Special Study Summary Report
Analysis of Advanced Driver Assistance Systems (ADAS)
Automatic Emergency Braking (AEB); City (CAEB); High-Speed (HAEB)
Results of Comparison of Nissan Without AEB/HAEB Against Toyota with AEB/HAEB

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1.0 Introduction

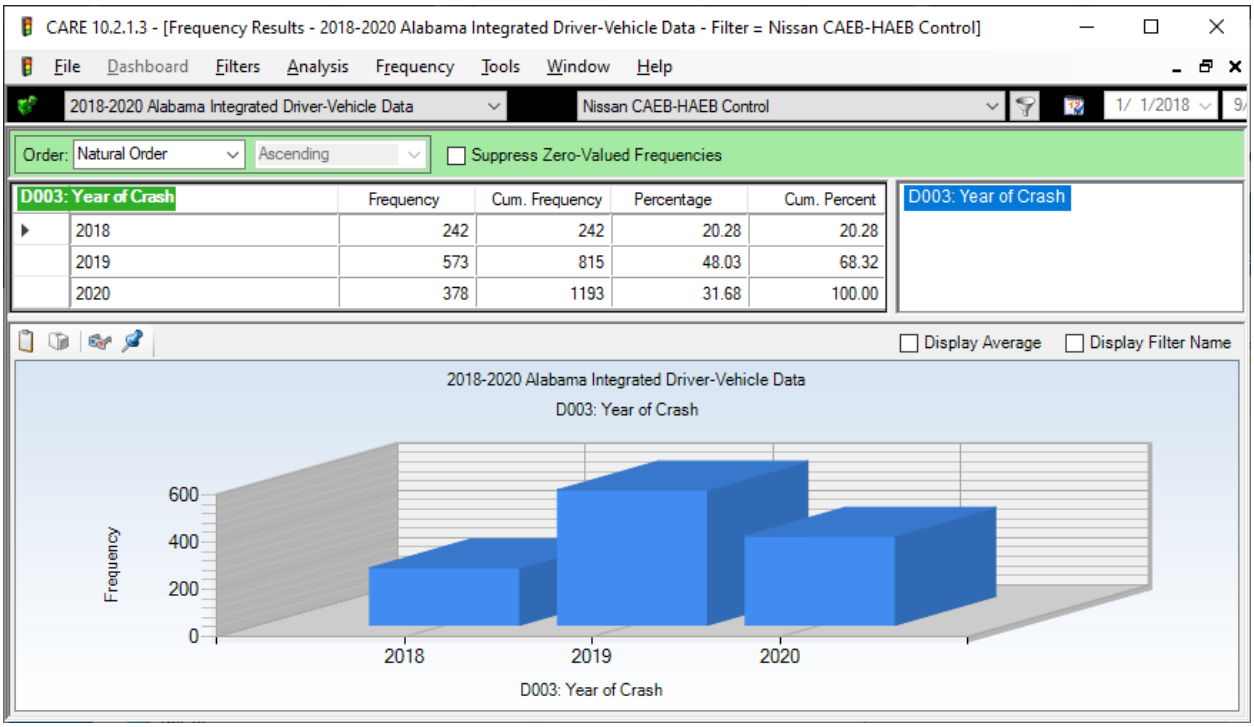
This document presents the results of an ADAS evaluation of both city and high speed Automatic Emergency Braking (AEB). With AEB brakes are automatically applied to reduce crash severity and to warn the driver in some cases to prevent the crash altogether. The particular comparisons that we made involved Toyotas for which AEB was in effect for both CAEB and HAEB. These were compared to Nissans that were selected to have neither of the AEB capabilities.

The use of the terms test and control could be confusing, and we will not use them here. The tables have two columns labeled "Subset" and two labeled "Other." The Nissans are in the Subset Frequency and Subset Percent columns in the table. We usually put the "inferior" subset (like DUI, Distracted Driving, etc.) in this position so that the results make more sense. The "Other" columns in this study are the Toyotas, which are being evaluated to see if they are superior to the Nissans.

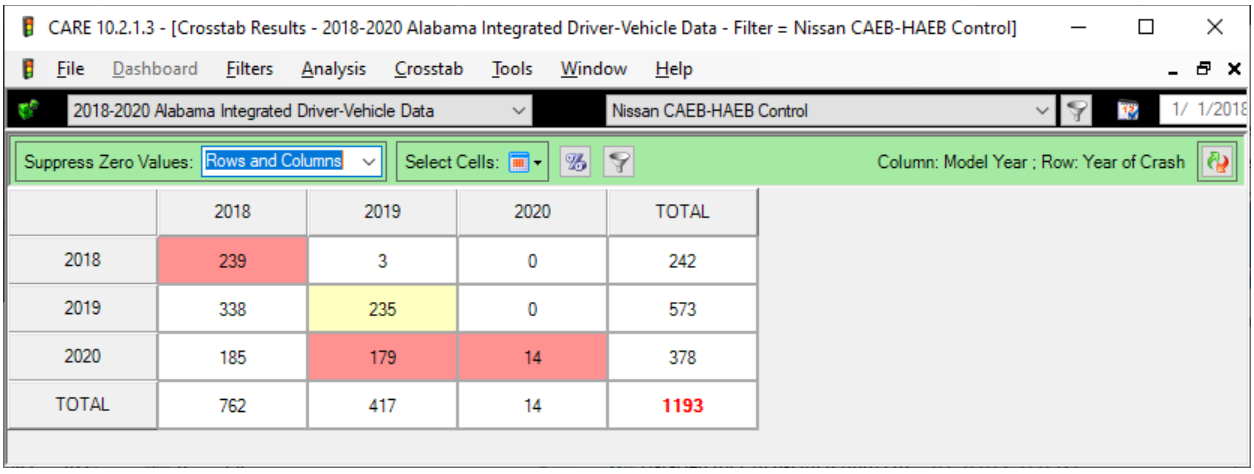
The following CARE results are given to provide further background for the analysis that will be given in Section 2:

- 1.1 Years of Crash for Nissans (Non-AEB) – these are the calendar years that the Nissan crashes took place.
- 1.2 Cross-tabulation, where the columns are the model years of the Nissans, and the rows are the calendar years in which these crashes took place.
- 1.3 Years of Crash for Toyotas (AEB) – these are the calendar years that the Toyota crashes took place.
- 1.4 Cross-tabulation, where the columns are the model years of the Toyotas, and the rows are the calendar years in which these crashes took place.
- 1.5 This is a comparison using IMPACT of the Nissan years of crash (in the Subset columns and having red bars in the chart) against the Toyota years of crash (in the Other columns and having blue bars in the chart).
- 1.6 This is the same comparison as above except that the attribute being compared is the model year as opposed to the year of the crash.

1.1 Years of Crash for Nissans (Non-AEB)

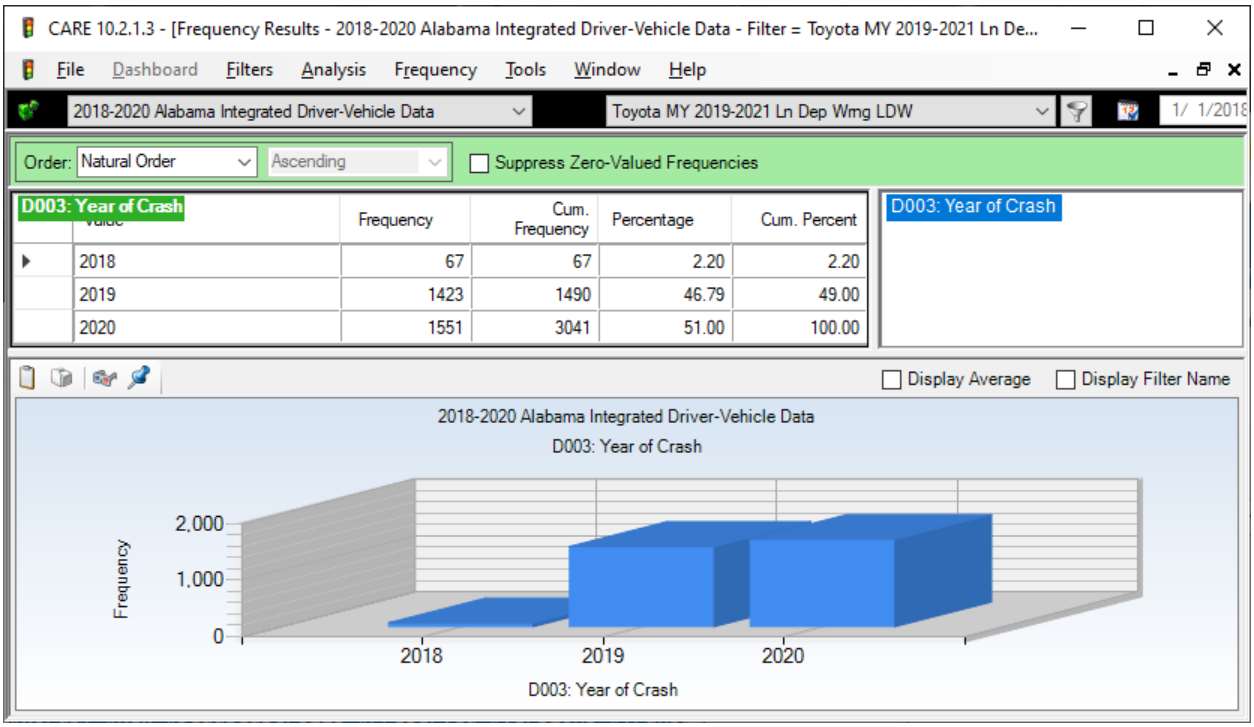


1.2 Model Year (Columns) by Year of Crash (Rows) for Nissans (Non-AEB)

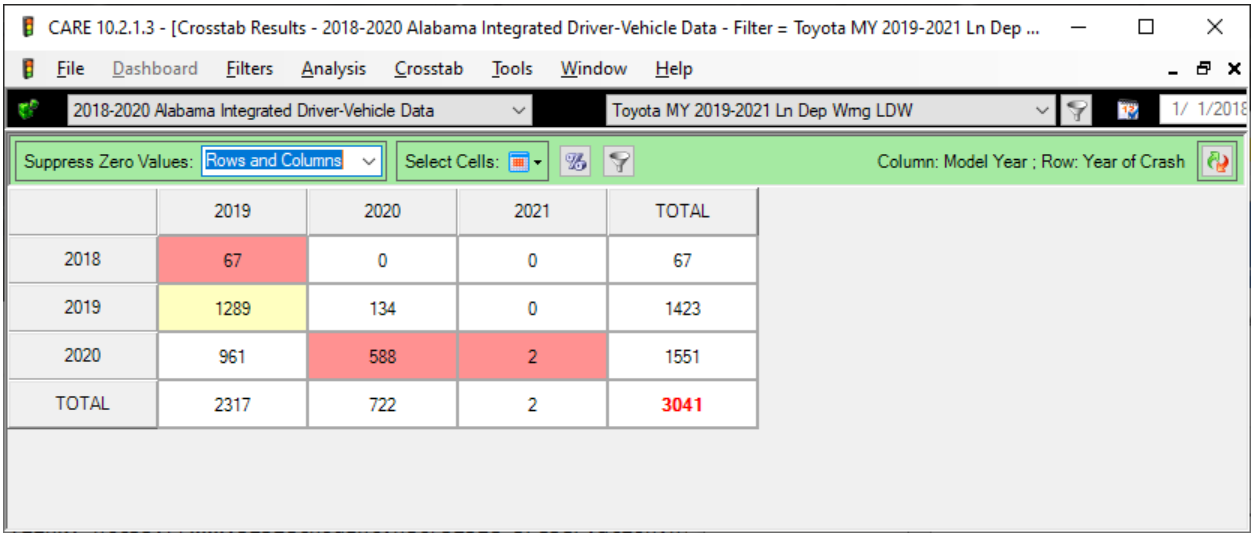


	2018	2019	2020	TOTAL
2018	239	3	0	242
2019	338	235	0	573
2020	185	179	14	378
TOTAL	762	417	14	1193

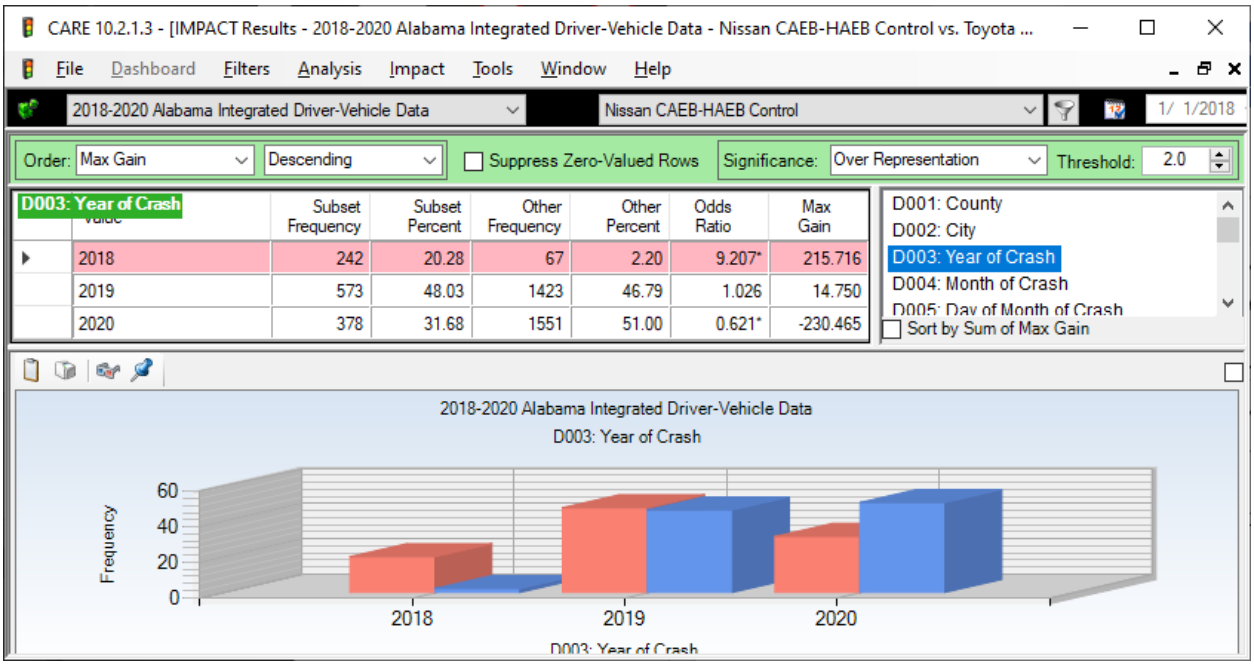
1.3 Years of Crash for Toyotas (AEB)



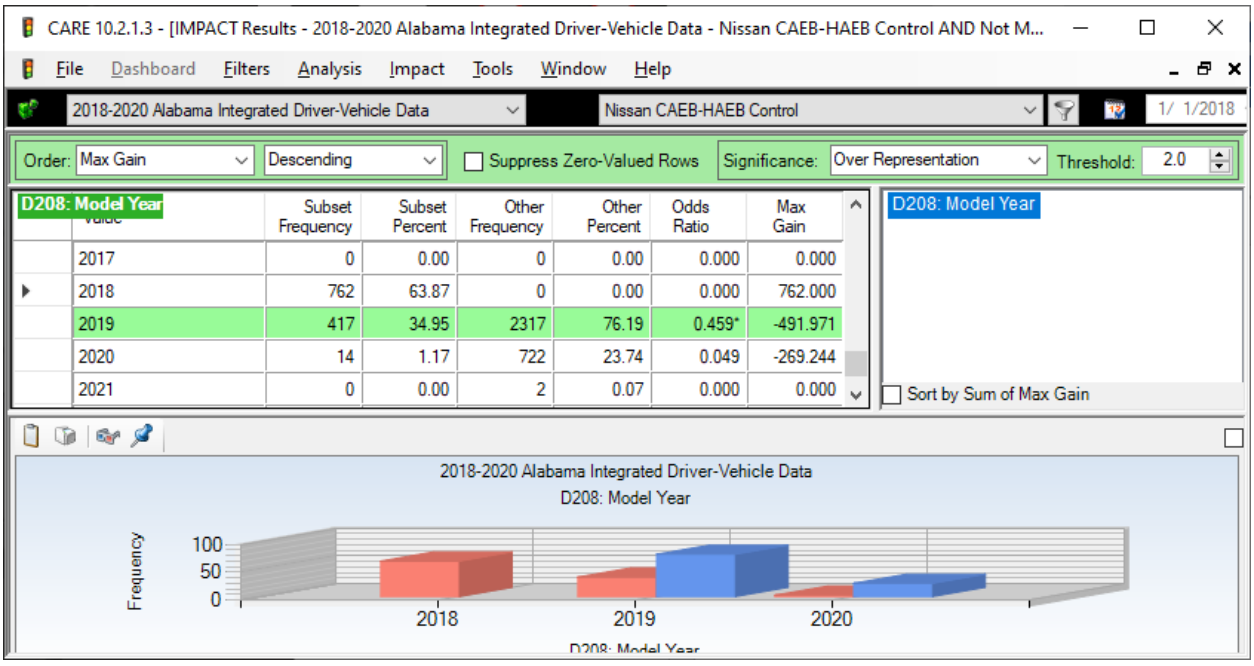
1.4 Model Year (Columns) by Year of Crash (Rows) for Toyotas (AEB)



1.5 D003 Year of the Crash IMPACT (Subset=Red Bars=Nissan)



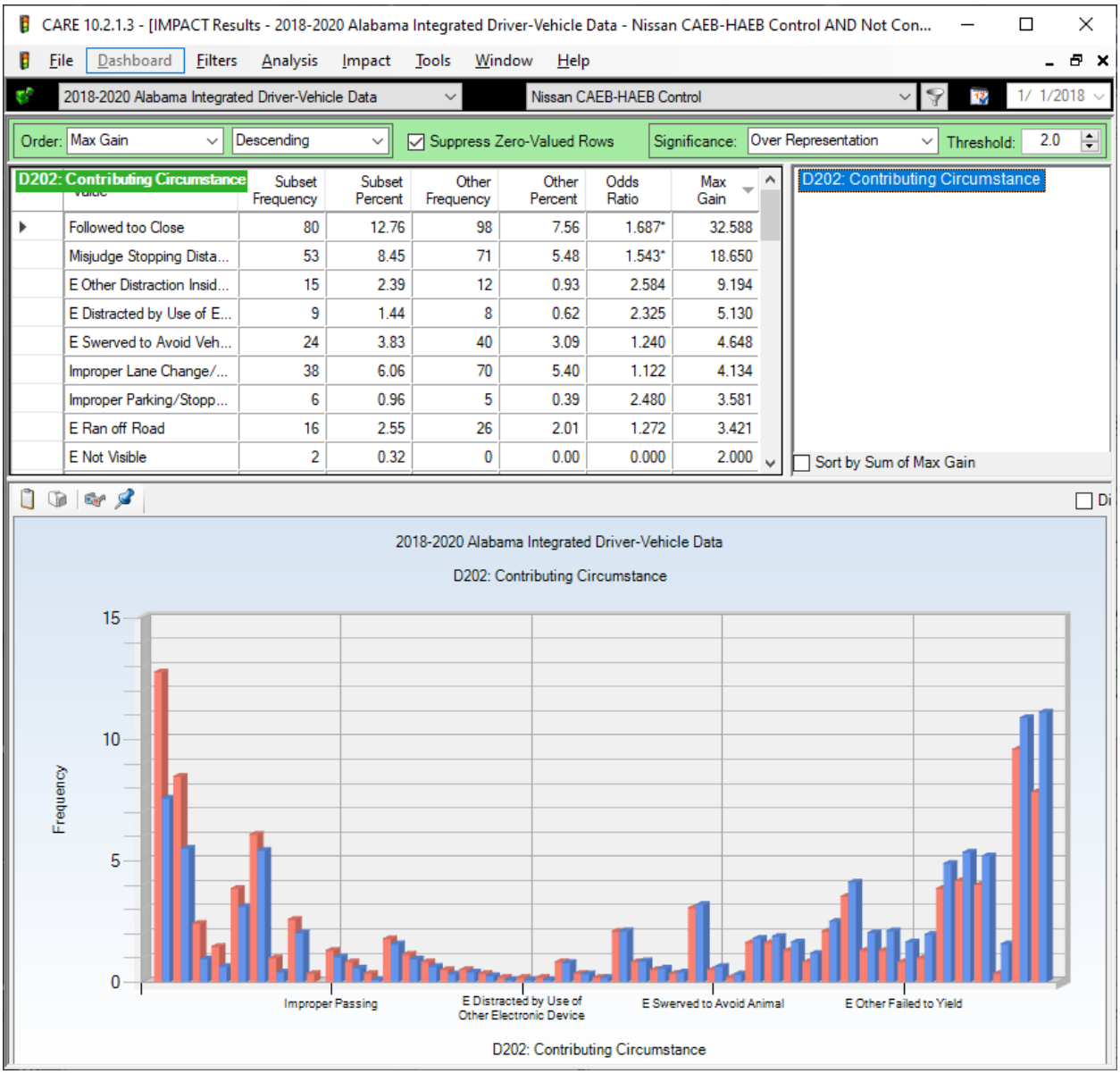
1.6 D208 Model Year IMPACT



2.0 IMPACT Analysis Comparing Nissans (non-AEB) with Toyotas (AEB)

Because the comparisons here are being made using the Driver-Vehicle Dataset within CARE, the numbers produced are in vehicles and not crashes. However, they were only vehicles that were involved in crashes. In order to emphasize this point, the term "Vehicle-Crashes" will be used in discussing these results.

D202 Contributing Circumstances

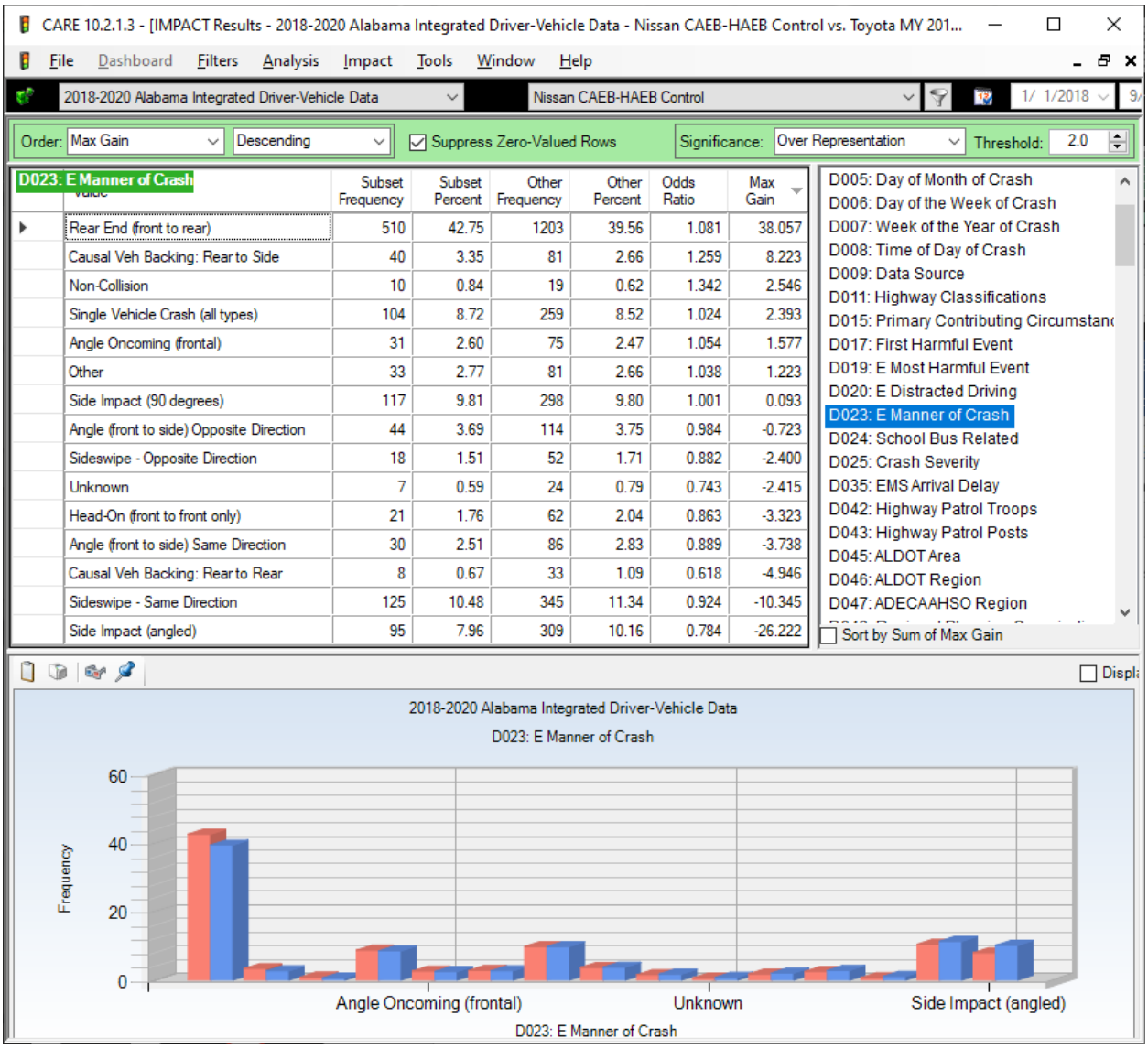


For the analysis above, 566 were removed where the reporting officer entered "Not Applicable" indicating that this attribute was in their opinions not applicable to the particular unit for which the report applied. The major results are:

- The Following Too Close proportion was reduced almost 70% (Odds Ration 1.687 = 68.7% reduction). This amounted to over 32 vehicle-crashes (Max Gain = 32.588).
- Misjudged Stopping Distance proportion was reduced 54.3%, saving over 18 vehicle-crashes (18.650 Max Gain).
- The total number of vehicle-crashes reduced for which either Following Too Close or Misjudged Stopping Distance compared to this expected number was over 50 vehicles.

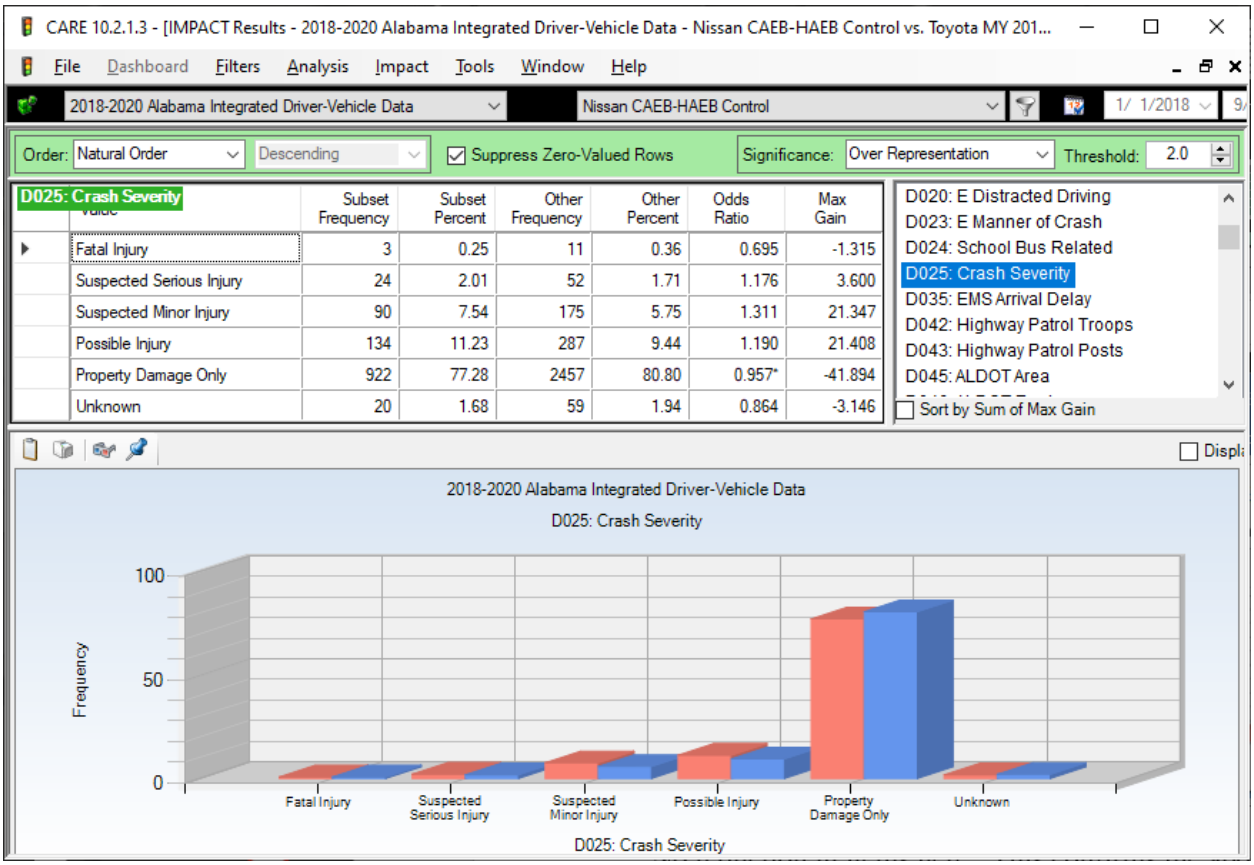
The tables are ordered by highest Max Gain at the top – the Max Gain is the maximum vehicle-crashes that would be reduced if <u>all</u> of the higher percent in the Subset Percent column was reduced to the (lower) value in the Other Percent column.

D023 Manner of Crash



None of the attribute outcome items were removed in the display above.. This finding confirms the results from D202. Interesting the sum of the two factors reduced was about 50 vehicles above, here the rear-end crashes are reduced by a little over 38 (38.057).

D025 Crash Severity

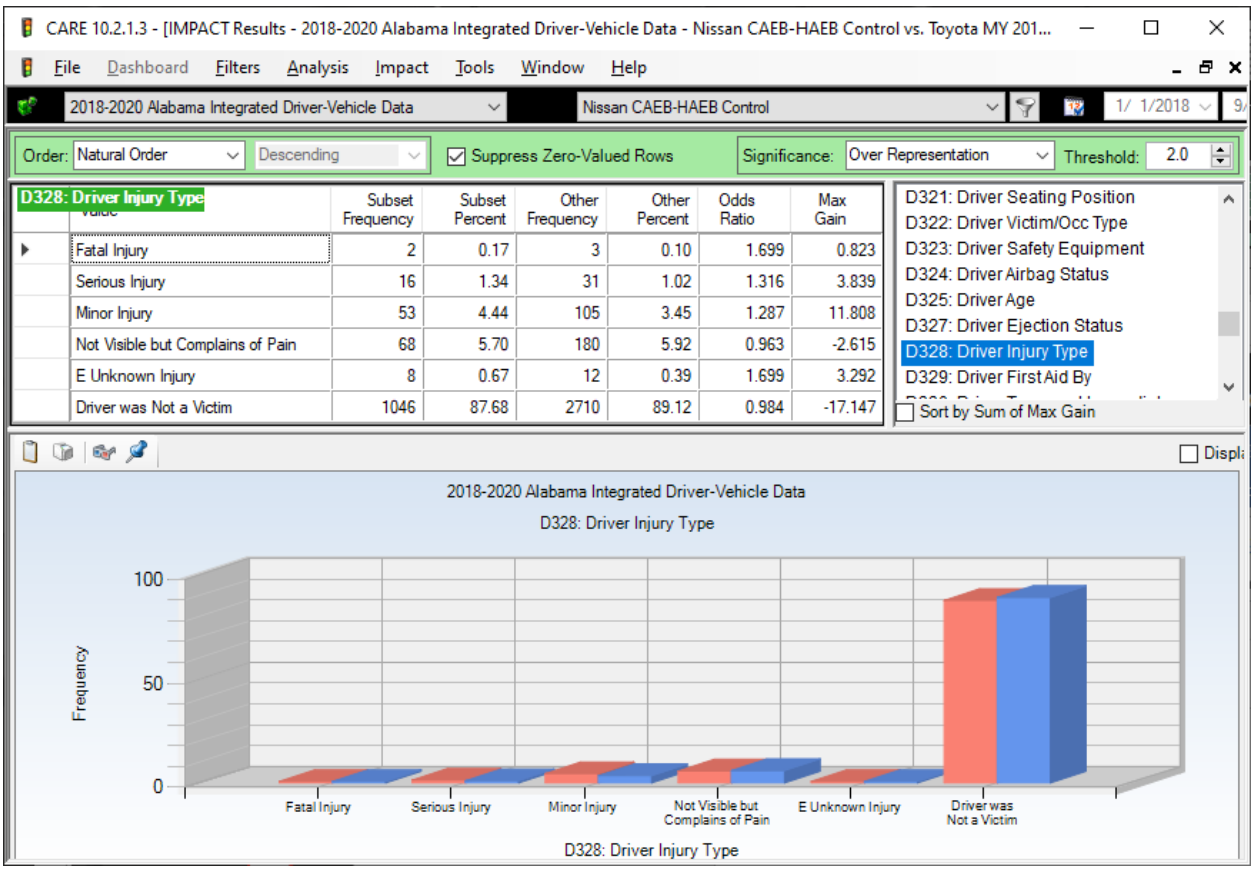


This is not ordered by Max Gain – we believe it makes more sense to put the worst severity at the top.

- Fatal Injury – Numbers are too low to do any meaningful statistical test, and fatalities are not necessarily related to AEB – e.g., they could be caused by not being properly restrained. See PCC above for the Toyotas that had 52 DUIs of which typically half would not be wearing seatbelts. There are too many variables to nail this down from the data given above.
- Suspected Serious Injury – This is a proxy for potential fatalities in the future. Its proportion was reduced about 18%.
- Suspected Minor Injury – could also serve as a proxy for fatalities, but not as definitive as the serious injury category. This proportion was reduced over 31%, and the number of vehicle-crashes affected was over 21.
- Possible Injury – this one is not as definitive, but it is good to see it reduced as well about 21 vehicle-crash cases that had this injury.

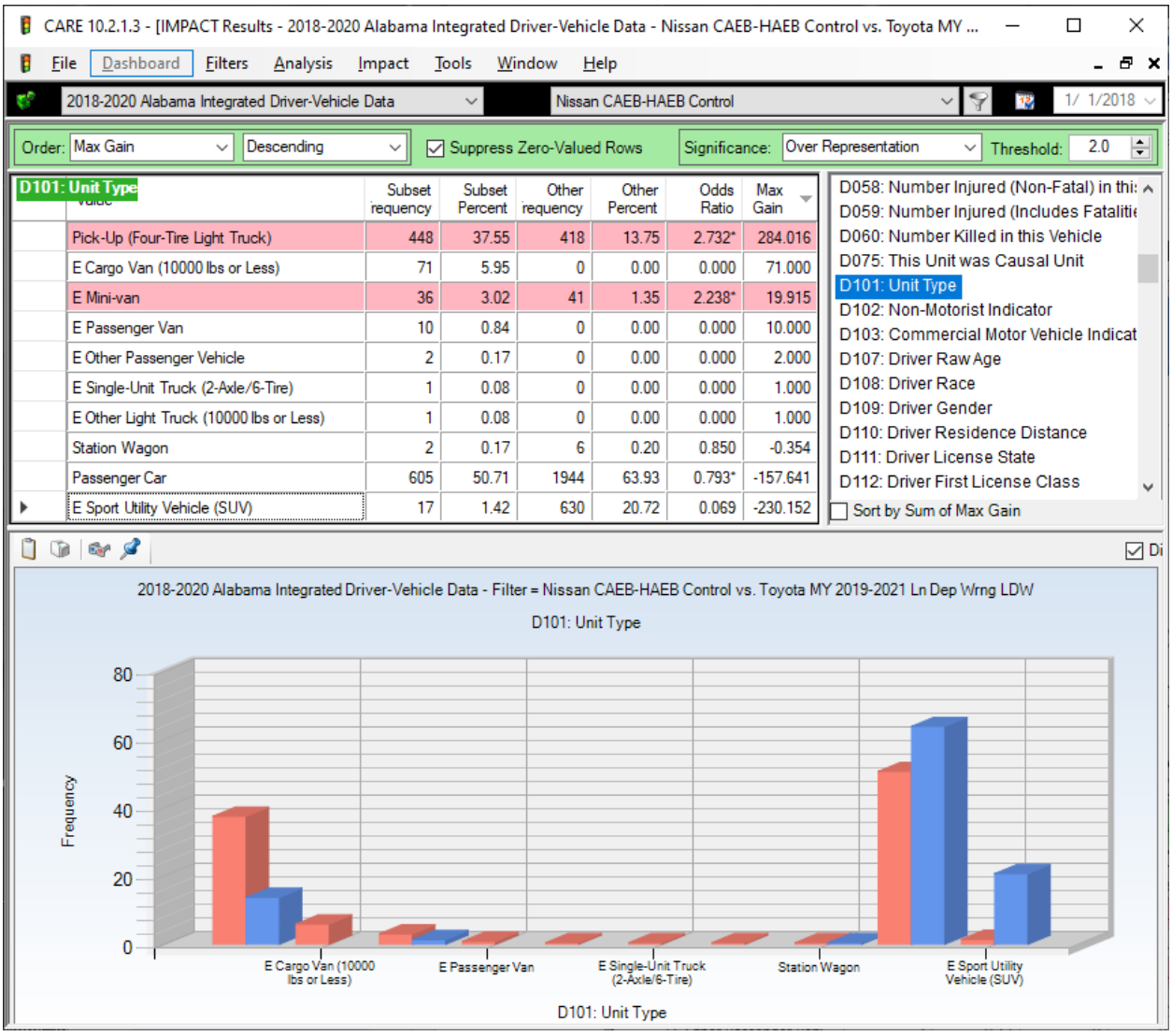
- Property Damage Only – this result was significant, showing that the collection of the injury reductions above was significant. There were about 42 crashes with no injuries.

D328 Driver Injury Type



This is another injury comparison for the driver only. Generally, it supports D025 findings given above.

D101 Unit Type



Some disparity, but that should not matter for the types of crashes we are considering. Differences are not in AEB performance – these are strictly the types of vehicles that occurred in the sampling.