

The Effects of COVID-19 on Police Issued Tickets*

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The number of police issued tickets increased between years 2019 and 2020. The increase in tickets was caused by a significant increase in speeding tickets. The percentage of total tickets being speeding is roughly constant between the periods of before and after 2020. This supports an inverse correlation between the number of vehicles on a road and the number of issued speeding tickets.

1 Introduction

This paper, titled The Effects of COVID-19 on Police Issued Tickets, examines how the COVID-19 pandemic impacted the issuance of traffic tickets by the police. Specifically, it explores the assumption that fewer vehicles on the roads due to lockdown measures would lead to a decrease in ticket issuance. However, the findings indicate a more complex outcome: while there was a reduction in several types of infractions (e.g., aggressive driving and distracted driving), there was a significant surge in speeding violations.

The analysis relies on data sourced from Gelfand (2022) and processed using the R programming environment. The data set includes variables such as ticket type, police division, and offense category, though some data points, such as neighborhood names, were omitted for clarity. The analysis is grounded in a hypothesis that the number of tickets is proportional to traffic volume, but the results show that while non-speeding offenses decreased, speeding offenses tripled, suggesting an inverse relationship between road congestion and speeding.

The paper is structured as follows: it opens with an introduction to the research question and data sources, followed by a detailed presentation of the dataset and its preparation. The core analysis discusses potential causes for the increase in speeding, including speed limit reductions and shifts in policing priorities. Finally, the paper addresses limitations, particularly related to

*The code and data supporting this analysis are available at: https://github.com/Richard-Guo1/Police_Issued_Tickets.

omitted data points, and presents conclusions supported by graphical evidence and statistical trends.

Overall, the paper offers a nuanced understanding of traffic enforcement dynamics during a period of reduced mobility, emphasizing how certain offenses like speeding may be more prevalent when road conditions change dramatically.

2 Data

The data used for this analysis was taken from Gelfand (2022). The raw data is sorted by the ticket ID, year, police division, ticket type, offence category, age group, neighborhood ID and name, and ticket count. The ticketable offences were Aggressive Driving, All Compulsory Automobile Insurance Act transgressions (All CAIA), Distracted Driving, Other Highway Traffic Act infractions (Other HTA), and Speeding. The categories of ticket ID, ticket type, and age group were omitted due to being irrelevant to the analysis. The category of neighborhood name was omitted in favour of using neighborhood IDs instead, for ease of sorting. The graphs and tables were generated with the help of R Core Team (2023) and Wickham et al. (2019).

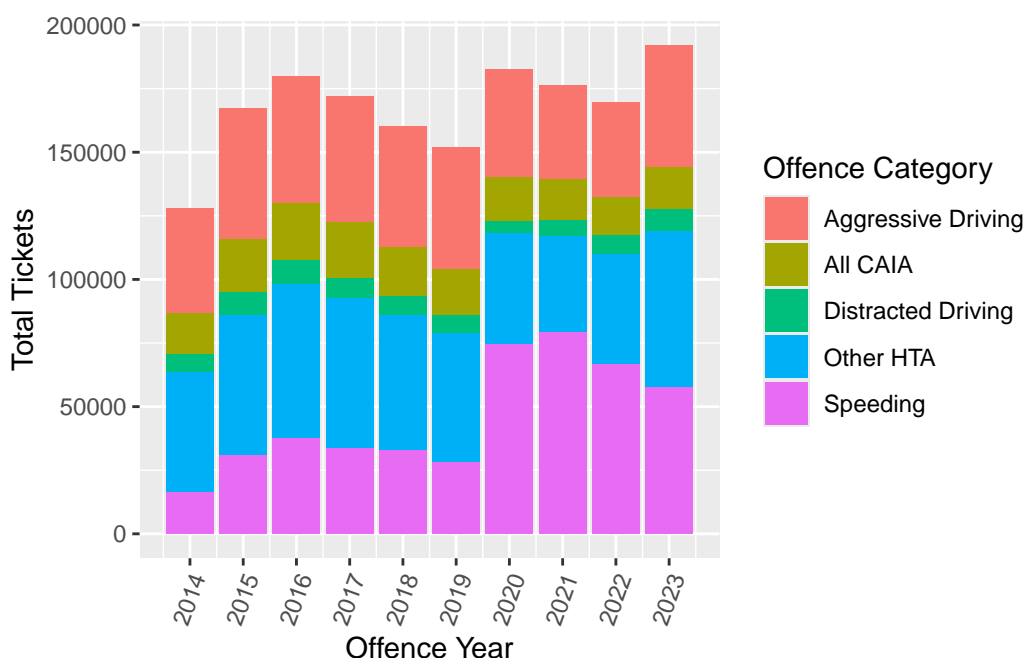


Figure 1: Annual Number of Police Issued Tickets between 2014 and 2023

This paper was written with the initial hypothesis that the amount of police issued tickets is directly proportional to the number of drivers on a road. The conclusion of this assumption is that fewer cars on the roads, and by extension the COVID-19 stay at home policies, would cause

a decrease in the number of tickets in 2020 compared to 2019. Figure 1 shows this is not the case. Compared to the previous years, there is a small decrease in tickets issued for aggressive driving, distracted driving, all CAIA, and other HTA infractions. However, the roughly tripled amount of speeding tickets offsets the decreased tickets from the four other offences combined. This data supports an alternative hypothesis that non-speeding based offences are positively correlated with the amount of drivers while speeding offences are inversely correlated.

3 Discussion

3.1 The speed limit reduction

An alternative explanation for the increase in speeding is the gradual reduction of major street speed limits from 60 to 50 km/h. Many drivers develop habits for how hard they need to step on the gas pedal to remain at a stable speed. Following this explanation, an increase in speeding tickets in 2020 in neighbourhoods where the changes were enacted, with speeding tickets decreasing in later years as drivers get used to the new speed limit. This pattern can be observed in Neighbourhood 4, the Rexdale-Kipling area, on Table 1. However, while it is a large increase in speeding relative to its own neighbourhood, it is a small fraction of the increase seen in Neighbourhood 1, the West Humber-Claireville region. In the full speeding table Table 2, a pattern where both the most speeding happens and the largest increases in speeding are in neighbourhoods with direct access to a highway is observed. This pattern supports the inverse correlation that less congestion on highways - fewer vehicles on the roads - predicts more speeding vehicles, and more speeding tickets.

Table 1: Speeding Tickets In Neighborhoods, 1-6 Sorted by Year

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	344	729	876	976	2173	2065	4465	4086	5883	4912
2	104	84	114	341	137	110	466	93	125	32
3	185	239	337	207	121	65	346	180	509	150
4	18	19	66	109	120	8	240	229	45	99
5	16	59	202	258	107	51	219	683	524	93
6	7	16	17	52	59	18	131	128	100	24

3.2 Shifts in policing focus

Another possible explanation is that some time between 2019 and 2020, the traffic divisions of the Toronto Police Services decided to more heavily enforce speeding violations. The outcome of this assumption would also be an increase in the number of speeding tickets. As this would be a city-wide change in priorities, there should be an observable increase in speeding tickets

across all police divisions, with an equal number or decrease in other tickted offences. Figure 2 compares the amount of speeding tickets issued by division in the four years prior to and after 2020. It shows the expected increase of speeding tickets from most police divisions, with divisions 31, 51 and 52 being the outliers.

Figure 1 shows that other HTA tickets were the most common before 2020. Figure 3 compares the tickets issued for other HTA infractions over the same time period as Figure 2. The graph shows that other HTA tickets decreased after 2020 in most police divisions. Comparing both graphs, it can be observed that divisions 31 and 52 saw a decrease in both ticket types, divisions 11, 14 and 32 saw an increase in both, and division 51 observed both a decrease in speeding and an increase in other HTA offences. Since six of sixteen observations do not align with the expectation, the data does not provide sufficient evidence to support the claim that there was a shift in police priorities.

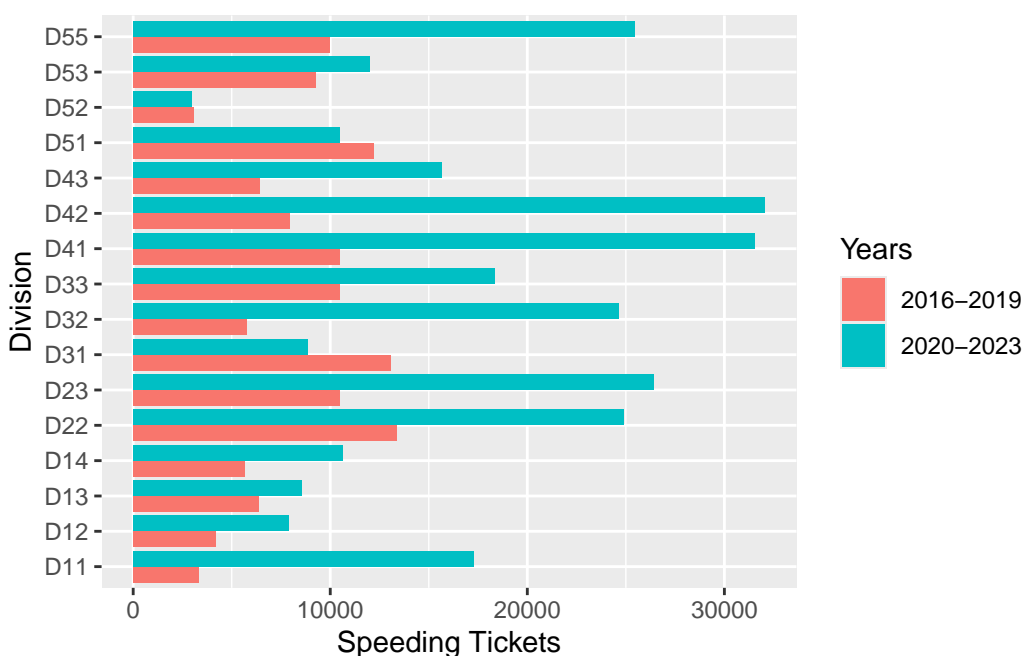


Figure 2: Police Issued Tickets for Speeding by Division in 2016-2023

3.3 Limitations

A significant portion of the data had to be omitted as either the police division or district number had no specified address (NSA). The datapoints with both categories returning NSA are not beneficial to any analysis, other than showing the trends of offence category by year, which can be sufficiently done with the remaining data. The datapoints with only one category returning NSA may be used for some analysis, but were omitted for the sake of clarity.

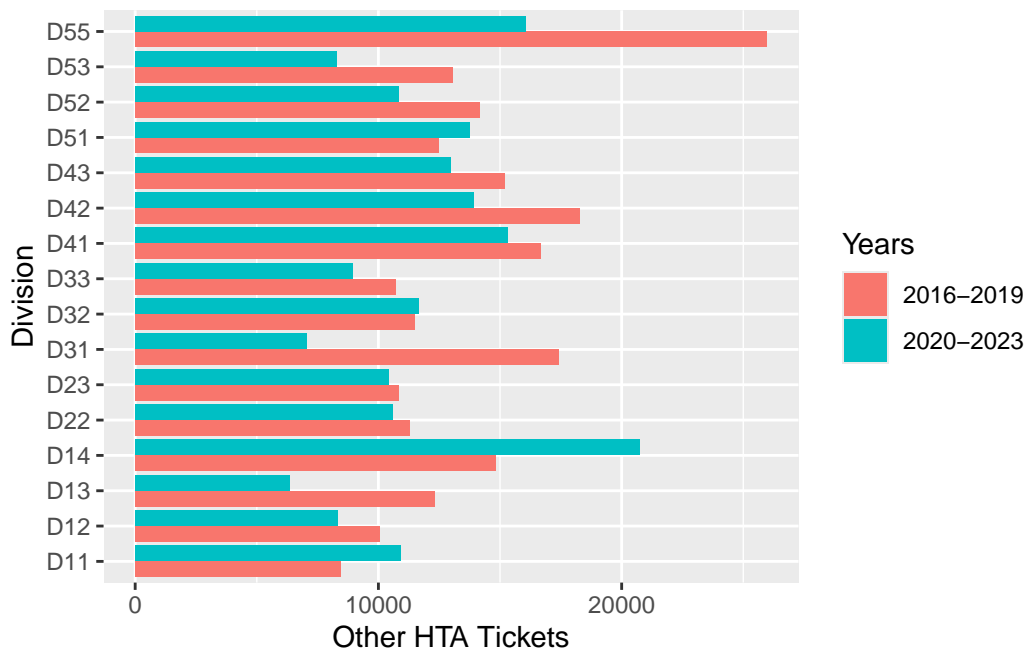


Figure 3: Police Issued Tickets by Division in 2016-2023

However, as the omitted data could not be analyzed, it is possible that some of the analysis does not align with reality.

A Additional data details

Table 2: Speeding Tickets In all Neighbourhoods, Sorted by Year

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
1	344	729	876	976	2173	2065	4465	4086	5883	4912
2	104	84	114	341	137	110	466	93	125	32
3	185	239	337	207	121	65	346	180	509	150
4	18	19	66	109	120	8	240	229	45	99
5	16	59	202	258	107	51	219	683	524	93
6	7	16	17	52	59	18	131	128	100	24
7	14	29	71	274	159	110	511	334	121	117
8	48	232	311	278	214	282	293	201	70	211
9	104	991	751	531	219	217	952	676	470	447
10	65	225	314	382	92	208	276	295	315	408
11	115	475	391	359	380	356	396	311	423	900
12	36	178	161	100	102	39	224	365	256	106
13	34	101	198	150	63	151	228	64	78	22
14	0	0	0	0	0	0	0	0	0	0
15	56	46	190	96	56	44	363	312	132	41
16	41	118	269	149	104	83	534	3195	1397	682
17	0	0	0	0	0	0	0	0	0	0
18	7	19	28	25	7	4	124	126	18	33
19	3	123	118	42	30	23	15	55	32	16
20	218	839	1058	528	676	436	524	456	507	318
21	764	1486	1395	1580	1364	691	1290	1158	879	624
22	218	364	372	526	438	290	796	171	119	104
23	809	973	743	786	620	373	234	126	56	35
24	77	129	248	78	20	11	19	7	17	40
25	7	29	35	93	118	133	121	9	16	80
26	0	0	0	0	0	0	0	0	0	0
27	312	306	669	615	223	131	1062	700	961	434
28	59	141	72	48	47	14	55	38	36	208
29	114	84	135	38	39	2	157	176	104	207
30	143	276	345	223	179	195	416	371	225	258
31	84	245	568	584	315	236	497	928	1268	466
32	60	242	583	327	156	21	77	100	30	8
33	11	37	69	39	133	56	466	1620	477	368
34	19	96	118	55	56	47	289	215	162	111
35	21	46	20	6	5	9	655	579	204	363
36	45	39	57	33	46	35	83	57	16	19
37	10	95	33	61	84	70	208	65	105	51

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
38	91	117	61	25	74	63	173	120	33	17
39	463	222	168	144	133	90	2646	2347	1053	432
40	67	72	113	177	88	125	1149	342	377	900
41	260	721	651	523	356	182	905	1127	558	1064
42	144	389	1014	805	612	278	1011	1414	1007	1062
43	97	470	594	451	374	418	676	618	794	649
44	141	272	451	168	121	323	718	1072	864	696
45	0	0	0	0	0	0	0	0	0	0
46	3	143	168	202	125	14	30	17	35	51
47	17	73	85	53	35	18	372	86	35	86
48	81	103	150	113	111	14	232	531	735	452
49	243	480	933	548	427	268	1283	1319	1264	1464
50	99	192	185	157	125	258	701	723	414	173
51	0	0	0	0	0	0	0	0	0	0
52	43	81	149	132	228	159	565	559	559	350
53	7	49	49	52	72	17	377	103	23	7
54	18	23	88	133	173	82	482	938	1342	1050
55	42	109	246	155	67	27	31	10	8	10
56	118	125	71	140	158	702	702	888	1336	666
57	18	41	38	31	33	34	32	54	256	87
58	66	381	735	302	321	155	616	865	1574	1680
59	56	46	12	10	141	109	206	254	118	7
60	19	8	18	6	10	7	6	17	34	20
61	0	1	54	34	22	15	10	5	1	4
62	6	33	15	30	84	84	61	51	45	126
63	47	96	53	38	61	42	136	100	80	334
64	7	19	21	12	43	16	44	23	10	3
65	51	10	17	34	21	28	44	40	6	8
66	1	1	16	31	52	26	18	18	1	3
67	1	1	1	1	17	18	19	52	94	116
68	103	150	261	525	717	885	787	709	858	363
69	8	13	24	48	21	17	99	49	102	18
70	384	491	450	470	522	474	1051	1005	722	352
71	335	706	1363	1764	1727	1441	2160	1917	986	520
72	49	60	101	23	44	11	38	35	24	9
73	680	914	971	1160	965	1072	1239	753	629	390
74	43	37	132	260	93	72	145	73	17	12
75	0	0	0	0	0	0	0	0	0	0
76	0	0	0	0	0	0	0	0	0	0
77	0	0	0	0	0	0	0	0	0	0
78	39	314	186	314	168	77	141	174	87	28

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
79	46	22	7	8	12	16	54	33	45	14
80	92	65	49	45	11	38	32	35	14	49
81	28	20	114	156	49	9	132	94	18	3
82	0	0	0	0	0	0	0	0	0	0
83	1	2	6	6	6	1	28	113	5	5
84	50	72	47	3	2	5	201	69	37	12
85	286	397	551	381	432	332	1873	2642	1726	1772
86	0	1	6	31	2	22	267	139	344	34
87	188	394	426	404	218	132	1508	1455	2196	1005
88	87	47	74	170	125	77	177	480	206	41
89	37	27	71	112	17	50	118	60	103	31
90	20	12	23	76	16	21	167	399	1053	2033
91	0	5	9	2	0	5	7	268	127	23
92	2	22	147	118	121	45	82	39	51	14
93	0	0	0	0	0	0	0	0	0	0
94	2	56	42	60	95	0	11	34	14	1
95	31	27	21	33	27	59	262	98	39	82
96	23	58	49	110	128	16	52	40	17	87
97	43	35	81	151	224	169	849	215	127	150
98	207	193	477	477	1026	584	445	192	147	215
99	15	31	33	32	23	20	35	6	8	2
100	148	131	176	178	167	259	92	18	119	17
101	270	382	1201	1045	539	86	1461	2285	1662	1285
102	6	28	25	132	138	109	121	33	5	14
103	52	85	120	123	260	798	1131	884	526	541
104	0	0	0	0	0	0	0	0	0	0
105	5	11	7	1	1	2	7	34	5	14
106	73	76	110	85	19	27	40	243	126	338
107	20	66	260	101	77	14	23	31	132	8
108	4	7	12	7	4	0	3	9	4	1
109	17	57	99	119	122	15	15	17	15	16
110	1	14	17	2	5	3	5	10	21	14
111	367	396	487	424	286	202	328	156	157	104
112	148	334	168	101	41	77	203	952	293	99
113	38	67	17	13	10	18	9	13	38	55
114	56	48	144	95	32	16	44	34	32	5
115	195	242	260	258	263	171	323	234	309	246
116	62	72	56	53	209	133	402	451	270	273
117	0	0	0	0	0	0	0	0	0	0
118	19	26	32	14	11	46	418	297	216	184
119	218	379	442	166	273	316	1958	1339	911	1057

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
120	255	1265	1184	540	500	442	1655	1730	988	1087
121	231	294	238	161	220	75	185	56	54	10
122	143	268	426	287	590	1457	1667	1468	990	862
123	104	229	218	116	117	180	366	200	179	88
124	64	93	189	75	195	87	206	207	519	266
125	8	7	18	17	8	18	126	34	43	36
126	132	164	258	178	249	503	2071	2968	2116	1503
127	0	0	0	0	0	0	0	0	0	0
128	87	244	202	92	415	104	470	214	156	242
129	93	342	130	120	323	114	379	459	340	552
130	343	695	429	240	526	194	1178	968	1079	992
131	0	0	0	0	0	0	0	0	0	0
132	0	0	0	0	0	0	0	0	0	0
133	25	93	94	41	168	70	340	1162	413	104
134	105	126	188	107	266	158	155	296	167	135
135	64	70	133	100	225	212	629	845	583	812
136	376	404	548	449	459	479	774	1154	761	1579
137	0	0	0	0	0	0	0	0	0	0
138	189	160	129	135	223	124	138	208	157	53
139	29	41	53	17	181	43	86	81	49	23
140	56	79	134	159	117	29	34	67	46	38
141	97	113	100	142	164	120	687	887	368	323
142	76	95	99	112	239	171	464	626	490	244
143	34	295	239	66	142	71	91	119	211	291
144	217	923	657	448	522	385	2087	3285	3120	2997
145	104	155	166	190	365	261	1984	1282	1482	1772
146	47	367	246	131	248	236	412	608	470	233
147	9	17	32	12	25	20	329	149	69	36
148	10	53	77	11	29	22	456	607	507	308
149	11	66	141	272	147	193	350	141	54	60
150	22	30	447	447	177	28	128	45	13	11
151	72	129	43	28	55	183	35	254	225	116
152	44	169	158	96	113	203	245	167	248	287
153	3	1	5	5	20	8	23	16	2	4
154	205	409	287	252	128	53	172	85	107	165
155	740	460	363	353	166	204	367	547	339	215
156	111	312	297	131	375	328	1831	2350	1528	1092
157	43	88	129	52	83	118	185	607	408	346
158	99	242	437	428	250	469	729	464	888	804
159	193	338	424	355	227	188	510	883	696	857
160	60	136	175	115	147	75	325	122	73	53

Neighbourhood	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
161	63	301	414	308	155	100	708	698	585	574
162	8	2	2	5	2	0	33	49	31	5
163	294	591	922	1272	1050	983	1707	1951	2102	2222
164	7	5	1	15	8	5	24	12	12	7
165	26	48	78	75	119	108	354	524	497	258
166	250	498	343	150	193	278	375	276	164	473
167	2	0	27	128	2	4	30	98	30	13
168	4	4	3	18	19	9	33	22	29	52
169	0	1	1	5	2	1	13	11	5	1
170	13	31	80	362	729	730	559	277	154	13
171	28	35	73	86	30	5	47	22	20	24
172	8	28	10	11	40	9	16	25	23	63
173	0	1	2	0	0	23	0	0	1	2
174	323	277	227	224	73	43	73	13	34	123

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