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Special Report: Impact of COVID19 on California Traffic Crashes

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Impact of COVID19 on California Traffic Accidents

Using observations of reported traffic incidents in our real-time “California Highway Incident Processing System” (CHIPS), the Road Ecology Center has estimated the **reduction in traffic incidents on state highways and rural roads that has resulted from the Governor’s “shelter in place” order**. We estimate that since the order went into effect, collisions and especially injury and fatality collisions have been reduced by half, from ~1,000 collisions and ~400 injury/fatal crashes per day to 500 and 200 per day, respectively. We also found that animal-related incidents did not experience the same reduction. We found that traffic volumes were up to 60% lower on certain highways after the order compared to a similar period prior to the order, which may account for the reduced number of collisions. We also found that peak and average traffic speeds increased slightly on certain highways, but only by a few mph. We highlight collision and injury/fatality hotspots on California highways since the shelter in place order went into effect and for a similar period in 2019. All data were derived from California Highway Patrol incident reports. This report includes **maps of incident hotspots**, and discusses this unexpected benefit of the shelter in place order.

This report and other tools are available on the Road Ecology Center website:

<https://roadecology.ucdavis.edu>.

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UC Davis Road Ecology Center: Special Report on COVID19 Impacts on California Traffic Crashes

Top 5 Talking Points

1) **The California Highway Patrol collects critical information about traffic collisions, but they need more resources.** The CHP patrols thousands of miles of California highways and rural roads every day, responding to >2,000 incidents per day to protect public safety. At the same time, they have to rely on out-of-date equipment and are under-staffed relative to the importance of their job. This study and our other research related to traffic incidents would not have been possible without the care they take in reporting details of traffic incidents.

2) **Governor Newsom’s “Shelter-in-Place” order resulted in a reduction in traffic collisions and injuries/fatalities.** The daily rate of collisions was reduced by half after the order, compared to the period before the order and to a similar period a year prior (2019). There was a similar reduction, by half, in fatal and injury crashes. Both changes were statistically-significant. The reduction works out to about 15,000 fewer collisions per month and 6,000 fewer injury/fatal collisions per month that can be directly or indirectly attributed to the shelter-in-place order.

3) **The reductions in traffic crashes is unparalleled and potentially because of a reduction in traffic volumes, with only small changes in speed.** There is no equivalent in our recent transportation history to such large changes in vehicle movement on our state and local roads. The reduction in traffic collisions and injury/fatal crashes in particular, was correlated with a similar % reduction in traffic volumes on a wide range of highways statewide. However, the reduction in traffic was not uniform, with only slight reductions (<30%) on certain interstates. There was also a slight increase in peak (1-6 mph) and average (1-9 mph) speeds, primarily on urban highways.

4) **There was no detectable reduction in animal-vehicle conflict, though with less traffic on roads, we predict that there may be fewer animals killed.** We could not find a statistically-significant change in all incidents involving animals, or deer-vehicle conflict events alone. This could be because not enough time has elapsed, or because even with a ~50% reduction in traffic, it is still not enough to measurably benefit wildlife and domestic animals.

5) **The COVID19 pandemic has caused social disruption, panic, and deaths. The Governor’s shelter-in-place order may have provided unexpected reductions in injuries and harm from traffic accidents.** The harm caused by COVID19 to global societies and economies only has parallels to large-scale wars. It may help to find the hidden and unexpected benefits from the changes in social functioning that we are taking to reduce the pandemic’s spread. We hope that people take solace in these benefits as we deal with the harmful impacts of the pandemic.

Introduction to Study

The COVID19 pandemic has created unprecedented challenges to US and California society and institutions. One of the primary methods to mitigate the impact of the virus is to reduce contact among people. In California, this has been implemented by cities, counties, and the Governor's office through "Shelter-In-Place" orders and related actions (e.g., closure of non-essential businesses). An intended impact of these orders is reduced vehicle traffic among and within cities and towns in order to reduce the rate of spread of the virus (by keeping people at home). A potential unintended impact of reduced traffic is reduced traffic crashes and thus injuries and fatalities for people involved in the incidents. Another potential impact is reduced collisions with animals.

We examined these potential unintended impacts of the Governor's shelter-in-place order on rates of collisions on California highways and certain major roadways patrolled by the California Highway Patrol. We used real-time data collection and querying tools in our California Highway Incident Processing System (CHIPS), in order to provide a close to real-time assessment of these impacts. In other words, this report came out on 4/1/2020 and includes data and analyses from 3/30/2020, 10 days after the start of the Governor's shelter in-place order. We used simple spatial analysis tools to compare distributions of traffic accidents before and after the Governor's order and statistical tests to compare daily rates of collisions before and after the order and with a similar time period from 2019.

Findings

1) Change in Collisions and Injuries/Fatalities

We compared daily rates of collisions on state highways and some major roads during the 10 days after the shelter in place order with collisions in the 10 days immediately prior to the order and to rates a year before (2019, Table 1). We found that the average daily number of collisions was significantly lower in the 10 days after the order (500, $p < 0.01$) than the 10 days prior to the order (1,116 collisions, $p < 0.01$) and lower than a similar 10-day period in 2019 (1,128 collisions, $p < 0.01$). There was no difference ($p > 0.2$) between the number of collisions before the order (1,116 collisions/day) and a similar period in 2019 (1,087 collisions/day). There was a similar, statistically-significant reduction in daily injury/fatal crashes from the 10-day period prior to the order (562/day) to the 10-day period after the order (274/day, $p < 0.01$).

Table 1. Change in rates of collisions and injury/fatal crashes before and after the Governor’s shelter-in-place order. The before period (3/10-19/2020) was compared to the equivalent period in 2019 and after the order (3/21-30/2020). A similar “after” period in 2019 was used for comparison.

ACCIDENT TYPE	BEFORE ORDER (3/10-19/2019)	BEFORE ORDER (3/10-19/2020)	“AFTER” ORDER (3/21-30/2019)	AFTER ORDER (3/21-30/2020)
COLLISION	1087	1116	1128	500
INJURY/FATALITY	481	562	473	274
% REDUCTION BEFORE/AFTER			n.s	55% (P<0.01)
% REDUCTION 2019-2020				42% (P<0.01)

The reduction in injury/fatal crashes was evenly-distributed throughout the state (Figure 1). There were injury/fatal collisions on most highways in California after the order (Figure 1A) and for a similar period in 2019 (Figure 1B).

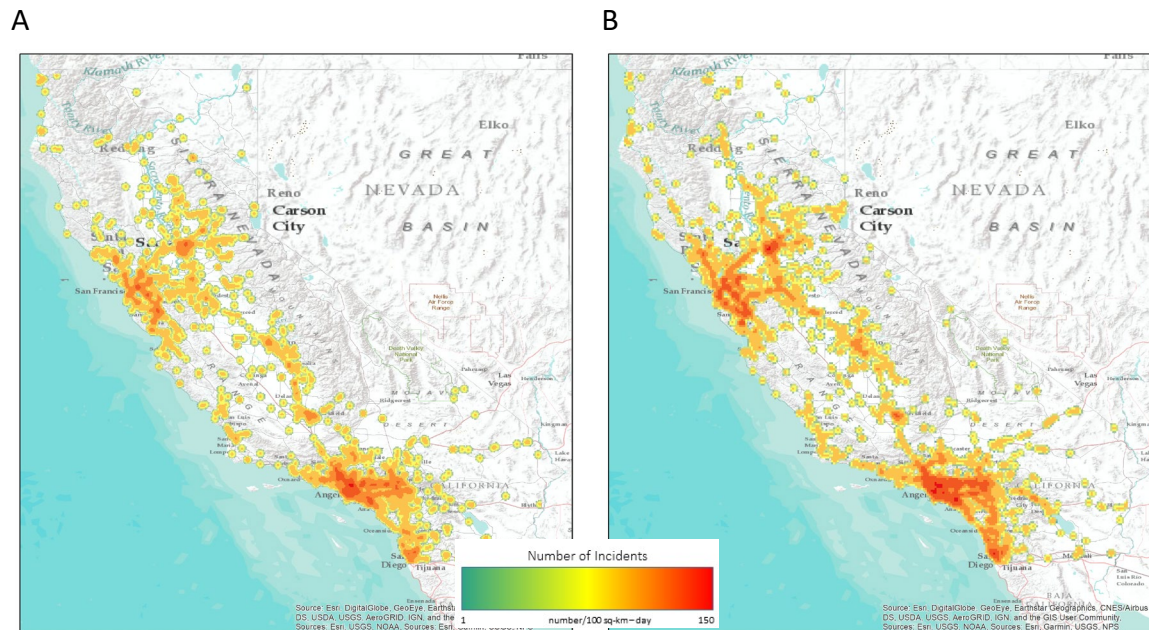


Figure 1. Density of injury/fatal crashes on state highways and certain major roads (A) between 3/21/2020 and 3/30/2020 and (B) between 3/21/2019 and 3/30/2019.

2) Change in Animal-Related Collisions

Every year the Road Ecology Center reports on the hotspots of wildlife-vehicle conflict on California highways (<https://roadecology.ucdavis.edu/research/projects/ca-wvc-hotspots>), a legacy effect of highway development that receives little treatment. Although there was a reduction in traffic crashes and traffic volumes, there was no statistically significant reduction in animal-related incidents, or deer-vehicle conflicts as indicated by the Real-Time Incident map here: <https://roadecology.ucdavis.edu/hotspots/map>. This result is quite different from the result for impacts on drivers and passengers and it may be related to: 1) there not being enough elapsed time since the shelter-in-place order to detect a change; and/or 2) to the reduction in traffic volumes that have occurred being insufficient to result in a reduction in animal-related incidents; and/or 3) vehicle speed plays a critical role in AVC, and with fewer cars, the average speed might increase.

3) Change in Traffic Volumes

Caltrans and other entities maintain an array of traffic volume and speed detectors throughout California. Traffic volumes were compared for select highways before and after the shelter-in-place order. There were reductions in traffic volumes of <30 to >50% compared to prior to the shelter-in-place order. Traffic volumes for a select set of highways is shown in Table 2.

Table 2. Average traffic volume (peak # vehicles/hour) changes before and after the Governor’s shelter-in-place order for select California highways. All changes were statistically significant. There was no difference between traffic volumes in 2019 and 2020 for the 10-day period before the order (3/10 - 3/19).

HIGHWAY	PEAK VOLUME BEFORE ORDER (VEH/HR)	PEAK VOLUME AFTER ORDER (VEH/HR)
I-5 (N OF LA)	8,892	6,950
I-5 (OCEANSIDE)	3,340	1,960
US101 (N OF SLO)	2,214	1,130
US101 (GEYSERVILLE)	1,058	630
US99 (S OF YUBA CITY)	790	541
SR152 (LOS BANOS)	1,225	735
I280 (DALY CITY)	3,798	2,392

4) Change in Traffic Speeds

Traffic speeds at the detectors mentioned in (3) were compared for select highways before and after the shelter-in-place order. There were small increases in peak speed (95th percentile of all speeds) and small, yet statistically-significant increases in average traffic speed of ~1 to 9 mph when compared to prior to the shelter-in-place order. In general, the changes were greater in urban highways than rural highways. Traffic speeds for a select set of highways are shown in Table 3 and charts showing speed on April 3rd relative to the month prior shown in Figure 2.

Table 3. Average traffic speed changes before and after the Governor’s shelter-in-place order for select California highways. Unless indicated with “n.s.” non-significant, all changes in average speed were statistically significant.

HIGHWAY	PEAK SPEED CHANGE (MPH)	AVERAGE SPEED CHANGE (MPH)
I-80 (NV BORDER)	+1	+3.9
US101 (GEYSERVILLE)	+1	-0.2 (n.s.)
US99 (S OF YUBA CITY)	0	+0.2 (n.s.)
I280 (DALY CITY)	+1	+1.7
SR46 (E OF SLO)	+1	+0.9
SR88 (IONE)	+0.8	+1.4 (n.s.)
SR49 (MARIPOSA)	+2	+0.2 (n.s.)
US101 (SLO)	+0.8	-0.2 (n.s.)
I-405 (GETTY)	+3	+6.9
I-405 (COSTA MESA)	+3	+4
SR91 (ANAHEIM HILLS)	+6	+3.2
I-5 (N OF LA)	0	+9.1
I-5 (OCEANSIDE)	+2	+0.4 (n.s.)
I-10 (SM)	+1	+3.1
I-10 (FONTANA)	+1.6	+3.1

Conclusions

Governor Newsom's shelter-in-place order and similar orders at the jurisdictional scale had a profound effect on daily travel in California, with >20 - 50% reductions found across select highways. This in turn seems to have resulted in a ~50% reduction in total collisions and injury/fatal crashes. Despite the large changes in traffic volumes there were only small changes in peak traffic speeds and average speeds. This unintended benefit of the orders was primarily for drivers and passengers. There was no detectable reduction in impacts to large animals reported by the CHP on state highways and certain major roads. We appreciate the critical attention to detail and complete incident reporting by the CHP and look forward to increased support for their reporting by the state government.

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