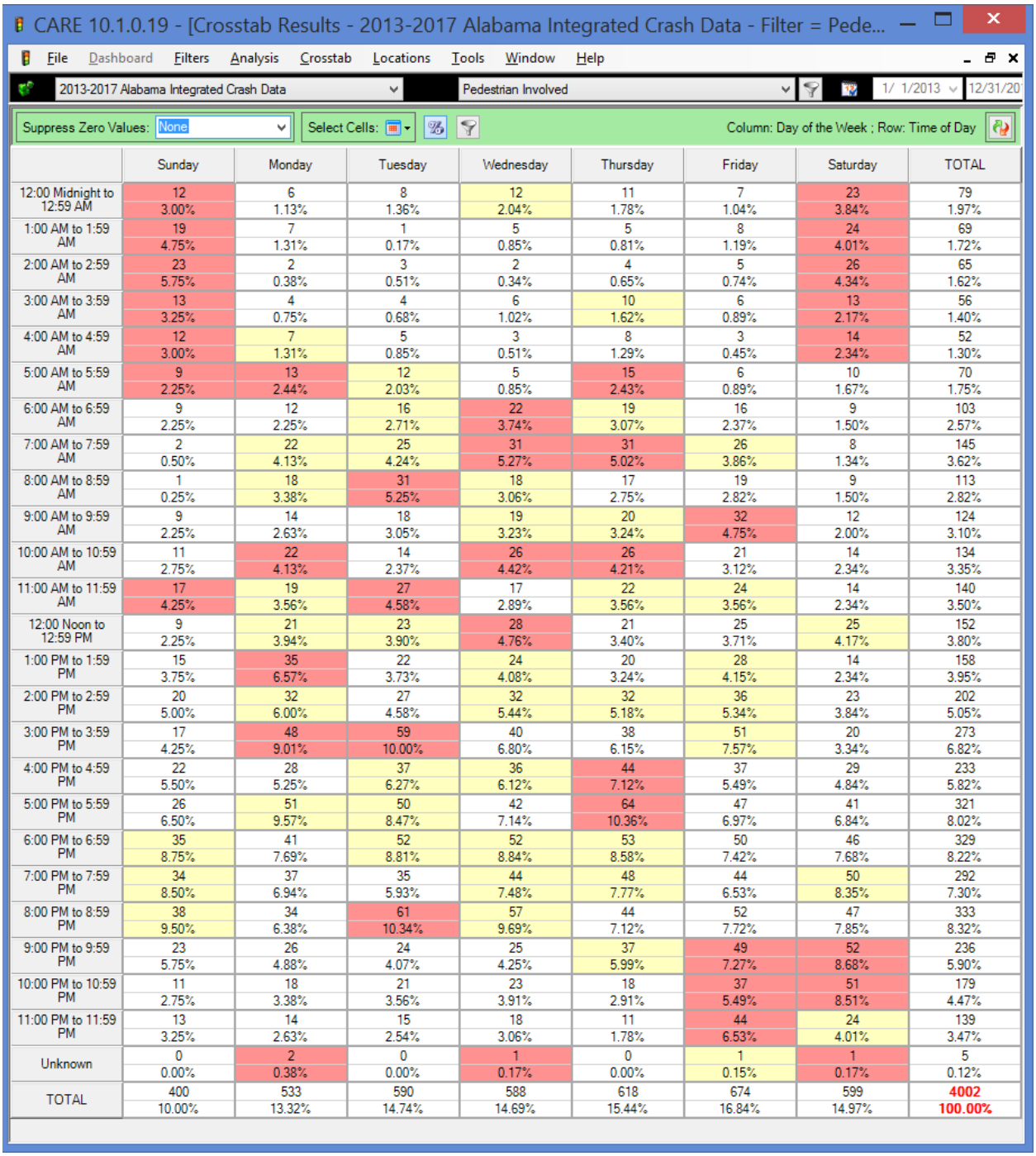


Saturday is significantly over-represented and Monday is significantly under-represented. The rest are as expected compared to all non-pedestrian crashes. Although not totally, this follows the typical alcohol/drugs day-of-the-week distribution, the main exception being Sunday, which is slightly under-represented for pedestrians.

The time of day by day of the week distribution is given on the next page. The night-time hours are clearly over-represented on Friday night, Saturday morning and night and Sunday morning. This is typical of crashes caused by alcohol/drugs, and the fault for such could either be on the impaired walking (IW) pedestrian or the impaired driving (ID) driver.

The weekend over-representations become more pronounced for fatal pedestrian crashes, with both Saturday and Sunday have significant over-representations.

C006 Day of the Week by C008 Time of Day



CARE 10.1.0.19 - [Crosstab Results - 2013-2017 Alabama Integrated Crash Data - Filter = Pede...

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

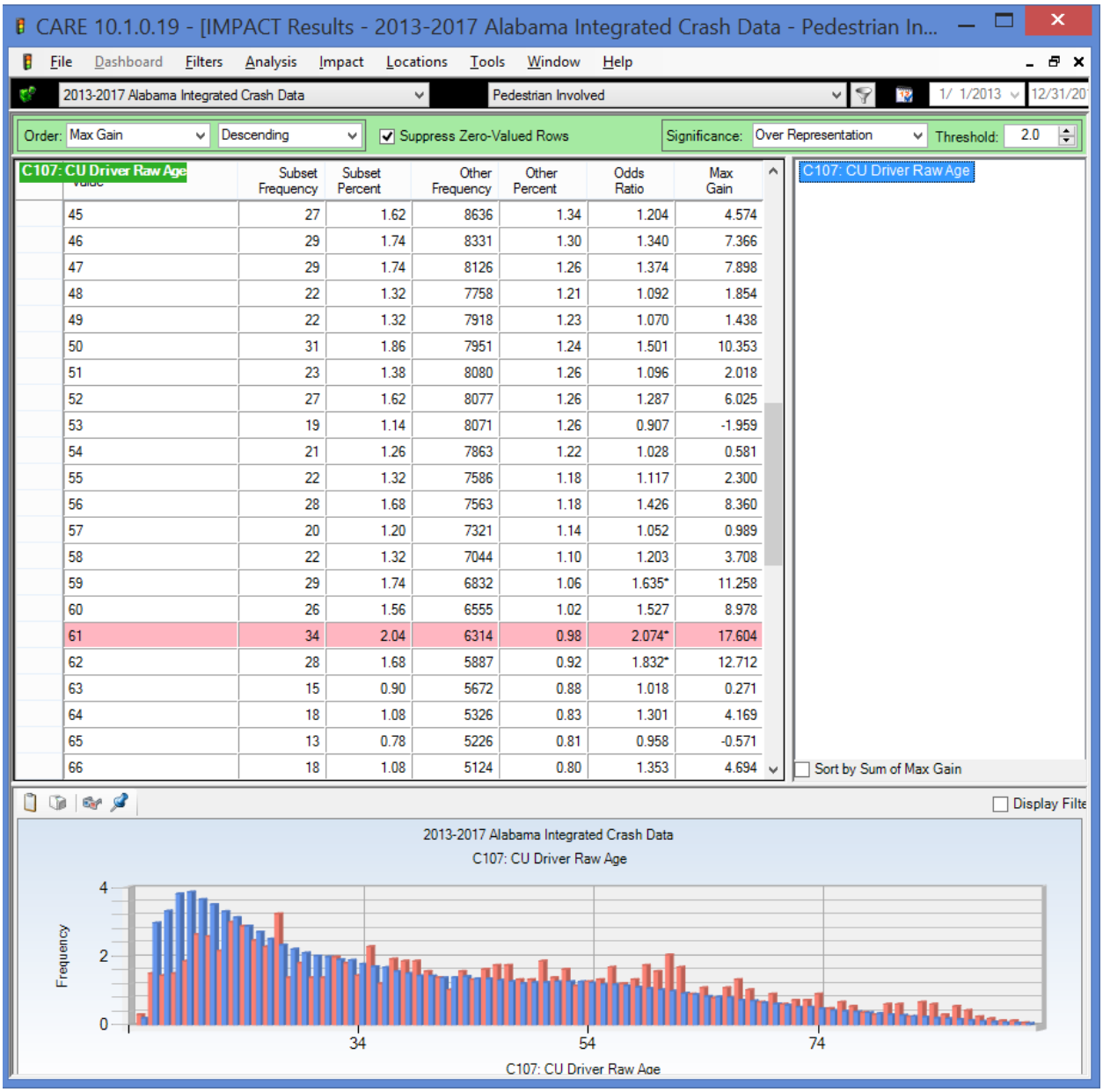
2013-2017 Alabama Integrated Crash Data | Pedestrian Involved | 1/ 1/2013 | 12/31/20

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	12 3.00%	6 1.13%	8 1.36%	12 2.04%	11 1.78%	7 1.04%	23 3.84%	79 1.97%
1:00 AM to 1:59 AM	19 4.75%	7 1.31%	1 0.17%	5 0.85%	5 0.81%	8 1.19%	24 4.01%	69 1.72%
2:00 AM to 2:59 AM	23 5.75%	2 0.38%	3 0.51%	2 0.34%	4 0.65%	5 0.74%	26 4.34%	65 1.62%
3:00 AM to 3:59 AM	13 3.25%	4 0.75%	4 0.68%	6 1.02%	10 1.62%	6 0.89%	13 2.17%	56 1.40%
4:00 AM to 4:59 AM	12 3.00%	7 1.31%	5 0.85%	3 0.51%	8 1.29%	3 0.45%	14 2.34%	52 1.30%
5:00 AM to 5:59 AM	9 2.25%	13 2.44%	12 2.03%	5 0.85%	15 2.43%	6 0.89%	10 1.67%	70 1.75%
6:00 AM to 6:59 AM	9 2.25%	12 2.25%	16 2.71%	22 3.74%	19 3.07%	16 2.37%	9 1.50%	103 2.57%
7:00 AM to 7:59 AM	2 0.50%	22 4.13%	25 4.24%	31 5.27%	31 5.02%	26 3.86%	8 1.34%	145 3.62%
8:00 AM to 8:59 AM	1 0.25%	18 3.38%	31 5.25%	18 3.06%	17 2.75%	19 2.82%	9 1.50%	113 2.82%
9:00 AM to 9:59 AM	9 2.25%	14 2.63%	18 3.05%	19 3.23%	20 3.24%	32 4.75%	12 2.00%	124 3.10%
10:00 AM to 10:59 AM	11 2.75%	22 4.13%	14 2.37%	26 4.42%	26 4.21%	21 3.12%	14 2.34%	134 3.35%
11:00 AM to 11:59 AM	17 4.25%	19 3.56%	27 4.58%	17 2.89%	22 3.56%	24 3.56%	14 2.34%	140 3.50%
12:00 Noon to 12:59 PM	9 2.25%	21 3.94%	23 3.90%	28 4.76%	21 3.40%	25 3.71%	25 4.17%	152 3.80%
1:00 PM to 1:59 PM	15 3.75%	35 6.57%	22 3.73%	24 4.08%	20 3.24%	28 4.15%	14 2.34%	158 3.95%
2:00 PM to 2:59 PM	20 5.00%	32 6.00%	27 4.58%	32 5.44%	32 5.18%	36 5.34%	23 3.84%	202 5.05%
3:00 PM to 3:59 PM	17 4.25%	48 9.01%	59 10.00%	40 6.80%	38 6.15%	51 7.57%	20 3.34%	273 6.82%
4:00 PM to 4:59 PM	22 5.50%	28 5.25%	37 6.27%	36 6.12%	44 7.12%	37 5.49%	29 4.84%	233 5.82%
5:00 PM to 5:59 PM	26 6.50%	51 9.57%	50 8.47%	42 7.14%	64 10.36%	47 6.97%	41 6.84%	321 8.02%
6:00 PM to 6:59 PM	35 8.75%	41 7.69%	52 8.81%	52 8.84%	53 8.58%	50 7.42%	46 7.68%	329 8.22%
7:00 PM to 7:59 PM	34 8.50%	37 6.94%	35 5.93%	44 7.48%	48 7.77%	44 6.53%	50 8.35%	292 7.30%
8:00 PM to 8:59 PM	38 9.50%	34 6.38%	61 10.34%	57 9.69%	44 7.12%	52 7.72%	47 7.85%	333 8.32%
9:00 PM to 9:59 PM	23 5.75%	26 4.88%	24 4.07%	25 4.25%	37 5.99%	49 7.27%	52 8.68%	236 5.90%
10:00 PM to 10:59 PM	11 2.75%	18 3.38%	21 3.56%	23 3.91%	18 2.91%	37 5.49%	51 8.51%	179 4.47%
11:00 PM to 11:59 PM	13 3.25%	14 2.63%	15 2.54%	18 3.06%	11 1.78%	44 6.53%	24 4.01%	139 3.47%
Unknown	0 0.00%	2 0.38%	0 0.00%	1 0.17%	0 0.00%	1 0.15%	1 0.17%	5 0.12%
TOTAL	400 10.00%	533 13.32%	590 14.74%	588 14.69%	618 15.44%	674 16.84%	599 14.97%	4002 100.00%

Driver Characteristics

C107 CU Driver Raw Age Frequency Distribution

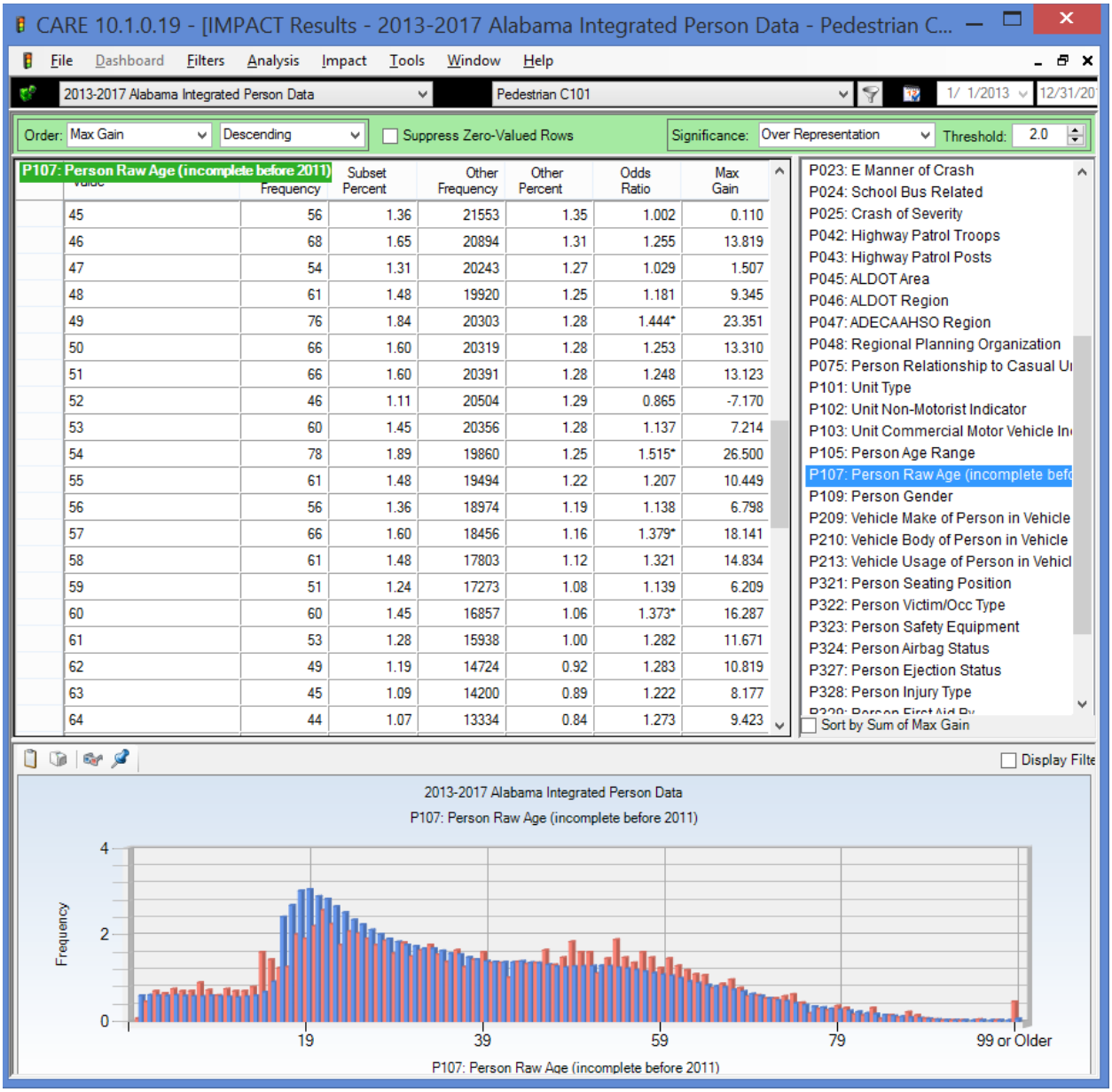


This distribution is of those known to be causal drivers. It does not include the following (estimated frequencies from C107):

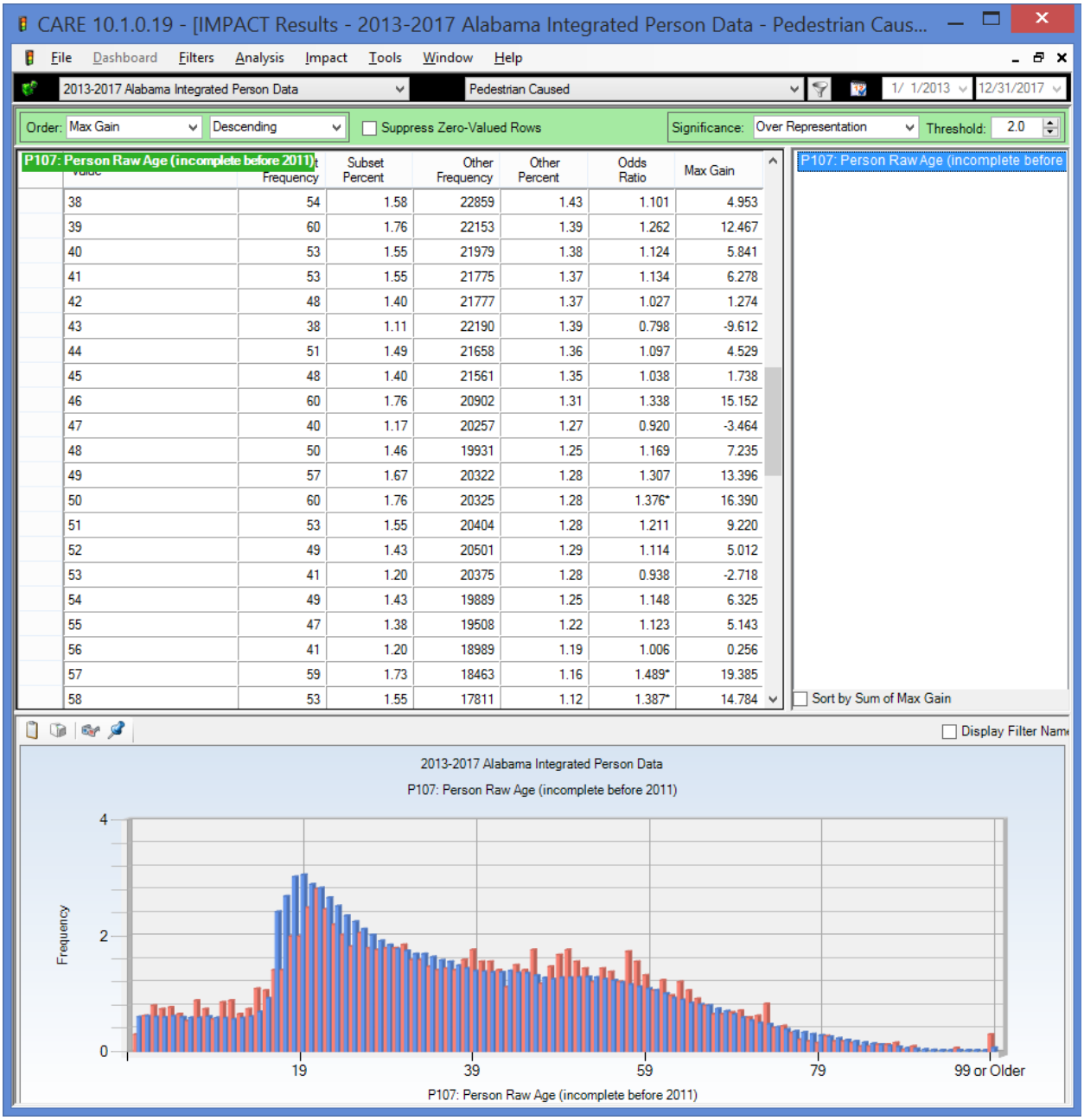
- Crashes in which the pedestrian was at fault (1516=47.6%),
- Unknown ages of drivers (446),
- Unknown causal unit (308).

Youngest drivers (16-30) have about the same average of pedestrian crashes as older drivers, but are under-represented because of their larger numbers in crashes in general. The most over-represented subset if the 45-66 year old group. Drivers older than this seem to continue to have problems with pedestrian crashes at about the same rate as the younger drivers. This indicates that age is not the causal factor that it is in some types of crashes (e.g., speed caused). As an example of how diversified the numbers are, the highest over-representation are at the ages of 27 and 61.

P107 Pedestrian Raw Age



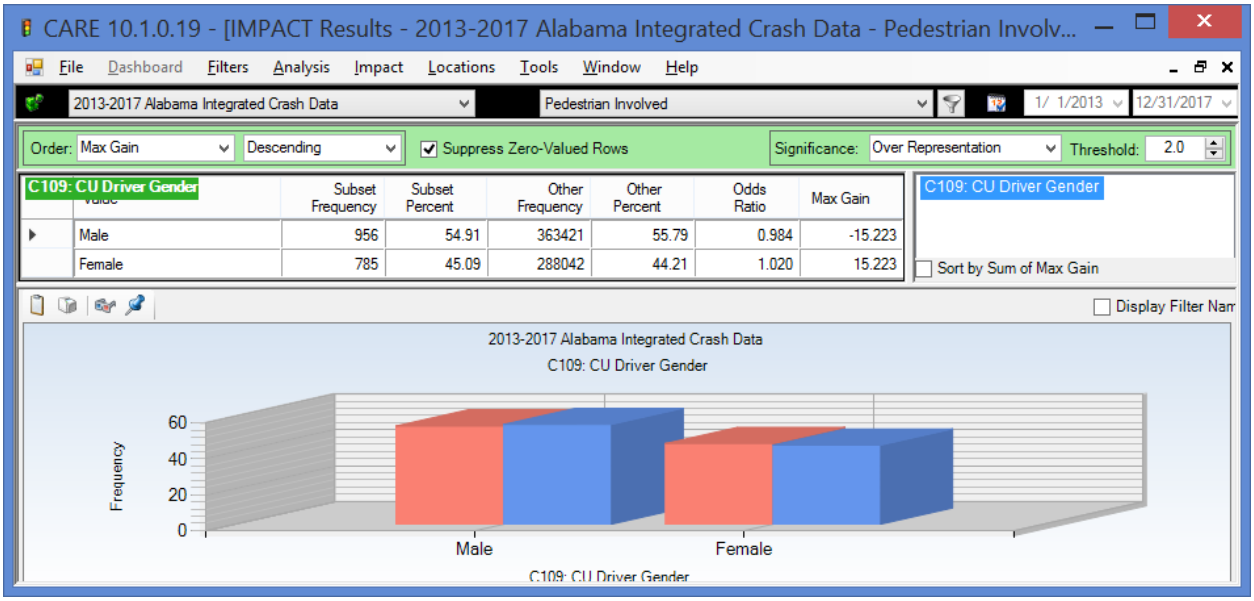
P107 Causal Pedestrian Raw Ages



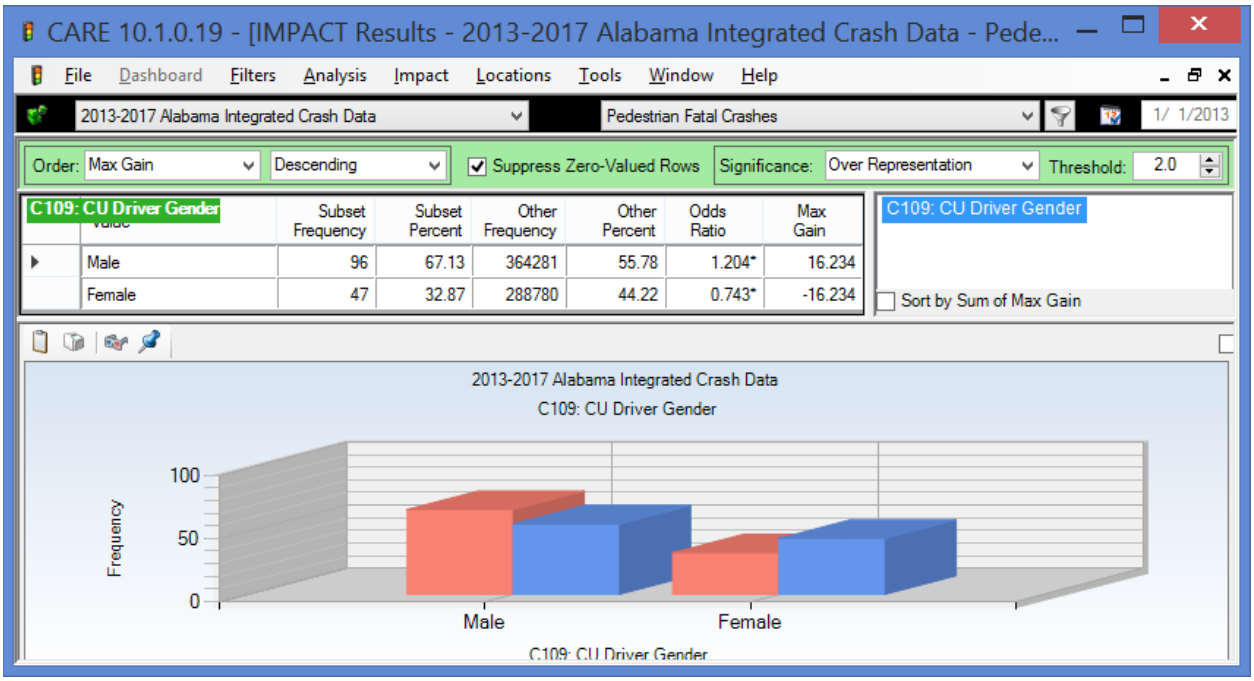
Value	Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
38	54	1.58	22859	1.43	1.101	4.953
39	60	1.76	22153	1.39	1.262	12.467
40	53	1.55	21979	1.38	1.124	5.841
41	53	1.55	21775	1.37	1.134	6.278
42	48	1.40	21777	1.37	1.027	1.274
43	38	1.11	22190	1.39	0.798	-9.612
44	51	1.49	21658	1.36	1.097	4.529
45	48	1.40	21561	1.35	1.038	1.738
46	60	1.76	20902	1.31	1.338	15.152
47	40	1.17	20257	1.27	0.920	-3.464
48	50	1.46	19931	1.25	1.169	7.235
49	57	1.67	20322	1.28	1.307	13.396
50	60	1.76	20325	1.28	1.376*	16.390
51	53	1.55	20404	1.28	1.211	9.220
52	49	1.43	20501	1.29	1.114	5.012
53	41	1.20	20375	1.28	0.938	-2.718
54	49	1.43	19889	1.25	1.148	6.325
55	47	1.38	19508	1.22	1.123	5.143
56	41	1.20	18989	1.19	1.006	0.256
57	59	1.73	18463	1.16	1.489*	19.385
58	53	1.55	17811	1.12	1.387*	14.784

The above is quite comparable to the previous age distribution despite the fact that this is for only causal pedestrians. The general conclusion that can be reached is that there is nothing inherent in age that makes pedestrians more apt to cause crashes, or conversely, more apt to avoid causing them.

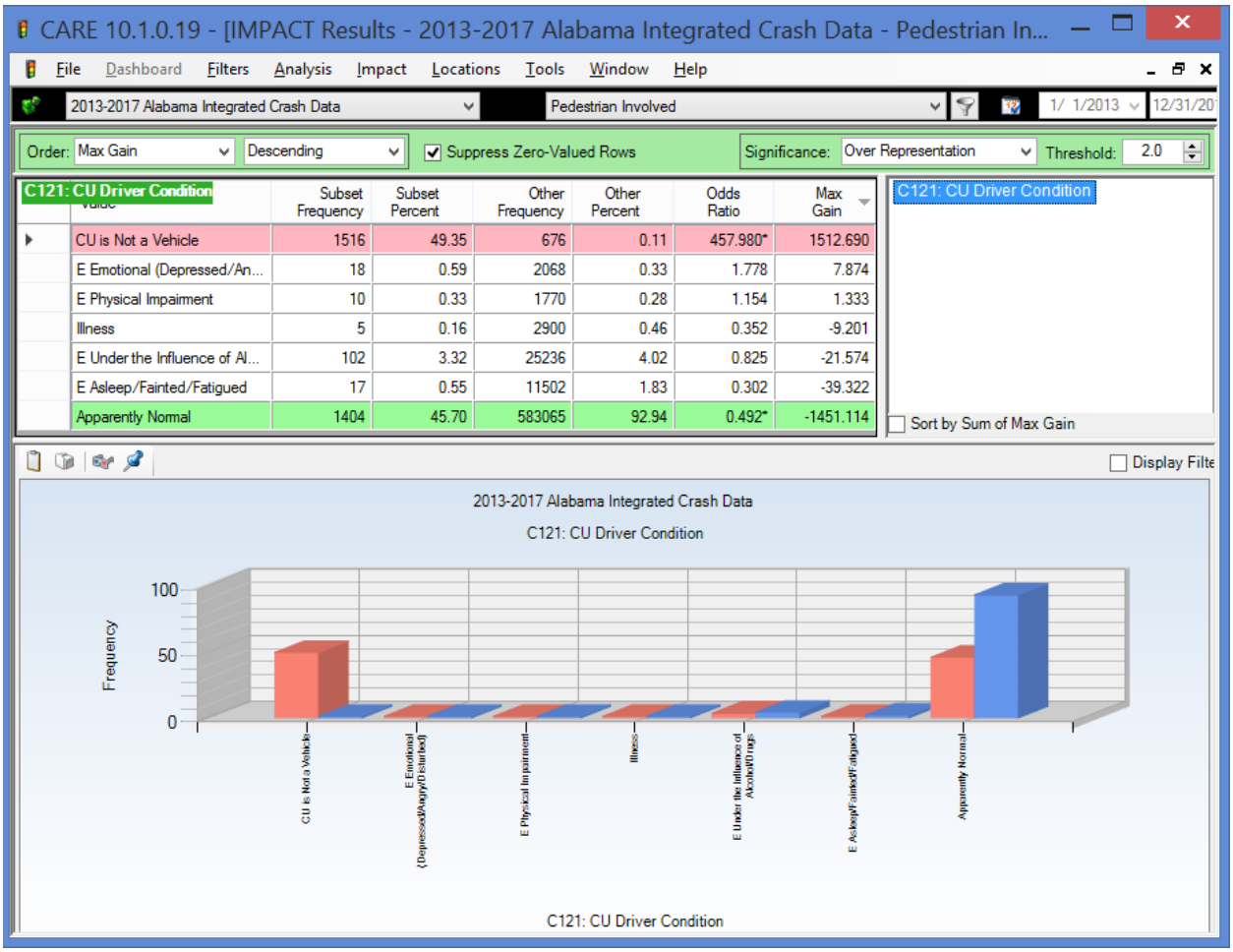
C109 CU Driver Gender



Driver gender is about the same for non-pedestrian crashes – there are no significant differences. However, the male over-representation becomes significant for fatal pedestrian crashes, given below.

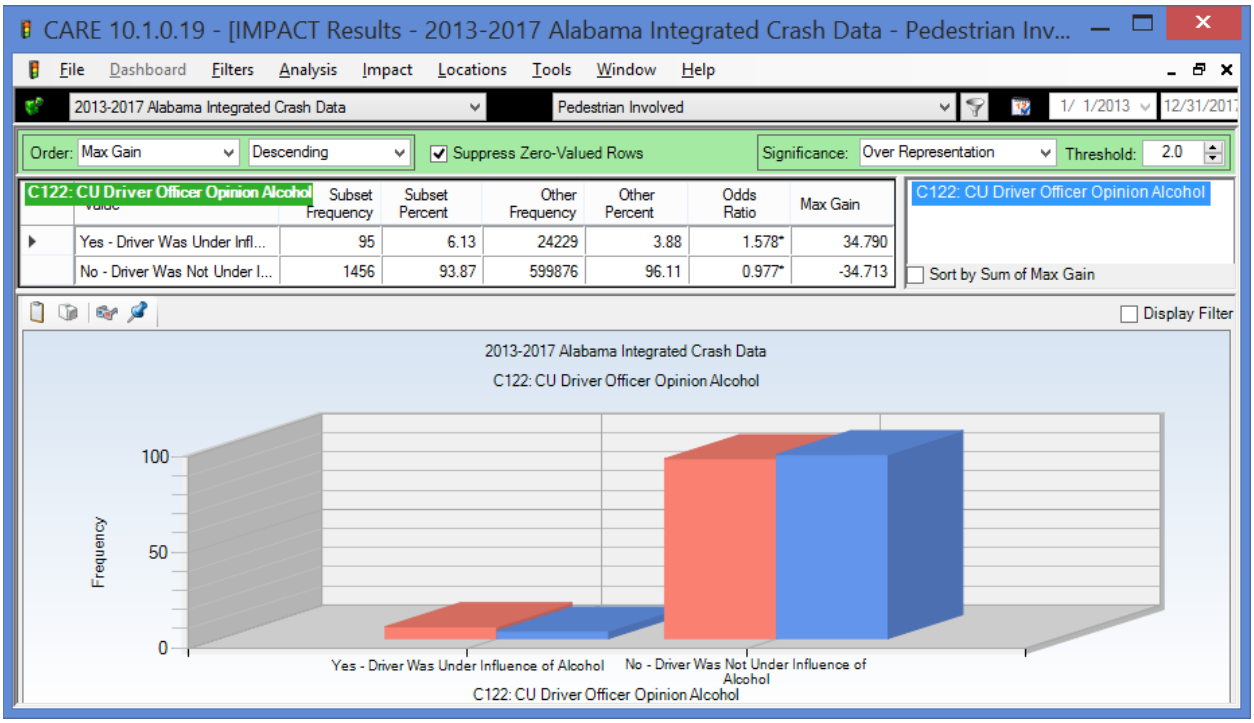


C121 CU Driver Condition



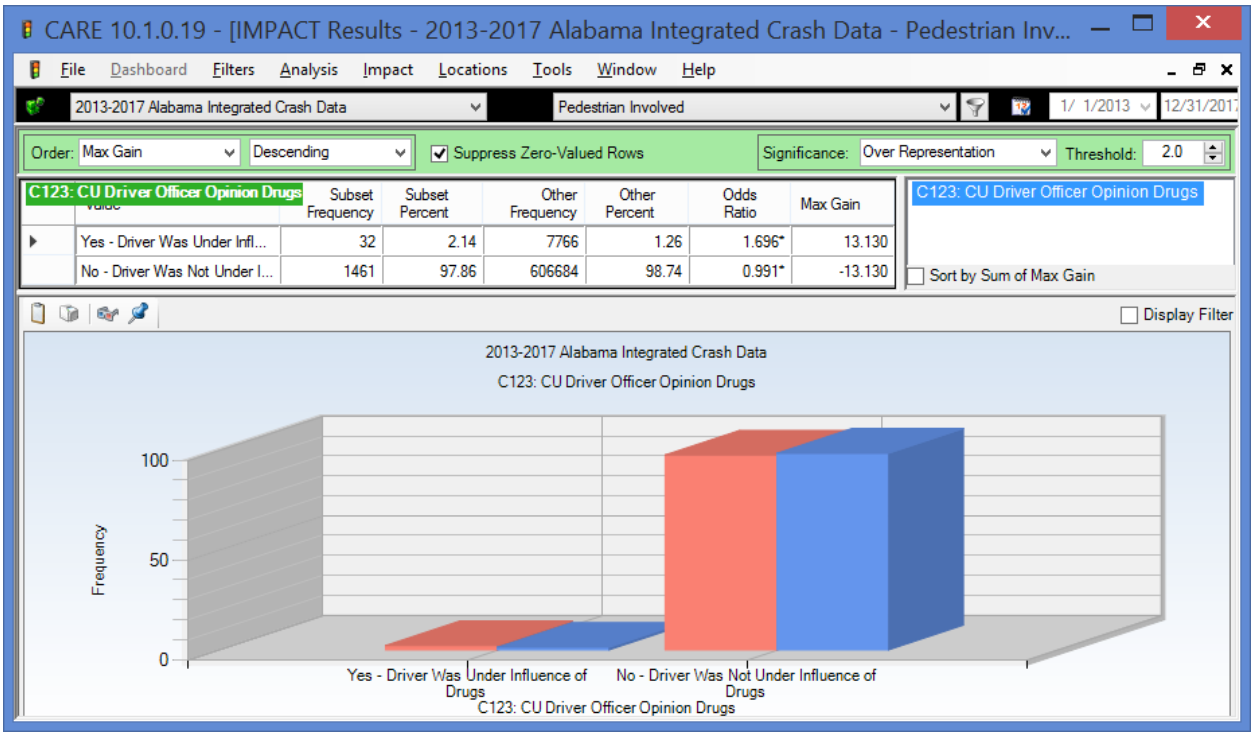
Driver abnormal conditions do not appear to be significant in causing pedestrian crashes. While the distribution for fatal pedestrian crashes is the same in most respects, Under the Influence or Alcohol or Other Drugs rises in significance, accounting for 23 fatalities and being over-represented by an Odds Ratio of 1.445 (about 45% higher than expected).

C122 CU Driver Officer Opinion Alcohol



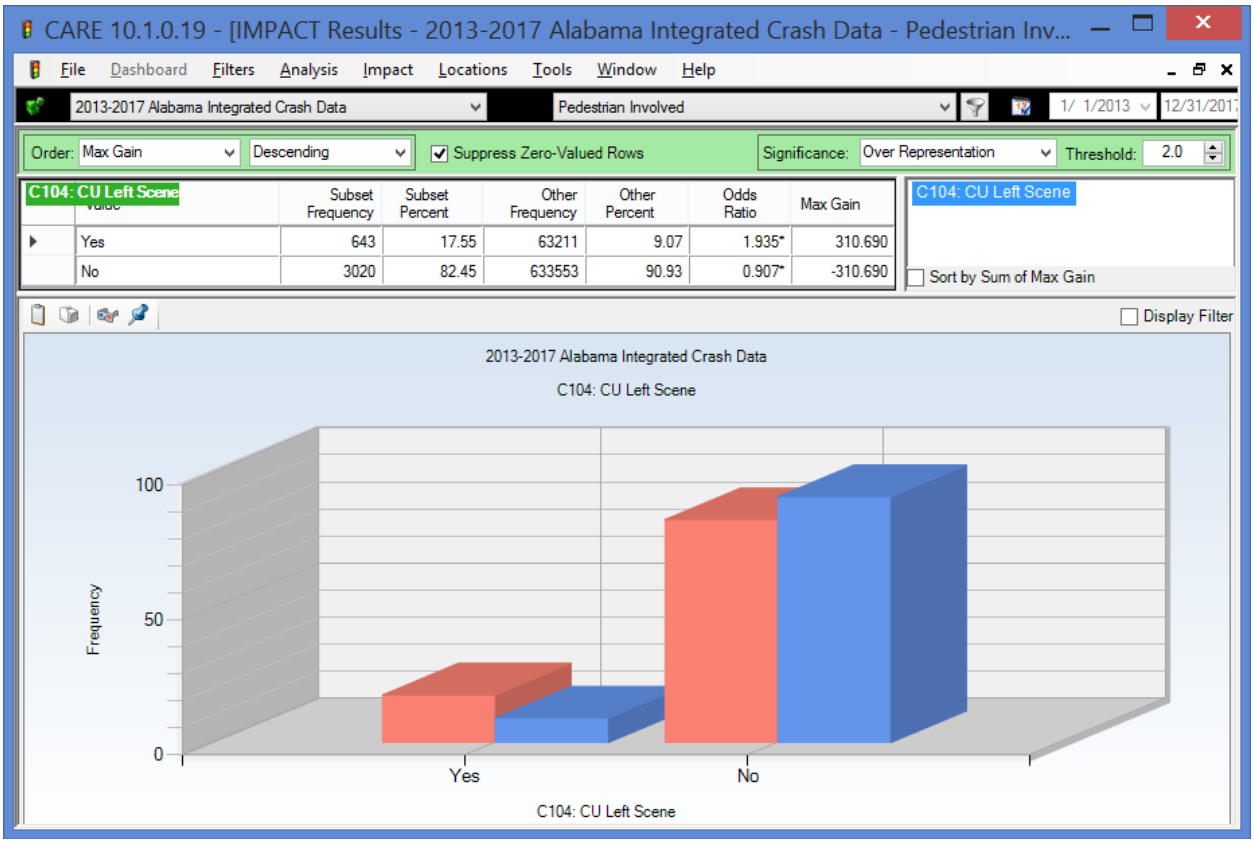
We suspected significant alcohol involvement with the time of day and day of the week results. This indicates that they had an over-representation of 57.8% times the expected proportion. When looking at the same results for fatalities, the ratio of yes to no goes from its value above of 6.13% to 17.65%, an over-representation odds ratio of 4.542. There is no doubt that driver impairment is a major cause of pedestrian fatalities.

C123 CU Driver Officer Opinion Drugs



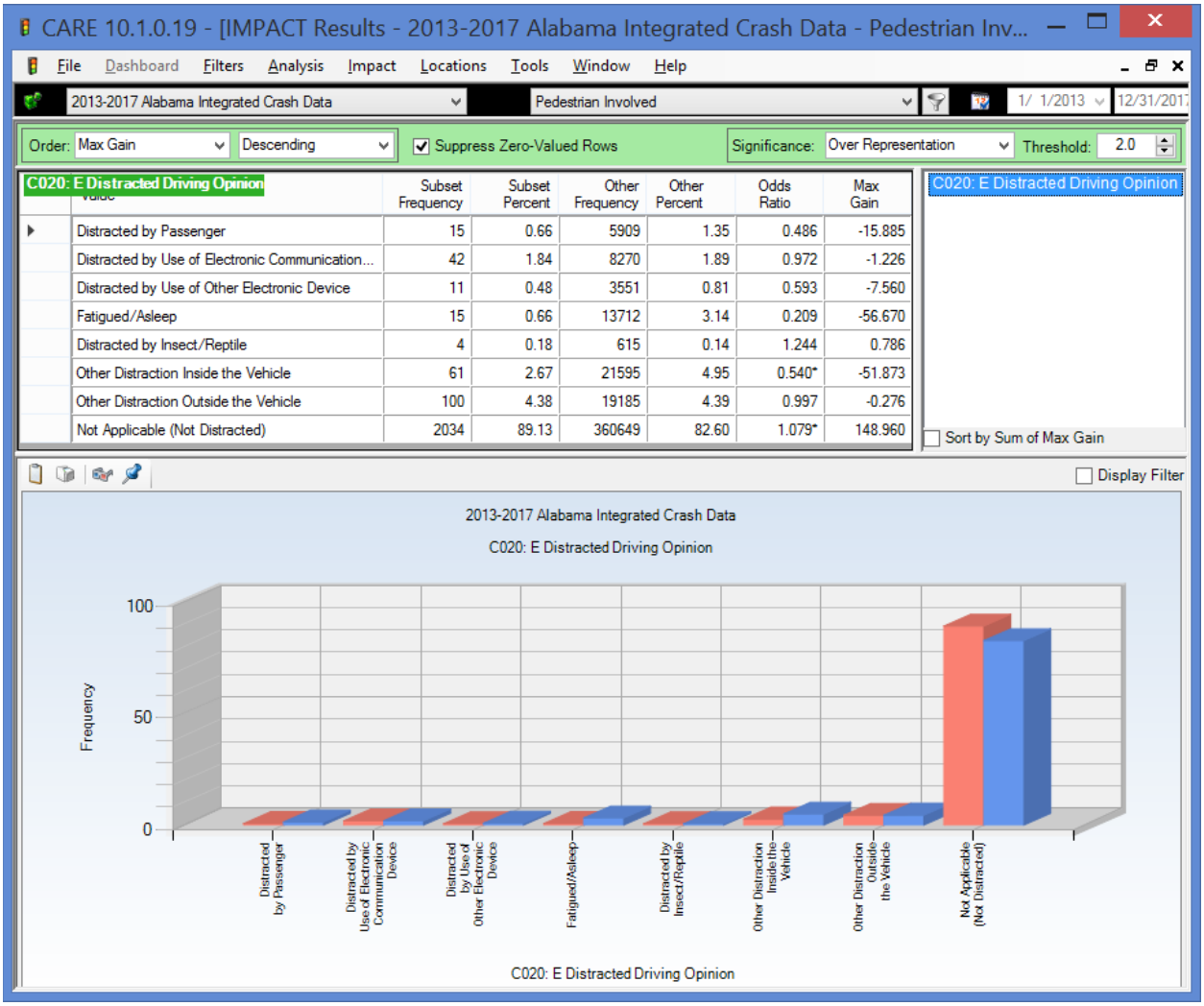
Although not as high in frequency (only about a third as many), the over-representation indicator (odds ratio) is about the same for drugs as for alcohol. When looking at the same results for fatalities, the ratio of yes to no goes from its value above of 2.14% to 13.10%, an over-representation odds ratio of 10.357. There is no doubt that driver impairment is a major cause of pedestrian fatalities.

C104 CU Left the Scene



This attribute is quite important in relatively high severity cases such as pedestrian involved. The Left-Scene rate is almost twice that which occurs in non-pedestrian crashes. This probably tracks ID and night-time hours. When there is a fatality involved, the proportion of leaving the scene drops down to under 10%, which is about the same rate that it has in crashes in general.

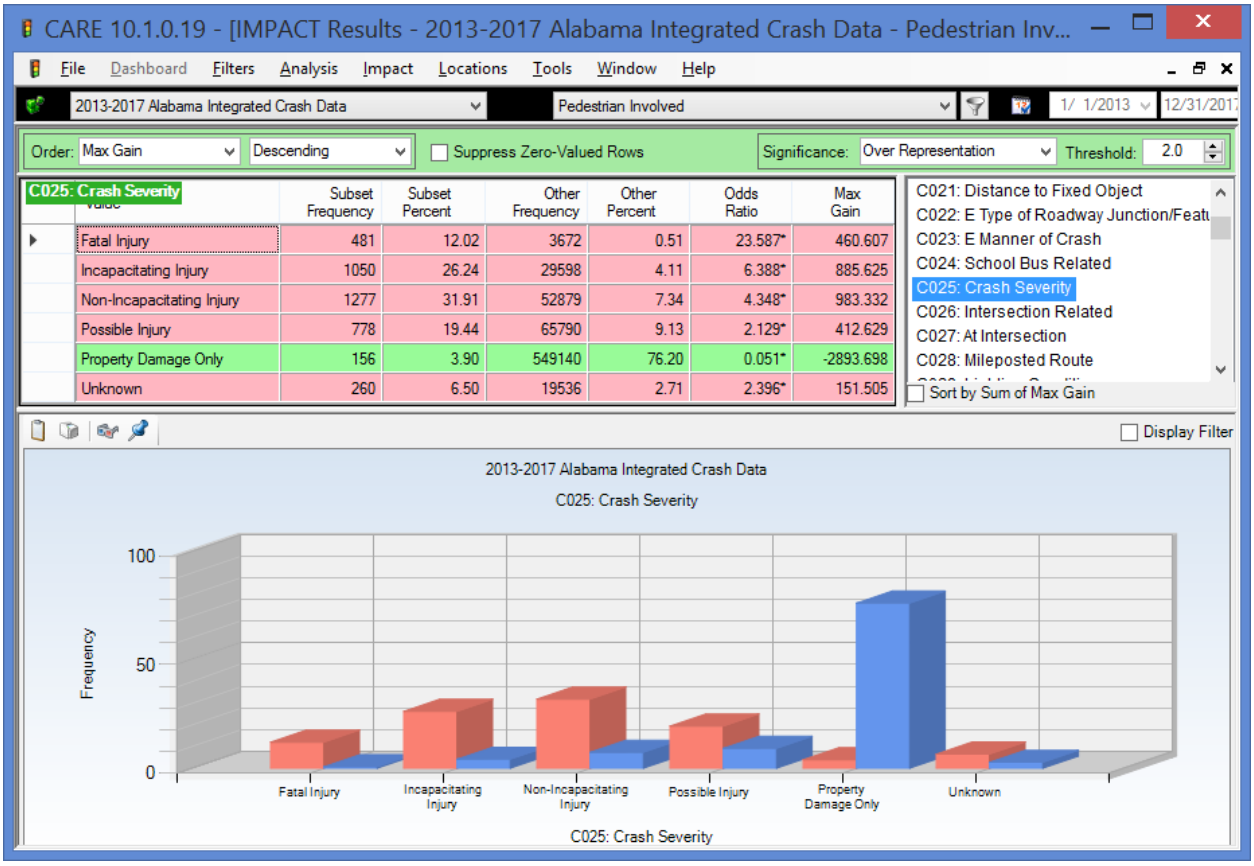
C020 E Distracted Driving Opinion



Relatively speaking, DD does not seem to be a major factor in pedestrian crashes. Recognize that this is only referring to the driver, not to the pedestrian. No practical differences were found in the pedestrian fatality analysis.

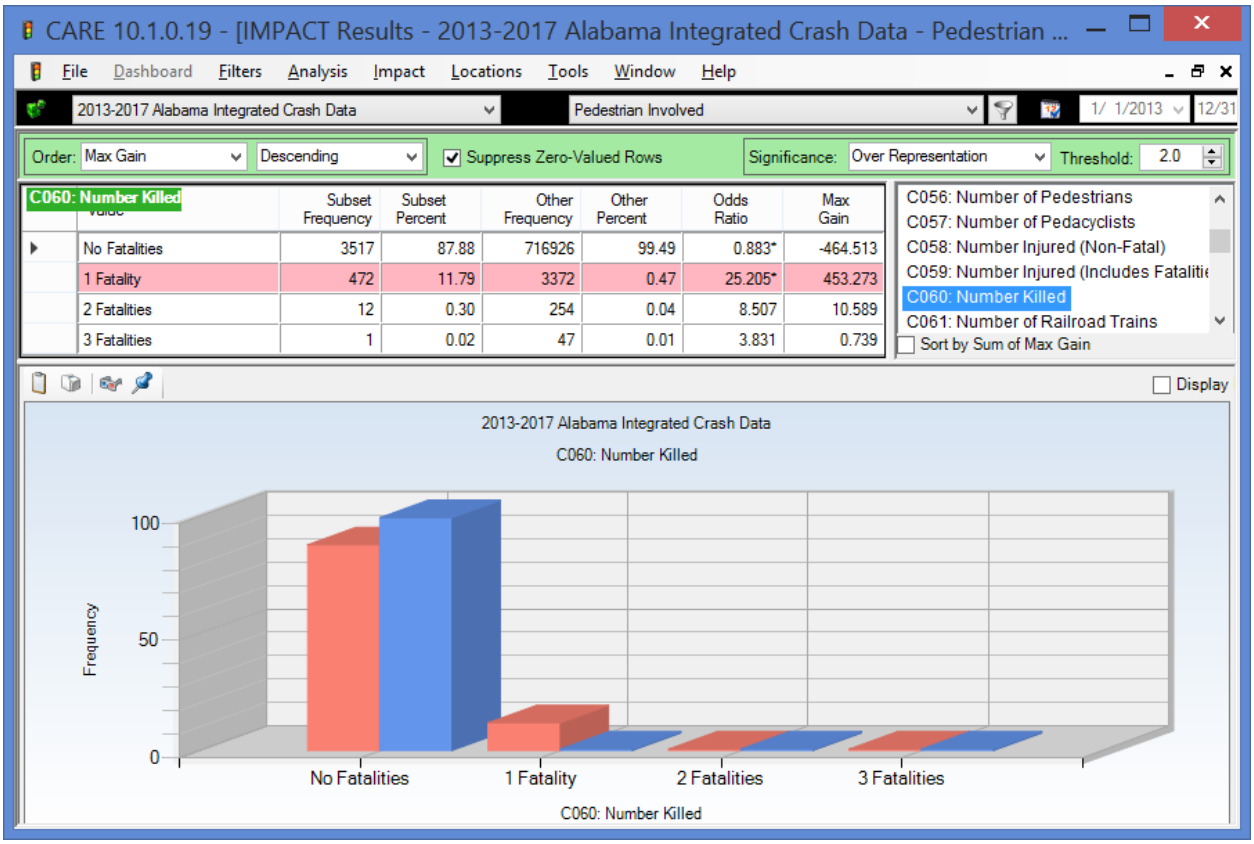
Severity Characteristics

C025 Crash Severity



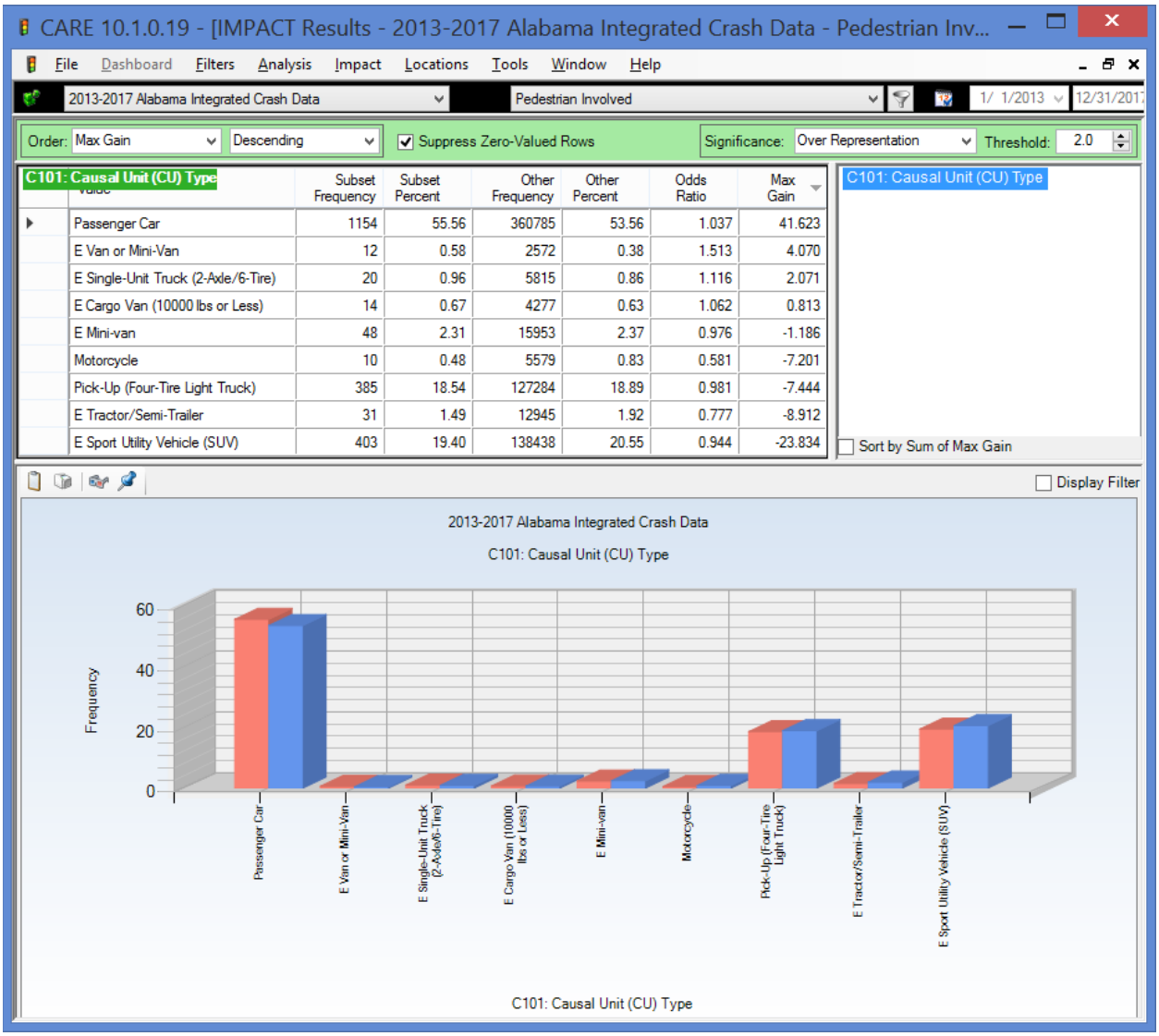
As would be expected, all of injury categories are significantly over-represented with the Odds ratio increasing exponentially with the severity.

C058 Number Killed



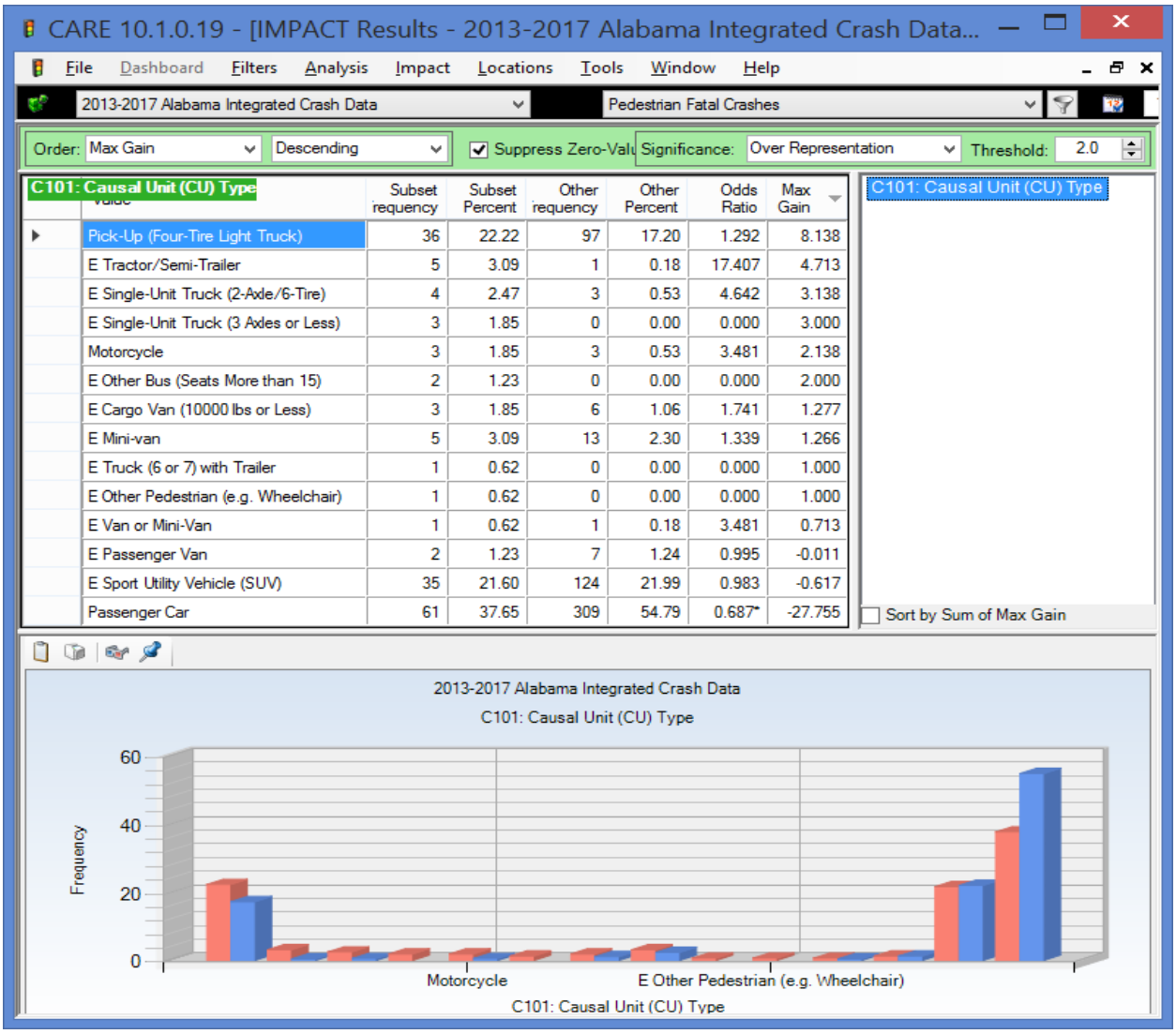
As indicated above, the chances of a pedestrian crash being fatal is about 25 times that of other crashes, and two fatalities result about 8 times the expected proportion.

C101 Causal Unit (CU) Type



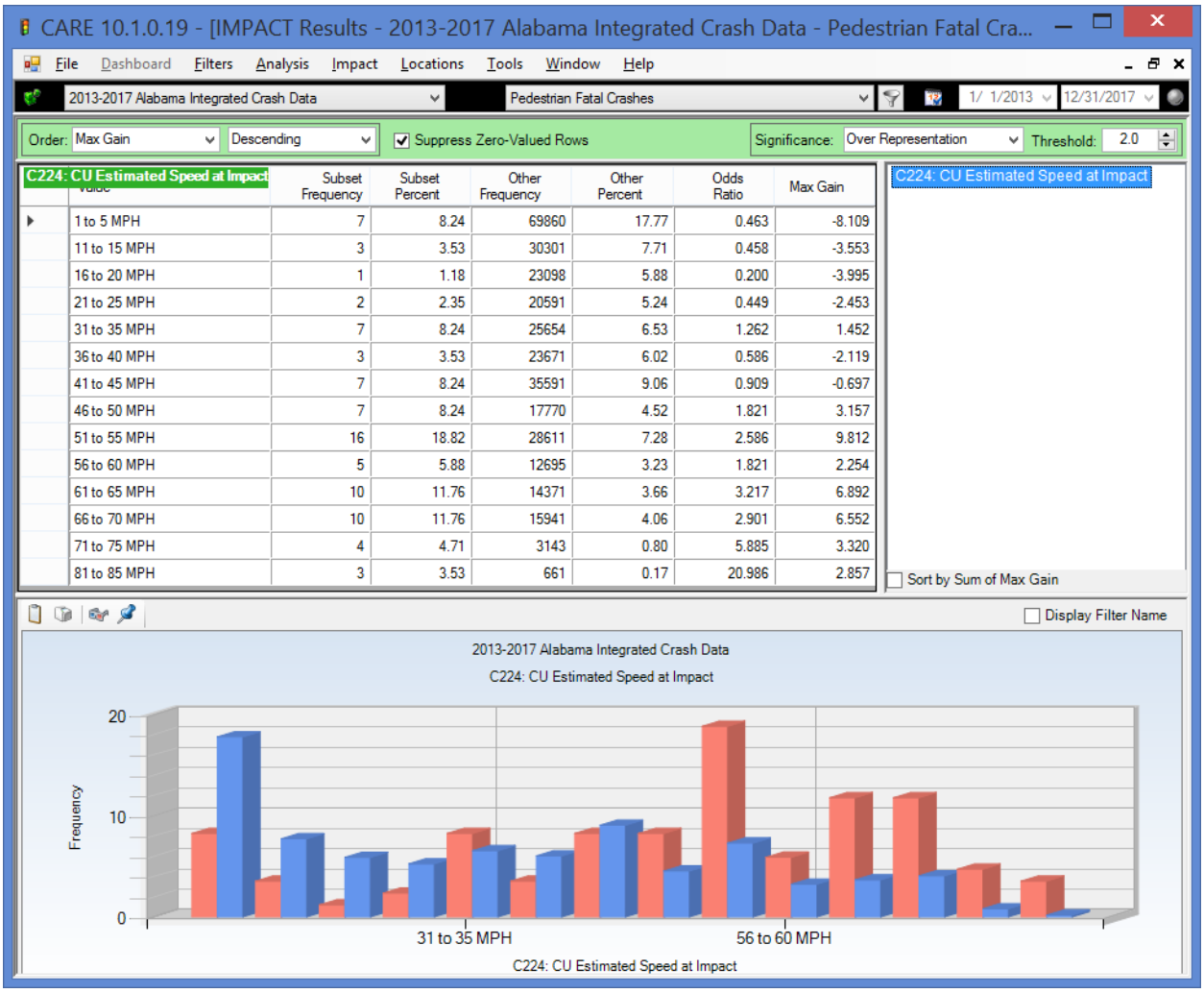
This attribute becomes important because of the recent research that has indicated that SUVs are more apt to cause fatal pedestrian crashes than are other passenger vehicle types. The display above shows that SUVs are in no way over-represented in causing pedestrian crashes. More analysis will be performed below to determine if pedestrian fatality crashes are more apt to be caused by SUVs than other vehicles. The next section contains the same display as above, but for pedestrian fatality crashes.

C101 Causal Unit (CU) Type – Fatality Causal Comparison



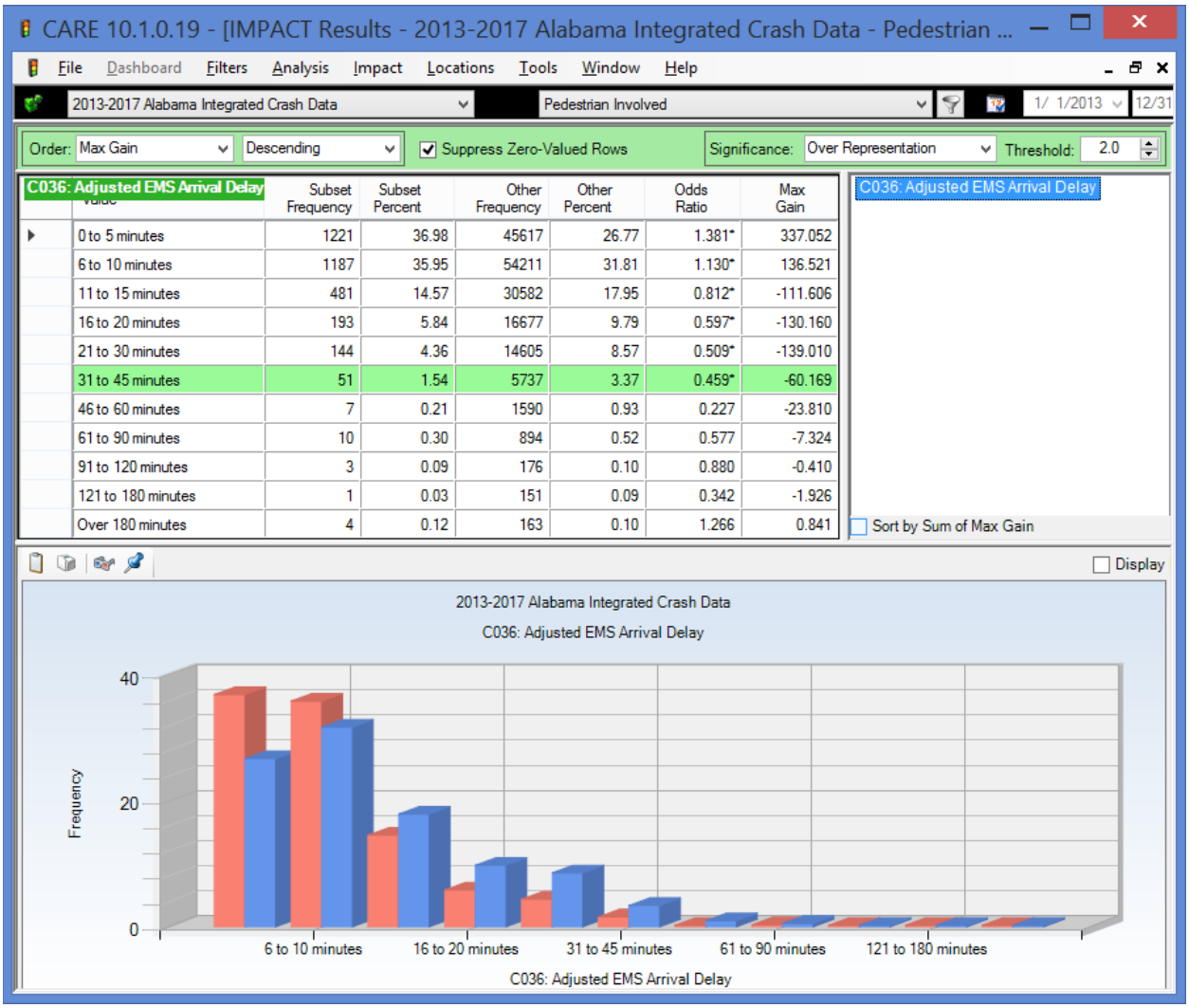
The above display is different from the other fatal pedestrian analyses in that this comparison is between fatal pedestrian crashes and non-fatal pedestrian crashes. This was performed in order to determine vehicle types that may be causing more than their share of fatalities. It has been postulated that because of their structure, SUVs cause more fatal pedestrian crashes (see: http://www.safehomealabama.gov/SafetyTopics/Pedestrians.aspx). Both SUVs and Passenger Cars are under-represented, falling to the bottom of the table above. It is true that Passenger Cars are significantly under-represented and have a much lower odds ratio than SUVs, and this could be interpreted that they are not causing as many fatalities (proportionately speaking) as SUVs. As can be seen, however, SUVs have almost identically their proportion of fatal crashes as their proportion of non-fatal crashes.

C224 CU Estimated Speed at Impact for Pedestrian Fatal Crashes



Generally pedestrian crashes occur at lower speeds than other crashes due to their being highly concentrated in urban areas. However, the same is not true of fatal pedestrian crashes as given above, which illustrates that speed is a major factor in causing these fatalities.

C036 Adjusted EMS Arrival Delay

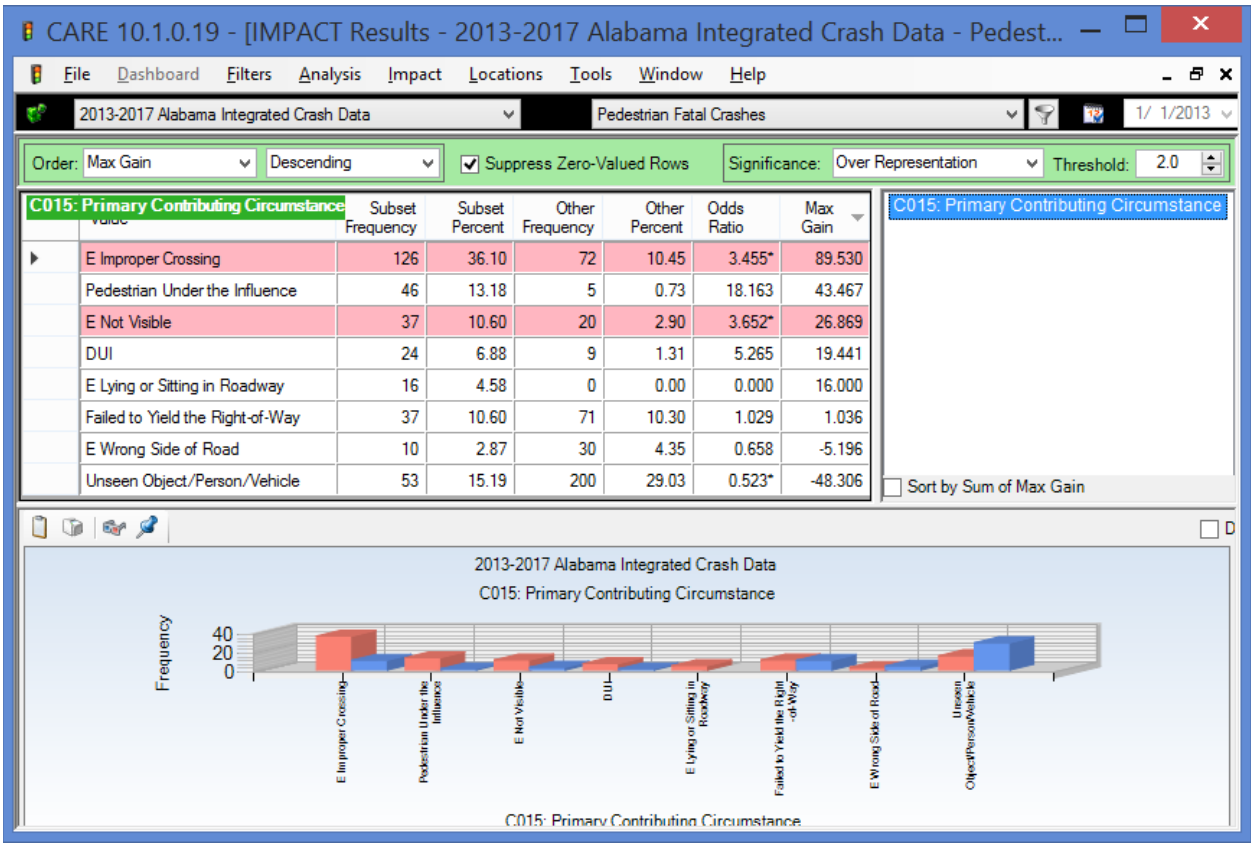


Over 70% of pedestrian crashes have an EMS arrival delay of 10 minutes or less. The delay is longer for fatal pedestrian crashes, with only 57.6% having arrivals less than 10 minutes, and 31.6% falling in the 11 to 30 minute ranges.

Pedestrian Fatal vs. Non-Fatal Analysis

The study above of vehicle types (C101) is repeated here for all other attributes, and those which were the most significant are given here, in order of those that were found to have the highest significance, as measure by their total Max Gain. For this section only the comparisons are between Pedestrian Fatal Crashes and Pedestrian Non-Fatal Crashes, with the purpose of surfacing what in a pedestrian crash leads to it being fatal.

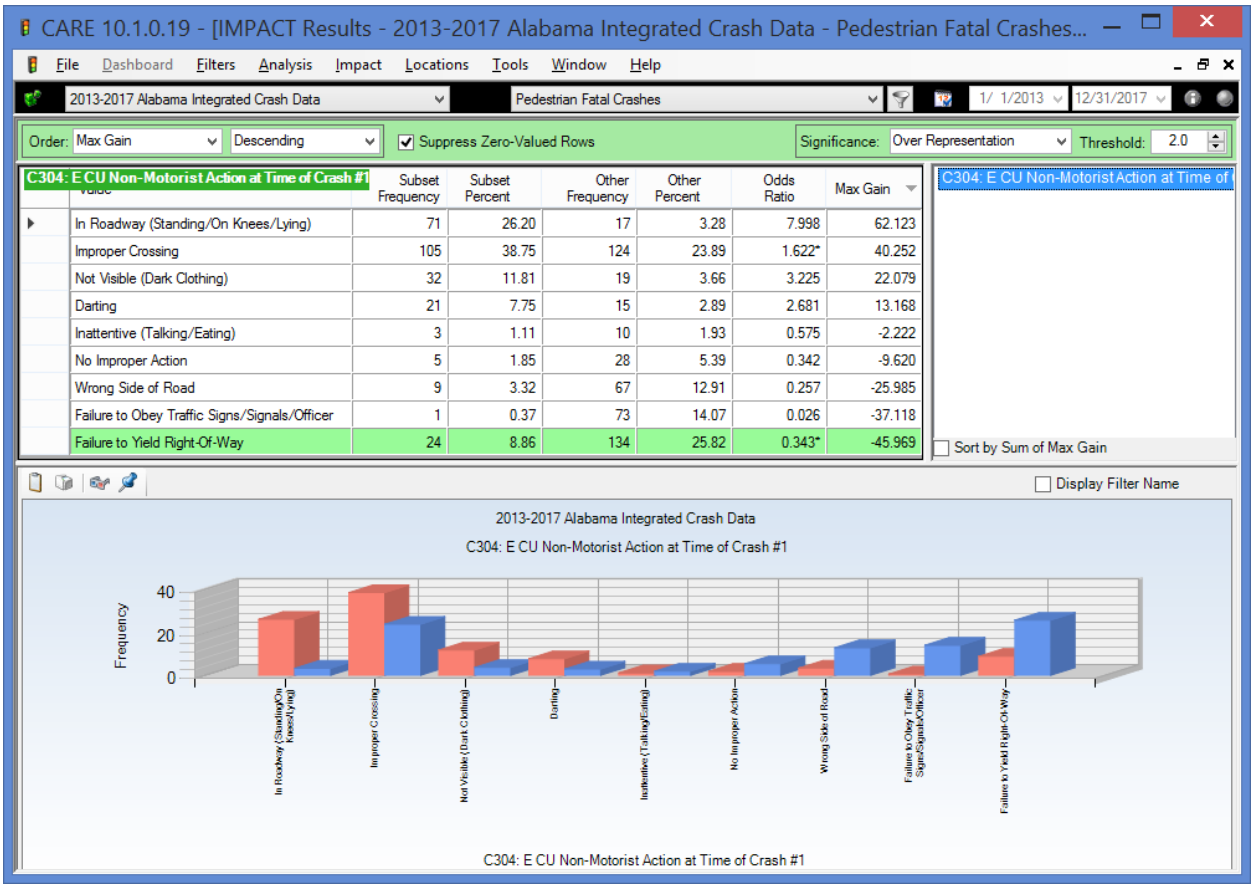
C015 Primary Contributing Circumstance (Fatal vs. Non-Fatal)



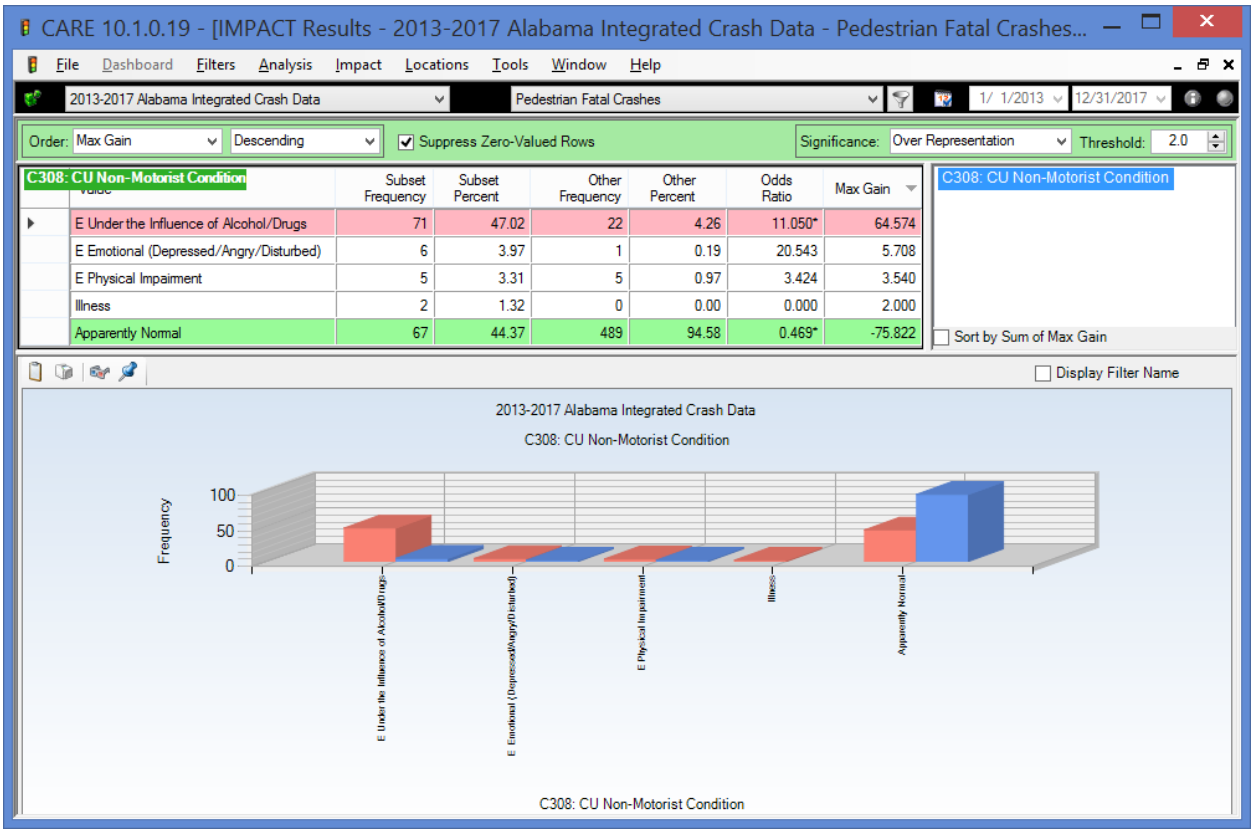
All of these PCCs are relevant. Improper Crossing (126) is the most over-represented. Pedestrian under the Influence (46) is over 18 times its expected proportion, creating situations where pedestrians do not take defensive protective action. Not Visible (37) at all, as opposed to unseen is significantly over-represented. DUI (24) of the causal driver is over five times expected. Lying or Sitting in Roadway (16) proved to be fatal 100% of the time. The other items should not be dismissed because they are under-represented.

C304 CU Non-Motorist Action at time of Crash #1

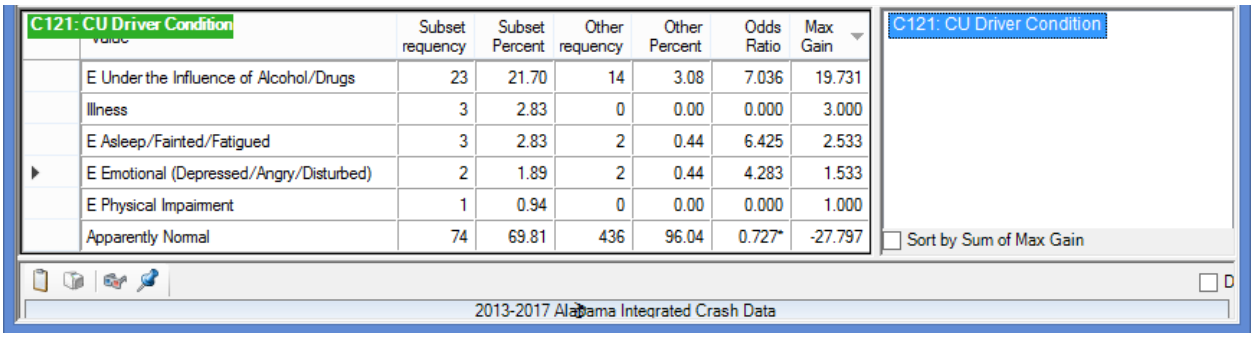
This display largely reflects the findings above, but it contains several categories not in the contributing circumstance codes. Generally, it shows the actions as opposed to what might have caused them (e.g., ID).



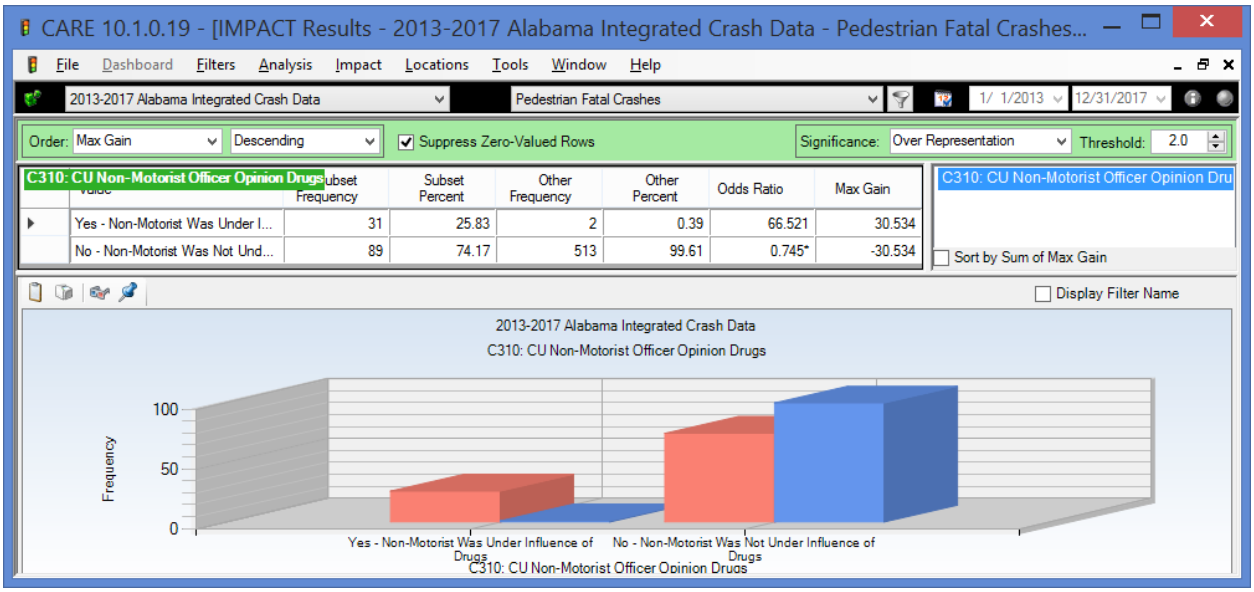
C308 CU Non-Motorist Condition



This attribute confirms the problem of impairment on the part of pedestrians, which leads them to ignore the care they would usually take while walking. It is interesting to compare this with the same driver distribution, C121 CU Driver Condition. The following shows that the results are not that different for the Pedestrian, there being over 7 times the expected proportion of fatal crashes when compared to the proportion for non-fatal crashes.

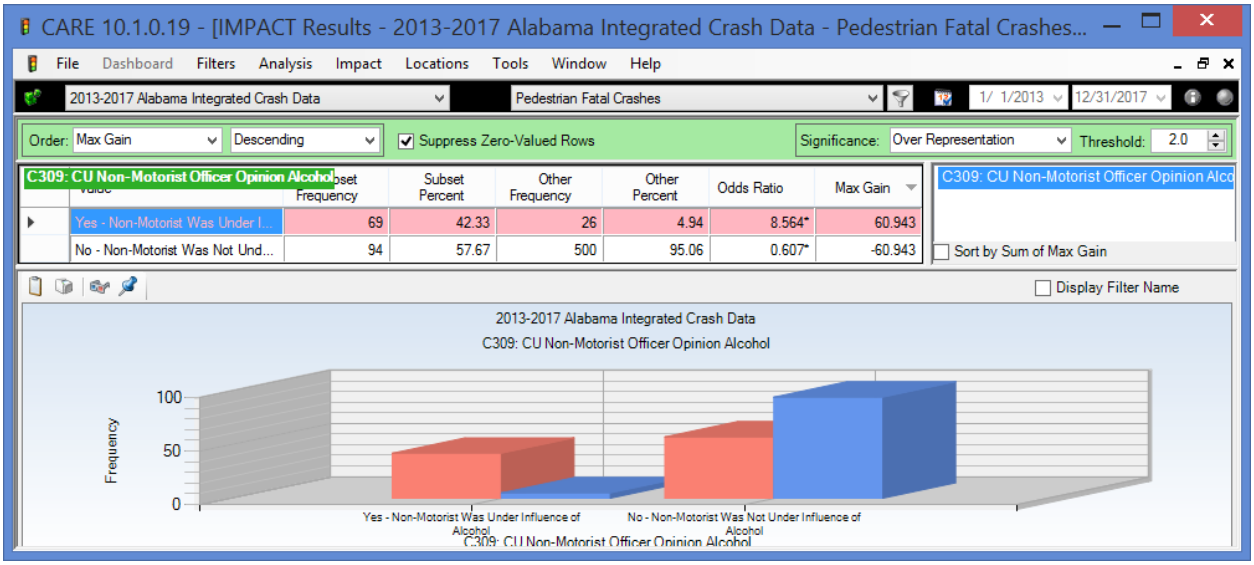


C310 CU Non-Motorist Officer Opinion Drugs



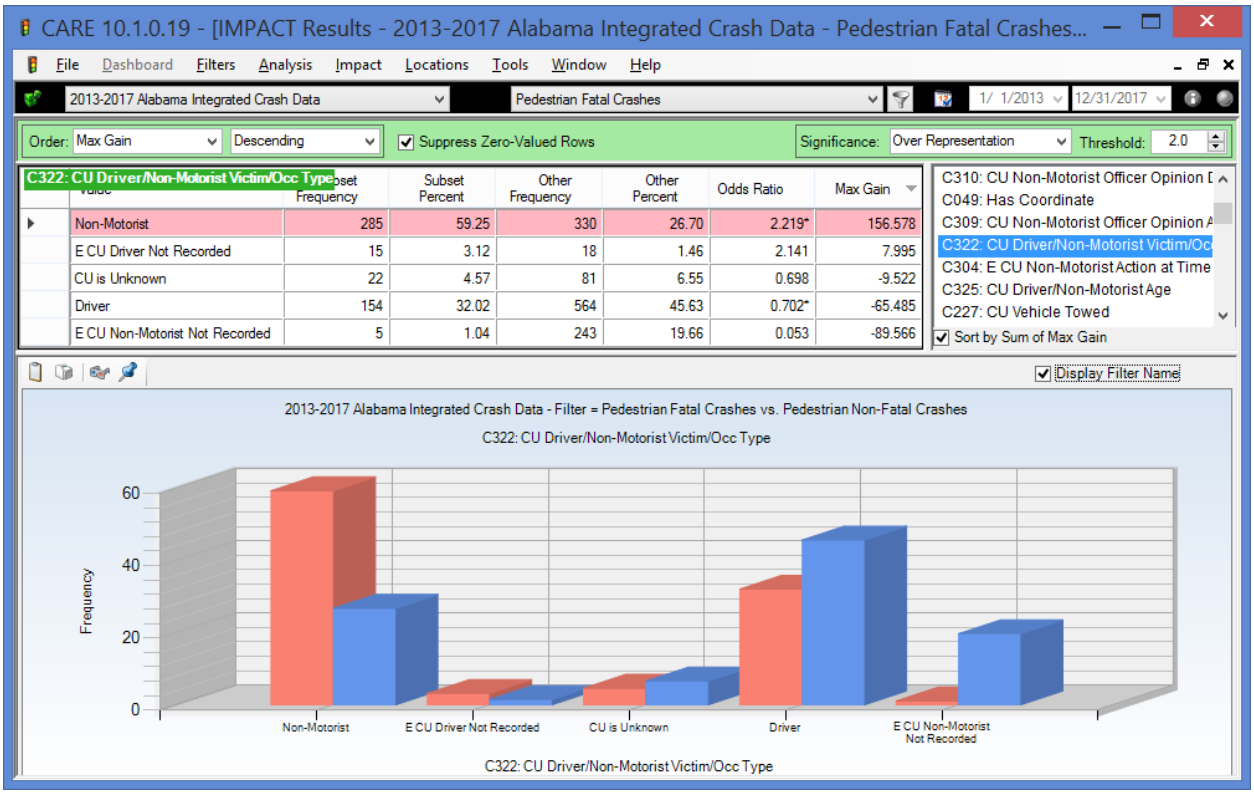
The problem of pedestrian impairment is further qualified by these displays. Above indicates that the pedestrian suffering death is 66.521 times the proportion of those pedestrians who survive their crashes. The multiplier for alcohol is not as great at 8.564, but this is still a major indicator of the role that alcohol is playing in that it is recorded to be affecting twice as many pedestrians being killed as drugs.

C309 CU Non-Motorist Officer Opinion Alcohol



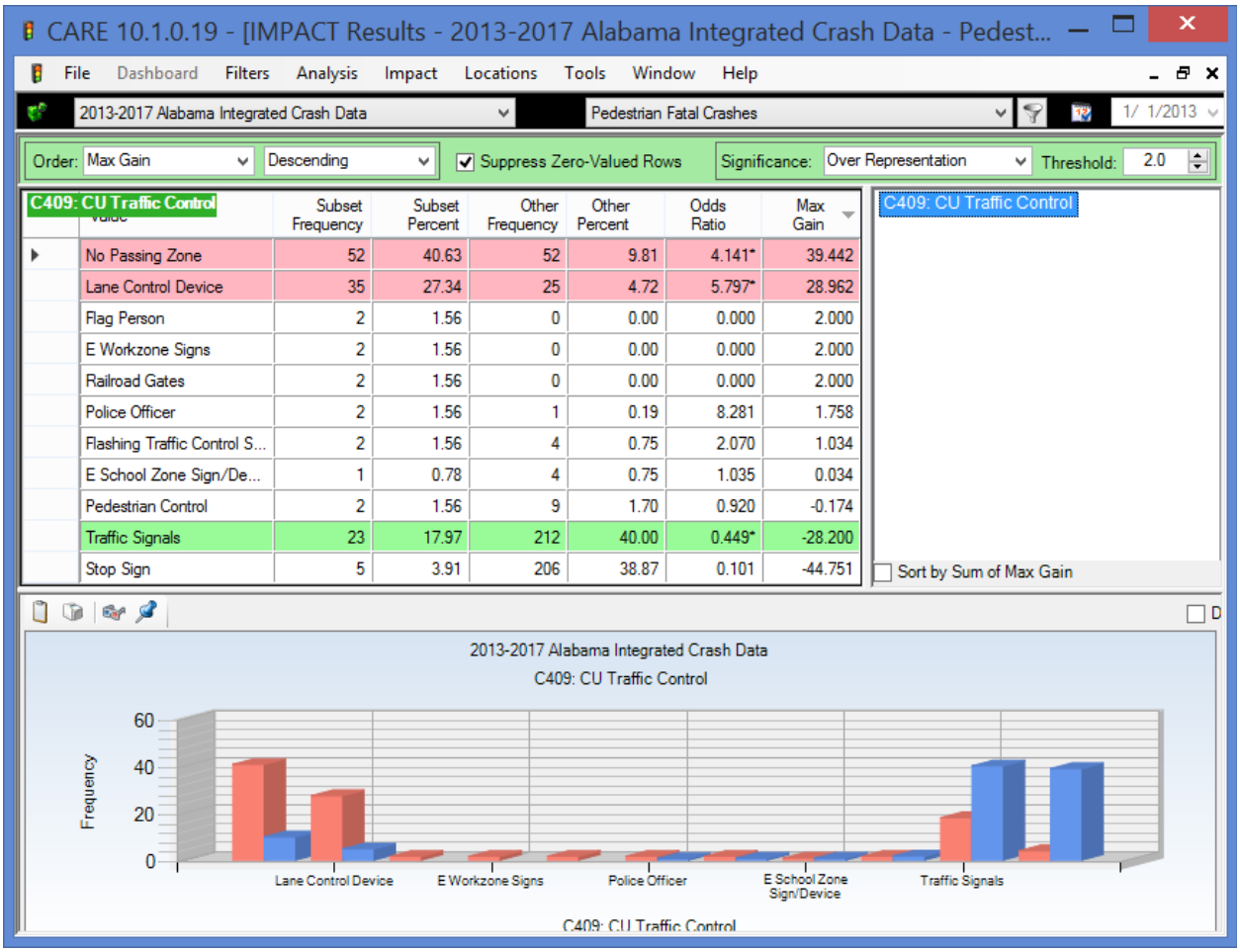
C322 CU Driver/Non-Motorist Victim/Occupant Type

In other words, who caused the crash; this is a very important aspect of countermeasure development, since it gives a good indication of where the resources should be concentrated.



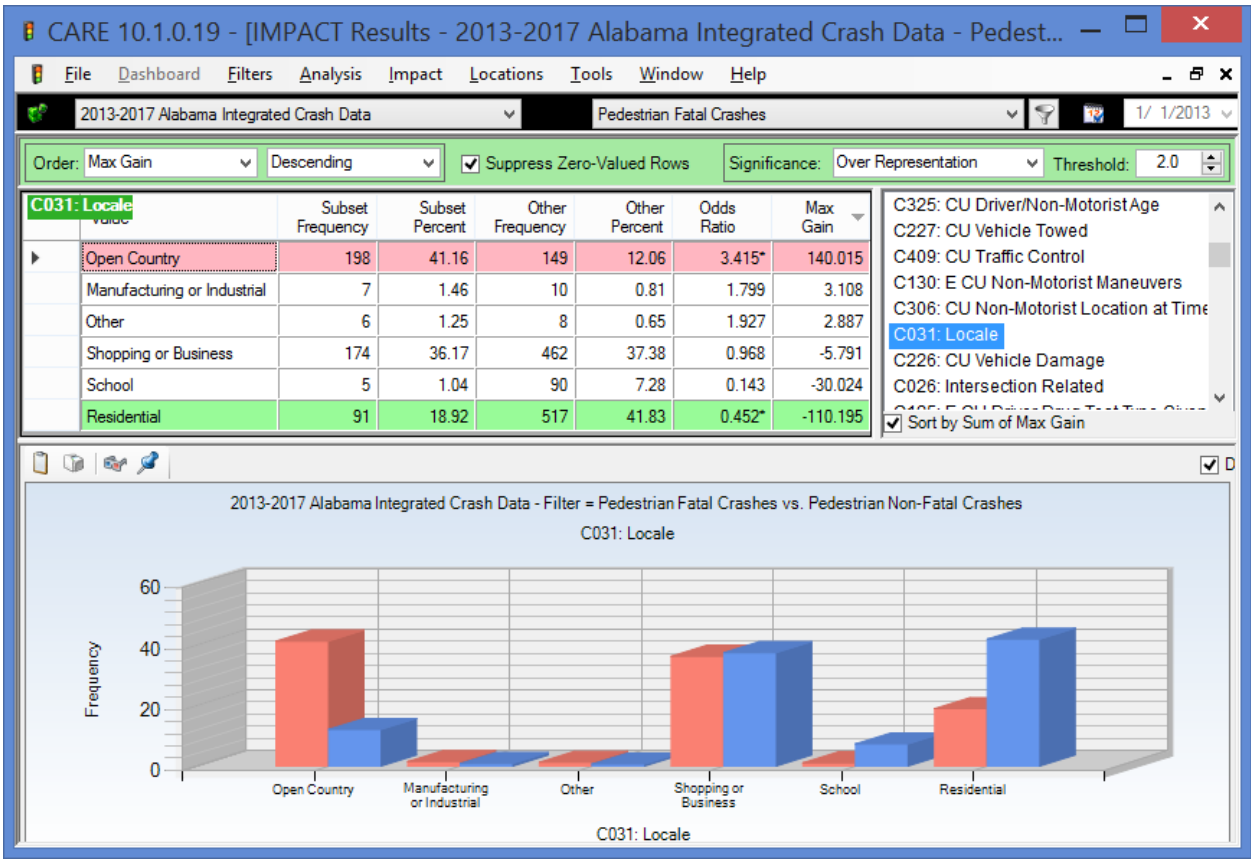
The display above shows a striking contrast. To get the perspective, recognize that if at-fault were just due to chance, then there would be a 50-50% chance for the driver and the pedestrian and their proportions would thus be the same (the ratio of the two would be 1.00). But here, for non-fatal pedestrian crashes, the driver is at fault 63.1% of the time (a ratio of 1.71 rather than 1.00). But for fatal pedestrian crashes just the opposite is true. The pedestrian is at fault 64.9% of the time (a ratio of 1.85 rather than 1.00). This shows that severity is highly dependent on fault. If a pedestrian cause a crash, the probability that s/he will be killed is close to twice what it would be if they were strictly the victim.

C409 CU Traffic Control



No Passing Zone and Lane Control Device both have significant over-representation of over 4 and close to six times, respectively. Traffic Signals have a high number but are under-represented, probably because the high volume make these locations very prone to pedestrian crashes.

C031 Locale



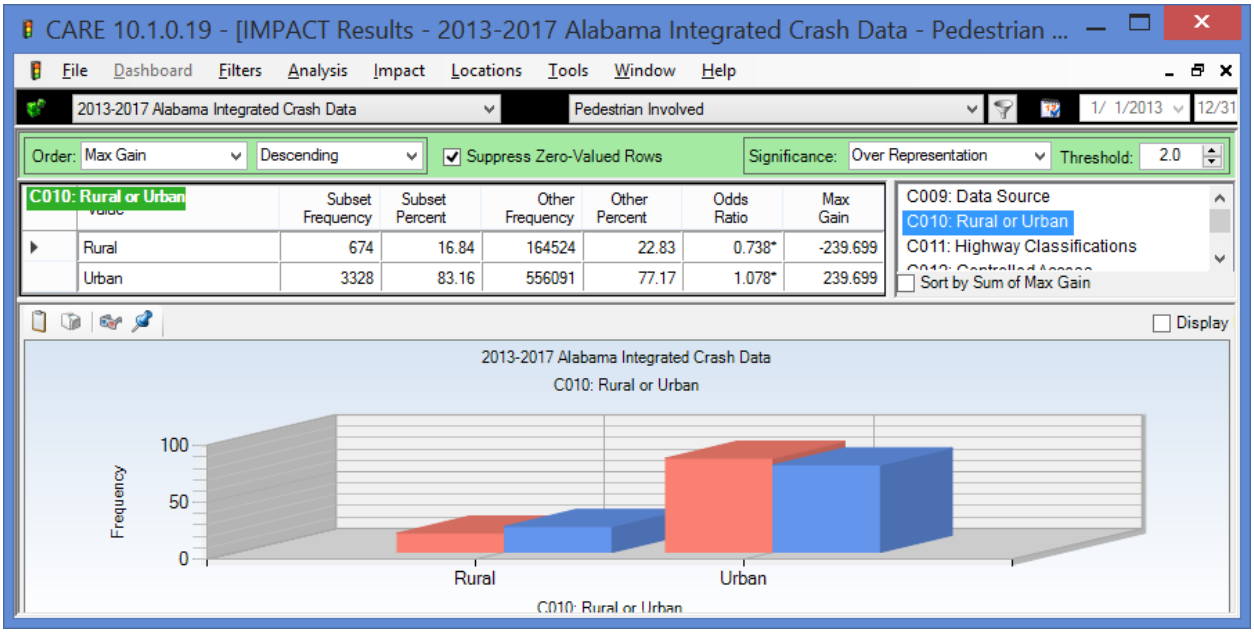
Open country is by far the most lethal locale, having 198 fatal crashes and an odds ratio of 3.415 times its expected proportion. Rural fatal crashes also have and odds ratio of 3.291, almost reflecting the locale result perfectly. C224 Estimated Speed at Impact further reinforces that the increased speed of impact on the rural roadways is a major cause of pedestrian fatalities on these roadway classifications.

Attributes Found Consistent with the General Comparisons

Displays were not be shown in this section for those attributes show no major differences in their findings than the fatal to non-fatal pedestrian comparisons. For example, Time of Day and Lighting Conditions are compounded for fatalities due to the PCCs given above; not being visible as well as ID on the part of drivers and impaired walking on the part of pedestrian, both of which are more apt to occur in hours of darkness.

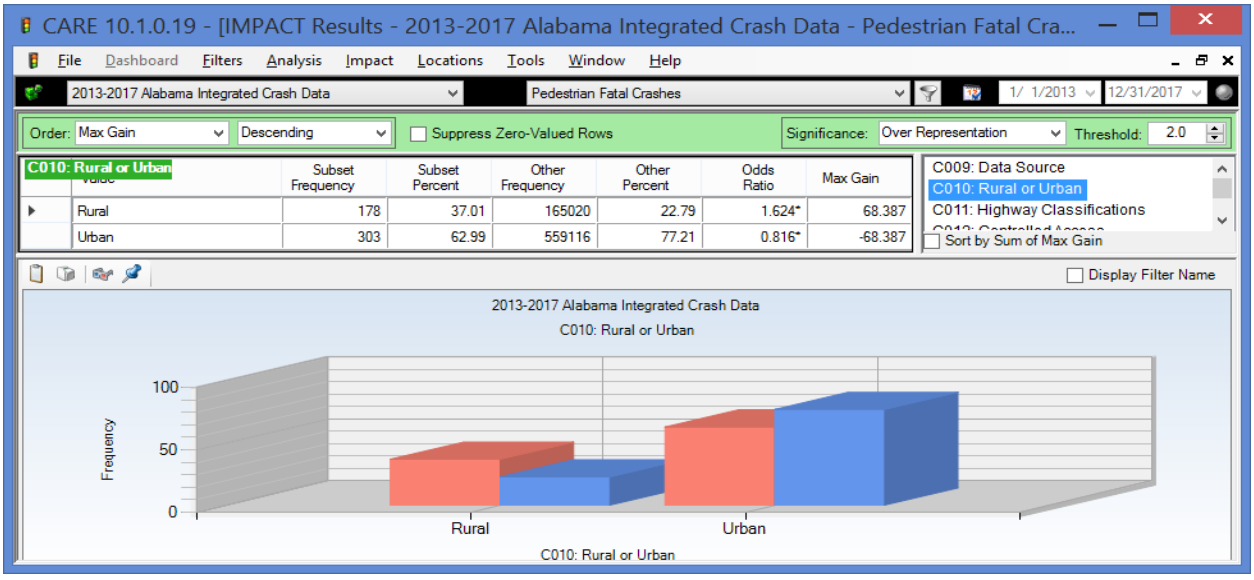
Geographical Characteristics

C010 Rural or Urban

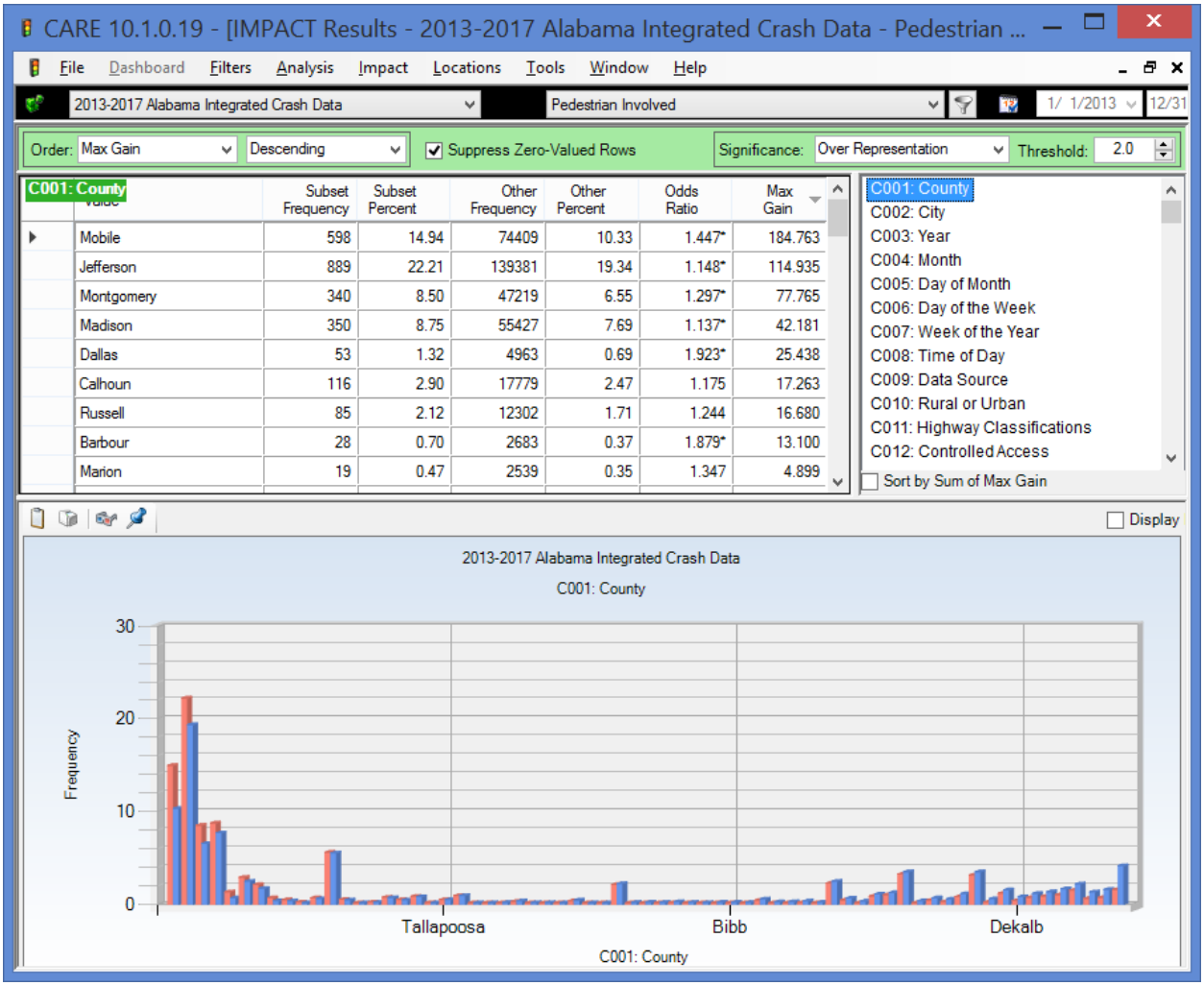


Pedestrian crashes are over-represented in the urban areas (see above), which pedestrian fatal crashes are over-represented in the rural areas (see below).

C010 Rural or Urban Fatal Pedestrian Crashes

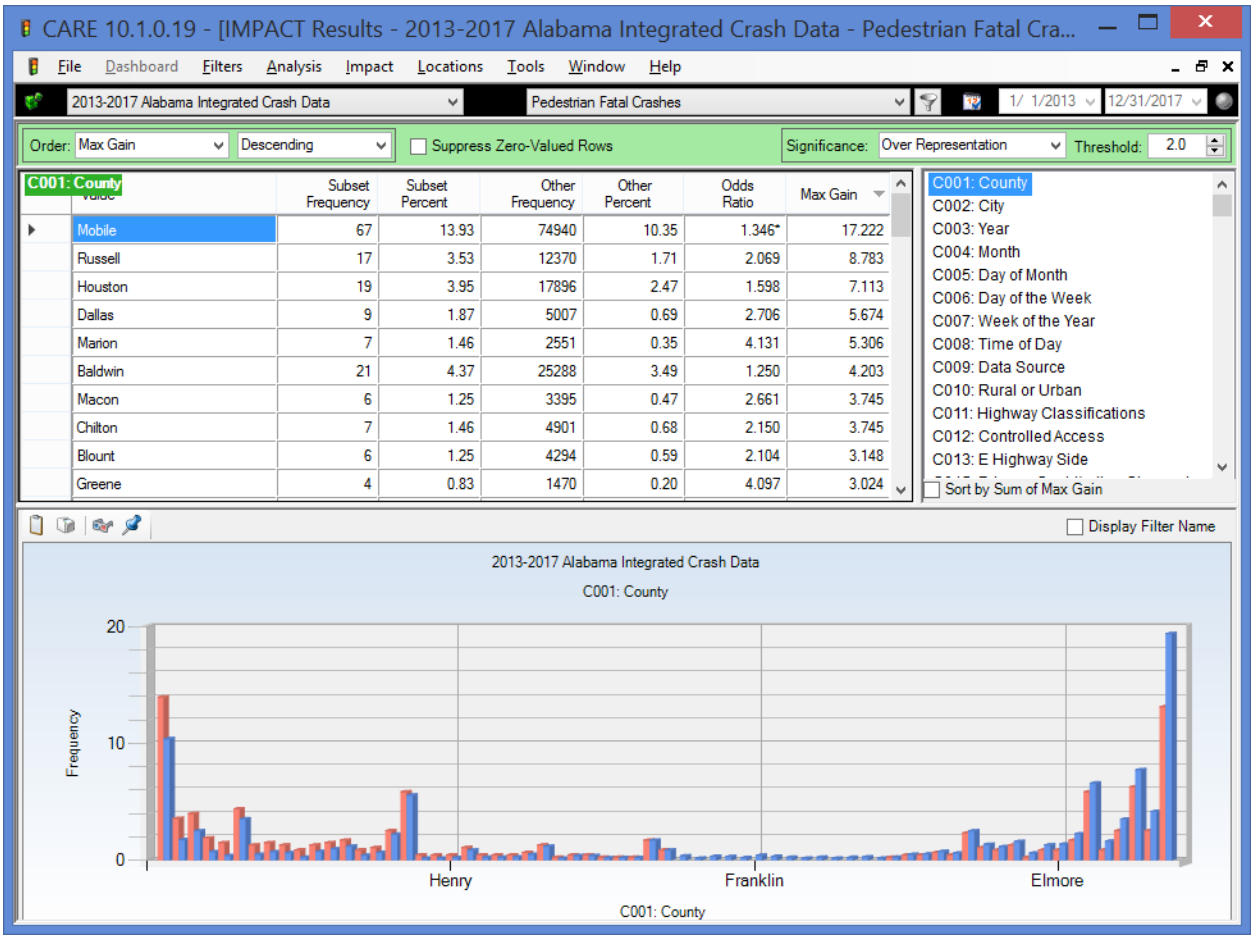


C001 County – Over-Represented



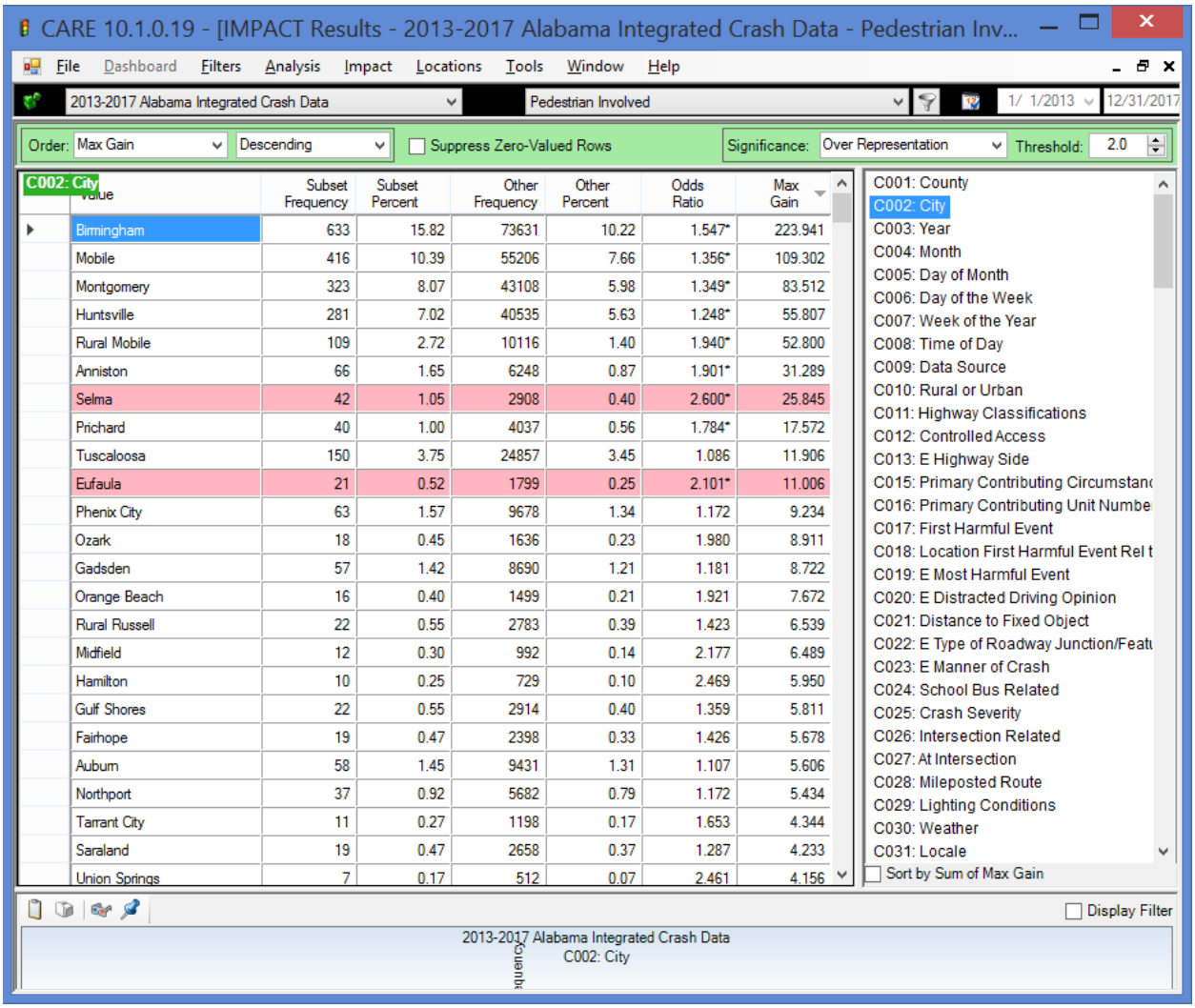
As expected, the urban counties are over-represented in pedestrian crashes.

C001 County Fatal Pedestrian Crashes – Over-Represented

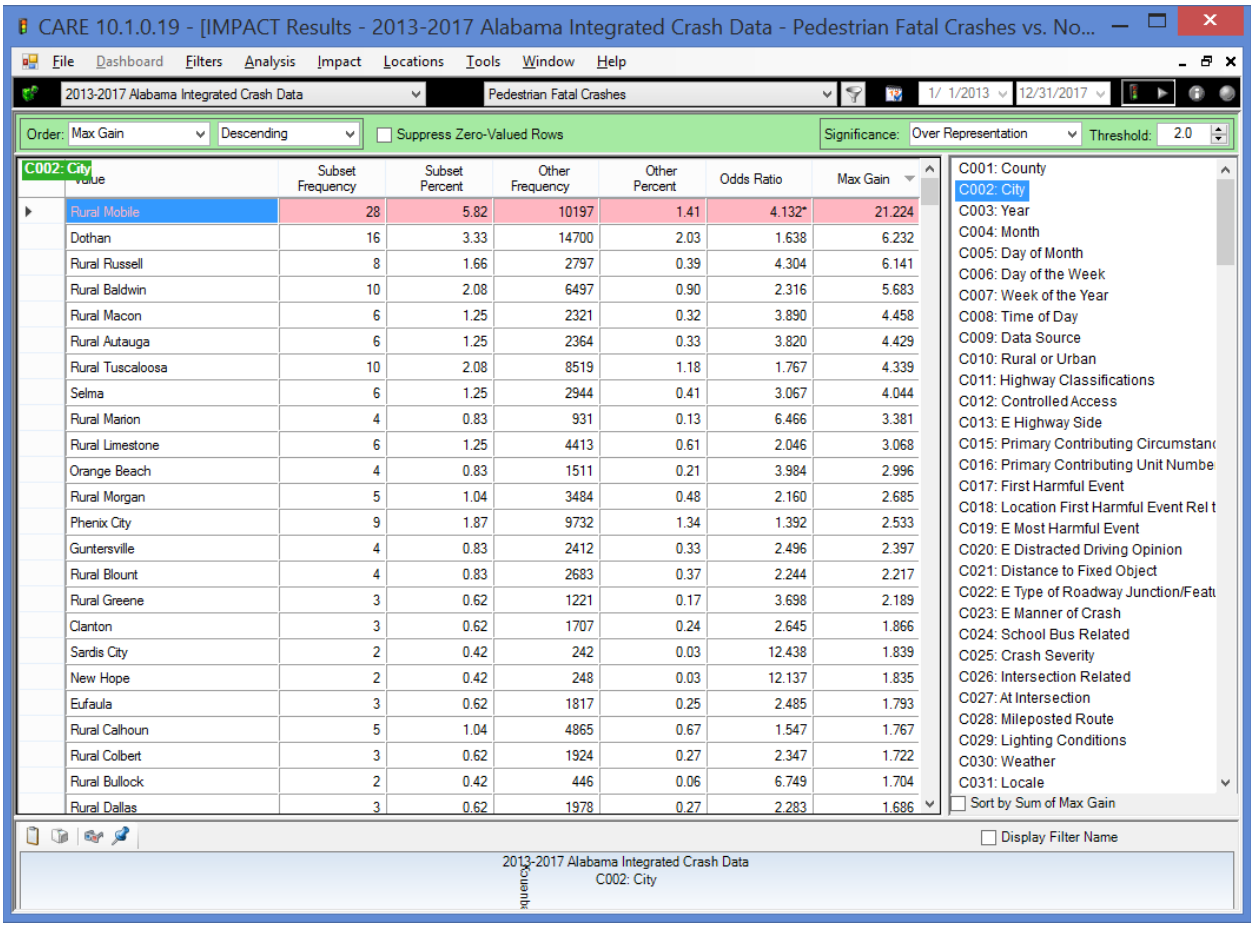


This comparison is between fatal pedestrian crashes (in red) and all other crashes (in blue). It should be noted that no statistical test is performed for items with less than 20 crashes in either side of the comparison. The most under-represented counties are: Etowah, Montgomery, Cullman, Lee, Madison, Shelby and Jefferson, so Mobile county is certainly a notable exception.

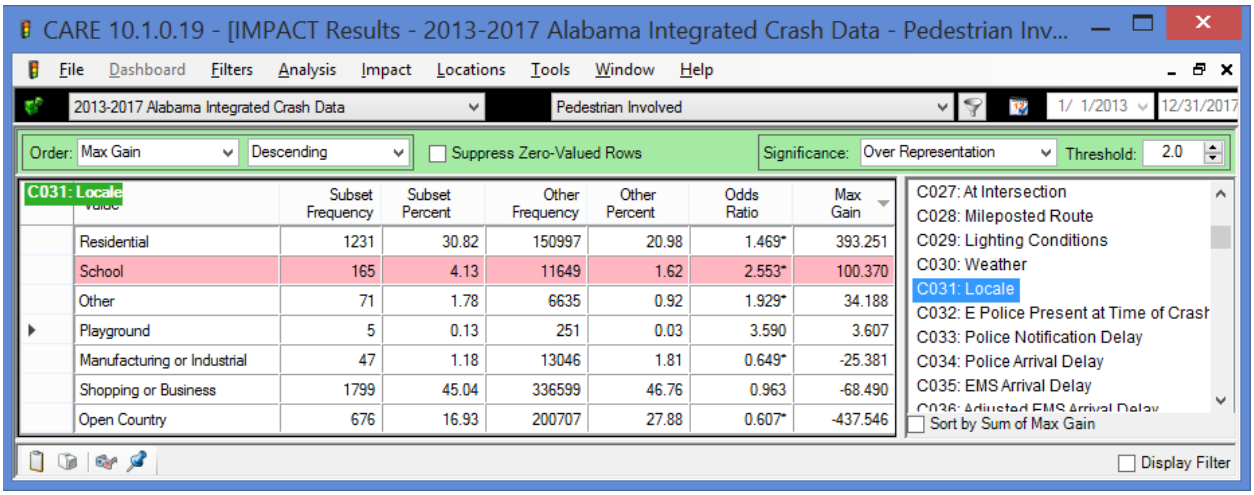
C002 City Over-Represented All Pedestrian Crashes



C002 City Over-Represented in Pedestrian Fatalities

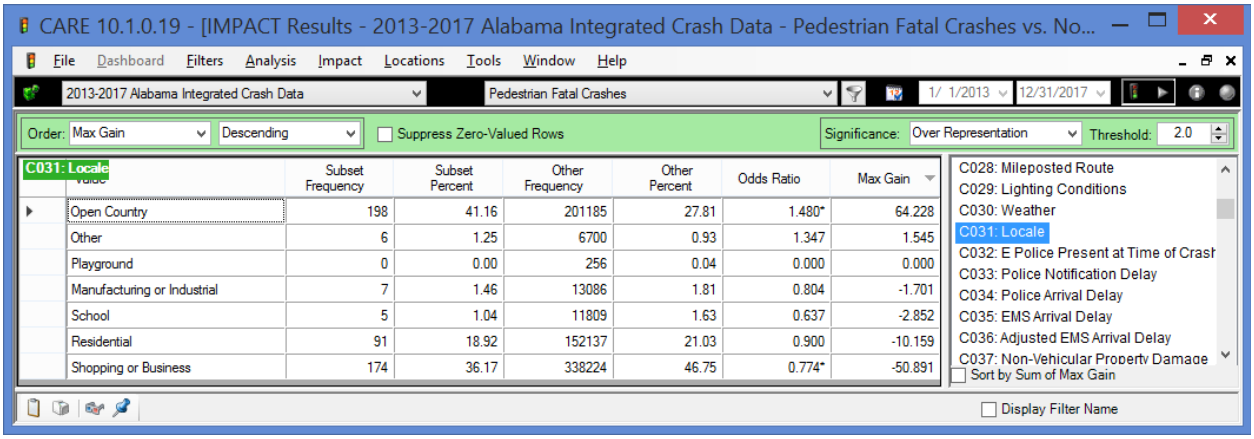


C031 Locale all Pedestrian Crashes

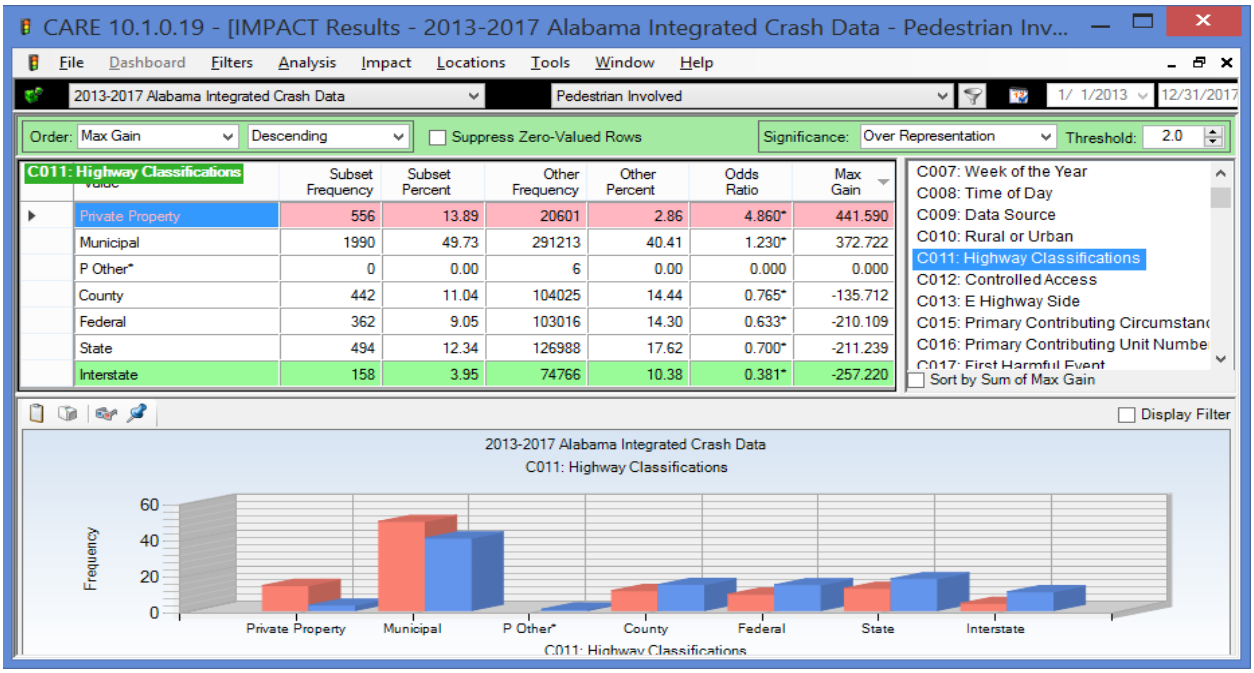


Of greatest concern is the great over-representation of pedestrian crashes in school zones. Fortunately, this locale is much further down on the list when it comes to fatal pedestrian crashes (see below).

C031 Locale Fatal Pedestrian Crashes

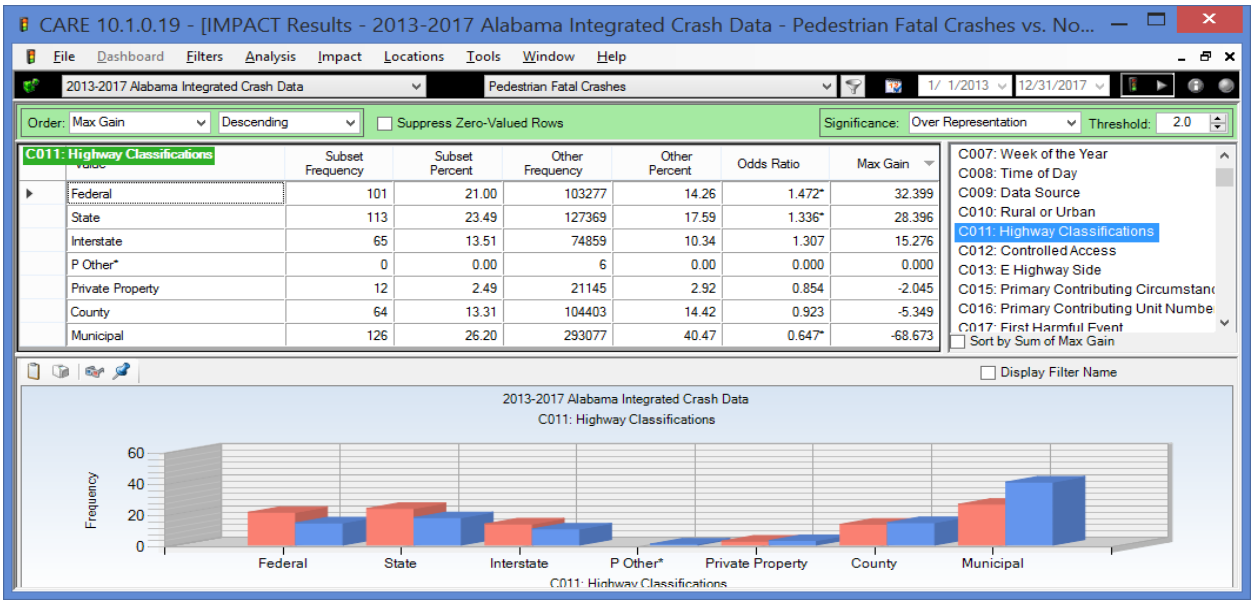


C011 Highway Classifications all Pedestrian Crashes

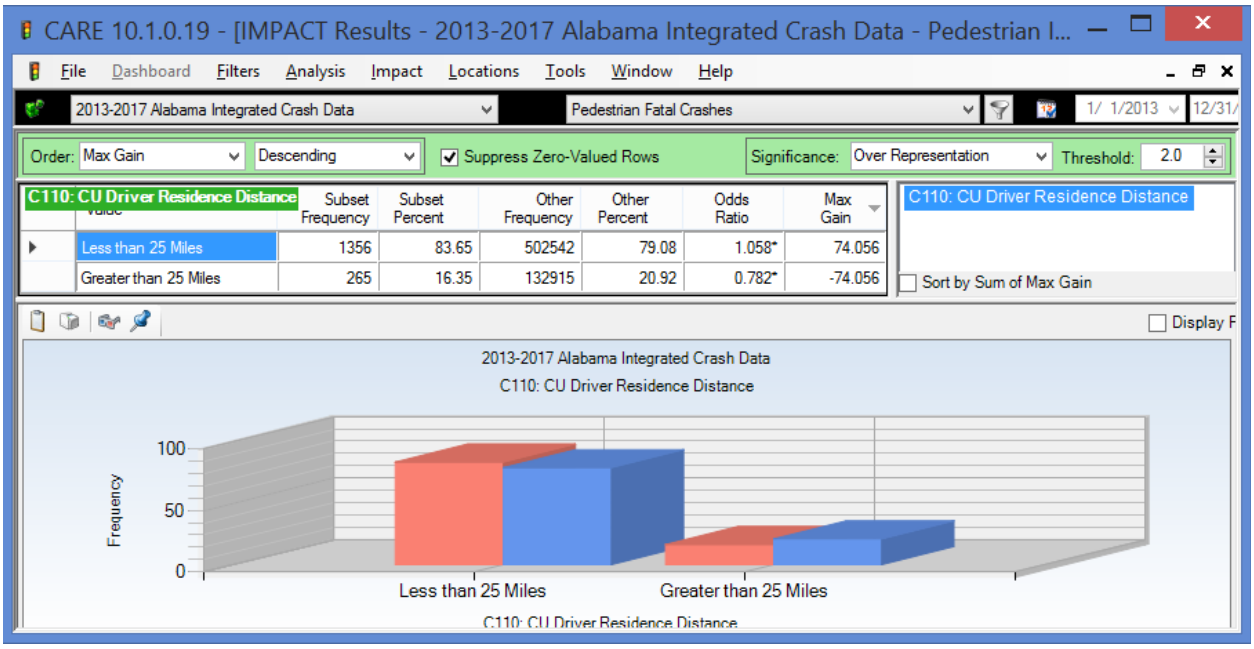


The typical pattern holds for the majority of pedestrian crashes to be on the urban roads, while the majority of fatalities are on the higher speed roadways.

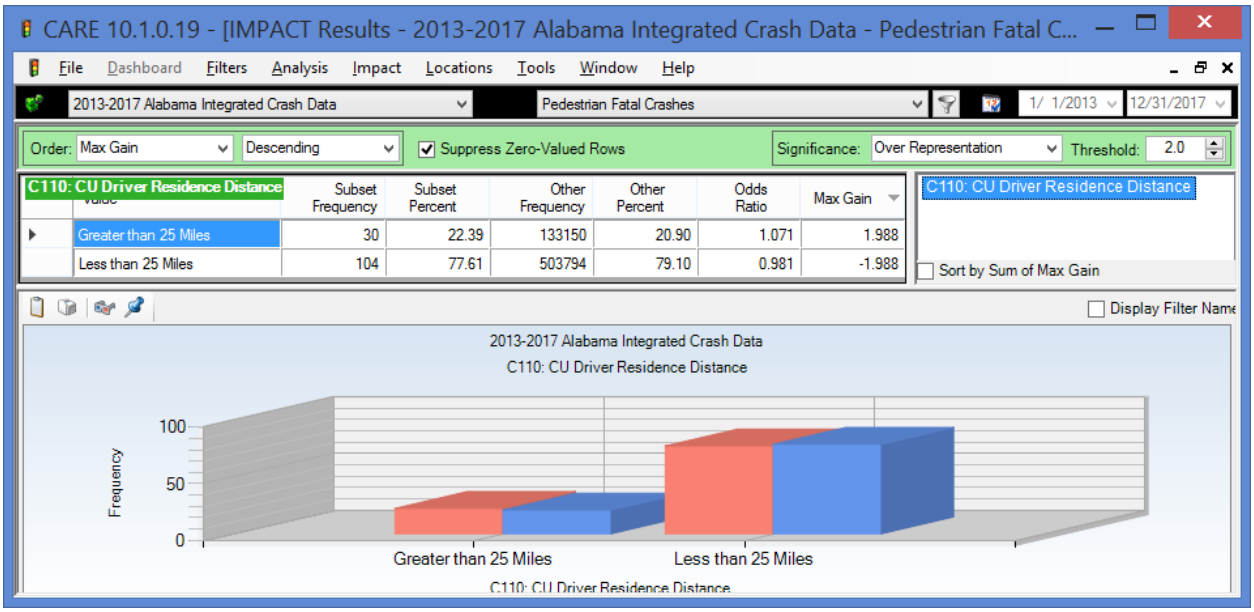
C011 Highway Classifications Fatal Pedestrian Crashes



C110 CU Driver Residence Distance (All and Fatal Crashes)



The display above is for all pedestrian crashes; the one below for fatal pedestrian crashes. As can be seen, they give the opposite picture due to the rural nature of pedestrian fatalities. Please realize that this is the distance from home of the causal driver, NOT the pedestrian.

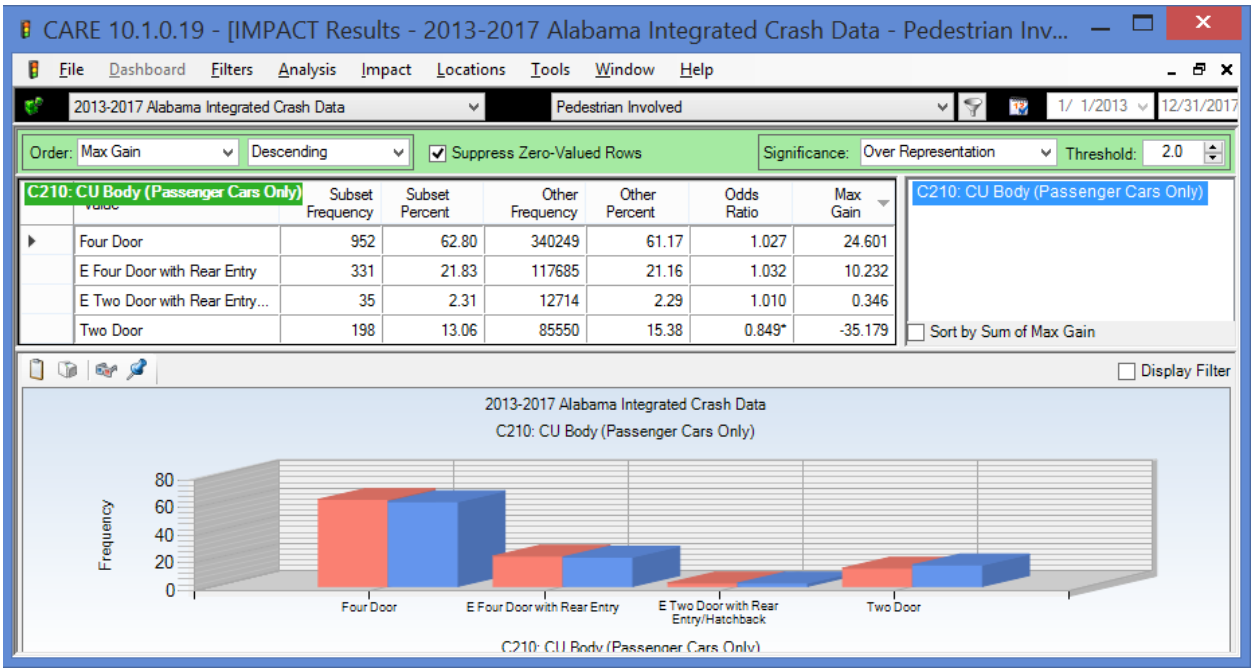


Vehicle Characteristics

C101 Causal Unit (CU) Type (All and Fatal)

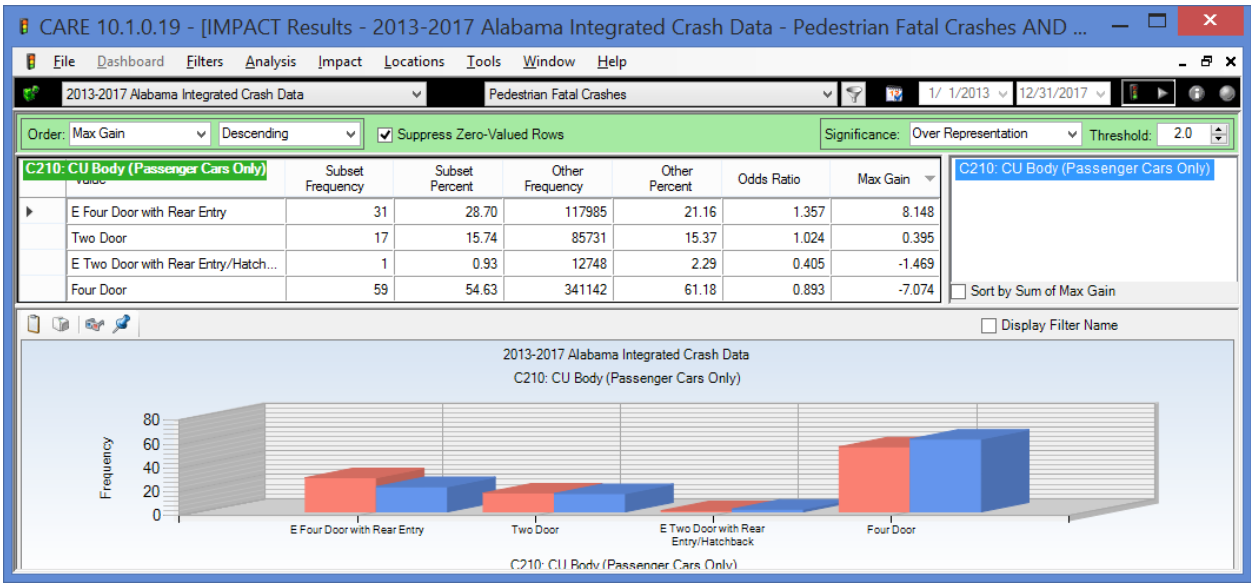
This was considered for both all pedestrian crashes and fatal pedestrian crashes in the major section on crash severity.

C210 CU Body (Passenger Cars Only) All Pedestrian Crashes

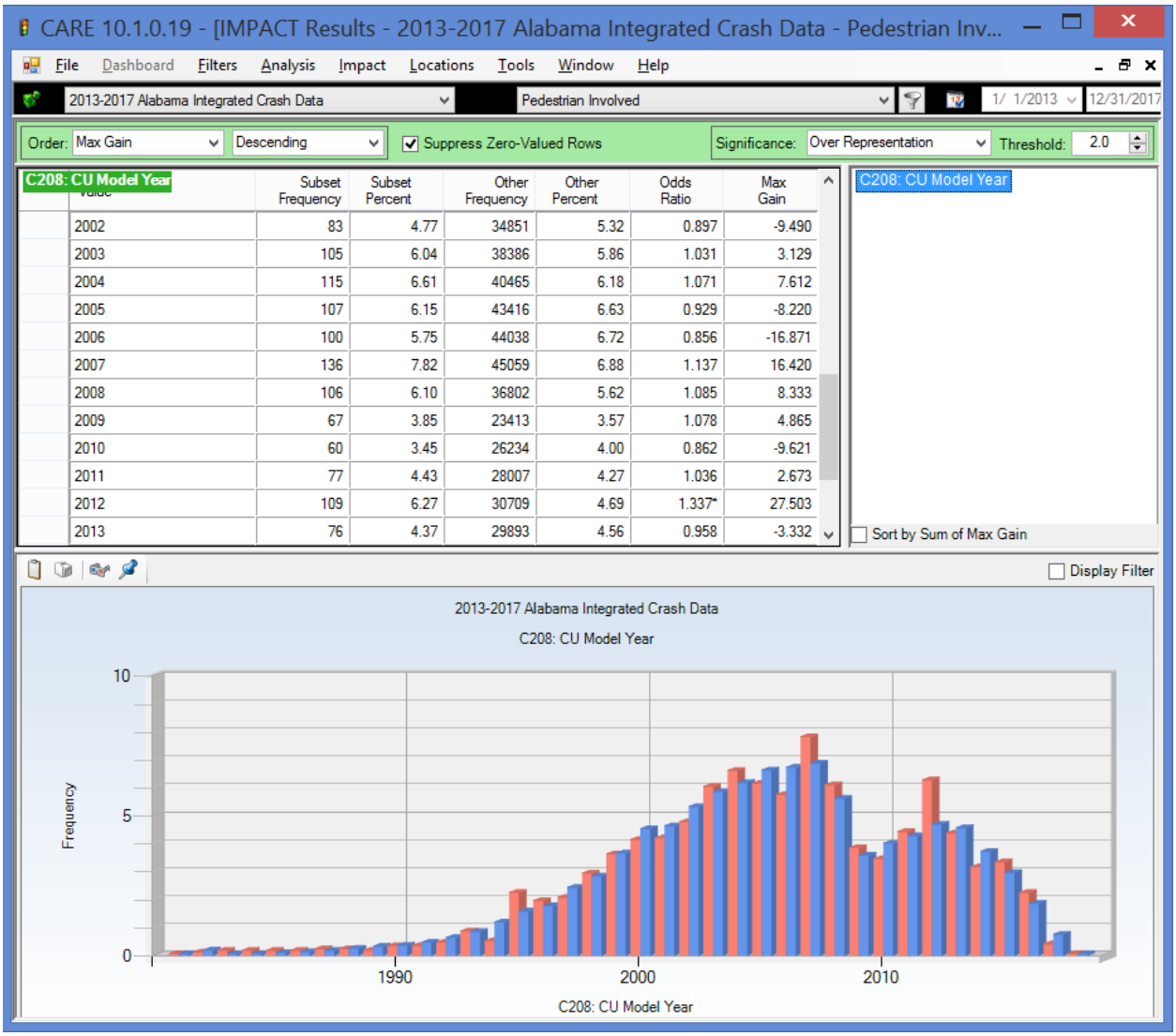


The difference in this display and the one below might tend to implicate SUVs in fatal crashes, but no statistically significant differences were found for the fatal crashes (below).

C210 CU Body (Passenger Cars Only) Fatal Pedestrian Crashes

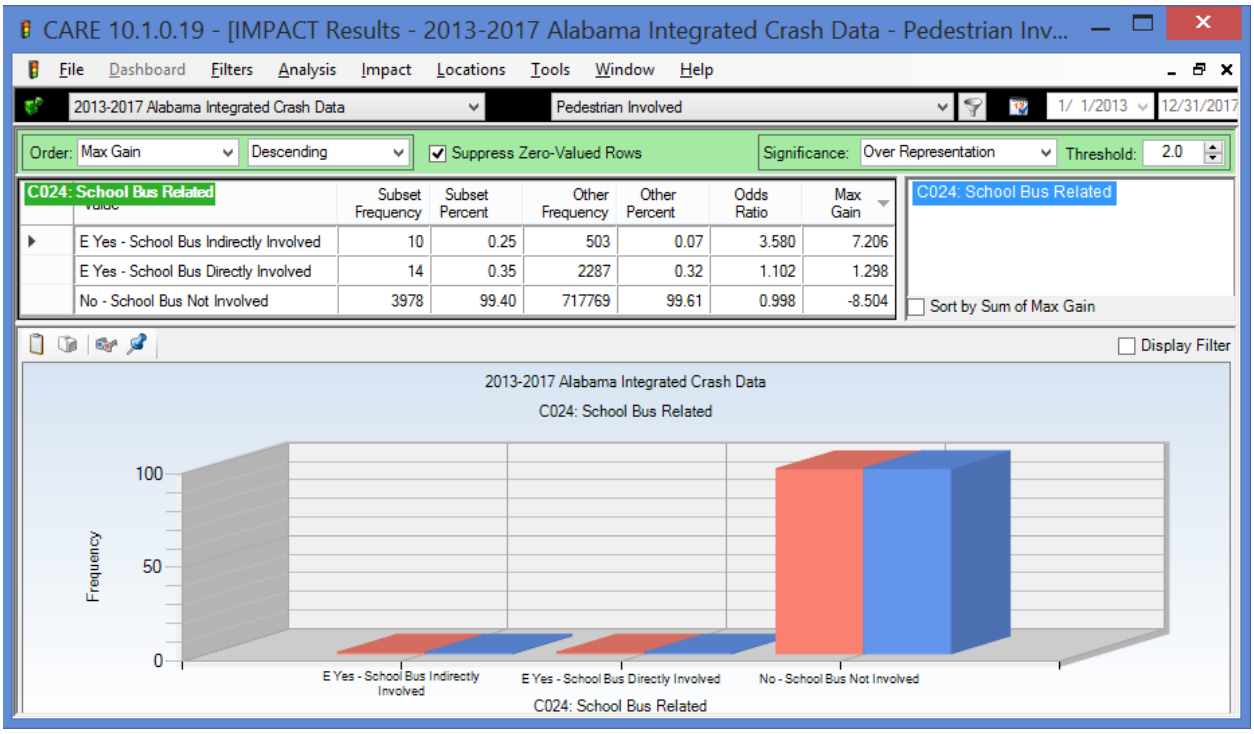


C208 CU Model Year



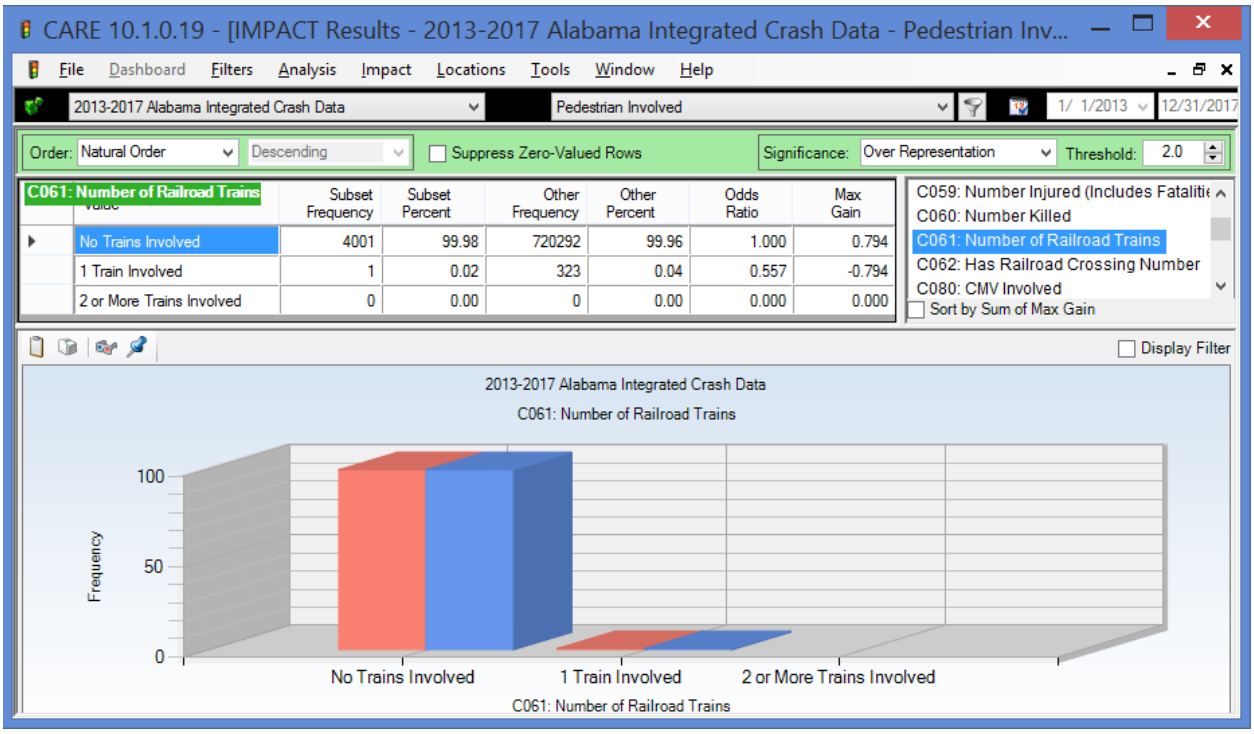
The years 2003-2012 were over-represented. There was no obvious difference in the distribution for fatal pedestrian crashes.

C024 School Bus Related



School bus involvement in pedestrian crashes are less than 1% of the pedestrian crashes. However, they are over-represented in both of the "Involved" categories, and "Directly Involved" accounted for the two fatalities within this attribute.

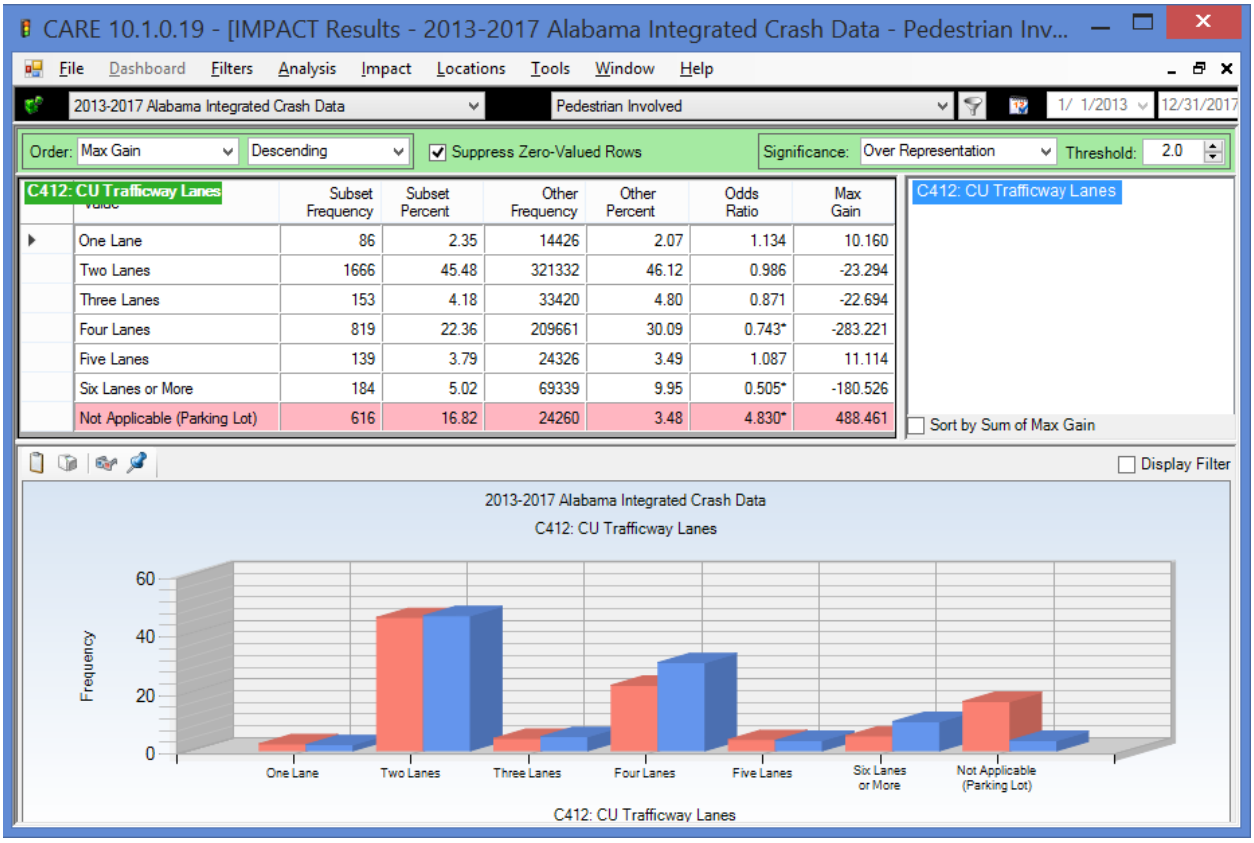
C061 Train Involved



Trains were only involved in one pedestrian crash over the five years of the study. This particular crash did prove to be fatal.

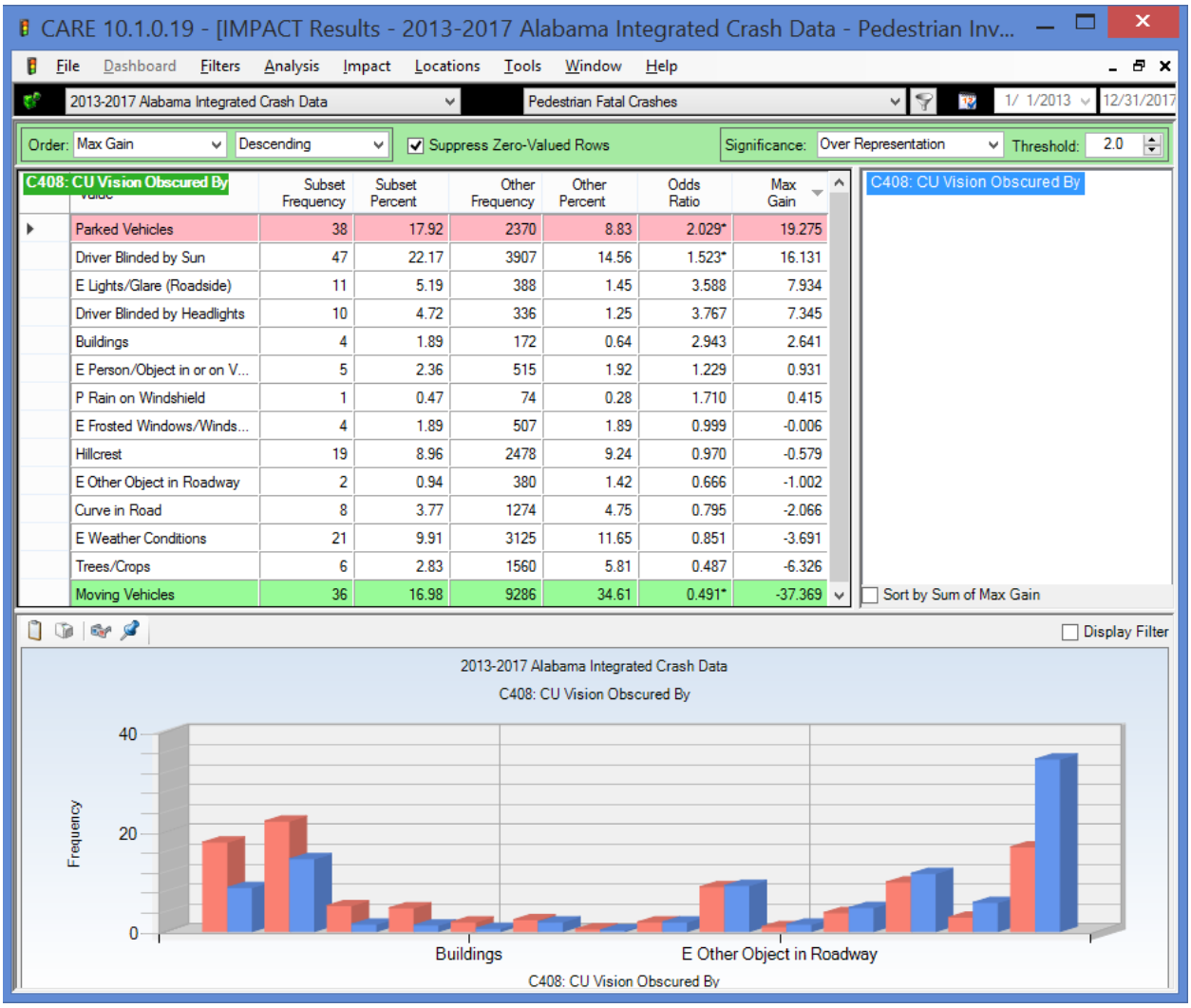
Roadway Environment and Pavement Characteristics

C412 CU Traffic Lanes



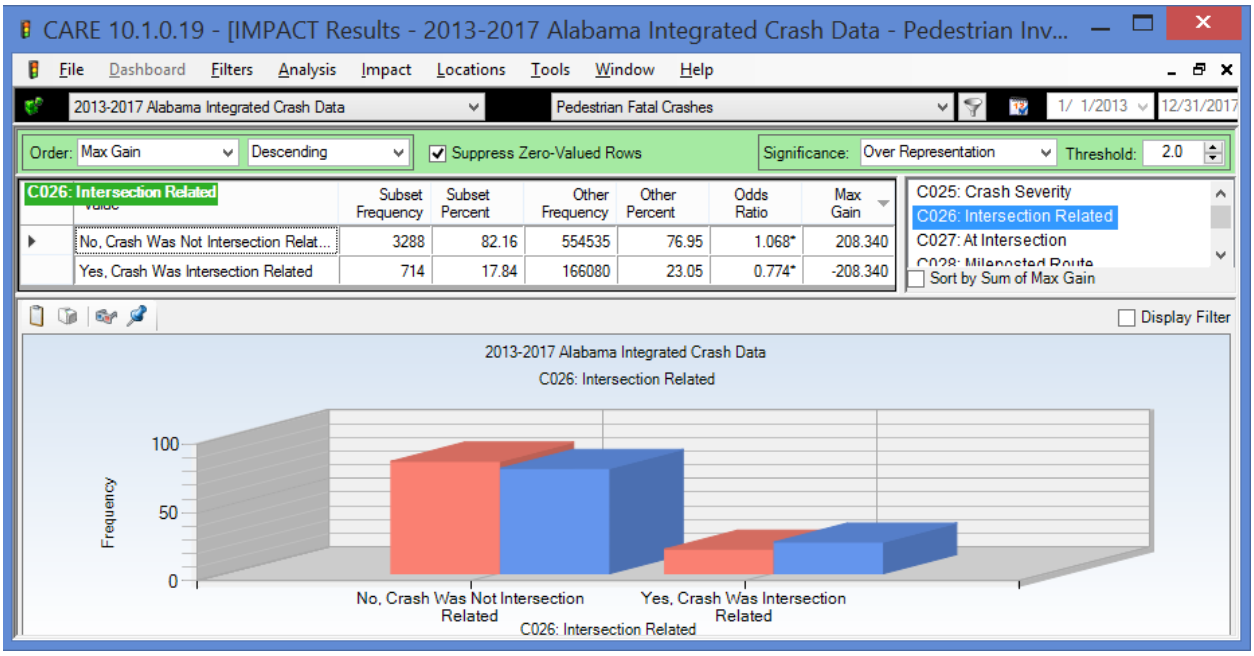
For fatal pedestrian crashes there was the expected shift to the higher speed roadways, with the two lane roads becoming significantly under-represented (0.870 odds ratio), and the four-lane roads becoming significantly over-represented (1.168).

C408 CU Vision Obscured By

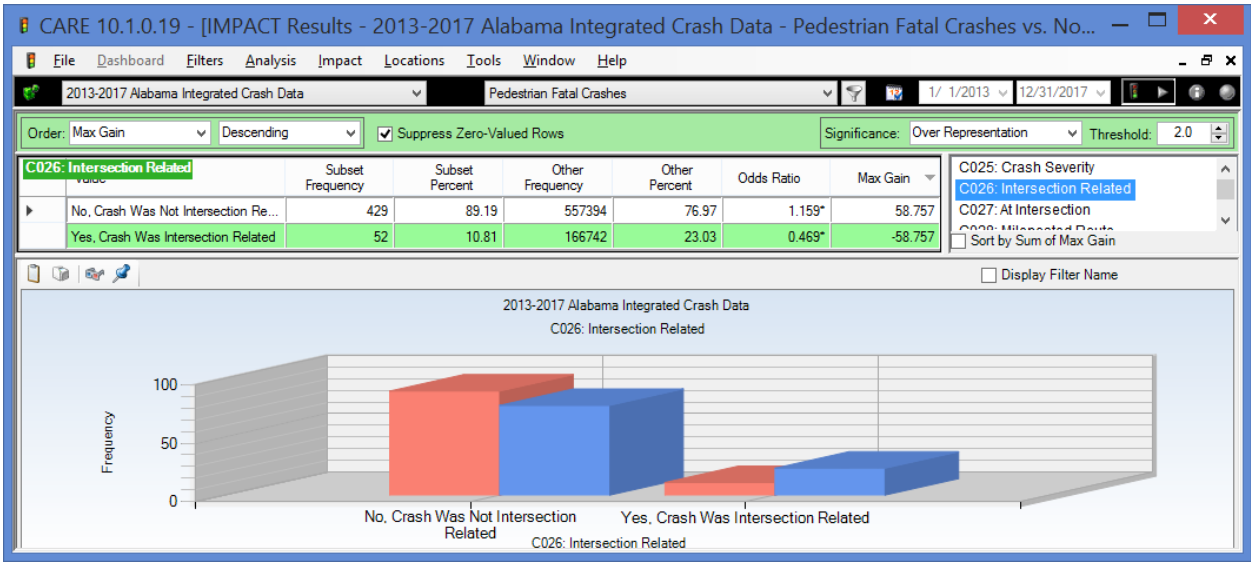


Vision obstructions play a part in some pedestrian crash causes, with about 8.55% of the crashes involving some vision obstructions (it is about 4.54% for non-pedestrian crashes). The display above is restricted to only those crashes in which meaningful obstructions were indicated (the no-obstruction crashes were suppressed along with Other, Unknown and Not Applicable. Parked Vehicles would be an obvious over-representation in that many vulnerable pedestrians probably emerge from parked vehicles. The next three are indicative of the difficulty to see pedestrians in night-time or other situations in which they are not wearing contrasting clothing. The distribution for fatal pedestrian crashes showed no significant differences than the more general analysis given above.

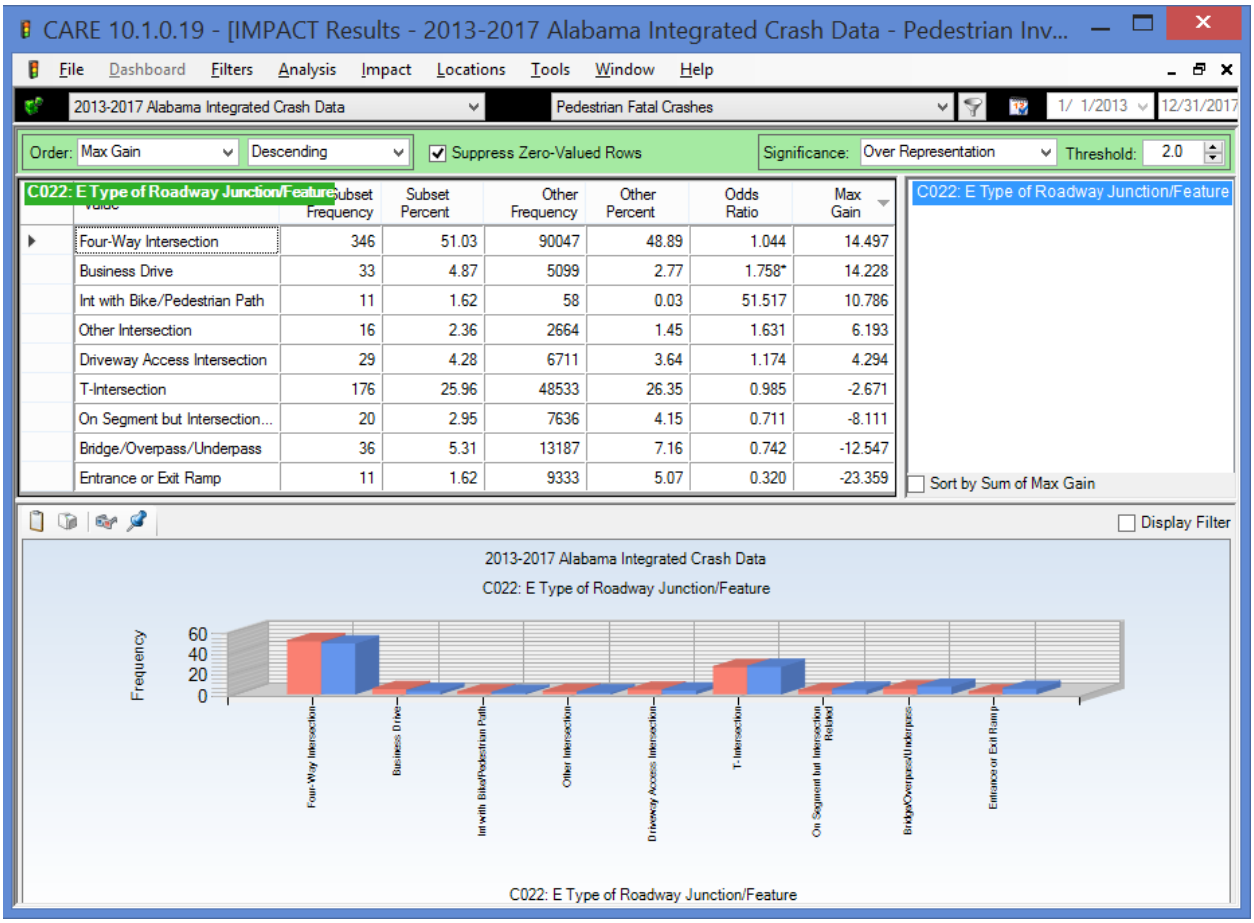
C026 Intersection Related (Non-Fatal and Fatal)



Pedestrian crashes are clearly over-represented away from intersections, and this becomes even more pronounced for fatal pedestrian crashes (see below).

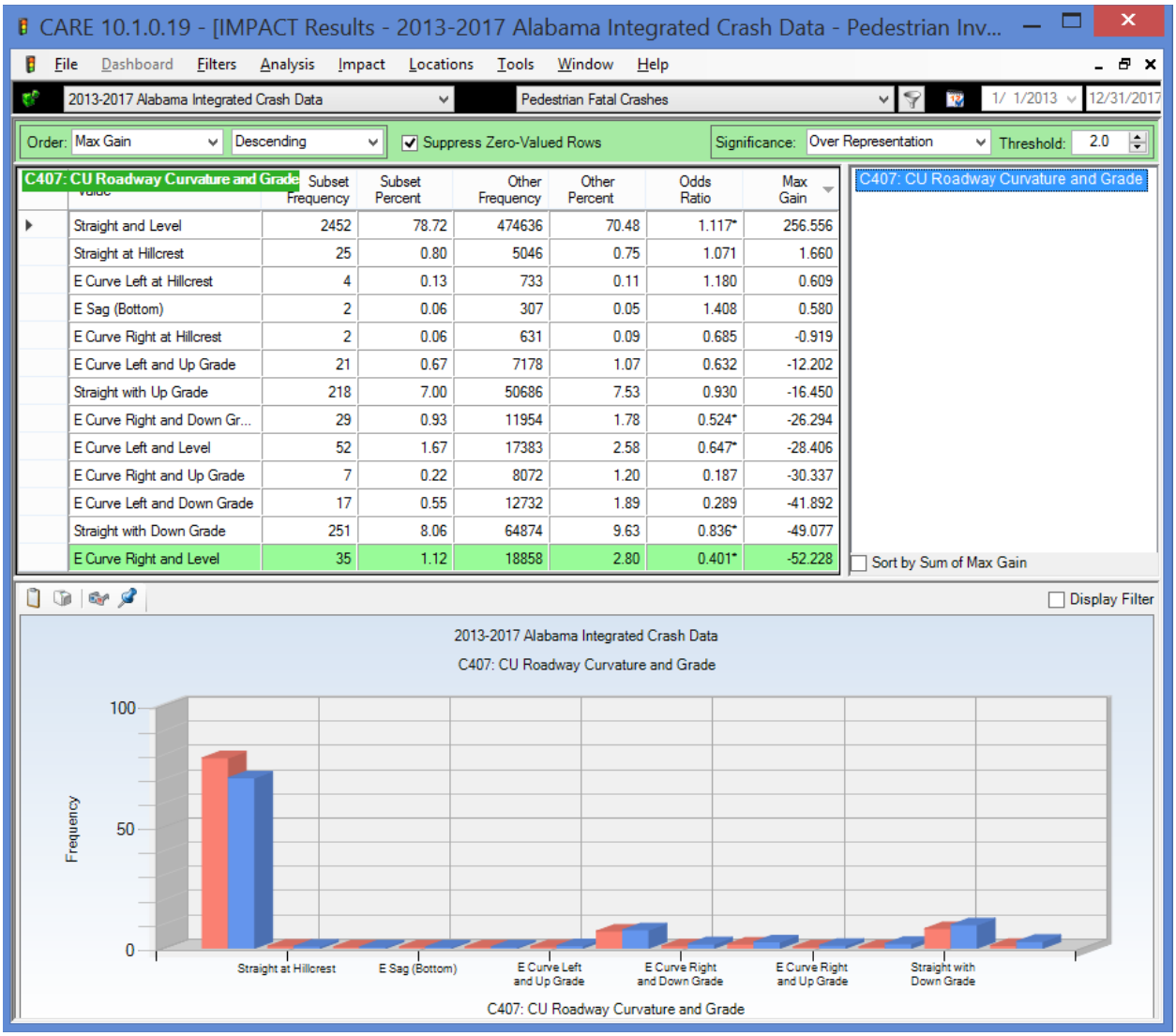


C022 E Type of Roadway Junction Feature



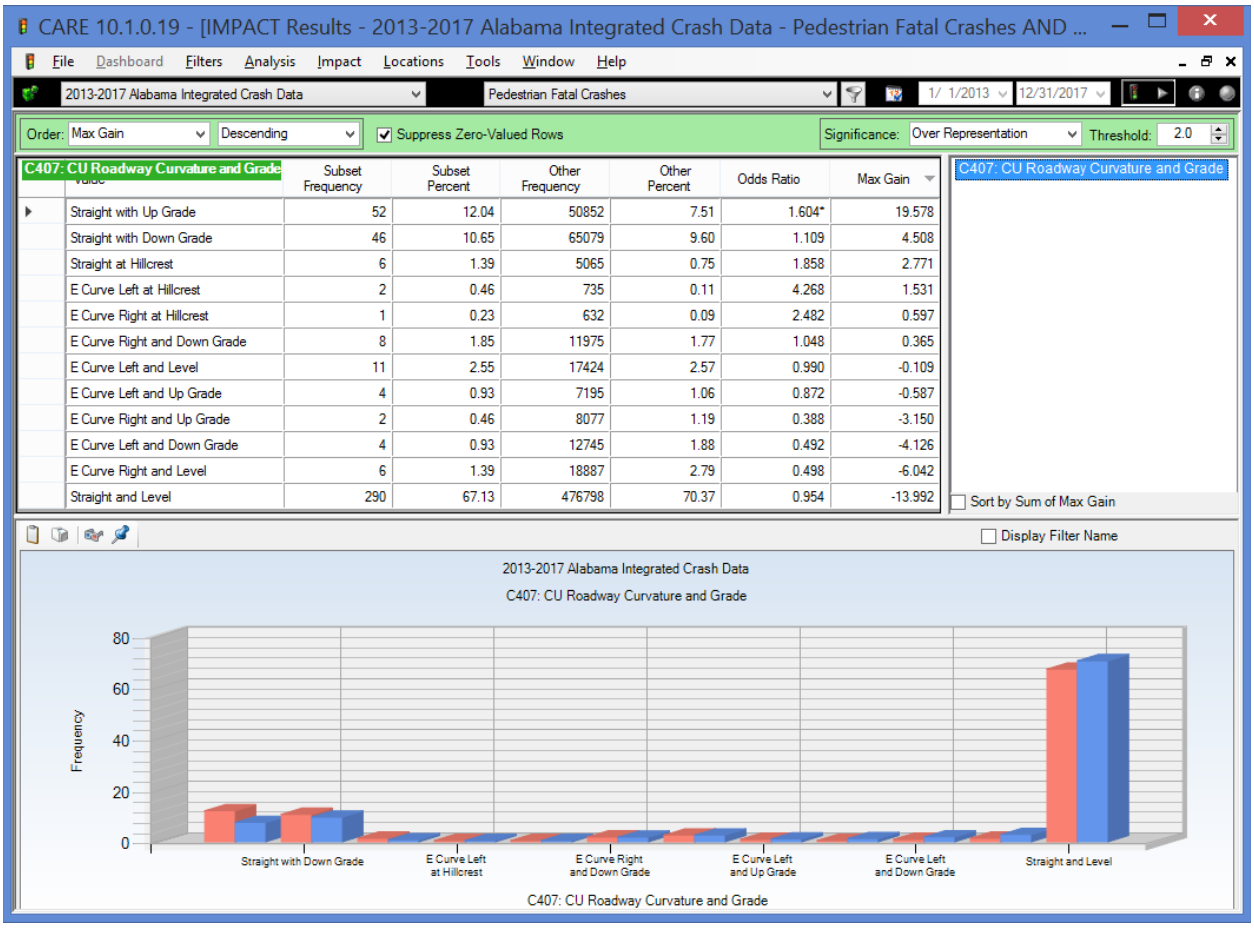
The above suppressed all categories that had less than ten occurrences. The four way intersection category was not significantly over-represented; nevertheless, because of the large number of pedestrian crashes that occur in this type of intersections, it should definitely get priority as far as countermeasures are concerned. The above do not vary much with fatal pedestrian crashes; however Bridge/Overpass/Underpass becomes over-represented with 12 fatalities over the five year period of the study.

C407 CU Roadway Curvature and Grade – All Pedestrian Crashes



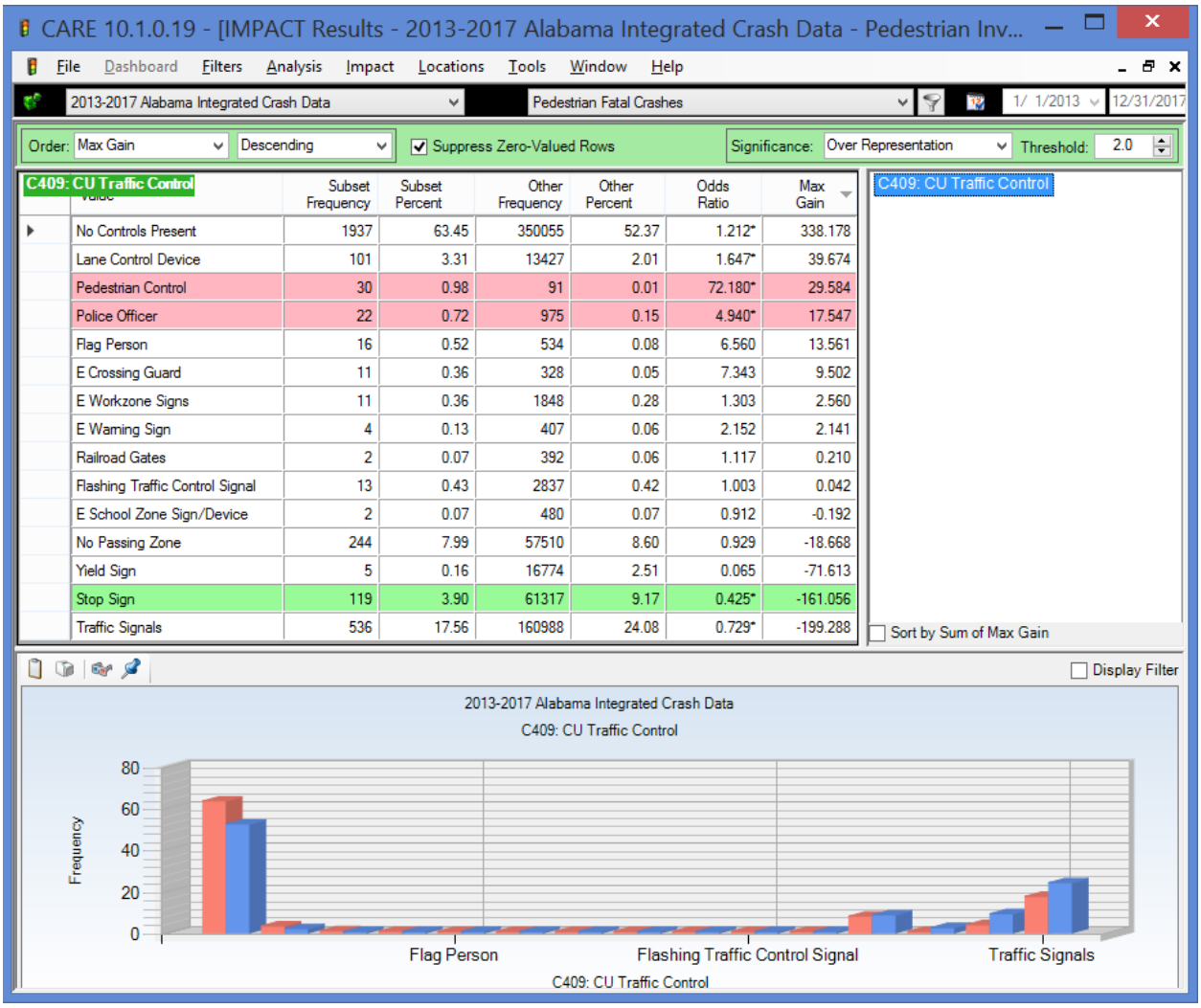
The above would lead you to believe that roadway curvature and grade has little to do with causing pedestrian crashes. However, the contrast below for fatal pedestrian crashes might give us second thoughts. The other differences in roadway classifications, rural-urban, and other differences in location types, should be considered in conjunction with curvature and grade.

C407 CU Roadway Curvature and Grade – Fatal Pedestrian Crashes



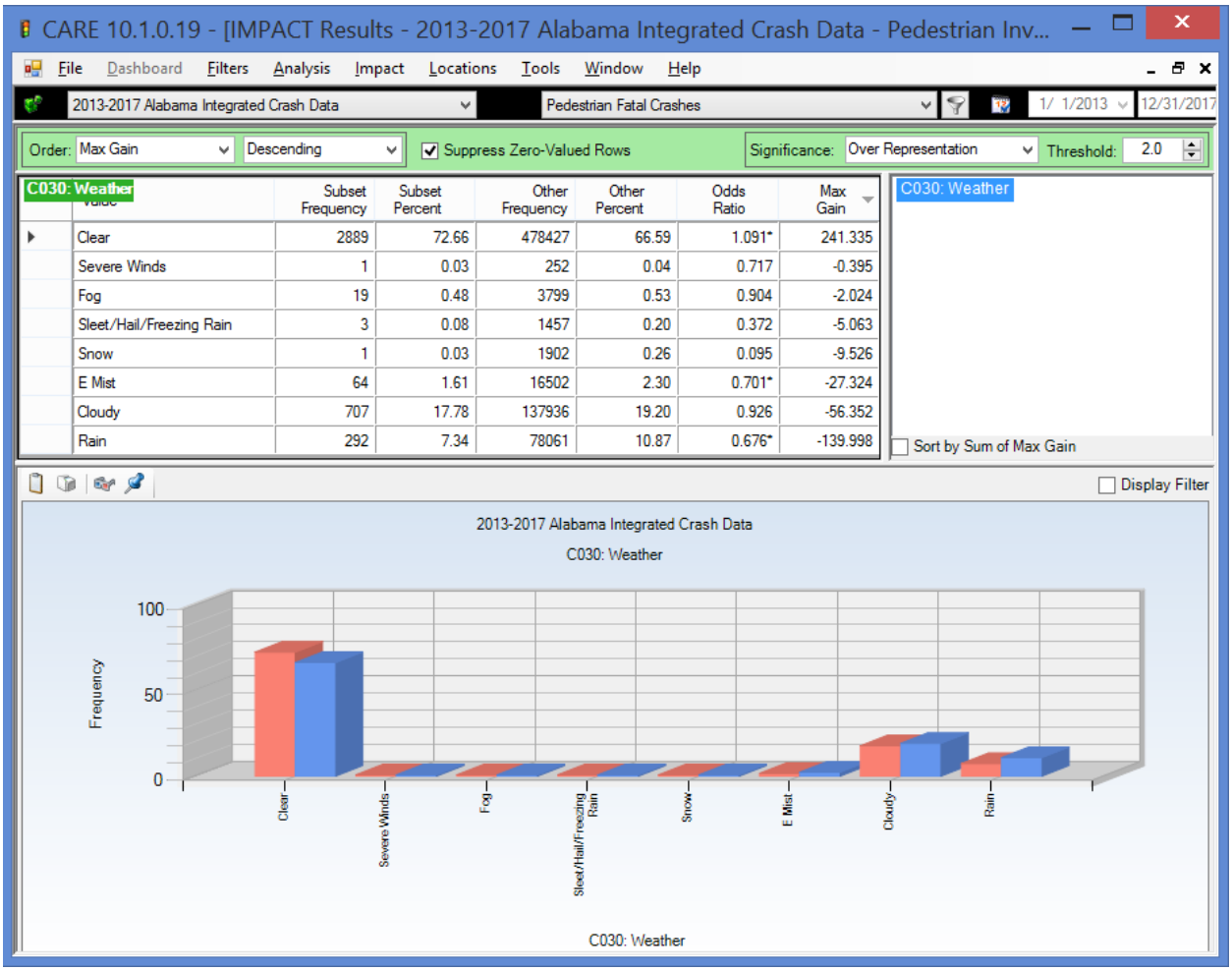
There are significant differences between this distribution and that of pedestrian crashed in general. However we surmise that this is because of the various necessary design characteristics of rural vs. urban roads.

C409 CU Traffic Control



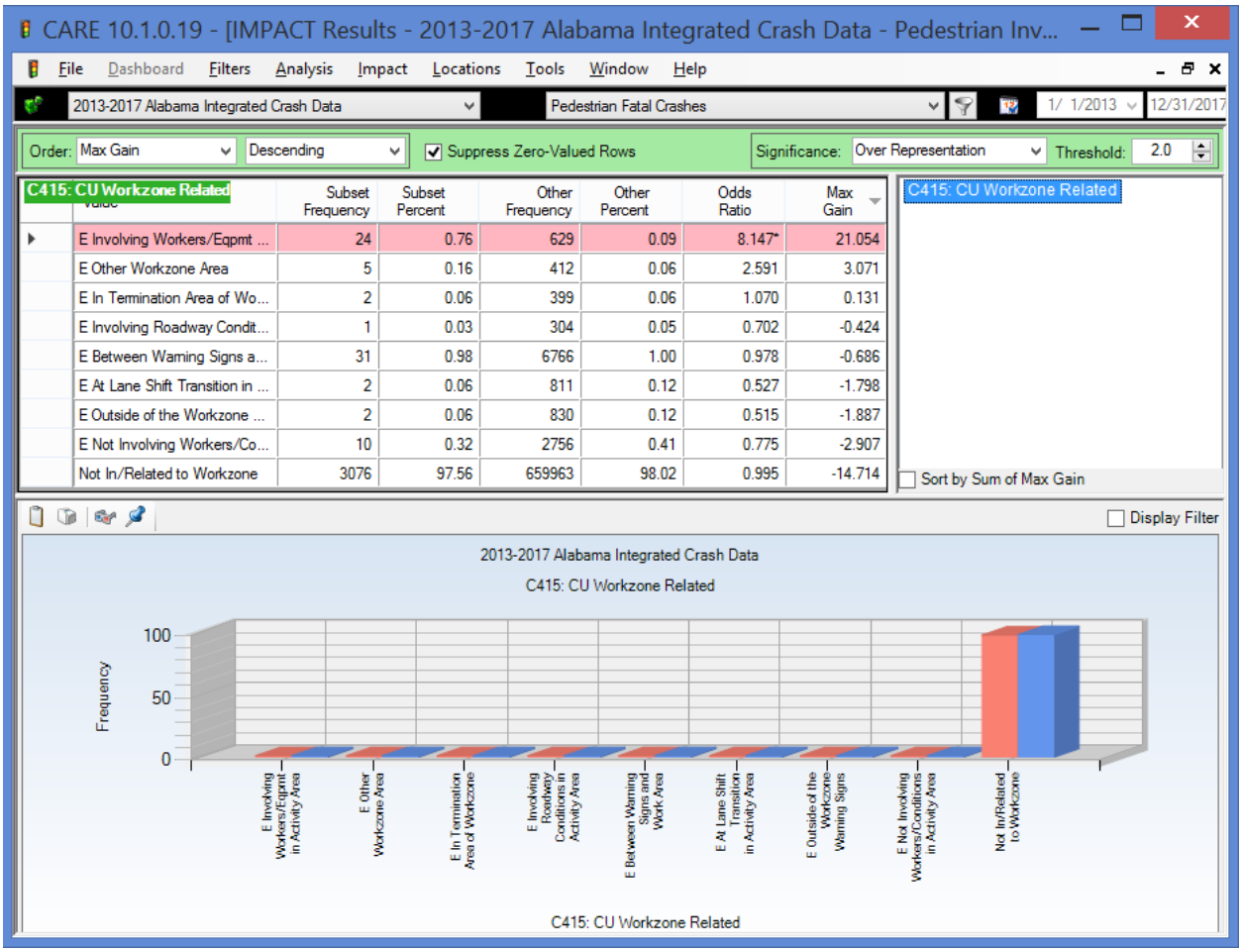
This is an interesting distribution to assist in determining where pedestrian countermeasures might be more effective. The only major difference in the fatal pedestrian distribution is the elevation of No Passing Zone to the third position down with 52 fatal crashes and a significant over-representation factor of 1.420 (42% higher than what would be expected from crashes in general).

C030 Weather



Rain works in favor of preventing pedestrian crashes. While visibility may be reduced, the fewer pedestrians greatly overcomes this factor. The under-representation factor is a significant 0.676 for all pedestrian crashes, and an amazingly close 0.653 for fatal pedestrian crashes. C403 Roadway Condition heavily reflects these findings.

C415 CU Workzone Related – All Items



This distribution will be of interest to those who are implementing work zone countermeasures. Of the 77 pedestrian crashes in work zones, 22 (28.6%) were fatal, which is much higher than the overall fatality rate (see severity section) of 12.02%.