IMPACT Analysis of Bicycle (Pedalcycle) Involved (BI) Crashes CY2017-2021 Data

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For additional bicycle information from NHTSA and other sources, see:
http://www.safehomealabama.gov/tag/bicycle/

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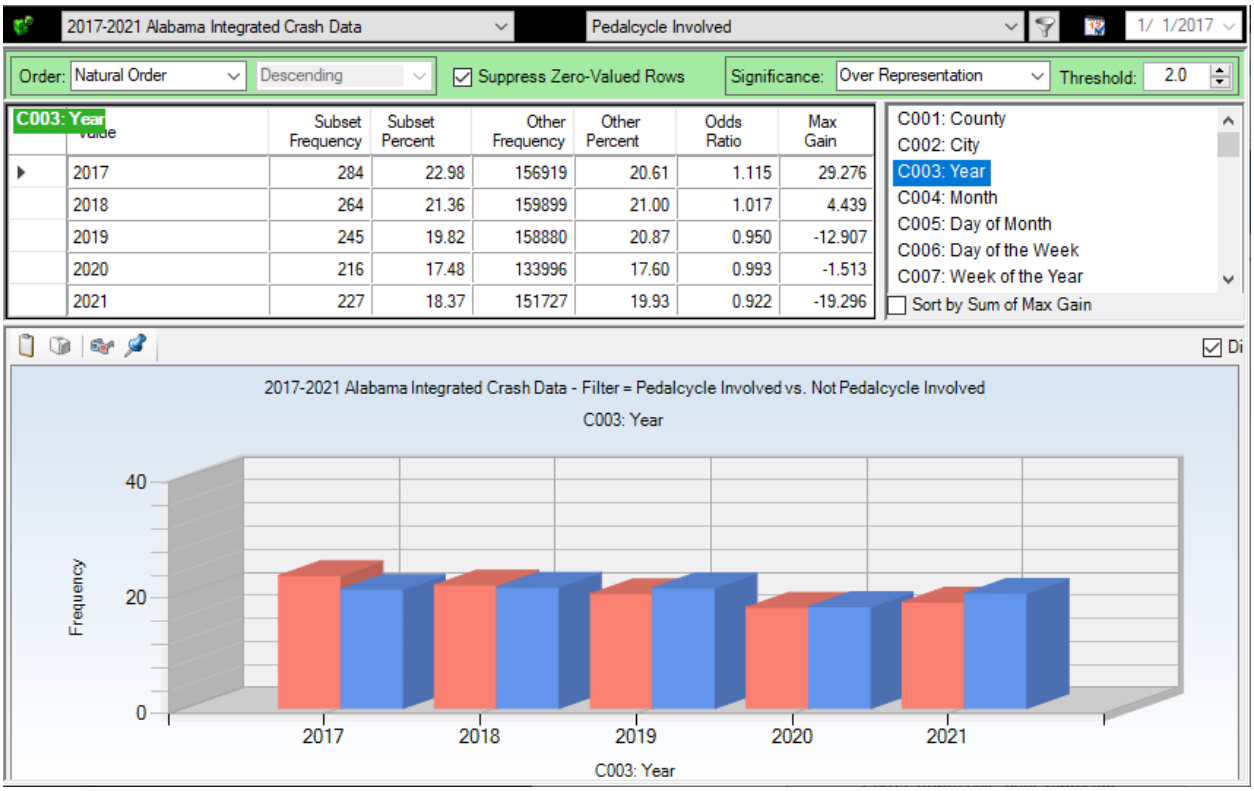
Introduction

The Alabama crash report has always referred to Bicycles as Pedalcycles. In theory, Pedalcycles might involve more than Bicycles, but since the overwhelming majority of them are Bicycles and Pedalcycle is not a common word, we will use the word Bicycle to represent all of these crashes.

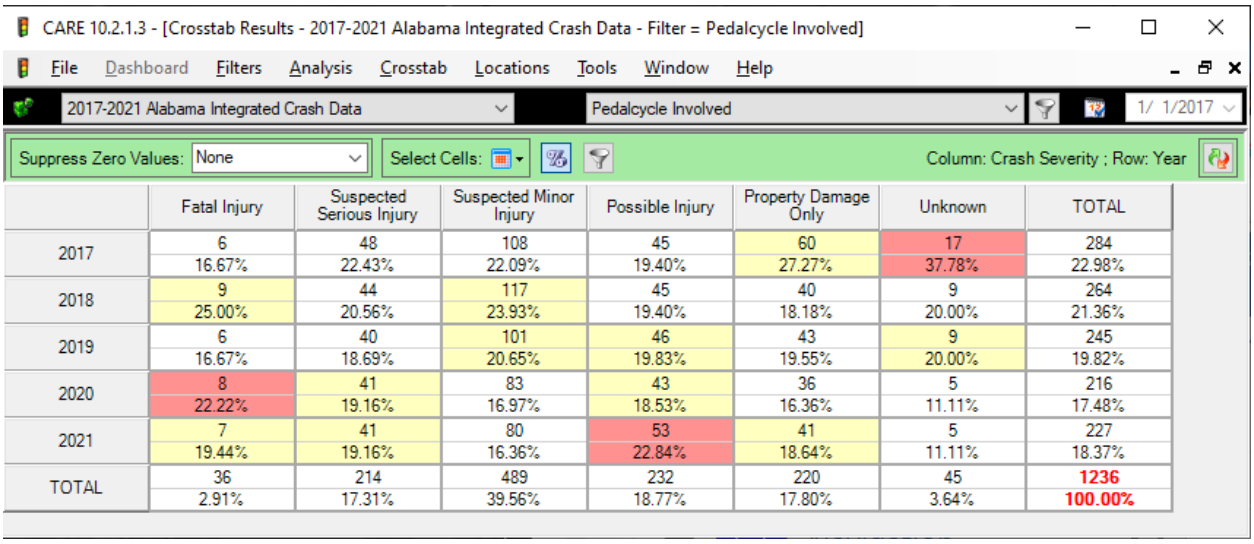
This report has the objective of presenting a Special Study that was done on Bicycle-Involved (BI) crashes, with the goal of establishing and improving countermeasures for reducing these crash frequencies and severities in the future. The IMPACT displays below are comparisons of two subsets, both restricted to the 2016 to 2020 (inclusive) time frame. In the first subset (called "Subset") a Bicycle was involved in the crash. The second (called "Other") consisted of all other crashes, i.e., where the vehicles involved in the crashes were not Bicycles.

This display also gives the frequency distribution for the overall 1,236 BI crashes by year. There is a major trend that can be seen in that, with the exception of 2021, there is about 20 fewer crashes per year. The cross-tabulation display on the next page is a further breakdown of the annual frequencies by severity.

C003 Year



C003 by C025 BI Crashes per Year by Injury Severity



	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
2017	6 16.67%	48 22.43%	108 22.09%	45 19.40%	60 27.27%	17 37.78%	284 22.98%
2018	9 25.00%	44 20.56%	117 23.93%	45 19.40%	40 18.18%	9 20.00%	264 21.36%
2019	6 16.67%	40 18.69%	101 20.65%	46 19.83%	43 19.55%	9 20.00%	245 19.82%
2020	8 22.22%	41 19.16%	83 16.97%	43 18.53%	36 16.36%	5 11.11%	216 17.48%
2021	7 19.44%	41 19.16%	80 16.36%	53 22.84%	41 18.64%	5 11.11%	227 18.37%
TOTAL	36 2.91%	214 17.31%	489 39.56%	232 18.77%	220 17.80%	45 3.64%	1236 100.00%

The severities seem fairly stable over the years. The two highest severities show little change, while the Suspected Minor Injury drops off in 2020 and 2021.

IMPACT Outputs for Bicycle Involved (BI) vs. Non-BI Crashes

General Tutorial on IMPACT

Interpretation of IMPACT displays. The following sections present a number of IMPACT runs that surface some of the major characteristics of crashes in which Bicycles were involved (BI) as compared to all of the rest of the crash records (non-BI). 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 video tutorial. In the IMPACT displays, and the the charts below the tables, the ***red bars represented BI crash proportions*** while the ***blue bars represent the non-BI crash proportions.*** Proportions, in percent, are calculated as the fraction of the number for a specific item divided by the total crashes in the respective column. Proportions are used for comparison since the item frequencies in the *Subset* and *Other* columns cannot be compared directly, being from two very different size populations.

Output pruning. Many of the output displays in the following sections were "pruned" using an extremely valuable CARE tool that can dynamically change the filter on the subset being viewed to eliminate "noise" from both IMPACT and Frequency output displays. In many cases the following noise causes were summarily eliminated as not contributing information to the outputs: Unknown, CU is Unknown, CU is Not a Vehicle, Not Applicable, and Other (in this case the word Other is being used to indicate that none of the given eCrash items apply). Important to recognize is that even if we did not eliminate these categories, we would still be making inferences from subsets of the total reality of 100% complete and accurate reporting. In cases where outputs were pruned, the result forms an estimate of reality, and the results were more understandable in the relative distribution sense than if these categories were left in. Their presence would also result in distractions from the important results. In situations where more than the items noted above were pruned, a note is made under the display.

Code interpretations. In some cases, a code or an entire variable (attribute) will be preceded by an E. This indicates that the attribute value was obtained exclusively from eCrash (E). If this E does not appear, then there was no change made in this item when eCrash was implemented. CU = Causal Unit – is the unit (and driver) indicated by the reporting officer to be the most probable cause of the crash.

Summary of output results by general IMPACT category. In most of the IMPACT displays, items with the highest Max Gain are listed at the top of the table, and these correlate well with those with the highest Odds Ratios. The Max Gain is the number of crashes that would be reduced if the Subset item under consideration had exactly the same proportion as the Other (control) proportion, i.e., there was no over- or under-representation, meaning that the Odds

Ratio for that item would be 1.000. Statistical significance of the Subset and Other proportional difference is indicated by the asterisk (*) after the Odds Ratio. The Odds Ratio is the item Subset proportion divided by the Other proportion. Cells with Odds Ratios greater than 2 are given with a red background; those (under-represented) with 0.5 or less are given with a green background.

Executive Summary: Brief Statements of IMPACT Findings

The following gives a brief summary for each of the IMPACT display findings that follow:

- **Geographical Attributes**
  - C001 County (BI over-represented) – counties with less than a Max Gain of 10 were excluded from consideration in this display. It is clear that the over-represented areas are Urban counties.
  - C002 City (BI over-represented) – clearly the Urban areas of the counties show a pattern of the highest over-representation in BI crashes. The Rural areas of counties are called County-Name Rural, and they are documented in CARE as virtual cities. For example, see Rural Mobile in the table for C002.
  - C010 Rural or Urban – it comes as no surprise after seeing the results above that the Urban areas are over-represented in BI crashes, while the Rural areas are over-represented in those caused by Non-BI vehicles. One reason for this is that the lower speeds in Urban areas make BI crashes less likely. However, the close concentration of vehicles and lower speeds make low-severity crashes a higher relative frequency. Bicyclists appear to be more alert in these areas as well.
  - C010 Locale – This further confirms that BI crashes occur more often in School and Residential area as opposed to those in Shopping or Business areas. It should be noted that some cites have a considerable amount of Residential Area. The cross-tabulation that follows show that most of the fatalities occurred in Open Country.
  - C110 Residence Distance – Consistent with the above findings, BI crashes tend to occur more in areas Less Than 25 Miles from the driver's residence. Quite often, this would put them in an Urban area.

- **Time Factors**
  - C003 Year – Comparing BI to non-BI crashes over the years shows that the BI crashes had lower proportions than the previous years, with the exception of 2020 and 2021 due to COVID-19. This is an excellent trend for BI that shows the value of the various Bicycle programs.
  - C004 Month – it seems reasonable that the number of overall BI crashes would diminish during the winter months (in this case is it quite visible for November, December, January and February. What is not intuitive is the degree to which the number of crashes drop off in these months. Clearly the total numbers of BI crashes are well under half, and some as much as less than a third of other months. Further analyses of these months compared to the others showed no major cause for this

decline during the winter other than the fewer miles driven by Bicycle riders. The dramatic decline is probably leveraged by the fact that those who do venture out in the winter are the more proficient and experienced Bicycle riders who know how to evade crashes, or perhaps stick to urban areas.

- C006 Day of the Week – Saturday through Wednesday are all over-represented, with Sunday having the highest over-representation (Odds Ratio 1.148). Thursday and Friday are under-represented, perhaps because of the high non-BI traffic.
- C008 Time of Day – the significantly over-represented times are in the evenings from 5 PM through 9:59 PM. The hours of 10 PM through 11:59 PM are also over-represented, but not significantly.
- C031 Lighting Conditions – This corresponds to the evening time over-representations. The four highest frequency over-representations for Lighting Conditions are: Dark—Spot Illumination Both Sides of Road (97), Dark – Continuous Lighting
  Both Sides of Road (54), Dark – Spot Illumination Both Sides of Road, and Dark – Roadway Not Lighted (126). These are not the times that most bicyclists choose to be riding, which shows the serious problem of being seen at night.

- **Roadway Characteristics**
  - C011 – Highway Classification – while it was expected from the results above (that BI crashes are significantly over-represented in the Urban areas), the degree to which the BI crashes were over-represented on Municipal roads by an odds ratio of 1.591 was not expected. This should be considered in education and enforcement policies for Municipal roads.
  - C026 – Intersection Related – because intersections are more associated with Urban roadways, these significant results were expected.
  - C407 – CU Roadway Curvature and Grade – The first three categories show a pattern that straight roadways seem to pose a larger problem than those with curves. Slopes seem to have little effect on BI crashes. The following show the preponderance of crashes on straight roadways: Straight and Level (870, 1.042), Straight with Down Grade (118, 70.39), and Straight at Hillcrest (118, 1.194).

- **Driver Factors**
  - C101 Causal Unit (CU) type – the Bicyclist was the causal unit in 42.80% of the crashes in which they were involved. By frequency and percentage for other vehicles: Passenger Car (289, 23.38%), Sports Utility Vehicle – SUV (140, 11.33%), and Pickup (125, 10.11%), all three of which were under-represented.
  - C015 – Primary Contributing Circumstance – by excluding those values with number of BI crashes less than 20, the major PCCs can be seen in this one table. This attribute is probably the most important IMPACT output to be considered in countermeasure development and improvement, since it relates most closely to the cause of the crash. The high Max Gain items show some very strong and significant over-representations for BI crashes – virtually all of the items in the top half of the

table are quite high with significant over-representations. The following give the highest by Max Gain along with their frequency numbers:

1. Failed to Yield the Right-of-Way (77)
2. Improper Crossing (72)
3. Unseen Object/Person/Vehicle (198)
4. Other Failed to Yield (68)
5. Failed to Yield Right-of-Way to Pedestrian in Crosswalk (36)
6. Not Visible (29)
7. Wrong Side of Road (20)
8. Traveling Wrong Way/Wrong Side (29)
9. Improper Passing (40)
10. Ran Stop Sign (42)

Of these, the following reflect on the attitude of the driver or bicyclist: 1, 2, 4, 5, 7, 8, 9, 10. This is most of them, and it certainly includes the worst of them. Some of these put the bicycle in the role of a victim: 3 and 6, although often visibility is in the realm of the bicyclist, especially at night (see recommendations). Working from the bottom of the table up illustrates the converse – those crash PCCs that are indicative of non-BI over-representations. Note that all of the Unseen Object and Failure to Yield categories could indicate a relatively increased visual perception problem on the part of the motorist. While not totally the fault of the BI drivers, defensive driving on their part should certainly take this factor into account. All of these factors provide the basis for Bicyclist information programs.

- C017 – First Harmful Event – The reason for the highly over-represented items is apparent (those with the red background have an Odds Ratio > 2). However, the collisions with pedestrians probably most often involves other motor vehicle typess and not Bicycles. Similarly, with the other items – swerving to miss a Bicyclist can often cause crashes that do not directly involve the Bicyclist. For most other types of crashes this attribute gives us "what was hit." This is true for the lower frequency items on this list as well.
- C311 CU Non-Motorist Most Harmful Event – The filter used in performing these IMPACTs assured that the "all non-motorists" here are Bicyclists. The largest, Collision with Vehicle in Traffic (441) shows that the largest danger for Bicyclists is active motor vehicles.
- C023 – Manner of Crash – Ignoring "Other" the top three over-represented items, are reasonable for Bicycles. These are Side Impact (90) degrees, Side Impact (angled), and Sideswipe – Same Direction. Many of the common Manner of Crash types for motor vehicles are under-represented for BI
- C104 – Left Scene – BI crashes caused by BI are less likely to be hit-and-run than are those caused by non-BI vehicles. The reason for this is probably that it is impossible in a relatively larger number of cases for the bicycle to leave the scene after the crash.
- C106 – CU Driver Age Range 2 (five year increments) – The age distribution here is strictly for causal motor vehicles, and it is presented in natural order. Restricting this vehicle to "bicycle causals only" led to 529 cases (as opposed to the 536 given here)

in which the "causal vehicle is not a vehicle" (ages are not required on the crash report form for non-motorized vehicles).
    - C109 – CU Driver Gender (causal motor vehicles only) – Both male and female were very close to their proportion in the total crashes in the population, so no inferences can be made that the proportions change for Bicycle crashes.
    - C309 – CU Non-Motorist Officer Opinion Alcohol – The filter we used in performing the IMPACTs assured that the all "non-motorists" here are bicyclists. We would not expect them to be under the influence of alcohol while enjoying their mode of transportation. No use of alcohol found was highly significantly over-represented and the positive alcohol findings "Yes" were under-represented (no statistical test are run when either sample size is less than 20.
    - C310 – CU Non-Motorist Officer Opinion Drugs – The filter we used in performing the IMPACTs assured that the all non-motorists here are bicyclists. Quite comparable to the results for alcohol, we would not expect them to be under the influence of non-alcohol drugs while enjoying their mode of transportation. No use of drugs was found was over-represented and the positive findings were under-represented.
    - C129 – CU Vehicle Maneuver (causal motor vehicles only) – As was seen in variable C407 above, Movement Essentially Straight are the major problem for Bicycles. While this item is not over-represented, it has the highest frequency next to "CU is Not a Vehicle" (which is referring to Bicycles). This also shows that Turning Right and Overtaking/Passing are significantly over-represented and should be avoided if at all possible.
    - C224 – CU Estimated Speed at Impact – BI crashes are typically at much lower speeds than Non-BI crashes. Most motorists know to slow down when they see Bicycles in the roadway.
    - Cross-tabulation of Injury Severity vs Impact Speed – this display makes the relationship between speed and Fatal or Serious Injury crashes quite clear.

- **Severity Factors**
    - C025 – Crash Severity – The fatality rate proportion for BI crashes is over five (5.176) times what it is for Non-BI crashes. Both Suspected Serious Injury and Suspected Minor Injury are close to this or exceed this multiplier. All of the injury categories were highly significantly over-represented.
    - C038 – Adjusted EMS Arrival Delay – as indicated above, the timing and urban nature of BI crashes clearly causes them to have relatively short EMS arrival delays, which reduces the number of BI crashes being fatal.

Recommendations from IMPACT Results Summarized from Above

Generally, recommendations will be presented in the same order as the IMPACT findings given above:

- **Geographical Attributes**
  - C001, C002, C020 and C033. BI countermeasures, either enforcement or PI&E, should focus on urban areas of the state.
- **Time Factors**
  - C004 Month – Bicycle countermeasures should become more intense during the milder and summer months (April through October) as opposed to the winter months. The summer months are when most BI crashes occur.
  - C006 and C008. These times reflect when the major parts of BI take place, which is also a metric when most bicyclists take to the streets. Saturday through Monday in the evening hours (5:00 PM through 9:59 PM).
- **Roadway Characteristics**
  - C011 – Municipal roads should be given the highest priority for overall BI crash frequency reduction. However, for fatalities and more serious injury crashes, the combination of Federal, State and County roads need to be given consideration as well.
  - C407 and C129 – Bicyclists and drivers should be made aware of the problems of BI crashes on straight stretches. We suspect that bicyclists have their guards up when on curves, but are more likely to stray out into the roads when the traffic movement is essentially straight.
- **Driver Factors**
  - C015 – Primary Contributing Circumstances (PCCs) – the top six PCCs and their frequencies were (with frequencies): Failed to Yield the Right-of-Way 77, Improper Crossing 72, Unseen Object/Person/Vehicle 198, Other Failed to Yield 68, Failed to Yield Right-of-Way to Pedestrian in Crosswalk 36, and Not Visible. These factors should be emphasized to both vehicle drivers and bicyclists in any training or educational programs. High visibility clothing and lighting at night are essential.
  - C015 – Primary Contributing Circumstances (PCCs) – special consideration for Unseen Object/Person/Vehicle and Not Visible. It cannot be expected that a motorist will slow down or take evasive action when a bicyclist cannot be seen. Reflective clothing is major life-saver and bicycling should never be even considered without it. This is especially a problem at night, and it is multiplied when bicycles travel against traffic (traveling with traffic is mandated by law). Night-time bicycling also requires that adequate lighting be provided on both the front and rear of the bicycles. Do not depend on reflectors. Being seen should receive primary emphasis in bicycle educational programs.
  - C017 First Harmful Event and C311 CU Non-Motorist Most Harmful Event. The first and last items in the table show that essentially all BI crashes involve collisions with vehicles or collisions with vehicles in traffic. Both motor vehicle drivers in

general and bicyclists need to be made aware that there are no safe zones when it comes to bicycle dangers.

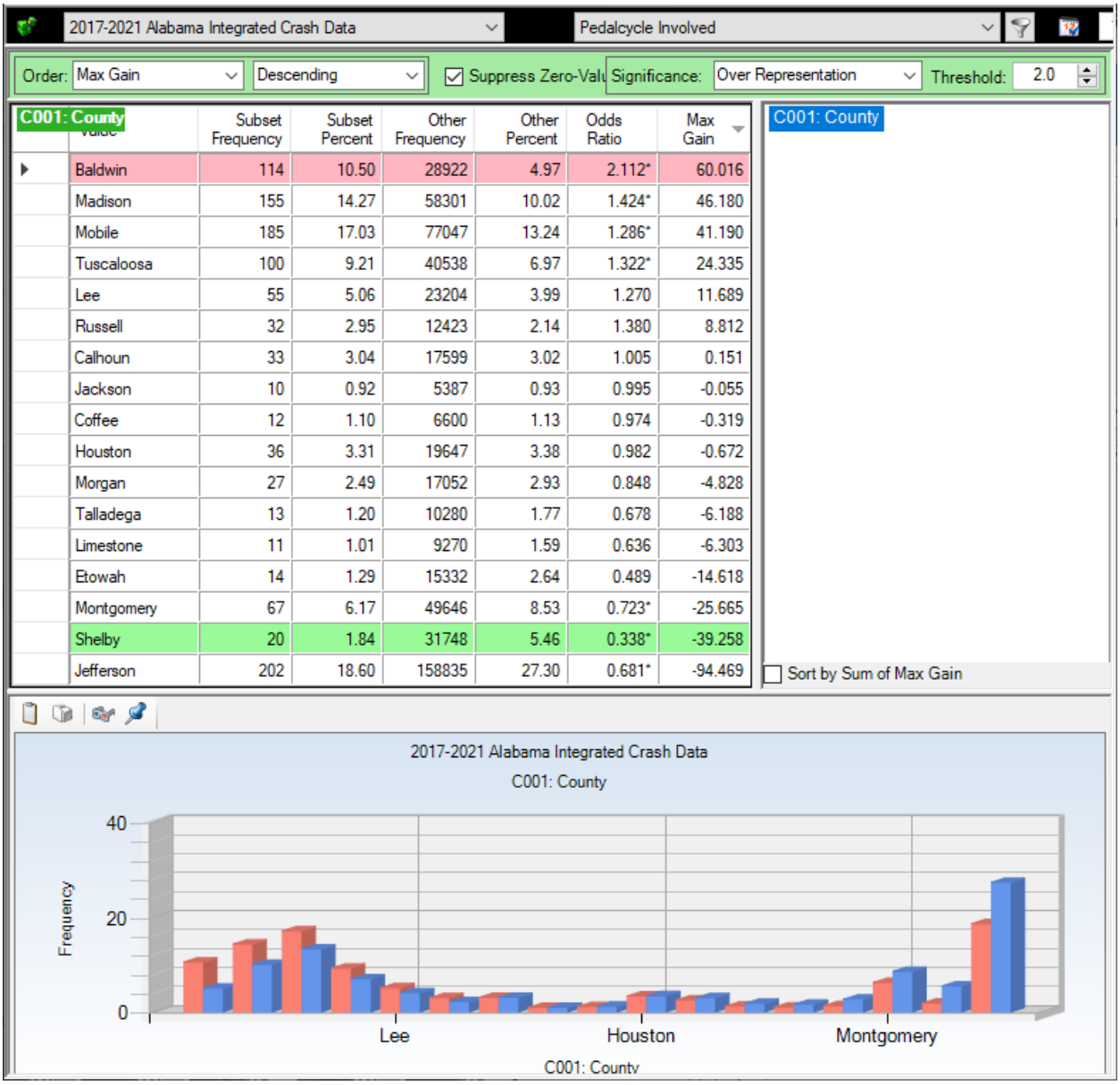
- C023 – Manner of Crash – quite often BI crashes are assumed to be rear-end, where the motor vehicle overtakes and crashes into the bicycle from behind. Although under-represented, this does involve 155 Rear End BI crashes. The various side impacts might provide further information for BI crash prevention. These include (with frequencies): Side Impact (90 degrees) 337, Side Impact (angled) 142, Sideswipe - Same Direction 148, Angle (front to side) Opposite Direction 51, Angle Oncoming (frontal) 42, and Head-On (front to front only) 36.
- C104 – Left Scene. The reporting officer's "Yes" response had a frequency of 192 and it was over-represented. However, we expect very few bicycle victims of crashes have either the desire or the ability to leave the scene. So we conclude that this is primarily a problem with the motor vehicle drivers. Bicyclists need to know this and to get contact information from causal motor vehicle drivers as quickly as possible.
- C106 – CU Driver Age Range 2 (five year increments for causal motor vehicles only). No information for recommendations.
- C109 – CU Driver Gender (causal motor vehicles only) – Both male and female were very close to their proportion in the total crashes in the population, so no inferences can be made that gender proportions change for Bicycle crashes.
- C309 and C310 – CU Non-Motorist Officer Opinion of Alcohol and Drugs. For the most part this is not a problem for either the bicyclists or the motor vehicle drivers in BI crashes.
- C129 – CU Vehicle Maneuver – As was seen in variable C407 above, Curves are not the major problem for Bicycles. We expect they take special precautions when encountering curves. This IMPACT analysis also shows that Turning Right and Overtaking/Passing are significantly over-represented, and thus, they should be given special consideration by bicyclists.
- C224 – CU Estimated Speed at Impact. Speed does not seem to cause too many BI crashes. However, speed could lead to more fatal crashes (both BI and non-BI).

- **Severity Factors**

  - C025 – Crash Severity – Because of the vulnerability of Bicyclists, the fatality rate proportion for BI crashes is over five (5.176) times what it is for non-BI crashes. Both Suspected Serious Injury and Suspected Minor Injury are close to or exceed this. All of the injury categories were highly significantly over-represented. There are few protective equipment items other than helmets, and these are mandated by law, riding a Bicycle should not even be considered without a helmet. The value of helmets has been proven and demonstrated in National studies. However, unlike restraints in motor vehicle crashes, reducing injury to Bicyclists in crashes is quite difficult, and so the emphasis needs to be on totally avoiding these crashes altogether.
  - C038 – Adjusted EMS Arrival Delay – as indicated above, the timing and urban nature of BI crashes clearly cause them to have relatively short EMS arrival delays, which has a positive effect of reducing the number of BI crashes being fata

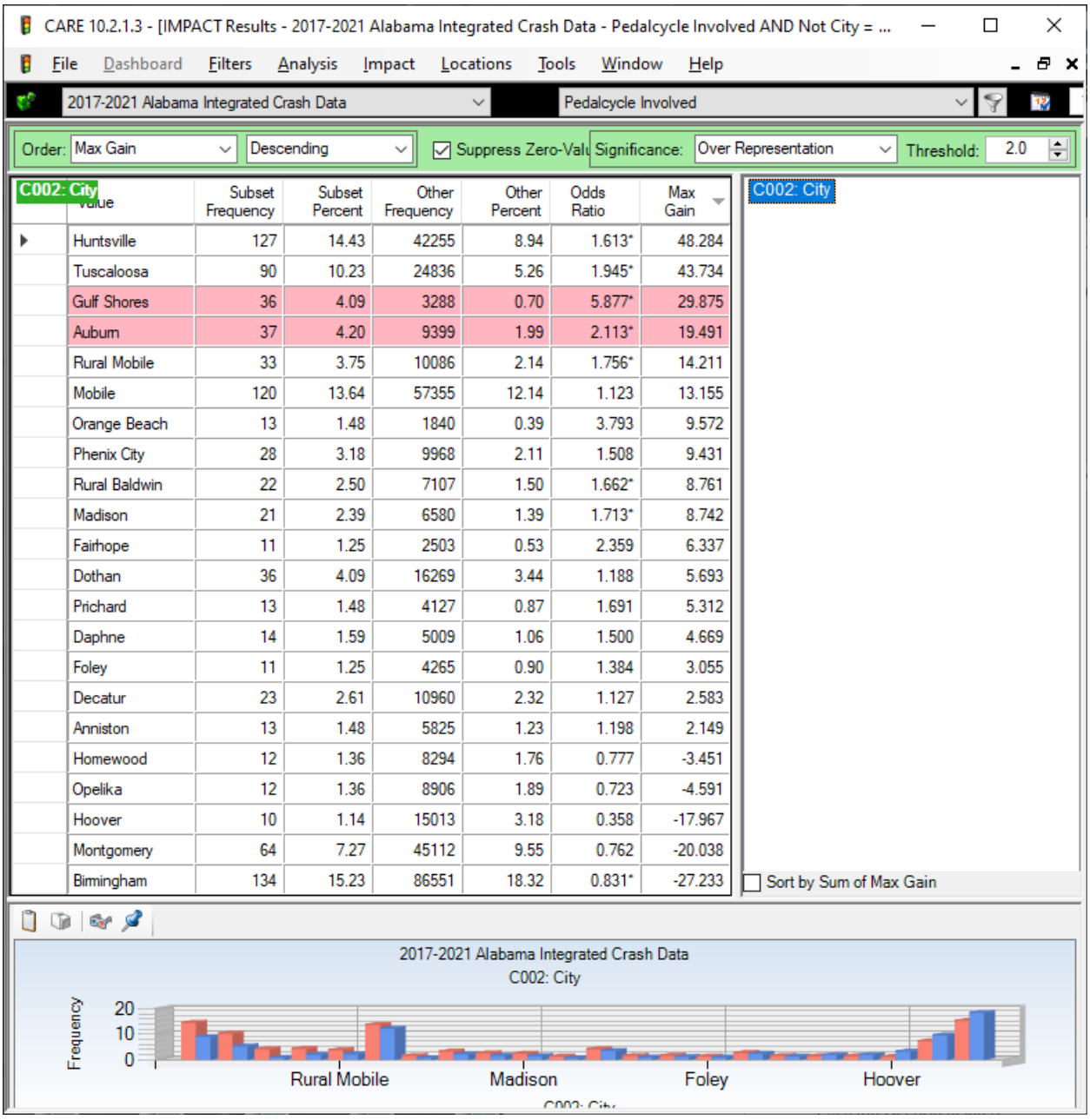
IMPACT DISPLAYS
Geographical Attributes

C001 County (BI over-represented; excluding Subset Frequencies < 10)



This is primarily an indicator of how many Bicycles that each county has on its roads, since the more that they have, the more that will be involved in BI crashes. Those under-represented at the bottom of the table have a BI proportion that is less than their non-BI proportion.

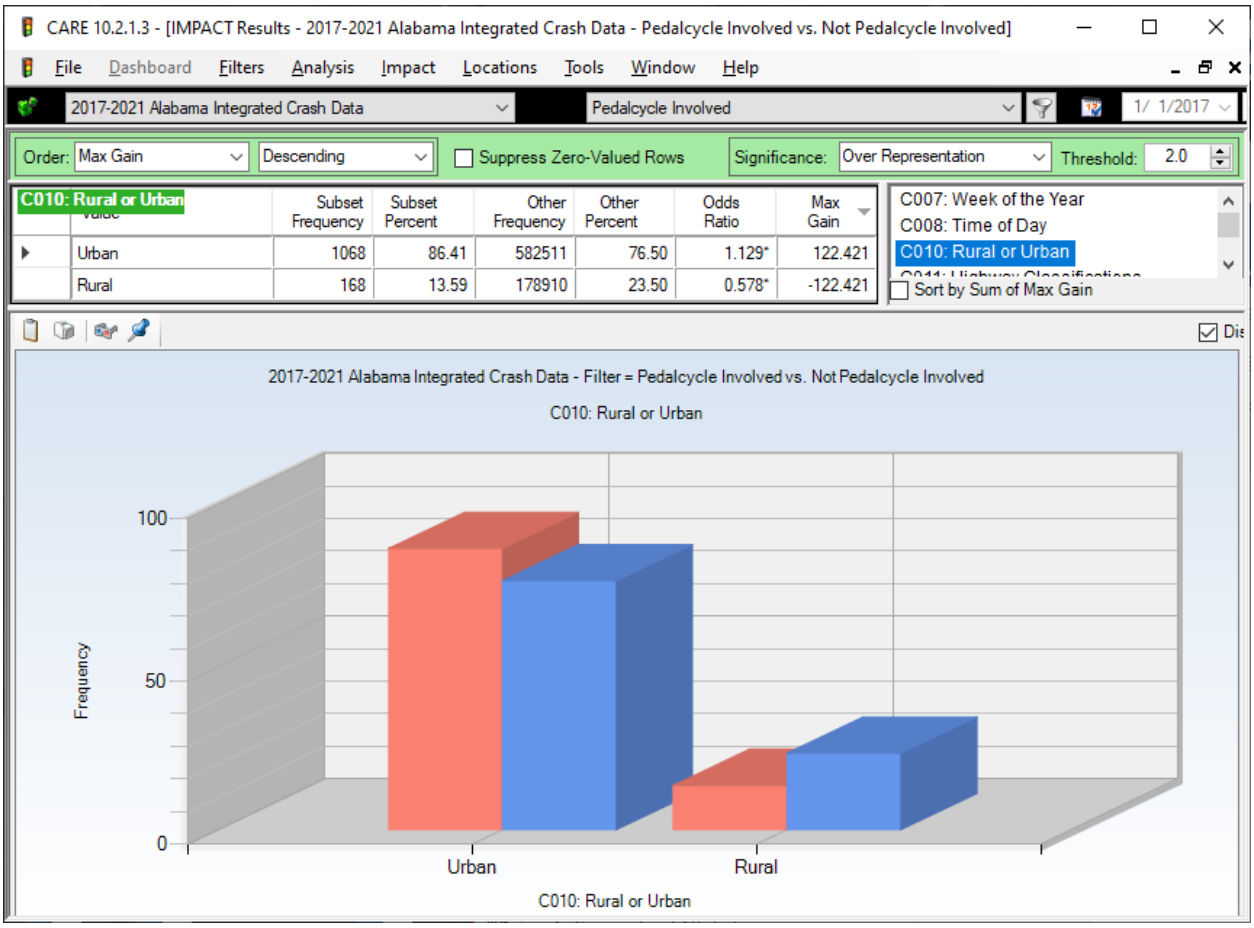
C002 City (BI over-represented; Max Gain < 10 excluded)



C002: City Value	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain
Huntsville	127	14.43	42255	8.94	1.613*	48.284
Tuscaloosa	90	10.23	24836	5.26	1.945*	43.734
Gulf Shores	36	4.09	3288	0.70	5.877*	29.875
Auburn	37	4.20	9399	1.99	2.113*	19.491
Rural Mobile	33	3.75	10086	2.14	1.756*	14.211
Mobile	120	13.64	57355	12.14	1.123	13.155
Orange Beach	13	1.48	1840	0.39	3.793	9.572
Phenix City	28	3.18	9968	2.11	1.508	9.431
Rural Baldwin	22	2.50	7107	1.50	1.662*	8.761
Madison	21	2.39	6580	1.39	1.713*	8.742
Fairhope	11	1.25	2503	0.53	2.359	6.337
Dothan	36	4.09	16269	3.44	1.188	5.693
Prichard	13	1.48	4127	0.87	1.691	5.312
Daphne	14	1.59	5009	1.06	1.500	4.669
Foley	11	1.25	4265	0.90	1.384	3.055
Decatur	23	2.61	10960	2.32	1.127	2.583
Anniston	13	1.48	5825	1.23	1.198	2.149
Homewood	12	1.36	8294	1.76	0.777	-3.451
Opelika	12	1.36	8906	1.89	0.723	-4.591
Hoover	10	1.14	15013	3.18	0.358	-17.967
Montgomery	64	7.27	45112	9.55	0.762	-20.038
Birmingham	134	15.23	86551	18.32	0.831*	-27.233

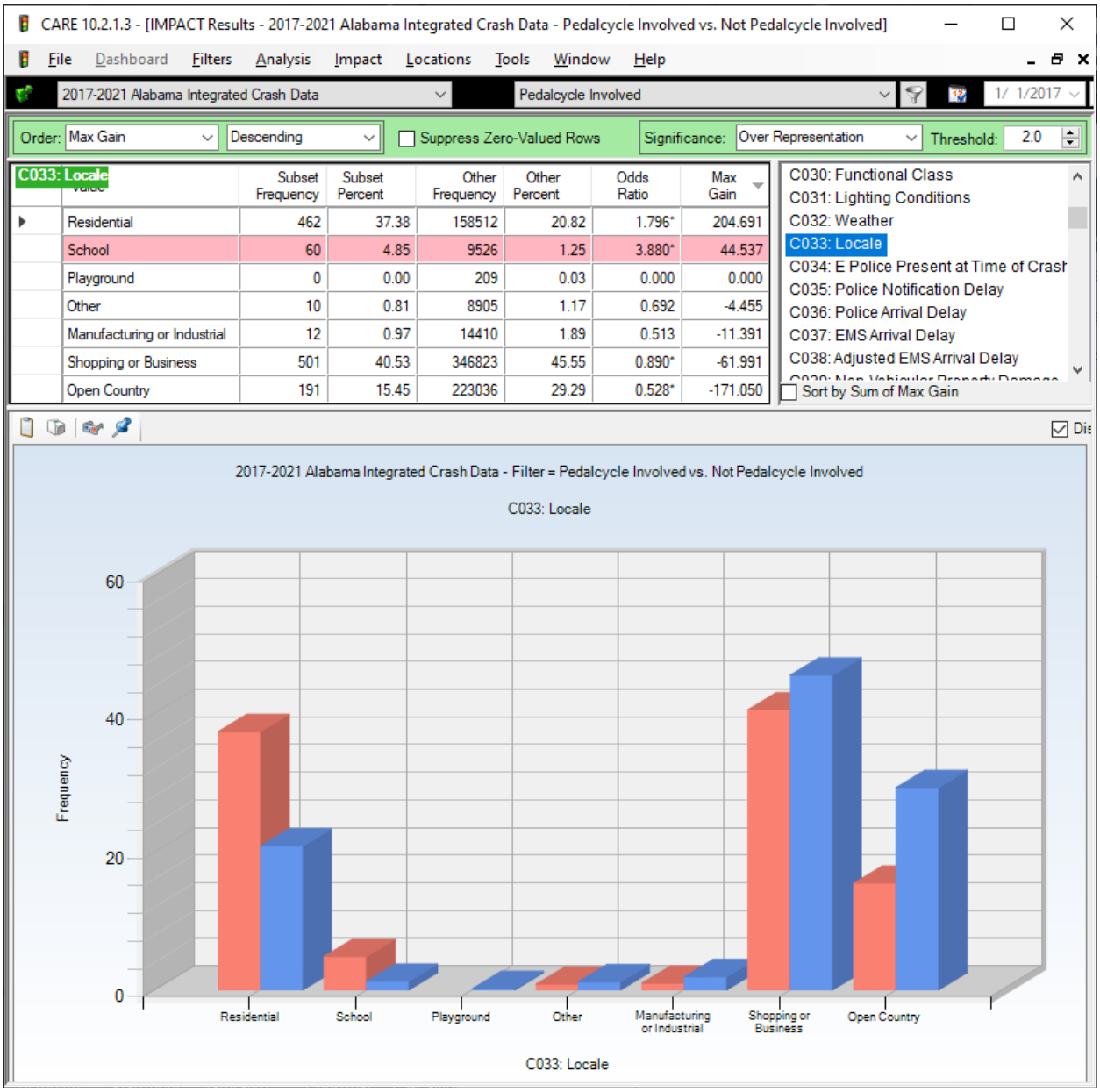
Not shown here, but no rural area of the counties had more than 10 BI crashes.

C010 Rural or Urban



After seeing the city and county results, it comes as no surprise that Urban areas of the state are over-represented by 1.129 times what would be expected in comparison to the non-BI crashes.

C033 Locale



Residential and School areas have the largest over-representations. Surprisingly, Playground had zero crashes compared to 209 non-BI crashes. Open Country is under-represented with a 0.528 Odds Ratio that indicates that its proportion is only about half of the proportion of non-BI crashes.

C025 Severity by C033 Locale

CARE 10.2.1.3 - [Crosstab Results - 2017-2021 Alabama Integrated Crash Data - Filter = Pedalcycle Involved]

File Dashboard Filters Analysis Crosstab Locations Tools Window Help

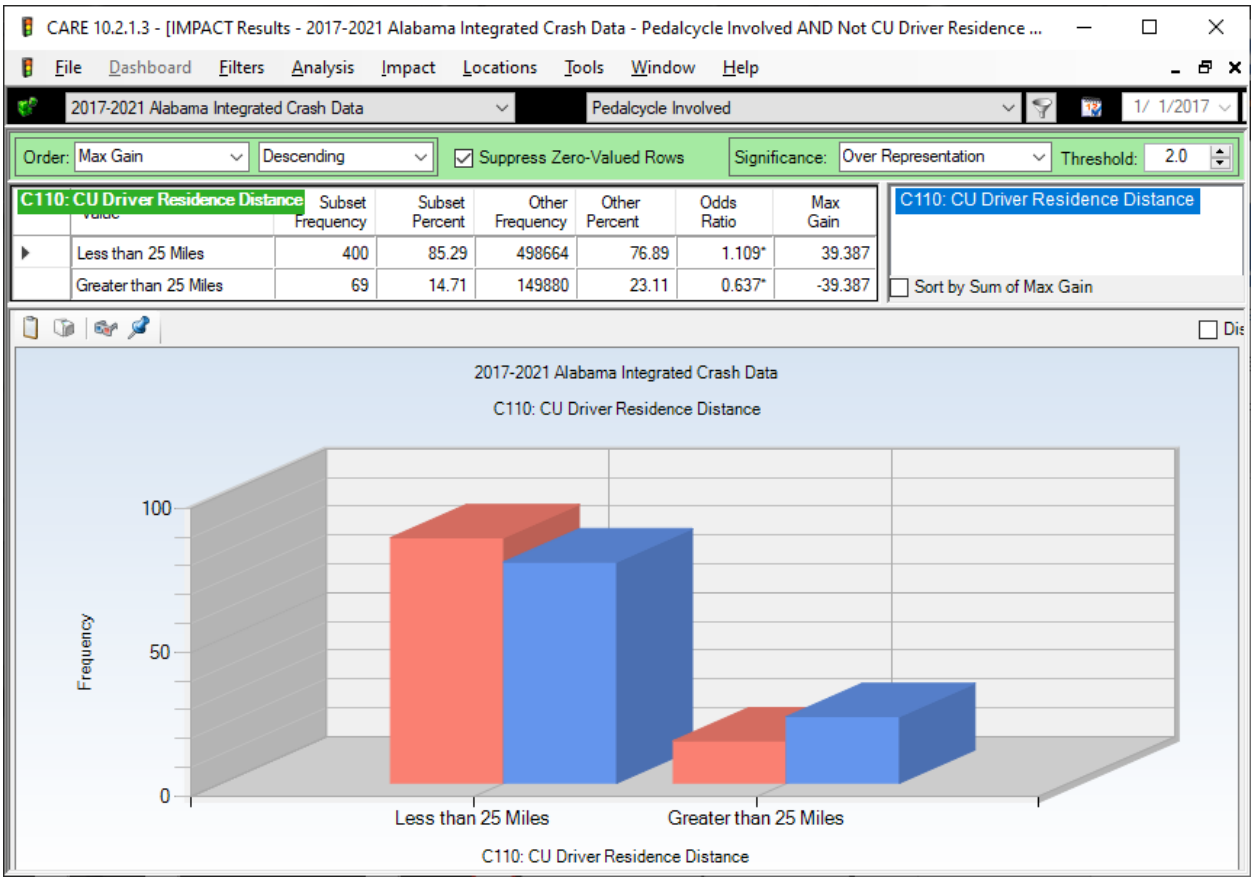
2017-2021 Alabama Integrated Crash Data | Pedalcycle Involved | 1/ 1/201

Suppress Zero Values: None | Select Cells: | Column: Crash Severity ; Row: Locale

	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
Open Country	21	62	61	23	19	5	191
Residential	6	71	214	88	70	13	462
Shopping or Business	8	74	177	107	111	24	501
Manufacturing or Industrial	1	2	5	2	0	2	12
School	0	3	29	10	17	1	60
Playground	0	0	0	0	0	0	0
Other	0	2	3	2	3	0	10
TOTAL	36	214	489	232	220	45	1236

This cross-tabulation shows that primarily Open Country, but also Residential and Shopping or Business had the more severe injuries.

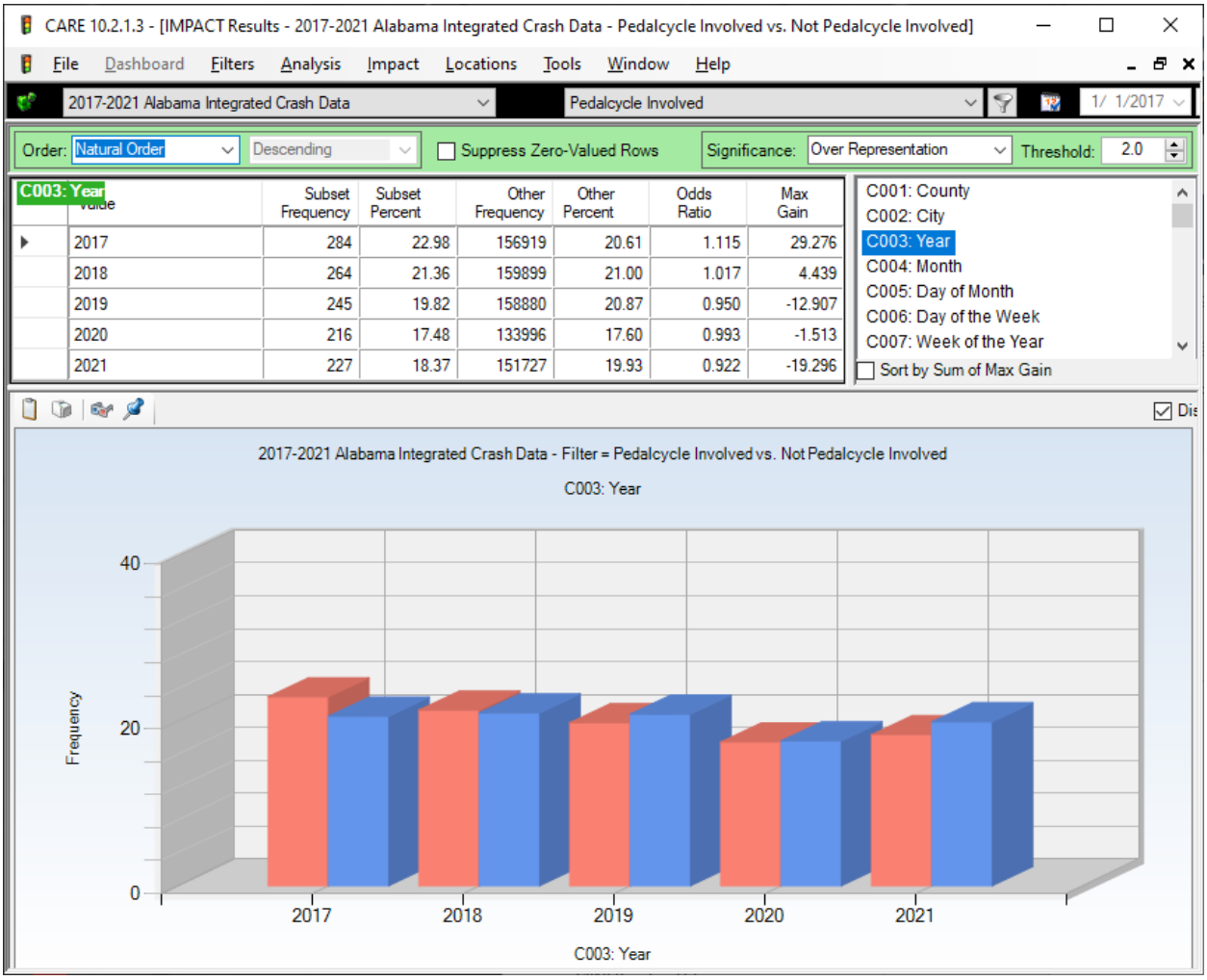
C110 CU Driver Residence Distance



BI crashes tend to be less than 25 miles from the Bicyclist's residence. The proportion of these crashes is over 10% (Odds Ratio = 1.109) greater than the non-BI crashes.

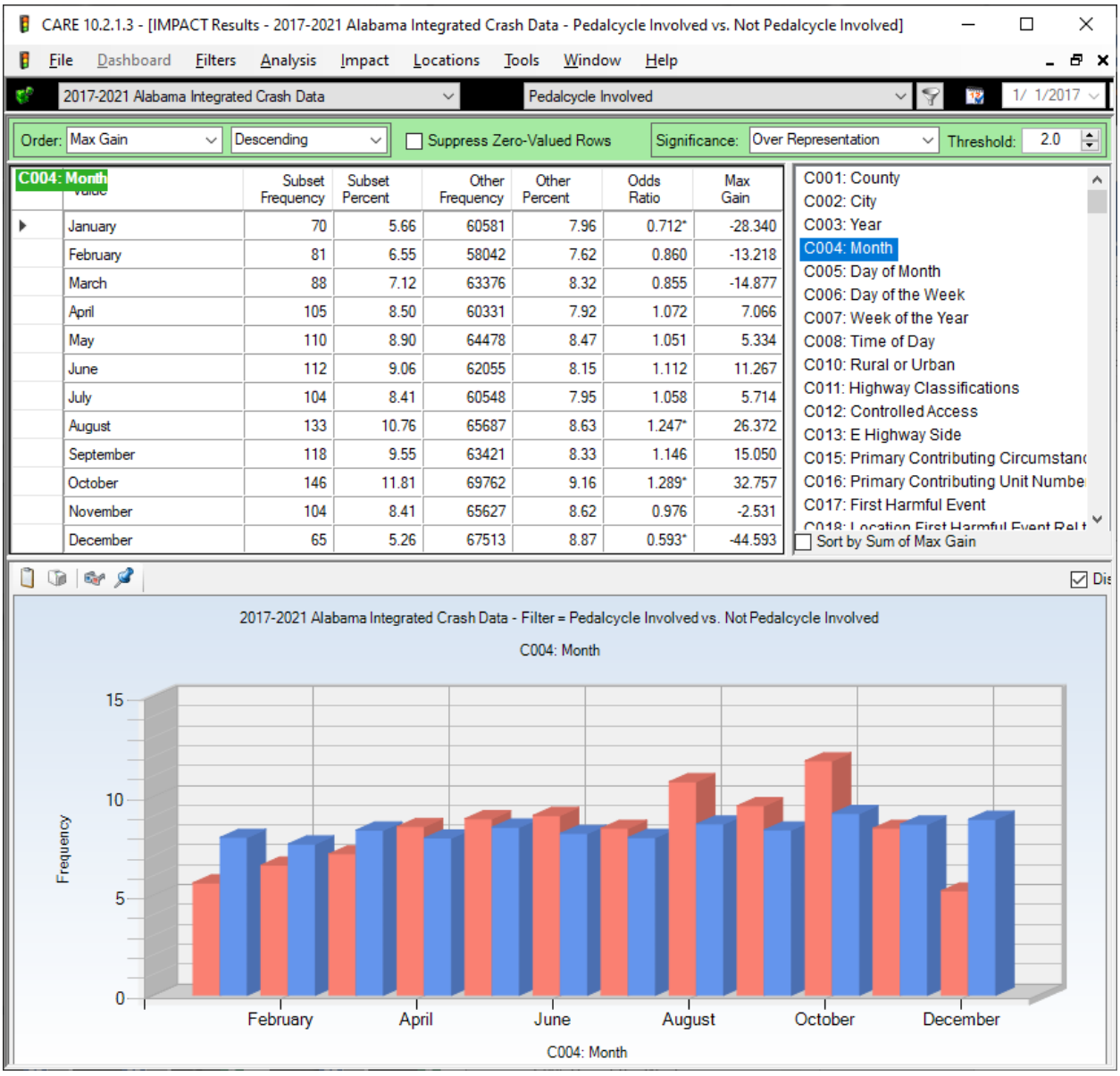
Time Factors

C003 Year (in Max Gain order)



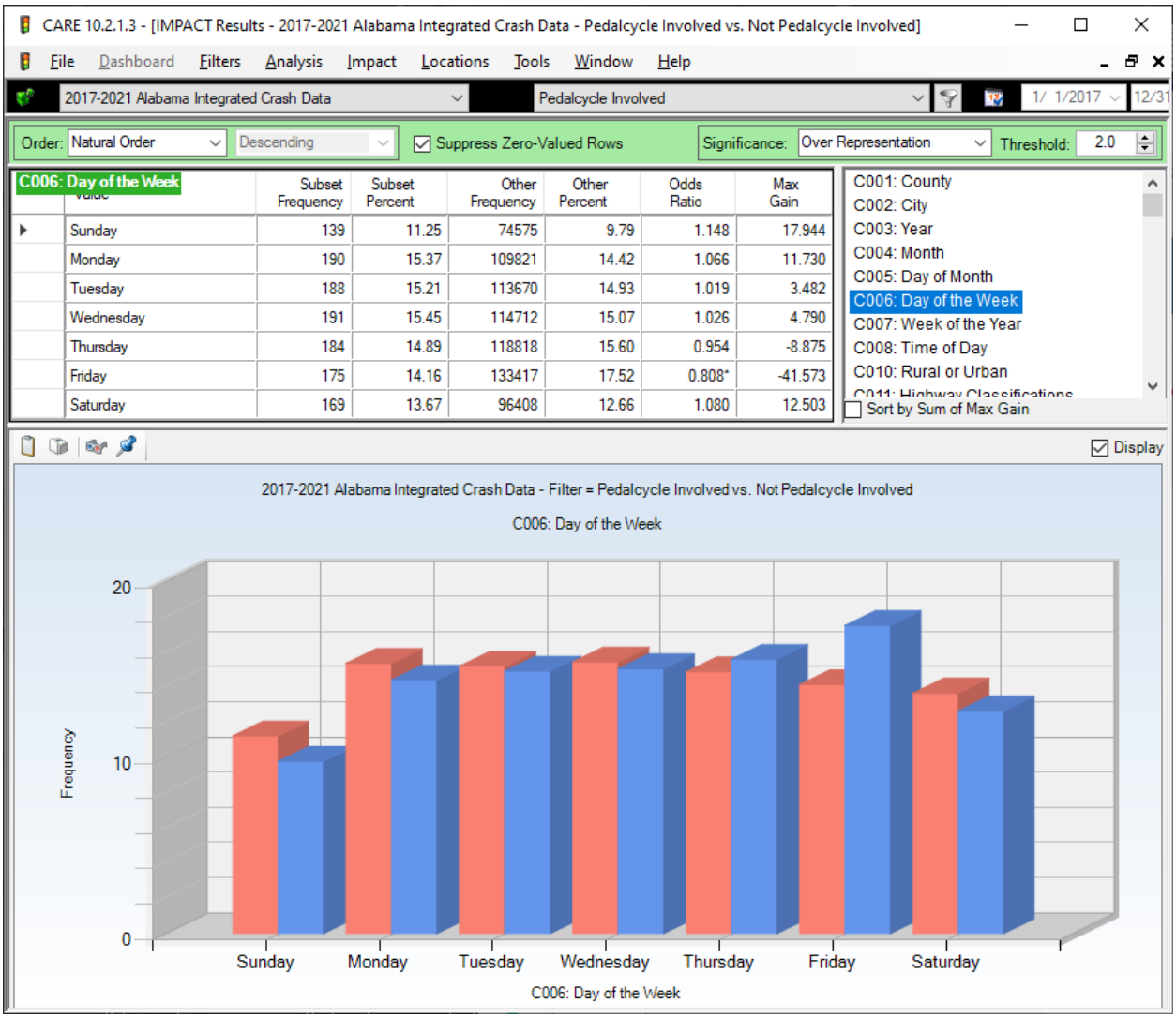
The 2017 year was over-represented (but not significantly). All of the years were quite close to that expected from the non-BI proportions as well. This tends to show that the number of BI crashes is highly dependent upon the non-BI traffic density as well as the number of Bicyclists on the streets.

C004 Month



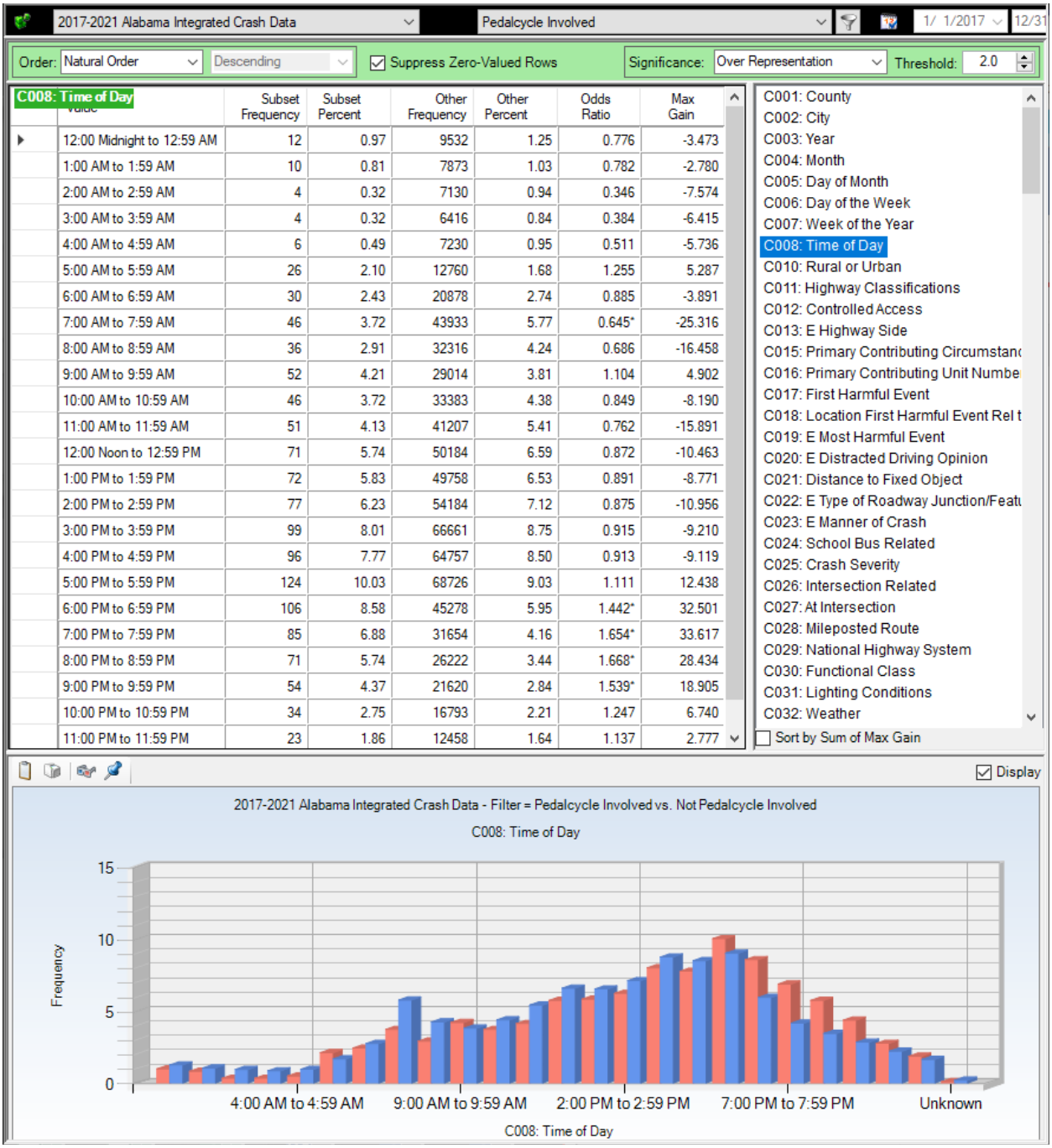
The spring and late summer months are favored by Bicyclists. December and January are significantly under-represented for BI crashes, while the preceding months of August, September and October are clearly over-represented. This would seem to depend on the number of Bicyclists who take to the roads as opposed to the traffic density in general.

C006 Day of the Week (in natural order)



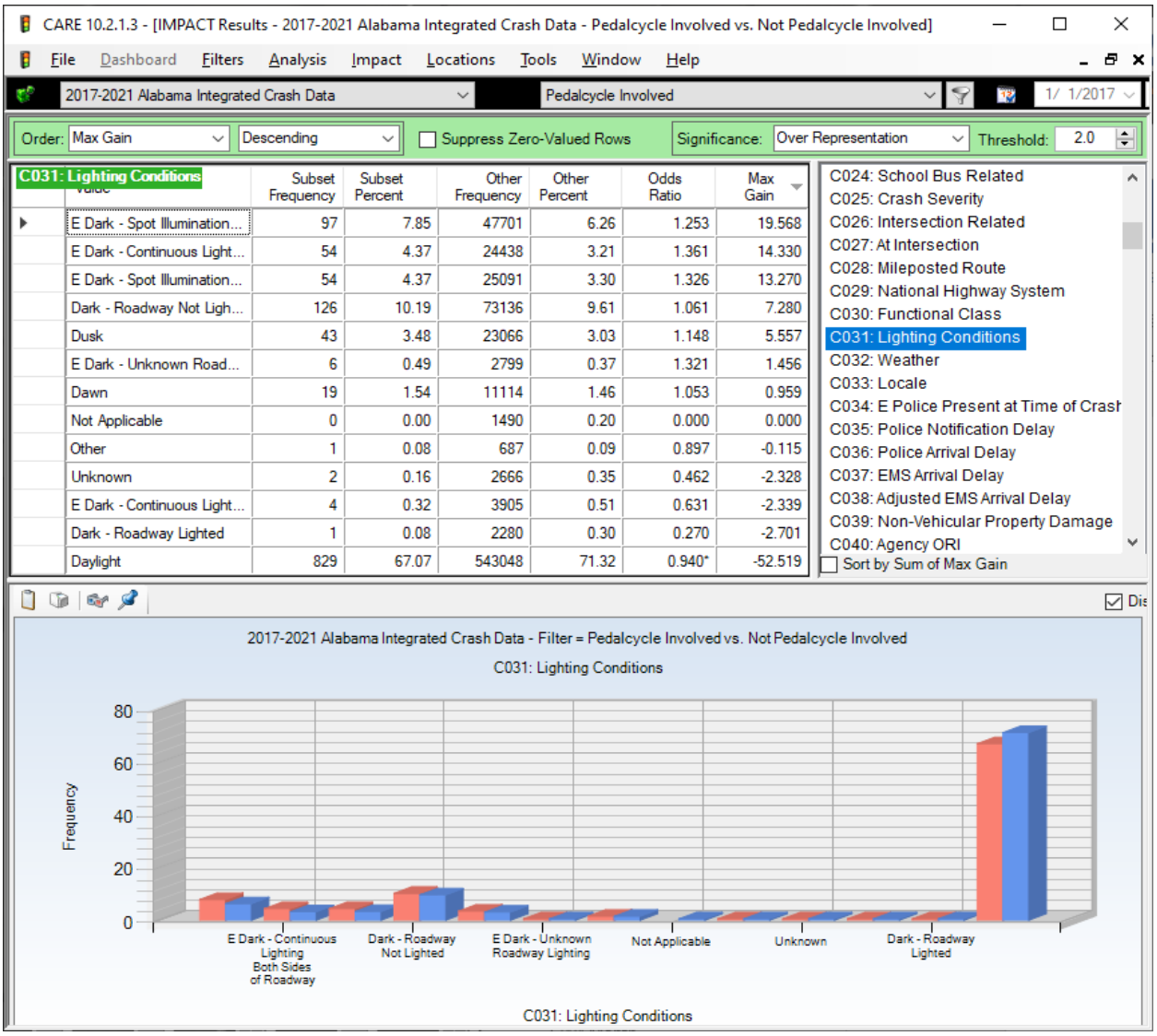
The non-work (and non-school) days of Saturday and Sunday, as well as Monday, Tuesday and Wednesday were over-represented, but none (except under-represented Friday) were statistically significant. Friday was significantly under-represented in that it typically has a much larger traffic density that the other days.

C008 Time of Day



Evening hours from 6 PM through 9:59M are consistently and significantly over-represented. All other hours are under-represented and few of these are significant. The strangest over-representation finding is that of 5-5:59 AM, which is probably a time when many Bicyclists get up to beat heavy traffic.

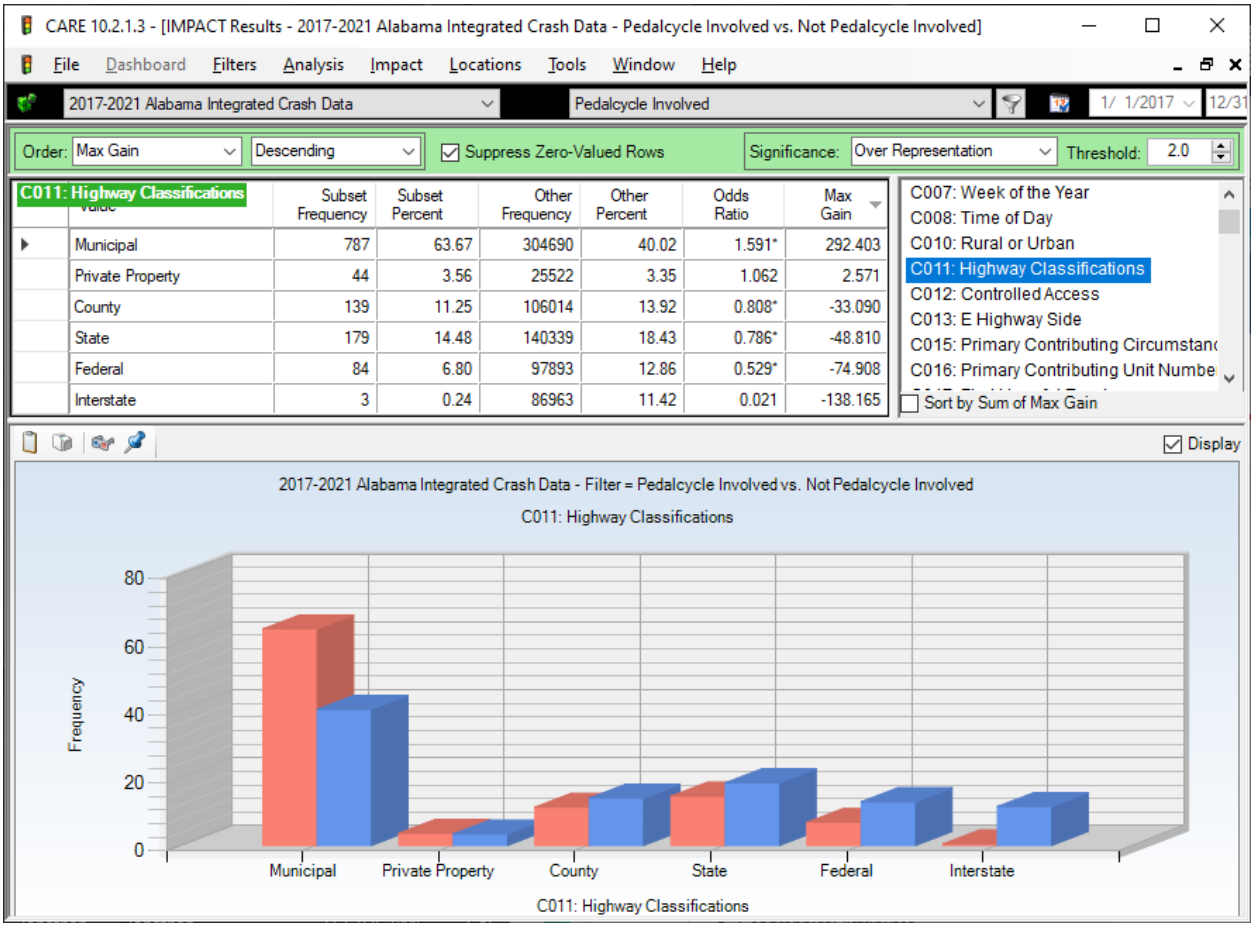
C031 Lighting Conditions (in Max Gain order)



While Daylight has the largest number (as would be expected) the proportion for this is under-represented with an Odds Ratio of 0.940, which is significant, but obviously still close to 1.000, which indicates little difference in the proportions. Bicyclists seem to have much more problems relatively speaking) in the following lighting conditions, all of which were over-represented (crash frequency and Odds Ratio given): Dark - Spot Illumination Both Sides of Roadway (97, 1.253), Dark - Continuous Lighting Both Sides of Roadway (54, 1.361), Dark - Spot Illumination One Side of Roadway (54 1.326), Dark - Roadway Not Lighted (126, 1.061), Dusk (43, 1.148), Dark - Unknown Roadway Lighting (6, 1.321), and Dawn (19, 1.053). All of these crashes could be caused by relative inability of motor vehicle drivers to see the Bicyclist.

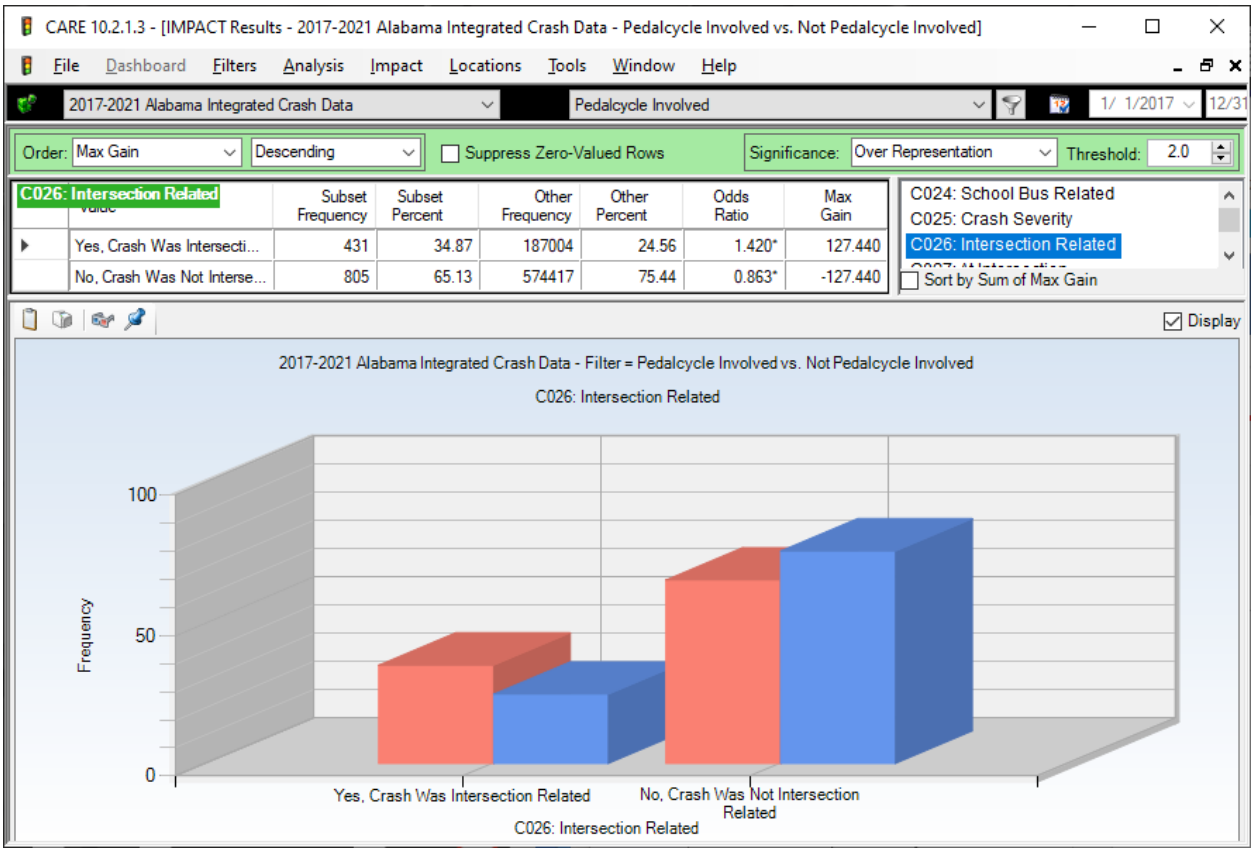
Roadway Characteristics

C011 Highway Classification



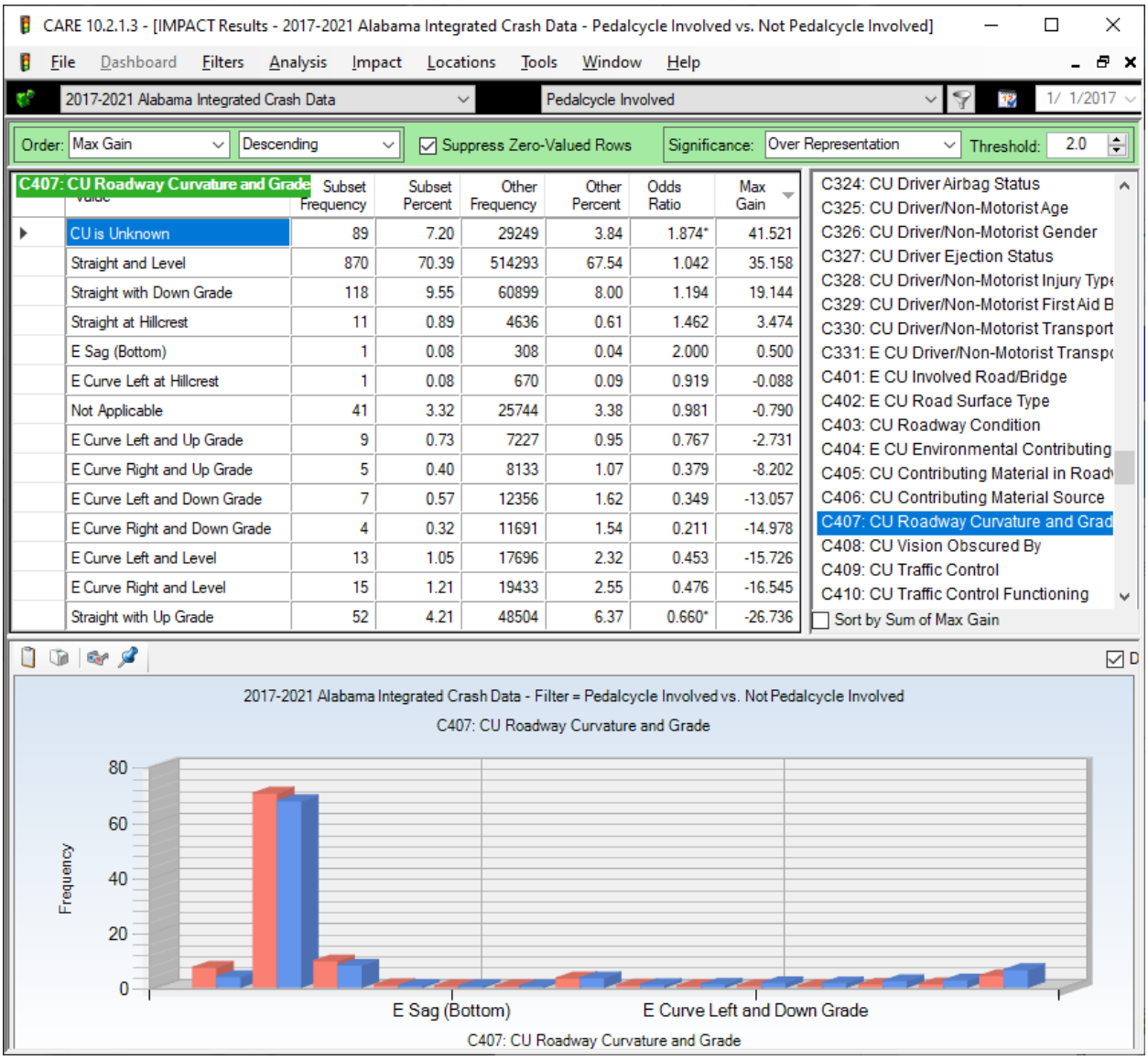
The Municipal BI proportion is 1,591 times the Non-BI. Private Property BI Crashes are also over-represented but not significantly. All other Highway Classifications are under-represented.

C026 Intersection Related



Intersection Related crashes are significantly over-represented, a further reflection of their Urban nature.

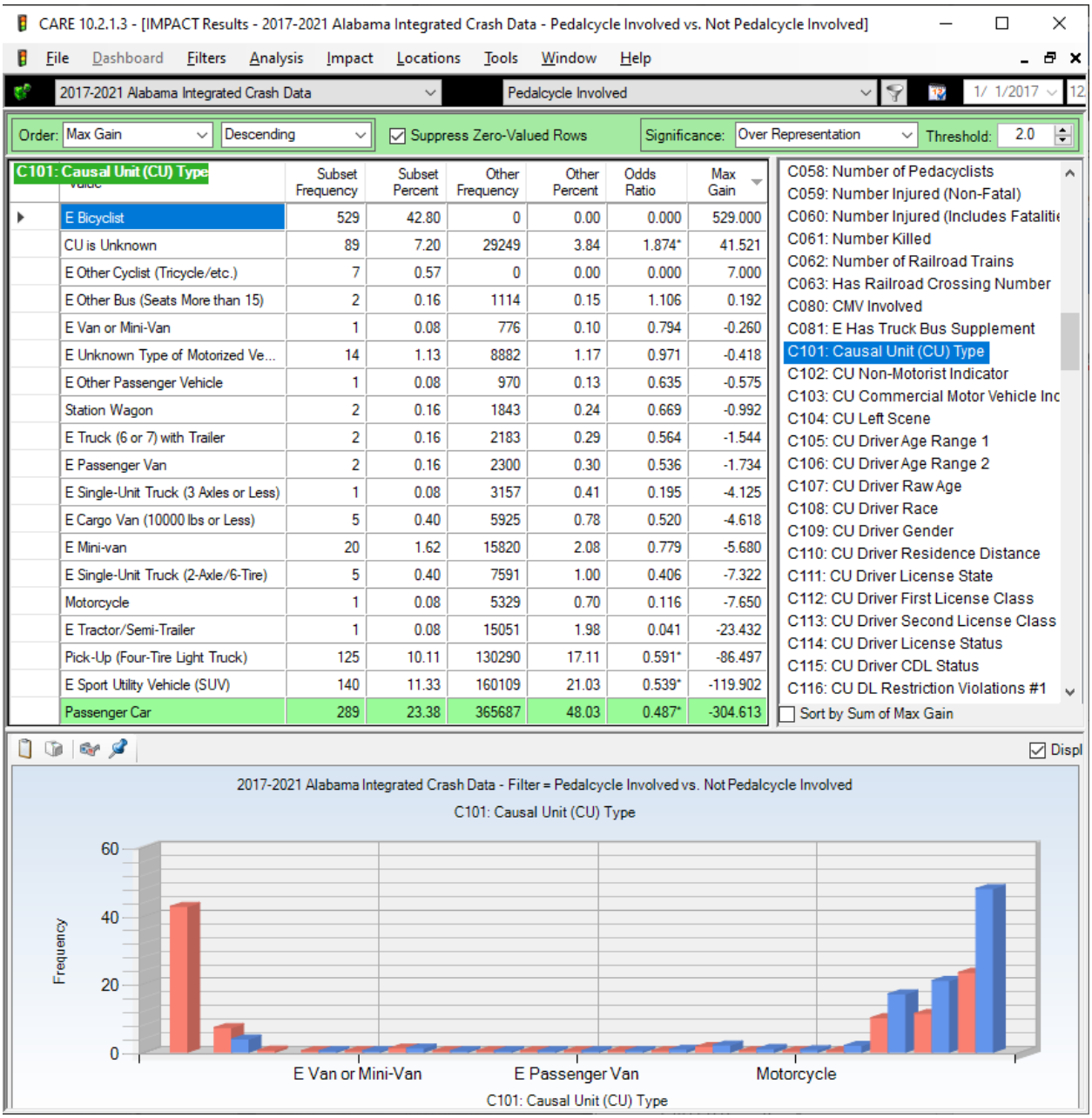
C407 CU Roadway Curvature and Grade



All of the highly significant over-represented items involve straight stretches. Perhaps this is because motor vehicle drivers are generally being more careful on curves to see any irregularities. Bicyclists need to be informed that straight roads are not safer, and they need to be equally vigilant on straight as well as curved roadways.

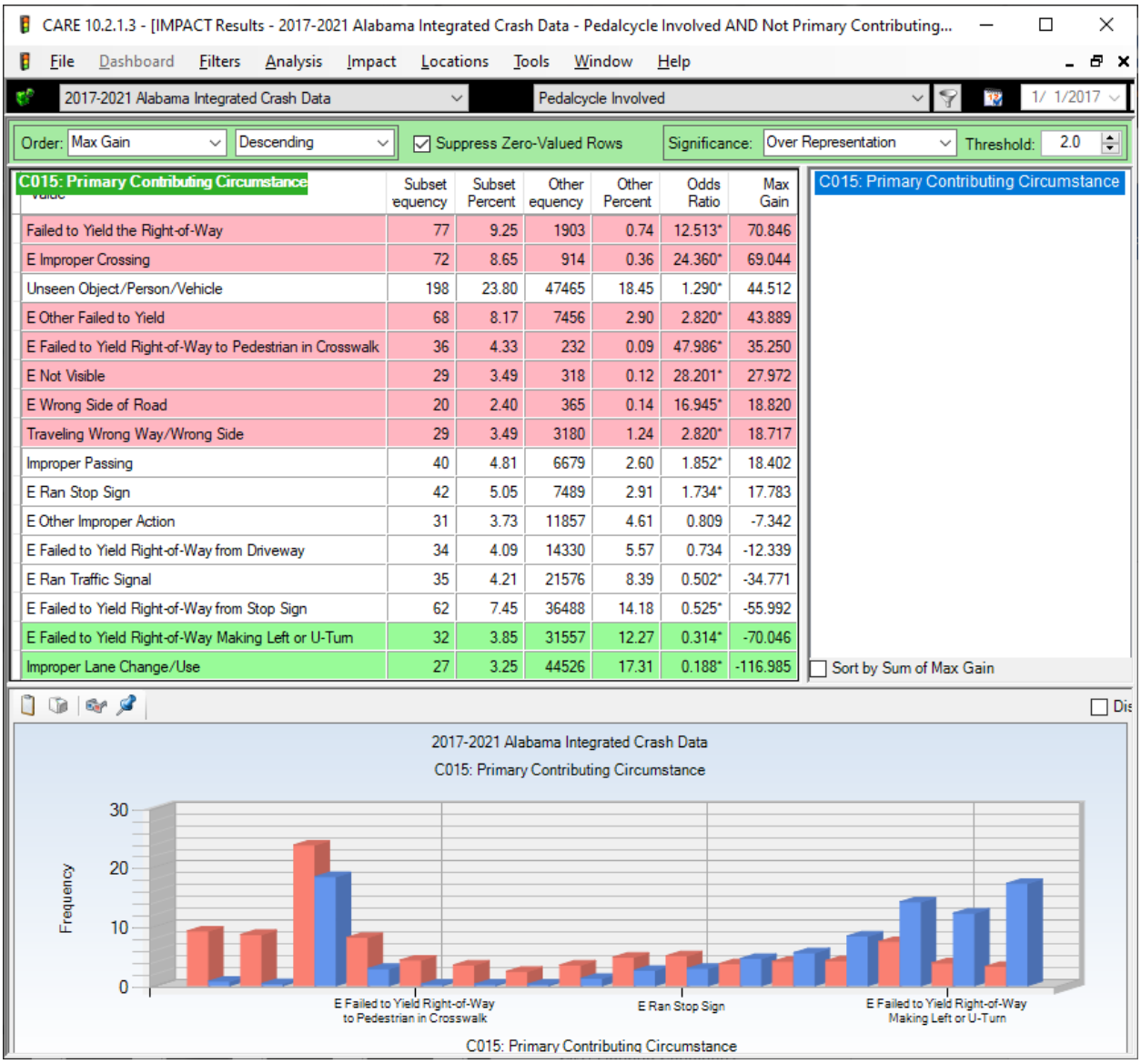
Driver Factors

C101 Causal Unit (CU)



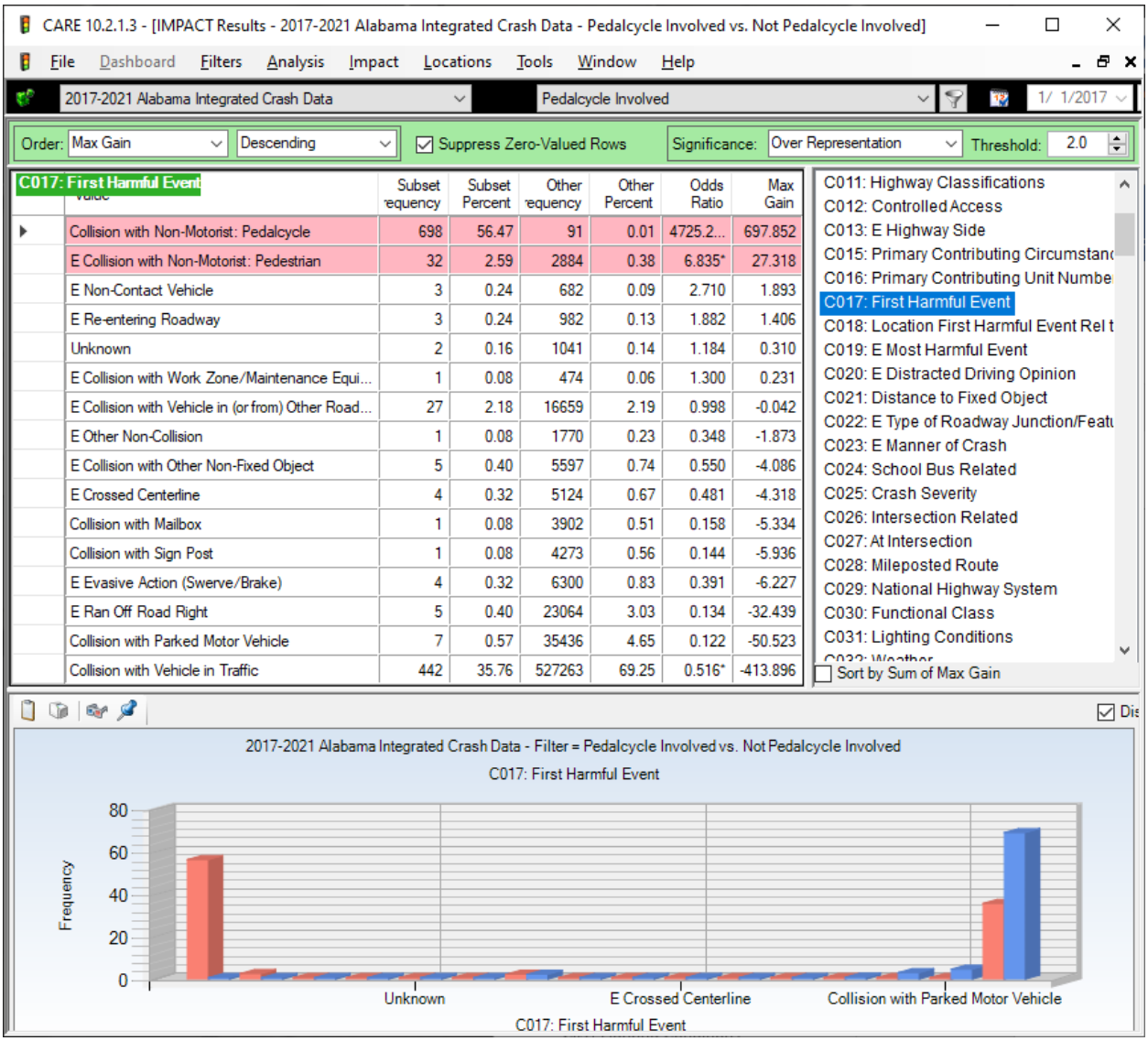
This attribute is very important because most of the items that follow are for the Causal Unit (CU), which was not necessarily the bicycle. The above shows that the bicyclist was only causal in 42.80% of the crashes. We did not force the bicycle to be the causal unit in order to get as many crashes as possible into the analyses.

C015 CU Primary Contributing Circumstances -- PCCs (excluding < 20 items)



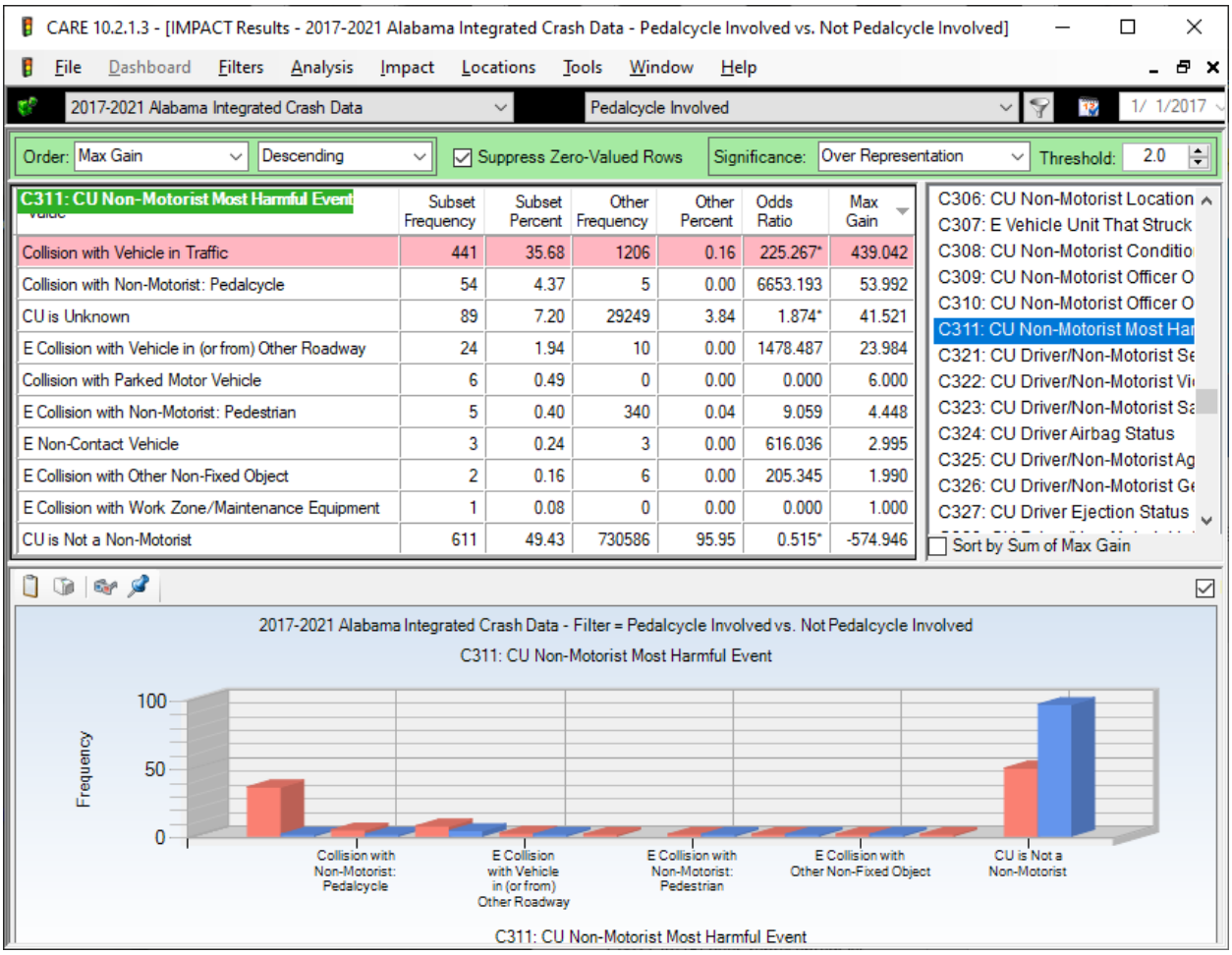
The following PCCs had 68 or more occurrences over the 5-year period of the study: Failed to Yield the Right-of-Way (77), Improper Crossing (72), Unseen Object/Person/Vehicle (198), and Other Failed to Yield (68). These are items that bicyclists should be especially cognizant of as well as the next four on the list. While all others are under-represented, they occur with sufficient frequency to be of concern.

C017 First Harmful Event



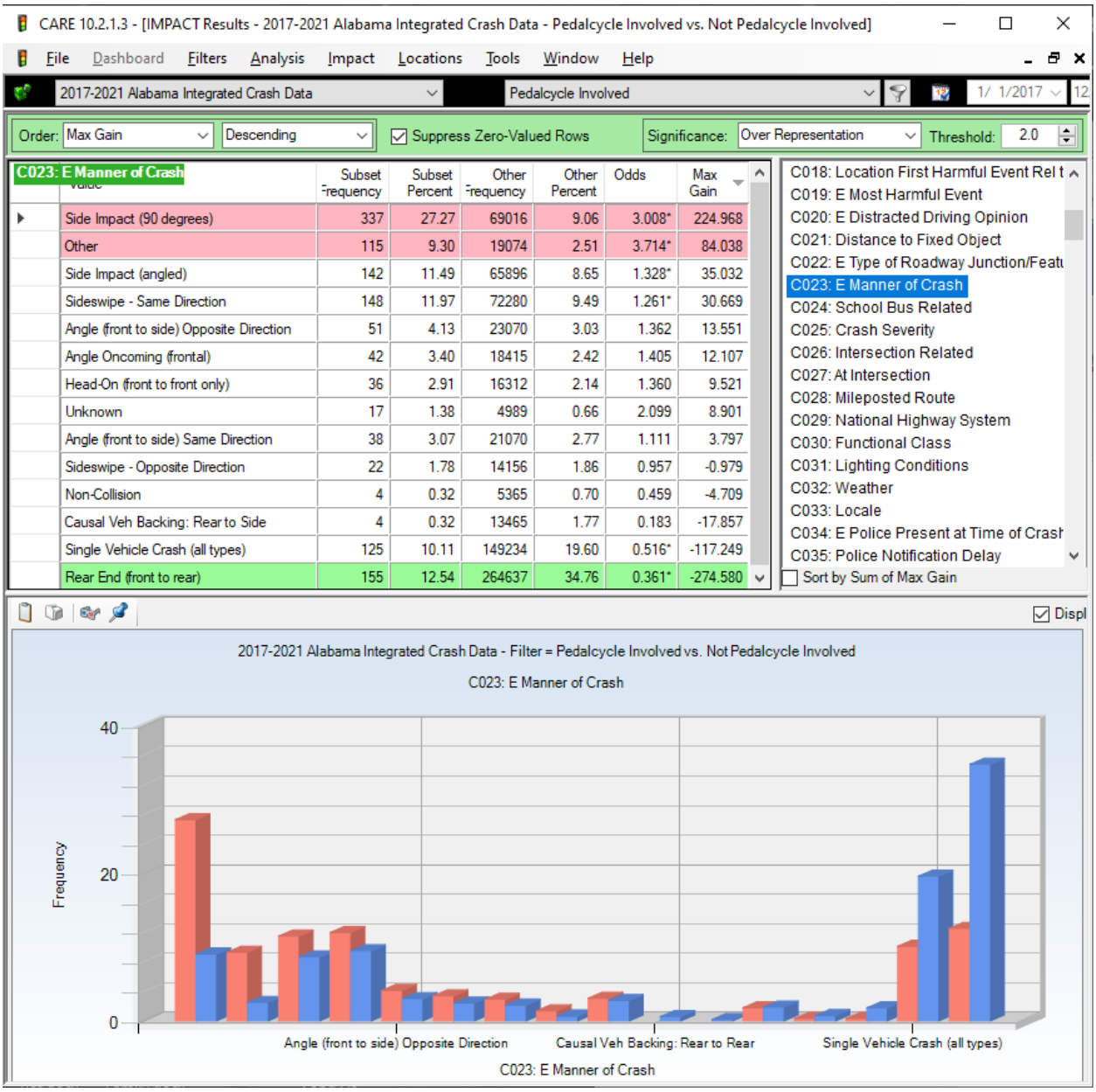
The vast proportion of bicycle crashes involve motor vehicle driver that are in their normal traffic. Although "Collision with Vehicle in Traffic" is under-represented, it is still of a high enough frequency to be of concern.

C311 CU Non-Motorist Most Harmful Event



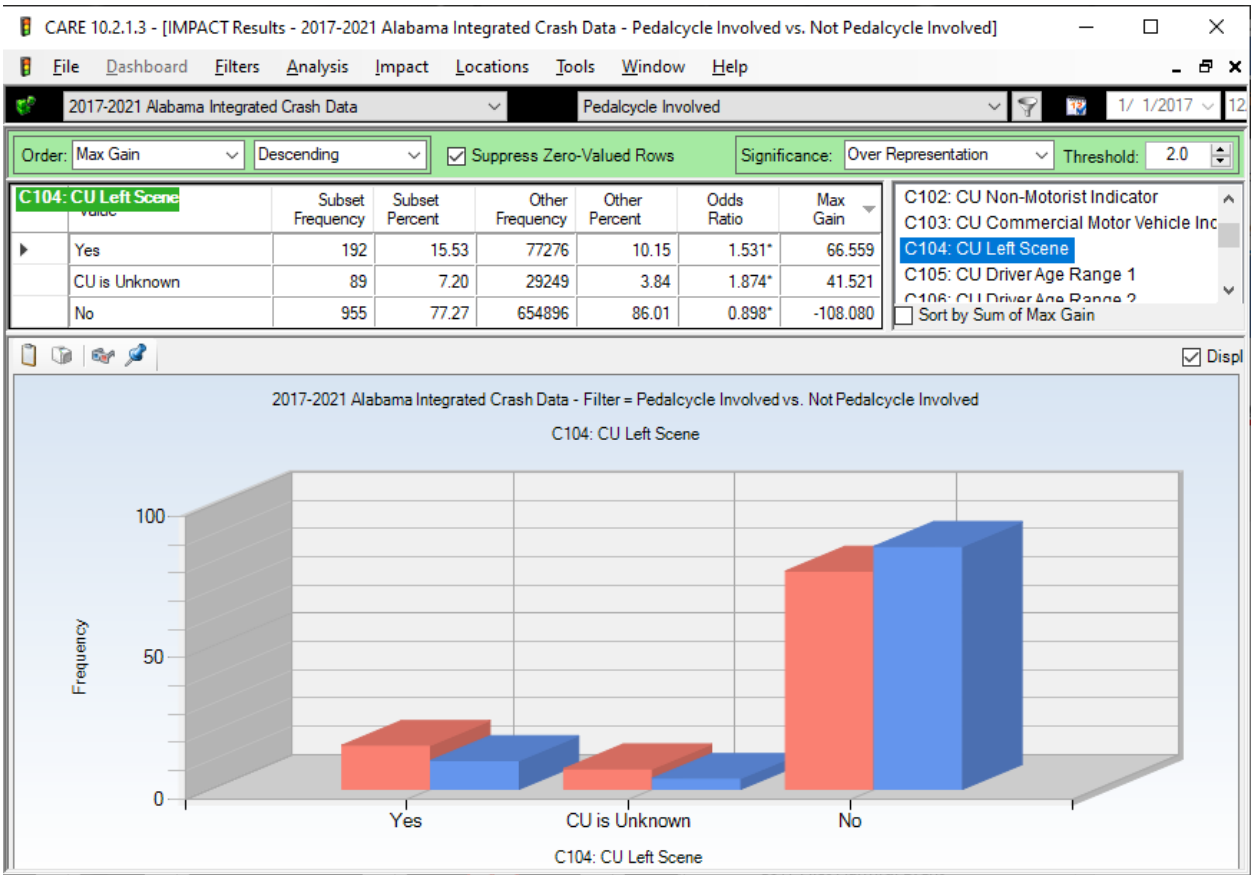
The filter we used in performing the IMPACTs assured that the all non-motorists here are Bicyclists. The largest, Collision with Vehicle in Traffic (441) shows where the primary danger is for bicyclists.

C023 Manner of Crash



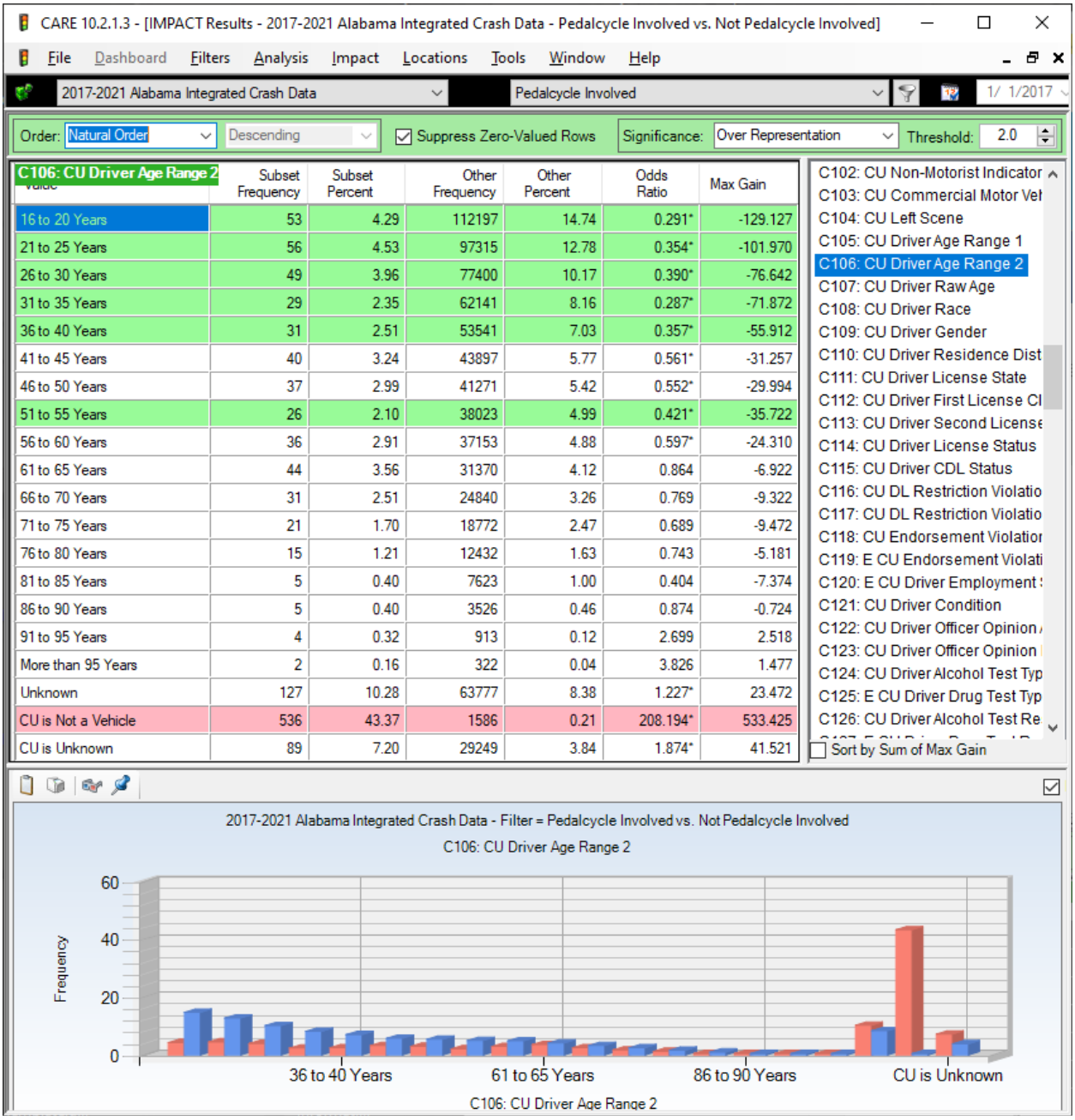
The top five by frequency are: Side Impact-90 degrees (337), Side Impact-angled (142), Sideswipe - Same Direction (148), Single Vehicle Crash-all types (125-under-represented), and Rear End-front to rear (155-under-represented). Bicyclists should be aware of these crash types. Most, but not all, crashes involve being overtaken by motor vehicles.

C104 CU Left Scene



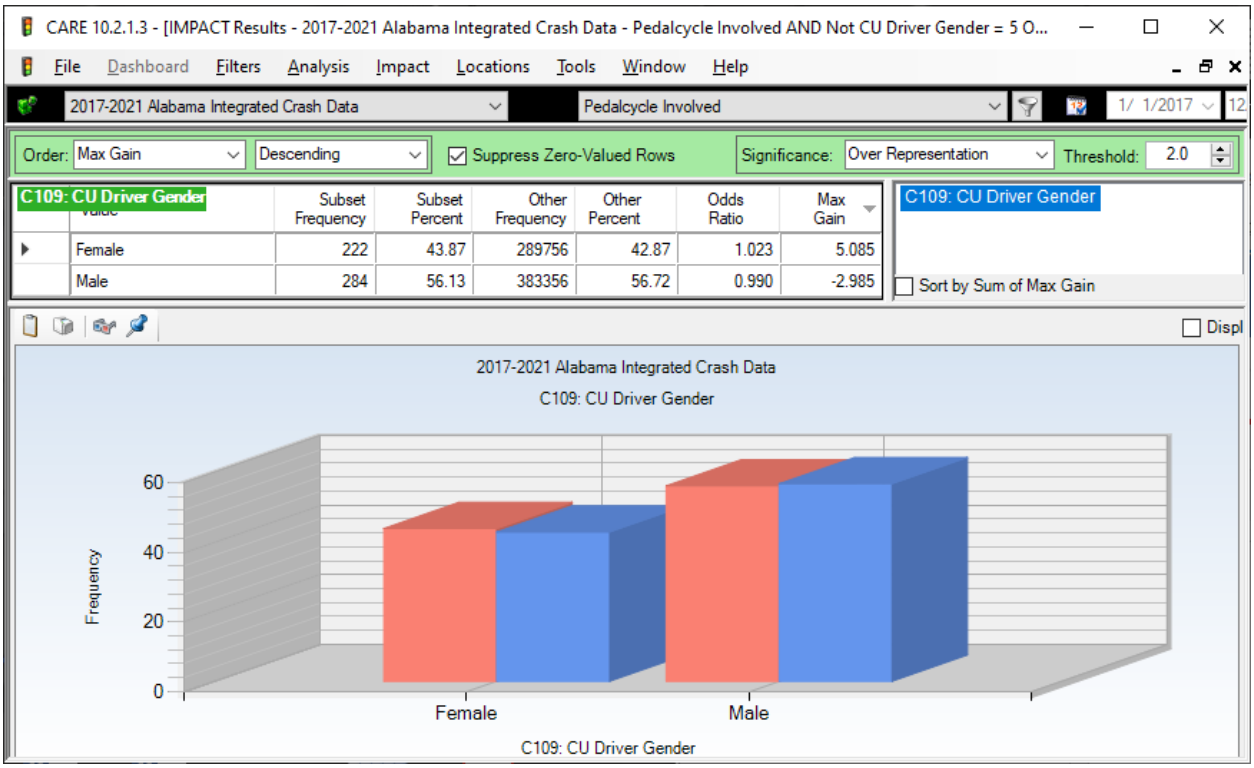
This is for the causal vehicle left the scene. No bicycle was recorded to have left the scene.

C106 CU Driver Age Range (motor vehicle CUs only)



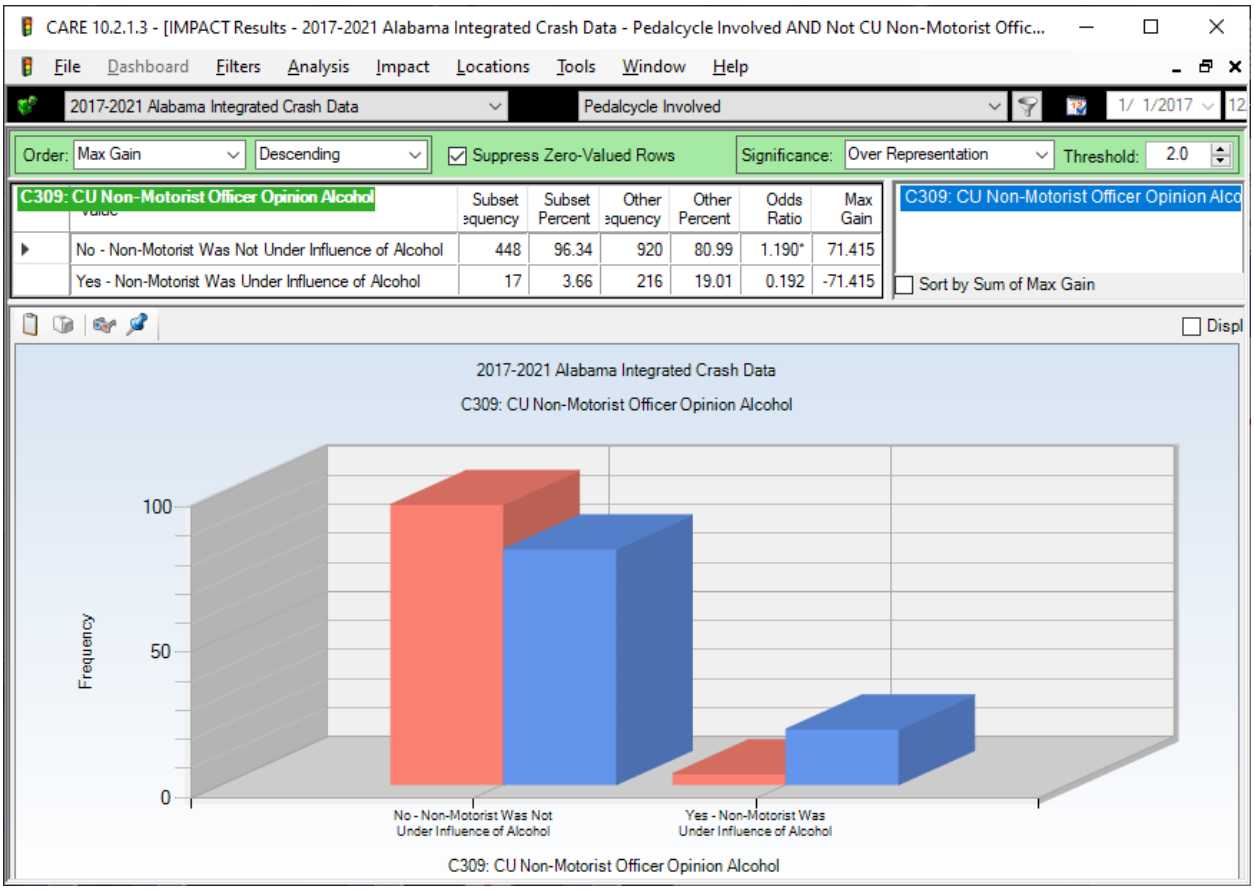
The age distribution here is strictly for causal motor vehicles, and it is presented in natural order.. Restricting this vehicle to “bicycle causals only” led to 529 cases (as opposed to the 536 given here) in which the “Causal Vehicle is not a Vehicle” (ages are not required on the crash report form for non-motorized vehicles).

C109 CU Driver Gender (causal motor vehicles only)



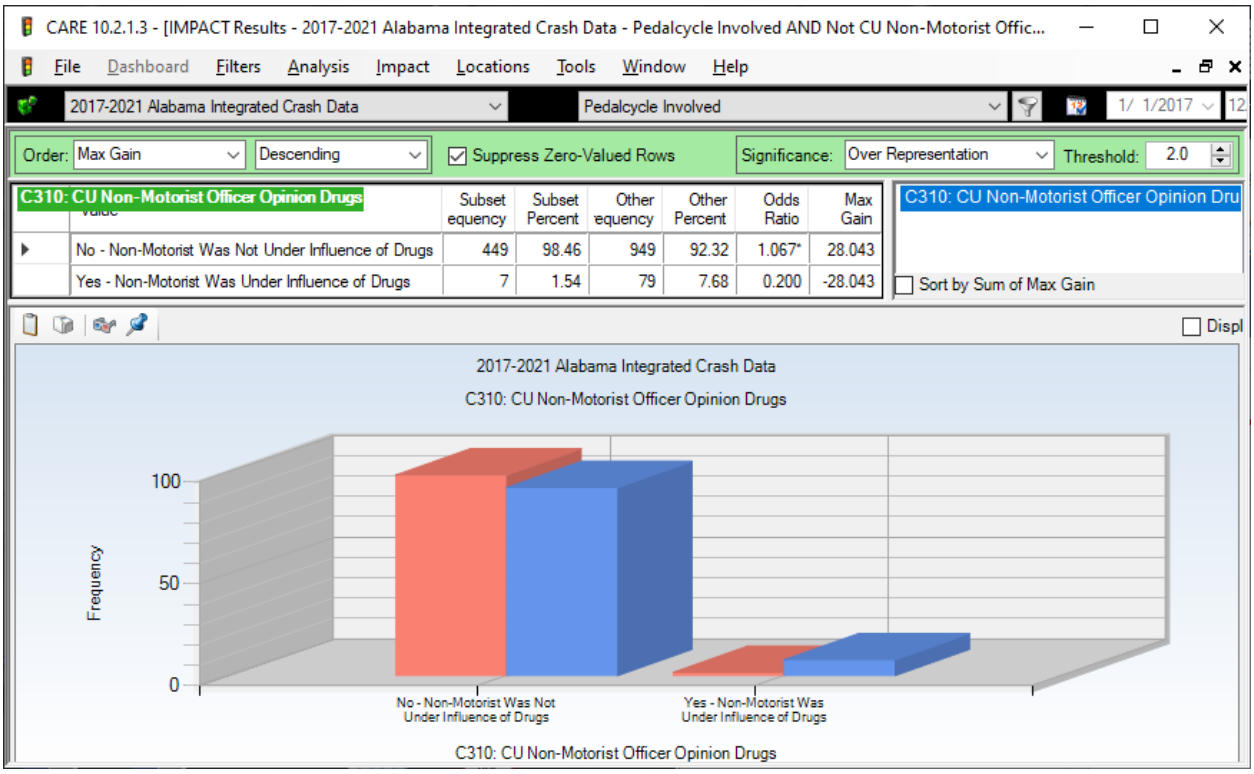
Both male and female were very close to their proportion in the total crashes in the population.

C309 CU Non-Motorist Officer Opinion Alcohol



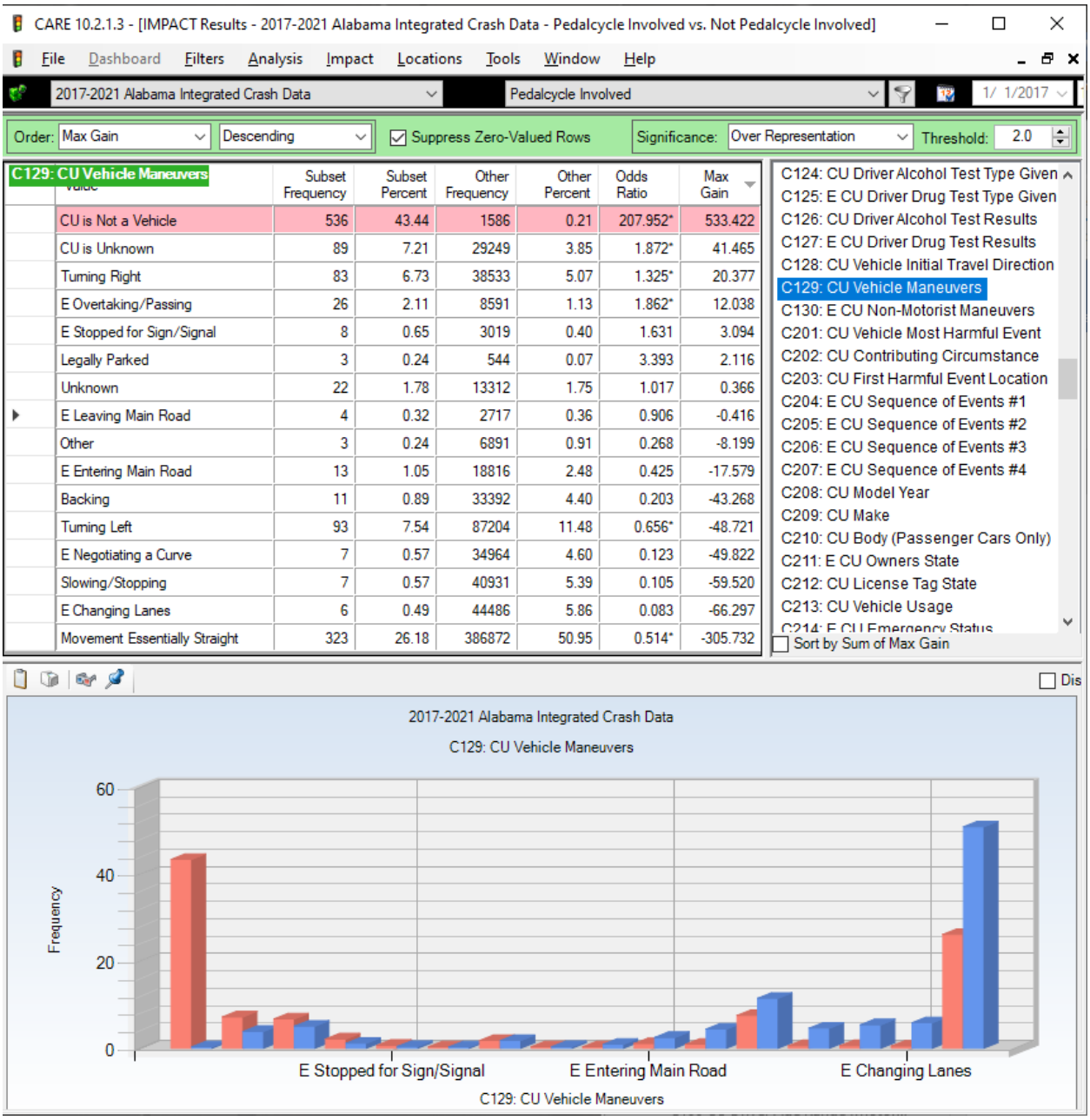
The filter we used in performing the IMPACTs assured that the all non-motorists here are bicyclists. We would not expect them to be under the influence of alcohol while enjoying their mode of transportation. No use of alcohol found was over-represented and the positive alcohol findings were under-represented.

C310 CU Non-Motorist Officer Opinion Drugs



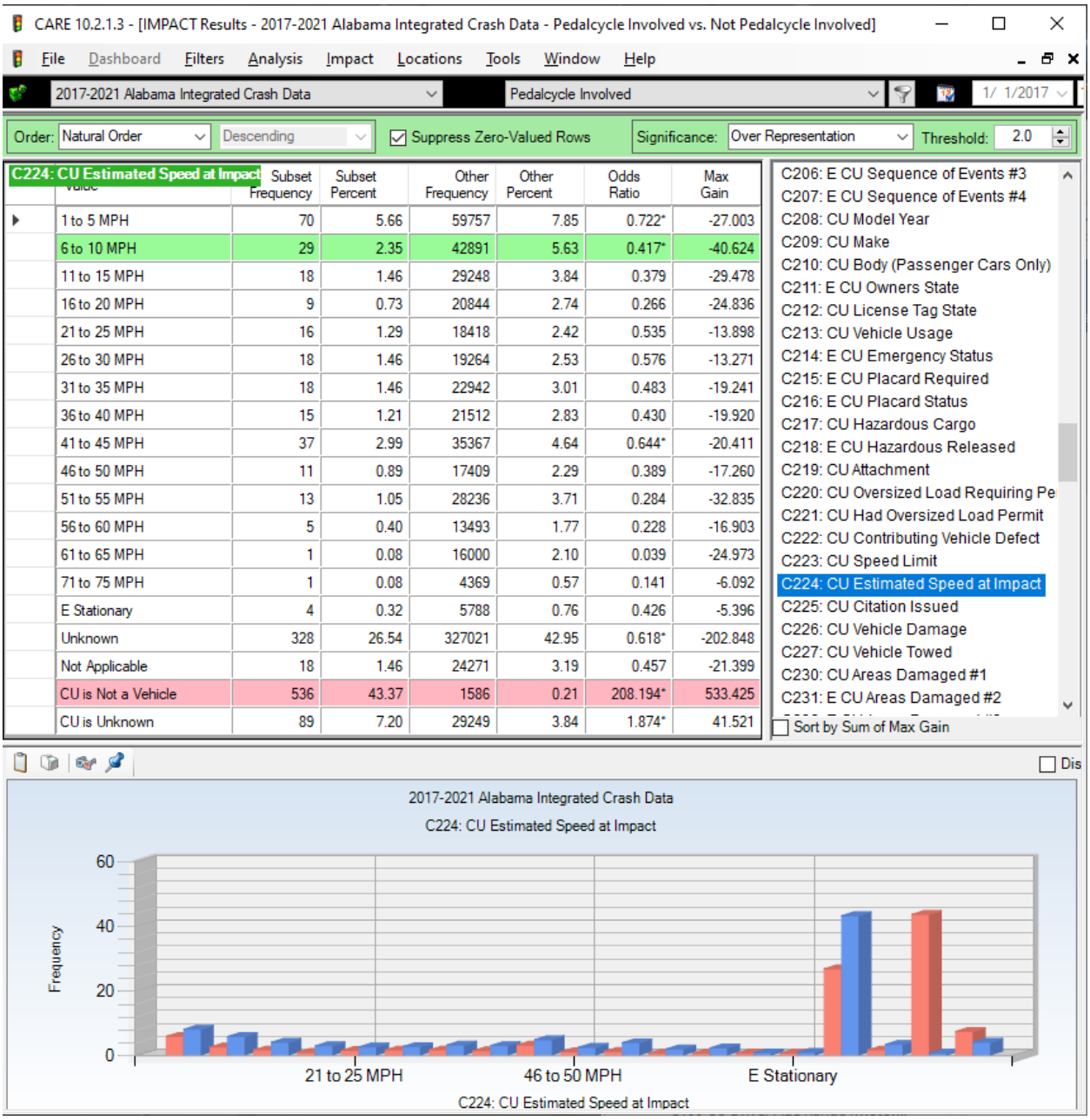
The filter we used in performing the IMPACTs assured that the all non-motorists here are Bicyclists. Quite comparable to the results for alcohol, we would not expect them to be under the influence of non-alcohol drugs while enjoying their mode of transportation. No use of drugs was found was over-represented and the positive findings were under-represented.

C129 CU Vehicle Maneuver (causal motor vehicles only)



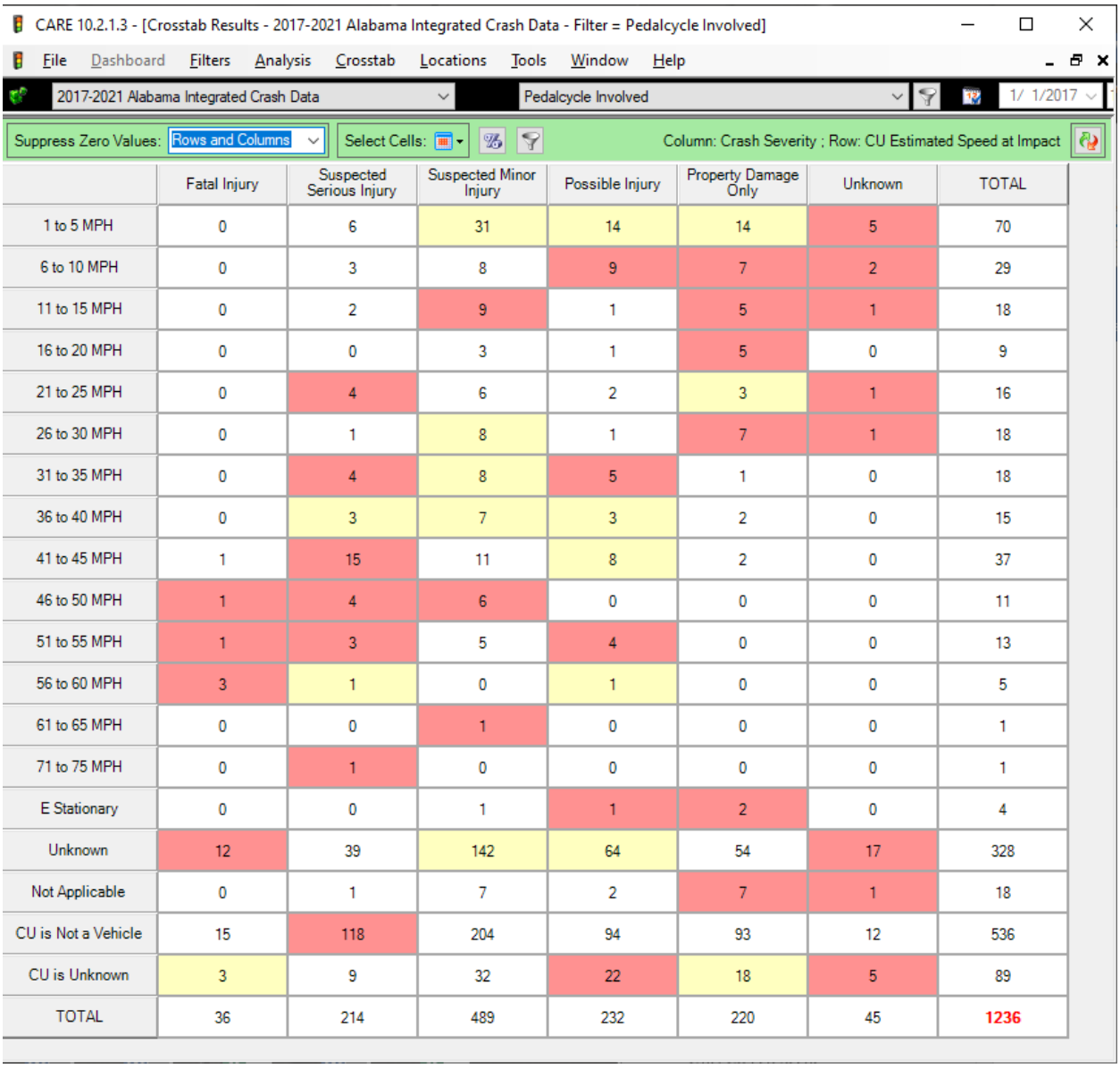
Causal Unit (CU) is not a [motor] Vehicle indicates the fault of bicyclists, since the filter used here is strictly bicycle [Pedalcycle] Involved. Movement Essentially Straight shows that curves and other roadway anomalies contribute very little to bicycle crashes.

C224 CU Estimated Speed at Impact (motor vehicles only)



Speed does not appear to be the causal factor in bicycle crashes as it is in most others. It does affect crash severity (see cross-tabulation below), which should get bicyclists to avoid high-speed roadways.

Cross-tabulation Injury Severity vs Impact Speed

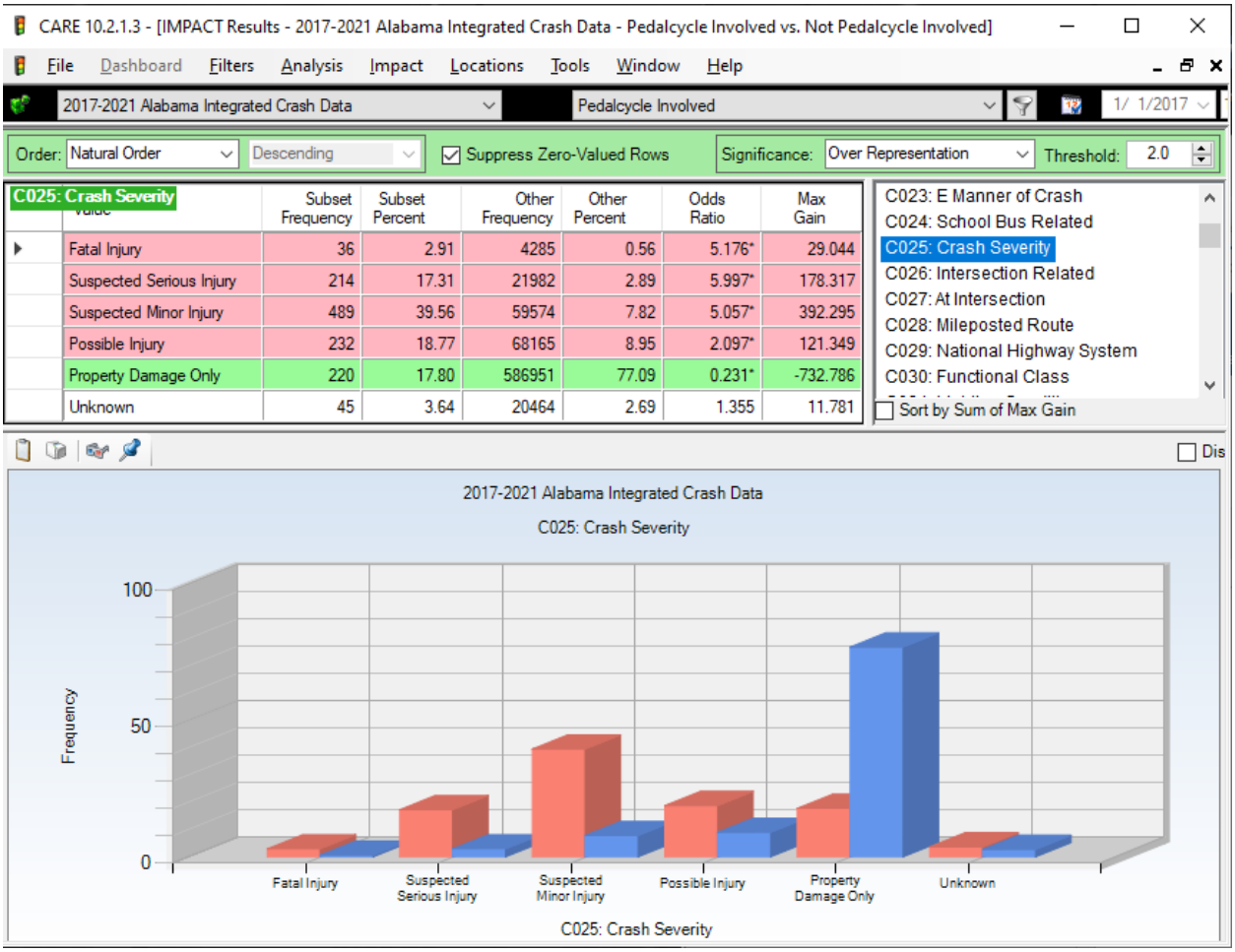


	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL
1 to 5 MPH	0	6	31	14	14	5	70
6 to 10 MPH	0	3	8	9	7	2	29
11 to 15 MPH	0	2	9	1	5	1	18
16 to 20 MPH	0	0	3	1	5	0	9
21 to 25 MPH	0	4	6	2	3	1	16
26 to 30 MPH	0	1	8	1	7	1	18
31 to 35 MPH	0	4	8	5	1	0	18
36 to 40 MPH	0	3	7	3	2	0	15
41 to 45 MPH	1	15	11	8	2	0	37
46 to 50 MPH	1	4	6	0	0	0	11
51 to 55 MPH	1	3	5	4	0	0	13
56 to 60 MPH	3	1	0	1	0	0	5
61 to 65 MPH	0	0	1	0	0	0	1
71 to 75 MPH	0	1	0	0	0	0	1
E Stationary	0	0	1	1	2	0	4
Unknown	12	39	142	64	54	17	328
Not Applicable	0	1	7	2	7	1	18
CU is Not a Vehicle	15	118	204	94	93	12	536
CU is Unknown	3	9	32	22	18	5	89
TOTAL	36	214	489	232	220	45	1236

Fatal and Suspected Serious Injury crashes occur at the relatively higher speeds.

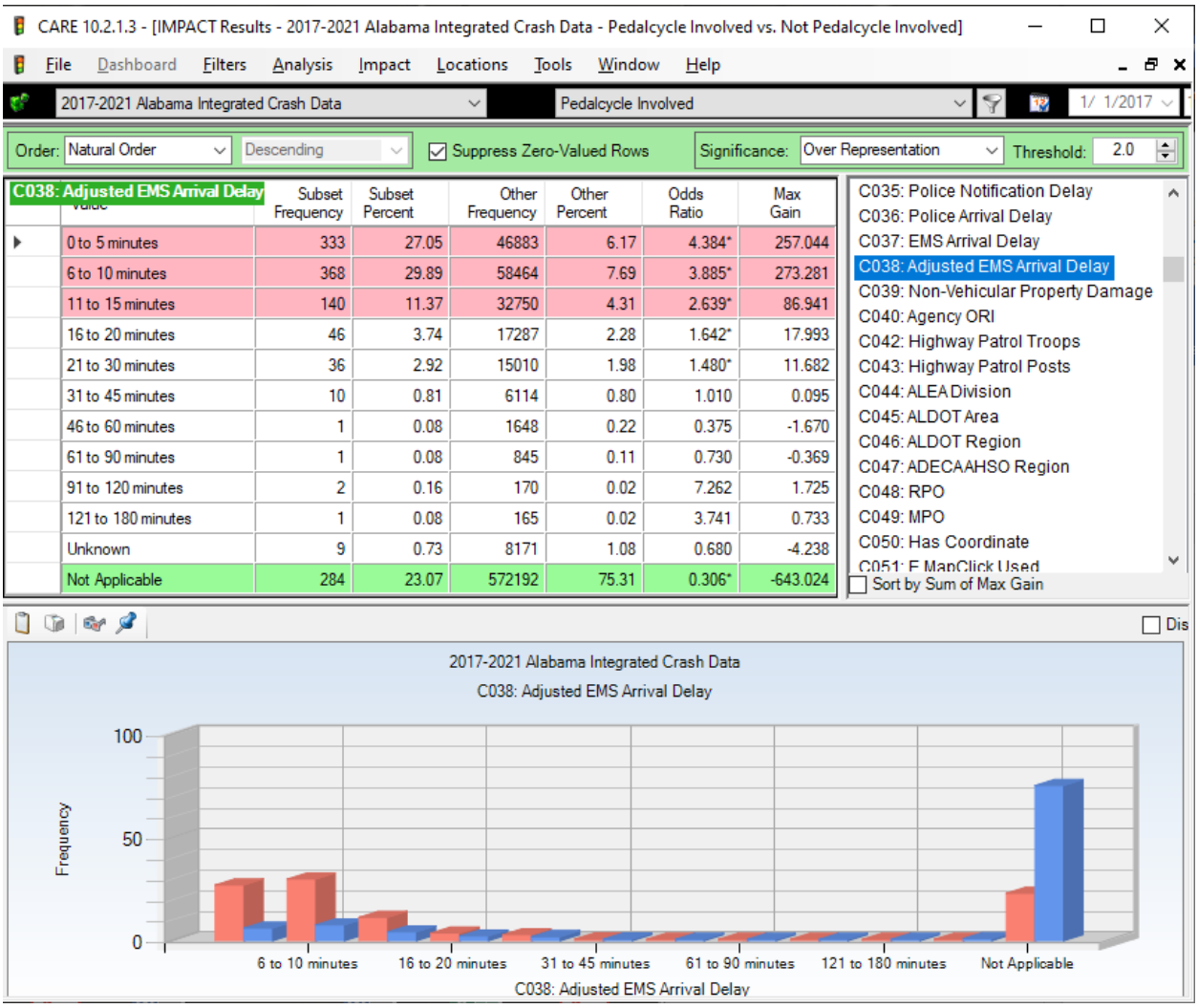
Severity Factors

C025 Crash Severity



The fatality rate proportion for BI crashes is over five (5.176) times what it is for Non-BI crashes. Suspected Serious Injury and Suspected Minor Injury are quite comparable to this with an Odds Ratios of 5.997 and 5.057.

C038 Adjusted EMS Arrival Delay



The urban location of a majority of BI crashes accounts for the extremely low response time.