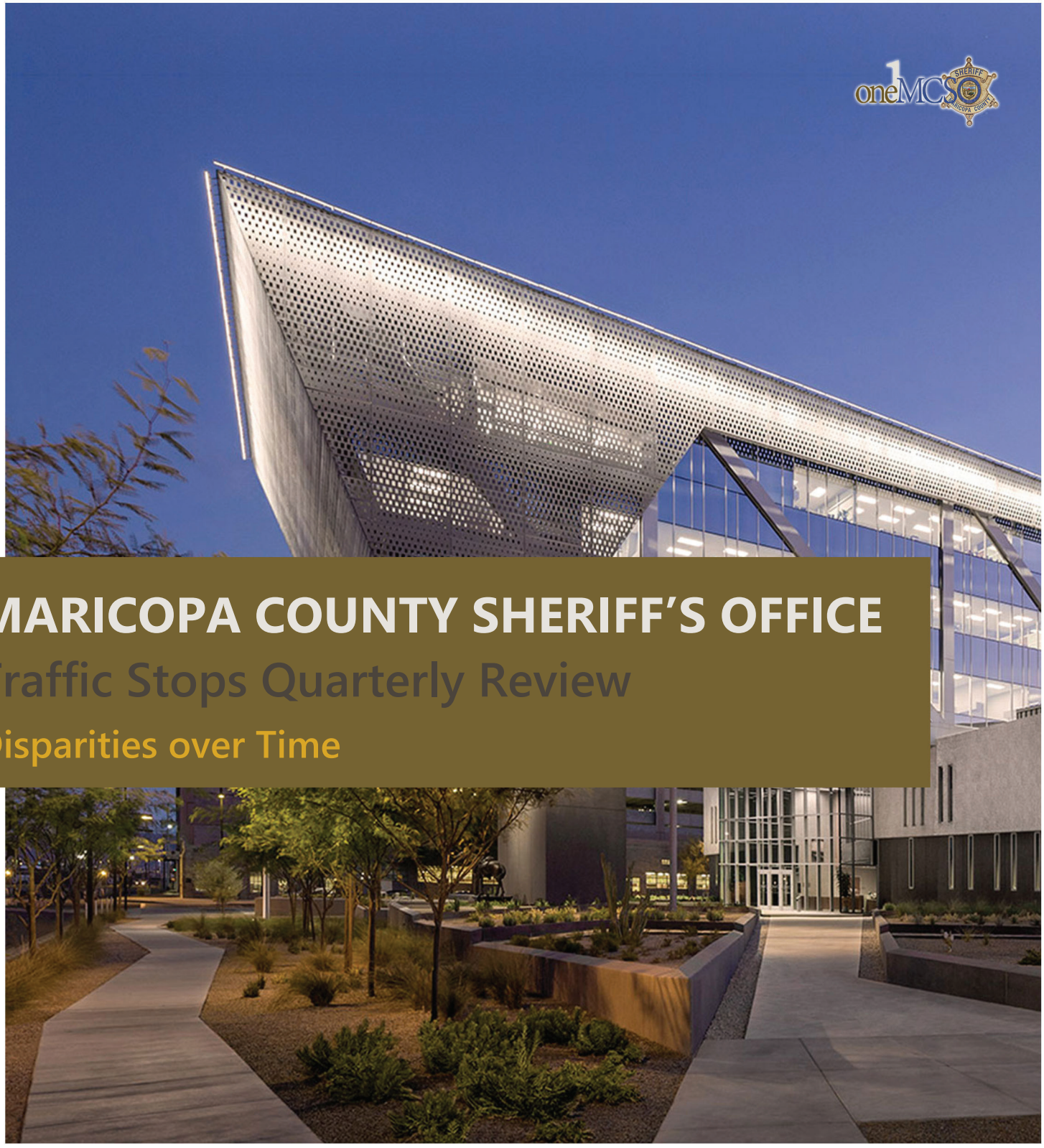

MARICOPA COUNTY SHERIFF'S OFFICE

Traffic Stops Quarterly Review

Disparities over Time

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CNA

September 2022

This document contains the best opinion of CNA at the time of issue.

CNA Analysis Team: Zoë Thorkildsen, Project Director; Jennifer Lafferty, Analyst; Bryce Peterson, Analyst

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Introduction

This Traffic Stops Quarterly Report (TSQR) focuses on analyzing disparities in traffic stop outcomes by race and ethnicity over time at the level of the overall patrol activity of the Maricopa County Sheriff's Office (MCSO). The goal of the analysis in this report is to assess whether estimated disparities in traffic stop outcomes (documented in the 2017–2018, 2019, 2020, and 2021 Traffic Stops Annual Reports (TSARs)) are increasing or decreasing over time. To assess time trends in observed disparities, the CNA analysis team implemented several analytical approaches, described in more detail in the Approach section, because there is no established methodology in the literature for analyzing time trends over more than two periods using a propensity score matching approach. This report will assist MCSO in understanding whether the efforts made to-date to reduce disparities in traffic stop activity have affected the observed statistical differences in outcomes for drivers of different races and ethnicities. It will also establish a repeatable methodology that can be used to monitor progress in the future. Finally, this methodology could be used in the future to assess the overall outcomes of interventions with individual deputies and other policy and practice interventions MCSO may develop.

Background and purpose of analysis over time

The time trend in observed disparities in traffic stop outcomes has been a topic of interest for all stakeholders to MCSO's court-ordered traffic stop analysis for several years. After the establishment of a repeatable methodology for the TSAR beginning with the 2017–2018 report, a question was raised regarding how MCSO's progress in reducing disparities in traffic stop outcomes could be assessed over time. As a result, the CNA analysis team developed the methodology for this TSQR to answer the following question: have observed disparities in traffic stops outcomes (i.e., stop length, citation rates, arrest rates, and search rates) increased, decreased, or remained steady over time since July 2017?

This question is complex, as illustrated in the 2020 TSAR. In that report, findings from the 2017–2018, 2019, and 2020 TSARs are presented in the Conclusion section; however, for many of these outcomes, no unidirectional trend was observed. Put another way, for most outcomes, disparities trended either downward and then upward (moving from 2017–2018, to 2019, to 2020) or vice versa. And, of course, no reasonable statistical conclusions could be drawn from a trend line composed of only three points. This quarterly report is intended to examine these changes over time.

However, as will be highlighted in this report, no established methodology combines multi-period (meaning more than two periods) time series analysis with propensity score matching methodology. In reviewing the literature, Heckman, Ichimura, and Todd (1997) originated the idea of combining propensity score matching and difference-in-difference approaches, further expanding on them in future work (1998). However, after Heckman, Ichimura, and Todd's exploration of the combination of these quasi-experimental approaches, few applications have emerged until very recently.

Researchers have applied the combined difference-in-difference and propensity score matching approach to studies involving two distinct periods (pre- and post-intervention) or to studies with canonical difference-in-difference designs (An, 2016; Gebel & Voßemer, 2014; Imai & Wang, n.d.; Stuart, Duckworth, Simmons, & Barry, 2014; Villa, 2016). By "canonical designs," we refer to studies in which assigned

treatment and control participants participate over multiple periods, which is not the case in the application of propensity score matching to traffic stop analysis. To the analysis team's knowledge, this report is the first application of such a methodology.

Organization of this report

We summarize our findings below. The Approach section presents our data, methodology, and limitations. The Findings section presents descriptive statistics and comparative analyses, organized into the seven districts. We then discuss the implications of these findings for the court-ordered traffic stop review process and conclude with MCSO's response.

Approach

Overview of data and variables

The MCSO uses Traffic and Criminal Software (TraCS) to capture field data about traffic stops. TraCS is the data collection, records management, and reporting software for MCSO's public safety professionals. This system allows deputies to document various aspects of each traffic stop, including the start time, the end time, and the stop's geolocation. This study includes data collected by MCSO from July 2017 through December 2021. We used a subset of the TraCS system's 209 variables to analyze racial or ethnic disparities in stop outcomes at the district level.

For this study, we used the same datasets and methods approved for data categorization or cleaning in previous TSARs. The outcomes of interest include length of stop, searches, citations (versus warnings and incidental contact), and arrests. We did not conduct any comparative analyses on seizures, since this outcome has never been statistically significant in any past TSARs.

Data about the stop. TraCS indicates whether a stop included a search of the driver or vehicle (we omitted passenger searches from this analysis because our focus was on drivers) and whether that search was incident to arrest or towing. We constructed a variable for analyzing searches that indicates whether a search of the driver or vehicle took place. For this analysis, we restricted our interest in searches to non-incidental searches (i.e., discretionary searches).

Data about the driver and stops. We used the post-stop perceived race or ethnicity of the driver to classify the driver as Asian, Black, Hispanic, Native American, or White. We also used the post-stop perceived sex of the driver to create an indicator variable for male drivers (with female drivers and unknown sex drivers collapsed as the comparison category). We also included the reported license plate of the vehicle the driver was operating, classifying it as in-state or out-of-state.

The CNA analysis team joined these data to include additional information, such as DUI (driving under the influence) task force assignment, geography, and the deputies' assigned districts, to complete our analysis at the district level. We also included data on the stop time of day, operationalized by stops during the day versus stops during the night (operationalized as daytime occurring from 8:00 a.m. until 8:00 p.m.), and the reasons for extended stops.

Data verification and missing data. This report used the same data from July 2017 through December 2021 that were used in previous annual reports. A small number of stops, representing less than 5 percent of the overall sample, had to be dropped from the analysis because they lacked information for license plate state or call sign categories. To prepare the dataset for the TSAR and for this TSQR, the analysis team removed non-traffic-stop data, corrected inaccurate stop outcomes, and dropped duplicate stop entries.

Methodology

Because we conducted multiple analyses to answer the same overall question (i.e., whether traffic stop disparities have increased or decreased over time), we incorporated post hoc corrections for multiple

testing after completing our analyses. Specifically, we used the Simes technique as operationalized in the Benjamini-Hochberg critical value formula:

$$Critical\ Value = \left(\frac{i}{m}\right) * Q$$

In this formula, i represents the rank of the p-value after we arrange the p-values from all the statistical tests conducted for this report from lowest to highest, m represents the total number of tests run across the entire TSQR (i.e., 252), Q represents our selected false discovery rate of 0.05, and the critical value is 0.004. Using the generated critical values and following the Simes technique, we could determine the significance of each statistical test after making such corrections. The largest p-value that was lower than the critical value of 0.004 was 0.003. All p-values lower than 0.003 were considered statistically significant.

Note that we applied this correction only to the difference-in-difference findings from each statistical test. For instance, in the "simplified two-period analysis" section, we use the Stata *diff* package, which analyzes the average treatment effects on the treated (ATTs) for both the pre- and post-periods included in the model, as well as the differences between the treatment and comparison group relative to the differences in ATTs from both periods (i.e., the difference-in-difference estimate). Because the ATTs and difference-in-difference estimates were produced in the same statistical test, we applied the Simes technique to only the difference-in-difference estimates.

Considerations and limitations

The primary limitation to our analyses is that 4.5 years may not represent sufficient time to identify changes in disparity levels at the level of MCSO's patrol function. This limitation is compounded by the fact that MCSO has implemented a number of initiatives staggered over the time span of this study; in addition, the individual deputy intervention program has been operating only since April 2021. Other MCSO-wide initiatives to address disparities (such as targeted educational programs regarding the importance of proper licensing and documentation) have also been implemented only recently. In addition, progress on many paragraphs of the Court Order occurred prior to the beginning of the sample period; thus, the effects of those changes could not be measured using this dataset.

In addition, even though individual analyses have high statistical power due to the sample size, the large volume of tests does result in a conservative alpha level after applying the Simes correction. We close the report with some discussion about the relative value of the various tests, which could be more limited in future reports replicating this approach.

Findings

In this section, we describe the variables included in the analyses. As part of the descriptive statistics, we present the rates of traffic stops by race of driver. The analysis team worked closely with the MCSO to assess various options for external benchmarks to use as a comparison condition for stop rates by race. Most existing or proposed external benchmarks provide inaccurate estimates of the driving population (e.g., census population data) or are cost-prohibitive (e.g., collecting data on driver race using observations at intersections). We considered several emerging practices (e.g., comparing daytime versus nighttime stop rates, using accident data, comparing criminal versus civil traffic stop rates), but we could not implement them using the currently available data from the MCSO. Therefore, for stop rates, we present descriptive statistics only.

Below, we present the findings from the comparative analyses for kernel propensity score analysis difference-in-difference models. For each stop outcome we analyzed using propensity score matching, we include the results from comparing Hispanic drivers to White drivers, comparing Black drivers to White drivers, and comparing all racial and ethnic minority drivers to White drivers. We did not specifically analyze Asian or Native American drivers because of the relative sparsity of stops involving drivers of these races.

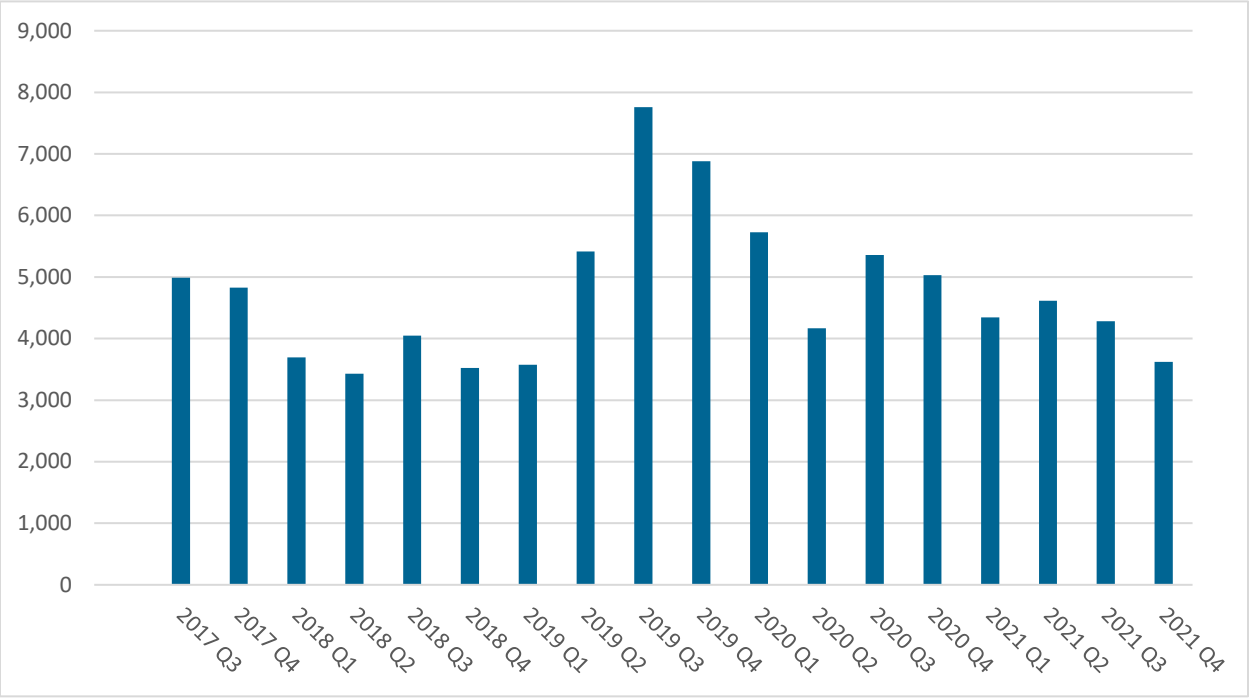
Descriptive statistics

In this section, we describe the data included in this analysis of traffic stops conducted by the MCSO from July 2017 through December 2021 (a time period of 4.5 years). We present the characteristics of the stops themselves, the characteristics of the stop outcomes, and the traffic stop count of the deputies making the stops. We present these variables in quarterly time segments (3-month time periods)[1] with a total of 18 quarters throughout the 4.5 years.

During this time period, MCSO conducted 85,276 traffic stops. Though the number of stops per quarter varied, MCSO conducted an average of 4,803 traffic stops (with a standard deviation of approximately 1,149 traffic stops) each quarter. Quarter 3 of 2019 (July 2019 to September 2019) saw the most traffic stops of any quarter with 7,760 stops. See Figure 1 for a count of traffic stops by quarter.

[1] Quarter 1 represents January, February, and March. Quarter 2 represents April, May, and June. Quarter 3 represents July, August, and September. Quarter 4 represents October, November, and December.

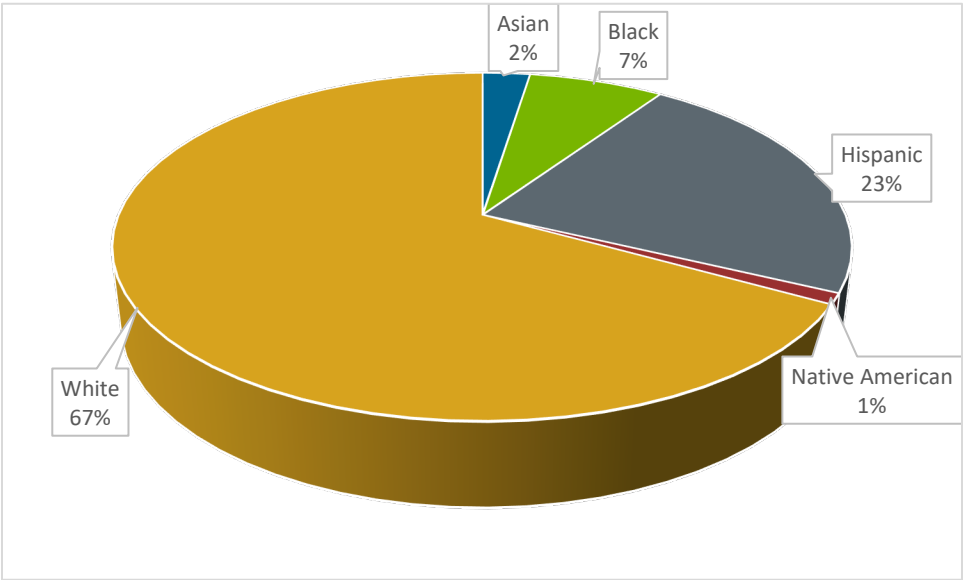
Figure 1. Traffic stops, by quarter



Driver characteristics

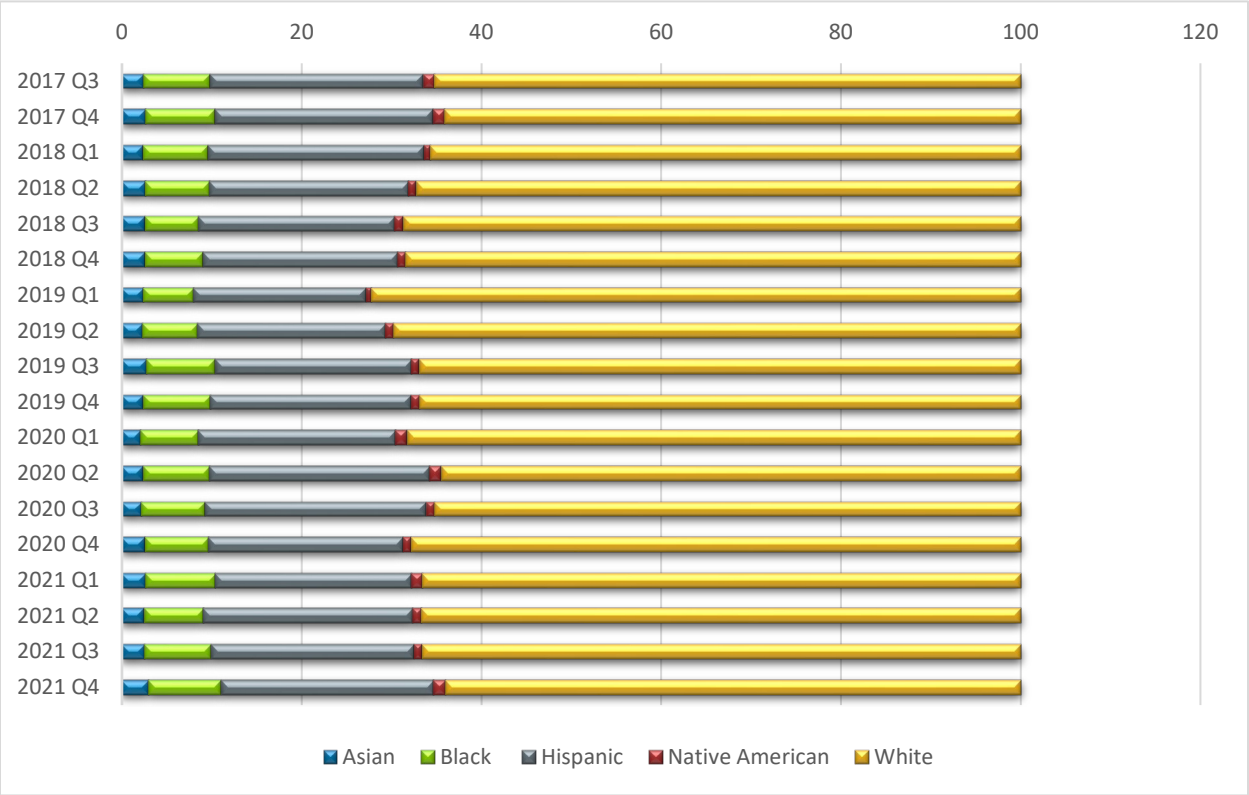
When deputies make a traffic stop, they document their observation of the perceived race of the driver both pre- and post-stop in TraCS. We omitted analysis of the pre-stop perception of driver race since this variable takes the value "unknown" in over 98 percent of stops. Post-stop, throughout the entire time period, deputies perceived 67 percent of drivers as White, 23 percent as Hispanic, and 7 percent as Black. The remaining 3 percent of stops were of Native American and Asian drivers (see Figure 2).

Figure2: Post-stop perceived driver race



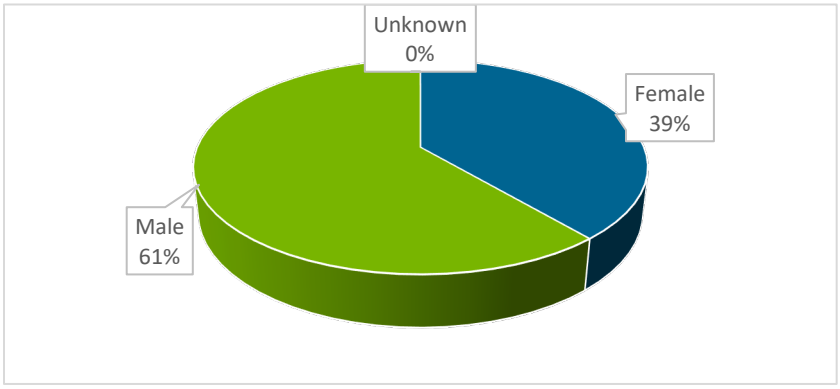
When broken down by quarter, the post-stop perceived race distribution looks similar across all quarters (see Figure 3). Though the quarters vary slightly, White drivers make up the majority of stops, and Hispanic drivers make up between 19 and 25 percent of stops.

Figure 3: Post-stop perceived driver race, by quarter



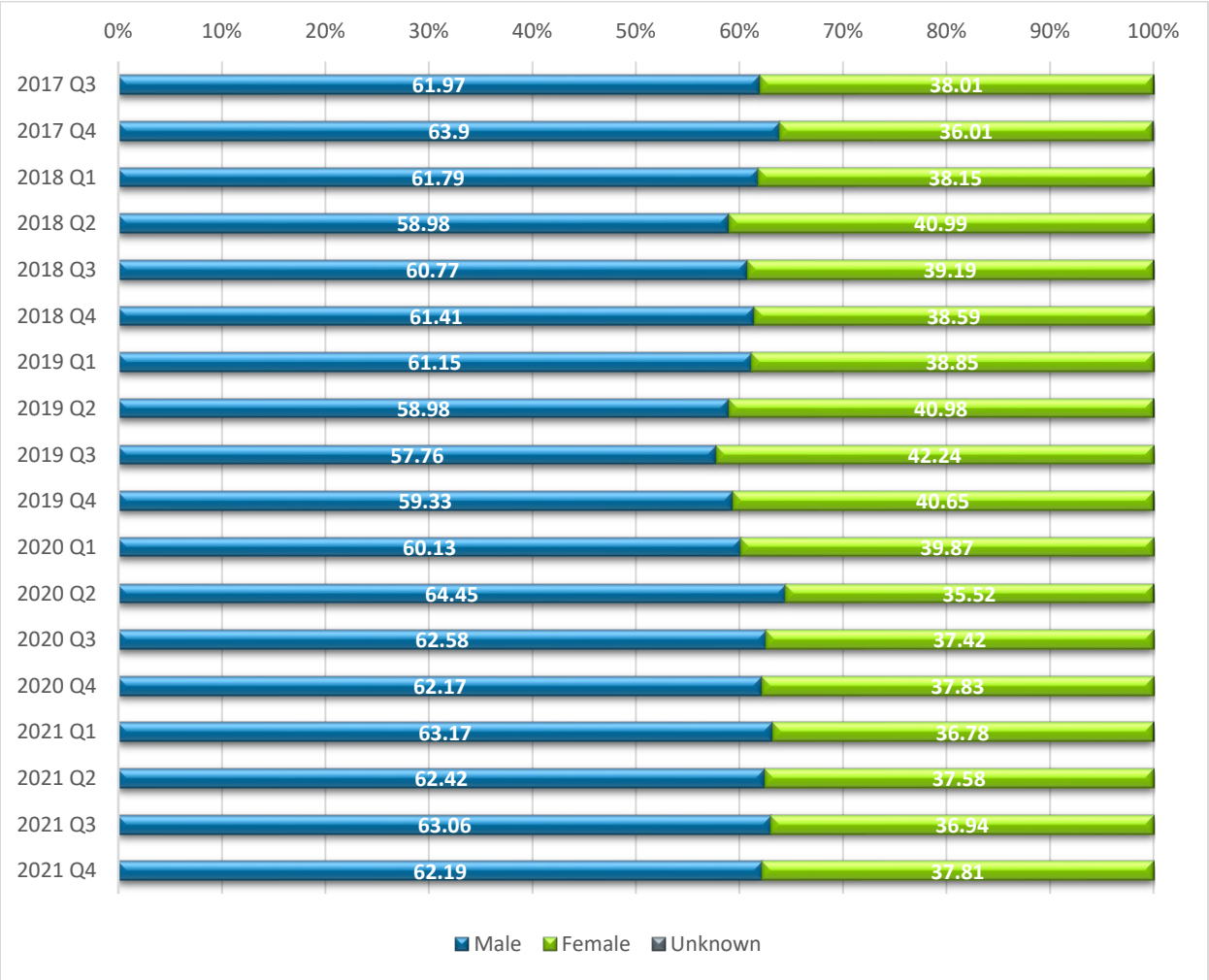
Post-stop, deputies also enter the driver's perceived sex into TraCS. Across all stops, approximately 61 percent of drivers were identified as male and 39 percent as female (see Figure 4). In 16 stops (0.02 percent of stops), the deputy could not determine the sex of the driver.

Figure 4: Post-stop perceived driver sex



Like perceived driver race, when broken down by quarters, perceived driver sex looks similar across each quarter throughout the entire time period (see Figure 5). Throughout each quarter, male drivers make up the majority of traffic stops (ranging from approximately 58 percent to approximately 64 percent).

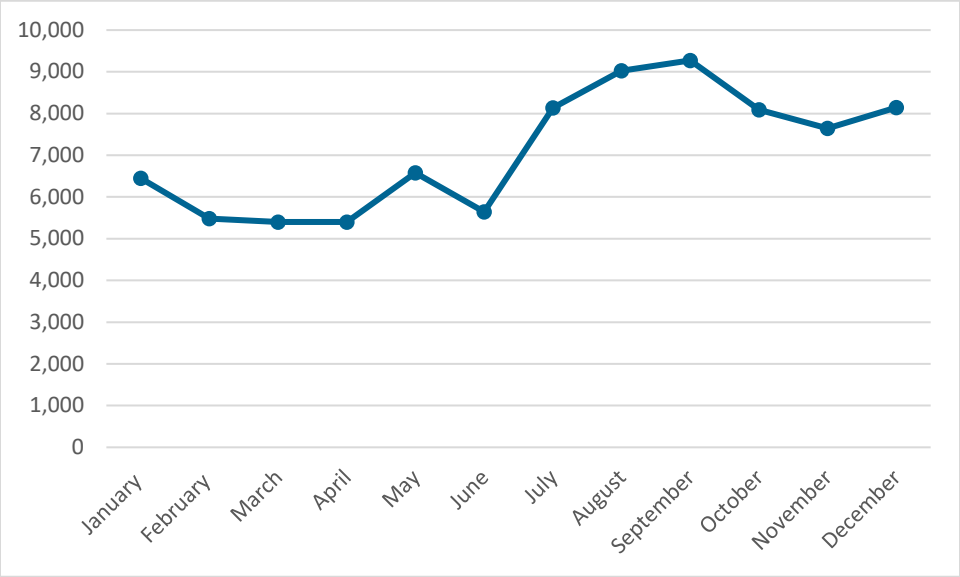
Figure 5: Post-stop perceived driver sex, by quarter



Stop characteristics

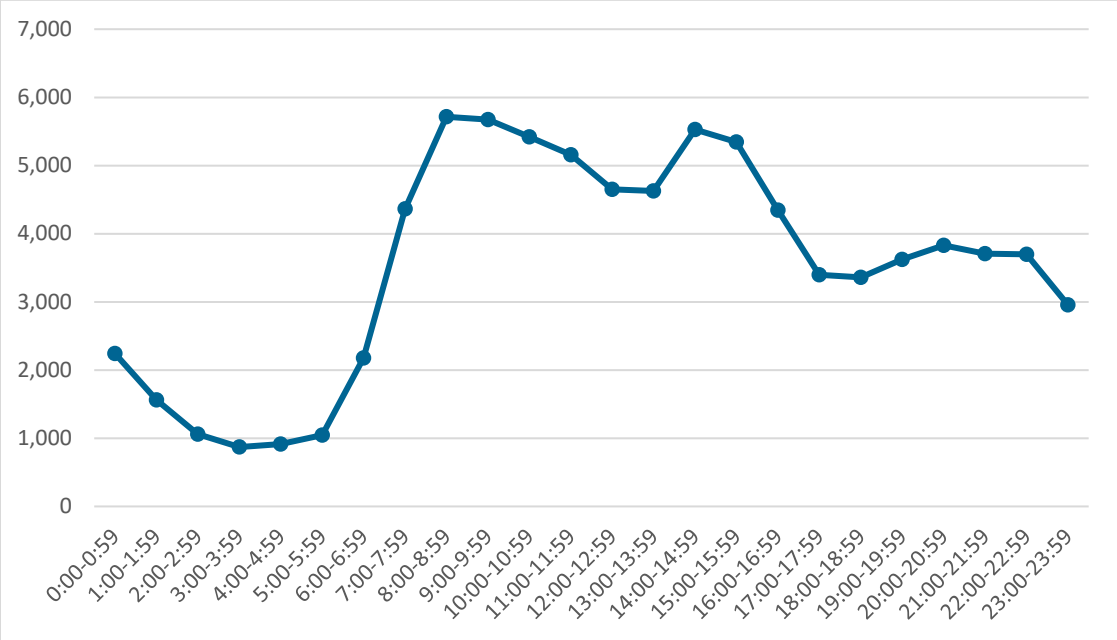
As Figure 6 illustrates, throughout the 4.5-year time span, traffic stops remained steady in the early months of year and began to increase between June and July. Traffic stops continued to rise through September before decreasing in October and November.

Figure 6: Stops by month, July 2017–December 2021



We also considered the time of day that a stop took place (Figure 7). A majority of the stops throughout the time span occurred between 7:00 a.m. and 5:00 p.m., which is similar to the trends seen in past TSARs.

Figure 7: Stops by time of day



Stop length is of particular importance to these analyses since it is a core aspect of the First Court Order. Stops lasted an average of 17.56 minutes (with a standard deviation of 28.81 minutes). When we remove extended stops, the average stop length falls to 13.41 minutes (with a standard deviation of 10.48 minutes). Most traffic stops last 35 minutes or less, with the median stop length being 12 minutes. The

average stop length does vary by quarter, with the average stop length falling between approximately 15 to 20 minutes. The shortest average stop length occurred in Quarter 4 of 2019, and the longest occurred in Quarter 4 of 2018. As can be seen by the standard deviations, we found high variation in stop lengths within each quarter. See Table 1.

Table 1. Average stop lengths, in minutes, by quarter

Quarter	Average	Standard Deviation	Minimum Stop Length	Maximum Stop Length	Average with Extended Stops Removed	Standard Deviation
2017 Q3	19.19	29.99	1	935	13.62	9.93
2017 Q4	19.89	29.31	2	517	13.79	8.72
2018 Q1	18.15	25.10	2	542	13.45	7.13
2018 Q2	19.14	30.23	1	436	13.27	8.39
2018 Q3	19.21	29.15	2	465	13.32	7.51
2018 Q4	18.09	27.96	1	460	12.74	7.20
2019 Q1	16.12	21.90	2	414	13.20	8.21
2019 Q2	15.61	19.46	1	389	13.26	10.78
2019 Q3	16.98	23.47	3	518	13.90	12.41
2019 Q4	15.59	20.93	1	495	12.93	9.36
2020 Q1	16.12	21.69	1	379	13.43	10.84
2020 Q2	18.39	27.00	3	367	13.90	11.34
2020 Q3	16.76	25.90	2	836	13.31	8.50
2020 Q4	16.65	23.59	2	349	13.17	10.29
2021 Q1	17.08	24.33	2	415	13.43	12.04
2021 Q2	17.32	27.23	4	433	13.44	14.14
2021 Q3	18.79	31.99	4	624	13.26	12.14
2021 Q4	17.77	27.50	1	654	13.74	13.51

Deputies document in TraCS whether a stop is extended for reasons that would reasonably extend a stop. The extended stops field contains five options: DUI stop, language barrier, technical issues, training stop, and vehicle towed. Deputies selected extended stop indicators for 13,686 stops, representing 16.05 percent of total stops. Technical issues were the most common, occurring during 7.42 percent of stops, and training stops were the second most common at 4.75 percent of stops. As can be seen in Table 2, we found variation in extended stop reasons throughout the quarters—especially training stops, which represented 1 percent of all stops in Quarter 3 of 2018 but comprised 14 percent of all stops in Quarter 2 of 2020.

Table 2. Extended stop reason, by quarter (in percentage points)

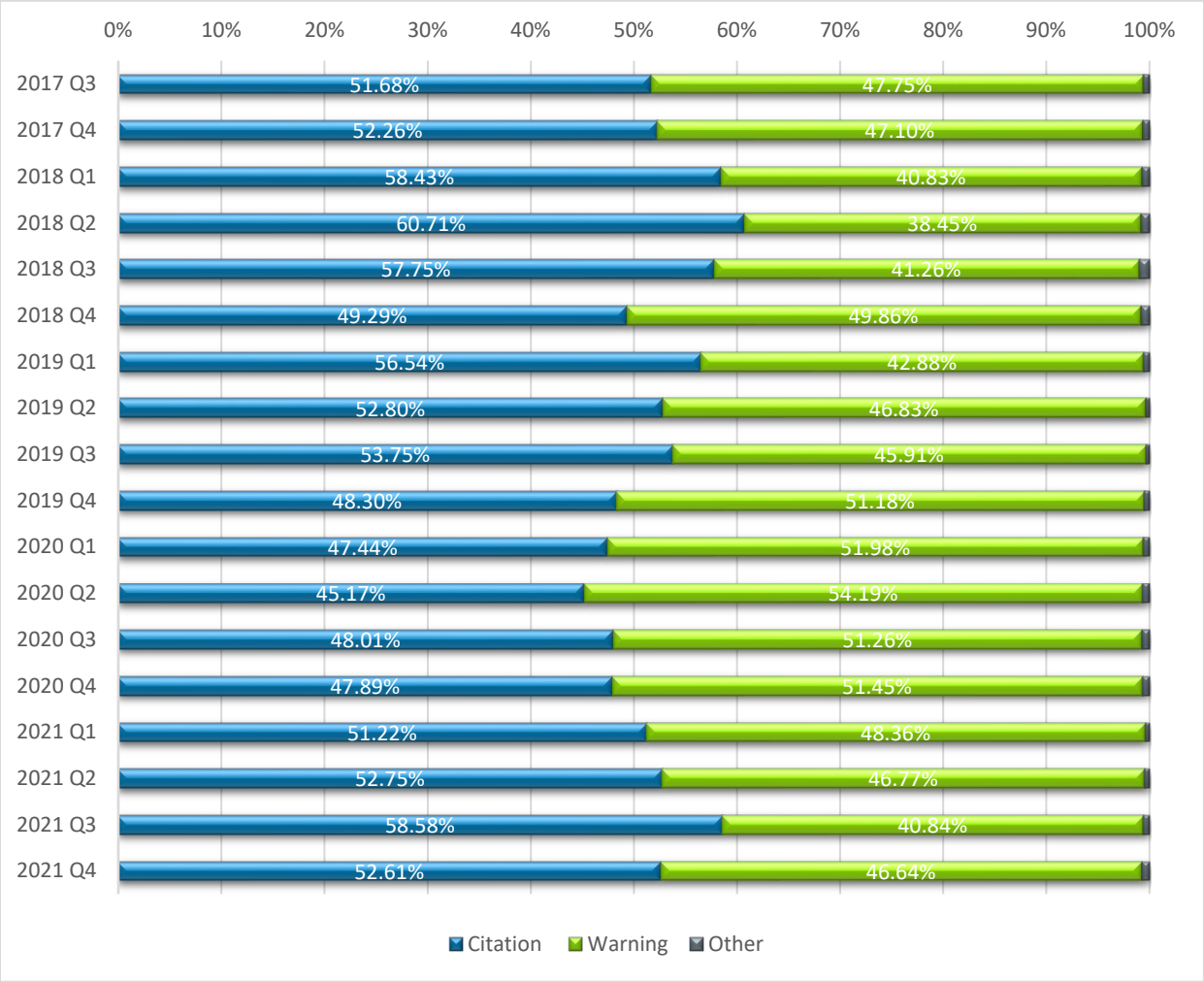
Quarter	DUI Stop	Language Barrier	Technical Issues	Training Stop	Vehicle Towed
2017 Q3	2.85	1.3	10.26	4.18	5.04
2017 Q4	3.19	1.6	8.1	2.2	5.99

2018 Q1	1.46	1.3	8.18	1.11	5.42
2018 Q2	4.11	1.37	7.12	2.19	4.61
2018 Q3	3.51	1.36	9.56	0.84	4.69
2018 Q4	3.04	1.42	9.22	9.22	3.23
2019 Q1	1.54	0.87	6.94	4.42	1.43
2019 Q2	1.59	1.18	5.91	5.02	1.14
2019 Q3	2.26	1.03	4.99	3.63	1.83
2019 Q4	2.11	1.16	8.28	5.01	1.26
2020 Q1	1.85	1.27	7.89	1.75	1.64
2020 Q2	2.95	1.39	7.03	14.27	1.68
2020 Q3	2.04	1.38	7.23	3.01	1.85
2020 Q4	3	1.07	6.36	2.43	1.75
2021 Q1	2.07	1.13	5.99	6.06	2.19
2021 Q2	3.08	1.24	6.26	3.88	1.95
2021 Q3	2.92	1.42	7.17	12.35	2.08
2021 Q4	3.04	1.66	9.17	7.1	1.6

Stop outcomes

The contact conclusion field in documents the outcomes from each stop (Figure 8). Of all stops, approximately 52 percent concluded with a citation, approximately 47 percent ended with a warning, and less than 1 percent ended with non-enforcement outcomes, such as when a deputy is preempted for a priority call and ends the traffic stop without issuing a citation or formal warning. Citation rates were relatively consistent throughout each quarter, with a few quarters (i.e., Quarter 2 of 2018) having increased percentages of citations.

Figure 8: Stop outcomes, by quarter



The MCSO organizes stops into five categories, based on ARS code: civil traffic, criminal traffic, petty, criminal, and civil. The majority of the stops that occurred in 2021 were civil traffic stops. *Civil traffic violations* are violations for which the driver does not face jail time and instead pays a fine. Examples include speeding, equipment violations, or seatbelt violations. *Criminal traffic violations* are violations that result in a fine and involve possible jail time. These include criminal speeding, reckless driving, driving under the influence, or driving on a revoked or canceled license. *Petty violations* are criminal violations with less severe penalties that do not include the possibility of jail time. These include boating violations, park violations, and curfew violations. *Criminal violations* are non-traffic violations that involve possible jail time and typically are incident to the traffic stop, such as a stopped individual having an active warrant for criminal activity or engaging in criminal activity not related to the stop. Of the traffic stops that resulted in a citation, over 97 percent were classified as civil traffic violations, and 2.59 percent were classified as criminal traffic violations. The dataset contains only 161 stops that were classified as criminal violations and only 15 stops that were classified as petty violations, accounting for approximately 0.2 percent of the stops. These numbers remained consistent throughout each quarter. See Figure 9.

Figure 9: Traffic stop classification percentages, by quarter

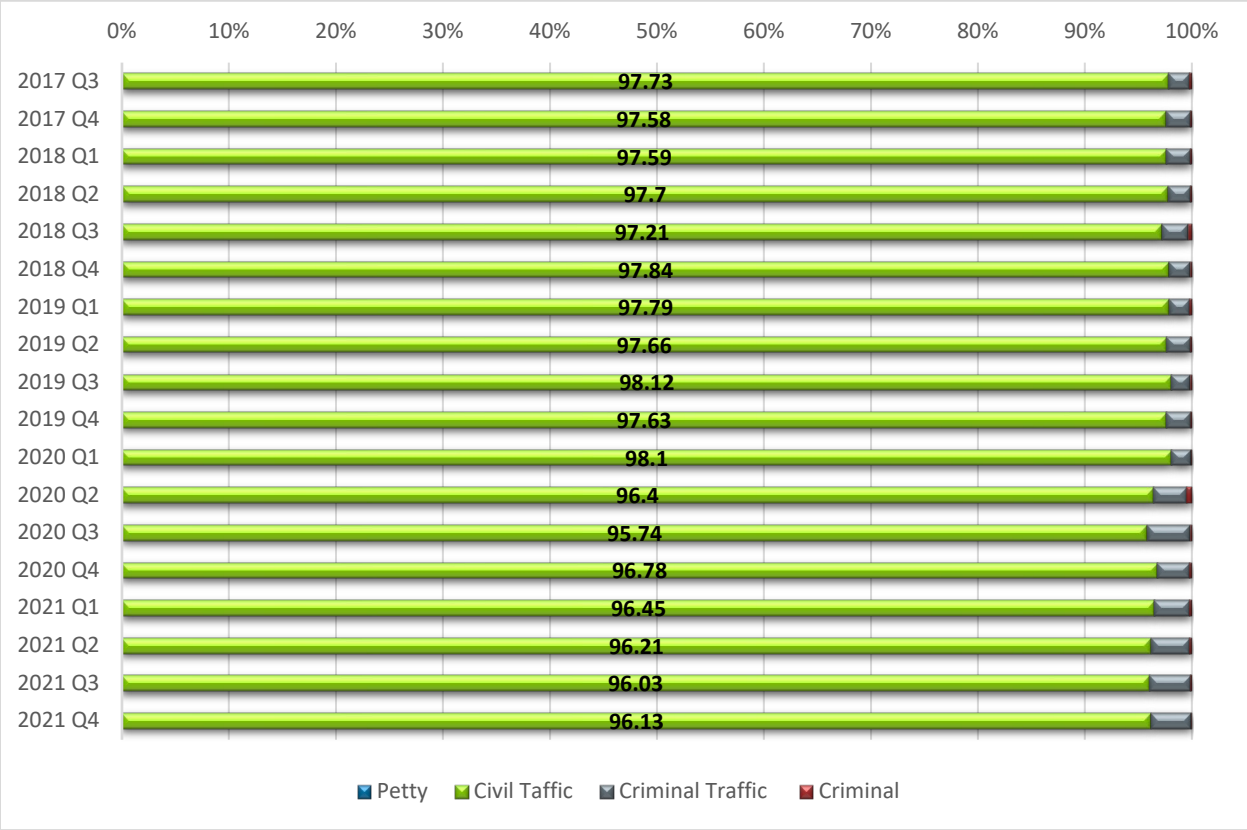


Table 3 presents information about searches. MCSO policy dictates that deputies search all arrested drivers and search all towed vehicles; these searches are not discretionary on the part of the deputy. *Non-incidental searches* refer to searches that are not connected to arrests or tows; these represent discretionary searches conducted by deputies. As Table 3 shows, the majority of searches of drivers or vehicles occurred incident to arrest. However, these searches occurred in only 3.2percent of all traffic stops. For this analysis, we considered searches of drivers or vehicles as a search outcome.

Table 3. Searches, by quarter

Quarter	Driver Search	Vehicle Search	Search Driver or Vehicle	Non-incidental Driver Search	Non-incidental Vehicle Search	Non-incidental Driver or Vehicle Search
2017 Q3	2.75%	4.80%	5.58%	0.26%	1.20%	3.09%
2017 Q4	3.44%	5.82%	6.46%	0.37%	1.24%	4.00%
2018 Q1	2.41%	4.79%	5.42%	0.27%	0.76%	2.68%
2018 Q2	2.71%	4.26%	4.90%	0.20%	0.96%	3.00%
2018 Q3	3.06%	4.67%	5.46%	0.37%	1.31%	3.60%
2018 Q4	2.58%	3.26%	3.86%	0.26%	0.88%	2.87%
2019 Q1	1.51%	1.71%	2.21%	0.17%	0.62%	1.76%
2019 Q2	1.24%	1.37%	1.88%	0.18%	0.59%	1.44%
2019 Q3	1.61%	1.88%	2.54%	0.12%	0.59%	1.77%

2019 Q4	1.79%	1.67%	2.47%	0.16%	0.70%	2.06%
2020 Q1	1.71%	2.08%	2.78%	0.23%	0.80%	2.06%
2020 Q2	2.45%	2.35%	3.57%	0.46%	1.37%	3.02%
2020 Q3	2.04%	2.41%	3.19%	0.21%	1.12%	2.45%
2020 Q4	1.91%	2.03%	2.96%	0.20%	0.74%	2.19%
2021 Q1	1.93%	2.05%	3.11%	0.35%	0.37%	0.69%
2021 Q2	2.38%	2.21%	3.16%	0.20%	0.69%	0.85%
2021 Q3	2.64%	2.31%	3.50%	0.26%	0.47%	0.68%
2021 Q4	2.38%	2.13%	3.20%	0.19%	0.39%	0.50%

For all stops involving a search, deputies record whether the search identified contraband (i.e., the incidence of seizures predicated on searches). Overall, 38.14 percent of non-incidental searches resulted in seizures. These numbers vary throughout each quarter, with a high of over 48 percent in Quarter 1 of 2018 and Quarter 3 of 2021 and a low of approximately 28 percent in Quarter 4 of 2021. See Table 4.

Table 4. Seizures during non-incidental searches, by quarter

Quarter	Driver Non-incidental Search and Seizure	Vehicle Non-incidental Search and Seizure	Driver or Vehicle Non-incidental Search and Seizure
2017 Q3	22.63%	47.46%	35.71%
2017 Q4	28.92%	40.00%	34.20%
2018 Q1	39.33%	53.57%	48.48%
2018 Q2	33.33%	48.48%	37.86%
2018 Q3	35.48%	47.17%	42.47%
2018 Q4	41.76%	45.16%	43.56%
2019 Q1	38.89%	36.36%	39.68%
2019 Q2	29.85%	59.38%	39.74%
2019 Q3	32.80%	65.22%	45.26%
2019 Q4	25.20%	52.08%	33.10%
2020 Q1	22.45%	45.65%	30.51%
2020 Q2	25.49%	50.88%	38.10%
2020 Q3	17.43%	58.33%	32.82%
2020 Q4	36.46%	45.95%	37.27%
2021 Q1	0%	62.50%	33.33%
2021 Q2	11.11%	50%	43.59%
2021 Q3	18.18%	60.00%	48.28%
2021 Q4	28.57%	28.57%	27.78%

Deputies use the driver arrest variable field to document whether arrests are classified as cite and release (i.e., citation in lieu of detention) or bookings. Depending on the charges against the driver, deputies can

use their discretion to choose between the two options. For example, a deputy arresting an individual for driving under the influence may use discretion regarding whether the individual is too impaired to be released on their own recognizance and should be booked for the night. Arrests of drivers (both cited and released and booked) are rare among traffic stops, representing 4.71 percent of all traffic stops. These numbers varied throughout the quarters, with a high of over 6 percent and a low of approximately 3 percent. See Table 5.

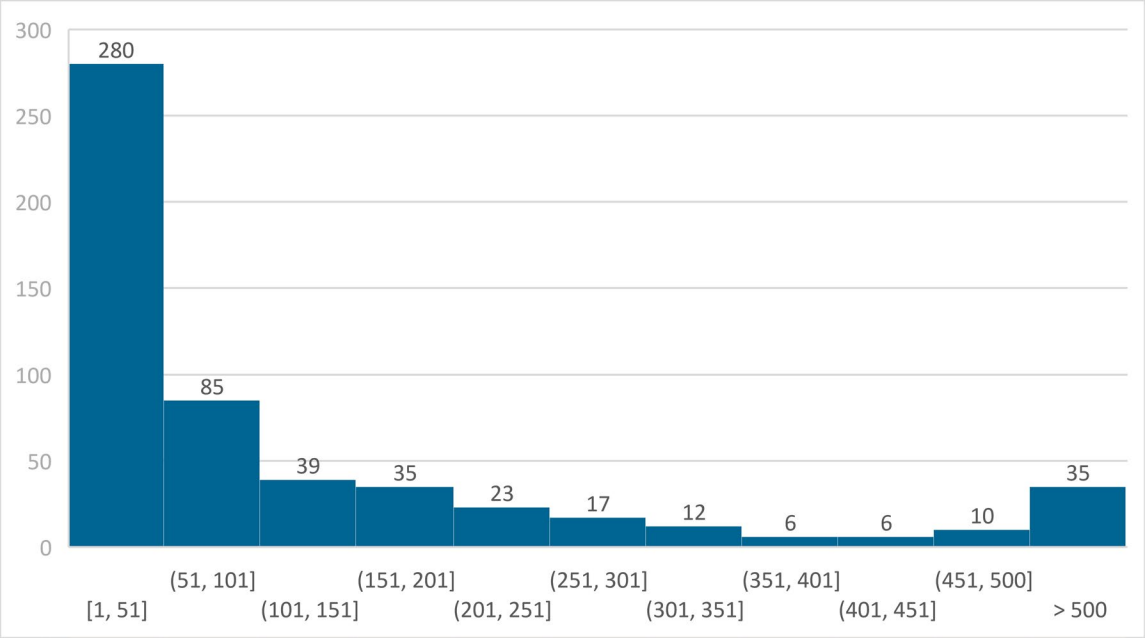
Table 5. Arrest during traffic stop, by district

Quarter	Driver Booked	Driver Cited	Total
2017 Q3	1.20%	4.05%	5.25%
2017 Q4	1.26%	5.47%	6.73%
2018 Q1	0.70%	5.14%	5.84%
2018 Q2	1.31%	4.70%	6.01%
2018 Q3	1.36%	4.62%	5.98%
2018 Q4	0.94%	3.63%	4.57%
2019 Q1	0.56%	2.57%	3.13%
2019 Q2	0.76%	2.64%	3.40%
2019 Q3	0.72%	2.60%	3.32%
2019 Q4	0.55%	2.99%	3.54%
2020 Q1	0.63%	2.69%	3.32%
2020 Q2	0.77%	3.86%	4.63%
2020 Q3	0.60%	4.54%	5.14%
2020 Q4	0.64%	4.10%	4.74%
2021 Q1	0.58%	3.75%	4.33%
2021 Q2	0.80%	4.51%	5.31%
2021 Q3	0.93%	5.09%	6.02%
2021 Q4	1.08%	4.94%	6.02%

Deputy stop activity characteristics

The dataset includes 548 deputies from the MCSO. We present data about deputy traffic stop activity measured as the total number of stops conducted by deputies over the period in this analysis. As Figure 10 shows, the majority of deputies conducted between 1 and 51 stops during this period, but some deputies made over 500 stops in the same period. This overall trend is similar to previous TSARs.

Figure 10. Deputy traffic stop count (number of stops over the period of analysis)



Comparative analysis

In this section, we present the findings from analyzing each stop outcome, and we summarize the findings from the statistical analyses. We used multiple statistical approaches, as discussed below, with the goal of drawing a consensus conclusion across these methods. Here we describe the different approaches in turn, noting that all utilized the same compiled dataset discussed above.

A simplified two-period analysis

We note in the introduction to this report that researchers have applied and developed established methods for conducting two-period propensity score matching difference-in-differences analyses. Indeed, researchers have created a Stata package called *diff* to facilitate this form of analysis. The *diff* package produces the ATTs for both the pre- and post-periods defined below, as well as the difference-in-difference estimate. The difference-in-difference estimate, for example, indicates the difference between stop length outcomes for Hispanic drivers from one period to the next, relative to the outcomes for White drivers over the same two periods. Below, we present both the post-period ATTs from each analysis and the difference-in-difference estimate. For the difference-in-difference estimate, we present the t-statistics, the corresponding p-value, and the corrected statistical significance after applying the Simes technique, as described in the methodology section above.

In this section, we define the pre- and post-periods in several ways to allow for robustness checks across the analytical approaches. Specifically, we created the following three 2-period comparisons from the study time frame:

- The halfway point between July 2017 and December 2021 (in quarters), meaning the pre-period is July 1, 2017, to September 30, 2019, and the post-period is October 1, 2019, to December 31, 2021
- Recent analysis: limit observations to 2020 and 2021 data and break at the new year
- Most recent analysis: limit observations to 2021 and break at the half-year

Halfway point for entire dataset

Our team broke the dataset into 18 quarters. For the first set of analyses, we compared stops in the first nine quarters (the pre-period) to stops in the remaining nine quarters (the post-period). Specifically, we compared stops from July 2017 through September 2019 to stops from October 2019 through December 2021. During the pre-period, MCSO made 41,257 traffic stops (representing 48.28 percent of the total stops). The remaining 44,021 traffic stops (51.62 percent of the total stops) were made in the post-period.

Stop length

The analysis team investigated differences in stop length between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. As noted above, deputies can indicate whether they experienced specific circumstances that extended the length of a stop beyond their control, which include technical issues (e.g., a printer failure), a language barrier, a DUI stop, training, or calling for a tow. These analyses removed all extended stops based on MCSO's quarterly report, which audited extended stop length indicators and found that deputies were using extended stop indicators appropriately and non-discriminatorily.

To provide context and a comparison point, the average stop length for White drivers was 16.33 minutes (with a standard deviation of 23.05 minutes) in the pre-period and 15.30 minutes (with a standard deviation of 21.08 minutes) in the post-period. Removing the extended stops, the average stop length for White drivers was 12.98 minutes (with a standard deviation of 8.64 minutes) in the pre-period and 12.83 minutes (with a standard deviation of 10.05 minutes) in the post-period. Table 6 and Table 7 summarize the findings from this analysis. **Our analysis found statistically significant differences in stop lengths between Hispanic and White drivers, between Black and White drivers, and between all racial and ethnic minority drivers and White drivers in both the pre-period and the post-period**. These differences ranged from 0.816 minutes (Hispanic drivers compared to White drivers in the pre-period) to 1.179 minutes (Black drivers compared to White drivers in the post-period).

Although the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average difference in stop lengths between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.**

Table 6. ATT results for stop length (halfway), extended stops removed

Model	Pre-difference (in minutes)	t-statistic	p-value	Post-difference (in minutes)	t-statistic	p-value

Hispanic v. White drivers	0.816	5.54	0.000	0.829	5.91	0.000
Black v. White drivers	1.279	9.20	0.000	1.123	8.61	0.000
All racial and ethnic minority v. White drivers	0.829	6.20	0.000	0.756	5.94	0.000

Table 7. Difference-in-difference stop length (halfway), extended stops removed

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	0.013	0.06	0.948	No
Black v. White drivers	-0.156	0.82	0.413	No
All racial and ethnic minority v. White drivers	-0.073	0.40	0.692	No

Citations

The analysis team investigated differences in citation rates (i.e., the percentage of stops that involved citations rather than warnings or incidental contacts) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, in the pre- period of the dataset, 54.86 percent of stops involving White drivers ended in a citation. In the post- period of the data, 50.35 percent of stops involving White drivers ended in a citation. Table 8 and Table 9 summarize the findings from this analysis. **In the post-period, compared to White drivers, Hispanic drivers and all racial and ethnic minority drivers were more likely to receive citations rather than warnings or other stop outcomes. Black drivers, however, were 4.7 percentage points less likely to receive citations rather than warnings or other stop outcomes when compared to White drivers in the post-period.**

After implementing the Simes technique for correction, only the difference between Black and White drivers remains statistically significant, though the direction of the effect indicates that Black drivers are cited less frequently than White drivers. We also found no evidence that the average rate of citations instead of warnings or other outcomes between all racial and ethnic minority drivers compared to White drivers changed between time periods.

Table 8. ATT results for citations (halfway)

Model	Pre-difference (percentage points)	t-statistic	p-value	Post-difference (percentage points)	t-statistic	p-value
Hispanic v. White drivers	2.50	4.84	0.000	4.00	8.07	0.000
Black v. White drivers	-0.10	-0.19	0.852	-4.70	8.58	0.000
All racial and ethnic minority v. White drivers	1.20	2.33	0.020	1.80	3.81	0.000

Table 9. Difference-in-differences results for citations (halfway)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	1.50	2.07	0.039	No
Black v. White drivers	-4.60	5.75	0.000	Yes
All racial and ethnic minority v. White drivers	0.60	0.94	0.346	No

Searches

The analysis team investigated differences in search rates (i.e., the percentage of stops that involved searches not incident to arrest or tow) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, approximately 1.98 percent of stops of White drivers involved a search in the pre-period, and approximately 1.20 percent of stops of White drivers involved a search in the post-period. Although the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average difference in search rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.**

Table 10 and Table 11 summarize the findings from this analysis. **In both the pre-period and the post-period, compared to White drivers, Hispanic drivers and Black drivers were more likely to be searched than White drivers. Both of these findings were statistically significant.** Although the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average difference in search rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.**

Table 10. ATT results for non-incidental searches (halfway)

Model	Pre-difference (percentage points)	t-statistic	p-value	Post-difference (percentage points)	t-statistic	p-value
Hispanic v. White drivers	0.80	6.67	0.000	0.80	7.46	0.000
Black v. White drivers	1.30	9.73	0.000	1.00	7.85	0.000
All racial and ethnic minority v. White drivers	-0.10	-1.16	0.246	0.20	1.66	0.096

Table 11. Difference-in-differences results for non-incidental searches

Model	Difference-in-differences (percentage points	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	0.00	0.32	0.75	No
Black v. White drivers	-0.30	1.68	0.093	No
All racial and ethnic minority v. White drivers	0.30	1.99	0.047	No

Arrests

The analysis team investigated differences in arrest rates (i.e., the percentage of stops that involved arrests) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, approximately 3.79 percent of stops involving White drivers ended in an arrest in the pre-period and 3.74 percent of stops ended in an arrest in the post-period. Although some of the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average difference in arrest rates between Hispanic drivers and White drivers,**

Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.

Table 12 and Table 13 summarize the findings from this analysis. **We found statistically significant differences in arrest rates in both the pre-period and the post-period for Hispanic and Black drivers when compared to White drivers.**

Although some of the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average difference in arrest rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.**

Table 12. ATT results for arrests (halfway)

Model	Pre-difference (percentage points)	t-statistic	p-value	Difference (percentage points)	t-statistic	p-value
Hispanic v. White drivers	2.00	8.34	0.000	1.60	6.90	0.000
Black v. White drivers	2.80	10.28	0.000	1.80	7.22	0.000
All racial and ethnic minority v. White drivers	-0.30	-1.20	0.229	0.30	1.33	0.184

Table 13. Difference-in differences results for arrests (halfway)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	-0.40	1.27	0.204	No
Black v. White drivers	-0.90	2.51	0.012	No
All racial and ethnic minority v. White drivers	0.60	1.79	0.074	No

2020 versus 2021 traffic stops

Our team also compared traffic stops in 2020 to stops in 2021, broken at the new year. MCSO made 20,281 traffic stops in 2020 and 16,860 traffic stops in 2021.

Stop length

The analysis team investigated differences in stop length between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. These analyses removed all extended stops based on MCSO's quarterly report, which audited extended stop length indicators and found that deputies were using them appropriately and non-discriminatorily.

To provide context and a comparison point, the average stop length for White drivers was 15.17 minutes (with a standard deviation of 19.81 minutes) in 2020 and 15.73 minutes (with a standard deviation of 23.15 minutes) in 2021. In 2020, removing the extended stops, the average stop length for White drivers was 12.83 minutes (with a standard deviation of 8.66 minutes) and in 2021 was 12.92 minutes (with a standard deviation of 11.80 minutes). Table 14 and Table 15 summarize the findings from this analysis. **Our analysis found statistically significant differences in stop lengths between Hispanic and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers, in both the pre- and post-period. These differences ranged from 0.61 minutes (Black drivers compared to White drivers in the post-period) to approximately 1.69 minutes (Black drivers compared to White drivers in the pre-period).**

However, when examining the difference-in-difference estimates, **the only statistically significant differences between the two time periods were for Black drivers (compared to White drivers), which showed a decrease in stop length disparities from 2020 to 2021. We do not have evidence that the average difference in stop lengths between Hispanic drivers and White drivers and all racial and ethnic minority drivers and White drivers changed between 2020 and 2021.**

Table 14. ATT results for stop length (2020 vs. 2021), extended stops removed

Model	Pre-difference (in minutes)	t-statistic	p-value	Difference (in minutes)	t-statistic	p-value
Hispanic v. White drivers	0.860	3.71	0.000	0.883	3.38	0.001
Black v. White drivers	1.687	7.75	0.000	0.610	2.58	0.010
All racial and ethnic minority v. White drivers	0.892	4.26	0.000	0.651	2.81	0.005

Table 15. Difference-in-difference stop length (2020 vs. 2021), extended stops removed

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	0.023	0.07	0.947	No

Black v. White drivers	-1.077	3.35	0.001	Yes
All racial and ethnic minority v. White drivers	-0.241	0.77	0.442	No

Citations

The analysis team investigated differences in citation rates (i.e., the percentage of stops that involved citations rather than warnings or incidental contacts) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, in 2020, 46.44 percent of stops involving White drivers ended in a citation. In 2021, 55.68 percent of stops involving White drivers ended in a citation. Table 16 and Table 17 summarize the findings from this analysis. **In both the pre- and post-period, compared to White drivers, Hispanic drivers and all racial and ethnic minority drivers were more likely to receive citations rather than warnings or other stop outcomes. Black drivers, however, were 6.90 percentage points less likely to receive citations rather than warnings or other stop outcomes when compared to White drivers in the post-period.**

After correction, only the change between Black and White drivers is statistically significant, though (again) the direction of the effect indicates that Black drivers are cited less frequently than White drivers. This finding suggests that between 2020 and 2021, the disparity in citation rates between Black drivers and White drivers decreased.

Table 16. ATT results for citations (2020 vs. 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	5.50	7.42	0.000	3.20	3.92	0.000
Black v. White drivers	-1.50	-1.79	0.073	-6.90	7.88	0.000
All racial and ethnic minority v. White drivers	3.40	4.80	0.000	0.90	1.17	0.244

Table 17. Difference-in-differences results for citations (2020 vs. 2021)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	-2.30	2.08	0.038	No
Black v. White drivers	-5.40	4.51	0.000	Yes
All racial and ethnic minority v. White drivers	-2.50	2.39	0.017	No

Searches

The analysis team investigated differences in search rates (i.e., the percentage of stops that involved searches not incident to arrest or tow) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, 1.68 percent of stops of White drivers involved a search in 2020. In 2021, 0.44 percent of stops of a White driver involved a search. Table 18 and Table 19 summarize the findings from this analysis. **Search rates had statistically significant differences (higher rates) for the Hispanic comparison in both the pre- and post-period. Differences between Black drivers and all racial and ethnic minority drivers compared to White drivers were statistically significant in the pre-period but not in the post-period.**

The comparison between Black drivers and White drivers across the time periods was statistically significant and negative. This finding implies that between 2020 and 2021, the disparity between non-incidental searches of Black drivers and White drivers decreased. We do not have evidence that the average difference in search rates between Hispanic drivers and White drivers and all racial and ethnic minority drivers and White drivers changed between time periods.

Table 18. ATT results for non-incidental searches (2020 vs. 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	1.20	7.02	0.000	0.70	3.73	0.000

Black v. White drivers	1.60	8.43	0.000	0.40	1.93	0.053
All racial and ethnic minority v. White drivers	0.40	2.19	0.028	0.00	0.06	0.950

Table 19. Difference-in-differences results for non-incidental searches (2020 vs. 2021)

Model	Difference-in-differences (percentage points	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	-0.50	1.95	0.051	No
Black v. White drivers	-1.20	4.37	0.000	Yes
All racial and ethnic minority v. White drivers	-0.40	1.53	0.126	No

Arrests

The analysis team investigated differences in arrest rates (i.e., the percentage of stops that involved arrests) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, in 2020, 3.42 percent of stops involving White drivers ended in an arrest. In 2021, 4.47 percent of stops involving White drivers ended in an arrest. Table 20 and Table 21 summarize the findings from this analysis. **We found statistically significant differences in arrest rates, with higher rates for Hispanic and Black drivers when compared to White drivers, in both the pre- and post-periods.**

Although some of the ATT estimates were statistically significant, none of the difference-in-difference estimates were statistically significant. In other words, the mean change in outcome between the pre- and post-periods was not significantly different from zero. **We do not have evidence that the average**

difference in arrest rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between time periods.

Table 20. ATT results for arrests (2020 vs. 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference in post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	1.30	3.67	0.000	1.70	4.41	0.000
Black v. White drivers	2.10	5.45	0.000	1.40	3.46	0.001
All racial and ethnic minority v. White drivers	0.10	0.40	0.688	0.40	1.10	0.272

Table 21. Difference-in-differences results for arrests (2020 vs. 2021)

Model	Difference-in-differences (percentage points	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	0.40	0.81	0.419	No
Black v. White drivers	-0.70	1.22	0.224	No
All racial and ethnic minority v. White drivers	0.30	0.54	0.591	No

2021 only

Our team also compared traffic stops during the first half of 2021 (January through June) to the second half of 2021 (July through September). In total, there were 16,860 stops in 2021, with 8,956 stops in the first half of the year and the remaining 7,904 stops in the second half of the year.

Stop length

The analysis team investigated differences in stop length between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. These analyses removed all extended

stops based on MCSO's quarterly report, which audited extended stop length indicators and found that deputies were using them appropriately and non-discriminatorily.

To provide context and a comparison point, the average stop length for White drivers was 15.42 minutes (with a standard deviation of 20.78 minutes) in the first half of 2021 and 16.08 minutes (with a standard deviation of 25.61 minutes) in the second half of 2021. Removing the extended stops, the average stop length for White drivers was 12.95 minutes (with a standard deviation of 8.66 minutes) in the first half of 2021 and 12.88 minutes (with a standard deviation of 10.97 minutes) in the second half of 2021. Table 22 and Table 23 summarize the findings from this analysis. **Our analysis found statistically significant differences in stop length between Hispanic and White drivers (in the post-period) and between Black drivers and White drivers (in the pre-period), with the average stop lengths being just over a minute longer than the average stop lengths for White drivers.**

There were no statistically significant differences in the difference-in-difference estimates comparing the stop lengths for any of the three comparisons. We do not have evidence that the average difference in stop lengths between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between the first half of 2021 and the second half of 2021.

Table 22. ATT results for stop length (first half of 2021 vs. second half of 2021), extended stops removed

Model	Difference pre-period (in minutes)	t-statistic	p-value	Difference post-period (in minutes)	t-statistic	p-value
Hispanic v. White drivers	0.642	1.64	0.101	1.193	2.71	0.007
Black v. White drivers	1.293	3.49	0.000	-0.145	0.36	0.715
All racial and ethnic minority v. White drivers	0.573	1.63	0.102	0.643	1.66	0.096

Table 23. Difference-in-difference results for stop length (first half of 2021 vs. second half of 2021), extended stops removed

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	0.551	0.93	0.350	No
Black v. White drivers	-1.438	2.65	2.650	No

All racial and ethnic minority v. White drivers	0.071	0.14	0.892	No

Citations

The analysis team investigated differences in citation rates (i.e., the percentage of stops that involved citations rather than warnings or incidental contacts) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, in the first half of 2021, 53.11 percent of stops involving White drivers ended in a citation. In the second half of 2021, 58.64 percent of stops involving White drivers ended in a citation. Table 24 and Table 25 summarize the findings from this analysis. **Compared to White drivers, Hispanic drivers were more likely to receive citations rather than warnings or other stop outcomes in both the pre-period and the post-period. Black drivers, however, were less likely to receive citations than warnings or other stop outcomes when compared to White drivers in both the pre- and post-period.**

However, we do not have evidence that the average difference in citation rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between the first half of 2021 and the second half of 2021.

Table 24. ATT results for citations (first half of 2021 vs. second half of 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	3.80	3.34	0.001	2.50	2.11	0.034
Black v. White drivers	-6.80	-5.54	0.000	-7.60	5.98	0.000
All racial and ethnic minority v. White drivers	1.50	1.41	0.159	-0.10	0.13	0.899

Table 25. Difference-in-difference results for citations (first half of 2021 vs. second half of 2021)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	-1.30	0.77	0.443	No

Black v. White drivers	-0.80	0.42	0.673	No
All racial and ethnic minority v. White drivers	-1.60	1.06	0.287	No

Searches

The analysis team investigated differences in search rates (i.e., the percentage of stops that involved searches not incident to arrest or tow) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, 0.54 percent of stops of White drivers involved a search in the first half of 2021. In the second half of 2021, 0.33 percent of stops of a White driver involved a search. Table 26 and Table 27 summarize the findings from this analysis. **Search rates had statistically significant differences (higher rates) for the Hispanic and Black drivers' comparisons, compared with White drivers. The Hispanic drivers' comparison was statistically significant in both time periods, while the Black driver comparison was statistically significant only in the post-period.**

However, we do not have evidence that the average difference in search rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between the first half of 2021 and the second half of 2021.

Table 26. ATT results for non-incidental searches (first half of 2021 vs. second half of 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	0.80	3.39	0.001	0.60	2.42	0.015
Black v. White drivers	0.10	0.41	0.683	0.70	3.00	0.003
All racial and ethnic minority v. White drivers	-0.10	-0.60	0.551	0.20	1.01	0.311

Table 27. Difference-in-difference results for non-incidental searches (first half of 2021 vs. second half of 2021)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	-0.20	0.58	0.565	No

Black v. White drivers	0.60	1.86	0.062	No
All racial and ethnic minority v. White drivers	0.40	1.14	0.252	No

Arrests

The analysis team investigated differences in arrest rates (i.e., the percentage of stops that involved arrests) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. To provide context and a comparison point, in the first half of 2021, 4.17 percent of stops involving White drivers ended in an arrest. In the second half of 2021, 4.18 percent of stops involving White drivers ended in an arrest. Table 28 and Table 29 summarize the findings from this analysis. **None of the comparisons in the pre-period were statistically significant. We found statistically significant differences in arrest rates, with higher rates for Hispanic and Black drivers in the post-period only.**

However, we do not have evidence that the average difference in arrest rates between Hispanic drivers and White drivers, Black drivers and White drivers, and all racial and ethnic minority drivers and White drivers changed between the first half of 2021 and the second half of 2021.

Table 28. ATT results for arrests (first half of 2021 vs. second half of 2021)

Model	Difference pre-period (percentage points)	t-statistic	p-value	Difference post-period (percentage points)	t-statistic	p-value
Hispanic v. White drivers	1.10	1.94	0.053	2.40	4.15	0.000
Black v. White drivers	0.20	0.41	0.685	2.20	3.48	0.001
All racial and ethnic minority v. White drivers	0.00	-0.04	0.972	1.00	1.78	0.075

Table 29. Difference-in-difference results for arrests (first half of 2021 vs. second half of 2021)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
Hispanic v. White drivers	1.30	1.68	0.094	No
Black v. White drivers	1.90	2.21	0.027	No
All racial and ethnic minority v. White drivers	1.00	1.31	0.190	No

Section summary

Once we implemented the Simes techniques for correction, very few of the analyses remained statistically significant. **Overall, we found only four models with statistically significant changes between the two time periods, and all of these were negative coefficients, implying a decrease in the disparity between the comparison groups in the post-period. For example, we found that the stop length for Black drivers decreased between 2020 and 2021 relative to White drivers. Likewise, between 2020 and 2021, Black drivers were less likely to receive a citation or be searched relative to White drivers over the same period. Black drivers were also less likely to receive a citation than White drivers in the halfway model. There were no other statistically significant findings in any of the other simplified two-period analysis models after using the Simes technique for correction.**

Table 30: Section summary

Model	Outcome	Time	Difference-in-difference estimate	t-statistic	p-value	Significant after Simes?
Hispanic vs. White drivers	Stop length	Halfway	0.013	0.06	0.948	No
	Stop length	2020 vs. 2021	0.023	0.07	0.947	No
	Stop length	2021 only	0.551	0.93	0.350	No
	Cite	Halfway	1.50	2.07	0.039	No
	Cite	2020 vs. 2021	-2.30	2.08	0.038	No
	Cite	2021 only	-1.30	0.77	0.443	No
	Search	Halfway	0.00	0.32	0.75	No
	Search	2020 vs. 2021	-0.50	1.95	0.051	No
	Search	2021 only	-0.20	0.58	0.565	No
	Arrest	Halfway	-0.40	1.27	0.204	No
	Arrest	2020 vs. 2021	0.40	0.81	0.419	No
	Arrest	2021 only	1.30	1.68	0.094	No
Black vs. White drivers	Stop length	Halfway	-0.156	0.82	0.413	No
	Stop length	**2020 vs. 2021**	**-1.077**	**3.35**	**0.001**	**Yes**
	Stop length	2021 only	-1.438	2.65	2.65	No

	Cite	**Halfway**	**-4.60**	**5.75**	**0.000**	**Yes**
	Cite	**2020 vs. 2021**	**-5.40**	**4.51**	**0.000**	**Yes**
	Cite	2021 only	-0.80	0.42	0.673	No
	Search	Halfway	-0.30	1.68	0.093	No
	Search	**2020 vs. 2021**	**-1.20**	**4.37**	**0.000**	**Yes**
	Search	2021 only	0.60	1.86	0.062	No
	Arrest	Halfway	-0.90	2.51	0.012	No
	Arrest	2020 vs. 2021	-0.70	1.22	0.224	No
	Arrest	2021 only	1.90	2.21	0.027	No
All racial and ethnic minority vs. White drivers	Stop length	Halfway	-0.073	0.40	0.692	No
	Stop length	2020 vs. 2021	-0.241	0.77	0.442	No
	Stop length	2021 only	0.071	0.14	0.892	No
	Cite	Halfway	0.60	0.94	0.346	No
	Cite	2020 vs. 2021	-2.50	2.39	0.017	No
	Cite	2021 only	-1.60	1.06	0.287	No
	Search	Halfway	0.30	1.99	0.047	No
	Search	2020 vs. 2021	-0.40	1.53	0.126	No
	Search	2021 only	0.40	1.14	0.252	No
	Arrest	Halfway	0.60	1.79	0.074	No
	Arrest	2020 vs. 2021	0.30	0.54	0.591	No
	Arrest	2021 only	1.00	1.31	0.190	No

Chained two-period analysis

In addition to the simplified two-period approach presented above, CNA conducted a series of two-period analyses as the second approach to understanding changes in disparities over time. In this analysis, we again leveraged the *diff* package in Stata and ran sequential two-period analyses at the level of quarters. We produced the propensity score matched difference-in-difference estimate between 2017 Quarter 3 and 2017 Quarter 4, and then between 2017 Quarter 4 and 2018 Quarter 1, and so on through 2021 Quarter 3 and 2021 Quarter 4. Doing so generated a series of quarter-to-quarter differences in the

difference-in-difference estimators, which indicates the statistically significant differences between each quarter and whether there are trends in these differences over time. Though this analysis does not provide a conclusive answer to the analysis question of interest, it offers a broader understanding than the simplified two-period analyses regarding (a) whether there are differences in traffic stops outcomes over time, (b) whether these differences tend to be positive or negative (representing increasing or decreasing levels of disparity, respectively), and (c) whether the differences are statistically significant.

Given the large number of analyses produced for this section, we present only the difference-in-difference estimates from each statistical test. We also provide the t-statistic and p-value from each test, as well as whether the test was statistically significant after implementing the Simes technique for correction. In addition, we present the results of these tests in a figure to facilitate easier interpretation of the findings.

Stop length

Following the same procedure as above, we investigated the difference-in-difference estimates in stop length between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. These analyses removed all extended stops based on MCSO's quarterly report, which audited extended stop length indicators and found that deputies were using them appropriately and non-discriminatorily. We examined the difference-in-difference estimates for each of the 17 quarter pairs, as described above.

Hispanic versus White drivers

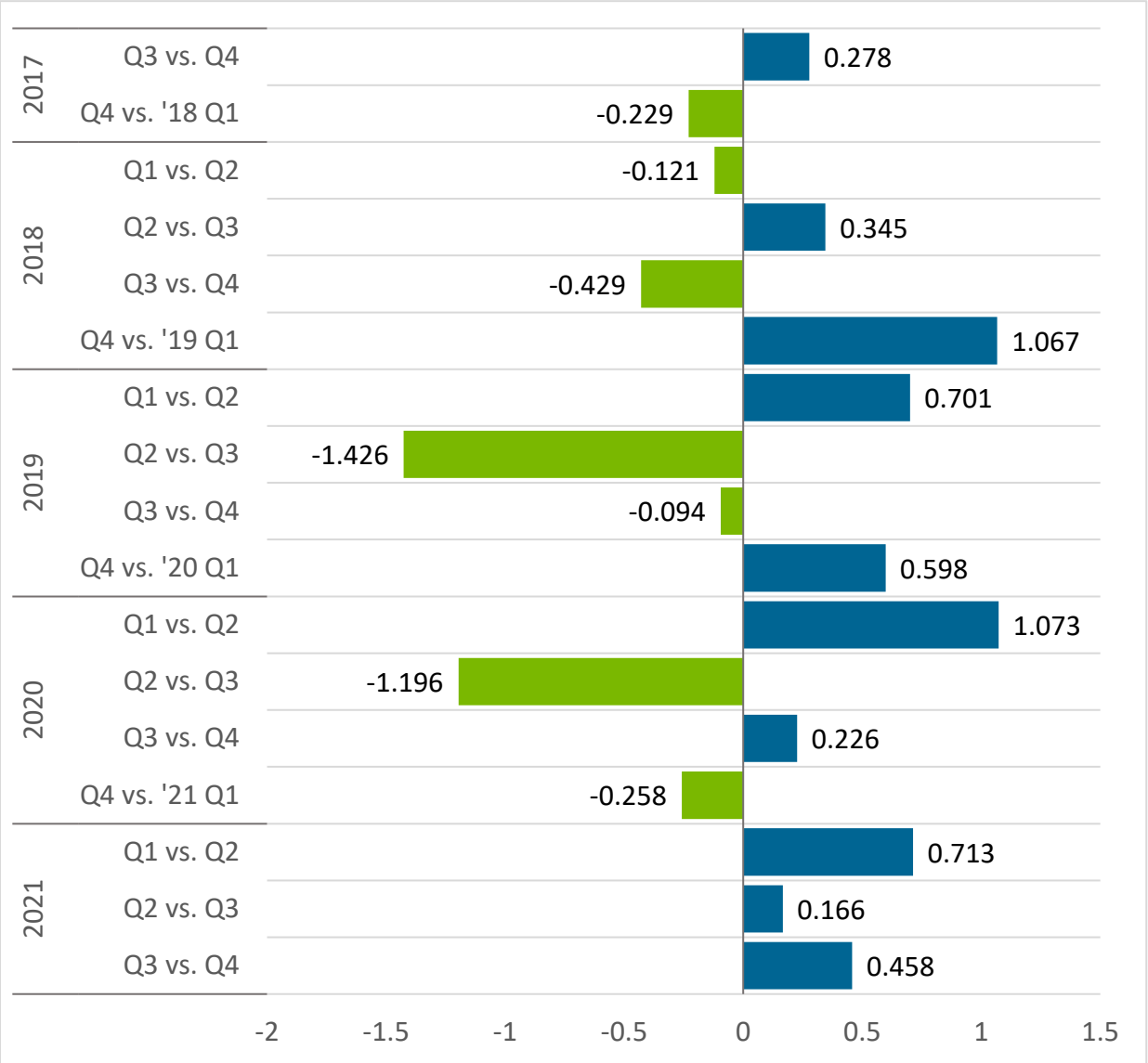
Table 31 and Figure 11 summarize the difference-in-difference estimates between Hispanic and White drivers in terms of stop length, with extended stops removed from the analysis. The difference-in-difference estimates indicate the difference between Hispanic drivers' stop length in one quarter compared to the following quarter, relative to White drivers over the same period. For example, the stop length for Hispanic drivers increased between 2017 Quarter 3 and 2017 Quarter 4 relative to White drivers over this same two-quarter period. Because the MCSO's TSARs have consistently shown disparities between the stop lengths of Hispanic drivers versus White drivers, we would hope to see negative, statistically significant difference-in-difference estimates across the quarters. Such a finding would demonstrate a reduction in the difference in stop lengths between Hispanic and White drivers. The results in the figure are bolded in red when the differences are statistically significant after the Simes correction throughout this section.

Across the 17 paired quarters included in our analysis, there was a mix of positive and negative difference-in-difference estimates. Three of these difference-in-difference estimates had p-values under 0.05, including two that were negative (2019 Quarter 2 versus 2019 Quarter 3; 2020 Quarter 1 versus 2020 Quarter 2) and one that was positive (2018 Quarter 4 versus 2019 Quarter 1). However, none of these differences were statistically significant after implementing the Simes correction. **Thus, there is no evidence overall that the average stop lengths for Hispanic drivers relative to White drivers significantly changed over the full analysis period.**

Table 31. Difference-in-difference results for stop length, extended stops removed (Hispanic vs. White drivers)

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	0.278	0.53	0.595	No
2017 Q4 vs. 2018 Q1	-0.229	0.47	0.641	No
2018 Q1 vs. 2018 Q2	-0.121	0.25	0.803	No
2018 Q2 vs. 2018 Q3	0.345	0.69	0.489	No
2018 Q3 vs. 2018 Q4	-0.429	0.89	0.374	No
2018 Q4 vs. 2019 Q1	1.067	2.23	0.026	No
2019 Q1 vs. 2019 Q2	0.701	1.24	0.216	No
2019 Q2 vs. 2019 Q3	-1.426	2.54	0.011	No
2019 Q3 vs. 2019 Q4	-0.094	0.2	0.843	No
2019 Q4 vs. 2020 Q1	0.598	1.22	0.224	No
2020 Q1 vs. 2020 Q2	1.073	1.68	0.093	No
2020 Q2 vs. 2020 Q3	-1.196	2.18	0.029	No
2020 Q3 vs. 2020 Q4	0.226	0.46	0.646	No
2020 Q4 vs. 2021 Q1	-0.258	0.4	0.686	No
2021 Q1 vs. 2021 Q2	0.713	0.97	0.333	No
2021 Q2 vs. 2021 Q3	0.166	0.21	0.832	No
2021 Q3 vs. 2021 Q4	0.458	0.49	0.622	No

Figure 11. Difference-in-difference results for stop length, extended stops removed (Hispanic vs. White drivers)



Black versus White drivers

Table 32 and Figure 12 display the difference-in-difference estimates between Black and White drivers in terms of stop length, with extended stops removed from the analysis. Again, we would expect to see negative, statistically significant difference-in-difference estimates if the MCSO had significantly decreased the length in which they stopped Black drivers, relative to White drivers, over any of these paired quarter periods.

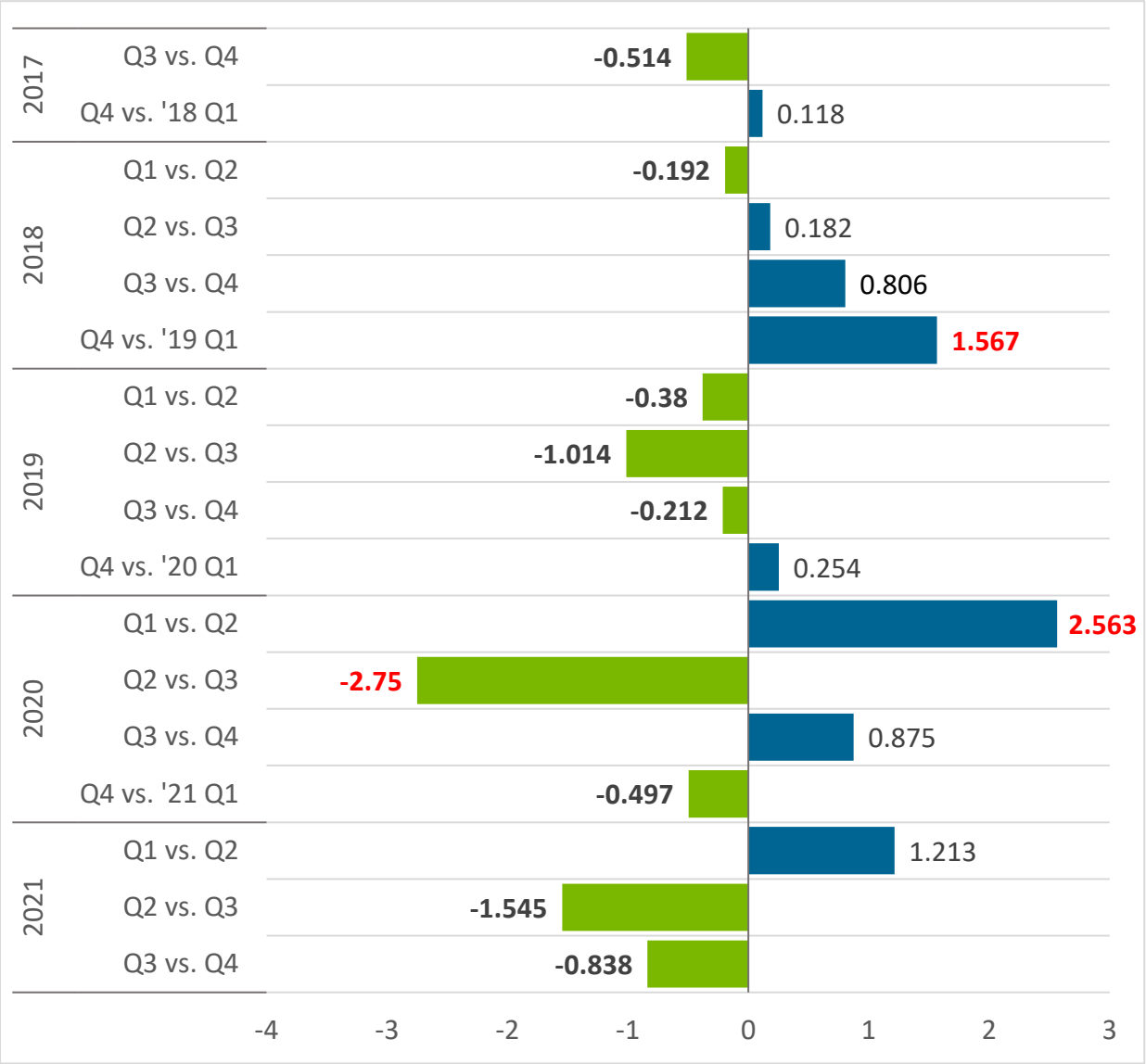
Similar to the findings for Hispanic drivers, there was a mix of positive and negative difference-in-difference estimates across the paired quarter periods. Three paired quarters were statistically significant after accounting for the Simes correction. Between 2018 Quarter 4 and 2019 Quarter 1, the stop length for

Black drivers increased by about 1.5 minutes relative to White drivers. Stop lengths similarly increased for Black drivers between 2020 Quarter 1 and 2020 Quarter 2, though it subsequently decreased between 2020 Quarter 2 and 2020 Quarter 3. **Given these inconsistent trends and the overall lack of significant findings, there is little evidence that the average difference in stop lengths between Black drivers and White drivers significantly changed over the full analysis period.**

Table 32. Difference-in-difference results for stop length, extended stops removed (Black vs. White drivers)

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-0.514	1.19	0.236	No
2017 Q4 vs. 2018 Q1	0.118	0.28	0.783	No
2018 Q1 vs. 2018 Q2	-0.192	0.51	0.612	No
2018 Q2 vs. 2018 Q3	0.182	0.45	0.652	No
2018 Q3 vs. 2018 Q4	0.806	2.15	0.032	No
2018 Q4 vs. 2019 Q1	1.567	3.02	0.003	Yes
2019 Q1 vs. 2019 Q2	-0.38	0.47	0.639	No
2019 Q2 vs. 2019 Q3	-1.014	1.53	0.125	No
2019 Q3 vs. 2019 Q4	-0.212	0.46	0.645	No
2019 Q4 vs. 2020 Q1	0.254	0.64	0.520	No
2020 Q1 vs. 2020 Q2	2.563	4.37	0.000	Yes
2020 Q2 vs. 2020 Q3	-2.75	4.76	0.000	Yes
2020 Q3 vs. 2020 Q4	0.875	1.79	0.074	No
2020 Q4 vs. 2021 Q1	-0.497	0.9	0.370	No
2021 Q1 vs. 2021 Q2	1.213	1.57	0.116	No
2021 Q2 vs. 2021 Q3	-1.545	1.82	0.070	No
2021 Q3 vs. 2021 Q4	-0.838	1.21	0.226	No

Figure 12. Difference-in-difference results for stop length, extended stops removed (Black vs. White drivers)



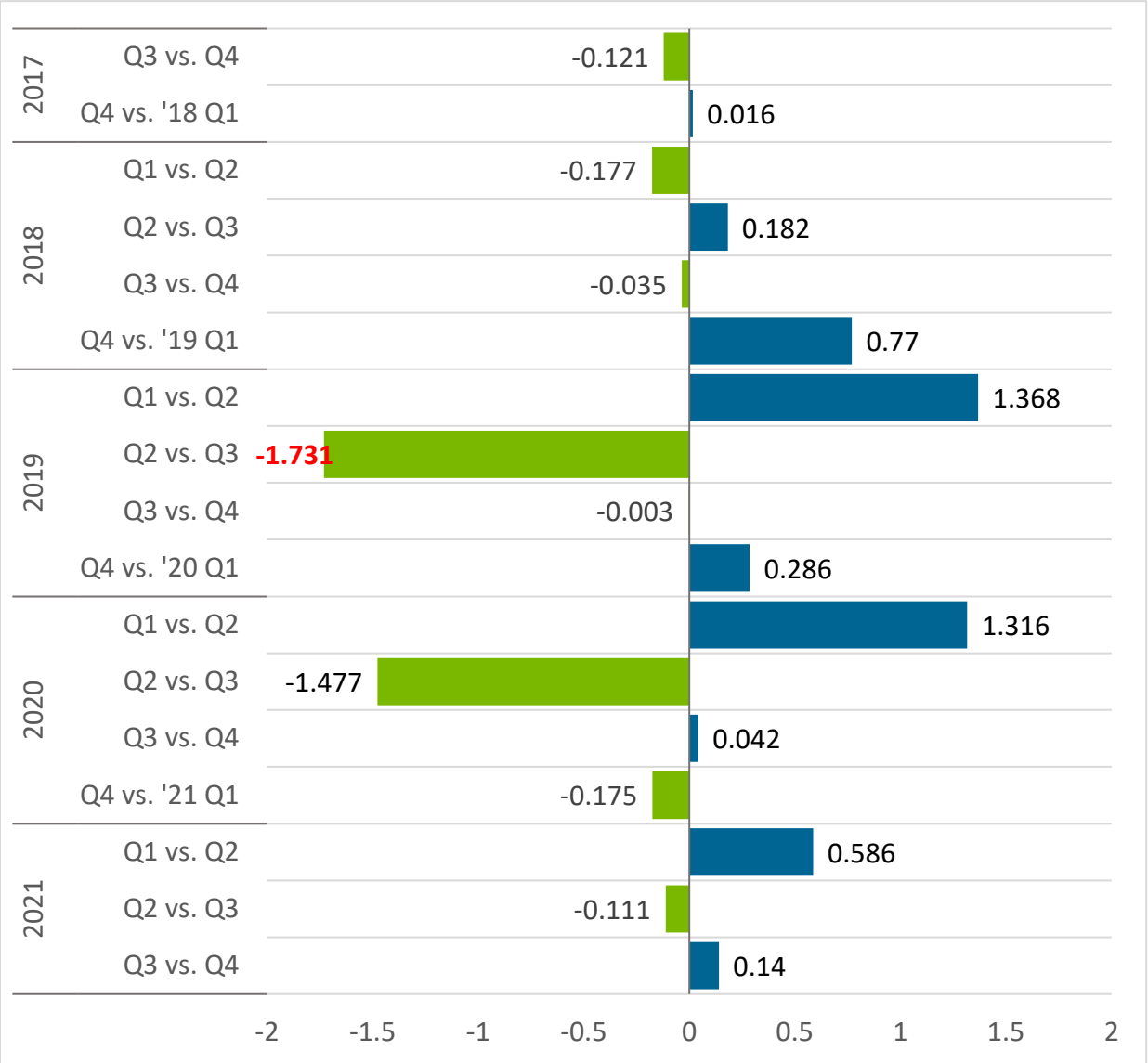
All racial and ethnic minority versus White drivers

The difference-in-difference estimates for stop length comparing White drivers to all racial and ethnic minority drivers are included in Table 33 and Figure 13. **As is the case in the analyses comparing only Hispanic or Black drivers to White drivers, there is little evidence that differences in stop lengths increased or decreased over the full analysis period. Though there were four paired quarters in which the difference-in-difference estimates had p-values under 0.05, including two periods in which stop lengths for all racial and ethnic minority drivers increased relative to White drivers and two periods in which stop lengths decreased, only one of these differences was statistically significant after applying the Simes correction (i.e., 2019 Quarter 2 versus 2019 Quarter 3).**

Table 33. Difference-in-difference results for stop length, extended stops removed (all racial and ethnic minority vs. White drivers)

Model	Difference-in-differences (in minutes)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-0.121	0.27	0.789	No
2017 Q4 vs. 2018 Q1	0.016	0.04	0.972	No
2018 Q1 vs. 2018 Q2	-0.177	0.41	0.683	No
2018 Q2 vs. 2018 Q3	0.182	0.42	0.671	No
2018 Q3 vs. 2018 Q4	-0.035	0.08	0.934	No
2018 Q4 vs. 2019 Q1	0.77	1.64	0.102	No
2019 Q1 vs. 2019 Q2	1.368	2.46	0.014	No
2019 Q2 vs. 2019 Q3	-1.731	3.28	0.001	Yes
2019 Q3 vs. 2019 Q4	-0.003	0.01	0.994	No
2019 Q4 vs. 2020 Q1	0.286	0.63	0.526	No
2020 Q1 vs. 2020 Q2	1.316	2.25	0.025	No
2020 Q2 vs. 2020 Q3	-1.477	2.87	0.004	No
2020 Q3 vs. 2020 Q4	0.042	0.09	0.928	No
2020 Q4 vs. 2021 Q1	-0.175	0.3	0.761	No
2021 Q1 vs. 2021 Q2	0.586	0.85	0.396	No
2021 Q2 vs. 2021 Q3	-0.111	0.15	0.883	No
2021 Q3 vs. 2021 Q4	0.14	0.18	0.859	No

Figure 13. Difference-in-difference results for stop length, extended stops removed (all racial and ethnic minority vs. White drivers)



Citations

We investigated difference-in-difference estimates in citation rates (i.e., the percentage of stops that involved citations rather than warnings or incidental contacts) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers. The difference-in-difference estimates are presented for each of the 17 quarter pairs included in the full analysis period (i.e., beginning 2017 Quarter 3 and ending 2021 Quarter 4).

Hispanic versus White drivers

Table 34 and Figure 14 present the difference-in-difference estimates in the citation rates between Hispanic and White drivers over the 17 paired quarter periods. The difference-in-difference estimates are

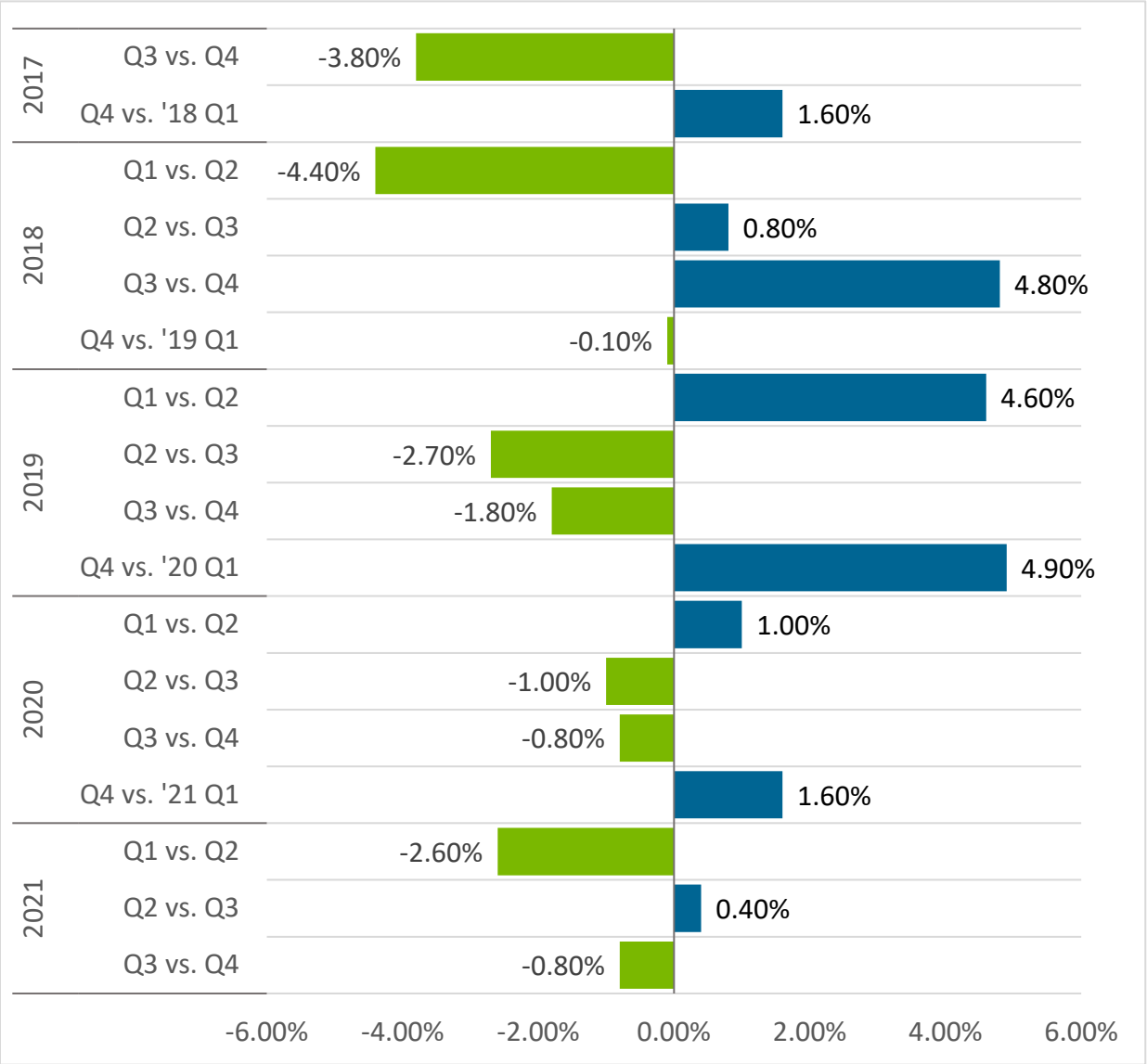
interpreted as the difference between the citation rate of Hispanic drivers in one quarter compared to the following quarter, relative to White drivers over the same period.

Three difference-in-difference estimates had p-values under 0.05, including 2018 Quarter 3 versus 2018 Quarter 4, 2019 Quarter 1 versus 2019 Quarter 2, and 2019 Quarter 4 versus 2020 Quarter 1. **However, none of these differences remain statistically significant after implementing the Simes correction, and there is no evidence overall that the citation rates change for Hispanic drivers relative to White drivers.**

Table 34. Difference-in-difference results for citations (Hispanic vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-3.80	1.78	0.074	No
2017 Q4 vs. 2018 Q1	1.60	0.67	0.501	No
2018 Q1 vs. 2018 Q2	-4.40	1.77	0.076	No
2018 Q2 vs. 2018 Q3	0.80	0.34	0.731	No
2018 Q3 vs. 2018 Q4	4.80	1.97	0.049	No
2018 Q4 vs. 2019 Q1	-0.10	0.04	0.968	No
2019 Q1 vs. 2019 Q2	4.60	2.04	0.041	No
2019 Q2 vs. 2019 Q3	-2.70	1.43	0.152	No
2019 Q3 vs. 2019 Q4	-1.80	1.02	0.310	No
2019 Q4 vs. 2020 Q1	4.90	2.59	0.010	No
2020 Q1 vs. 2020 Q2	1.00	0.46	0.646	No
2020 Q2 vs. 2020 Q3	-1.00	0.47	0.642	No
2020 Q3 vs. 2020 Q4	-0.80	0.36	0.715	No
2020 Q4 vs. 2021 Q1	1.60	0.72	0.470	No
2021 Q1 vs. 2021 Q2	-2.60	1.14	0.254	No
2021 Q2 vs. 2021 Q3	0.40	0.19	0.849	No
2021 Q3 vs. 2021 Q4	-0.80	0.35	0.728	No

Figure 14. Difference-in-difference results for citations (Hispanic vs. White drivers)



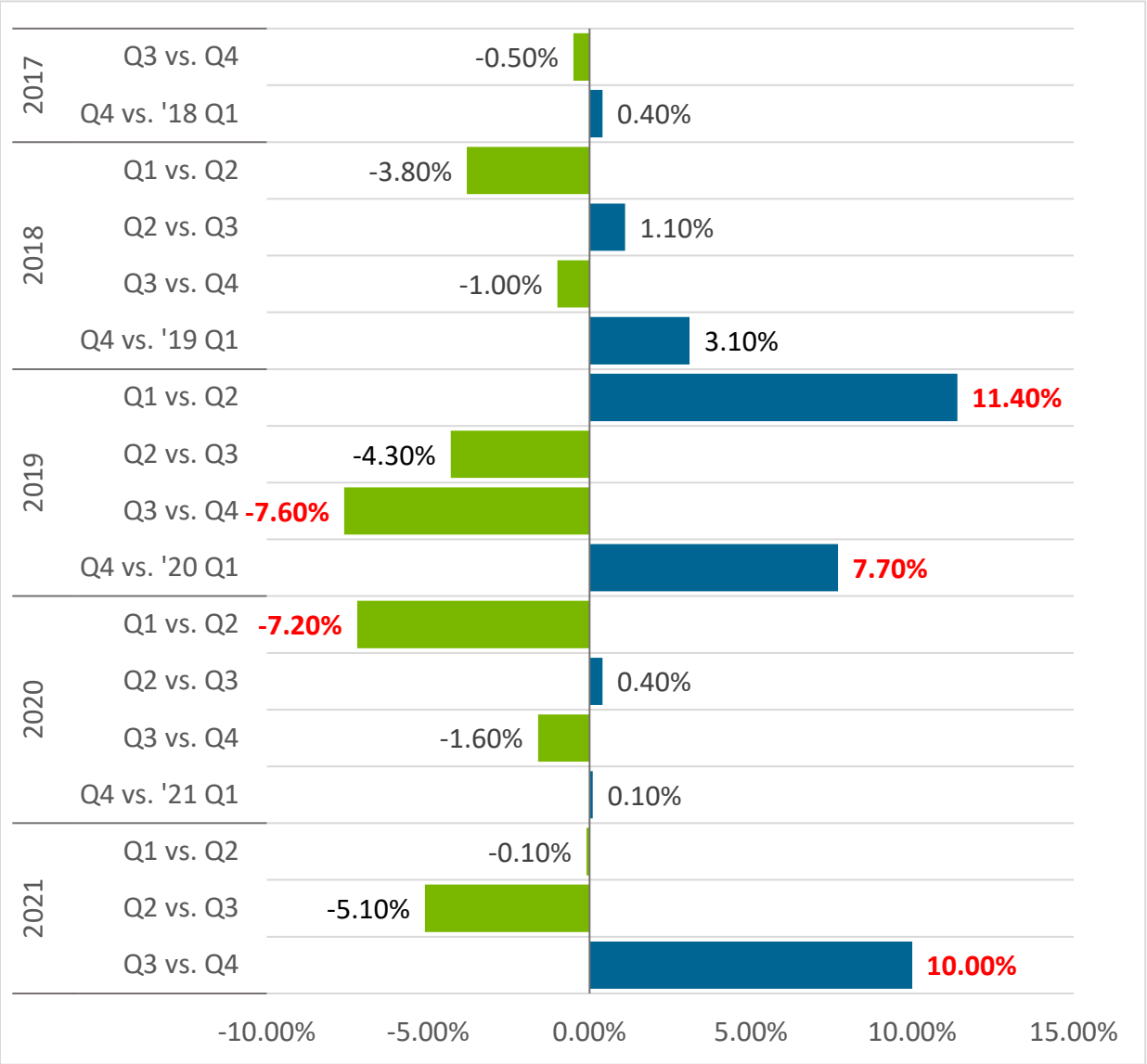
Black versus White drivers

Table 35 and Figure 15 demonstrate the difference-in-difference estimates in the citation rates between Black and White drivers over the 17 analysis periods. There are five paired quarter periods in which the difference-in-difference estimates were statistically significant after implementing the difference-in-difference estimates. Three of these difference-in-difference estimates were positive while two were negative, ranging from a 7.6 percentage point decrease in citation rates for Black drivers relative to White drivers between 2019 Quarter 3 and 2019 Quarter 4 to a 11.4 percentage point increase in citation rates between 2019 Quarter 1 and 2019 Quarter 2. **Overall, there is no clear pattern of a significant increase or decrease in the citation rates of Black drivers compared to White drivers across the 17 analytic periods.**

Table 35. Difference-in-difference results for citations (Black vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-0.50	0.23	0.822	No
2017 Q4 vs. 2018 Q1	0.40	0.16	0.870	No
2018 Q1 vs. 2018 Q2	-3.80	1.37	0.171	No
2018 Q2 vs. 2018 Q3	1.10	0.43	0.671	No
2018 Q3 vs. 2018 Q4	-1.00	0.36	0.718	No
2018 Q4 vs. 2019 Q1	3.10	1.13	0.259	No
2019 Q1 vs. 2019 Q2	11.4	4.61	0.000	Yes
2019 Q2 vs. 2019 Q3	-4.30	2.05	0.040	No
2019 Q3 vs. 2019 Q4	-7.60	3.99	0.000	Yes
2019 Q4 vs. 2020 Q1	7.70	3.69	0.000	Yes
2020 Q1 vs. 2020 Q2	-7.20	3.08	0.002	Yes
2020 Q2 vs. 2020 Q3	0.40	0.17	0.866	No
2020 Q3 vs. 2020 Q4	-1.60	0.71	0.477	No
2020 Q4 vs. 2021 Q1	0.10	0.03	0.972	No
2021 Q1 vs. 2021 Q2	-0.10	0.06	0.953	No
2021 Q2 vs. 2021 Q3	-5.10	2.08	0.037	No
2021 Q3 vs. 2021 Q4	10.0	3.82	0.000	Yes

Figure 15. Difference-in-difference results for citations (Black vs. White drivers)



All racial and ethnic minority versus White drivers

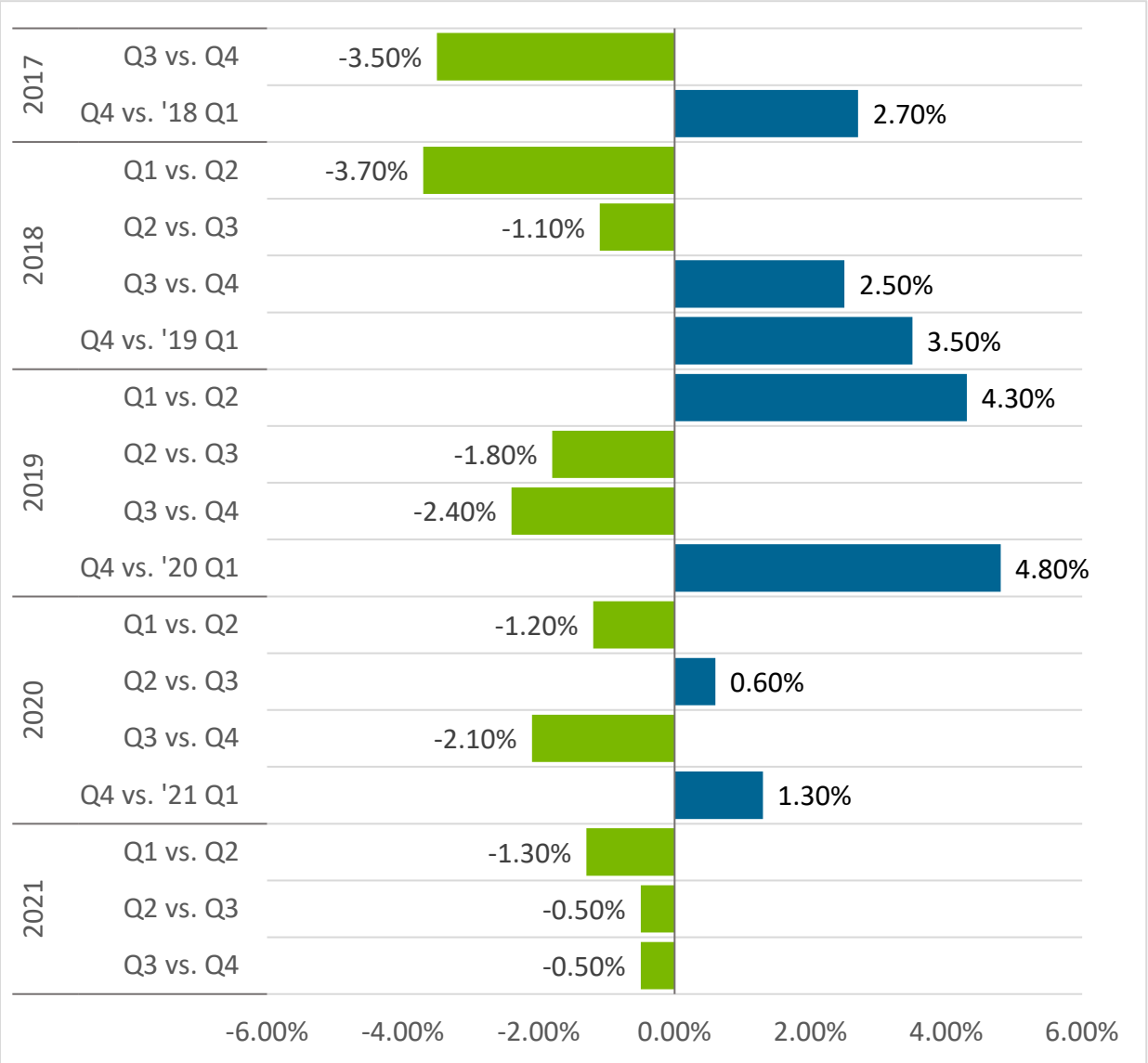
Table 36 and Figure 16 present the difference-in-difference estimates for the citation rates of all racial and ethnic minority drivers compared to White drivers. **There is little evidence overall that citation rates changed over the full analysis period. None of the difference-in-difference estimates were statistically significant once we employed the Simes correction.**

Table 36. Difference-in-difference results for citations (all racial and ethnic minority vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?

2017 Q3 vs. 2017 Q4	-3.50	1.71	0.087	No
2017 Q4 vs. 2018 Q1	2.70	1.23	0.218	No
2018 Q1 vs. 2018 Q2	-3.70	1.58	0.114	No
2018 Q2 vs. 2018 Q3	-1.10	0.46	0.644	No
2018 Q3 vs. 2018 Q4	2.50	1.11	0.267	No
2018 Q4 vs. 2019 Q1	3.50	1.47	0.141	No
2019 Q1 vs. 2019 Q2	4.30	1.98	0.048	No
2019 Q2 vs. 2019 Q3	-1.80	1.02	0.307	No
2019 Q3 vs. 2019 Q4	-2.40	1.44	0.150	No
2019 Q4 vs. 2020 Q1	4.80	2.66	0.008	No
2020 Q1 vs. 2020 Q2	-1.20	0.58	0.563	No
2020 Q2 vs. 2020 Q3	0.60	0.28	0.781	No
2020 Q3 vs. 2020 Q4	-2.10	1.05	0.293	No
2020 Q4 vs. 2021 Q1	1.30	0.63	0.531	No
2021 Q1 vs. 2021 Q2	-1.30	0.6	0.548	No
2021 Q2 vs. 2021 Q3	-0.50	0.23	0.818	No
2021 Q3 vs. 2021 Q4	-0.50	0.21	0.831	No

Figure 16. Difference-in-difference results for citations (all racial and ethnic minority vs. White drivers)



Searches

This section examines the difference-in-difference estimates in search rates (i.e., the percentage of stops that involved searches not incident to arrest or tow) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers for the 17 quarter pairs that comprise the full analysis period.

Hispanic versus White drivers

The difference-in-difference estimates for the search rate of Hispanic and Black drivers over the 17 paired quarter periods are included in Table 37 and Figure 17. Like the models above, these estimates are interpreted as the difference between the rate at which Hispanic drivers were searched in one quarter

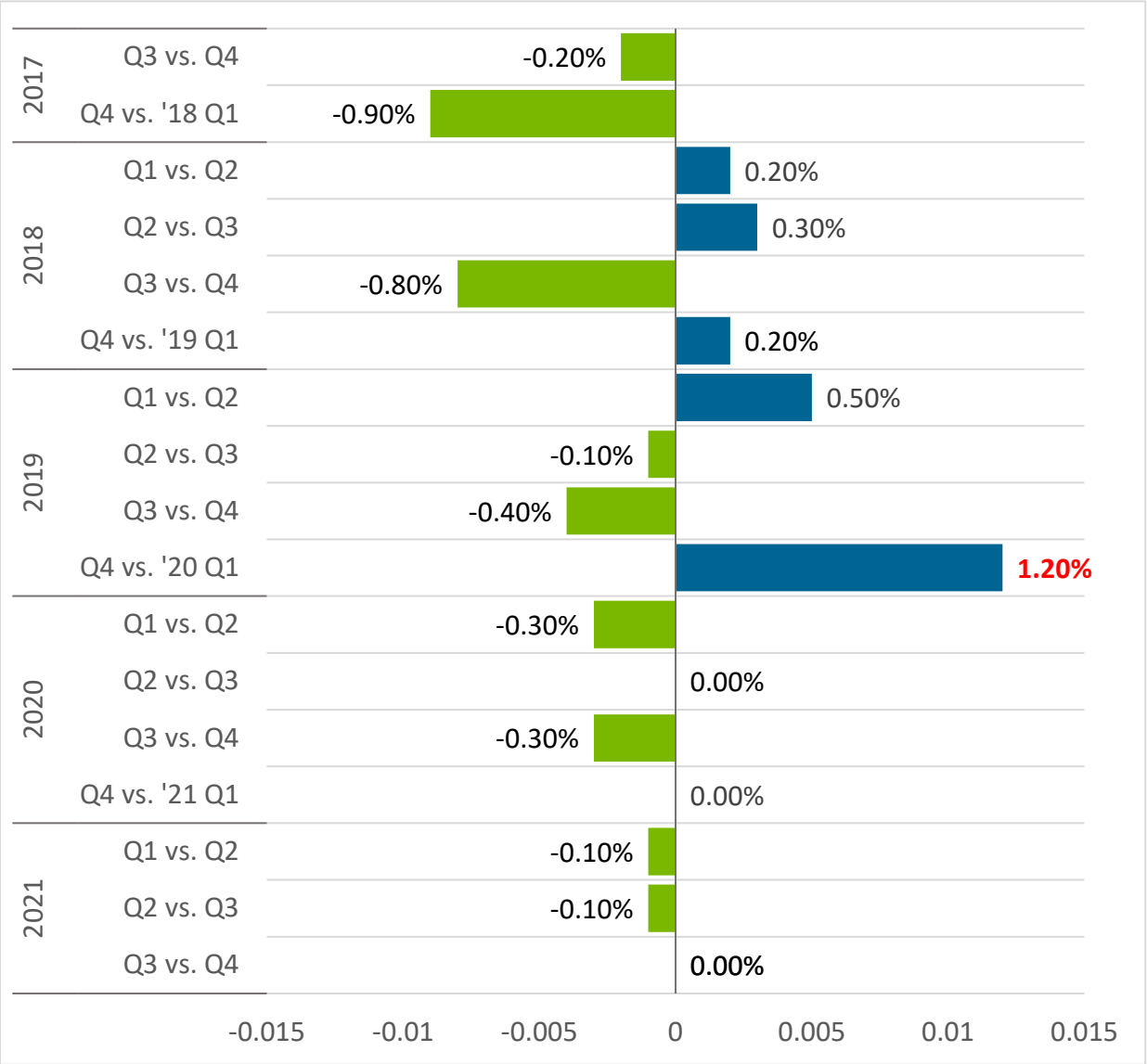
compared to the subsequent quarter, relative to the difference in search rates for White drivers over the same period.

Only one of the difference-in-difference estimates was significant after using the Simes correction. This finding suggests that a slightly higher percentage of Hispanic drivers (i.e., an increase of 1.2 percentage points) was searched in the first quarter of 2020 compared to the final quarter of 20219, after accounting for the difference in search rates for White drivers of this same period. **Overall, there is limited evidence that the search rates for Hispanic drivers relative to White drivers changed across the full analysis period.**

Table 37. Difference-in-difference results for non-incidental searches (Hispanic vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-0.20	0.34	0.730	No
2017 Q4 vs. 2018 Q1	-0.90	1.67	0.095	No
2018 Q1 vs. 2018 Q2	0.20	0.38	0.705	No
2018 Q2 vs. 2018 Q3	0.30	0.48	0.634	No
2018 Q3 vs. 2018 Q4	-0.80	1.29	0.197	No
2018 Q4 vs. 2019 Q1	0.20	0.46	0.647	No
2019 Q1 vs. 2019 Q2	0.50	1.19	0.233	No
2019 Q2 vs. 2019 Q3	-0.10	0.39	0.698	No
2019 Q3 vs. 2019 Q4	-0.40	1.28	0.201	No
2019 Q4 vs. 2020 Q1	1.20	2.98	0.003	Yes
2020 Q1 vs. 2020 Q2	-0.30	0.56	0.577	No
2020 Q2 vs. 2020 Q3	0.10	0.23	0.822	No
2020 Q3 vs. 2020 Q4	-0.30	0.59	0.553	No
2020 Q4 vs. 2021 Q1	-0.10	0.32	0.752	No
2021 Q1 vs. 2021 Q2	-0.10	0.31	0.756	No
2021 Q2 vs. 2021 Q3	-0.10	0.18	0.857	No
2021 Q3 vs. 2021 Q4	0.00	0.01	0.991	No

Figure 17. Difference-in-difference results for non-incidental searches (Hispanic vs. White drivers)



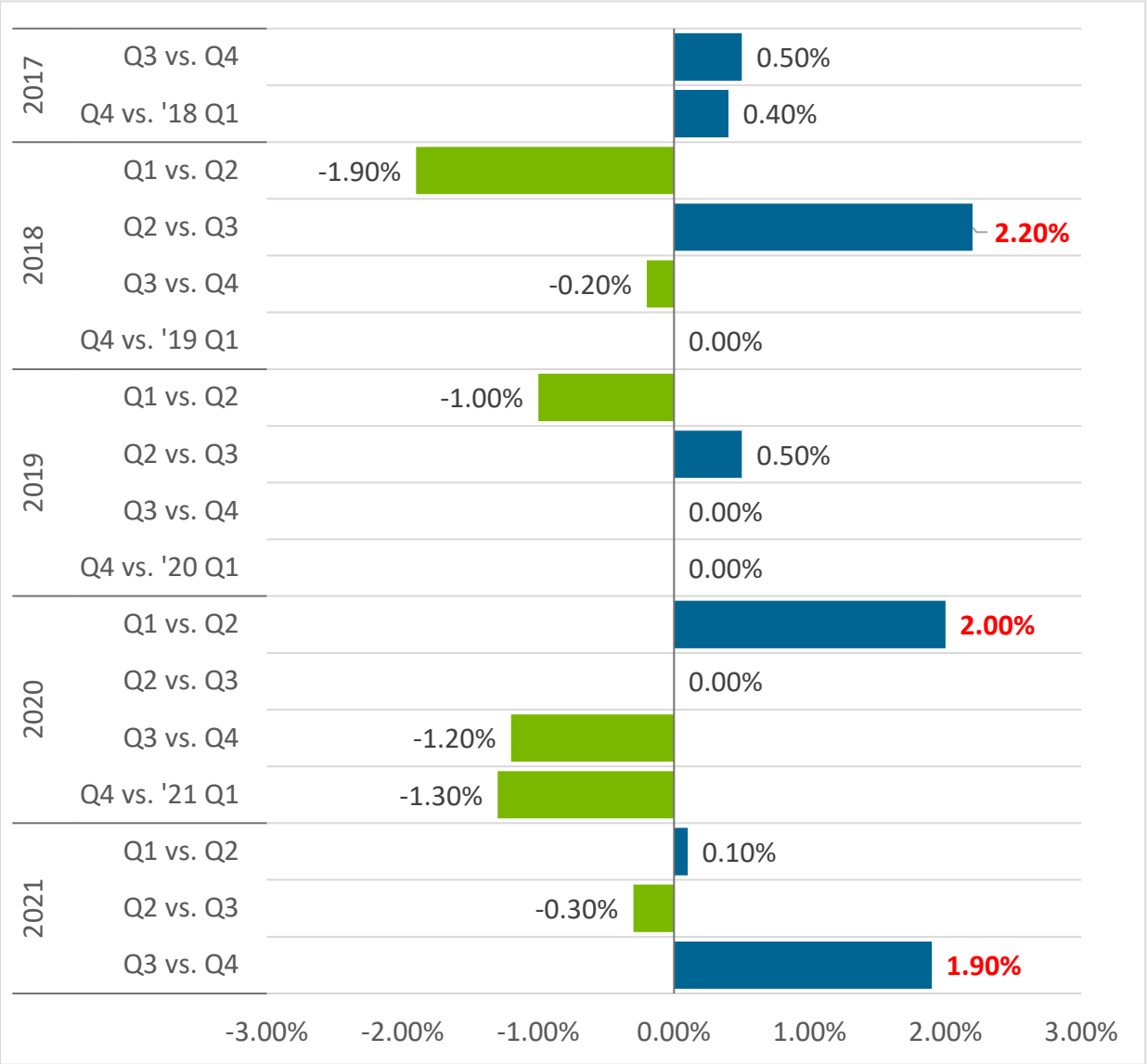
Black versus White drivers

Table 38 and Figure 18 depict the difference-in-difference estimates in the search rates for Black versus White drivers over the 17 paired quarter periods. The difference-in-difference estimates for three paired quarter periods were statistically significant after correction. From the second to the third quarter in 2018, Black drivers experienced a 2.2 percentage point increase in their likelihood of receiving a non-incidental search during a traffic stop relative to White drivers. Black drivers experienced similar increases in their likelihood of being searched between the second and third quarter of 2020 and between the third and fourth quarter of 2021. All other difference-in-difference estimates were insignificant after the Simes correction and included increases and decreases in search rates. **Overall, though some periods show a statistically significant increase in the search rates of Black drivers compared to White drivers, this trend is not consistent when examining all 17 analytic periods.**

Table 38. Difference-in-difference results for non-incidental searches (Black vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	0.50	0.76	0.448	No
2017 Q4 vs. 2018 Q1	0.40	0.5	0.619	No
2018 Q1 vs. 2018 Q2	-1.90	2.8	0.005	No
2018 Q2 vs. 2018 Q3	2.20	3.06	0.002	Yes
2018 Q3 vs. 2018 Q4	-0.20	0.27	0.785	No
2018 Q4 vs. 2019 Q1	-1.10	1.5	0.133	No
2019 Q1 vs. 2019 Q2	-1.00	2.07	0.038	No
2019 Q2 vs. 2019 Q3	0.50	1.32	0.186	No
2019 Q3 vs. 2019 Q4	0.30	0.86	0.390	No
2019 Q4 vs. 2020 Q1	-0.90	2.15	0.032	No
2020 Q1 vs. 2020 Q2	2.00	3.54	0.000	Yes
2020 Q2 vs. 2020 Q3	0.00	0.07	0.943	No
2020 Q3 vs. 2020 Q4	-1.20	1.99	0.047	No
2020 Q4 vs. 2021 Q1	-1.30	2.74	0.006	No
2021 Q1 vs. 2021 Q2	0.10	0.23	0.816	No
2021 Q2 vs. 2021 Q3	-0.30	0.72	0.470	No
2021 Q3 vs. 2021 Q4	1.90	3.78	0.000	Yes

Figure 18. Difference-in-difference results for stop non-incidental searches (Black vs. White drivers)



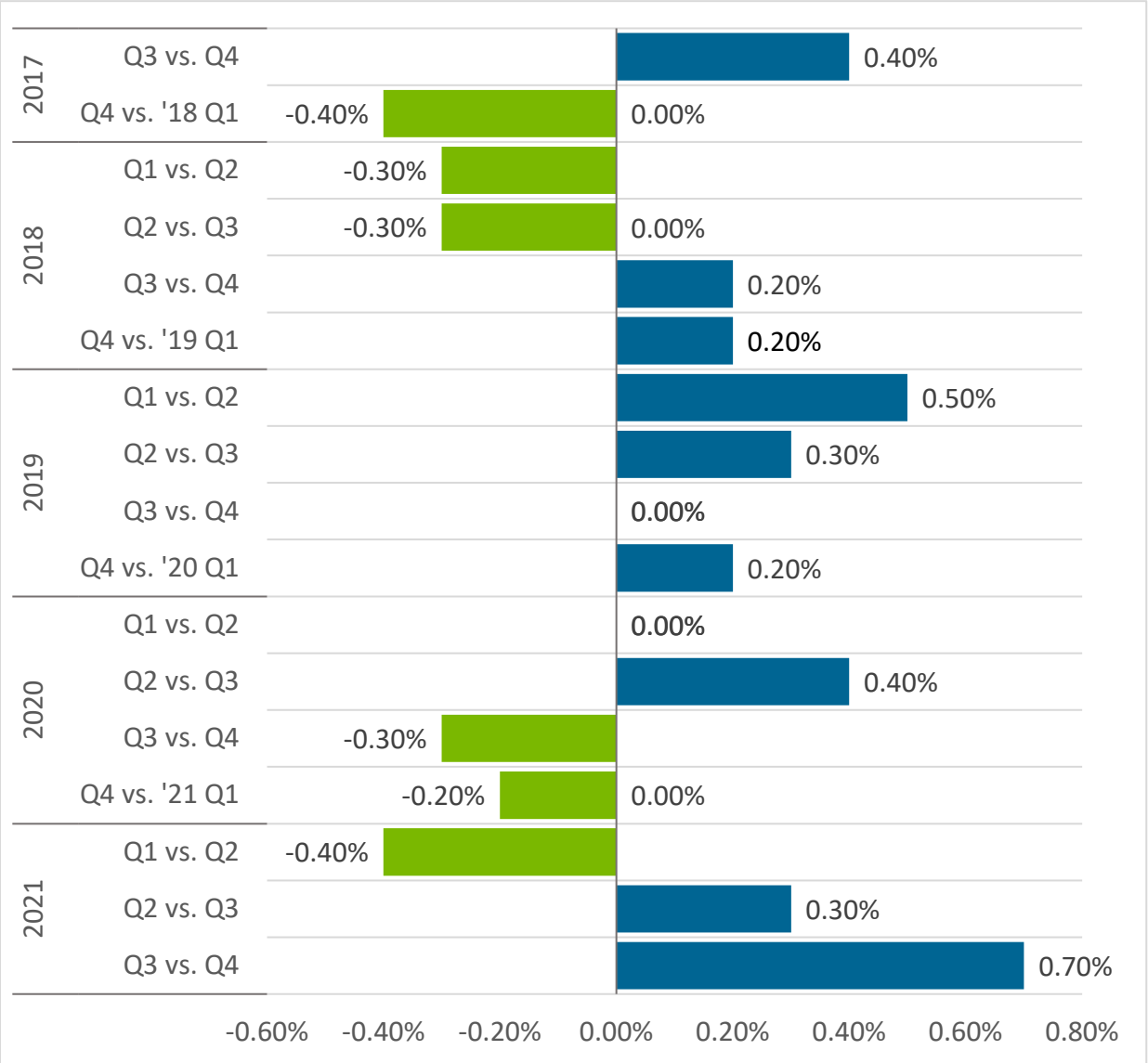
All racial and ethnic minority versus White drivers

The difference-in-difference estimates for the search rates of all racial and ethnic and minority drivers, compared to White drivers, are presented in Table 39 and Figure 19. **None of the difference-in-difference estimates were statistically significant after the Simes correction; thus, there is no evidence that the differences in search rates between all racial and ethnic minority drivers and White drivers changed over time.**

Table 39. Difference-in-difference results for non-incidental searches (all racial and ethnic minority vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	0.40	0.67	0.503	No
2017 Q4 vs. 2018 Q1	-0.40	0.6	0.548	No
2018 Q1 vs. 2018 Q2	-0.30	0.47	0.641	No
2018 Q2 vs. 2018 Q3	-0.30	0.38	0.702	No
2018 Q3 vs. 2018 Q4	0.20	0.34	0.737	No
2018 Q4 vs. 2019 Q1	0.20	0.34	0.733	No
2019 Q1 vs. 2019 Q2	0.50	1.01	0.310	No
2019 Q2 vs. 2019 Q3	0.30	0.91	0.365	No
2019 Q3 vs. 2019 Q4	0.00	0.01	0.989	No
2019 Q4 vs. 2020 Q1	0.20	0.6	0.547	No
2020 Q1 vs. 2020 Q2	0.00	0.02	0.987	No
2020 Q2 vs. 2020 Q3	0.40	0.69	0.489	No
2020 Q3 vs. 2020 Q4	-0.30	0.51	0.613	No
2020 Q4 vs. 2021 Q1	-0.20	0.34	0.735	No
2021 Q1 vs. 2021 Q2	-0.40	0.8	0.421	No
2021 Q2 vs. 2021 Q3	0.30	0.6	0.552	No
2021 Q3 vs. 2021 Q4	0.70	1.62	0.106	No

Figure 19. Difference-in-difference results for stop non-incidental searches (all racial and ethnic minority vs. White drivers)



Arrests

This section examines the difference-in-difference estimates for arrest rates (i.e., the percentage of stops that involved arrests) between Hispanic and White drivers, Black and White drivers, and all racial and ethnic minority and White drivers across all 17 quarter periods.

Hispanic versus White drivers

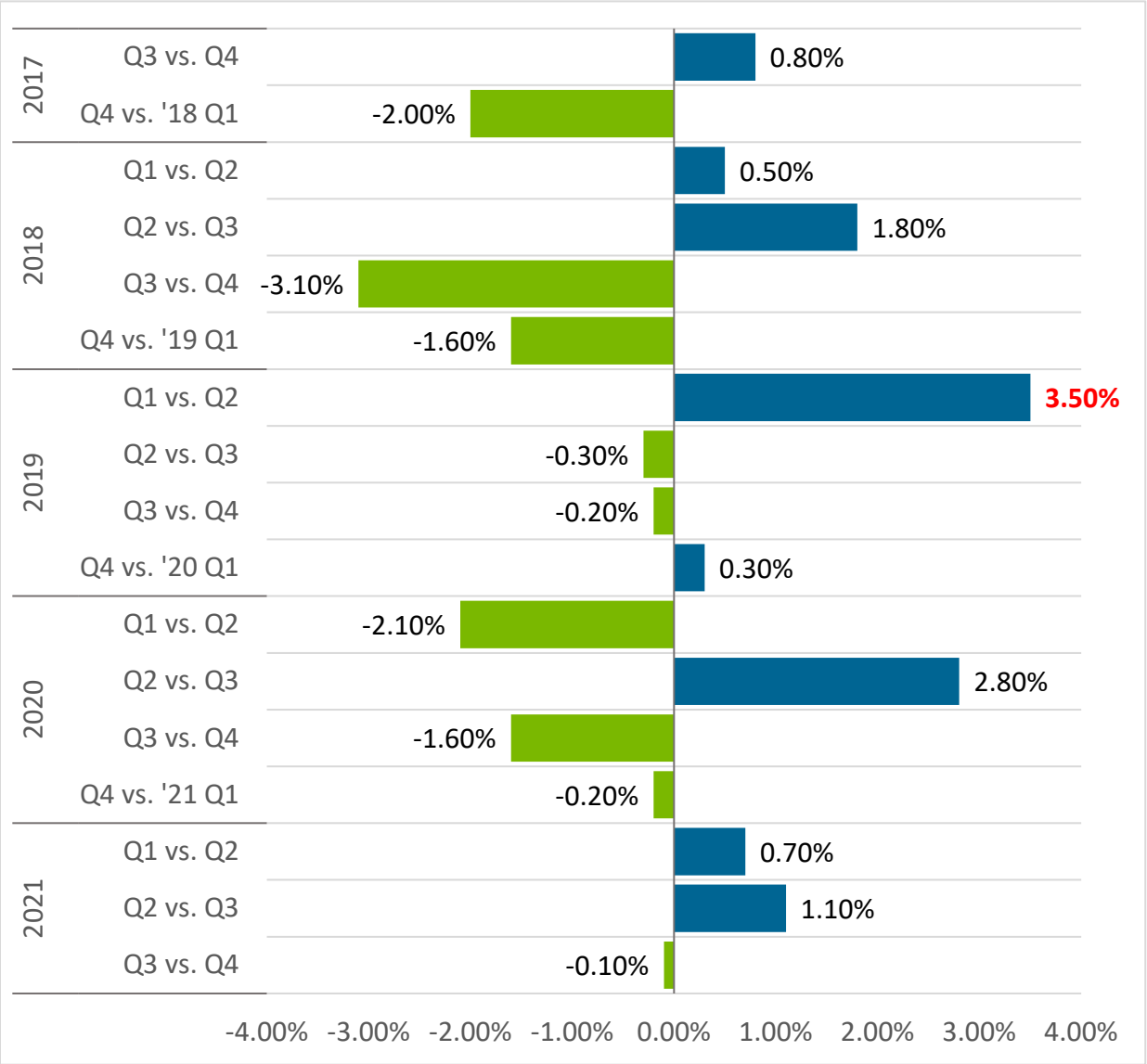
Table 40 and Figure 20 summarize the difference-in-difference estimates for Hispanic versus White drivers in terms of their arrest rates (i.e., the percentage of stops that involved arrests) over the 17 analysis periods. Only one difference-in-difference estimate was statistically significant after the Simes correction, suggesting that the percentage of Hispanic drivers arrested during traffic stops increased by 3.5

percentage points between the first and second quarters of 2019. **No other difference-in-difference estimates were statistically significant, and we thus found limited evidence of changes in the arrest rates of Hispanic drivers relative to White drivers over time.**

Table 40. Difference-in-difference results for arrests (Hispanic vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	0.80	0.72	0.473	No
2017 Q4 vs. 2018 Q1	-0.200	1.62	0.105	No
2018 Q1 vs. 2018 Q2	0.50	0.42	0.671	No
2018 Q2 vs. 2018 Q3	1.80	1.39	0.164	No
2018 Q3 vs. 2018 Q4	-3.10	2.5	0.013	No
2018 Q4 vs. 2019 Q1	-1.60	1.36	0.175	No
2019 Q1 vs. 2019 Q2	3.50	3.77	0.000	Yes
2019 Q2 vs. 2019 Q3	-0.30	0.35	0.725	No
2019 Q3 vs. 2019 Q4	-0.20	0.22	0.829	No
2019 Q4 vs. 2020 Q1	0.30	0.35	0.726	No
2020 Q1 vs. 2020 Q2	-2.10	2.37	0.018	No
2020 Q2 vs. 2020 Q3	2.80	2.64	0.008	No
2020 Q3 vs. 2020 Q4	-1.60	1.55	0.120	No
2020 Q4 vs. 2021 Q1	-0.20	0.15	0.883	No
2021 Q1 vs. 2021 Q2	0.70	0.67	0.500	No
2021 Q2 vs. 2021 Q3	1.10	1.01	0.315	No
2021 Q3 vs. 2021 Q4	-0.10	0.09	0.926	No

Figure 20. Difference-in-difference results for arrests (Hispanic vs. White drivers)



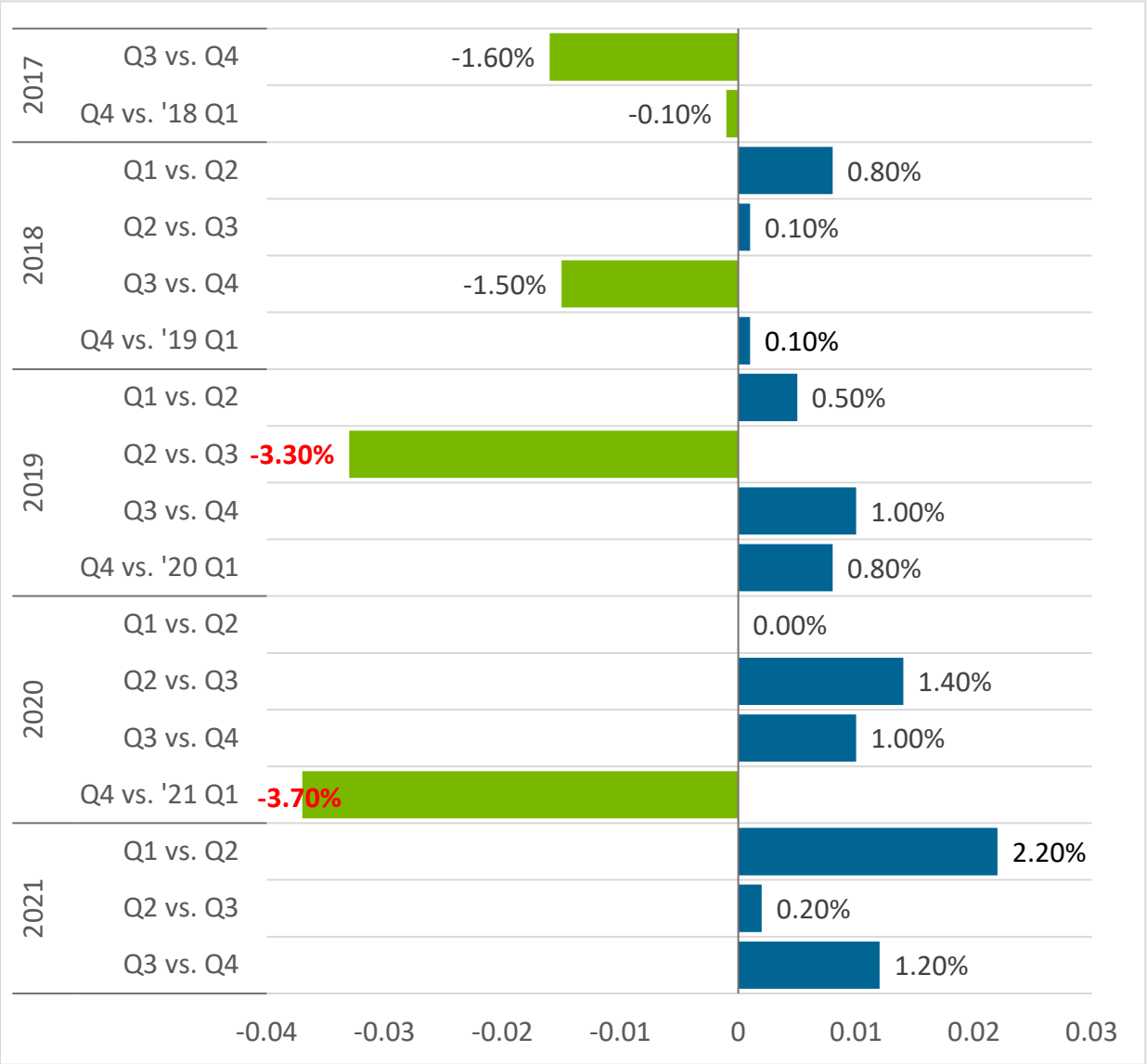
Black versus White drivers

Table 41 and Figure 21 present the difference-in-difference estimates in the arrest rates for Black drivers compared to White drivers over the 17 paired quarter periods. After correction, we found a significant decrease in the arrest rates of Black drivers compared to White drivers between the second and third quarter of 2019 (a decrease of 3.3 percentage points) and between the last quarter of 2020 and the first quarter of 2021 (a decrease of 3.7 percentage points). **Given the lack of other significant findings, these estimates present limited evidence that arrest rates decreased for Black drivers over the full analysis period.**

Table 41. Difference-in-difference results for arrests (Black vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?
2017 Q3 vs. 2017 Q4	-1.60	1.24	0.216	No
2017 Q4 vs. 2018 Q1	-0.10	0.09	0.931	No
2018 Q1 vs. 2018 Q2	0.80	0.58	0.561	No
2018 Q2 vs. 2018 Q3	0.10	0.09	0.925	No
2018 Q3 vs. 2018 Q4	-1.50	1.13	0.259	No
2018 Q4 vs. 2019 Q1	0.10	0.08	0.934	No
2019 Q1 vs. 2019 Q2	0.50	0.48	0.629	No
2019 Q2 vs. 2019 Q3	-3.30	4.34	0.000	Yes
2019 Q3 vs. 2019 Q4	1.00	1.47	0.142	No
2019 Q4 vs. 2020 Q1	0.80	1.00	0.318	No
2020 Q1 vs. 2020 Q2	0.00	0.02	0.982	No
2020 Q2 vs. 2020 Q3	1.40	1.24	0.216	No
2020 Q3 vs. 2020 Q4	1.00	0.88	0.380	No
2020 Q4 vs. 2021 Q1	-3.70	3.43	0.001	Yes
2021 Q1 vs. 2021 Q2	2.20	1.99	0.047	No
2021 Q2 vs. 2021 Q3	0.20	0.15	0.877	No
2021 Q3 vs. 2021 Q4	1.20	0.89	0.375	No

Figure 21. Difference-in-difference results for arrests (Black vs. White drivers)



All racial and ethnic minority versus White drivers

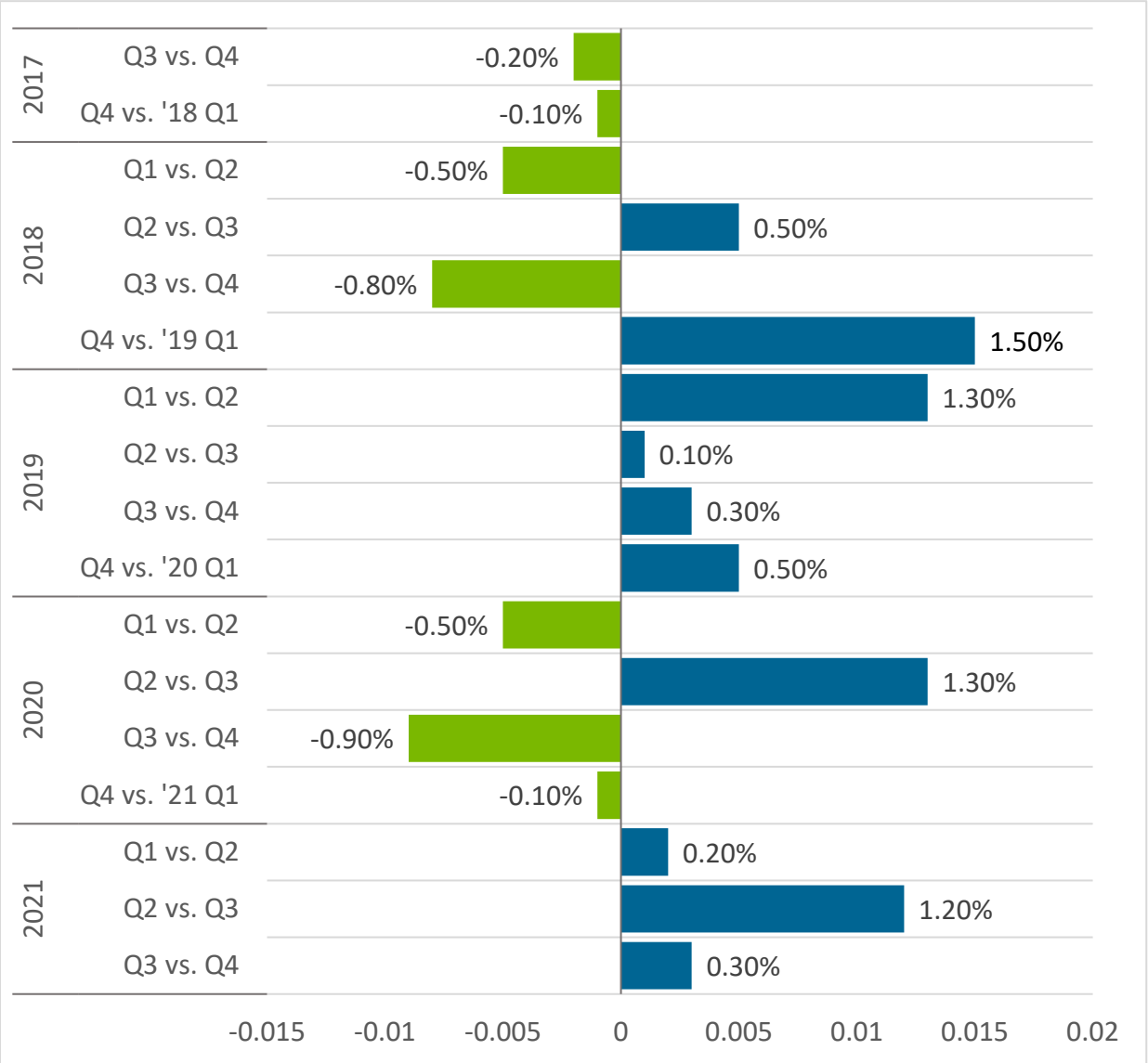
The difference-in-difference estimates for the arrest rates of all racial and ethnic minority drivers compared to White drivers are included in Table 42 and Figure 22. **None of the difference-in-difference estimates were statistically significant after correction, and we thus found no evidence that the arrest rates for all racial and ethnic minority drivers changed over the full analysis period.**

Table 42. Difference-in-difference results for arrests (all racial and ethnic minority vs. White drivers)

Model	Difference-in-differences (percentage points)	t-statistic	p-value	Significant after Simes?

2017 Q3 vs. 2017 Q4	-0.20	0.18	0.858	No
2017 Q4 vs. 2018 Q1	-0.10	0.05	0.959	No
2018 Q1 vs. 2018 Q2	-0.50	0.37	0.711	No
2018 Q2 vs. 2018 Q3	0.50	0.4	0.686	No
2018 Q3 vs. 2018 Q4	-0.80	0.58	0.560	No
2018 Q4 vs. 2019 Q1	1.50	1.36	0.174	No
2019 Q1 vs. 2019 Q2	1.30	1.39	0.163	No
2019 Q2 vs. 2019 Q3	0.10	0.13	0.895	No
2019 Q3 vs. 2019 Q4	0.30	0.46	0.642	No
2019 Q4 vs. 2020 Q1	0.50	0.67	0.504	No
2020 Q1 vs. 2020 Q2	-0.50	0.57	0.567	No
2020 Q2 vs. 2020 Q3	1.30	1.25	0.210	No
2020 Q3 vs. 2020 Q4	-0.90	0.85	0.393	No
2020 Q4 vs. 2021 Q1	-0.10	0.1	0.921	No
2021 Q1 vs. 2021 Q2	0.20	0.24	0.807	No
2021 Q2 vs. 2021 Q3	1.20	1.08	0.280	No
2021 Q3 vs. 2021 Q4	0.30	0.26	0.797	No

Figure 22. Difference-in-difference results for arrests (all racial and ethnic minority vs. White drivers)



Section summary

Overall, we hoped to see negative difference-in-difference coefficients for the traffic stop outcomes included in the analyses above. Such a finding would have demonstrated a reduction in disparities between Hispanic, Black, and all racial and ethnic minority drivers relative to White drivers. However, we found limited evidence of any significant changes in the stop lengths, citation rates, search rates, or arrest rates. Moreover, across the few analyses with significant outcomes, some difference-in-difference estimates were negative while others were positive, making it difficult to discern any clear patterns.

Time series analysis

To conclude the comparative analyses, CNA executed a simple time series analysis of estimated ATTs by period, derived from the chained two-period analysis results. For these analyses, we used the ATT estimated for the pre-period for periods 1–17 as well as the post-period estimate in the final chained analysis for period 18.[2] We aligned each ATT with the relevant period and ran an ordinary least squares regression using the following model for each combination of stop outcome and racial and ethnic category. This resulted in 12 analyses in which the coefficient of interest is β_1.

$$\widehat{ATT} = \beta_0 + \beta_1(Period) + \epsilon$$

The results from the 12 analyses are summarized in Table 43.

Table 43. Time series analyses results

Racial and ethnic group	Stop outcome	Coefficient	t-statistic	p-value	Significant?
Hispanic v. White driver	Stop length	0.134	0.60	0.560	No
Hispanic v. White driver	Citation	0.002	1.37	0.188	No
Hispanic v. White driver	Search	-0.0005	1.63	0.123	No
Hispanic v. White driver	Arrest	-0.0002	0.39	0.698	No
Black v. White driver	Stop length	-0.012	0.27	0.794	No
Black v. White driver	Citation	-0.003	1.57	0.136	No
Black v. White driver	Search	-0.0008	1.68	0.113	No
Black v. White driver	Arrest	-0.001	2.55	0.021	No
All racial and ethnic minority v. White driver	Stop length	-0.003	0.11	0.910	No
All racial and ethnic minority v. White driver	Citation	0.001	0.96	0.350	No
All racial and ethnic minority v. White driver	Search	0.0009	2.68	0.017	No
All racial and ethnic minority v. White driver	Arrest	0.001	3.33	0.004	No

As seen above, no models are statistically significant after implementing the Simes correction. **We found no evidence to conclude that estimated disparities are either increasing or decreasing over time based on this analysis.** In addition, the estimated coefficients are extremely small—representing fractions of seconds or fractions of percentage points (depending on the outcome).

[2] Due to the use of propensity score matching in combination with difference-in-difference, the ATTs are similar but not identical when estimated in each subsequent chained two-period model. We chose to use pre-periods for all but the final period for consistency.

Conclusion and MCSO Response

The results of the analyses performed do not demonstrate a clear pattern of disparities consistently increasing or decreasing over time.

This report analyzes data collected from 2017 through 2021. Given that the available data covers a time period that begins after MCSO implemented many of the most impactful policy reforms targeting the practices that led to the Court Order, it is not wholly unexpected that significant reductions in disparities are not evidenced in these findings. As a result, the measurement of change identified in this report likely underestimates the true impact of MCSO's reform efforts since the Court issued its first Order.

MCSO has conducted individual deputy-level analyses to identify racial/ethnic disparity in stops since April 2021 through the implementation of the Traffic Stop Monthly Report pilot process. With lessons learned from the pilot, MCSO is currently transitioning to a finalized Monitor-approved process for identifying indicia of potential bias that will be used to monitor and intervene on when necessary.

Further, MCSO continues to investigate disparities with its quarterly reports, which provide better insight into the disparities evidenced in the TSAR annual report and how to best address them. For example, information gleaned from this, and other quarterly reports inform training on constitutional policing and MCSO's community outreach efforts. MCSO provides ongoing CP-8 training and extensive training on constitutional, bias-free policing

The Community Outreach Division has increased efforts and partnerships with the Hispanic Community as we are emerging out of the pandemic. Specifically, MCSO has facilitated educational programs on criminal law, civil rights, detention, and drug education and has worked diligently to maintain working partnerships between MCSO and the communities it serves.

Through these efforts, and with cooperation with the Monitoring Team and Parties, MCSO has achieved 99 percent and 80 percent compliance with Phase 1 and Phase 2 of the First Order, respectively. And MCSO has attained 100 percent compliance in Phase 1 of the Second Order and 93 percent compliance with Phase 2 of the Second Order.

As noted previously in this report, these results may be an indication that MCSO's more recently implemented efforts to reduce traffic stop outcome disparities, have not yet had sufficient time to produce the desired impacts. MCSO is hopeful that the more recently implemented interventions will decrease disparities and remains committed to doing all it can to reduce disparities in traffic stop outcomes in the communities we serve.

CNA