IMPACT Analysis of Motorcycle Caused (MC) Crashes CY2016-2020 Data by Dave Brown October 26, 2021

For additional motorcycle information from NHTSA and other sources, see: <u>http://www.safehomealabama.gov/tag/motorcycles/</u>

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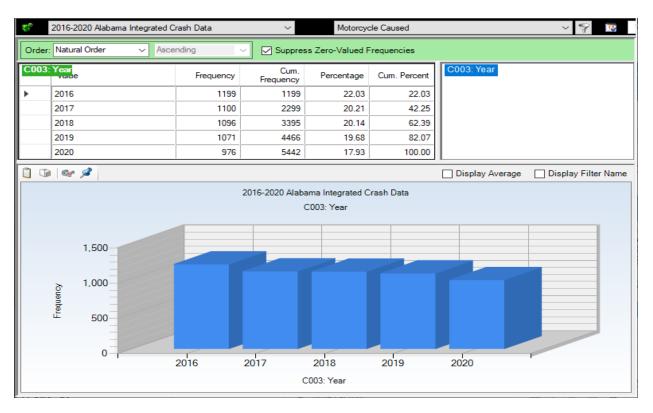
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Introduction

This report has the objective of presenting a problem identification that was done on Motorcycle Caused (MC) crashes, with the goal of establishing and improving countermeasures for reducing these crash frequencies and severities in the future. The IMPACT displays show comparisons of two subsets, both restricted to the 2016 to 2020 (inclusive) time frame. In the first subset (called "Subset") the motorcycle was the cause of the crash as entered on the crash report form. The second (called "Other") consisted of all other crashes, i.e., where the vehicles causing the crashes were not motorcycles. This second subset included motorcycle crashes where the motorcycle was not indicated to be the causal vehicle.

The following display gives the frequency distribution for the overall 5,442 MC crashes by year. There is no major trend to be inferred here, since the 2020 year was largely influenced by a reduction in travel caused by COVID-19. The 2016 year was recognized as a high year for all crashes, and the motorcycle caused crashes seemed to be largely carried over into 2017.



The display at the top of the next page is a further breakdown of the above by severity. The various severities reflect the total amounts during the years for the most parts. Year 2016 is generally higher, and year 2020 is generally lower for all severities.

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2016-202	0 Alabama Integrated	Crash Data	~	Motorcycle Caused		~	P 1/			
Suppress Zero	Suppress Zero Values: None 🗸 Select Cells: 💼 🗸 📆 😭 Colo									
	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL			
2016	72	335	396	80	292	24	1199			
2016	24.74%	23.96%	22.40%	16.03%	22.19%	14.12%	22.03%			
2017	59	284	350	84	278	45	1100			
2017	20.27%	20.31%	19.80%	16.83%	21.12%	26.47%	20.21%			
2018	59	278	368	105	251	35	1096			
2016	20.27%	19.89%	20.81%	21.04%	19.07%	20.59%	20.14%			
2019	58	250	341	124	266	32	1071			
2019	19.93%	17.88%	19.29%	24.85%	20.21%	18.82%	19.68%			
2020	43	251	313	106	229	34	976			
2020	14.78%	17.95%	17.70%	21.24%	17.40%	20.00%	17.93%			
TOTAL	291	1398	1768	499	1316	170	5442			
TUTAL	5.35%	25.69%	32.49%	9.17%	24.18%	3.12%	100.00%			

MC Crashes per Year by Severity

IMPACT Outputs for Motorcycle Caused (MC) vs. Non-MC Crashes

Interpretation of IMPACT displays. The following sections present a number of IMPACT runs that surface some of the major characteristics of crashes in which MC were involved as compared to all of the rest of the crash records (non-MC). 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. In the charts below the *red bars represented MC crash proportions* while the *blue bars represent the non-MC crash proportions*. Proportions 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.

Output pruning. Most 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 IMPACT and Frequency output displays. In many cases the following were summarily eliminated as not contributing information to the outputs: Unknown, CU is Unknown, CU is Vehicle, Other, Not Applicable. Important to recognize is that even if we did not have 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 (that is, in most cases), the results were more accurate 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 does not appear then there was no change made in this item when eCrash was implemented. CU = Causal Unit – 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, and these correlate well with those with the highest Odds Ratios. The Max Gain is the number of crashes that would be reduced it the Subset item under consideration had the same proportion as the Other proportion, i.e., there was no over- or under-representation and 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 with 0.5 or less are given with a green background.

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

• Geographical Attributes

- C001 County (MC 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 counties are those that are rural.
- C001 County (non-MC over-represented) this contains the bottom of the IMPACT output listing, which gives the areas where the MCs are under-represented. Looking at it another way, this would also be the areas where the non-MC crashes have their highest over-representation. The greatest non-MC over-representation is at the bottom of the table, with Mobile, Jefferson and Tuscaloosa being the least apt to have MC crashes. This shows that counties containing the largest cities are the highest under-representations for MC crashes.
- C002 City (MC over-represented) clearly the rural areas of the counties (which are documented in CARE as virtual cities) show a pattern of the highest over-representation in MC crashes.
- C002 City (non-MC over-represented) with but few exceptions the counties characterized by urban area concentrations have proportions that are over-represented in non-MC crashes. This is reasonable because of the greater traffic counts in the urban areas.
- C010 Rural or Urban it comes as no surprise after seeing the results above that the rural areas are over-represented in MC crashes, while the urban areas are over-represented in those caused by non-motorcycle vehicles. One reason for this is that the lower speeds in urban areas make MC crashes less likely. The close concentration of vehicles makes low-severity crashes of a higher relative frequency. Motorcyclists appear to be more alert in these areas as well.
- C010 Locale This further confirms that MC crashes occur more often in Open Country and Residential area as opposed to those in Shopping or Business areas. It should be noted that some cites have a considerable amount of Open Country.
- C110 Residence Distance Consistent with the above findings, MC crashes tend to occur more when the motorcycles are traveling Greater than 25 Miles from the driver's residence. Generally, this would put them in a rural area.

• Time Factors

- C003 Year Comparing MC to non-MC crashes over the years shows that, other than 2016, the MC crashes effectively had the same proportions as the non-MC crashes. No trend can be inferred because of the lower traffic volume in 2020 due to COVID-19.
- C004 Month it seems reasonable that the number of overall MC 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 MC crashes are

well under half, and some as much as less than a third of the 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 motorcycle 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 motorcycle drivers who know how to evade crashes.

- C006 Day of the Week Saturday is the worst day for MC crashes. This could be due to these drivers on average being less experienced casual recreational motorcycle riders leveraged by the lack of experience and skill. The Saturday effect spills over to both Friday and Sunday, while Monday through Thursday are significantly under-represented. These times are highly correlated with DUI (alcohol and drugs) times.
- C008 Time of Day these over-represented times are also highly correlate with DUI crash times, and this will be given more detailed consideration in the analysis of C122 and C123.
- C031 Lighting Conditions This corresponds to the early and late night time overrepresentations, but it also gives an indication of location. Three Lighting Conditions are significantly over-represented: Dark – Roadway Not Lighted (796), Dusk (210), and Dark – Roadway Lighted (26).

• Roadway Characteristics

- C011 Highway Classification while it was expected from the results above (that MC crashes are significantly over-represented in the rural areas), the degree to which the MC crashes were over-represented on County roads by an odds ratio of 2.322 was not expected. This should be considered in enforcement policies on County roads, and to a much lesser extent on State roads. Further analysis on county roads is needed to determine what the issues on these roadways are that might be remediated by roadway modifications.
- C026 Intersection Related because intersections are more associated with urban roadways, these significant results were expected.
- C407 CU Roadway Curvature and Grade The first six categories show a pattern of all types of curves causing significant over-representation in MC crashes. Slopes seem to have little effect on MC crashes. The following show the preponderance of curves (highest Max Gain first): Curve Left and Level, Curve Left and Down Grade, Curve Right and Level, Curve Left and Up Grade, Curve Right and Down Grade, and Curve Right and Up Grade.

• Driver Factors

 C015 – Primary Contributing Circumstance – by excluding those values with number of MC crashes less than 20, the major PCCs can be seen in the one table. This item 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 cells at the top show some very strong and significant over-representations for MC crashes – virtually all of the items in the top half of the table are quite high with significant over-representations. The following had significant over-representations with Max Gains > 20:

- 1. Aggressive Operation
- 2. Over Speed Limit
- 3. Swerved to Avoid Vehicle
- 4. Ran off Road
- 5. Driving too Fast for Conditions
- 6. Swerved to Avoid Animal
- 7. Over Correcting/Over Steering
- 8. Defective Equipment
- 9. Improper Passing
- 10. Other Improper Action
- 11. DUI
- 12. Roadway/Sign/Signal Defect

Of these the following reflects on the attitude of the driver: 1, 2, 5, 9, 11. This is most of them, and it certainly includes the worst of them. Some are very likely to be a byproduct of excessive speed: 4, 7. Others put the motorcycle in the role of a victim: 3, 6, and 12. Working from the bottom of the table up illustrates the converse – those crash PCCs that are indicative of non-MC causes. Note that all of the Unseen Object and Failure to Yield categories indicate a relatively increased visual perception problem on the part of the non-motorcycle drivers (or perhaps an improved capability on their part). While not the fault of the MC, defensive driving on their part should certainly take this factor into account. All of these factors provide the basis for motorcyclist information programs.

- C017 First Harmful Event When we consider motorcycle operations the reason for the highly over-represented items becomes apparent (those with the red background have an Odds Ratio > 2). For most other types of crashes this attribute gives us "what was hit." This is true for the lower frequency items on this list, but the ones on the top reflect motorcycle vulnerabilities. The following is an ordered list of all items with greater than 90 Max Gain (all significantly over-represented by an Odds Ratios greater than 2): Overturn/Rollover, Evasive Action (Swerve/Brake), Collision with Ditch, Ran Off Road Right, Other Non-Collision, Fell/Jumped from Motor Vehicle, Collision with Other Fixed Object, Collision with Curb/Island/Raised Median, Collision with Animal: Other, and Ran Off Road Left.
- C023 Manner of Crash The top two over-represented items, which are highly significant, are reasonable for motorcycles. These include Single Vehicle Crash (all types) and Non-Collision. Most of the common Manner of Crash types for 4-wheeled vehicles are under-represented for motorcycles.
- C105 Left Scene MC crashes are less likely to be hit-and-run than are those caused by non-MC vehicles. The reason for this is probably that it is impossible in a relatively larger number of cases for the motorcycle to leave the scene after the crash.
- C107 CU Driver Raw Age Except for ages 14 and 15, the younger ages are under-represented up to ages 28 and 33. The major over-represented grouping is from 39 to 61.

- C600 CU Driver Age Range (five year increments) The over-representation in the 11 to 15 year-old category is alarming, and requires additional investigation. Perhaps it reflects the early motorcycle licensing of 14 and 15 year olds. The major over-representation is in the 41 to 60 year-old categories.
- C109 CU Driver Gender clearly males are predominant by a factor of about 20 to one. Countermeasures should be directed almost exclusively toward males.
- C122 CU Driver Officer Opinion Alcohol Alcohol was a factor in almost 70% more than expected compared to the non-MC crashes. While the number of DUI crashes is not reported to be high, the relative values are more important here since it is well known and accepted that alcohol and drugs are under-reported. Many officers will not mark this item positive unless they know they can prove it in court even though that was not the objective of this attribute.
- C123 CU Driver Officer Opinion Drugs The officer opinion here has indicated a smaller problem than that found with alcohol. In this case the reported results indicate that the drug over-representation was not statistically significant.
- C129 CU Vehicle Maneuver As was seen in variable C407 above, Curves are the major problem for motorcycles. This also shows Overtaking and Passing to be a potential problem, but it consists of only 197 crashes in the five years as opposed to 1,155 for Negotiating a Curve. Both had over-representations that were very highly significant.
- C224 CU Estimated Speed at Impact the bar chart is quite explicit MC crashes are typically at much higher speeds than non-MC crashes.
- Cross-tabulation of Injury Severity vs Impact Speed this display makes the relationship between speed and fatal crashes quite clear.
- C226 CU Vehicle Damage "Major and Disabled" was the only over-represented value, having a proportion that is over 60% higher than the non-MC crashes.

• Severity Factors

- C026 Crash Severity The fatality rate proportion for MC crashes is close to ten (9.860) times what it is for non-MC crashes. Suspected Serious Injury is close to this with an Odds Ratio of 8.496. All of the three more severe injury categories were highly significantly over-represented.
- C038 Adjusted EMS Arrival Delay as indicated above, the timing and rural nature of MC crashes clearly causes them to have longer EMS arrival delays, which accounts for some of the MC crashes being fatal.
- C060 Number Injured (Includes Fatalities) the multiple injury numbers provide additional information above the crash severity data given above. Each MC injury crash accounted for 1.11 injured persons.
- C061 Number Killed Only 6 of the 292 fatal MC crashes involve two fatalities.

Recommendations from IMPACT Results Summarized Above

Recommendations will be presented in the same order as the IMPACT findings given above:

Geographical Attributes

• C001, C002, C033 and C110. Motorcycle countermeasures, either enforcement of PI&E, should focus on rural areas of the state.

• Time Factors

- C004 Month Motorcycle countermeasures should become more intense during the milder and summer months (March through October) as opposed to the winter months.
- C006 and C008. Time of day and day of the week correlate strongly with DUI, and thus consideration should be given to enlarge selective enforcement for DUI to consider MC crashes. This could be a combined PI&E effort as opposed to just targeting of motorcycles in selective enforcement. DUI PI&E should never exclude the considerations for motorcycles.

Roadway Characteristics

- C011 County roads should be given the highest priority for MC crash reduction. A distant second to that would be Sate routes. Recommended is more detailed analysis including MC hotspots. Further analysis is required to determine if there are issues on county roads that are causing or increasing the severity of motorcycle crashes, e.g., obstacles at curves.
- C407 and C129 Hands on motorcycle training should concentrate more on the negotiation of all types of curves, and if possible include hands on over difficult curvature terrain.

• Driver Factors

- C015, C017, C023, C224 The top two Primary Contributing Circumstances, Aggressive Operation and Over Speed Limit, are closely linked to each other, and they show an attitude on the part of the driver. This is true of some of the others, including Driving Too Fast for Conditions, Improper Passing, and DUI. To the extent possible, these should be pointed out in motorcycle training programs. Many of the others show the motorcyclist as a victim, e.g., Swerved to Avoid Vehicle, and Swerved to Avoid Animal. These are summarized below:
- . The following had significant over-representations with Max Gains > 20:
 - 1. Aggressive Operation
 - 2. Over Speed Limit
 - 3. Swerved to Avoid Vehicle
 - 4. Ran off Road
 - 5. Driving too Fast for Conditions
 - 6. Swerved to Avoid Animal
 - 7. Over Correcting/Over Steering
 - 8. Defective Equipment
 - 9. Improper Passing
 - 10. Other Improper Action

11. DUI

12. Roadway/Sign/Signal Defect

Of these the following reflects on the attitude of the driver: 1, 2, 5, 9, 11. This includes the worst of them. Some are very likely to be a by-product of excessive speed: 4, 7. Others put the motorcycle in the role of a victim: 3, 6, and 12. This information should be worked into the training programs. This training should also highlight the dangers of the following:

- Overturn/Rollover
- Evasive Action (Swerve/Brake)
- Collision with Ditch
- Ran Off Road Right
- Other Non-Collision
- Fell/Jumped from Motor Vehicle
- Collision with Other Fixed Object
- Collision with Curb/Island/Raised Median
- Collision with Animal
- Ran Off Road Left

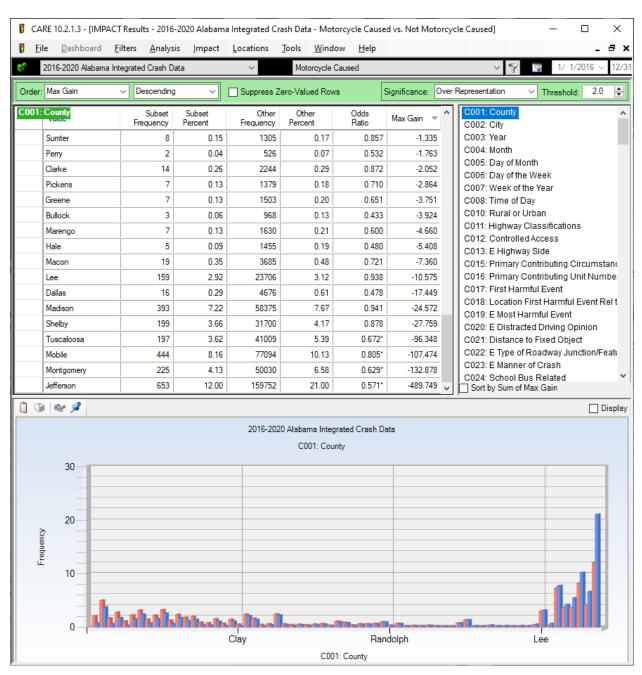
These would provide the basis for motorcyclist information to prepare them to be more aware of the most common hazards. They should also be made aware of the large number of single-vehicle motorcycle crashes. A remedial course should be developed that specifically selects motorcycle drivers who have consistently shown poor attitudes either in crash causation of citations. After the course, they should be required to pass a test that indicates their recognition of the problems both on the roadway and in their own attitudes, especially toward speed.

- C107 and C600 while it is obviously much easier to administer training to the novice drivers, it should be recognized that the over-represented problems found have not been in these younger drivers but in those who obviously have some experience and are depending on that to overcome the risks that they are taking. The most over-represented age groups were in the 41 to 60 year-old categories.
- C122 and C123 CU Driver Officer Opinion Alcohol Alcohol was a factor in almost 70% more than expected for non-MC crashes. While the number of DUI crashes is not reported to be high, the relative values are more important here since it is well known and accepted that alcohol is under-reported. The excellent programs to counter DUI in Alabama are sufficient, but they need additional funding to employ more specialists to make them more effective. For a review of these countermeasures see Section one of http://www.safehomealabama.gov/wpcontent/uploads/2021/09/15100_Countermeasures10th_080621_v5_tag.pdf. This document also recommends other countermeasures for the items given above.
- C129 CU Vehicle Maneuver As was seen in variable C407 above, Curves are the major problem for motorcycles. This also shows Overtaking and Passing to be a potential problem, but it is has only 197 crashes in the five years as opposed to 1,155 for Negotiating a Curve.

Geographical Attributes

C001 County (MC over-represented; excluding Max Gain < 10)

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Order:	Max Gain	~	Descending	~	Suppres	s Zero-Valu	ued Row Sigr	nificance: Ove	er Representation V Threshold: 2.0 🖨
C001:	County		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max 🚽 ^	C001: County C002: City
•	Jackson		110	2.02	5380	0.71	2.858*	71.515	C003: Year
	Baldwin		270	4.96	28051	3.69	1.346*	69.344	C004: Month
	Dale		90	1.65	4409	0.58	2.854*	58.461	C005: Day of Month C006: Day of the Week
	Russell		148	2.72	12744	1.68	1.623*	56.839	C007: Week of the Year
	Cleburne		58	1.07	2147	0.28	3.777*	42.642	C008: Time of Day
	Lauderdale		121	2.22	11109	1.46	1.523*	41.534	C010: Rural or Urban
	Calhoun		168	3.09	17692	2.33	1.327*	41.444	C011: Highway Classifications C012: Controlled Access
	Dekalb		77	1.41	5217	0.69	2.063*	39.681	C013: E Highway Side
	Cullman		118	2.17	11587	1.52	1.424*	35.115	C015: Primary Contributing Circumstance
	Houston		172	3.16	19183	2.52	1.253*	34.779	C016: Primary Contributing Unit Number
	Blount		67	1.23	4603	0.61	2.035*	34.074	C017: First Harmful Event
	Marshall		125	2.30	12913	1.70	1.353*	32.630	C018: Location First Harmful Event Rel t C019: E Most Harmful Event
	Limestone		95	1.75	8727	1.15	1.522*	32.573	C020: E Distracted Driving Opinion
	St Clair		105	1.93	10211	1.34	1.438*	31.958	C021: Distance to Fixed Object
	Cherokee		45	0.83	2572	0.34	2.446*	26.602	C022: E Type of Roadway Junction/Featu
	Geneva		41	0.75	2167	0.28	2.645*	25.499	C023: E Manner of Crash C024: School Bus Related
	Colbert		79	1.45	7614	1.00	1.450*	24.535	C024: School Bus Related
	Winston		34	0.62	1499	0.20	3.171*	23.277	C026: Intersection Related
	Walker		74	1.36	7820	1.03	1.323*	18.061	C027: At Intersection
	Clay		25	0.46	1039	0.14	3.364*	17.568	C028: Mileposted Route
	Etowah		128	2.35	15627	2.05	1.145	16.216	C029: National Highway System C030: Functional Class
	Talladega		87	1.60	10061	1.32	1.209	15.031	C031: Lighting Conditions
	Coosa		22	0.40	1164	0.15	2.642*	13.674	C032: Weather
	Lawrence		30	0.55	2597	0.34	1.615*	11.423	C033: Locale
	Morgan		130	2.39	16636	2.19	1.092	10.998 🗸	Sort by Sum of Max Gain
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						C0(01: County		



C001 County (MC under-represented counties – negative Max Gain)

The large urban counties are under-represented in Motorcycle Caused (MC) crashes. Those over-represented are for the most part, the more rural counties.

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8	2016-2020 Alabama	Integrated	d Crash Data		\sim	Motorcycle Cau	sed		✓ ♥ 1/ 1/2016 ∨ 12.
Order	: Max Gain	∼ De	escending	~ □	Suppress Zero	-Valued Rows	S	Significance: Over F	Representation V Threshold: 2.0
C 002	: City		Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max 🚽 ^	C001: County C002: City
•	Rural Baldwin		124	2.28	6865	0.90	2.525*	74.896	C003: Year
	Rural Lauderdale		82	1.51	2806	0.37	4.086*	61.929	C004: Month C005: Day of Month
	Rural Calhoun		89	1.64	5103	0.67	2.438*	52.499	C005: Day of Month C006: Day of the Week
	Rural Jackson		63	1.16	1648	0.22	5.344*	51.212	C007: Week of the Year
	Rural Mobile		119	2.19	9970	1.31	1.669*	47.686	C008: Time of Day
	Rural Houston		59	1.08	2350	0.31	3.510*	42.191	C010: Rural or Urban C011: Highway Classifications
	Rural Marshall		61	1.12	2744	0.36	3.108*		C012: Controlled Access
	Rural Cleburne		54	0.99	1785	0.23	4.229*		C013: E Highway Side
	Rural Madison		109	2.00	9649	1.27	1.579*		C015: Primary Contributing Circumstance
	Rural Lee		69	1.27	4105	0.54	2.350*		C016: Primary Contributing Unit Number C017: First Harmful Event
	Rural Morgan		64	1.18	3582	0.47	2.498*		C018: Location First Harmful Event Rel t
	Rural Jefferson		170	3.12	18597	2.44	1.278*		C019: E Most Harmful Event
	Rural Russell		54	0.99	2608	0.34	2.895*		C020: E Distracted Driving Opinion
	Rural Cullman		74	1.36	5417	0.71	1.910*		C021: Distance to Fixed Object C022: E Type of Roadway Junction/Featu
	Rural Walker		58	1.07	3365	0.44	2.410*		C022: E Manner of Crash
	Rural Limestone		67	1.23	4899	0.64	1.912*		C024: School Bus Related
	Rural Blount		48	0.88	2560	0.34	2.621*		C025: Crash Severity
	Rural Dekalb Rural Tuscaloosa		45	0.83	2197 8885	0.29	2.864*		C026: Intersection Related C027: At Intersection
			92	1.69		1.17			C028: Mileposted Route
	Rural Talladega		59 75	1.08	4341 6974	0.57	1.900*		C029: National Highway System
	Rural Shelby Rural Dale		34	1.38 0.62	1295	0.92	3.671*		C030: Functional Class
	Rural Winston		34	0.62	779		5.384*		C031: Lighting Conditions
	Rural Winston		30	0.55	1505	0.10	5.384 3.251*		C032: Weather C033: Locale
	Rural Colbert		35	0.64	1879	0.20	2.679*		C034: E Police Present at Time of Crash
	Phenix City		94	1.73	10/5	1.35	1.277*		C025: Police Notification Dolov
] []) 🗞 🖉							20.000	 Disp
					2016-2020 A	labama Integrate	d Crash Da	ata	
						C002: City			
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	0-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1	and and the de	and had been been a second		Cottonwo	od		ç	Siluria
					00101110	C002:	City		

C002 City (MC over-represented; Max Gain < 20 excluded)

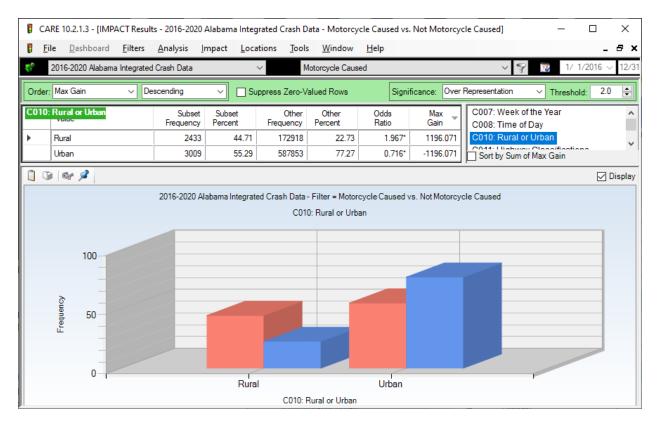
Rural areas of the more populated counties have the highest over-representations.

CARE 10.2.1.3 - [IMPACT Resu	lts - 2016-2020	Alabama Inte	grated Crash	Data - Motorc	ycle Caused	vs. Not Motorcyc	cle Caused] — 🗆 🗘
<u>File D</u> ashboard <u>Filters</u>	<u>A</u> nalysis <u>I</u>	mpact <u>L</u> oc	ations <u>T</u> oo	ols <u>W</u> indow	<u>H</u> elp		_ 8
2016-2020 Alabama Integrate	d Crash Data		\sim	Motorcycle Cau	sed		✓ ♥ 1/ 1/2016 ∨ 1
rder: Max Gain 🗸 D	escending	~ 🗆 s	uppress Zero	-Valued Rows	Sig	gnificance: Over I	Representation V Threshold: 2.0
002: City	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max 🚽 ^	C001: County C002: City
Jasper	13	0.24	3368	0.44	0.540	-11.091	C003: Year
Enterprise	21	0.39	4507	0.59	0.651	-11.238	C004: Month
Madison	35	0.64	6478	0.85	0.755	-11.336	C005: Day of Month C006: Day of the Week
Prattville	26	0.48	5260	0.69	0.691	-11.624	C007: Week of the Year
Fairhope	7	0.13	2621	0.34	0.373	-11.748	C008: Time of Day
Daphne	22	0.40	4926	0.65	0.624	-13.235	C010: Rural or Urban
Dothan	100	1.84	15964	2.10	0.876	-14.188	C011: Highway Classifications C012: Controlled Access
Gadsden	46	0.85	8507	1.12	0.756	-14.849	C013: E Highway Side
Selma	4	0.07	2707	0.36	0.207	-15.363	C015: Primary Contributing Circumstan
Florence	37	0.68	7340	0.96	0.705	-15.502	C016: Primary Contributing Unit Number C017: First Harmful Event
Decatur	59	1.08	10532	1.38	0.783	-16.334	C018: Location First Harmful Event Rel
Aubum	48	0.88	9331	1.23	0.719	-18.743	C019: E Most Harmful Event
Mountain Brook	5	0.09	3367	0.44	0.208	-19.084	C020: E Distracted Driving Opinion
Vestavia Hills Alabaster	12	0.22	4487 5970	0.59	0.374	-20.095	C021: Distance to Fixed Object C022: E Type of Roadway Junction/Feat
Bessemer	22	0.40	8767	0.78	0.638*	-20.702	C023: E Manner of Crash
Northport	40	0.74	5828	0.77	0.638	-25.687	C024: School Bus Related
Pelham	15	0.29	6005	0.77	0.349	-27.953	C025: Crash Severity
Opelika	34	0.20	9698	1.27	0.490*	-35,368	C026: Intersection Related C027: At Intersection
Homewood	14	0.02	8444	1.11	0.232	-46.398	C028: Mileposted Route
Hoover	59	1.08	15342	2.02	0.538*	-50,739	C029: National Highway System
Huntsville	251	4.61	42495	5.59	0.826*	-52,959	C030: Functional Class
Tuscaloosa	83	1.53	25387	3.34	0.457*	-98,589	C031: Lighting Conditions C032: Weather
Montgomery	203	3.73	45705	6.01	0.621*	-123.920	C033: Locale
Mobile	267	4.91	57510	7.56	0.649*	-144.359	C034: E Police Present at Time of Cras
Birmingham	287	5.27	88893	11.69	0.451*	-348.836 🗸	C035: Police Notification Delav Sort by Sum of Max Gain
1 a p							Disj
			2016-2020 A	labama Integrate	ed Crash Data	в	
15				C002: City			
15							
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U			Cottonwoo	od		ę	Siluria
				C002:	City		

C002 City (MC under-represented; total < 11 excluded)

The largest under-representations are in the large urban cities.

C010 Rural or Urban

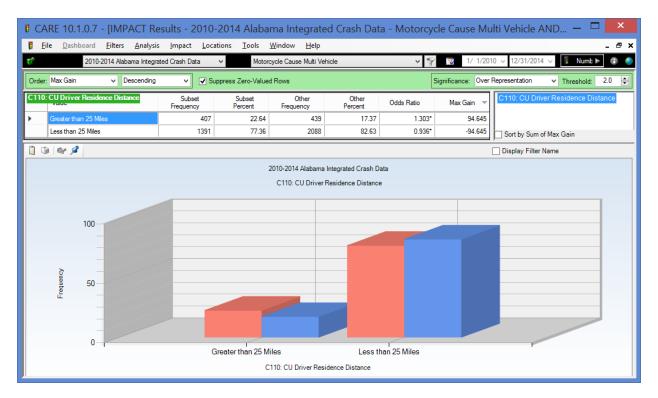


After seeing the city and county results, it comes as no surprise that rural areas of the state are over-represented by about twice what would be expected in comparison to the non-MC crashes.

-		-	T Results - 2016-20 jilters <u>A</u> nalysis		tegrated Crash D ocations <u>T</u> ools	-	cle Caused vs. <u>H</u> elp	Not Motorcyc	:le Caused] —	_ _	- ×
6	2016-	-2020 Alabama In	tegrated Crash Data		\sim N	lotorcycle Caus	ed		✓ ♥ 1/	1/2016 $ \smallsetminus $	12/
Order	: Max	Gain	 ✓ Descending 	~ 🗆	Suppress Zero-V	alued Rows	Signifi	cance: Over	Representation V Thresh	old: 2.0	*
C033	: Loca		Subs Frequen		Other Frequency	Other Percent	Odds Ratio	Max Gain	C030: Functional Class C031: Lighting Conditions		
•	Oper	n Country	26	72 49.1	10 215520	28.33	1.733*	1130.208	C032: Weather		
	Resid	dential	12	35 22.6	59 158442	20.83	1.090*	101.534	C033: Locale		
	Play	ground		0 0.0	0 217	0.03	0.000	0.000	C034: E Police Present at 1 C035: Police Notification D		asr
	Othe	r		49 0.9	8208	1.08	0.834	-9.719	C036: Police Arrival Delay	ciay	
	Man	ufacturing or Indu	strial	83 1.5	53 14060	1.85	0.825	-17.583	C037: EMS Arrival Delay		
	Scho	lool		43 0.7	79 10313	1.36	0.583*	-30.777	C038: Adjusted EMS Arrival		
	Shop	oping or Business	13	60 24.9	353952	46.53	0.537*	-1172.110	Sort by Sum of Max Gain	tillomor	`
1		* 🔎								D	ispl
			2016-2020) Alabama Integ	rated Crash Data	- Filter = Motore C033: Locale	cycle Caused v	s. Not Motorcyc	de Caused		
		60									
	requency	40									
	Fre	20									
		0	Open Country	Residential	Playground	Other	Manufacturi		al Shopping or		
						C033: Local	or Industria	al	Business		

Open Country, which could be within some city limits, has the highest over-representation (Odds Ratio = 1.733), indicating a little over 73% higher than expectation from the non-Motorcycle-Caused (non-MC) crashes. It is the only Locale that has a statistically significant over-representation. Residential is also over-represented but clearly not as much (OR = 1.090). School and Shopping or Business were significantly under-represented.

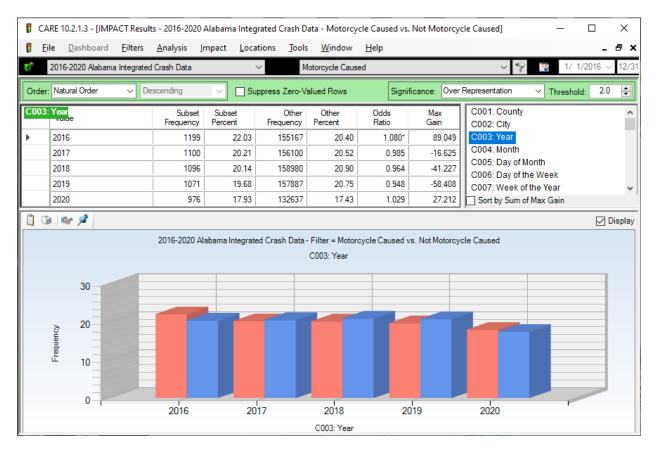
C110 CU Driver Residence Distance



MC crashes tend to be further than 25 miles from the driver's residence. The proportion of these crashes is over 30% (Odds Ratio = 1.303) greater than the non-MC crashes.

Time Factors

C003 Year



The 2016 year was significantly over-represented, but the following three were quite close to expected. The 2020 year (of COVID) showed an increase of about 3%, which was not considered to be statistically significant.

🖡 CA	ARE 10.2.1.3 - [IMPACT R	lesults - 2016-2020 /	Alabama Integ	rated Crash D	ata - Motorcy	cle Caused vs.	Not Motorcyc	le Caused]	_		×
E E	ile <u>D</u> ashboard <u>F</u> ilte	ers <u>A</u> nalysis <u>I</u> r	mpact <u>L</u> oca	tions <u>T</u> ools	s <u>W</u> indow	<u>H</u> elp				- 6	5 ×
e	2016-2020 Alabama Integ	grated Crash Data		~ N	Notorcycle Cause	ed		~ 9	1/ 1/2	016 \vee	12/31
Order	Natural Order 🗸 🗸	Descending	🗸 🗌 Su	ppress Zero-V	alued Rows	Signifi	icance: Over	Representation	✓ Threshold:	2.0	-
C004	Month	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C001: County C002: City			^
•	January	215	3.95	61485	8.08	0.489*	-224.819	C003: Year			
	February	274	5.03	60158	7.91	0.637*	-156.326	C004: Month	le elle		
	March	454	8.34	64306	8.45	0.987	-5.998	C005: Day of N C006: Day of th			
	April	566	10.40	59923	7.88	1.320*	137.355	C007: Week of			
	May	626	11.50	63768	8.38	1.372*	169.850	C008: Time of			
	June	498	9.15	60977	8.02	1.142*	61.815	C010: Rural or			
	July	477	8.77	59742	7.85	1.116*	49.649		y Classifications		
	August	593	10.90	65980	8.67	1.256*	121.027	C012: Controll C013: E Highw			
	September	654	12.02	62760	8.25	1.457*	205.061		Contributing Cir	cumstar	nc
	October	548	10.07	68796	9.04	1.114*	55.884	C016: Primary Contributing Unit Nu C017: First Harmful Event		it Numb	e
	November	359	6.60	65254	8.58	0.769*	-107.779				
	December	178	3.27	67622	8.89	0.368*	-305.718	C018: Location	n First Harmful F f Max Gain	vent Rel	it *
	≥ ≪ <i>\$</i>	2016-2020 Ala	abama Integrate		- Filter = Motore C004: Month	cycle Caused vs	s. Not Motorcyc	le Caused		Dis Dis	play
	15										
										_	
	10		_							_	
		H									
		February	April		June	Augus	t (October	December		
					C004: Mon	th					

The spring and late summer months are favored by motorcyclists.

C006 Day of the Week

-	ARE 10.2.1.3 - [IMPACT ile <u>D</u> ashboard <u>F</u> i			-	h Data - Moto ools <u>W</u> indow		vs. Not Mot	orcycle Caused] — 디 × _ 문 ×
¢?	2016-2020 Alabama Int	_ ,		~	Motorcycle Ca			~ 🌱 🍞 1/ 1/2016 ~
Order	: Natural Order	✓ Descending	~ D	Suppress Zer	o-Valued Rows	Signific	ance: Over f	Representation V Threshold: 2.0 🖨
C006	: Day of the Week	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C001: County A C002: City
	Sunday	953	17.51	73298	9.63	1.818*	428.680	C003: Year
	Monday	574	10.55	110080	14.47	0.729*	-213.432	C004: Month C005: Day of Month
	Tuesday	590	10.84	114398	15.04	0.721*	-228.320	C006: Day of the Week
	Wednesday	575	10.57	114340	15.03	0.703*	-242.905	C007: Week of the Year
	Thursday	645	11.85	119297	15.68	0.756*	-208.364	C008: Time of Day
	Friday	826	15.18	134363	17.66	0.859*	-135.135	C010: Rural or Urban
	Saturday	1279	23.50	94995	12.49	1.882*	599.475	Sort by Sum of Max Gain
	9 6 7 <i>9</i>	2016-2020 Ala	bama Integrat		-Filter = Motor 6:Day of the We	-	vs. Not Motoro	☑ Di
	40							
	20 20	ß	1	1	ŀ	1	T	
	0	Sunday I	l Monday	Tuesday C	Wednesda 006: Day of the		ay Frid	day Saturday

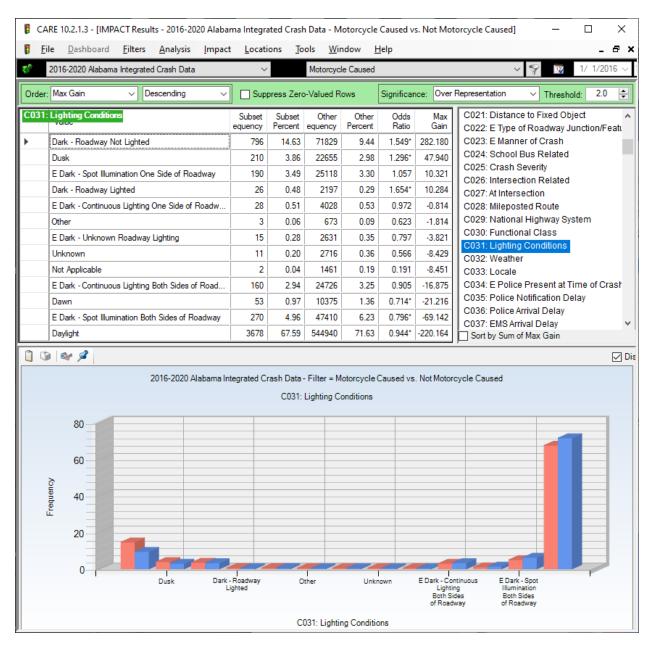
The very high over-representations on Saturday and Sunday are indicative of DUI, which will be considered further below in the Driver Factors section.

CARE 10.2.1.3 - [IMPACT Results - 2016-2020 Alabama Integrated Crash Data - Motorcycle Caused vs. Not Motorcycle Caused] Х E <u>F</u>ile <u>D</u>ashboard Filters Analysis <u>I</u>mpact Locations Tools Window Help Β× _ 2016-2020 Alabama Integrated Crash Data Motorcycle Caused 1/2016 12 Order: Natural Order Suppress Zero-Valued Rows Over Representation \sim Descending Significance: Threshold: 2.0 ÷ C008: Time of Day C001: County Odds Ratio Subset Subset Other Other Max Frequency Percent Percent Frequency Gain C002: City C003: Year 12:00 Midnight to 12:59 101 1.86 9358 1.23 1.509* 34.060 C004: Month 1:00 AM to 1:59 AM 1.71 1.01 1.690* 93 7693 37,970 C005: Day of Month 2:00 AM to 2:59 AM 63 1.16 7057 0.93 1.248 12.519 C006: Day of the Week 3:00 AM to 3:59 AM 53 0.97 6270 0.82 1.182 8,149 C007: Week of the Year 4:00 AM to 4:59 AM 60 1.10 7064 0.93 1.187 9.469 C008: Time of Day C010: Rural or Urban 5:00 AM to 5:59 AM 67 12383 1.63 0 756 -21.579 1.23 C011: Highway Classifications 6:00 AM to 6:59 AM 97 1.78 20345 2.67 0.667* -48.533 C012: Controlled Access 7:00 AM to 7:59 AM 2.68 0.453* 146 45078 5.93 -176.455 C013: E Highway Side 8:00 AM to 8:59 AM 125 2.30 33003 4.34 0.529* -111.079 C015: Primary Contributing Circumstant 9:00 AM to 9:59 AM 2.26 29146 3.83 0.590* -85.489 C016: Primary Contributing Unit Number 123 C017: First Harmful Event 10:00 AM to 10:59 AM 225 4.13 33613 4.42 0.936 -15.443 C018: Location First Harmful Event Rel t 11:00 AM to 11:59 AM 4 96 41240 5 4 2 0.915 -25.001 270 C019: E Most Harmful Event 12:00 Noon to 12:59 PM 332 6.10 50037 6.58 0.928 -25.928 C020: E Distracted Driving Opinion 1:00 PM to 1:59 PM 382 7.02 49456 6.50 1.080 28.228 C021: Distance to Fixed Object 2:00 PM to 2:59 PM 385 7.07 53840 7.08 1.000 -0.132 C022: E Type of Roadway Junction/Featu C023: E Manner of Crash 3:00 PM to 3:59 PM 451 8 29 67281 8 84 0.937 -30.279 C024: School Bus Related 4:00 PM to 4:59 PM 455 8.36 64968 8.54 0.979 -9.734 C025: Crash Severity 5:00 PM to 5:59 PM 468 8.60 69328 9.11 0.944 -27.922 C026: Intersection Related 6:00 PM to 6:59 PM 7.72 1.297* C027: At Intersection 420 45277 5.95 96.121 C028: Mileposted Route 7:00 PM to 7:59 PM 352 6.47 30892 4.06 1.593* 131.021 C029: National Highway System 8:00 PM to 8:59 PM 25831 3.40 1.423* 78.224 263 4.83 C030: Functional Class 9:00 PM to 9:59 PM 202 3.71 21359 2.81 1.322* 49.213 C031: Lighting Conditions 10:00 PM to 10:59 PM 51.864 170 3.12 16515 2.17 1.439 C032: Weather C033: Locale 11:00 PM to 11:59 PM 132 2.43 12312 1.62 1.499* 43.929 Sort by Sum of Max Gain 7 Unknown 0.13 1425 0.19 0.687 -3.193 📋 🕼 | 🗞 💋 🔽 Dis 2016-2020 Alabama Integrated Crash Data - Filter = Motorcycle Caused vs. Not Motorcycle Caused C008: Time of Day 10 Frequency 5 4:00 AM to 4:59 AM 2:00 PM to 2:59 PM 7:00 PM to 7:59 PM 9:00 AM to 9:59 AM Unknown C008: Time of Day

C008 Time of Day

Nighttime is consistently over-represented from 6:00 PM through 4:49 AM.

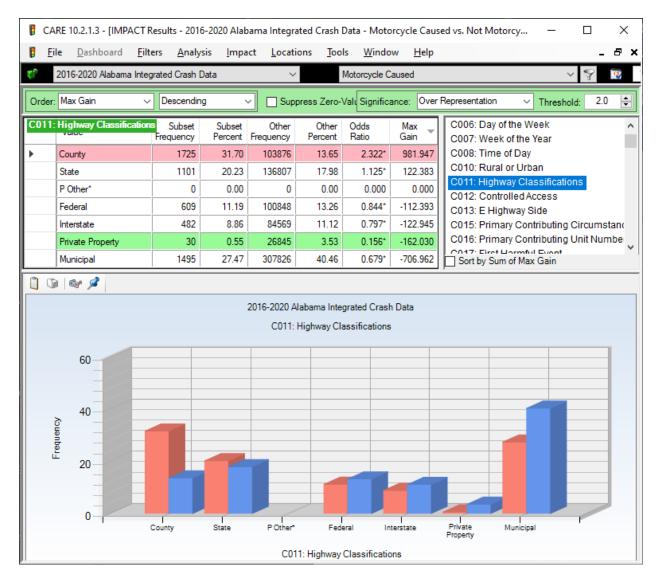
C031 Lighting Conditions



Significantly over-represented in order: Dark – Roadway Not Lighted, Dusk, and Dark – Roadway Lighted. Significantly under-represented Daylight, Dark – Spot Illumination Both Sides of Roadway, and Dawn.

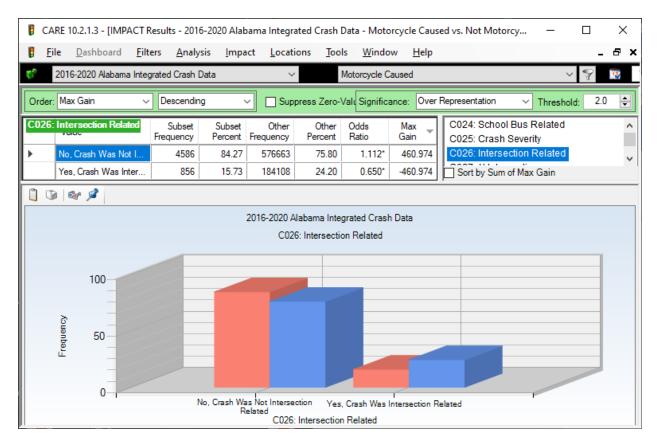
Roadway Characteristics

C011 Highway Classification

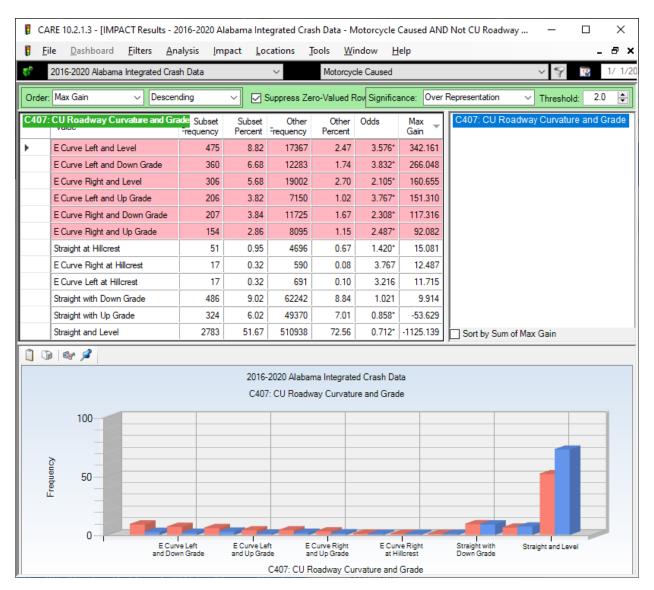


The county MC proportion is over twice the non-MC. State routes are also significantly overrepresented but only by a little over 12%. All other Highway Classifications are under-represented.

C026 Intersection Related



Intersection Related crashes are significantly under-represented, further reflection of their rural nature.



C407 CU Roadway Curvature and Grade

All of the highly significant over-represented items involve curves. In order, these are: Curve Left and Level, Curve Left and Down Grade, Curve Right and Level, Curve Left and Up Grade, Curve Right and Down Grade, and Curve Right and Up Grade. Two of the others that are not red because of less than 20 sample sizes also show very high Odds Ratios. We can conclude that slopes do not affect crash causation nearly as much as curves.

Driver Factors

C015 Primary Contributing	Circumstances	(excluding < 20 item	n frequency)
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Order:	Max Gain ~ Descending	3 `	Su	ppress Zero	-Valued Ro	w Significa	nce: Over	Representation V Threshold: 2.0
C015:	Primary Contributing Circumstance	Subset requency	Subset Percent	Other requency	Other Percent	Odds Ratio	Max Gain 👻	C015: Primary Contributing Circumstance
	E Aggressive Operation	545	11.68	12488	2.17	5.389*	443.867	
	Over Speed Limit	461	9.88	10478	1.82	5.433*	376.145	
	E Swerved to Avoid Vehicle	425	9.11	18203	3.16	2.883*	277.585	
	E Ran off Road	361	7.74	16921	2.94	2.634*	223.967	
	E Other - No Improper Driving	189	4.05	8373	1.45	2.787*	121.192	
	E Swerved to Avoid Animal	151	3.24	7645	1.33	2.439*	89.088	
	E Over Correcting/Over Steering	147	3.15	7595	1.32	2.390*	85.493	
	Driving too Fast for Conditions	317	6.79	28823	5.00	1.358*	83.580	
•	Improper Passing	122	2.61	6448	1.12	2.336*	69.781	
	Defective Equipment	164	3.51	12114	2.10	1.672*	65.896	
	E Other Improper Action	140	3.00	12405	2.15	1.394*	39.539	
	DUI	187	4.01	20390	3.54	1.132	21.874	
	E Roadway/Sign/Signal Defect	25	0.54	466	0.08	6.625*	21.226	
	Traveling Wrong Way/Wrong Side	25	0.54	3272	0.57	0.943	-1.498	
	E Ran Stop Sign	39	0.84	7259	1.26	0.663*	-19.786	
	E Other Distraction Outside the Ve	72	1.54	12973	2.25	0.685*	-33.061	
	E Crossed Centerline	41	0.88	9913	1.72	0.511*	-39.279	
	Made Improper Turn	35	0.75	14752	2.56	0.293*	-84.468	
	Unseen Object/Person/Vehicle	299	6.41	47881	8.31	0.771*	-88.760	
	E Failed to Yield Right-of-Way from	20	0.43	14517	2.52	0.170*	-97.565	
	E Ran Traffic Signal	59	1.26	21410	3.72	0.340*	-114.387	
	E Failed to Yield Right-of-Way Mak	41	0.88	31385	5.45	0.161*	-213.168	
	Improper Lane Change/Use	105	2.25	42065	7.30	0.308*	-235.659	
	E Failed to Yield Right-of-Way from	46	0.99	36214	6.29	0.157*	-247.276	
	Misjudge Stopping Distance	239	5.12	66985	11.63	0.441*	-303.472	
	Followed too Close	411	8.81	105188	18.26	0.482*	-440.855	Sort by Sum of Max Gain
) 🞯 🖉							,
)20 Alabam Primary Cor	-			
			C015.1	rninary Cor	inibuting Ci	rcumstanc	6	
Freeman			I .	80	I		La.I	
	E Othe Improper	r - No Driving		e Equipment		an Stop Sign		E Failed to Yield Misjudge Stopping Right-of-Way Distance from Driveway
			С	015: Primar	y Contributi	ng Circum	stance	

See discussion after C017.

2	2016-2020 Alabar	ma Integr	ated Crash Da	ata	`	~	Motorcycle	Caused			~ 9	1/
)rder:	Max Gain	~	Descending	Ý	🛛 🖂 Su	ppress Zero	o-Valued Ro	v Significa	nce: Over	Representation	✓ Threshold:	2.0
017:	First Harmful E	vent		Subset requency	Subset Percent	Other requency	Other Percent	Odds Ratio	Max Gain 👻	C017: First H	larmful Event	
	Overtum/Rollove	er		773	14.76	6670	0.93	15.854*	724.241			
	E Evasive Action	n (Swerve	e/Brake)	291	5.56	5965	0.83	6.674*	247.395			
	Collision with Dito	ch		369	7.04	18301	2.55	2.758*	235.217			
	E Ran Off Road	Right		395	7.54	22762	3.18	2.374*	228.606			
	E Other Non-Coll	ision		238	4.54	1537	0.21	21.182*	226.764			
	E Fell/Jumped fro	om Motor	Vehicle	209	3.99	176	0.02	162.445*	207.713			
	Collision with Oth	er Fixed	Object	176	3.36	5156	0.72	4.670*	138.309			
	E Collision with C	ùrb/Islan	d/Raised	146	2.79	3417	0.48	5.845*	121.021			
	E Collision with A	nimal: Ot	her	113	2.16	1429	0.20	10.817*	102.554			
	E Ran Off Road Left			184	3.51	12715	1.77	1.980*	91.051			
	E Collision with A	nimal: De	er	148	2.83	10380	1.45	1.950*	72.121			
	E Collision with O	ther Non	-Fixed Obj	69	1.32	5378	0.75	1.755*	29.686			
	E Non-Contact V	/ehicle		34	0.65	631	0.09	7.371*	29.387			
	E Vehicle Defect	Compor	nent Failure	46	0.88	2556	0.36	2.462*	27.315			
	E Ran Off Road	Straight		36	0.69	2315	0.32	2.127*	19.077			
	E Collision with E	mbankm	ent	43	0.82	3920	0.55	1.501*	14.344			
	E Collision with G	iuardrail F	ace	45	0.86	4692	0.65	1.312	10.701			
	Collision with Fen	nce		34	0.65	3366	0.47	1.382	9.394			
	Collision with Cul	vert Head	dwall	31	0.59	2990	0.42	1.418	9.143			
	Collision with Sig	n Post		33	0.63	4318	0.60	1.045	1.435			
	Collision with Tre	e		71	1.36	15455	2.16	0.628*	-41.978			
	E Collision with V	ehicle in	(or from)	41	0.78	16469	2.30	0.341*	-79.391			
	Collision with Par	ked Moto	or Vehicle	43	0.82	36486	5.09	0.161*	-223.718			
	Collision with Veh	nicle in Tr	affic	1670	31.88	529454	73.89	0.431*	-2200.3	Sort by Sum	of Max Gain	
0	1 🗞 🖉											
					2016-20)20 Alabam	a Integrated	Crash Dat	а			
						C017: Firs	t Harmful E	/ent				
	100											_
- Ole	50											
Frequency	50											
LL.												
	0											
			E Other	Von-Collision	E F	Ran Off Road	d Left E 7:First Han		oad Straight	Collision with S	lign Post	

C017 First Harmful Event (excluding < 30)

See discussion below.

C015 Primary Contributing Circumstances Discussion

The top two, Aggressive Operation and Over Speed Limit, are closely linked to each other, and they show an attitude on the part of the driver. This would also be true of some of the others, including Driving too Fast for Conditions and DUI. Many of the others show the motorcyclist as a victim, e.g., Swerved to Avoid Vehicle, Swerved to Avoid Animal and Improper Passing. Any of these might provide the basis for motorcyclist information. At the other end, Improper Turns and Failure to Yield and several others that are under-represented, show the common sense of most motorcyclists, and thus would not need to be emphasized.

C017 First Harmful Event Discussion

When we consider motorcycle operations the reason for the highly over-represented items becomes apparent (those with the red background have an Odds Ratio > 2). For most other types of crashes this attribute gives us "what was hit." This is true for the lower frequency items on this list, but the ones on the top reflect motorcycle vulnerabilities. The following had highly significant over-representations with Max Gains in excess of 20 crashes:

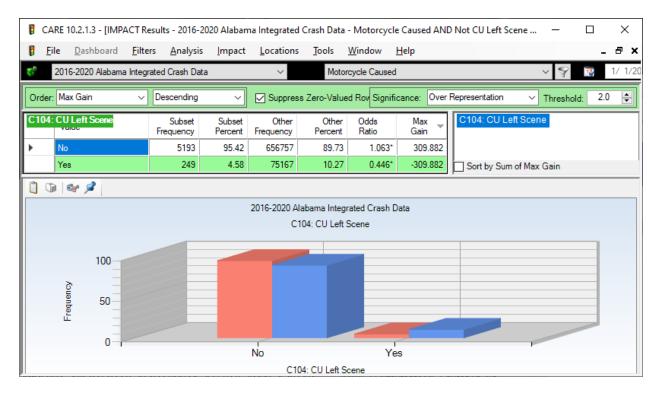
- Overturn/Rollover,
- Evasive Action (Swerve/Brake),
- Collision with Ditch,
- Ran Off Road Right,
- Other Non-Collision,
- Fell/Jumped from Motor Vehicle,
- Collision with Other Fixed Object,
- Collision with Curb/Island/Raised Median,
- Collision with Animal: Other than Deer,
- Ran Off Road Left,
- Collision with Animal: Deer,
- Collision with Other Non-Fixed Object,
- Non-Contact Vehicle,
- Vehicle Defect/Component Failure, and
- Ran Off Road Straight.

C023 Manner of Crash

-	RE 10.2.1.3 - [IMPACT Results -			-		-		
			npact <u>L</u> o	cations			lelp	
<u> </u>	2016-2020 Alabama Integrated Cra	ash Data		\sim	Motorcyc	de Caused		\[\] \[\
Order	Max Gain V Desce	nding	~ 🗸	Suppress Ze	ero-Valued F	Rov Significa	ance: Over	Representation V Threshold: 2.0
C023:	E Manner of Crash	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds	Max Gain 👻	C023: E Manner of Crash
•	Single Vehicle Crash (all types)	3282	61.97	145369	20.30	3.053*	2207.006	
	Non-Collision	165	3.12	5115	0.71	4.362*	127.175	
	Head-On (front to front only)	106	2.00	15924	2.22	0.900	-11.757	
	Sideswipe - Opposite Direction	52	0.98	13862	1.94	0.507*	-50.509	
	Angle (front to side) Same Dire	75	1.42	20486	2.86	0.495*	-76.493	
	Angle Oncoming (frontal)	51	0.96	18167	2.54	0.380*	-83.344	
	Angle (front to side) Opposite	65	1.23	22231	3.10	0.395*	-99.397	
	Side Impact (angled)	228	4.31	65489	9.14	0.471*	-256.287	
<u> </u>	Sideswipe - Same Direction	230	4.34	70032	9.78	0.444*	-287.882	
	Side Impact (90 degrees)	216 826	4.08	68896 270595	9.62 37.78	0.424*	-293.481	
<u> </u>	Rear End (front to rear)	020	10.60	270595	37.70	0.413*	-1175.032	Sort by Sum of Max Gain
00) 🐼 🖉							
			2016	-2020 Alaba	ma Integrate	ed Crash Da	ita	
				C023: E	Manner of C	Crash		
	80							
	60							
	ð							
	ASuenber							1
	20							
	0							
	Non-(Collision	Sidesw Opposite D	frection	Angle Oncor (frontal)		de Impact (ang	led) Side Impact (90 degrees)
				C02	3: E Manner	of Crash		

The top two over-represented items are reasonable for motorcycles. Most of the common Manner of Crash types for 4-wheeled vehicles are under-represented for motorcycles.

C104 Left Scene

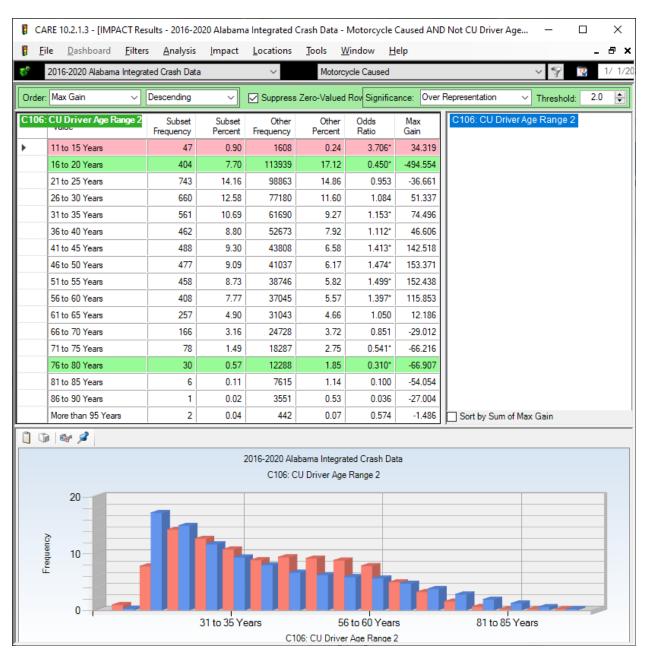


Motorcyclists proportion of leaving the scene is significantly lower than those of the general population of drivers.

C107 CU Driver Raw Age

CA	RE 10.2.1.3 - [IMPA	ACT Re	sults - 2016-2)20 Alaban	na Integrated	Crash Data	a - Motorcyc	le Caused	ND Not CU Driver Raw —	
🔋 <u>E</u> il	e <u>D</u> ashboard	<u>F</u> ilter	s <u>A</u> nalysis	<u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools	<u>W</u> indow	<u>H</u> elp		_ 8 >
6	2016-2020 Alabama	Integra	ated Crash Data	3	~	Moto	orcycle Cause	ed	~ 9	1/ 1/2
Order:	Max Gain	~	Descending	~	Suppres	s Zero-Valu	ed Rov Signi	ficance: O	ver Representation V Threshol	d: 2.0 🜩
C107:	CU Driver Raw Ag	e	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C107: CU Driver Raw Age	
	39		96	1.84	10201	1.59	1.160	13.252		
	40		92	1.77	9775	1.52	1.160	12.707		
	41		89	1.71	9116	1.42	1.204	15.053		
	42		100	1.92	8914	1.39	1.383*	27.692		
	43		98	1.88	8742	1.36	1.382*	27.087		
	44		95	1.83	8461	1.32	1.384*	26.366		
	45		106	2.04	8575	1.34	1.524*	36.442		
	46		105	2.02	8589	1.34	1.507*	35.328		
	47		80	1.54	8426	1.31	1.170	11.650		
	48		90	1.73	8228	1.28	1.348*	23.256		
	49		118	2.27	7963	1.24	1.827*	53.406		
	50		84	1.61	7831	1.22	1.322*	20.477		
	51		80	1.54	7697	1.20	1.281	17.564		
	52		110	2.11	7487	1.17	1.811*	49.267		
	53		85	1.63	7892	1.23	1.328*	20.982		
	54		94	1.81	7833	1.22	1.479*	30.461		
	55		89	1.71	7837	1.22	1.400*	25.428		
	56		99	1.90	7756	1.21	1.574*	36.085		
	57		88	1.69	7686	1.20	1.411*	25.653		
	58		88	1.69	7366	1.15	1.473*	28.249		
	59		63	1.21	7248	1.13	1.072	4.206		
	60		70	1.35	6989	1.09	1.235	13.307		
	61		70	1.35	6897	1.08	1.251	14.053	✓ Sort by Sum of Max Gain	
0	See 🖉									
					2016-2020 A	labama Integ	grated Crash	Data		
					C10	7: CU Driver	Raw Age			
Frequency				h	lm	mu		ulu		Maa,
	-				33	C107: CU [)river Raw A	53 ne		73

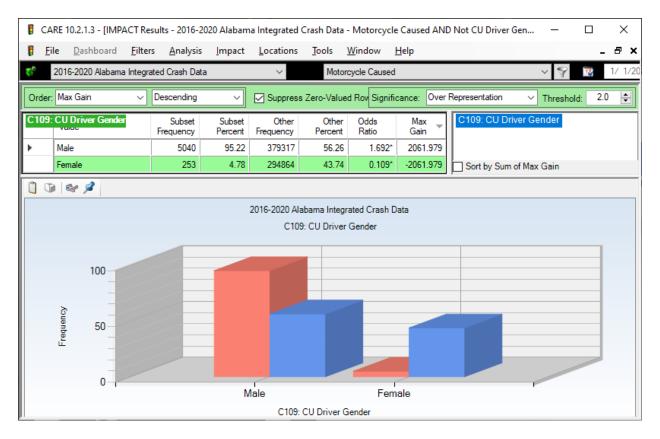
Except for ages 14 and 15, the younger ages are under-represented up to ages 28 and 33. The major over-represented grouping is from 39 to 61, which are shown in the table above.



C106 CU Driver Age Range – five year intervals

The over-representation in the 11 to 15 year-old category is alarming, but it probably reflects the motorcycle licensing of 14 and 15 year olds. The major over-representation is in the 41 to 60 year-old category.

C109 CU Driver Gender



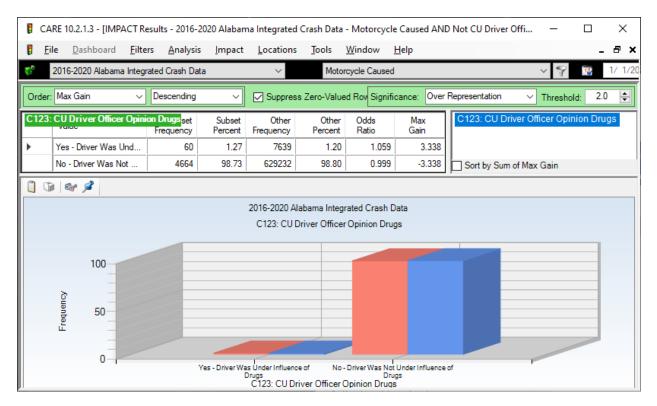
It is no surprise that males outnumber females as drivers in MC crashes by about 20 to 1.





The proportion of MC alcohol DUI crashes is about 70% higher than non-MC crashes.

C123 CU Driver Officer Opinion Drugs



The proportion of MC drug DUI crashes is about 60% higher than non-MC crashes.

Alcohol is a drug – we are using the word "drugs" accommodatively here to mean non-alcohol drugs.

C129 CU Vehicle Maneuver

🖡 CA	RE 10.2.1.3 - [IMPACT Results - 2	016-2020 AI	abama Inte	egrated Cra	sh Data - N	lotorcycle (Caused vs. N	Not Motorcycle Cau — 🗆 🗙
Ei Ei	le <u>D</u> ashboard <u>F</u> ilters <u>A</u> n	alysis <u>I</u> m	pact <u>L</u> o	cations]	<u>[</u> ools <u>W</u> i	ndow <u>H</u>	elp	_ & ×
6	2016-2020 Alabama Integrated Cras	sh Data		\sim	Motorcyc	de Caused		✓ ♥ 1/ 1/20
Order:	Max Gain ~ Descen	nding	<u>∽</u> ⊘s	ouppress Ze	ro-Valued F	Rov Significa	ance: Over	Representation V Threshold: 2.0
C129:	CU Vehicle Maneuvers	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds	Max Gain 👻	C125: E CU Driver Drug Test Type Given A C126: CU Driver Alcohol Test Results
	E Negotiating a Curve	1155	21.27	33756	4.45	4.780*	913.366	C127: E CU Driver Drug Test Results
	Movement Essentially Straight	3009	55.40	386772	50.98	1.087*	240.393	C128: CU Vehicle Initial Travel Direction
	E Overtaking/Passing	197	3.63	8204	1.08	3.355*	138.274	C129: CU Vehicle Maneuvers C130: E CU Non-Motorist Maneuvers
	Other	68	1.25	6886	0.91	1.380*	18.708	C201: CU Vehicle Most Harmful Event
	E Leaving Main Road	27	0.50	2649	0.35	1.424	8.038	C202: CU Contributing Circumstance
	P Go Straight in Right Turn Lane	1	0.02	4	0.00	34.925	0.971	C203: CU First Harmful Event Location
	P Change Lanes Right*	1	0.02	19	0.00	7.353	0.864	C204: E CU Sequence of Events #1 C205: E CU Sequence of Events #2
	Illegally Parked	4	0.07	1050	0.14	0.532	-3.516	C206: E CU Sequence of Events #2
	Stopped in Traffic	10	0.18	2769	0.36	0.505	-9.821	C207: E CU Sequence of Events #4
	E Stopped for Sign/Signal	9	0.17	2941	0.39	0.428	-12.052	C208: CU Model Year
	Making U-Tum	11	0.20	4219	0.56	0.364	-19.201	C209: CU Make
	Unknown	37	0.68	13458	1.77	0.384*	-59.336	C210: CU Body (Passenger Cars Only) C211: E CU Owners State
	Slowing/Stopping	243	4.47	43139	5.69	0.787*	-65.799	C212: CU License Tag State
	Turning Right	200	3.68	37816	4.98	0.739*	-70.696	C213: CU Vehicle Usage
	E Entering Main Road	64	1.18	19202	2.53	0.466*	-73.453	C214: E CU Emergency Status
	E Changing Lanes	134	2.47	43429	5.72	0.431*	-176.875	C215: E CU Placard Required C216: E CU Placard Status
	Backing	1	0.02	34886	4.60	0.004	-248.722	C217: CU Hazardous Cargo V
•	Turning Left	260	4.79	85767	11.30	0.423*	-353.941	Sort by Sum of Max Gain
00) 🕼 🖉							
			2016-	2020 Alabar C129: CU \	ma Integrate /ehicle Mar		ta	
		E Leaving	Main Roa			or Sign/Sig Maneuvers		E Entering Main Road

As was seen in variable C407 above, Curves are the major problem for motorcycles. This also shows Overtaking and Passing to be a potential problem, but it has only 197 crashes in the five years as opposed to 1,155 for Negotiating a Curve.

CARE 10.2.1.3 - [IMPACT Results - 2016-2020 Alabama Integrated Crash Data - Motorcycle Caused AND Not CU Estimated ... \times 8× <u>F</u>ile <u>D</u>ashboard **Filters** <u>Analysis</u> <u>I</u>mpact Locations Tools Window <u>H</u>elp _ 2016-2020 Alabama Integrated Crash Data Motorcycle Caused 1/ 1/20 Order: Natural Order Suppress Zero-Valued Rov Significance: Over Representation + Descending Threshold: 2.0 \sim C224: CU Estimated S C224: CU Estimated Speed at Impact d at Impact_{ubset} Subset Other Other Odds Max Frequency Percent Frequency Percent Ratio Gain 63274 15.44 0.170* -470.176 1 to 5 MPH 96 2.62 0.330* 6 to 10 MPH 44048 10.75 -264.142 130 3.55 11 to 15 MPH 139 3.79 29600 7.22 0.525* -125.861 16 to 20 MPH 147 4.01 21496 5.25 0.764* -45.346 21 to 25 MPH 212 5.78 18973 4.63 1.249* 42.229 26 to 30 MPH 242 6.60 20083 4.90 1.347* 62 297 5.74 31 to 35 MPH 348 9.49 23507 1.654* 137.659 36 to 40 MPH 322 8.78 22030 5.38 1.633* 124.875 41 to 45 MPH 558 15.22 35245 8.60 1.769* 242.627 274 7.47 17254 4.21 1.775* 119.611 46 to 50 MPH 51 to 55 MPH 396 10.80 28095 6.86 1.575* 144.606 56 to 60 MPH 200 5.46 13229 3.23 1.690* 81.627 61 to 65 MPH 174 4.75 15514 3.79 1.253* 35.181 4.45 17874 1.019 66 to 70 MPH 163 4.36 3.063 71 to 75 MPH 56 1.53 3951 0.96 1.584* 20.646 76 to 80 MPH 64 1.75 2485 0.61 2.878* 41.764 81 to 85 MPH 25 0.68 765 0.19 3.652* 18.155 0.15 6.157* 27.640 86 to 90 MPH 33 0.90 599 7 91 to 95 MPH 0.19 130 0.03 6.018 5.837 96 to 100 MPH 46 1.25 329 0.08 15.626* 43.056 34 0.93 0.04 Over 100 MPH 184 20.651* 32.354 Sort by Sum of Max Gain 📋 🕼 | 🗞 💋 2016-2020 Alabama Integrated Crash Data C224: CU Estimated Speed at Impact 20 15 Frequency 10 5 0 21 to 25 MPH 71 to 75 MPH 96 to 100 MPH 46 to 50 MPH C224: CU Estimated Speed at Impact

C224 CU Estimated Speed at Impact

The combination of speed and the lack of protection is a deadly combination for motorcycle crashes. See this relationship in the next display.

CARE 10.2.1.3	- [Crosstab Result	s - 2016-2020 Alaba	ma Integrated Crasl	h Data - Filter = Mo	otorcycle Caused]		- 0			
<u>File D</u> ashb	oard <u>Filters</u>	<u>A</u> nalysis <u>C</u> rossta	b <u>L</u> ocations <u>T</u>	ools <u>W</u> indow	<u>H</u> elp		-	đ		
2016-2020	Nabama Integrated (Crash Data	\sim	Motorcycle Caused		~	· 💡 🔞 1/ 1	/2		
uppress Zero Va	lues: Rows and Co	olumns 🗸 Select	Cells: 🔳 🗸 🚿	9	Column: Crash Severi	ty ; Row: CU Estin	nated Speed at Impac	t		
	Fatal Injury	Suspected Serious Injury	Suspected Minor Injury	Possible Injury	Property Damage Only	Unknown	TOTAL			
0 MPH	0	0	0	0	1 0.08%	0 0.00%	1 0.02%	-		
1 to 5 MPH	1	8 0.57%	14 0.79%	9 1.81%	60 4.56%	4 2.35%	96 1.76%			
6 to 10 MPH	1	14	30 1.70%	12 2.41%	69 5.24%	4 2.35%	130 2.39%	1		
11 to 15 MPH	1	16 1.15%	47 2.66%	9	66 5.02%	0	139			
16 to 20 MPH	2	20	45	15	60 4.56%	5	147			
21 to 25 MPH	1 0.34%	39	72	28	69 5.24%	3	212			
26 to 30 MPH	2	45	90 5.09%	22	76	7 4.12%	242			
31 to 35 MPH	4	89 6.37%	128	24	94 7.14%	9 5.29%	348			
36 to 40 MPH	15	100	109	28	62 4.71%	8 4.71%	322			
41 to 45 MPH	23	201 14.39%	177	53	98 7.45%	6 3.53%	558			
46 to 50 MPH	11 3.78%	97	100	25	38	3 1.76%	274 5.04%			
51 to 55 MPH	21 7.22%	135	153	25	57 4.33%	5	396			
56 to 60 MPH	22 7.56%	76 5.44%	64 3.62%	13 2.61%	23 1.75%	2	200			
61 to 65 MPH	15 5.15%	15 67				13 2.61%	20	5 2.94%	174	
66 to 70 MPH	17 5.84%	60 4.29%	51	4	27	4 2.35%	163 3.00%			
71 to 75 MPH	3	20 1.43%	20	7	6 0.46%	0	56			
76 to 80 MPH	14	27	15	0	7	1 0.59%	64 1.18%			
31 to 85 MPH	6 2.06%	10 0.72%	7	0	2 0.15%	0	25 0.46%			
36 to 90 MPH	5	11 0.79%	11 0.62%	2	3 0.23%	1 0.59%	33 0.61%			
91 to 95 MPH	4 1.37%	2 0.14%	0	0	1 0.08%	0	7 0.13%			
6 to 100 MPH	19 6.53%	16 1.15%	7 0.40%	3	1 0.08%	0	46 0.85%			
over 100 MPH	13 4.47%	10 0.72%	5 0.28%	1 0.20%	5 0.38%	0 0.00%	34 0.63%			
E Stationary	0 0.00%	9 0.64%	3 0.17%	0 0.00%	10 0.76%	1 0.59%	23 0.42%			
Unknown	89 30.58%	313 22.41%	543 30.71%	193 38.76%	434 32.98%	94 55.29%	1666 30.63%			
lot Applicable	2 0.69%	12 0.86%	23 1.30%	12 2.41%	12 27		84 1.54%			
TOTAL	291 5.35%	1397 25.68%	1768 32.50%	498 9.15%	1316 24.19%	4.71% 170 3.13%	5440 100.00%	1		

Cross-tabulation Injury Severity vs Impact Speed

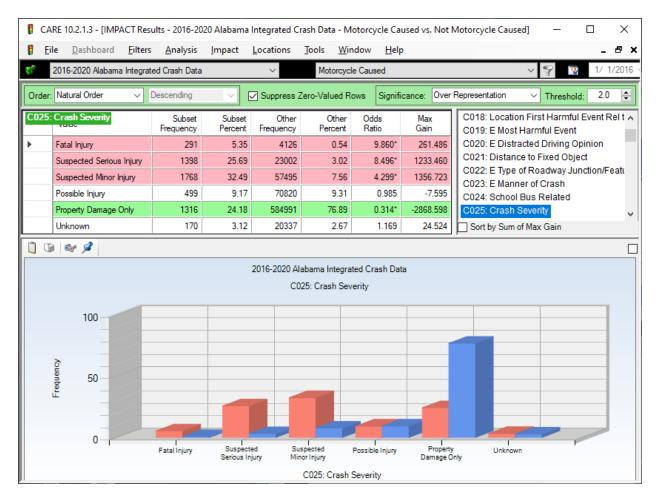
C226 CU Vehicle Damage

🔋 CAI	RE 10.2.1.3 - [IMPACT Res	ults - 2016-20	20 Alabama I	ntegrated Cr	ash Data - Mo	otorcycle Ca	used vs. Not N	Motorcycle Caused] — 🛛	×			
🔋 <u>E</u> il	e <u>D</u> ashboard <u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpact	Locations	<u>T</u> ools <u>W</u> in	dow <u>H</u> elp)	-	8 X			
6	2016-2020 Alabama Integrat	ed Crash Data		\sim	Motorcycle	e Caused		✓ ♥ 1/ 1/	2016 ·			
Order:	Max Gain 🗸 🛛	Descending	~ 2	Suppress Z	ero-Valued Ro	ows Signifi	cance: Over	Representation V Threshold: 2.0	÷			
C226:	CU Vehicle Damage	Subset Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C222: CU Contributing Vehicle Defect C223: CU Speed Limit	^			
	Major and Disabled	2957	54.34	257560	33.86	1.605*	1114.495	C224: CU Estimated Speed at Impact				
	Not Applicable	12	0.22	2485	0.33	0.675	-5.777	C225: CU Citation Issued				
	Major Not Disabled	489	8.99	83018	10.91	0.823*	-104.885	C226: CU Vehicle Damage C227: CU Vehicle Towed				
	None Visible	89	1.64	37902	4.98	0.328*	-182.139	C230: CU Areas Damaged #1				
	Unknown	172	3.16	50795	6.68	0.473*	-191.372	C231: E CU Areas Damaged #2	~			
	E Minor	1723	31.66	297931	39.16	0.808*	-408.307	Sort by Sum of Max Gain				
1												
			1	2016-2020 Ala	abama Integrat	ed Crash Dat	a					
				C226:	CU Vehicle D	amage						
	60											
	≥ ⁴⁰											
I	<u>20</u>											
	0	Major and Disabled	Not Applicab		or Not abled	None Visible	Unknown	E Minor				
				C22	6: CU Vehicle	Damage						

Major and Disabled was the only over-represented value, having a proportion that is over 60% higher than the non-MC crashes.

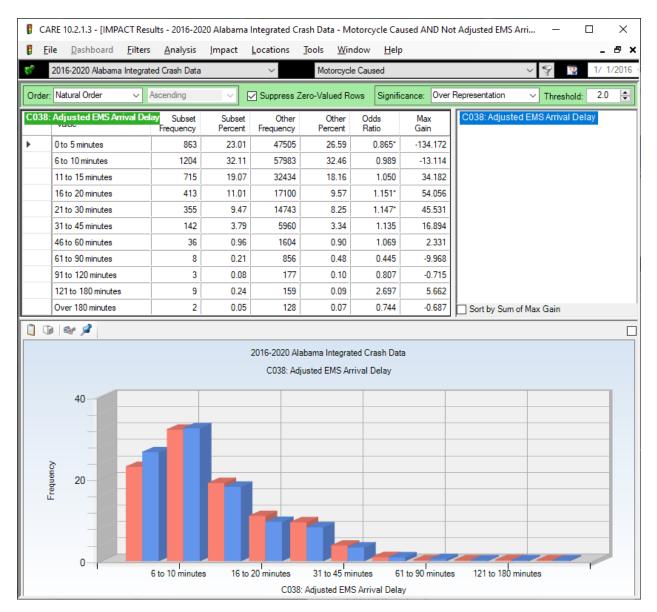
Severity Factors

C026 Crash Severity



The fatality rate proportion for MC crashes is close to ten (9.860) times what it is for non-MC crashes. Suspected Serious Injury is comparable to this with an Odds Ratio of 8.496.

C038 Adjusted EMS Arrival Delay

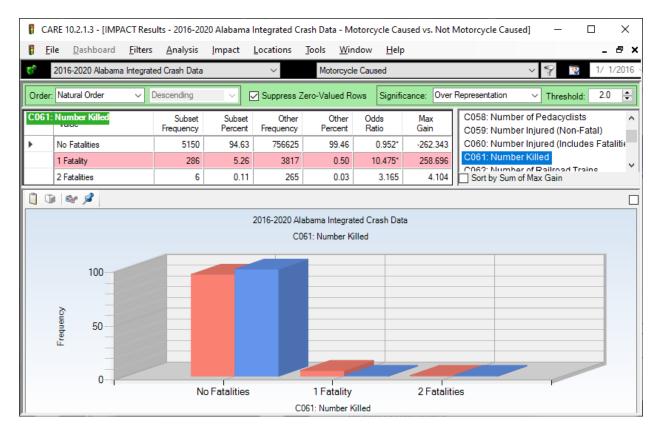


Some of the increased delay has to do with the proportion of the SC crashes being in rural areas. A few of the highest delay times were probably due to a lack of discover in the late night or early morning hours.

C060 Number of Injured (Includes Fatalities)

🚦 CA	RE 10.2.1.3 - [IMPACT Res	ults - 2016-20	20 Alabama I	ntegrated Cr	ash Data - M	otorcycle Ca	used vs. Not N	Motorcycle Caused] —		×			
🔋 Ei	e <u>D</u> ashboard <u>F</u> ilters	<u>A</u> nalysis	<u>I</u> mpact	<u>L</u> ocations	<u>T</u> ools <u>W</u> in	idow <u>H</u> elp			-	₽ ×			
8	2016-2020 Alabama Integrat	ed Crash Data		\sim	Motorcycl	e Caused		~ 9	1/ 1/	/2016 \			
Order:	Natural Order 🗸 🗸	Descending	~ 2	Suppress Z	ero-Valued R	ows Signifi	cance: Over	Representation V Three	hold: 2.0	÷			
C060:	Number Injured (Includes	Fatalities) _{et} Frequency	Subset Percent	Other Frequency	Other Percent	Odds Ratio	Max Gain	C055: Number of Motoris C056: Number of Non-Mo					
•	No Injuries	1437	26.41	603926	79.38	0.333*	-2883.045	C057: Number of Pedest					
	1 Injury	3601	66.17	114947	15.11	4.379*	2778.753	C058: Number of Pedacy					
	2 Injuries	374	6.87	29164	3.83	1.793*	165.382	C059: Number Injured (N C060: Number Injured (In		1197			
	3 Injuries	23	0.42	8387	1.10	0.383*	-36.994	C060: Number Hijdred (m	ciudes Fala				
	4 Injuries	5	0.09	2737	0.36	0.255	-14.578	C062: Number of Railroa	d Trains				
	6 Injuries	2	0.04	371	0.05	0.754	-0.654	Sort by Sum of Max Gain		· · ·			
	Co60: Number Injured (Includes Fatalities)												
	100 50 0	No Injuries	l Injur	,	i njuries	3 Injuries ncludes Fatali	4 Injurie ties)	es 6 Injuries					

C061 Number Killed



For additional motorcycle information from NHTSA and other sources, see: <u>http://www.safehomealabama.gov/tag/motorcycles/</u>