

Examining the Response of Law Enforcement Officers to Reporting Periods

Unifying Data Science Project Proposal

MIDS Team 7:

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Topic

On May 25th, 2020, in Minneapolis, Minnesota, a black man named George Floyd Jr. was killed by a local police officer named Derek Chauvin during an interaction arising over allegations that Floyd attempted to use counterfeit money to pay for a purchase in a nearby store. The event was tragic, and public shock and outcry were only worsened as videos of the incident spread through the information space like wildfire. In the days and weeks following Floyd's death, police conduct and oversight vaulted to the forefront of the American social consciousness as cries for greater transparency were bolstered by protesting masses.

Policing, and policing transparency, are difficult social questions to study because of the numerous intertwined elements that affect the police department, its officers, and the local communities they serve. However, due to the jurisdictional nature of local police departments, some facets can be examined further. One such area that we propose is "policing-for-profit." This concept centers on the idea that police departments pick up their ticketing activity towards the end of a financial period to impact an implied or explicit revenue objective.

Evidence of police ticketing quotas is hard to come by. Some states, approximately 20 in all, explicitly ban the practice. Nonetheless, there still exists the belief in many citizens that police departments utilize ticket quotas for purposes such as promotion or revenue generation. These beliefs are only further by journalism that claims a relationship between tools such as grants from the Federal Government that are tied to certain types of traffic stops.¹

Project Question

Until 2018, the state of North Carolina prohibited the establishment of police ticketing quotas by departments. Therefore, in the years leading up to 2018, officers should have faced no pressure to issue additional tickets unless formal or informal pressure was applied to them. This project proposes to address whether or not the end of reporting periods such as months, quarters, or the year still impacted the behavior of law enforcement officers:

"Is the ticketing behavior of law enforcement officers sensitive to the end of a reporting period?"

Motivation

Answering this question is essential in addressing aspects of the "policing-for-profit" debate. While we do not expect to provide a concise conclusion to the discussion single-handedly, we believe there is room to move the dialogue forward while embracing causal inference to gain better insight into drivers of behavior, or perceived behavior, by law enforcement officers. More importantly, by leveraging these

¹ Keller, Michael H. "The Demand for Money Behind Many Police Traffic Stops (Published 2021)." *The New York Times*, 2 November 2021, <https://www.nytimes.com/2021/10/31/us/police-ticket-quotas-money-funding.html>.

methods in our research, we can better understand what portions of the public discussion are supported by fact and what areas can be considered misinformation.

Ideal Experiment

In a purely ideal world, we would study the effect described in our question by splitting a major metropolitan area in half as randomly, yet balanced, as possible. To ensure no spillover effect between the two sides, we construct a wall between the two halves and isolate them from each other electronically. We also ensure that officers only live on the side of the city where they are reporting for duty. Once the city is divided, we begin the experiment by operating one half as a control. The control continues normal police operations on a standard calendar without ticketing quotas. On the experiment side, we operate the police department without any quota but have removed any indication of time or date. As time progresses, we capture data on citations issued each day and examine the data from both sides for an indication that the experiment group exhibits a different pattern of ticketing behavior relative to the control group, especially as the end of a month/quarter/year nears.

Study Context

The Stanford Open Policing Project is the definitive data source on police activity in the United States. This data is captured with various degrees of granularity depending on the report requirements of state police departments. In some states, such as Massachusetts, data is only available for the state highway patrol. Whereas in North Carolina, the largest seven cities and state highway patrol all have data reported. For the city of Durham, this data captures a record of activity from January 2002 - December 2015, with individual traffic stops detailed to include time, cause, demographic data, and outcome.

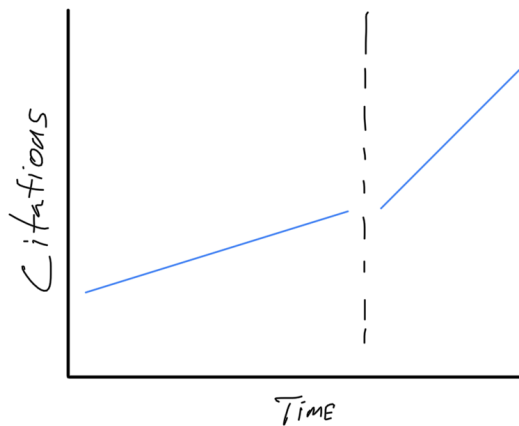
Project Design

The team will utilize a pre-post analysis to determine the treatment effect of the end of a reporting period on the behavior of law enforcement officers. In particular, we believe the number of citations issued will be a good indicator of revenue-seeking behavior as a fine or fees also accompany most citations. We will analyze two levels: monthly and quarterly. For the pre-post analysis of monthly behavior, we will reorganize our dataset to annotate the number of days a citation was issued from the end of the month. We then fit a model and plot the data to visualize and determine if there is an effect on officer behavior posed by the approaching end of a month. We will also repeat this process for analyzing the end of a quarter. We do not anticipate conducting this analysis at the annual level due to the presence of two major holidays approximately one month from the end of the calendar year and reporting period.

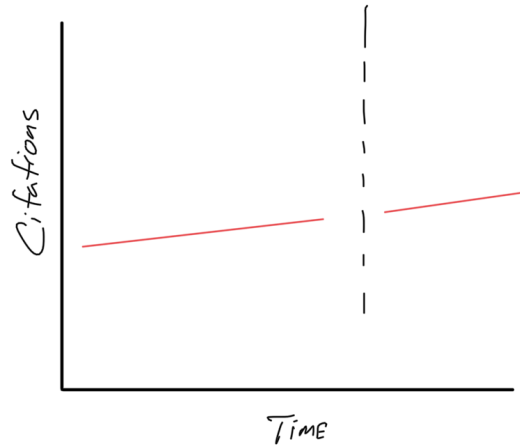
Templated Model Results

Our project hypothesis is that law enforcement activity is sensitive to the end of a reporting period, even in locations where ticketing quotas are explicitly banned. When we visualize our analysis, we expect to see a fairly consistent trend leading up to the end of a month or quarter, at which point a noticeable increase in the volume of tickets issued should become observable.

Result if the hypothesis is true



Result if the hypothesis is false



Final Variables Required

To conduct the analysis described, the team will construct a dataset that utilizes the following approximate variable structure. The data is mainly available from a single source, but will require transformation and grouping to enable the final analysis:

Date	# Police Incidents	# Citations Issued	Days from Month End	Days from Quarter End
Primary Key				

Data Sources

The Stanford Open Policing Project² maintains an authoritative catalog of data on policing activity around the United States, from state to local levels. In the case of Durham, North Carolina, this dataset includes:

- Stop Date
- Stop Time
- Driver Race
- Driver Sex
- Driver Age
- Search Conducted (T/F)
- Contraband Found (T/F)
- Citation Issued (T/F)
- Warning Issued (T/F)
- Frisk Performed (T/F)
- Arrest Made (T/F)
- Reason for Stop

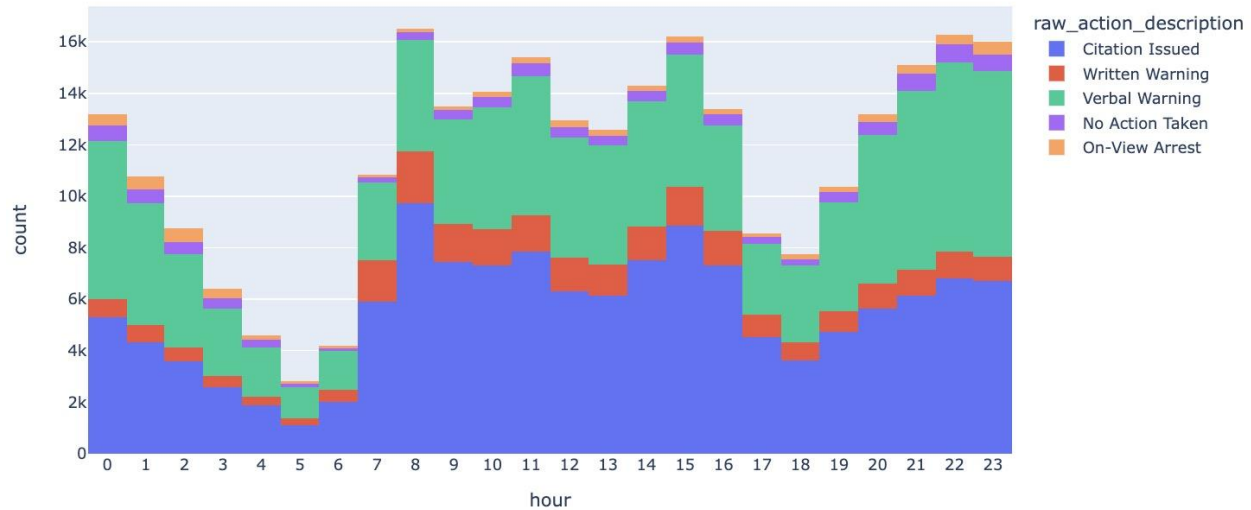
Because of the comprehensive nature of this dataset, we do not anticipate augmenting this source with additional data. The team explored mining data from the records of the Durham Police Department, but there appear to be several years of missingness in the publicly available records. Further exploration is warranted, and if that data becomes available, it will be matched to the above format and included.

² Stanford Opening Policing Project. "Data." *The Stanford Open Policing Project*, 2015, <https://openpolicing.stanford.edu/data/>.

Exploratory Questions

Question 1: At what time of the day is one more likely to be stopped by police?

At what time of the day is one more likely to be stopped by police? (By Action)



Based on the bar plot, it is evident that there are three prominent peaks at 8:00 AM, 3:00 PM, and 10:00 PM. Additionally, the graph shows a trend where there are more stops in the afternoon before 5:00 PM, and the number of stops increases again from 8:00 PM to midnight, followed by a decline until 7:00 AM the next morning. These patterns align with our expectations as there tend to be fewer vehicles on the road during the late night hours.

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raw_action_description	Citation Issued	No Action Taken	On-View Arrest	Verbal Warning	Written Warning	citation_percentage
hour						
0	5274	627	417	6113	742	0.40
1	4349	551	517	4721	661	0.40
2	3601	463	543	3598	547	0.41
3	2587	408	345	2636	416	0.40
4	1889	286	180	1909	338	0.41
5	1133	142	119	1177	248	0.40
6	2024	110	88	1507	468	0.48
7	5887	258	72	3028	1597	0.54
8	9720	322	115	4315	2038	0.59
9	7448	359	132	4096	1457	0.55
10	7280	377	200	4779	1410	0.52
11	7879	477	249	5434	1368	0.51
12	6302	422	244	4697	1282	0.49
13	6162	388	222	4599	1217	0.49
14	7490	410	208	4884	1316	0.52
15	8848	460	228	5149	1528	0.55
16	7313	418	197	4080	1373	0.55
17	4525	259	180	2747	871	0.53
18	3651	270	191	2992	662	0.47
19	4718	412	214	4219	825	0.45
20	5644	511	304	5802	936	0.43
21	6124	643	350	6951	1020	0.41
22	6810	680	394	7360	1046	0.42
23	6709	680	477	7188	952	0.42

The table indicates that citations make up the majority of all actions taken. Notably, at 8:00 AM, there were the most stops and the highest proportion of citations. Furthermore, during the morning hours (7:00 AM to 11:00 AM) and afternoon hours (2:00 PM to 5:00 PM), citations accounted for a more significant share of actions than other hours.

Question 2: What percentage of stops ended in a citation being issued?

The total percentage from 2001-2015: 51.64%

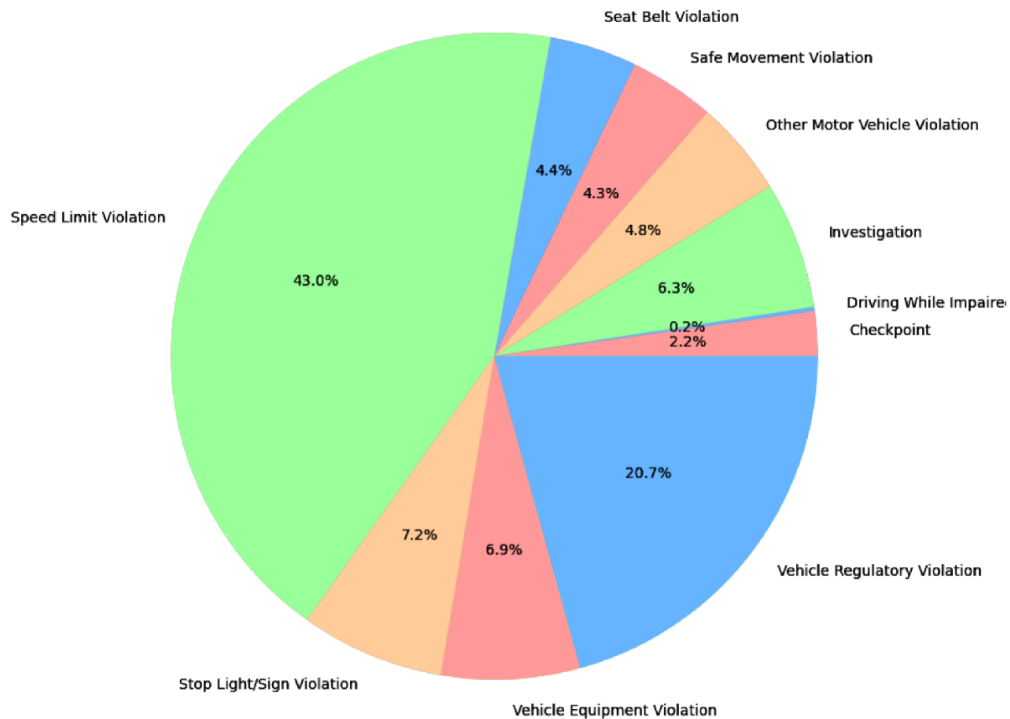
Percentage by year:

raw_action_description	Citation Issued	No Action Taken	On-View Arrest	Verbal Warning	Written Warning	citation_percentage
year						
2001	0	0	0	1	0	0.00
2002	12524	464	819	4201	2432	0.61
2003	13344	356	557	2876	2067	0.70
2004	11198	232	442	2495	2273	0.67
2005	10031	186	400	1659	1927	0.71
2006	10499	228	496	3376	1576	0.65
2007	11140	495	494	6703	1660	0.54
2008	14519	1469	891	11542	2634	0.47
2009	9191	949	418	7230	1753	0.47
2010	14837	1529	642	12128	2240	0.47
2011	14200	1225	614	13024	2314	0.45
2012	12453	1069	610	11944	2200	0.44
2013	13142	1048	449	12953	1924	0.45
2014	10801	786	386	11131	1403	0.44
2015	10472	746	455	10204	1348	0.45

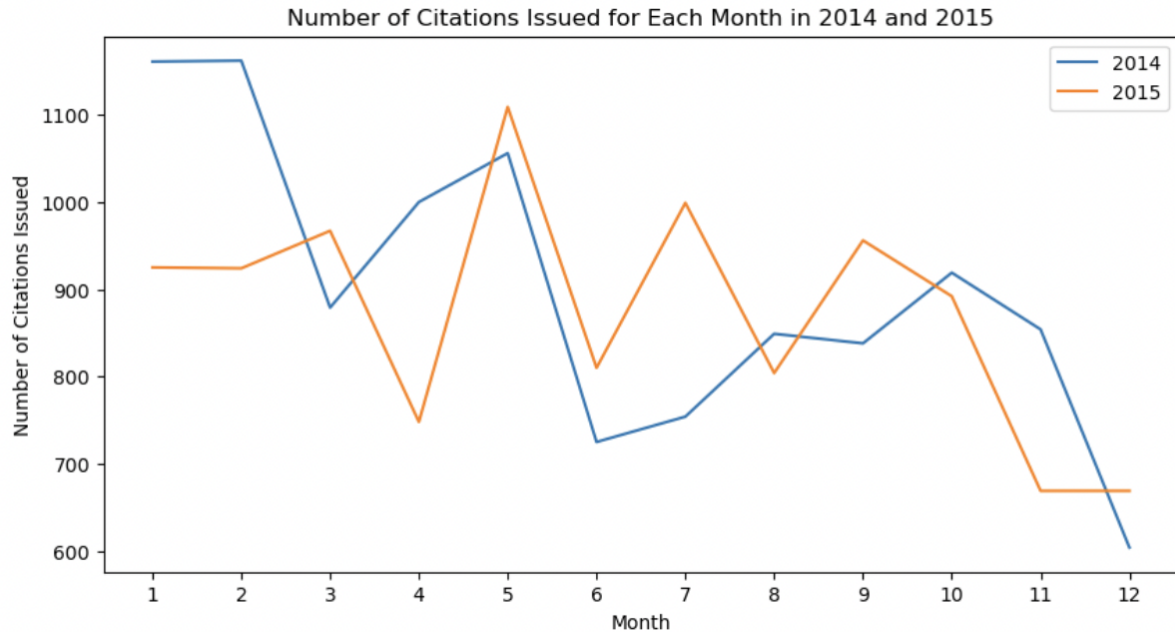
According to the table, citations consistently represent the most significant proportion of all actions following a stop. The highest share was recorded in 2005, where citations accounted for 71% of all activities, gradually decreasing in subsequent years. Since 2011, the percentage of citations has stabilized at around 45%.

Question 3: Are there any differences in ticketing behavior across different reasons for a stop, such as speed limit violation or vehicle regulatory regulation?

Reason for Stop and Citation Issued



From the pie chart above, we can find that among the ten possible reasons that citations were issued, Speed Limit Violation is the most significant reason drivers received citations, accounting for 43% of all citations. In the meantime, Vehicle Regulatory Violation is the second most common reason for traffic stops, accounting for around 20.7% of citations. By contrast, Driving While Impaired is the least common reason for a traffic stop, which only takes a proportion of 0.2% of citations. These insights can be helpful for figuring out the probable prioritized types of traffic violations among law enforcement agencies and policymakers.

Question 4: How does the distribution of citations issued by law enforcement officers vary across months and years?

The line chart above presents the number of citations issued by law enforcement officers in specific months between 2014 and 2015. The chart reveals some noticeable patterns in the monthly distribution of citations across the two years. For instance, there is an upward trend in citations issued from April to May in both years, while a decline is observed from October to December. These similarities suggest that common factors or influences may affect citation issuance during certain months of the year.

Division of Labor

Data Preparation and Pre-Processing: Wafiakmal Miftah & Andrew Kroening

Data Visualization: Jenny Shen & Chloe Liu

Model Experimentation and Fitting: Wafiakmal Miftah & Chloe Liu

Model Evaluation: Andrew Kroening & Jenny Shen

Outcome Visualization: Wafiakmal Miftah & Jenny Shen

Report Compilation: Andrew Kroening & Chloe Liu