

# Socioeconomic Disparities in Response to COVID-19 Lockdown Orders: Analyzing New York City Motor Vehicle Collisions

## **Abstract:**

In times of public crisis, citizens look towards governmental figures for guidance in the form of public announcements and official policies. As the novel coronavirus, COVID-19, overtook the United States in early March, it quickly undermined American daily lives, as government orders impacted citizens' perceptions of danger and forced them to adapt to a "new normal." However, these mandates have disproportionately affected poorer, nonwhite communities. Our objective in this paper is to analyze the impact of government announcements and decrees on motor vehicle collisions in New York City. In this case study of motor vehicle collisions in New York City, collisions were analyzed both on an aggregate and by-borough level to determine levels of human activity throughout the city.

## **Background and significance**

In the spring of 2020, as the coronavirus pandemic spread across the United States, governors issued statewide stay-at-home orders. To contain the spread of the virus, these orders intended to reduce social contact by limiting mobility. While such policies have been successful in this objective, the drastic decrease in ground traffic has had unintended effects. A study by the UC Davis Road Ecology Center found that wildlife-vehicle conflict could have declined by up to 58% in some states, protecting certain local threatened species (Nguyen et al. 3). A separate study by the same group found that the decrease in property damage, insurance claims, and emergency response costs in California have saved \$1 billion (Shilling et al.).

It is well documented that people drove less, but not as clear whether the people still driving were doing so differently. Understanding changes in driving patterns can help policymakers keep communities safe, e.g. increasing transportation channels in necessary areas or preventing crashes due to speeding on empty roads. To study this, this paper analyzes motor vehicle collision data from New York City, one of the most impacted regions in America, with the general research question: how has government policy affected New York City drivers' motivations and safety?

Based on anecdotal and empirical evidence, it is reasonable to believe that because of government mandates issued by Governor Cuomo of New York, aggregate motor vehicle collisions will decrease; however, the vehicles involved and the cause of these collisions will vary as stay-at-home orders become more stringent.

## **Methods**

The data used in this analysis originated from the NYC Open Data website. The Motor Vehicle Collisions data tables contain information from all police-reported motor vehicle collisions in New York City. A police report (MV104-AN) is required to be filled out for collisions where someone is injured or killed or where there is at least \$1,000 worth of damage. When analyzed, the data contained collisions from January 1 through April 14, 2020, with any changes to the data made afterward not being reflected in this paper.

This data set included 29 variables about each car crash, including the timestamp of the incident, location, contributing factors, and the number of people injured and/or killed. Because the variables of contributing factors for crash and type of vehicle were so diverse, they were simplified. Similar contributing factors were consolidated into overarching categories, including driver inattention, fatigue, mechanical defect, road environment, health, and obstruction of view. To analyze car crashes over specific periods of time, using the timestamp variable of each car crash, new variables were created for the day of the week, month, AM or PM, and pre-lockdown or post-lockdown.

A time-series graph was created using the date of the collision from January 1, 2020, to April 14, 2020. Important government orders were then overlaid on the graph to show possible relationships between different policy decisions and motor vehicle accidents. For geographical analysis, latitude and longitude in the dataset were utilized to plot accidents by week on a map of New York City (Appendix). This produced a visualization of the density of the number of collisions that occurred in the given week, with larger circles at a certain location representing more collisions than smaller circles. Finally, car crashes by week were graphed against vehicle type and contributing factors to crash, yielding significant results for the latter.

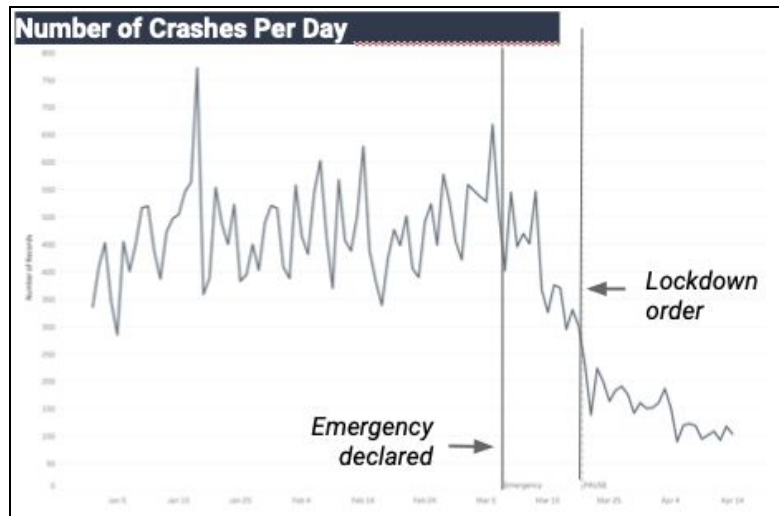
This study is reproducible by others who are also interested in observing trends of motor vehicle accidents over time and throughout a city. Data entry may depend on city policy, which can lead to variance in variable simplification and analysis. Similar to differences in accident and

type of vehicle descriptions, the local, county, or state levels of policy amidst the COVID-19 pandemic would differ as well.

**Results**

There were 14,277 recorded New York City motor vehicle collisions in January with 461 per day. There were 13,677 in February, at 472 per day. Collisions fell to 10,967 in March, at 354 per day, and there only 1,724 from April 1-14 at a rate of 123 per day (Figure 1).

While January and February showed similar numbers of total and daily crashes, average daily collisions in March dropped by 25% from the previous month. Furthermore, though only half of April is accounted for, April still shows a significantly smaller number of crashes proportionally over its two weeks, with average daily crashes decreasing 65.25% from March.



**Figure 1:** Motor Vehicle Collisions in New York City Jan. 1 - Apr. 14, 2020

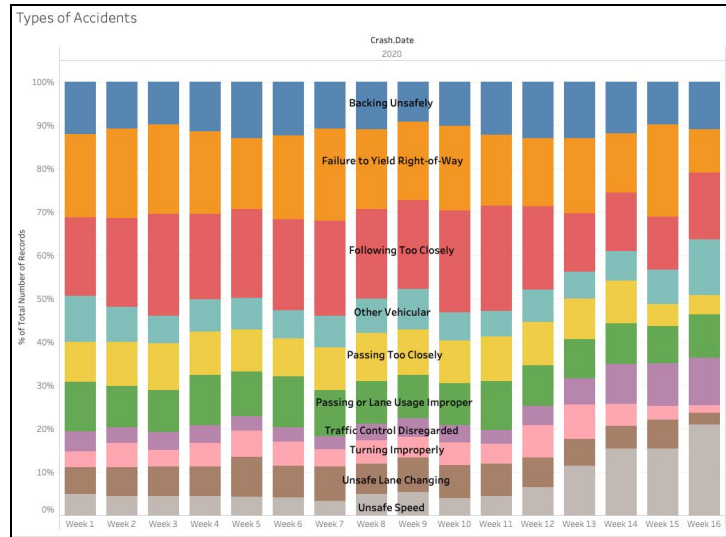
Two major orders by the Governor of New York Andrew Cuomo correlated with sharp decreases in crashes per day. They are Cuomo’s declaration of a state of emergency on March 7 and the March 20 statewide lockdown order (Figure 1).

The effect of these orders differed by borough. Before the stay-at-home order, New York’s poorest borough, the Bronx, and New York’s richest borough, Manhattan, accounted for a roughly equal proportion of the city’s vehicle collisions. But after lockdown, drivers in Manhattan fared far better than those in the Bronx. In fact, there were nearly double the number of crashes in the poor borough than the rich one (Table 1).

Borough	Median Household Income (U.S)	Pct. Collisions Pre-Lockdown	Pct. Collisions Post-Lockdown
Bronx	\$38,085	17.5	20.1
Manhattan	\$82,459	17.2	10.7

**Table 1:** Proportion of New York City Motor Vehicle Collisions by Borough

Significant changes in driving behavior were also observed. While vehicle types involved in collisions did not change over the time period, the reasons for accidents did. “Unsafe Speed” as a cause for collision increased from about 5% of the accidents pre-lockdown to about 20% during lockdown (Figure 2).



**Figure 2:** Proportion of Collisions by Cause

## Discussion/Conclusions

This study aimed to find how policy affected New York City drivers. The results suggest that drivers in poorer boroughs were more likely to get into accidents than those in wealthier areas. The analysis also shows more drivers colliding due to speeding.

The nature of the residents’ jobs may have contributed to the borough effect more than government guidance. Richer New Yorkers could afford to stay at home and work remotely, while residents in the Bronx are considered essential workers who must continue commuting to work. Despite the government’s attempts to curtail interaction, they are forced to leave their apartments and come into contact with other drivers. Reduced tourism to Manhattan also may have contributed to the disparity in driver outcomes.

This disparity in driver outcomes by borough is particularly important because the Bronx, a majority-nonwhite borough, has more coronavirus cases than any other New York City borough, whereas wealthy, majority-white Manhattan has the fewest (De Freytas). While this study was limited to New York City, it may be worthwhile to study other cities to see whether this phenomenon is recurring. The results of this paper also suggest that although the lockdown reduced overall traffic collisions, governments should reevaluate the implementation of stay-at-home orders in more vulnerable areas.

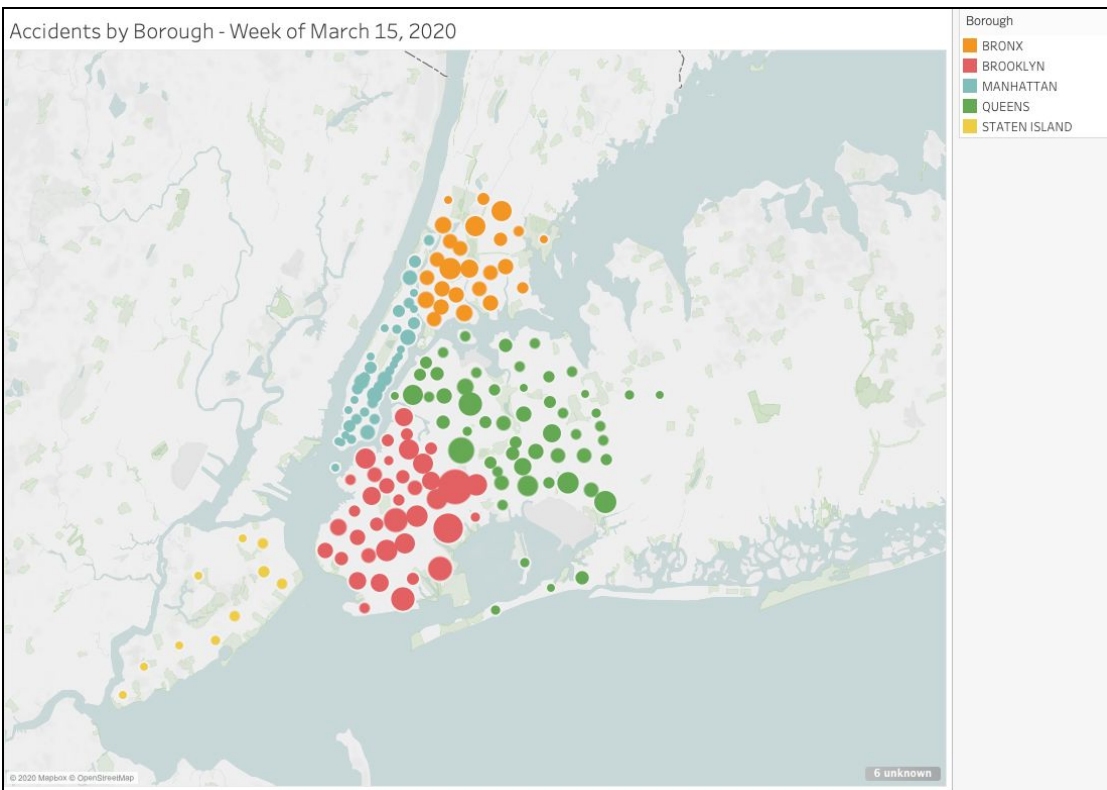
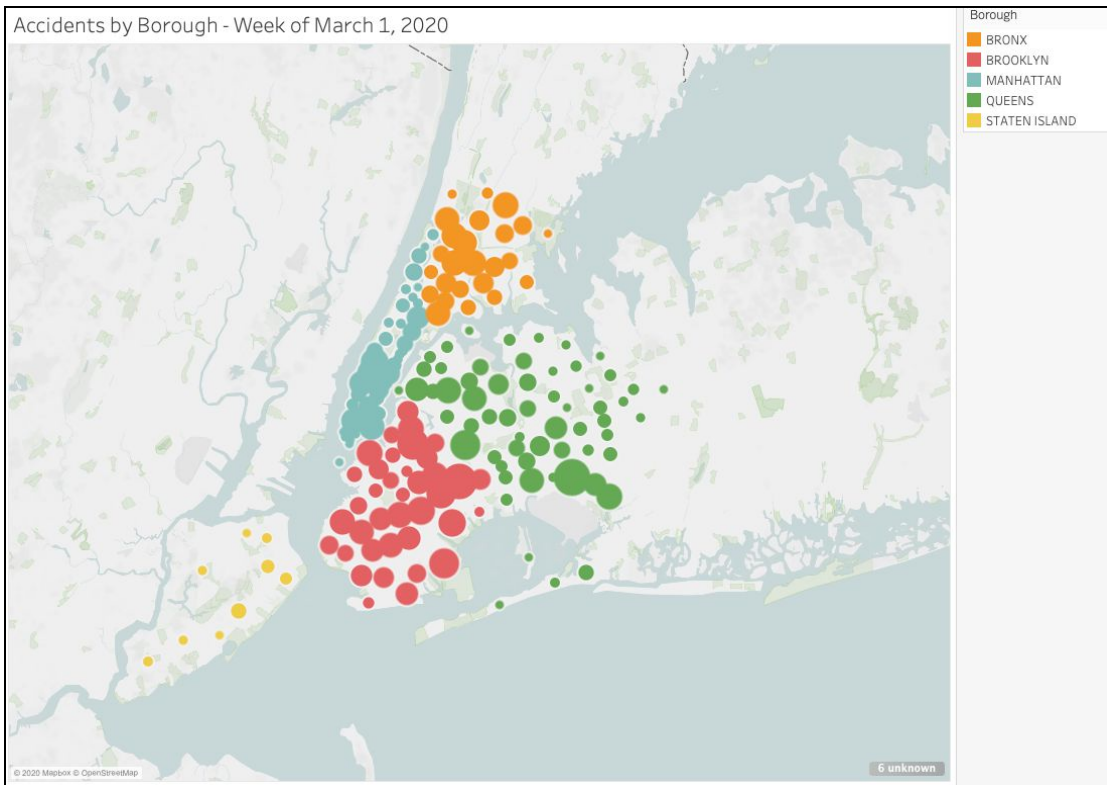
A New York Times study found that speeding tickets doubled from the end of February to the end of March (Hu). Beyond the New York Times’ work or other studies of vehicle mobility, this paper adds by noting that the proportion of car crashes with speeding as a contributing factor increased nearly fourfold in that same time period. Given the time constraints of the DataFest project, further research is needed to study how collision behavior changes after government-sanctioned reopenings.

## References

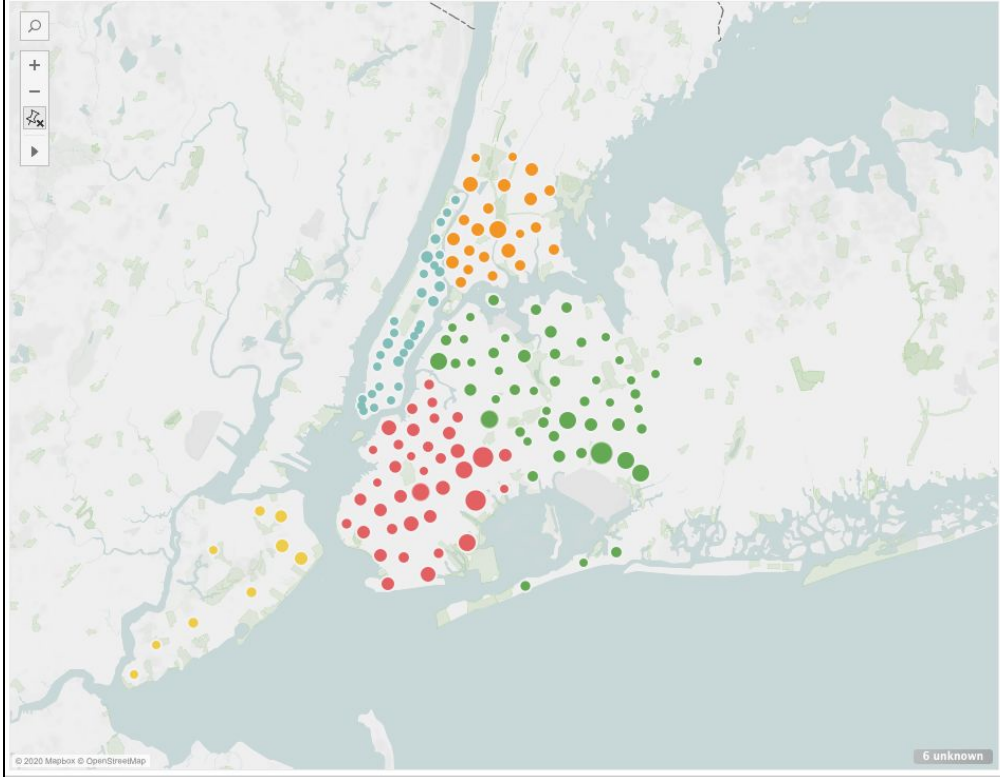
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## Appendix

**Figures 3-6:** Motor Vehicle Collisions by Location over Time, March 1-April 14, 2020



Accidents by Borough - Week of March 29, 2020



Accidents by Borough - Week of April 12, 2020

