Special Study of
Response of Various Traffic Sectors to COVID Quarantine
Weeks Ending March 3 through June 16, 2020 Data (15 Weeks)
The first 15 Weeks of the government quarantine recommendations

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1 Introduction

The purpose of this report is to present the results of several analyses that have been performed during and subsequent to the COVID quarantine actions. The base week (Week 1 on all charts) was originally the crash results from the week of March 4-10, 2020. This week was used in the original studies, since this was the last week in which the traffic volume and vehicle mix were considered to be "normal."

It was determined by a review of the findings this past week that some of the estimates for Week 1 were outliers in the sense that they were either significantly higher or significantly lower than the average over the first 10 weeks of 2020. It was determined that the average over the ten weeks itself would be a much better "Week 1" comparison. For this reason, the original Week 1 (represented by a value of 1 in the charts) has been adjusted to be the average over the first 10 weeks of 2020, i.e., the weeks before the COVID advisories were issued. We feel that the results given in this report are an improvement over those in previous reports, and we will continue to attempt to improve the information presented in any way that comes to our attention.

All cases where the "Week 1" base has been changed are given in Table 1 below. Although several of these now are not close approximations to the original Week 1 values, we will still for consistency call them "Week 1." So think of the Week 1 crash number as *the closest number that we could derive that approximates the crash levels of the various crash types prior to the COVID quarantine actions.* The questions to be answered relate to how the various types of crashes were reduced (or increased) with the decline in traffic after Week 1. This is given in each of the charts by Weeks 2, 3, … 15, the last of which is June 10 through June 16, 2020.

There are many things being written at this time regarding ramifications of the COVID-19 virus. If this report contradicts any of those reported findings, this should not infer that other sources are incorrect. They are most likely based on different data sources, which could vary considerably from state to state. The data source for the results in this report are Alabama crashes as reported by eCrash, and thus the results obtained should only be applied directly within the state of Alabama. See credit at end of this section.

How can metrics of extremely different values (e.g., all crashes and bicycle crashes) be compared on the same chart? The answer is that the *number of crashes* for each are not being compared. What is being compared are the *proportions* by which the metric increased or decreased in the weeks following initiation of the COVID quarantine. These proportions (e.g., 0.9, 0.8, 1.2, etc.) are given on the Y axis. Week 1 is the name we are giving to the baseline week chosen to gauge increases and decreases from the average in the various types of crashes. It is considered representative of crash frequency (of various types) under normal (pre-COVID) conditions.

All of the crash charts contain two lines representing *fatal* and *all crashes* in order to provide a common frame of reference for comparing how the various crash types changed. In addition to

all crashes and fatal crashes, which are in all of the charts, the following crash types were also compared (each independently, two lines per chart);

- Speeding Crashes and ID/DUI Crashes
- Pedestrian Crashes and Bicycle Crashes
- Motorcycle Crashes and Large Truck Crashes
- Aggressive Driving and Interstate Travel
- Young Driver Crashes and Federal/State Travel
- Rural Crashes and Urban Crashes.

The crash frequencies for the above for the original and updated Week 1 are given in Table 1.

Table 1. Week 1 and Current Week Crash Frequencies

Crash Type	Original Week 1	Updated Week 1
All Crashes	3,445	2,794
Fatal Crashes	22	14
Speeding Involved Crashes	141	207
Impaired Driving (ID/DUI) Crashes	99	97
Pedestrian Involved	19	15
Bicycle Crashes	4	3
Motorcycle Crashes	22	14
Large Truck Caused Crashes	132	104
Aggressive Driving Crashes	53	44
Crashes on Interstate Highways	435	321
Misjudged Stopping Distance	315	257
Young Driver (16-20) Caused Crashes	522	404
Rural Crashes	790	665
Urban Crashes	2,655	2,129

The Y axis measures how much the particular crash type either increased (greater than1) or decreased (less than one) from Week 1. Multiply by 100 to turn these proportions into percentage increases or decreases. Comments are given beneath each of the charts.

Four additional charts are included after the standardized charts:
- Section 3. Weekly new COVID cases plotted with weekly total crashes;
- Section 4. Daily comparison of 2020 fatalities against 2019 fatalities;
- Section 5. Updates to Section 3 beginning with April 1, 2020; and
- Section 6.   Correlation analysis showing how total crashes predict AADT.
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This final chart demonstrates the very high correlation between traffic volume and crash frequency. Crash frequency is an excellent proxy measure for traffic volume, and thus the charts can be used to gauge the degree to which the drivers of the various vehicle types conformed to the COVID quarantine, assuming that this was possible.

To begin, please consider the *All crashes* (yellow) and the *fatal crashes* (orange) lines first, illustrated in the display below. These two lines will be incorporated into all of the charts in Section 2. Consistent with what has been observed in most states, all crashes came down to about 50% of their pre-COVID levels. However, fatal crashes did not remain at these lower levels consistently, and in a couple cases (Weeks 8 and 13) they moved above their pre-COVID levels.

In Weeks 10-12, the two curves move together at close to 80% of their pre-COVID levels. "All crashes" have now leveled out to just under 80%. Fatal crashes rose in Weeks 13 to almost 40% higher than the pre-COVID level, but in the last two weeks it has come back to about the same as pre-COVID (0.99). See Sections 3 and 4 below for how the fatalities in 2020 compare by day to those of 2019.
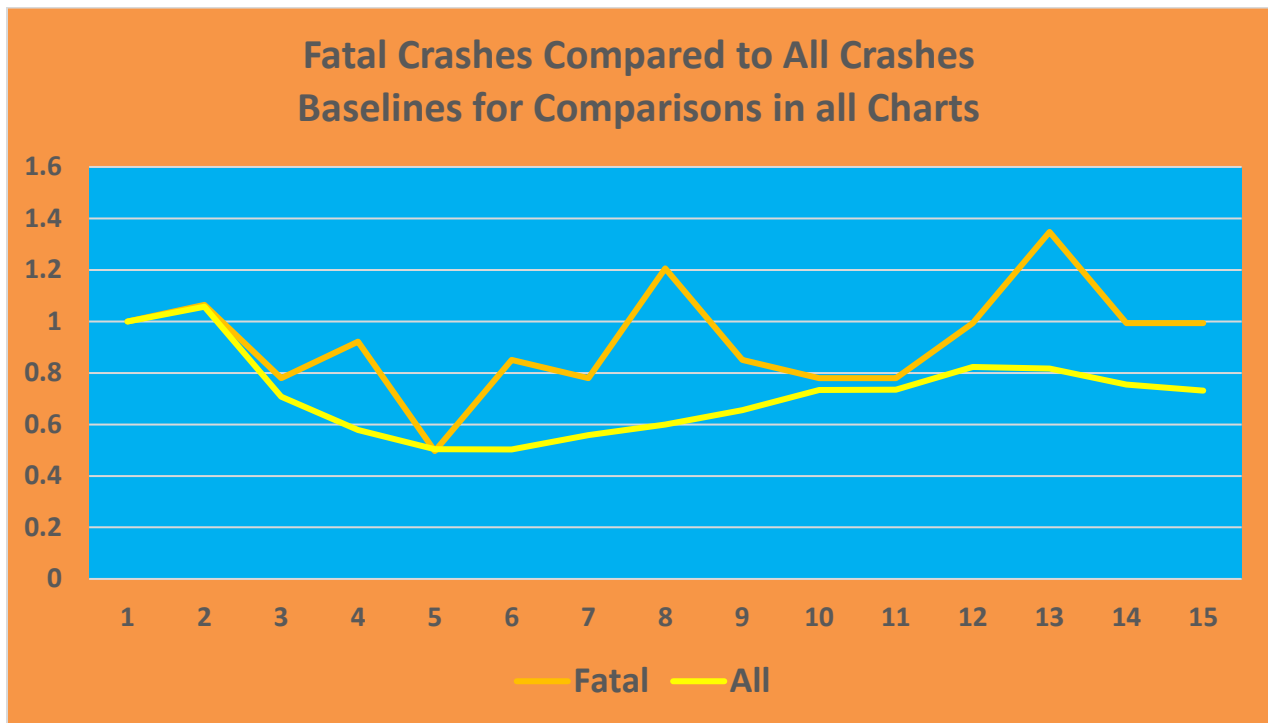
Fatal Crashes Compared to All Crashes
Baselines for Comparisons in all Charts

2 First 15 Weeks Response Temporal Displays

2.1 Speeding Crashes and Impaired Driving Crashes (ID/DUI)

Speeding, and DUI with Fatal, and All
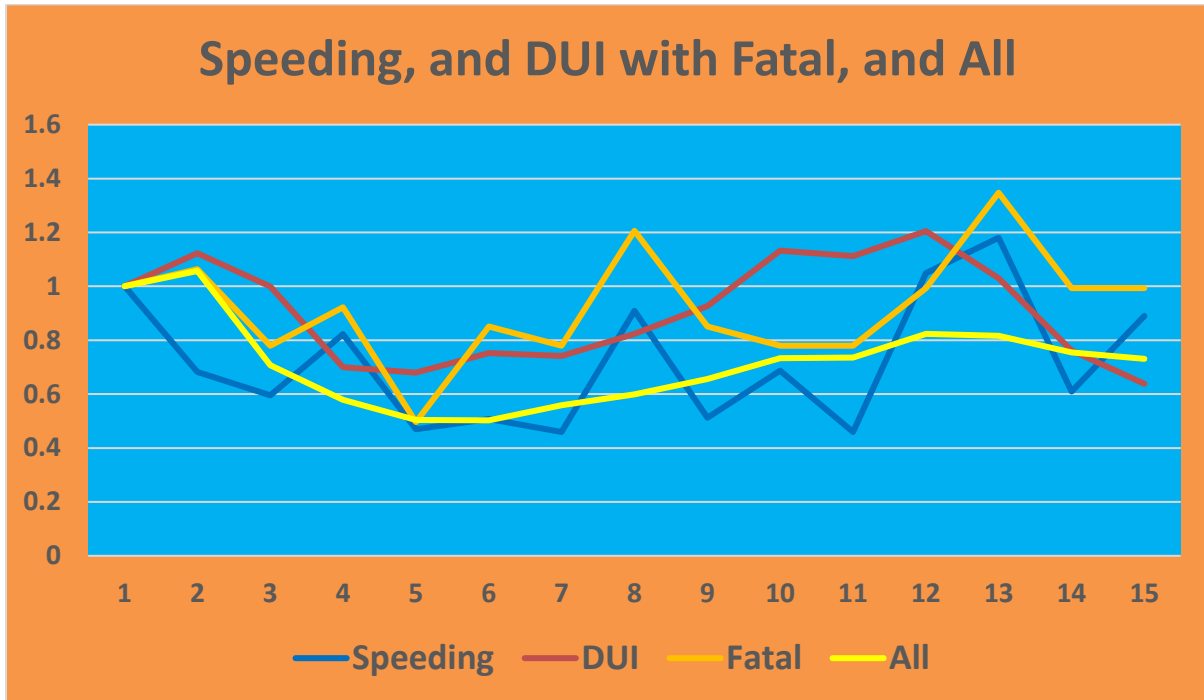
According to the latest Alabama crash reports, our deaths this year as of June 20, 2020 are 7.7% lower than this day in 2019. However, the fatality rate per mile has increased significantly, as it has in all states according to the National Safety Council. The total crash frequency through the end of May 2020 was 51,243, as compared to 65,898 for the end of May in 2019. This is a 22.2% reduction in total crashes, which provide an excellent proxy for traffic volume (see Section 6 of this report) for those years through May. However, the fatality reduction through the end of May 2020 was only 8.4%.

The conclusion that must be drawn is that the overall crash reduction was 2.65 times the fatality reduction. The following quote shows that this general result has been observed nationally:
"The risk [of death per crash] on our roads has actually increased," according to the NSC's manager of statistics Ken Kolosh. He stated that although an 8 percent decrease in deaths from one March to the next March is great news, that decrease should have been even greater if the risk on our roads had stayed the same. We should have seen closer to an 18 percent decrease in deaths."
In Alabama, we should have seen over 20% decrease in fatalities as opposed to less than 10%.

It is interesting to see the Speeding and Fatal crash line somewhat mirroring each other. Very few fatal crashes do not involve some degree of excessive speed. Speeding crashes, the blue line, came down roughly the same as the All Crashes and almost consistently more than Fatal crashes.

On the other hand, ID/DUI crashes actually increased in the first week, and while it decreased for a few weeks after that, it was higher than its pre-COVID proportion from Weeks 10 through 13 before recently decreasing. While the most recent weeks show it coming down, this curve needs special consideration going forward, especially since CAPS studies have shown a major failure of ID/DUI passengers to be properly restrained.

2.2 Pedestrian and Bicycles

Pedestrians, and Bicycles with Fatal, and All
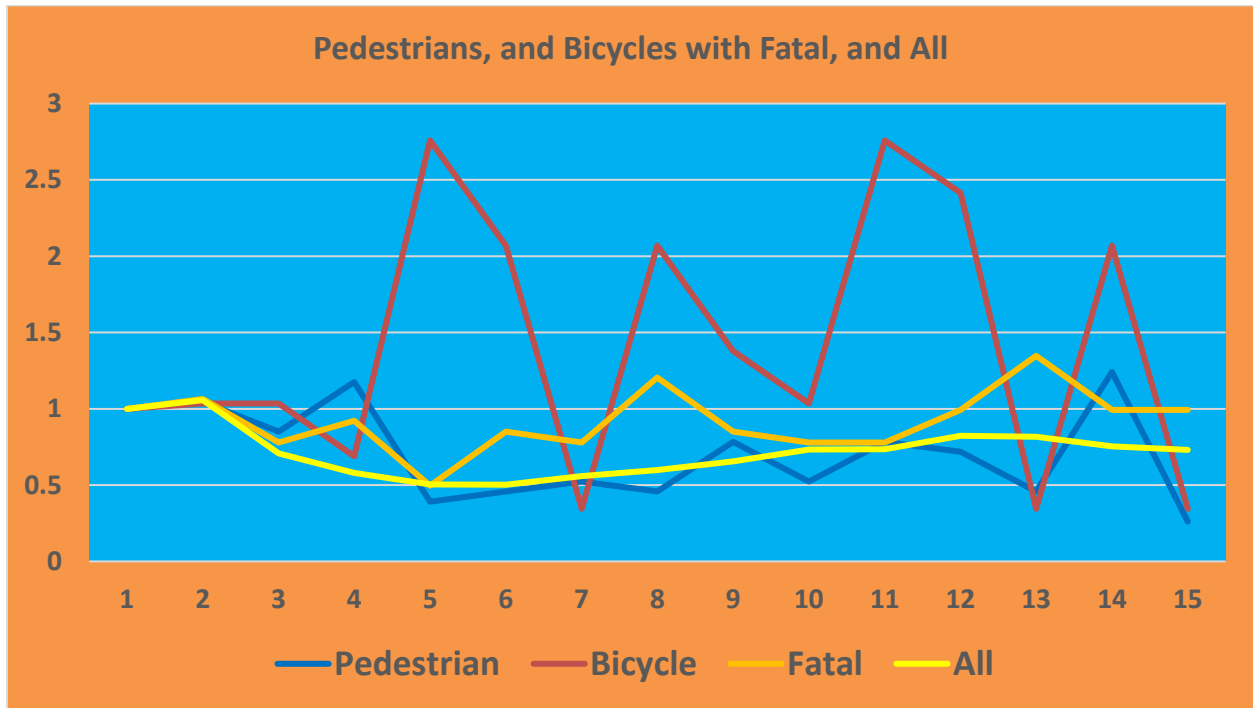
Pedestrian collisions (blue) had a slight rise in the 4ᵗʰ week but then came down to the very near the All Crash levels. This seems to be generally confirmed by the most recent weeks.

Bicycles on the other hand had a dramatic increase in crashes relative to the other crash proportions, which might indicate that a large number of new bicyclists are engaging in this activity without the normal crash avoidance habits of more experienced bicyclists. While this came down in Weeks 7, 13 and 15 it was above its pre-COVID level in the other weeks. The relatively small numbers per week accounts for the jagged line.

2.3 Motorcycles Involved Crashes and Large Truck Caused

**Motrcycles, Large Truck Caused with Fatal, and All**
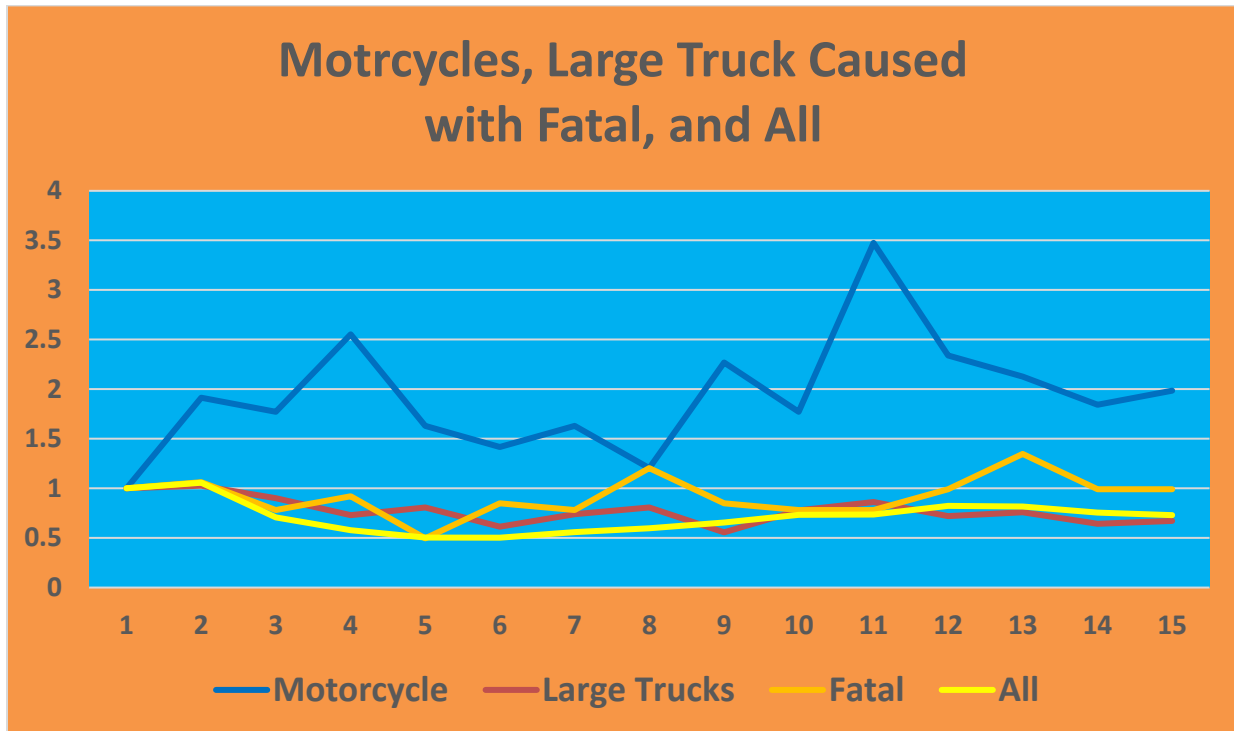
It was speculated that since the number of trucks on the road had not decreased nearly as much as passenger vehicles, that truck crashes might have relatively higher comparative proportion. This has not been the case, as can be seen. It could be noted that a significant proportion of two-vehicle truck crashes have historically been caused by passenger cars (especially at the higher severity levels), so fewer cars on the road what help to reduce truck crashes as well. For a study of causative vehicle types in disparate two-vehicle crashes for a large variety of vehicle types and all severity classifications, please see:

http://www.safehomealabama.gov/wp-content/uploads/2018/12/At-Fault-Analyses-Discussion-v04.pdf

Clearly motorcycles (blue) have a much different pattern, and we suspect that the cause would be much the same as that discussed for bicycles above. Clearly the proportion of motorcycle crashes are now nearly the same as their pre-COVID levels, and this has contributed to a relatively higher fatal crash rate. There have been 9 fatal crashes caused by motorcycles duting the COVID period.

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2.4 Aggressive Driving Crashes and Interstate Crashes
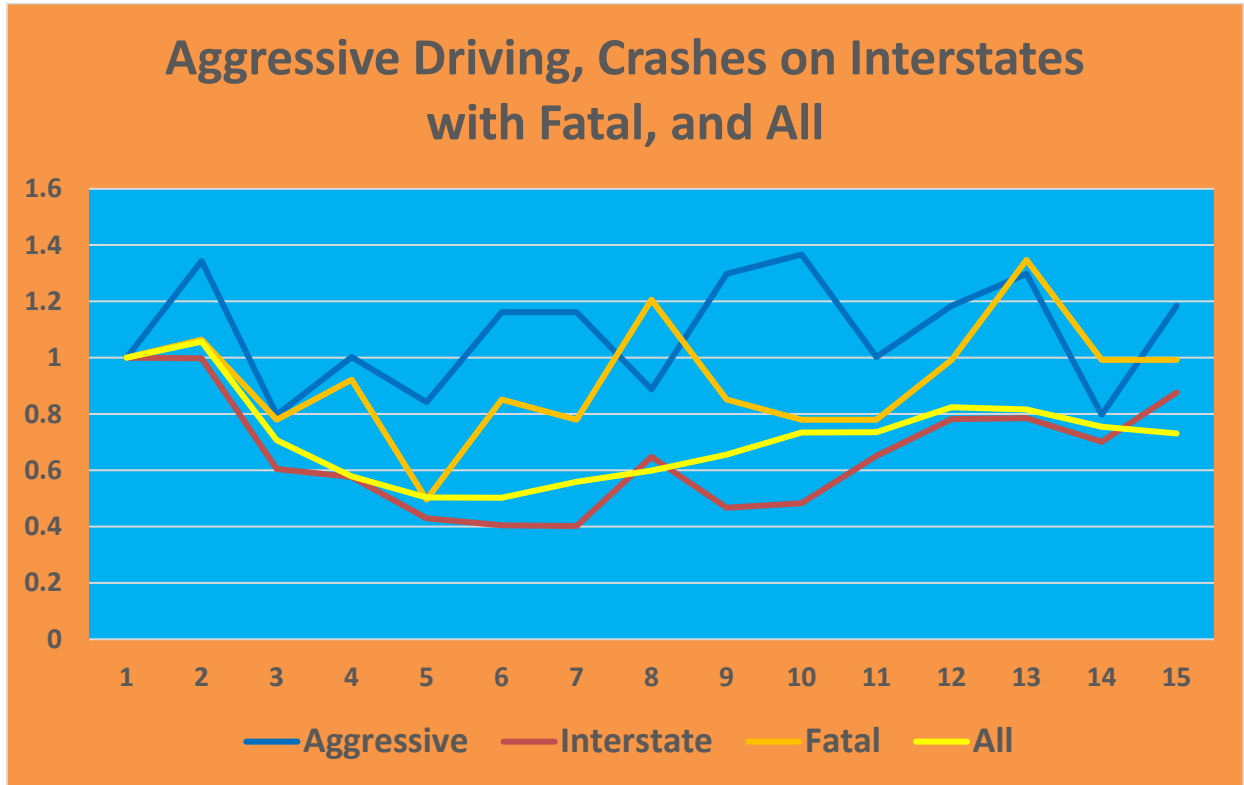
With very few exceptions, Interstate travel crashes dropped off more than either fatal crashes or total crashes, which probably indicates that fewer longer trips are being taken in the COVID period.
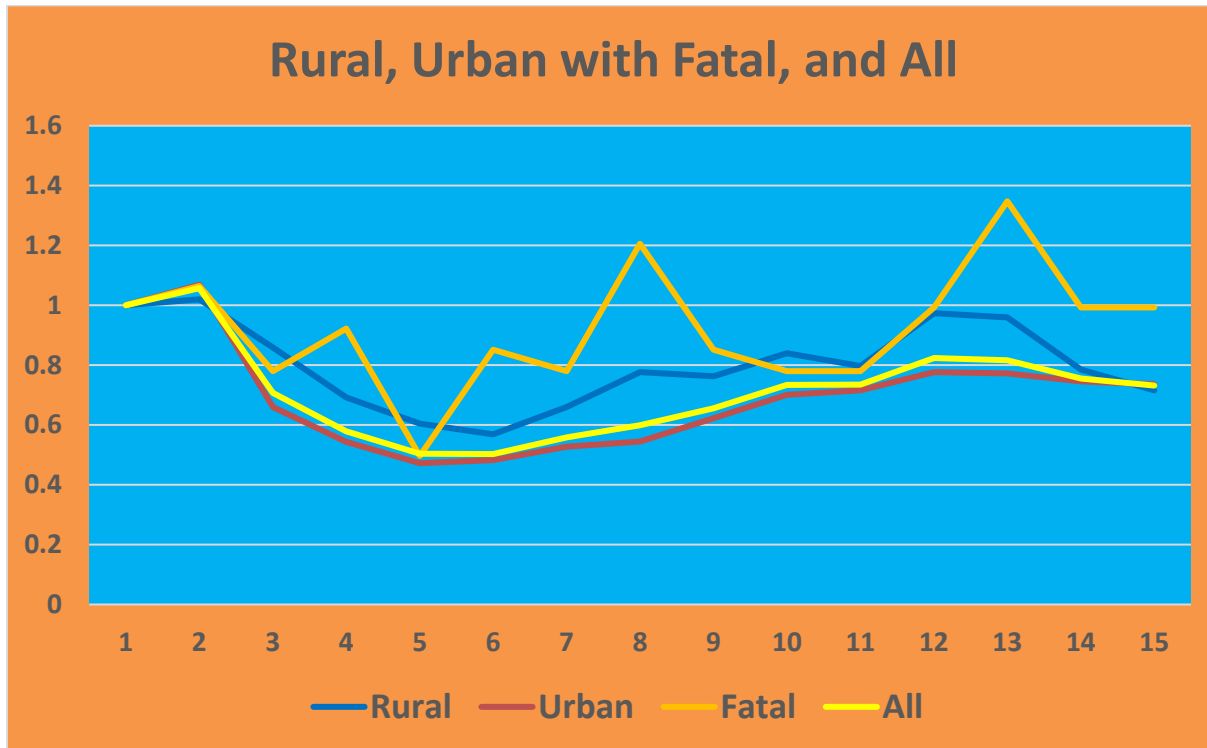
On the other hand, aggressive driving rose in Week 2, and then fell for about three weeks, but clearly not as much as crashes in general, and Interstate crashes in particular. The aggressive driving line is choppy because of the relatively few crashes that typically fall into this category. It was good to see the reduction in week 8, but after that it has generally than would be expected. This is a time of considerable frustration on the roadways for many people. We appeal to everyone to be patient and have consideration for other drivers on the road. Driving aggressively is not going to get you there any quicker, and it might not get you there at all.

2.5 Misjudge Stopping Distance and Young (16-20) Driver Caused Crashes
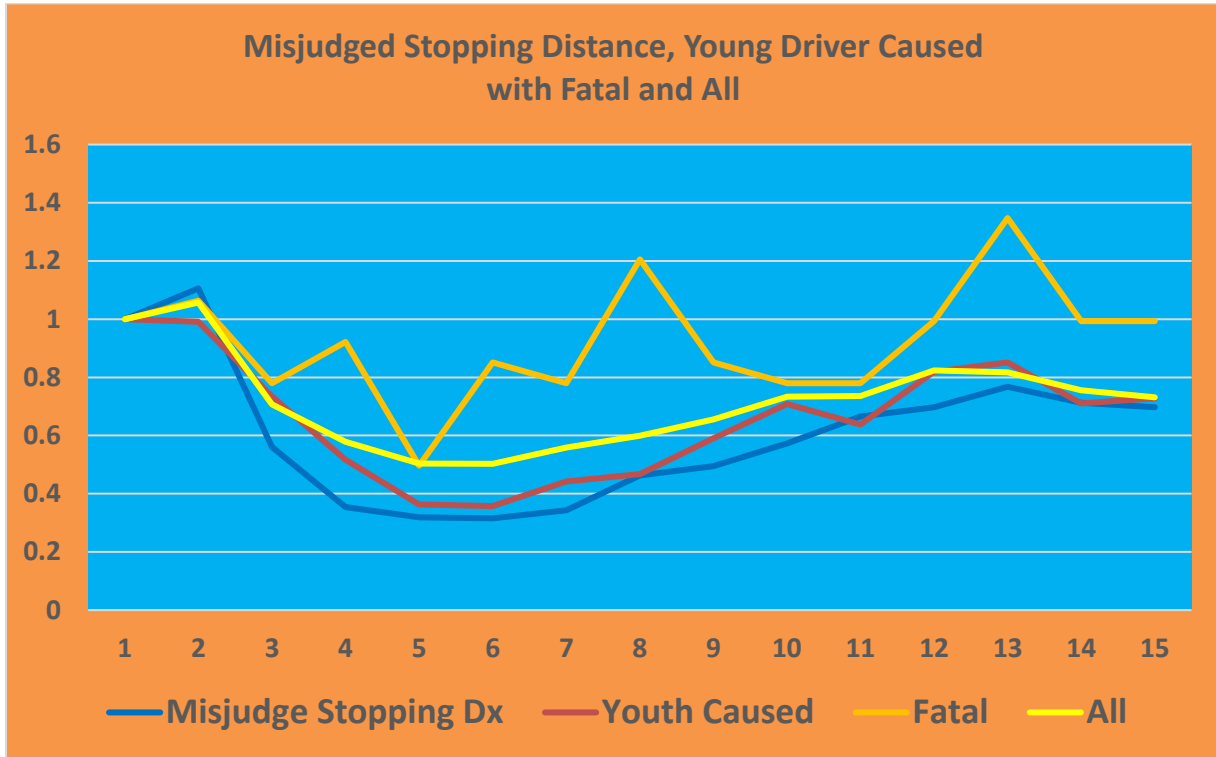

Misjudging stopping distance and youth driver (aged 16-20) caused crashes both followed the general All Crash trend in their reductions, as far as the shapes of the curves are concerned. Both of these generally had a greater proportionate reduction than the overall crashes.

2.6 Rural and Urban

Rural, Urban with Fatal, and All

A line chart with the y-axis ranging from 0 to 1.6 in increments of 0.2, and the x-axis showing weeks 1 through 15. Four lines are plotted: Rural (blue), Urban (red), Fatal (orange/yellow), and All (yellow).

Since the total of Urban and Rural crashes equals All-Crashes, it is expected that one of these will be above, and the other below, the yellow (All Crash) line. Since Week 1, the Rural crashes have been above this line, and the Urban crashes have been below it. This indicates that rural driving did not fall off as much as city driving, a fact that could be out of the need for rural dwellers in securing the necessities of life.

## 3 COVID Case and Crash Change Comparison over the 15 Weeks
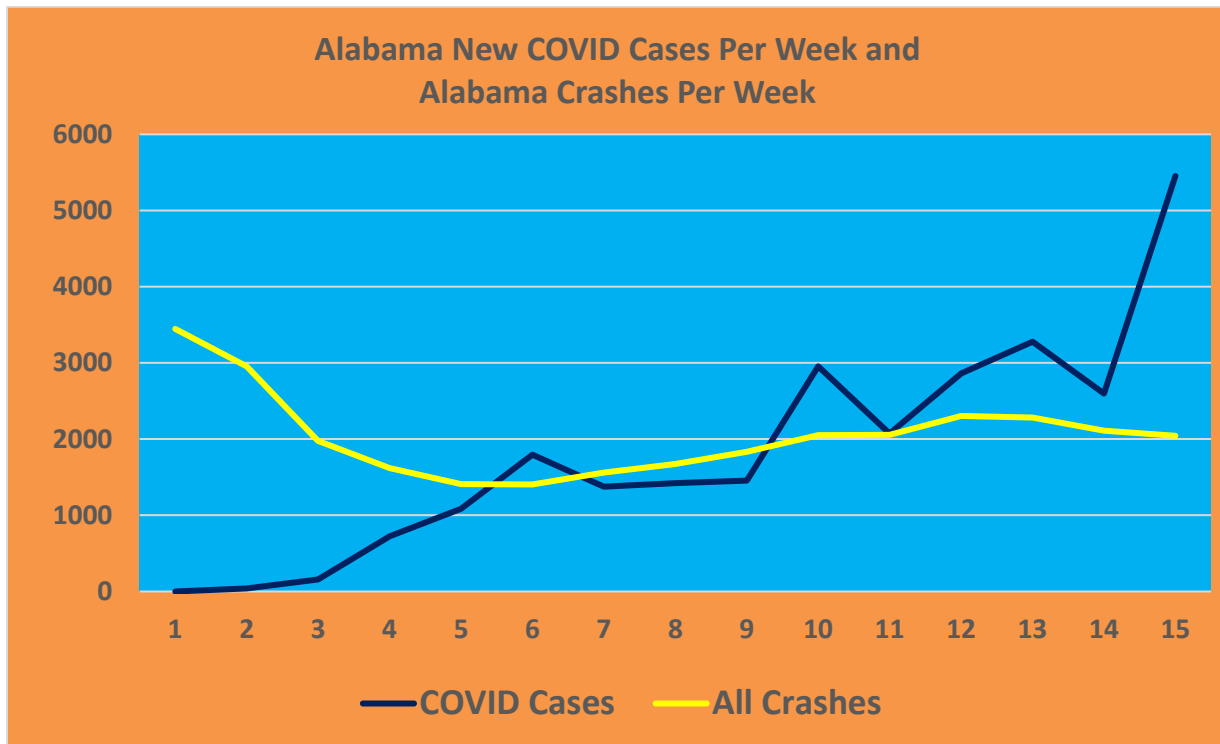
The chart shows the actual number of <u>new</u> COVID cases per week (blue line) and the number of crashes in the same week (yellow line). The number of crashes per week started out with its Week 1 level and dropped to less than half of that, which then bottomed out in Weeks 5 and 6. It has now gone back up to over 2000 per week and we expect it to stabilize at this level for a few more weeks. The general up trend in the number of new COVID cases per week (dark blue line) seemed to have been broken in Week 10, but then it resumed its upward trend. The most recent (Week 15) dramatic increase, *to 5,453 cases*, seems to have little correlation with roadway traffic volume, but some effects might be seen moving forward with it. Consider this quote from AL.com this past week:

"It's a real increase in cases that we're finding," said Dr. Jeanne Marrazzo, director of infectious diseases at the University of Alabama at Birmingham, during a public update on Monday afternoon. "People ask about a second wave, and I've been saying we never stopped having a first wave." AL.com reference:
https://www.al.com/news/2020/06/birmingham-sees-new-high-in-coronavirus-hospitalizations-at-uab.html

To get an idea of what lies ahead, the weekly totals for the weeks ending June 17th, 18th and 19th (the first three days of Week 16) are 5,686; 5,322; and 5,292, respectively. Based upon these we are not anticipating a significant reduction in COVID cases for the week ending June 24, 2020.

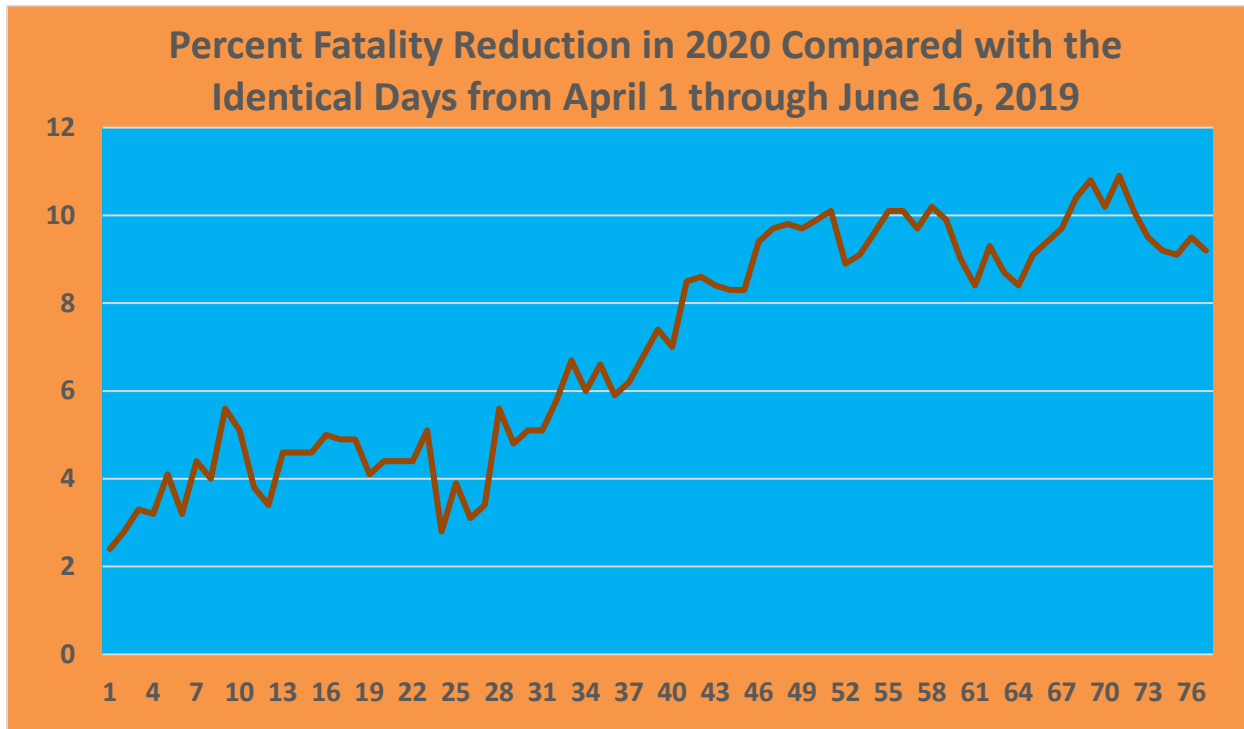## 4 Percent Reduction in 2020 Traffic Fatalities vs. 2019
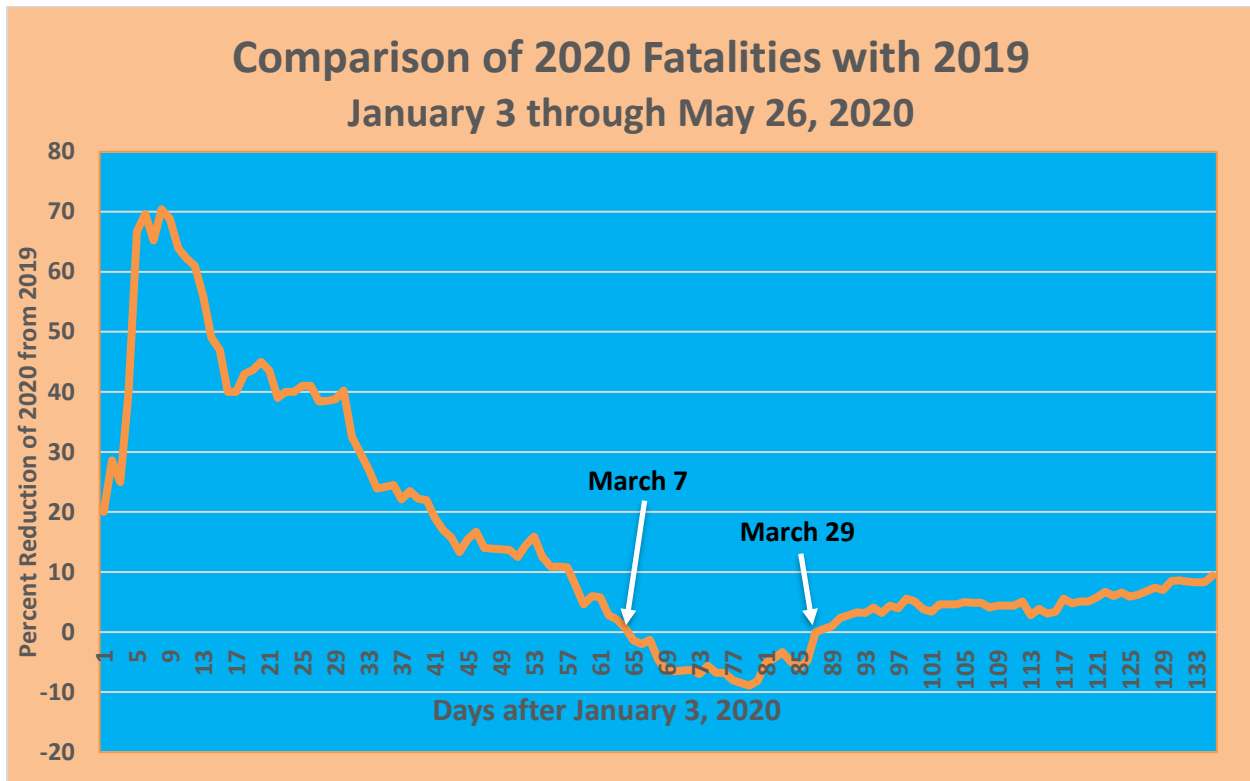
The current reduction in 2020 from 2019, as of June 13, 2020, is 9.2% fewer in 2020 than 2019.

Alabama started off year 2020 with major reductions in fatalities compared to 2019. At one point it had a 70% reduction, but this was early in the year before there were enough daily numbers to do any reasonable statistical comparison. From this high, it slid down in almost a straight line until March 7, when it reached the zero break-even point (same in both years). At that point in time the 2020 fatalities numbered exactly what they did in 2019 – no percent reduction.

March 7 is within our "Week 1" (March 3-9, 2020) for the charts in Section 2. Recall that Week 1 was the last week before the COVID quarantines took effect, but the number of crashes for the comparisons have been updated to be the average of the first ten weeks in 2020.. It is strictly co-incidental that this was the week in which the fatality counts for 2019 and 2020 became identical. As can be seen from the chart, the 2020 increase in fatalities continued past March 7, and it was not zero again until March 29, well after the first quarantines had taken effect. This chart extends until May 16, 2020, and it will not be updated. *See the next section for a continuation of the chart above, which will be updated weekly, bringing it up to date.*

5 UPDATE: Reduction in % Fatalities 2020 vs. 2019 after April 1, 2020

Percent Fatality Reduction in 2020 Compared with the Identical Days from April 1 through June 16, 2019

This chart is an update to that in the Section 4. These are *daily readings* as opposed to the other charts above, which are weekly changes in the various types of crashes. These two charts are also reporting *actual fatalities* as opposed to fatal crashes, which are reported in the previous charts in Section 2.

Rather than starting on January 3, 2020 (as is true of the graph in the previous section, this graph starts in April 1, 2020, so it is redundant with the part of the previous graph that appears after March 29, 2020. The numbers on the X-axis here are the number of <u>days</u> after April 1,2020.

This chart includes updates up to June 16, 2020, which is the last day reported (Day 76). The exact readings for June 16, 2020 were: 413 fatalities in 2019; 375 fatalities in 2020; a reduction of 9.2% as of that date.

6 Correlation Analysis: Relationship between ADT and Crash Frequency

MOBILE CO TRAFFIC VOLUME VS CRASHES
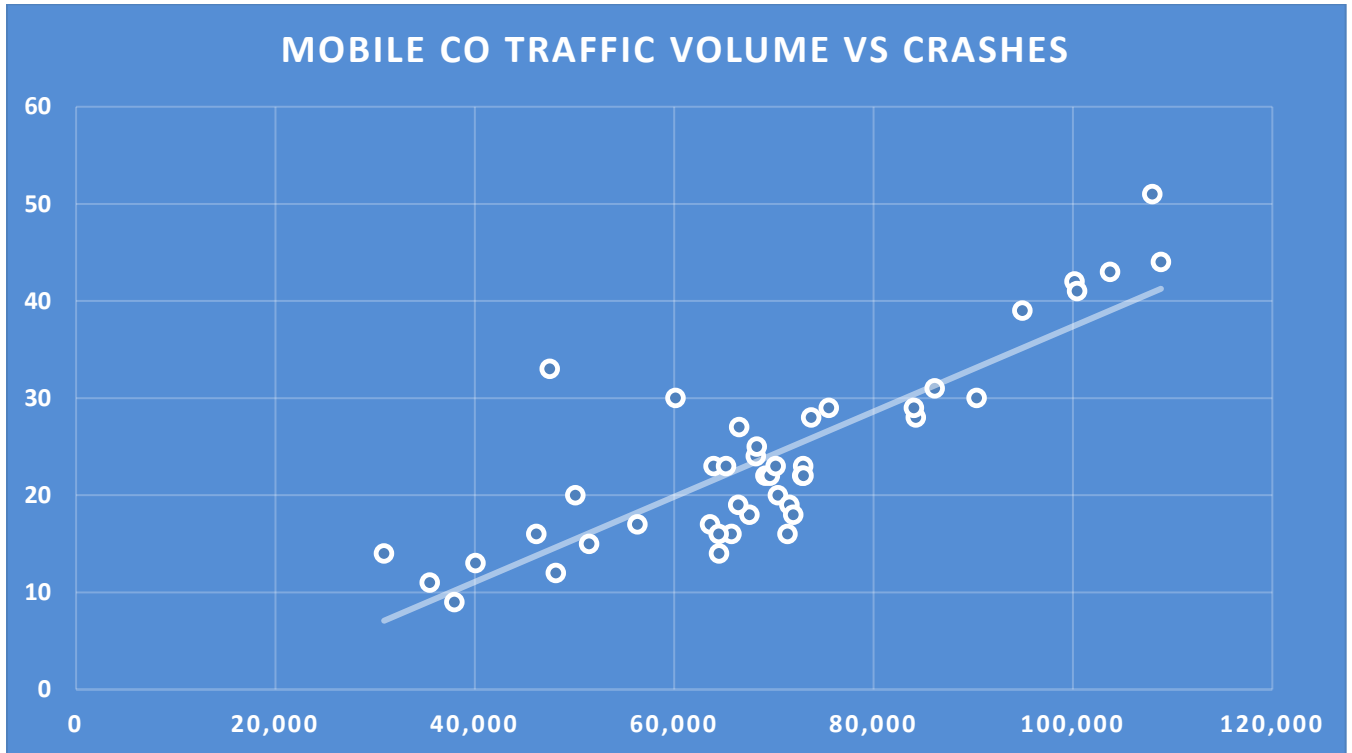
The regression above, with a correlation coefficient = 0.8430, indicates a nearly perfect relationship between Crashes and Average Daily Traffic (ADT). This analysis, which considered the identical roadway and a similar traffic mix, was performed where the differences in traffic volumes were due solely to the quarantine caused by COVID. Volume and crashes were compared over 43 days from 3/9/2020 to 4/23/2020, and the correlation coefficient of the resulting least-squares regression line was 0.8430, which indicates an extremely high correlation. The sample of traffic volume was obtained from I-10, Milepost 3.

The conclusion that can be drawn from this is that the major portion (virtually all) of the variations experienced after Week 1 (March 3-9) were due to the reduction in traffic volume. The only other cause of it could have been that the drivers remaining on the road (after the COVID quarantine went into effect) were of superior skill and experience. While we believe this is true, and that it had some effect, its effect would be relatively small compared to the reduction in traffic volume.
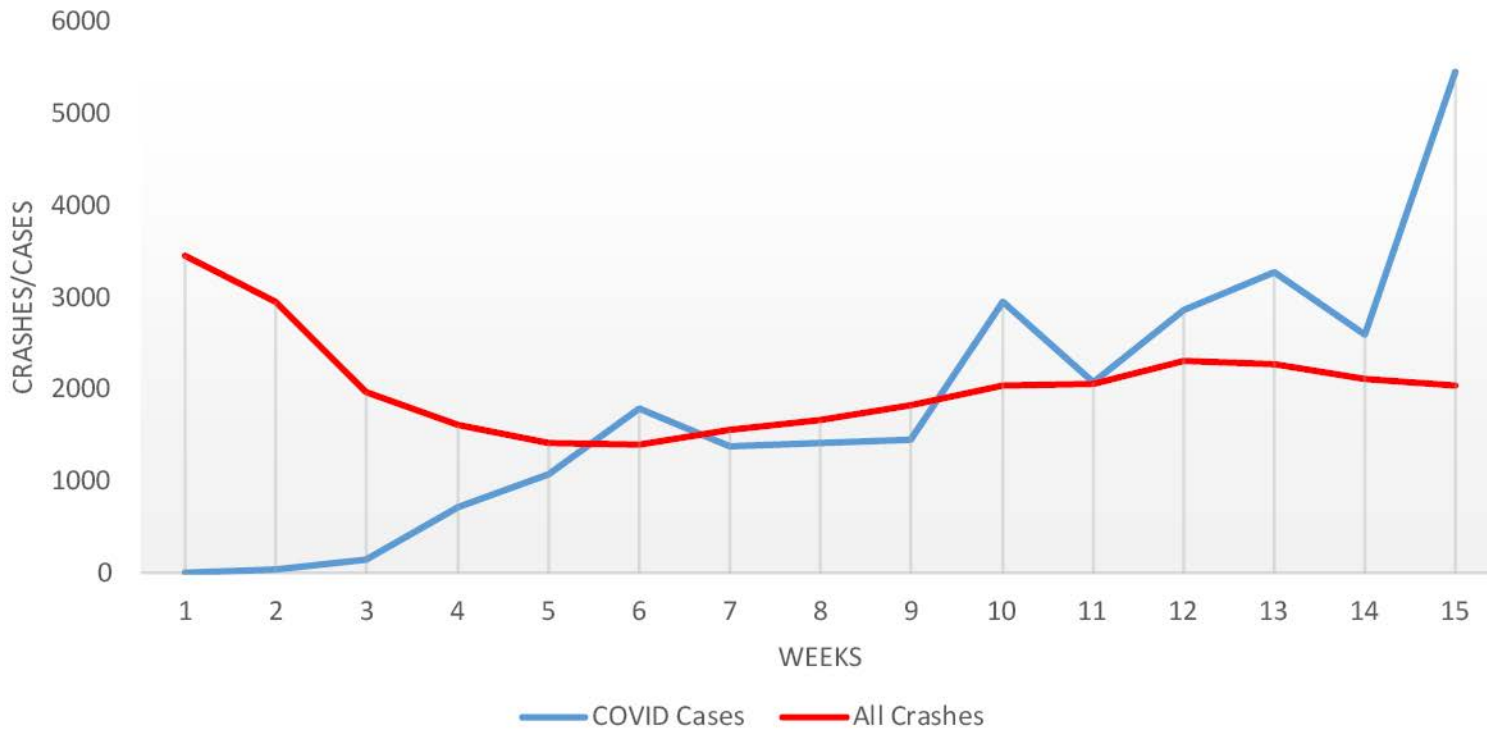
Driver Response in Terms of Speeding, DUI, Fatal and All Crashes
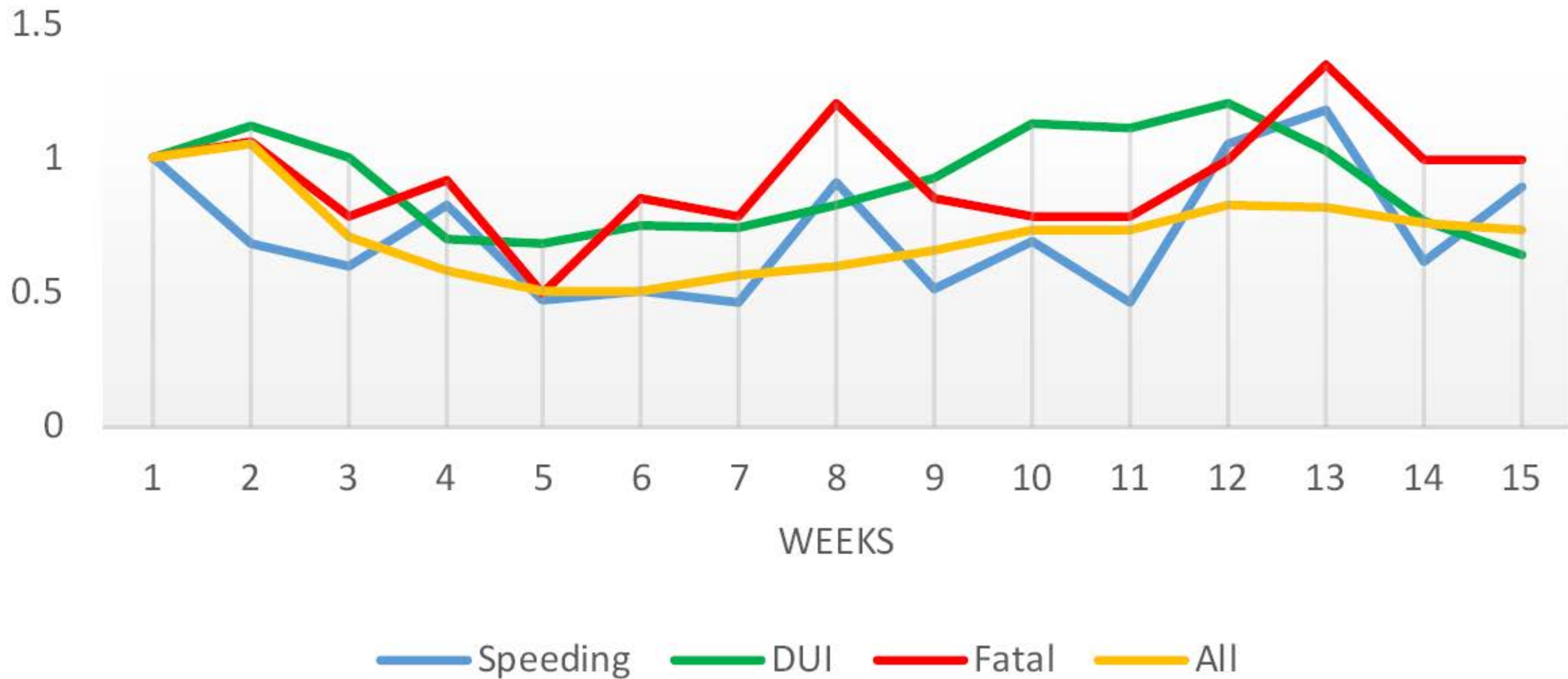
All crashes were reduced to less than 40% of their pre-COVID numbers in Week 15. Speed-related crashes increased.

Crashes caused by alcohol and other drugs lessened during Week 15.

COVID-19 Cases in Relation to Alabama Crash Data

In Week 15, COVID-19 cases were significantly higher than the reported number of crashes in Alabama.

Overall, crashes have shown higher numbers when fewer cases of COVID-19 were reported.