Worst Times of the Year for Senior (Aged 65 and Older) Driver Involvement in Traffic Crashes

September 16, 2015

Introduction

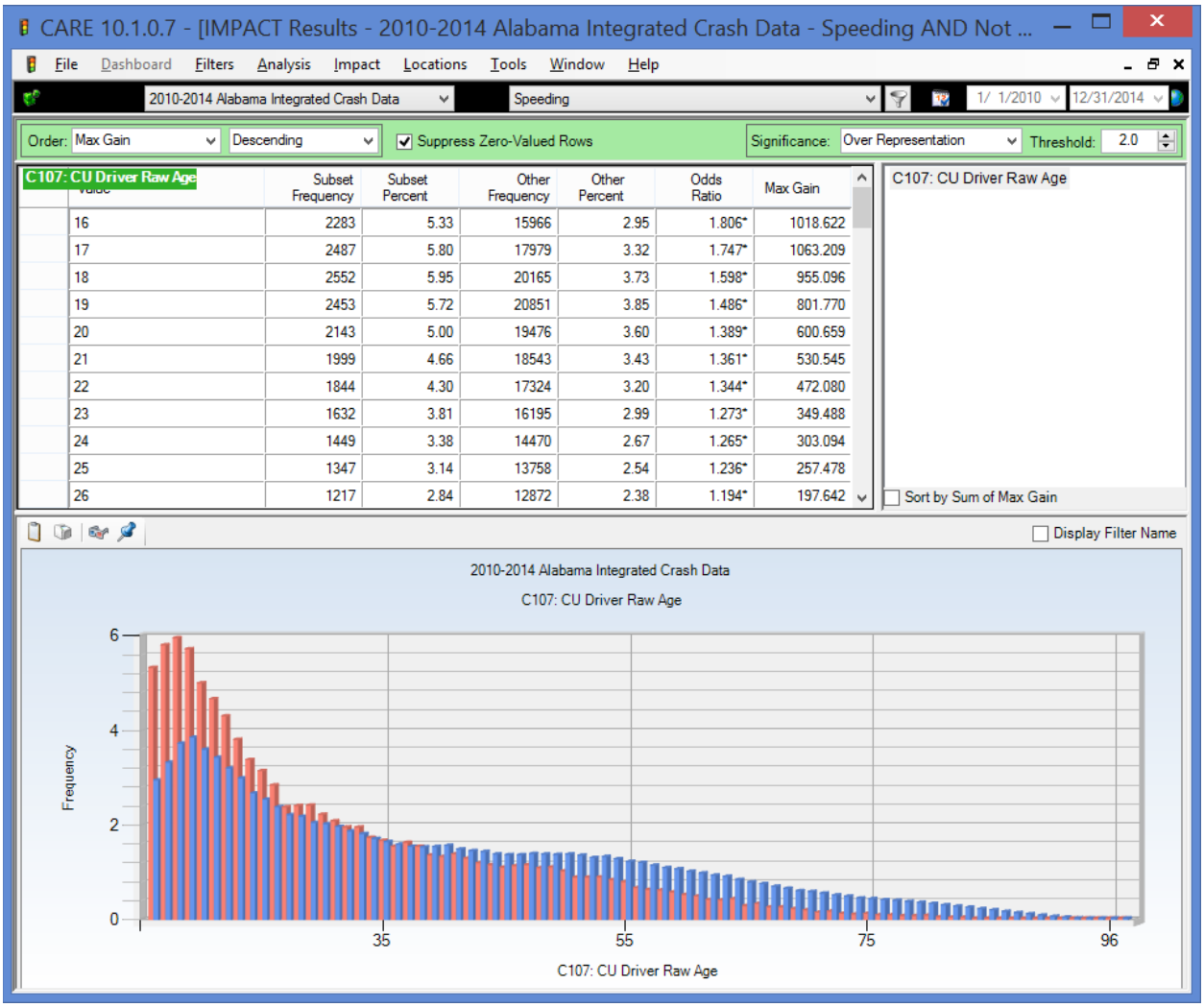
This report summarizes the findings of a research study performed by The University of Alabama Center for Advanced Public Safety (CAPS) on the subject of senior driver crash involvement times. The goal of this study was to determine the worst days, weeks, and months of the year for senior driver crash involvement, where "senior drivers" are defined to be those of age 65 years and older. This is important information to let senior drivers and in some cases care givers know when they are more apt to be in crashes so that there is additional awareness during these times; it also had the goal to raise awareness of the problems involved in senior driver crashes in general.

General Issues of Senior Drivers

The study used crash data collected by investigating law enforcement officers and submitted to the Alabama Law Enforcement Agency (ALEA) central crash records database for calendar years 2010-2014 (five years). This included a total of 647,347 crashes for Alabama, of which 57,712 (8.9%) were *caused* by drivers in the senior driver age range (65 and older). Based on federal estimates, this age range constitutes only about 14.3% of the drivers, indicating that they are about two-thirds of the probability of causing any given crash than the drivers that are younger than 65. Recognize that this is based on number of licenses issued and not miles driven; the fewer miles driven by senior drivers could account for a large portion of their disparity with younger drivers.

Another reason that senior driver do not have the proportion of crashes as younger drivers is indicated quite dramatically in Display 1, which compares causal driver ages in speed (red bars in the chart) and non-speed (blue bars) crashes. Even those crashes not involving speed (blue bar distribution) shows a skew to the left with the senior drivers being well below half of the average of other drivers in causing crashes. The red bars show that this is dramatically diminished to less than half again for speed involved crashes. Speed is an excellent proxy for all *risk taking driving behaviors*, and thus the underlying cause for the relative low proportion of senior-driver-caused crash is a combination of experience and their aversion to risk-taking. In general, seniors have been found to be extremely responsive to various types of behavioral modification and PI&E programs. Past studies have found that with no exceptions seniors are under-represented in all metrics that indicate risk-taking activity. As will be shown below in the IMPACT analyses, senior problems are characterized by their physical and perception limitations, so they are over-represented in failing to yield the right-of-way, issues involving sight, and other turn-movement operations (lane changes, improper turns, improper backing).

Display 1. Causal Driver Age Distributions for Speed Caused (Red) vs. Non-Speed (Blue)



C107: CU Driver Raw Age Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
16	2283	5.33	15966	2.95	1.806*	1018.622
17	2487	5.80	17979	3.32	1.747*	1063.209
18	2552	5.95	20165	3.73	1.598*	955.096
19	2453	5.72	20851	3.85	1.486*	801.770
20	2143	5.00	19476	3.60	1.389*	600.659
21	1999	4.66	18543	3.43	1.361*	530.545
22	1844	4.30	17324	3.20	1.344*	472.080
23	1632	3.81	16195	2.99	1.273*	349.488
24	1449	3.38	14470	2.67	1.265*	303.094
25	1347	3.14	13758	2.54	1.236*	257.478
26	1217	2.84	12872	2.38	1.194*	197.642

The major part of this study used all crash records in which senior persons were *involved* (independent of crash causation). It was felt that this larger dataset would be most useful in determining when seniors were more likely to be involved in crashes over the year independent of causation. There were a total of 101,504 crashes in which senior drivers were involved over the five year period. Of these, we saw above that 57,712 (56.9%) were caused by senior drivers. This would include all single vehicle crashes in which they were involved (8,874 single-vehicle crashes). Deducting these from the totals yields a probability of 52.7%, which is within the margin of error of 50%, the expected proportion if crash causation in a two-vehicle crash is due strictly to chance.

This document will continue with an analysis of the days, weeks and months of the year that were found to be *over-represented* for senior driver crashes. The term *over-represented* will be used to refer to situations that occur higher than *expected* to a statistically significant degree. The *expected* occurrence will be that given by the mean or average occurrence of a comparable control group. The Critical Analysis Reporting Environment (CARE) system was used to determine the days of the year in which a greater than expected number of senior driver crashes occurred (http://www.caps.ua.edu/software/care/). Unlike some recent studies in this regard, we were not looking for just a single date, for reasons that will be explained in more detail below. However, to those who are curious, for the five year period under consideration the day of December 3rd had the highest number of senior driver involved (not necessarily caused) crashes, with 422 total crashes summed over the five year period (83crashes per year). This was the only daily reading in excess of 400 crashes.

Study Approach

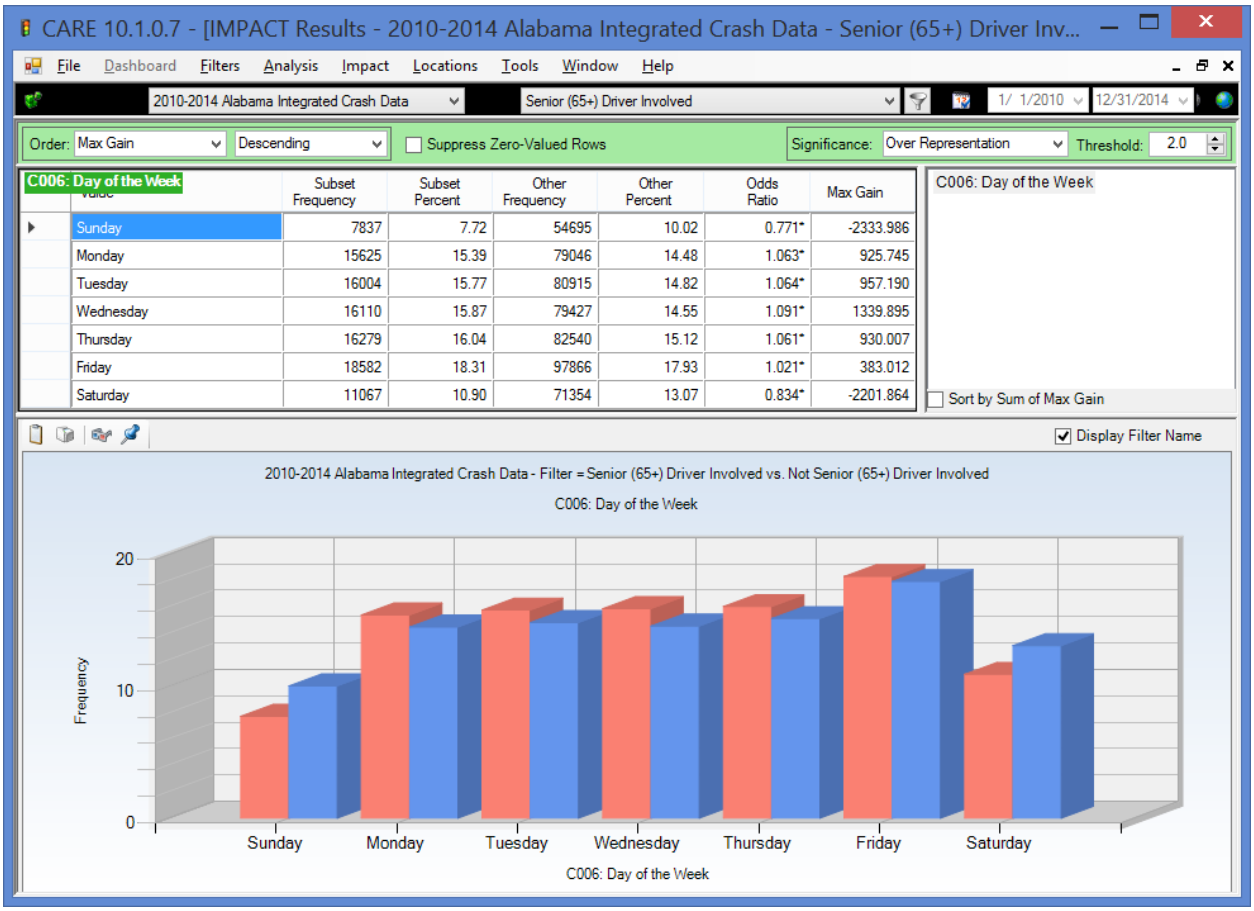
One problem in citing a date is that this date does not fall on the same day of the week every year – it may not again fall on the same day of the week for another seven years. Day of the week is a very important factor for senior driver involved crashes, as shown in Display 2. This shows that senior drivers generally follow the overall trend of Friday afternoon rush hour and night-time activity driving being the highest, and the weekends being lower. This pattern is more pronounced in the senior than in younger drivers. We can see from this that if December 3rd was summed over a Monday-through-Friday sequence in the five years of data, citing it for caution the following year would not be accurate if in the next year it occurred on a Sunday. Of course, this does not mean that we dismiss this data point altogether, but rather, we consolidate it into a six day period over which the special caution should be exercised, as will be illustrated below. And, in this case, the 422 crashes on December 3rd are part of a major span of several weeks in which senior drivers are particularly vulnerable.

One day is much too low sample in any event. Things like weather and special events can have a great influence that might not carry over year to year. Because of this it was determined to consider six day periods. Six days were selected (as opposed to entire weeks) to eliminate the observed pattern of at least one day in any seven-day sequence being significantly lower than the other six. It was felt that these six-day intervals would be quite representative of the relative frequency of crashes in that general time frame.

A heuristic process was developed to determine the six-week periods that were over-represented in the five years of data (2000-2014). The overall average number of crashes per day involving senior drivers was found to be 278. By the definition of an average, half of the numbers of crashes on any given day fall above this average and half below. Thus, the probability of a given reading falling above the average based on chance alone is 50% (analogous to flipping a coin). In a six day period it would be expected that half (3) of the readings would fall about the average of 396, and the other three would fall below. The probability of there being four is about 31%, and the probability of there being five of the six above average falls to less than 10%. Of course,

the probability for all six to be above the average is considerably smaller, at about 1.5% (which would be the probability of flipping a coin six times and getting all heads). These probabilities assume that the chances of the crashes being above or below average on any given day is strictly random. Of course, we know that is not true – these non-random days caused by a variety of factors (most notably the number of senior drivers on the road) are what we are trying to surface.

Display 2. Day of the Week Comparison: Senior Drivers (Red) vs Younger Drivers (Blue)



C006: Day of the Week	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Sunday	7837	7.72	54695	10.02	0.771*	-2333.986
Monday	15625	15.39	79046	14.48	1.063*	925.745
Tuesday	16004	15.77	80915	14.82	1.064*	957.190
Wednesday	16110	15.87	79427	14.55	1.091*	1339.895
Thursday	16279	16.04	82540	15.12	1.061*	930.007
Friday	18582	18.31	97866	17.93	1.021*	383.012
Saturday	11067	10.90	71354	13.07	0.834*	-2201.864

The important thing to recognize at this point is that the greater the number of above-average readings in a given six day sequence (range: 4, 5 or 6), the more chance that this period of time is going to be detrimental to senior drivers.

Results of the Six Day Analyses

Displays 3a and 3b present the results of the six day analyses, with the numbers in this calendar representing the number of above-average readings (> 278) in the six-day segment. Generally the numbers in the table indicate, for any six day period that was found to be over-represented,

how many of the days were above average, starting with four. The higher the number the greater the probability of this being a more dangerous time frame. In addition, the indicators were further adjusted by adding one to them if any of the days had a reading greater than or equal to 350. So, in two cases, five above-average-readings were increased to 6 in the table. The 350+ day cases are shown in the table by inserting the number of crashes for that day in place of the six day rating number further discussed below. Multiple 350 readings did not increase the six day score by more than 1. Remember that the number of crashes is for a five year period.

Display 3a. Summary of Over-Represented Six Day Periods

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1				**6**						**353**	**371**	**366**
2				**6**					**4**	**7**	**7**	**367**
3				**6**	**391**	**4**			**4**	**361**	**7**	**422***
4				**6**	**6**	**4**			**4**	**354**	**7**	**7**
5				**6**	**6**	**4**			**4**	**7**	**7**	**7**
6				**6**	**6**	**4**			**4**	**6**	**7**	**373**
7					**6**	**4**			**4**	**6**	**6**	**6**
8				**5**	**6**	**4**				**6**	**6**	**6**
9				**5**	**4**	**4**				**6**	**6**	**6**
10				**5**	**4**	**4**				**6**	**6**	**6**
11			**5**	**5**	**4**	**4**				**6**	**6**	**6**
12			**5**	**5**	**4**	**4**				**5**	**6**	**6**
13			**5**	**5**	**4**	**4**				**5**	**7**	**7**
14			**5**		**4**	**4**				**5**	**7**	**7**
15			**5**							**5**	**385**	**7**
16			**5**							**5**	**7**	**376**
17										**5**	**7**	**362**
18											**7**	**7**
19												**379**
20										**5**		**355**
21										**5**		**7**
22									**5**	**5**		**352**
23									**5**	**5**		**366**
24									**5**	**5**		
25									**5**	**5**		
26									**5**	**4**		
27									**5**	**4**		
28										**4**		
29		**NA**								**4**		
30		**NA**							**7**	**4**		
31		**NA**		**NA**		**NA**			**NA**	**4**	**NA**	

Display 3b. Summary of Over-Represented Six Day Periods

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1										353	371	366
2										*	*	367
3					391					361	*	422*
4										354	*	*
5										*	*	*
6											*	373
7												
8												
9												
10												
11												
12												
13											*	*
14											*	*
15											385	*
16											*	376
17											*	362
18											*	*
19												379
20												355
21												*
22												352
23												366
24												
25												
26												
27												
28												
29		NA										
30		NA							*			
31		NA		NA		NA			NA		NA	

The following explains the terminology employed in Displays 3a and 3b:

- Blank cell – indicates that for all six-day periods that this day was part of, there were three or less cells above the 278 average; in many of these cases all six cells were below average. The conclusion for these days is that there is *no indication that these times would be detrimental* in terms of senior drivers' crashes.
- **4 (in purple)** – indicates that any four of the six days were above average. This could easily occur by chance, and so this should be regarded as the least possible indication of added danger. Consideration was given to leaving these out of these displays, but it was decided that they may play a positive role in establishing patterns.
- **5 (in orange)** – indicates that five of the six days in the sequence were above average. As indicated above, this has a much lower probability of occurring by chance than those given by the "4" indicator.
- **6 (in red)** – this indicates that all six of the days in the sequence were above average, a result that has a very low probability of occurring by chance, and thus a much greater indicator of a problem time.
- **7 (in red)** – this indicates that not only were all six days above average but that there was at least one reading above 300, so it was given an additional point. No score was increased more than one point.
- **NNN** – all readings that were above 350 are entered into the table in lieu of the six-day score as indicated above. This should also be interpreted that one (+1) was added to the six-day period score as indicated above.

Note that all indicators are given in six-day batches, the goal being to specify a general period of time as opposed to an exact date. Also, notice that one of the six-day periods wraps over the end of one month and the beginning of the next.

Discussion of the Results

As discussed above, Displays 3a and 3b were not assembled to pinpoint a particular day to avoid driving – its goal is to provide an overall view of the patterns that are in effect. Working from the simplest to the more intricate interpretations:

- It should be clear that January, February and the summer months of July and August are the months with the fewest senior-driver involved crashes. Of course, this does not mean that the same concern should not be used when driving at these times – it illustrates the basic statistical reality that for every over-representation there must be compensating under-representations. Senior driver crashes are not being compared against younger-driver crashes; they are being compared against themselves in determining these over-represented six-day periods. While more research will be given as to reasons for certain

months being over-represented, it might be speculated that the harsh cold and hot weather curtails senior driver travel during these months.

- On the other end of the scale, it is clear that October, November and December are collectively the worst sequence of three months. September might be added, but its indicators are not nearly as strong as those later on in the year. The reason for this will be discussed in light of some IMPACT studies that are documented below.
- In particular, the 23 days prior to Christmas appears to be by far the worst period for senior drivers. While this time period is over-represented in general and not just for senior drivers, the over-representations are greatly amplified for senior drivers.
- All three of the last three months have greater problems at the beginning than the end of the months. This is much more pronounced in November and December than in October. It seems clear that there is a build up to the holidays that occur toward the end of these two months, and there is a dramatic drop in senior driver traffic during and after the holidays.
- Tuning to the spring, it is clear that the first half of April, May and June are over-represented while the second halves of these months are under-represented. This will also be subjected to additional study below.
- March and September have some high points, but do not have the consistency of the other months mentioned to be over-represented above.

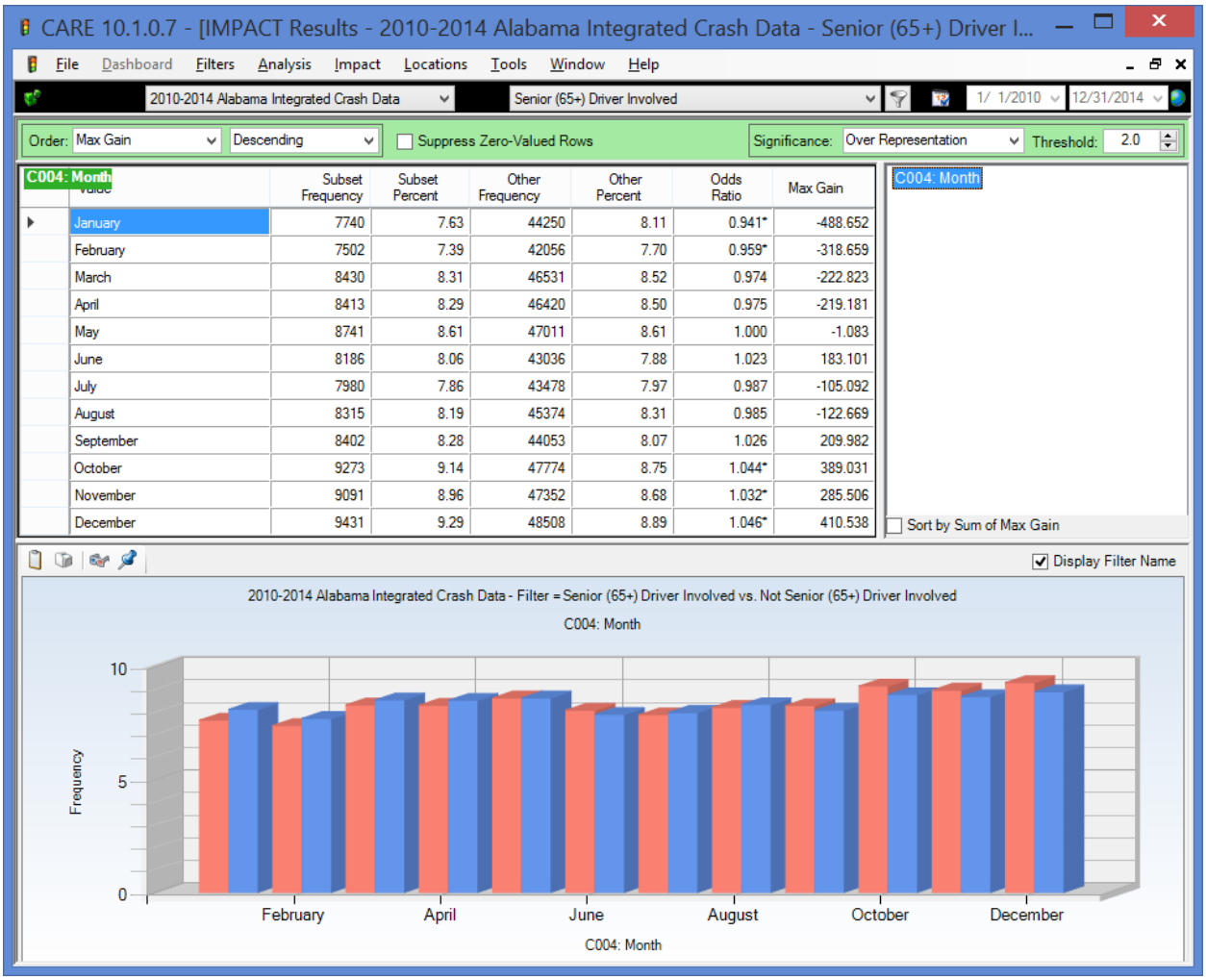
Additional consideration can be given to the ordering of the months once they are compared with the crashes that do not involve senior drivers. This is done in Display 4. Note that the comparison here is between *senior (65 and older) drivers and younger drivers*, so some of the results may seem inconsistent with those given above. But recognize that Display 4 discounts those times when both senior and younger drivers are over-represented.

Display 4 is arranged in the natural ordering of months so that patterns among months can more easily be seen. Similar to the findings above, the most over-represented months are the three at the end of the year (all significantly over-represented in comparison to the younger driver complement). This shows that senior drivers have a relative as well as an absolute over-representation at the end of the year.

Let us consider each of these in turn in adding this to the information that we already have in Displays 3a and 3b to set the months in a worst-first ordering:

- December – this is clearly the worst month by all metrics. Additional analysis will be performed on the last three months in an attempt to determine the cause of these over-representations.
- October and November are clearly the next worse, indicated by both the absolute and relative comparisons. November has only 30 days and that tends to make it look better from the Max Gain point of view. However, Display 3b indicates that things tend to get progressively worse as the end of the year arrives.

Display 4. IMPACT for Month comparing Senior Driver Involved vs. Complement



C004: Month Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
January	7740	7.63	44250	8.11	0.941*	-488.652
February	7502	7.39	42056	7.70	0.959*	-318.659
March	8430	8.31	46531	8.52	0.974	-222.823
April	8413	8.29	46420	8.50	0.975	-219.181
May	8741	8.61	47011	8.61	1.000	-1.083
June	8186	8.06	43036	7.88	1.023	183.101
July	7980	7.86	43478	7.97	0.987	-105.092
August	8315	8.19	45374	8.31	0.985	-122.669
September	8402	8.28	44053	8.07	1.026	209.982
October	9273	9.14	47774	8.75	1.044*	389.031
November	9091	8.96	47352	8.68	1.032*	285.506
December	9431	9.29	48508	8.89	1.046*	410.538

- March, April, May and June – while these have some frequency over-representations, they are not significantly different from the expected from the rest of the population, so these should be given minor concern.
- July and August – these had no frequency over-representation and no significant differences from the rest of the population of drivers.
- January and February – these were significantly under-represented from the results of Display 4, and would seem to be the best times, although it is expected that the bad weather during these months might act as a deterrent to senior driving.

Comparison of Young and Senior High Six-Day Periods

Display 5 presents results from the companion study that was an identical to this but for young (age 16-20) drivers. Display 6 shows these results superimposed on Display 3b to present a visualization of the overlaps.

Display 5. Display 3a from the Young Person Study

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			5	7						4	7	5
2			5	7	6				4		7	5
3			5	7	592				4	5	7	5
4			5	508	6				4	5	7	5
5			517	6	6				4	5	7	4
6				6	6				4	5		4
7				6	6				4	5	4	4
8				6					4	5	4	4
9				6	4				4	5	4	4
10		4	4	6	4				4	5	4	4
11		4	4	6	4				4	5	4	
12		4	4	6	4				4	5	4	
13		4	4	6	4				4	5		6
14		4	4	6	4					5	5	6
15		4	4	6						5	690*	6
16				6	5				5	5	5	566
17					5				5	5	5	6
18					5			4	5	5	5	6
19			5		5			4	5	5	5	6
20			5		5			4	5	5		502
21			5		5			4	5			6
22			515					4			4	6
23			5					4			4	6
24			5							5	4	6
25										5	4	
26									4	5	4	
27									4	5	4	
28		5							4	5		
29		NA							4	5	5	
30		NA	7						4		5	
31		NA	7	NA		NA			NA	511	NA	

Display 6. Senior Drivers (Background) and Young Driver (Numbers) Overlap

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1			5	7						4	7	5
2			5	7	6						7	5
3			5	7	6				4	5	7	5
4			5	7	6				4	5	7	5
5			5	6	6				4	5	7	4
6				6	6				4	5		4
7				6	6				4	5	4	4
8				6					4	5	4	4
9				6	4				4	5	4	4
10		4	4	6	4				4	5	4	4
11		4	4	6	4				4	5	4	
12		4	4	6	4				4	5	4	
13		4	4	6	4				4	5		6
14		4	4	6	4					5	5	6
15		4	4	6						5	5	6
16				6	5				5	5	5	6
17					5				5	5	5	6
18					5			4	5	5	5	6
19			5		5			4	5	5	5	6
20			5		5			4	5	5		6
21			5		5			4	5			6
22			5					4			4	6
23			5					4			4	6
24			5							5	4	6
25										5	4	
26										5	4	
27										5	4	
28		5								5		
29		NA								5	5	
30		NA	7								5	
31		NA	7	NA		NA			NA	7	NA	

Terminology: as we use the terms *senior* (65 and above) and *younger* (16-20) drivers, recognize that the ages or 21-64 inclusive and not explicitly considered in Display 6. A summary for all drivers including young, senior and all other ages is given for reference purposes in Display 7.

In display 6 the senior drivers are represented by the backgrounds while the numbers represent the younger drivers (from better to worst: 4=purple; 5=orange; 6=red). The following conclusions can be drawn from Display 6, beginning with those times that appear to be bad for both the senior drivers and the younger drivers:

- October, November and December are by far the worst months, with heavy overlap on most dates. The post-holiday days in both November and December are the exceptions. The senior and younger drivers do not seem to have too many differences in these months.
- September is the next worst month after the three months at the end of the year. Seniors seem to have their problems early and later in the month, while young drivers are more distributed throughout the month.
- April and May, especially in the first halves of these months seem to be problematic for both age groups. April is fairly consistent for both age groups, while May shows the older drivers problem to be in first ten days, while the younger higher crash concentrations are more distributed throughout the month.
- March has the greatest disparity between the age groups, although collectively it is not a bad month. The senior drivers are better off with only one six-day 5-rated period. Younger driver high crash times are more distributed throughout the month, and clearly this month is much more of a problem for young than senior drivers.
- June seems to be a minor issue for senior drivers by no indication of any issues for the younger drivers.
- January, February, July and August are clearly the best months for both the senior and the younger drivers. Younger drivers have some minor issues, but the 4 (purple) indicator has the least probability of a problem associated with it.

Display 7 maintains the same color scheme for all driver ages. November 15th was found to have the highest number of crashes with 2,680 over the five years (536/year). The average number of crashes per day over the five year period for all ages was 1,774. Display 7 for all ages largely reflects the composite for the young and senior drivers give in Display 6, showing that the drivers in the composite is fairly representative of all driver in Alabama.

Display 7. All Drivers (No Adjustments)

Date	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
13												
14												
15											2,680	
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29		NA										
30		NA										
31		NA		NA		NA			NA		NA	

Additional IMPACT Analyses

This section presents a number of IMPACT runs that surface some of the major characteristics of crashes in which senior drivers are involved. For information regarding the interpretation of IMPACT outputs, see: http://www.caps.ua.edu/software/care/ and scroll down to the bottom of the page for the IMPACT tutorial.

The main question that we wanted to answer was what it was about the end of year months that could be causing the crashes. So a comparison was made in senior-driver-involved crashes between these bad months (October, November and December) and the three under-represented summer months (June, July and August). January and February were not part of the comparison since it is known that senior drivers avoid inclement weather that characterizes these two months. March, April and May were eliminated because they were not best months for senior driver involvement and thus might dilute the results.

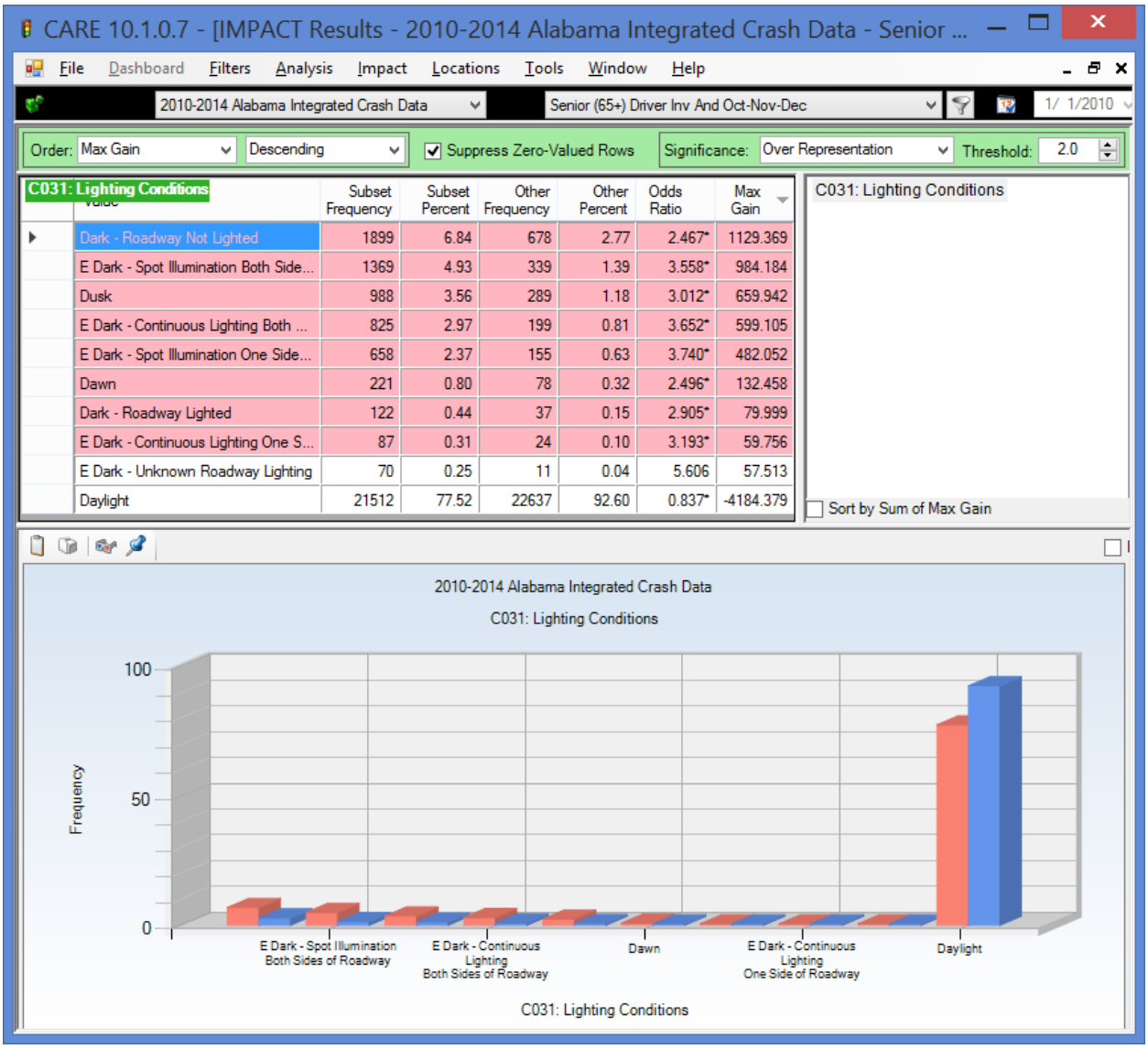
In the order of their statistical significance, the following findings resulted from the IMPACT comparison of senior driver involved crashes occurring end of year (EOY) October-November-December (red bars) as opposed to the summer months of June-July-August (blue bars):

- C031 Lighting Conditions – The fewer daylight hours accounts for a large proportion of the increase in senior involved EOY crashes, although the exact degree of this causation cannot be determined since the number of daylight hours is greatly diminished, and thus pure chance could account for much of the increase. It seems reasonable with the diminished night vision capabilities of older people that this is playing a major factor. This is further confirmed by the Time of Day variable.
- C008 Time of Day – Of particular interest is the increase seen in the 5 PM through 8 PM time frame that would be dark most of the EOY months and daylight in the summer months. These hours all show significant increase of at least 31% and in the 7-7:59 PM hour it is 46% higher than expected. The major difference in these two subsets is the presence of daylight, so this in fact confirms what seemed to be the case in the lighting conditions over-representations.
- C002 City – this is an interesting variable that shows little pattern. It might be suspected that all large cities are over-represented in the EOY months, but there are exceptions of Dothan, Montgomery and Huntsville that show just the opposite tendencies. If this variable is of interest for countermeasure decisions more study will need to be given to it. This was one of the most significant variables from a total Max Gain point of view.
- C015 Primary Contributing Circumstances – the pattern here seems to confirm the vision cause factor since all of the over-represented factors could be traced to vision issues. Failure to yield especially could be due to inability to observe the signs and other roadway indications that signal the need to yield. Driving too fast for conditions is not over-represented – it is about the same in both time periods, and is relatively low for senior drivers, who are typically risk avoiders. We suspect that officers mark this item for older

drivers in their assessment that they should not be driving this fast under the prevailing conditions.

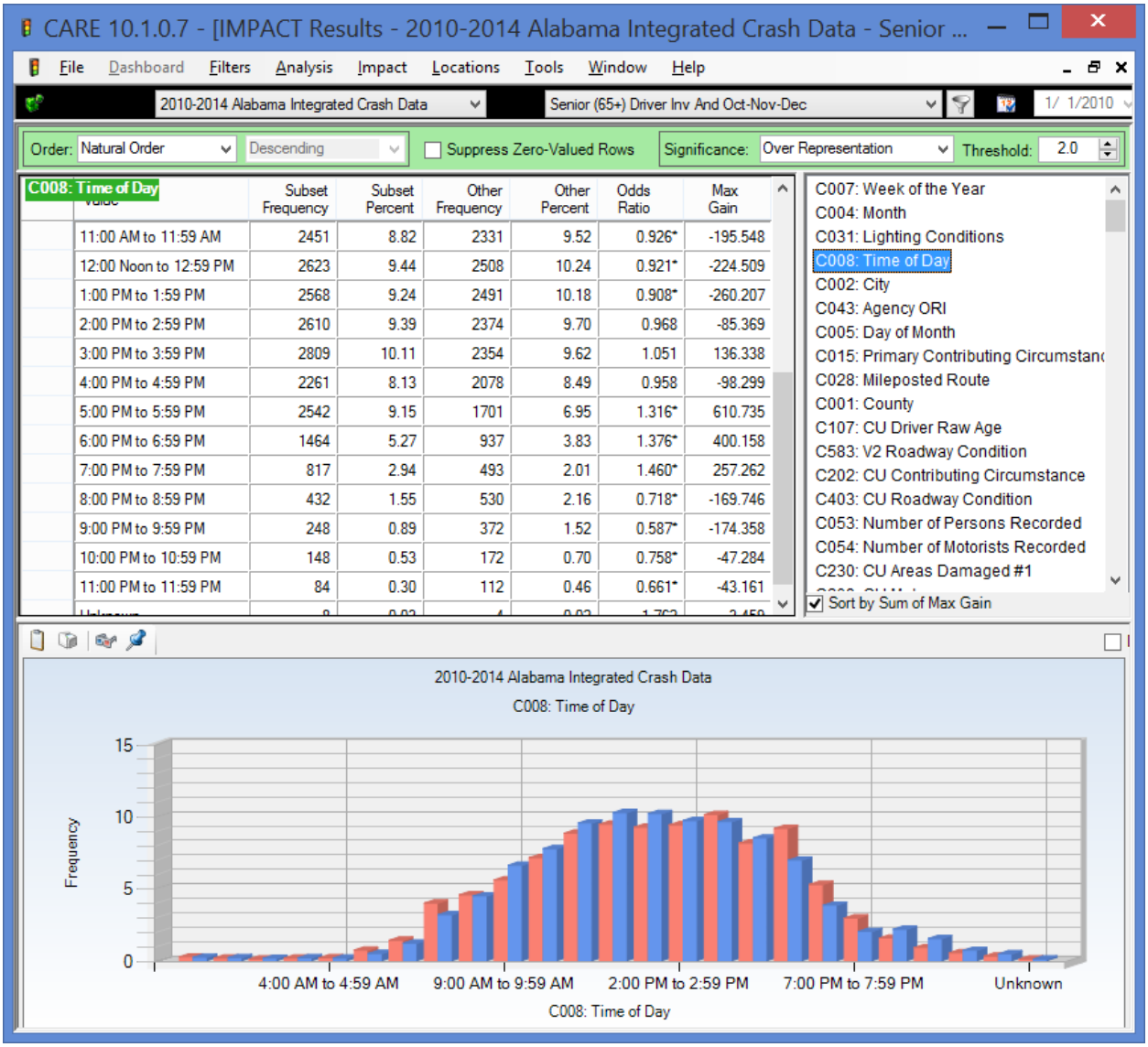
- C403 Causal Unit (CU) Roadway Condition – this brings up a second major factor that appears to be causing senior drivers more problems at the end of the year – wet road conditions. See also weather next.
- C032 Weather – the combination of darkness and bad weather with slippery roads is a lethal combination for the senior driver, and these factors working together explain much of the EOY increase. We would also note that the pre-holiday (Thanksgiving and Christmas) six-day periods are those that are highly over-represented. Seniors must feel compelled to finish their shopping or other activities that require driving at these times. At other times throughout the year we would expect them to defer their trips until the weather and road conditions improved.
- C204 CU Sequence of Events #1 – this variable is included in order to show the potential problem with deer this time of year. Deer do not pose nearly the problem in the summer because they are not being moved around by hunters and forced to seek food at night. Deer only accounted for 254 crashes, which is only about 1% of the EOY crashes. Nevertheless, they are avoidable, and they also indicate potential vision issues.
- C129 CU Vehicle Maneuvers – turning movements would also track to potential vision and perception issues – the left turns are the only item in this variable that is significantly over-represented, but the combined of the others also indicate similar problems. If combined, these would be significant.
- C226 CU Vehicle Damage – Major and Disabled seems to be over-represented in the EOY period for senior drivers. We have no apparent explanation for this, other than to say that since we are only talking about 5%, this could be due to chance.
- C006 Day of the Week – EOY are clearly over-represented on Mondays and under-represented on Saturdays. This is consistent with their urgency to "get the job done" regardless of the time of day or weather.
- C110 Driver Residence Distance – EOY months are slightly but significantly over-represented in their less than 25 mile trips, indicating perhaps that these trips are for shopping as opposed to vacation travel. The slight difference should not be used to justify any decisions in that the difference is barely over 1%.
- C408 CU Vision Obscured By – the only over-represented value here is "Driver Blinded by Sun." This would be a problem in the late afternoon before darkness, which tends to extend the vulnerable time for senior drivers.
- C011 Highway Classification – There were no significant difference in the highway classifications on which the driving took place. We present this since it well could be reasoned that there is a shift in the roadway classifications, but this was not found to be the case.
- C025 Crash Severity – Crash severity is always an important variable. In this case no significant difference were found in the relative severities of the crashes at the EOY months when compared to those during the summer.

C031: Lighting Conditions



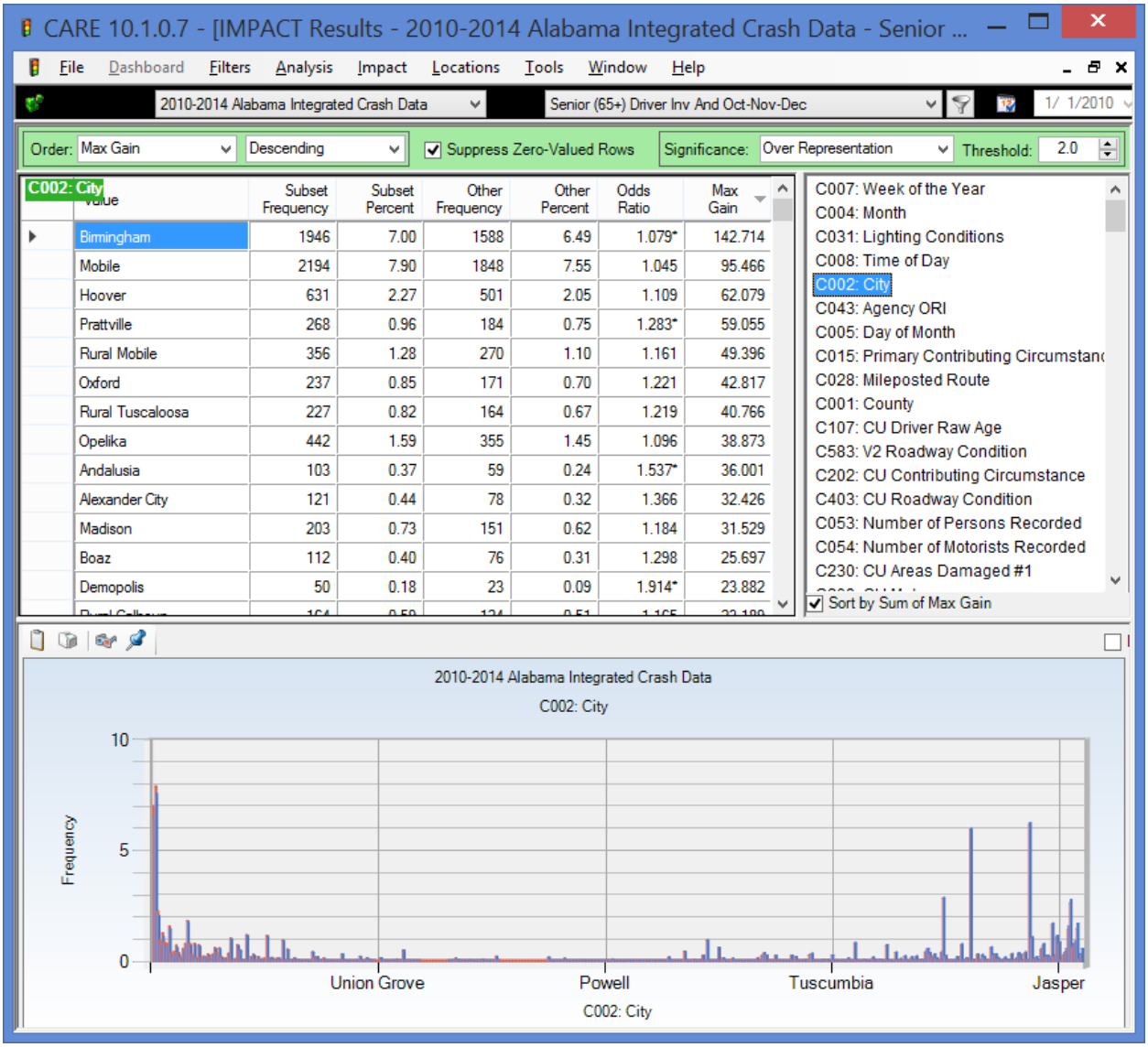
C031: Lighting Conditions	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Dark - Roadway Not Lighted	1899	6.84	678	2.77	2.467*	1129.369
E Dark - Spot Illumination Both Side...	1369	4.93	339	1.39	3.558*	984.184
Dusk	988	3.56	289	1.18	3.012*	659.942
E Dark - Continuous Lighting Both ...	825	2.97	199	0.81	3.652*	599.105
E Dark - Spot Illumination One Side...	658	2.37	155	0.63	3.740*	482.052
Dawn	221	0.80	78	0.32	2.496*	132.458
Dark - Roadway Lighted	122	0.44	37	0.15	2.905*	79.999
E Dark - Continuous Lighting One S...	87	0.31	24	0.10	3.193*	59.756
E Dark - Unknown Roadway Lighting	70	0.25	11	0.04	5.606	57.513
Daylight	21512	77.52	22637	92.60	0.837*	-4184.379

C008: Time of Day



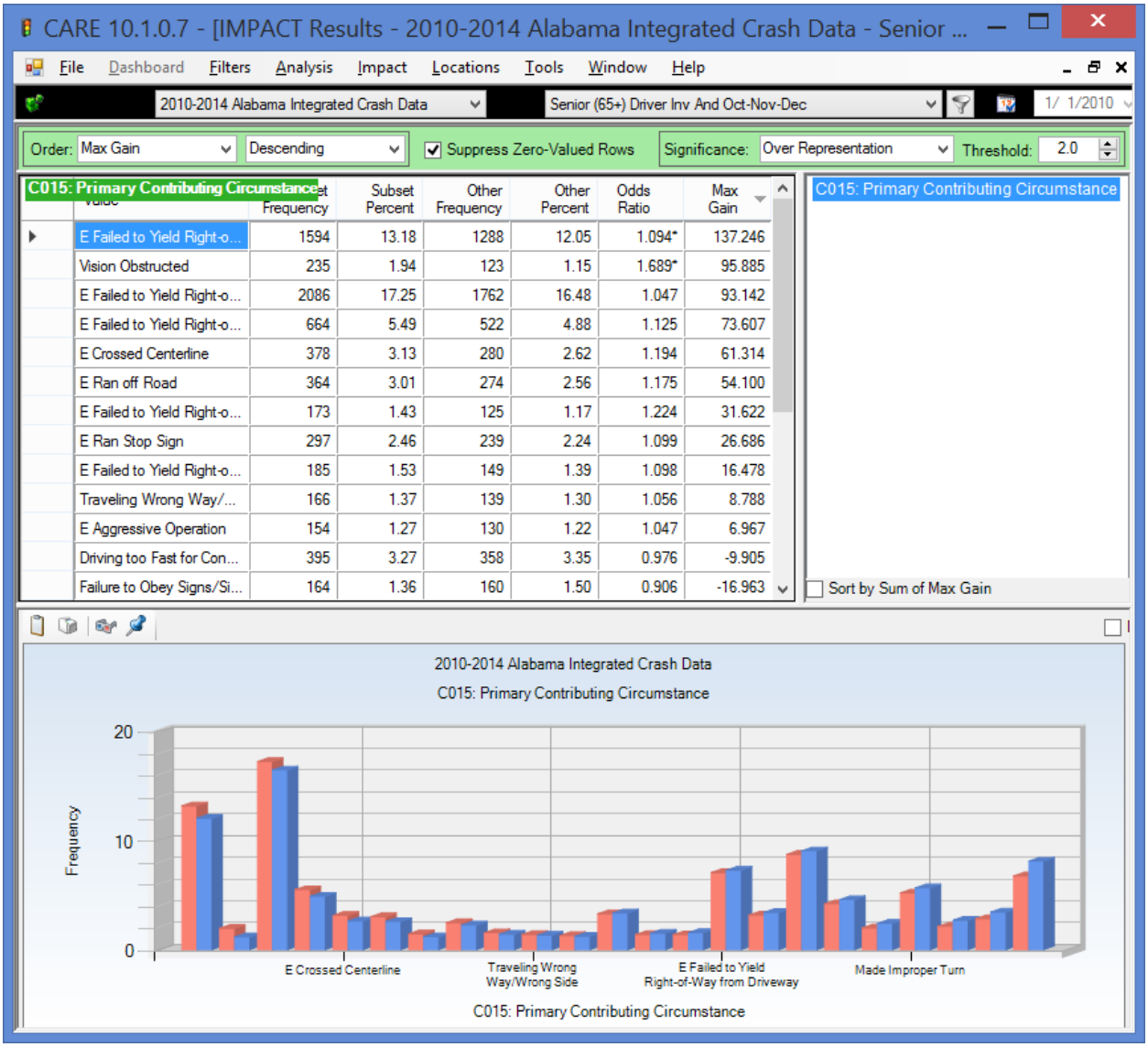
C008: Time of Day Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
11:00 AM to 11:59 AM	2451	8.82	2331	9.52	0.926*	-195.548
12:00 Noon to 12:59 PM	2623	9.44	2508	10.24	0.921*	-224.509
1:00 PM to 1:59 PM	2568	9.24	2491	10.18	0.908*	-260.207
2:00 PM to 2:59 PM	2610	9.39	2374	9.70	0.968	-85.369
3:00 PM to 3:59 PM	2809	10.11	2354	9.62	1.051	136.338
4:00 PM to 4:59 PM	2261	8.13	2078	8.49	0.958	-98.299
5:00 PM to 5:59 PM	2542	9.15	1701	6.95	1.316*	610.735
6:00 PM to 6:59 PM	1464	5.27	937	3.83	1.376*	400.158
7:00 PM to 7:59 PM	817	2.94	493	2.01	1.460*	257.262
8:00 PM to 8:59 PM	432	1.55	530	2.16	0.718*	-169.746
9:00 PM to 9:59 PM	248	0.89	372	1.52	0.587*	-174.358
10:00 PM to 10:59 PM	148	0.53	172	0.70	0.758*	-47.284
11:00 PM to 11:59 PM	84	0.30	112	0.46	0.661*	-43.161

C002: City



Cities with high June, July and August on the right end of the chart are Dothan, Montgomery and Huntsville, respectively,

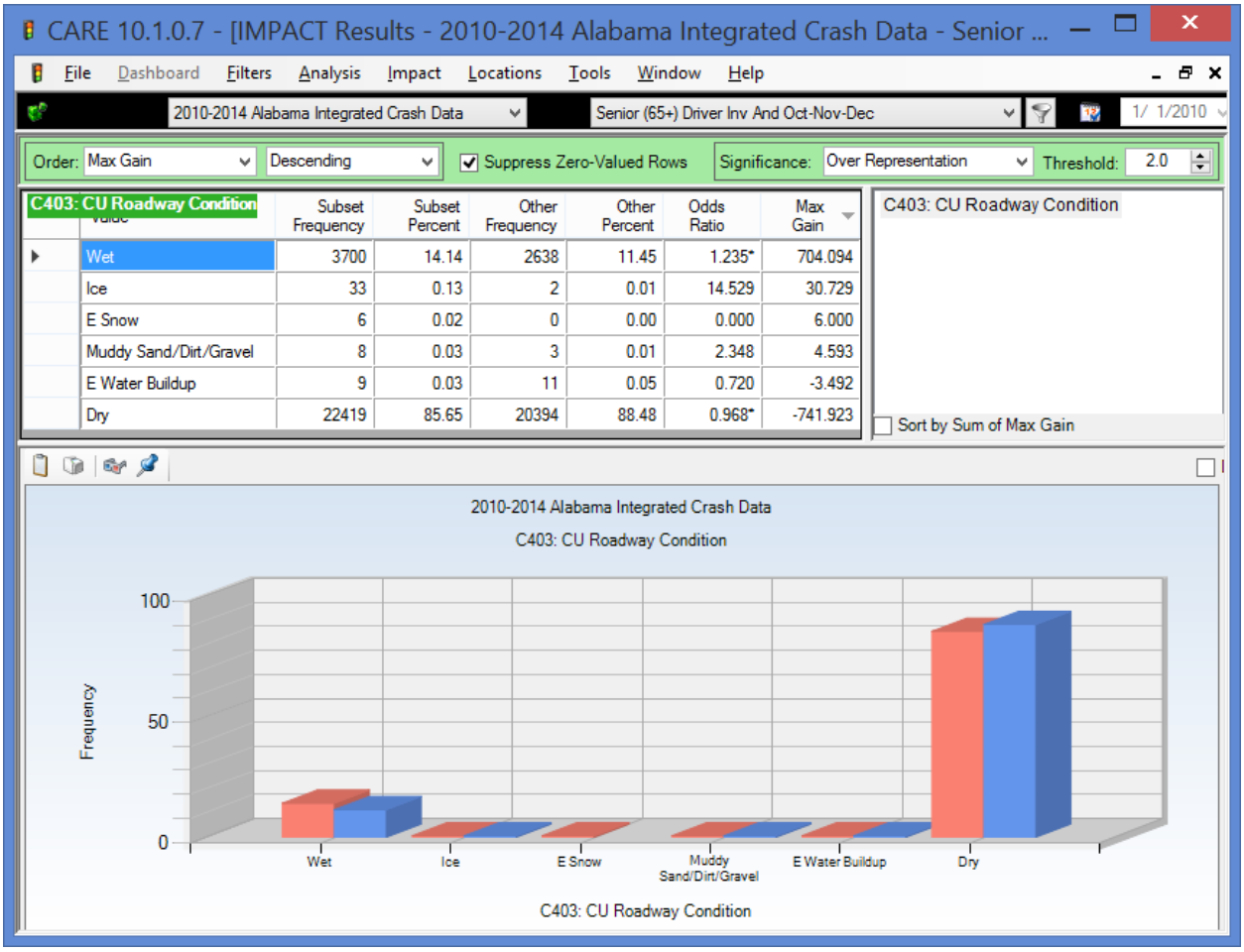
C015: Primary Contributing Circumstances



C015: Primary Contributing Circumstance	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
E Failed to Yield Right-o...	1594	13.18	1288	12.05	1.094*	137.246
Vision Obstructed	235	1.94	123	1.15	1.689*	95.885
E Failed to Yield Right-o...	2086	17.25	1762	16.48	1.047	93.142
E Failed to Yield Right-o...	664	5.49	522	4.88	1.125	73.607
E Crossed Centerline	378	3.13	280	2.62	1.194	61.314
E Ran off Road	364	3.01	274	2.56	1.175	54.100
E Failed to Yield Right-o...	173	1.43	125	1.17	1.224	31.622
E Ran Stop Sign	297	2.46	239	2.24	1.099	26.686
E Failed to Yield Right-o...	185	1.53	149	1.39	1.098	16.478
Traveling Wrong Way/...	166	1.37	139	1.30	1.056	8.788
E Aggressive Operation	154	1.27	130	1.22	1.047	6.967
Driving too Fast for Con...	395	3.27	358	3.35	0.976	-9.905
Failure to Obey Signs/Si...	164	1.36	160	1.50	0.906	-16.963

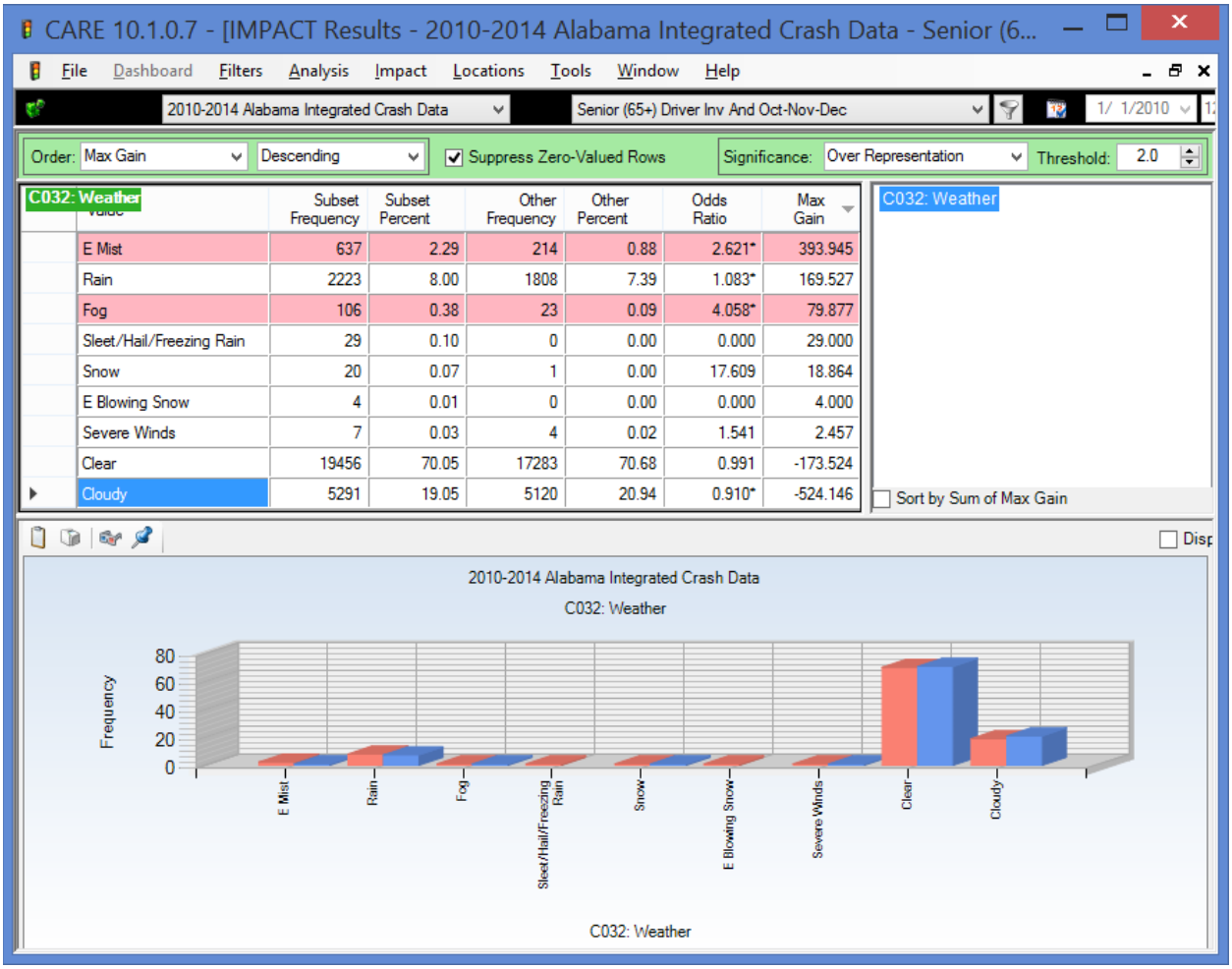
Suppressing all values with less that 150 occurrences in the Oct-Nov-Dec subset, and all cases with 0.02 or less difference in odds ratio.

C403: CU Roadway Condition



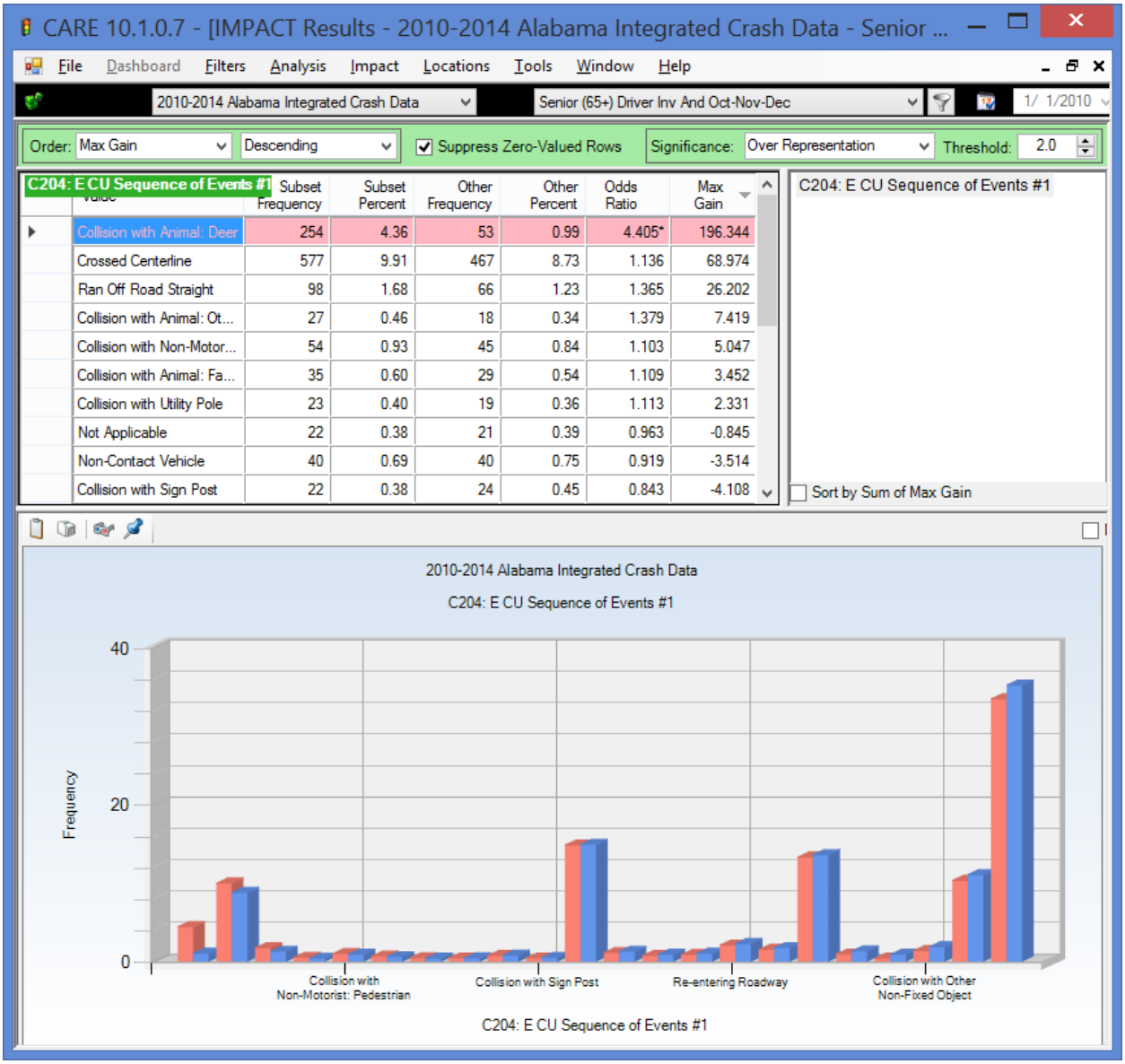
C403: CU Roadway Condition Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Wet	3700	14.14	2638	11.45	1.235*	704.094
Ice	33	0.13	2	0.01	14.529	30.729
E Snow	6	0.02	0	0.00	0.000	6.000
Muddy Sand/Dirt/Gravel	8	0.03	3	0.01	2.348	4.593
E Water Buildup	9	0.03	11	0.05	0.720	-3.492
Dry	22419	85.65	20394	88.48	0.968*	-741.923

C032: Weather



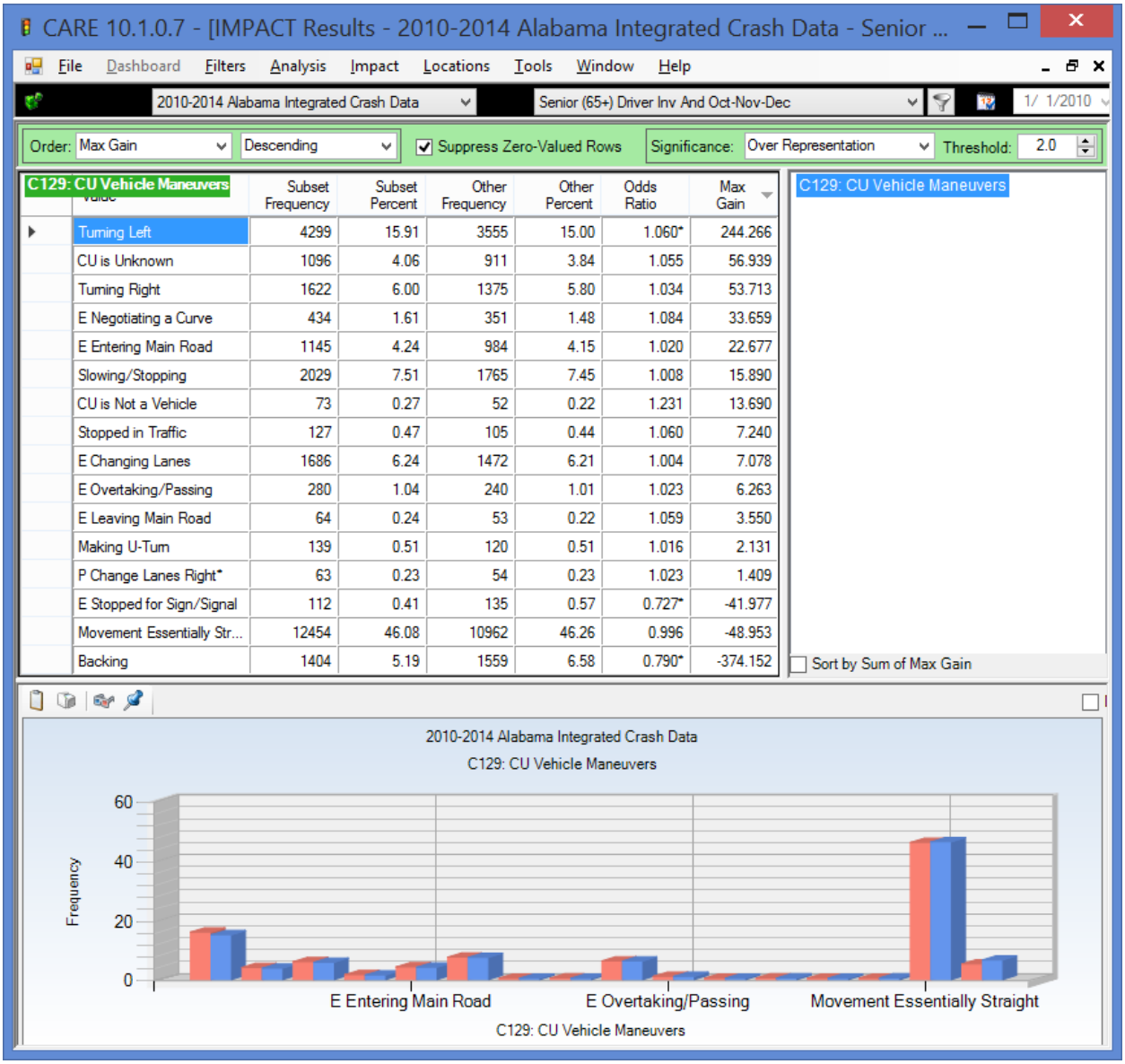
C032: Weather	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
E Mist	637	2.29	214	0.88	2.621*	393.945
Rain	2223	8.00	1808	7.39	1.083*	169.527
Fog	106	0.38	23	0.09	4.058*	79.877
Sleet/Hail/Freezing Rain	29	0.10	0	0.00	0.000	29.000
Snow	20	0.07	1	0.00	17.609	18.864
E Blowing Snow	4	0.01	0	0.00	0.000	4.000
Severe Winds	7	0.03	4	0.02	1.541	2.457
Clear	19456	70.05	17283	70.68	0.991	-173.524
Cloudy	5291	19.05	5120	20.94	0.910*	-524.146

C204: E CU Sequence of Events #1



C204: E CU Sequence of Events #1	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Collision with Animal: Deer	254	4.36	53	0.99	4.405*	196.344
Crossed Centerline	577	9.91	467	8.73	1.136	68.974
Ran Off Road Straight	98	1.68	66	1.23	1.365	26.202
Collision with Animal: Ot...	27	0.46	18	0.34	1.379	7.419
Collision with Non-Motor...	54	0.93	45	0.84	1.103	5.047
Collision with Animal: Fa...	35	0.60	29	0.54	1.109	3.452
Collision with Utility Pole	23	0.40	19	0.36	1.113	2.331
Not Applicable	22	0.38	21	0.39	0.963	-0.845
Non-Contact Vehicle	40	0.69	40	0.75	0.919	-3.514
Collision with Sign Post	22	0.38	24	0.45	0.843	-4.108

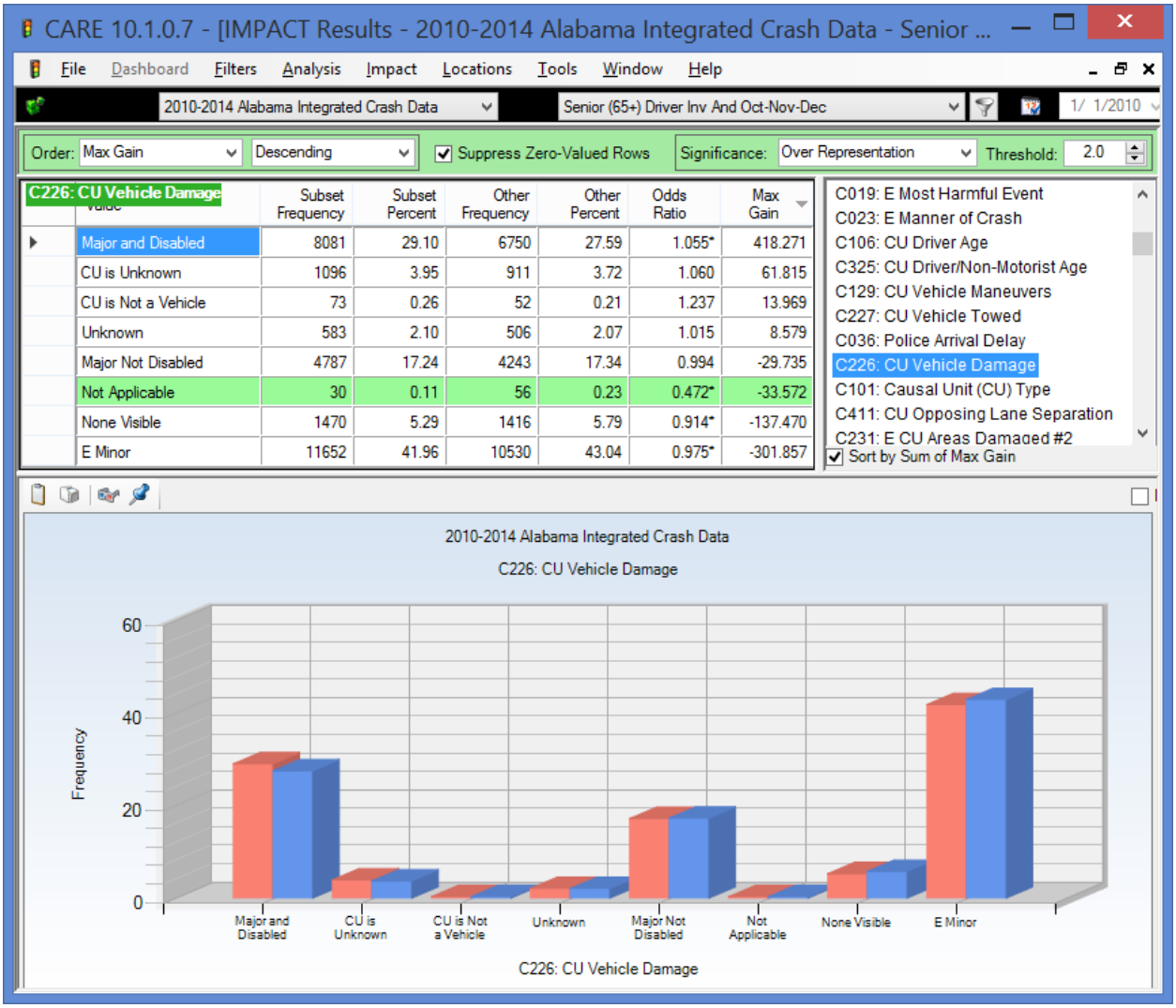
C129: CU Vehicle Maneuvers



C129: CU Vehicle Maneuvers	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Turning Left	4299	15.91	3555	15.00	1.060*	244.266
CU is Unknown	1096	4.06	911	3.84	1.055	56.939
Turning Right	1622	6.00	1375	5.80	1.034	53.713
E Negotiating a Curve	434	1.61	351	1.48	1.084	33.659
E Entering Main Road	1145	4.24	984	4.15	1.020	22.677
Slowing/Stopping	2029	7.51	1765	7.45	1.008	15.890
CU is Not a Vehicle	73	0.27	52	0.22	1.231	13.690
Stopped in Traffic	127	0.47	105	0.44	1.060	7.240
E Changing Lanes	1686	6.24	1472	6.21	1.004	7.078
E Overtaking/Passing	280	1.04	240	1.01	1.023	6.263
E Leaving Main Road	64	0.24	53	0.22	1.059	3.550
Making U-Turn	139	0.51	120	0.51	1.016	2.131
P Change Lanes Right*	63	0.23	54	0.23	1.023	1.409
E Stopped for Sign/Signal	112	0.41	135	0.57	0.727*	-41.977
Movement Essentially Str...	12454	46.08	10962	46.26	0.996	-48.953
Backing	1404	5.19	1559	6.58	0.790*	-374.152

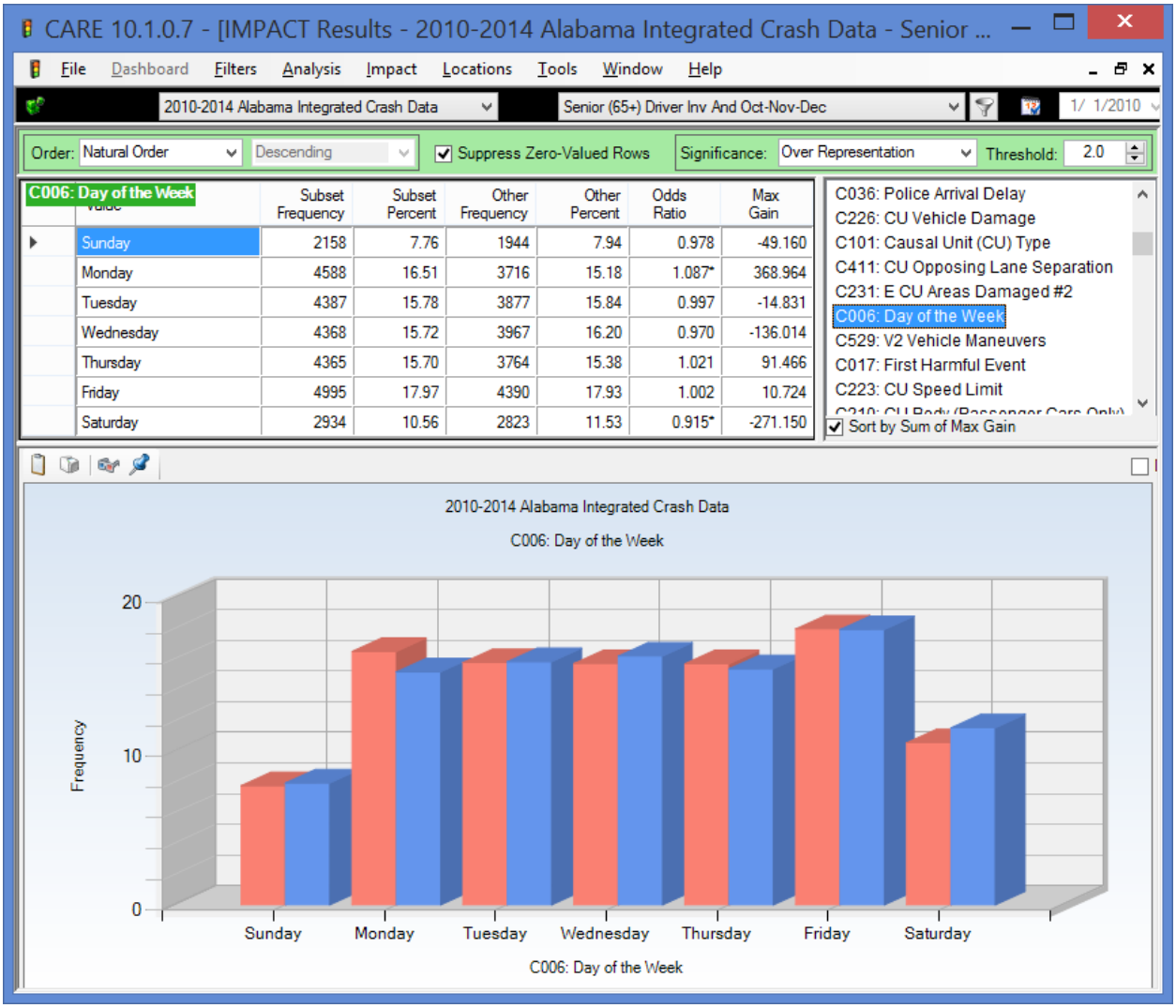
Suppressed all values with less than 50 occurrences in the Oct-Dec time frame.

C226: CU Vehicle Damage

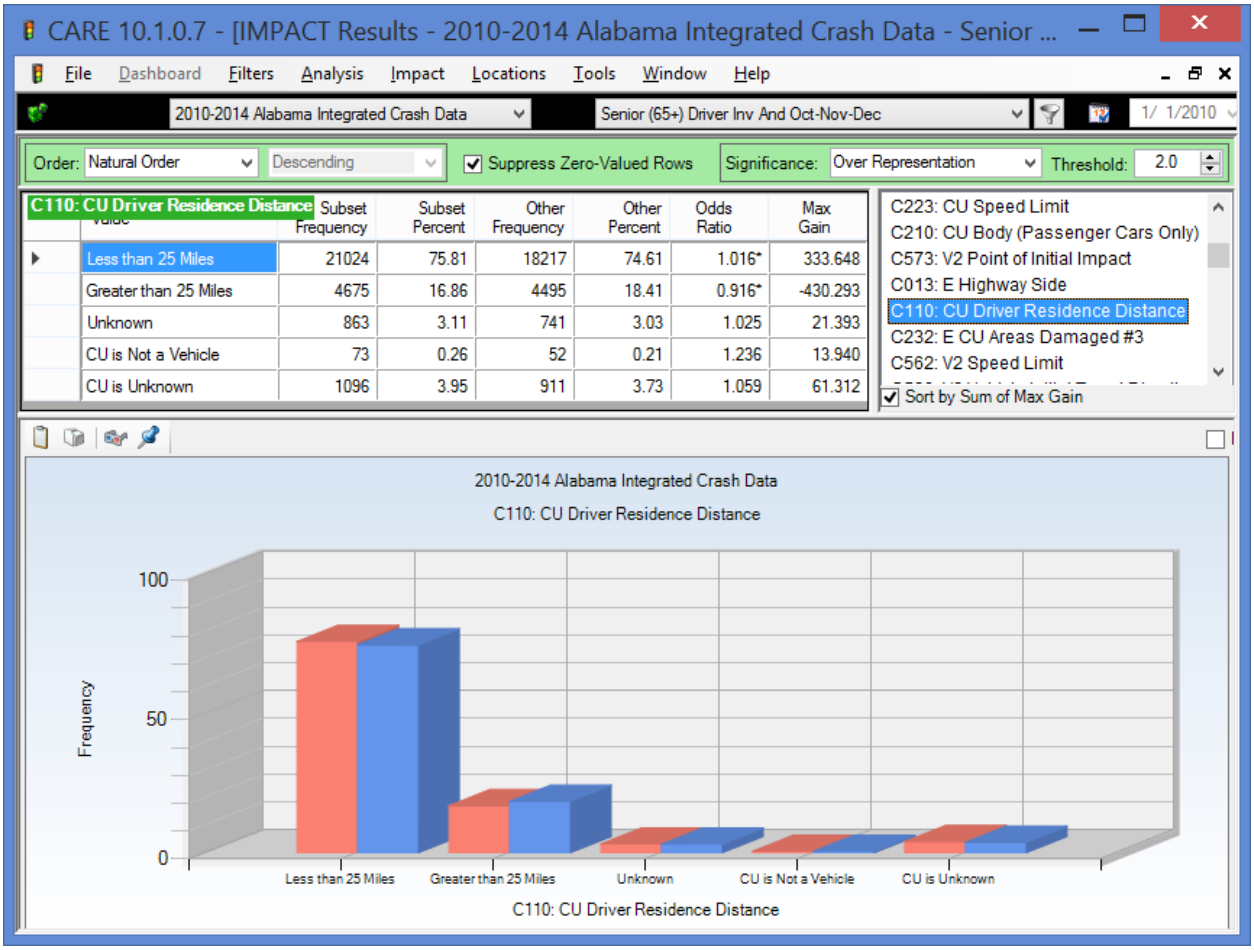


C226: CU Vehicle Damage Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Major and Disabled	8081	29.10	6750	27.59	1.055*	418.271
CU is Unknown	1096	3.95	911	3.72	1.060	61.815
CU is Not a Vehicle	73	0.26	52	0.21	1.237	13.969
Unknown	583	2.10	506	2.07	1.015	8.579
Major Not Disabled	4787	17.24	4243	17.34	0.994	-29.735
Not Applicable	30	0.11	56	0.23	0.472*	-33.572
None Visible	1470	5.29	1416	5.79	0.914*	-137.470
E Minor	11652	41.96	10530	43.04	0.975*	-301.857

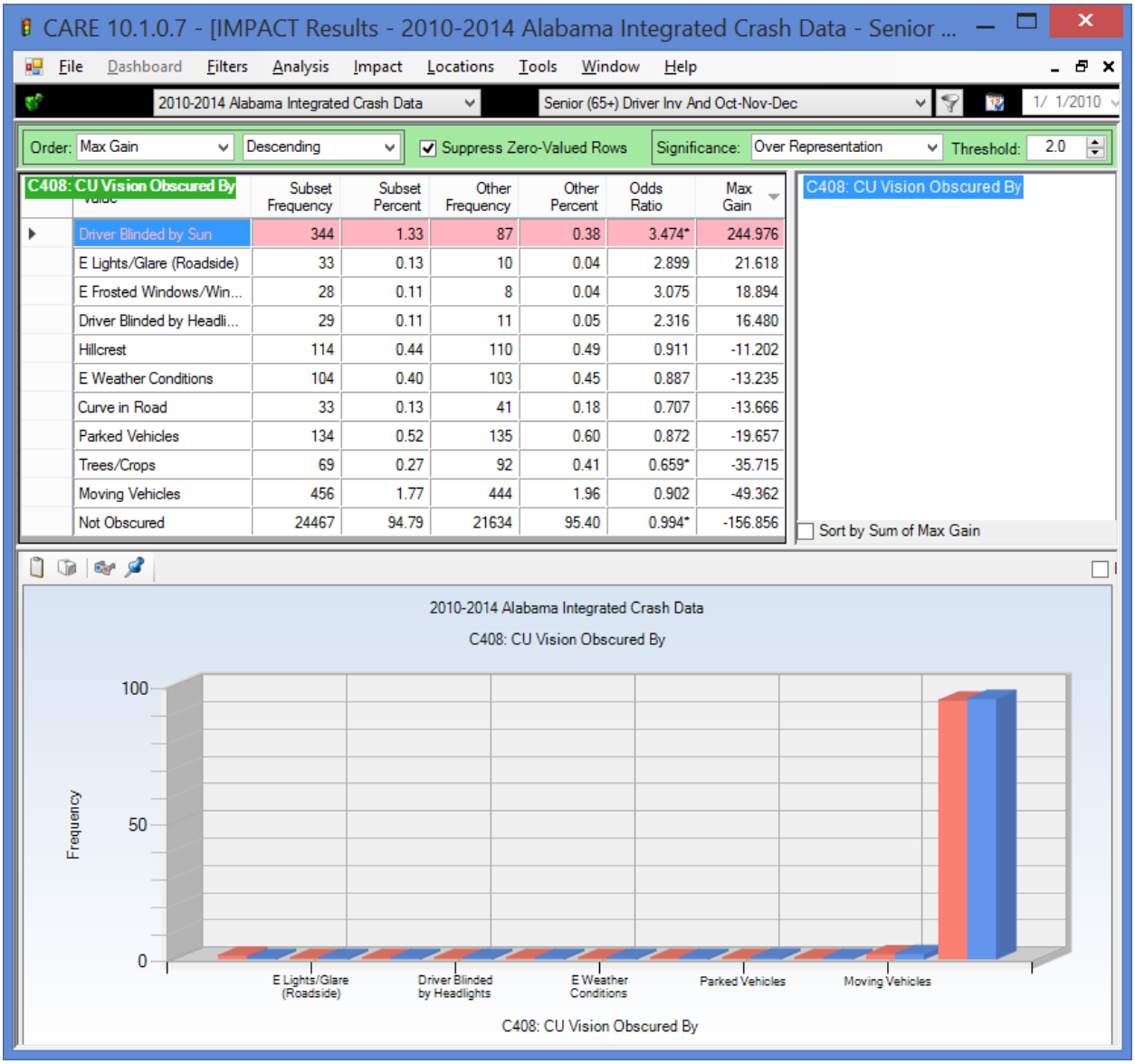
C006: Day of the Week



C110: Driver Residence Distance

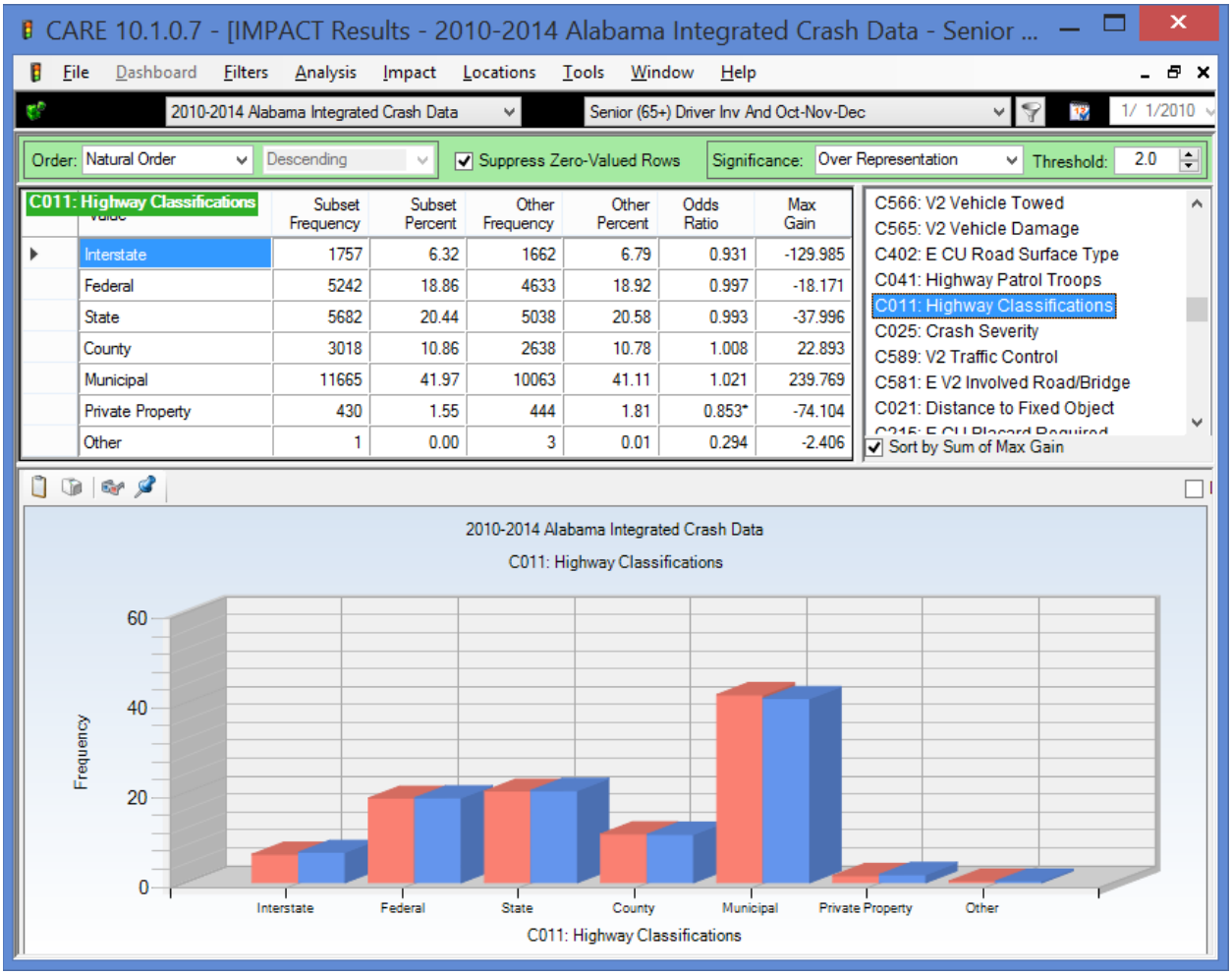


C408: CU Vision Obscured By



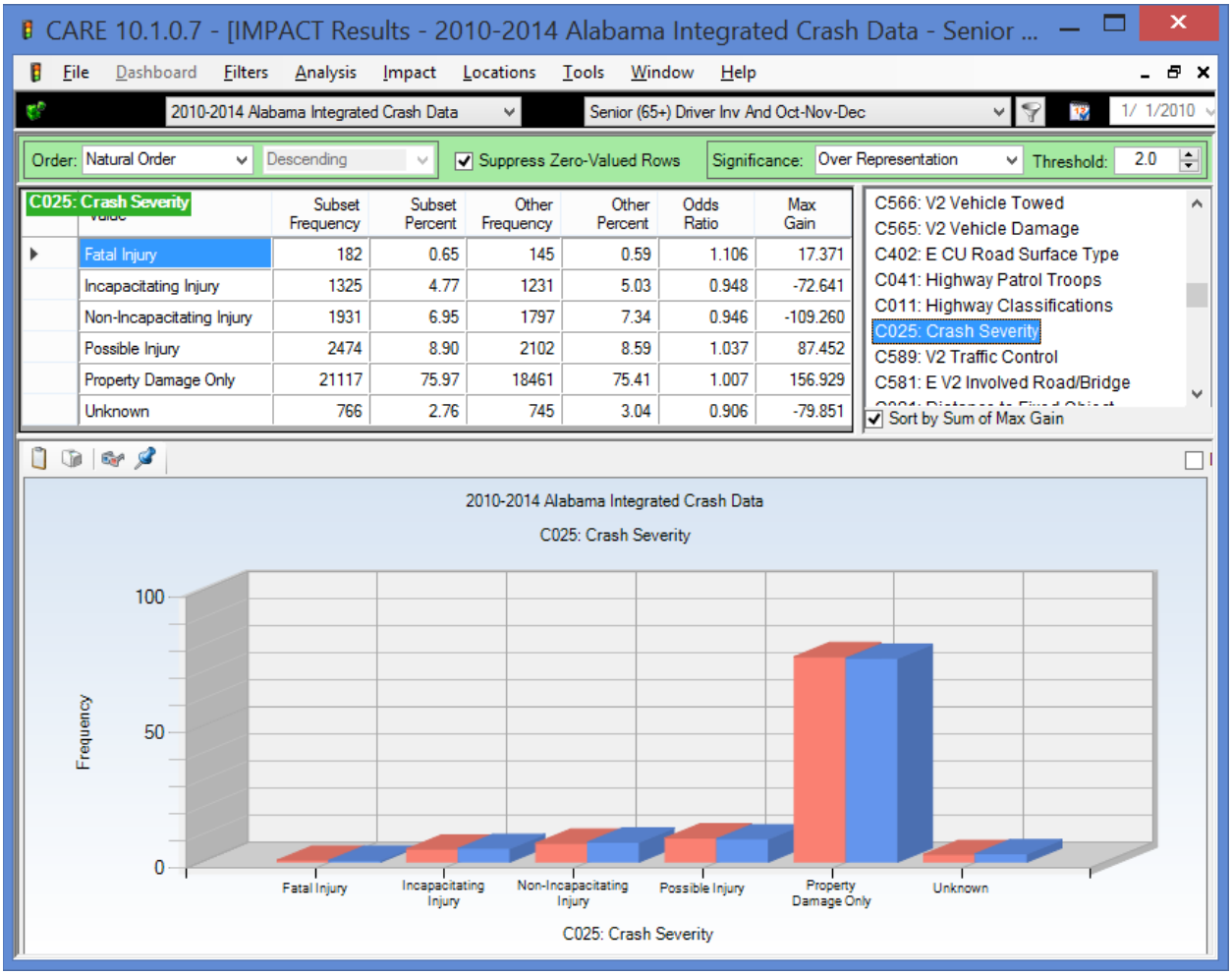
C408: CU Vision Obscured By	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Driver Blinded by Sun	344	1.33	87	0.38	3.474*	244.976
E Lights/Glare (Roadside)	33	0.13	10	0.04	2.899	21.618
E Frosted Windows/Win...	28	0.11	8	0.04	3.075	18.894
Driver Blinded by Headli...	29	0.11	11	0.05	2.316	16.480
Hillcrest	114	0.44	110	0.49	0.911	-11.202
E Weather Conditions	104	0.40	103	0.45	0.887	-13.235
Curve in Road	33	0.13	41	0.18	0.707	-13.666
Parked Vehicles	134	0.52	135	0.60	0.872	-19.657
Trees/Crops	69	0.27	92	0.41	0.659*	-35.715
Moving Vehicles	456	1.77	444	1.96	0.902	-49.362
Not Obscured	24467	94.79	21634	95.40	0.994*	-156.856

C011: Highway Classification



C011: Highway Classifications Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Interstate	1757	6.32	1662	6.79	0.931	-129.985
Federal	5242	18.86	4633	18.92	0.997	-18.171
State	5682	20.44	5038	20.58	0.993	-37.996
County	3018	10.86	2638	10.78	1.008	22.893
Municipal	11665	41.97	10063	41.11	1.021	239.769
Private Property	430	1.55	444	1.81	0.853*	-74.104
Other	1	0.00	3	0.01	0.294	-2.406

C025: Crash Severity



C025: Crash Severity	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Fatal Injury	182	0.65	145	0.59	1.106	17.371
Incapacitating Injury	1325	4.77	1231	5.03	0.948	-72.641
Non-Incapacitating Injury	1931	6.95	1797	7.34	0.946	-109.260
Possible Injury	2474	8.90	2102	8.59	1.037	87.452
Property Damage Only	21117	75.97	18461	75.41	1.007	156.929
Unknown	766	2.76	745	3.04	0.906	-79.851