



MARICOPA COUNTY SHERIFF'S OFFICE
Traffic Stops Quarterly Report 6
2020 Citations and Warnings

The background image for the title section is a photograph of the Maricopa County Sheriff's Office building at dusk. The building features a prominent, large, white, perforated metal canopy structure that is illuminated from within, creating a glowing effect against the dark blue sky. The building's facade is primarily glass, reflecting the ambient light.

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Traffic Stop Quarterly Report 6: Citations and Warnings
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This study was developed and conducted by Maricopa County Sheriff’s Office (MCSO) Traffic Stop Analysis Unit and Research and Reporting Unit. The methodology was approved by the Court Monitoring Team and Parties on October 5th, 2021. Due to the additional analyses requested by the parties this report was approved to satisfy requirements of Paragraph 65 of the First Order, as a Traffic Stop Quarterly Report for Quarter 4, 2021 and Quarter 1, 2022.

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EXECUTIVE SUMMARY

The sixth Traffic Stop Annual Report (TSAR) found disparity in citation rates between Hispanic and White drivers. To investigate those disparities, MCSO used the TSAR data in this quarterly research to comprehensively investigate other characteristics of traffic stops that led to citation and warning outcomes not studied in the TSAR. These characteristics included the number of violations indicated on citations and warnings, the specific offenses that were cited or warned and the reason motorists were stopped. These investigations also disaggregated stops at the County, District, and Beat levels, and by the time of day the stops occurred. MCSO also focused on speeding citations specifically as these violations are the most common traffic offense cited or warned by MCSO deputies. This included examinations of criminal versus civil citations and citations versus warnings. MCSO conducted an agreement analysis to identify violations that were not initially reported as the reason for the traffic stop and compared differences in rates of agreement for Hispanic and White drivers.

The research in this quarterly report aligned with the findings of the 6th TSAR, as the data used for both reports represented all stops from calendar year 2020. However, this report identified specific offenses and disparities in the outcomes of these stops not explored in the TSAR. Specifically, MCSO examined not only disparities in stop outcomes, but also disparities in documented driving behavior. This examination was approved as a mechanism to identify potential MCSO responses to the disparity in citation outcomes identified in TSAR 6 and to identify potential methodological adjustments to the TSAR and Traffic Stop Monthly Report (TSMR).

MCSO sought to answer the following questions:

1. What types of violations are identified as the reason a traffic stop was made? Is there a difference among racial/ethnic groups for the types of violations identified as the reason the traffic stop was made?

Stop Reason was categorized into six different categories: speeding, non-speed moving violation, equipment violation, license/registration/insurance, other/missing, and two or more stop reasons. Overall, Hispanic drivers were more likely to be stopped for non-speed related moving violations and equipment violations than White drivers. Statistically significant findings are discussed in the report, and all findings can be found in Appendix A.

2. Are Hispanic and White drivers cited or warned for the initial reason a stop was made?

Analysis of agreement for both Hispanic and White drivers indicate a very high level of agreement for each group at 94.9 and 97.5 percent agreement, respectively. Given the difference in rates of agreement, MCSO examined the violations that were most commonly associated with the lack of agreement.

Results suggest that certain types of violations are commonly discovered after the stop has been initiated for other reasons. All drivers are asked for license, registration, and insurance upon contact and these violations are the most often cited when the original stop reason was not the same as the violation. Further, DUI investigations were rarely indicated as the reason for a stop, which may be any observed violation such as failure to maintain lane, as deputies generally determine impairment, or the need to investigate for impairment, while interacting with the driver.

3. What is the racial/ethnic composition of drivers who receive citations and warnings by MCSO deputies?

This question is the same question from the TSAR 6 that led to further analyses. As such, the expected findings of disparity in citation rates between Hispanic and White drivers at the County level were reflected. At the County level, the citation rate for Hispanic drivers was approximately 5 percent higher than White drivers. This report disaggregates citations and warnings at the district, beat and time of day levels.

4. What type of violations do MCSO deputies issue citations and warnings for during traffic stops? Are different racial/ethnic groups issued citations and warnings for the various violation types?

At the County level, there was a statistically significant difference between Hispanic and White drivers for the civil traffic violation type, with Hispanic drivers cited at a rate approximately 6 percent higher than White drivers. The civil traffic violation type was near 50/50 for citations and warnings for both racial/ethnic groups; however, Hispanic drivers were slightly higher than 50 percent for citations in contrast to White drivers who were slightly lower than 50 percent for citations. There were also findings of disparate outcomes between Hispanic and White drivers by time of day, with 10 of the 24 hours having statistically significant differences in citation rate for Hispanic and White drivers.

5. What specific violations do MCSO deputies issue citations and warnings for during traffic stops and what are the frequencies of violations by ARS codes for citations and warnings? Are different racial/ethnic groups issued citations and warnings for various specific violations?

There were 148 statutes noted during traffic stops in 2020¹. The statutes were aggregated at the section level; it is notable that many statutes have subsections that further specify the nature of the offense. For this report, the analysis was done at the section level of statute. As an example, the most common offense across the County was 28-701, speeding. This statute has subsections that reference general civil levels of speed, criminal levels of speed, and speed within protected zones. MCSO had statistically significant differences in citation rate across 12 specific ARS statute violations at the office level. They were: 28-701 Speeding, 28-4135 Insurance, 28-925 Tail Lamps, 28-924 Head Lamps, 28-3151 No Driver's License, 28-2354 License Plate Display, 28-922 Lighted Lamps, 28-751 Position and Method of Turning, 28-754 Turn Signals, 28-927 Stop Lamps, 28-737 High Occupancy Vehicle Lane, and 28-3154 Learner's Permit violations.

6. Is there a difference among racial/ethnic groups in the number of violations per citation given?

Differences in the number of violations cited per traffic stop where a citation was issued were found to be statistically significant by two different measures: a) a t-test of mean number of violations per citation for Hispanics and White drivers and b) a Fisher's Exact Test of the violation count across the categories of the number of violations, 1-7. These tests identified that Hispanic drivers had a higher number of documented violations than White drivers at the County level and across all of the districts. These results are presented in the report, with complete findings available in Appendix E.

¹ Appendix K: Arizona Revised Statutes provides the complete list of violations referenced in 2020 traffic stops, with brief descriptions of each.

7. Are Hispanic drivers more or less likely than White drivers to receive a criminal citation for speeding when their approximate speed is recorded in the citation is above the threshold for distinguishing between civil and criminal violations?

Hispanic drivers were more likely to receive a criminal citation for speeds above the criminal speed threshold when compared to White drivers in the majority of models presented in this report. However, certain combinations of control variables erase the effect of race/ethnicity as a statistically significant predictor of whether a driver receives a criminal or civil citation. This was the case for six different variations of applied statistical controls, suggesting that, in part, some of the observed variation in criminal/civil citation disparity can be attributed to certain race-neutral characteristics of the stop.

Licensure, insurance, plate, and registration violations that are coupled with criminal speeding infractions have little effect on the likelihood that a driver will be cited for criminal speed. DUIs appear to be an important correlate of criminal speed citations. DUI violations are positively associated with the likelihood that a driver receives a criminal citation as opposed to a civil citation, for speeds above the criminal speed threshold.

Based on the bunching analysis, there was no evidence to suggest deputies downgrade speeds on citation forms, favoring White drivers, for speeds considered criminal. This finding was not surprising as deputies have the discretion to write civil citations for any speed above the criminal speed threshold.

8. Are Hispanic and White drivers issued citations and warnings at different rates for comparable speeds above the speed limit?

Hispanic drivers were more likely to receive a citation for speed rather than a warning when compared to White drivers in the majority of models presented in this report. However, certain combinations of control variables erase the effect of race/ethnicity as a statistically significant predictor of citation and warning activity for speeding. This was the case for six different variations of applied statistical controls. Of particular interest is one model which modeled the likelihood of receiving a citation for speed when speed was the only offense (Model 28)². This model used only race/ethnicity and speed binned in 5-MPH increments as predictors. This model found no difference in the citation rate for White and Hispanic drivers who are observed speeding at the same speed.

Licensure violations and speeding in school zones were the strongest predictors of whether a driver received a citation for speeding.

9. Is there a difference among racial/ethnic groups in how speed was measured as reported on the citation and warning forms.

Analyses were conducted to determine if there was any difference between Hispanic and White drivers on what speed measurement tool was used to determine the speed of the offending driver's vehicle. The methods employed by MCSO vary based on the availability of equipment and the circumstances of the initiation of the stop. The speed measurement devices used were categorized into one of 6 categories: laser,

² By limiting the analysis to speeding with one violation, this analysis sought to avoid the confounding effects of additional violations on the likelihood that a driver is cited for speed. In Model 28, N=10,031 for stops of Hispanic and White drivers.

pace, radar, time and distance, other, none/missing. The Office had statistically significant differences between Hispanics and White drivers across this speed measure. Statistically significant findings are presented at the County, district, and beat area in the report section, with complete results available in Appendix F.

The purpose of this and other Traffic Stop Quarterly Reports (TSQR) is to help understand the disparities observed in the TSAR reports and identify and investigate potential improvements to the TSAR and Traffic Stop Monthly Report (TSMR) reports and processes. Specific findings from this report have prompted MCSO to consider responses that include continuing current activities, providing data informed trainings, and applying additional community engagement strategies. Additionally, MCSO is continually monitoring data quality and making improvements as issues are identified. Findings from this report suggest that the introduction of additional controls, specifically around the violations cited and number of violations present in traffic stops will improve the measurement of disparity in outcomes across the Office. Statistically significant citation/warning outcome results are discussed in the report with all findings presented in the Appendices.

INTRODUCTION

The sixth Traffic Stop Annual Report (TSAR) uncovered increased disparity in citation outcomes between Hispanic drivers and White drivers when compared to the previous year's findings. Because of these findings MCSO committed to examining these stops comprehensively to develop a better understanding of the types of violations that might be associated with these disparities, and to identify administrative and geographic enforcement areas that may be targeted for response to address disparity. This research is the most in-depth examination of traffic stop activity ever conducted by MCSO. The goal of the research was to comprehensively examine patterns of citation and warning activity associated with MCSO's 2020 traffic stops and to determine whether race/ethnicity was related to a) the types of citations/warnings being issued, b) specific violations that were cited or warned, c) the number of violations on citations and warnings issued, d) the reason a stop was initiated, and e) whether certain violations are disproportionately cited with members of the plaintiff class. Additionally, the research sought to examine criminal speeding and speeding violations and warnings (the most common citation or warning given by MCSO deputies) to determine if Hispanic and White drivers were differentially cited/warned for speeding.

The contents of this report are organized as follows. First, the overarching research questions are explained with a discussion of relevant contextual and methodological considerations made by MCSO researchers. This information is provided to the reader to clarify why and how each research question was investigated. Second, an analysis of the agreement between the stop reasons identified and citation/warning outcomes is presented, which examines whether Hispanic and White drivers differ in whether the stop reason and the violations cited or warned differ from one another. Such an analysis can shed light on possible profiling and/or differential offending patterns for violations that are not apparent "on sight." Third, analyses of speeding outcomes are presented with a series of 83 logistic regression models that explore the effect of different statistical controls to help explain the role contextual factors play in leading to disparate outcomes (e.g., the speed the driver was traveling, and additional violations uncovered during the stop). Fourth, findings from descriptive analyses at the Office and District level are discussed, highlighting areas where stop outcome disparity was most prevalent. Finally, significant findings of beat-level disparities are presented and discussed. The report concludes with a summary of key findings and policy considerations for addressing these disparities.

METHODOLOGY

MCSO evaluated citation and warning data comprehensively by exploring fourteen different research questions at different levels of data aggregation. Each of these questions are listed and described below and relevant contextual and methodological considerations are discussed for each. Data for the research was drawn exclusively from 2020 traffic stop data which included demographic information on contacted drivers, the reason for the traffic stop, complete citation/warning information and other stop characteristics relevant to the research questions (N =20,348). Apart from one brief analysis of Incidental Contacts, only data on Hispanic and White drivers were used for racial and ethnic comparisons (N = 18,247). In these data sets, each case represented a stop with a single driver. Depending on the research question asked, the unit of analyses for the research were the traffic stop, or the violation as a single stop could have multiple violations (N = 20,481).

One caveat must be acknowledged regarding these data. Data on citation forms can be considered complete. When a citation is issued, a record is kept. However, data on warning forms is limited to written warnings as documentation of verbal warnings is incomplete. This reflects the operational process of issuing a verbal warning when multiple violations occur. MCSO policy requires deputies to document contact with drivers with four main forms: The vehicle stop contact form (VSCF) which are completed for every traffic stop; the citation form which is the citation(s) issued to the driver; the warning form that documents the violation for which motorists were warned; and incidental contact forms that document contact without any particular outcome.³ Should a driver have multiple violations, deputies have the option to document one or more violations in the citation and/or warning forms and offer verbal warnings for additional infractions. This practice is apparent in the data as deputies often indicate the practice in the comment box of the VSCF, e.g., “Cited registration but gave verbal warning for speed.” Because of this, certain research questions explore citation activity alone (e.g., criminal speed), while others utilize both citations and warnings as the outcome.

The following research questions are discussed throughout the report although the organization of the report does not align with the order these questions are presented here. All findings are available in Appendices A-J. Main results from the investigation are provided in the main body of the report.

1. *What is the racial/ethnic composition of drivers who receive citations and warnings by MCSO deputies?*
 - a. *At the County, District, and Beat levels*
 - b. *By time of day*

As a starting point for the investigation, all traffic-related citation and warning activity during 2020 was examined to determine the racial and ethnic composition of drivers who received citations and warnings. While this information is available in the TSAR 6 report, this quarterly research also explored the racial and ethnic distribution of stops at the district and beat levels, and by the time of day the stop was made. Thus, this information provides a more nuanced description of the racial/ethnic composition of drivers for administrative units (districts), patrol geography (beats) and time. Additional analyses investigate citation and warning activity at these same levels of analyses. The unit of analysis for this investigation was the traffic stop.

³ Additional forms are used by MCSO deputies when making traffic stops (e.g., incident reports, long forms, DUI documentation, etc.) Data from these forms were not used in the analyses, except to confirm certain outcomes observed in the data.

2. *What type of violations do MCSO deputies issue citations and warnings for during traffic stops?*

a. *At the County, District, and Beat levels*

b. *By time of day*

The TSAR and Traffic Stop Monthly Report (TSMR) utilize two violation types of traffic stops, civil and criminal, in their analyses. These are aggregate types of five different classes of offenses: civil traffic, criminal traffic, criminal (non-traffic), petty offenses, and incorrigible offenses. Deputies may issue multiple citations or warnings for different violation types (e.g., a civil speeding violation and a criminal drug offense) during a single stop. To address this, and explore citation outcomes for types of offenses, all violations were tabulated for all traffic stops, using all types at the office, district and beat levels and by the time of day. The unit of analysis for this investigation was the violation.

3. *What specific violations do MCSO deputies issue citations and warnings for during traffic stops and what are the frequencies of violations by Arizona Revised Statutes (ARS) codes for citations and warnings?*

a. *At the County, District, and Beat levels*

b. *By time of day*

MCSO deputies give citations and warnings for a variety of offenses. Drivers who are stopped for one traffic violation may be cited for other violations during the encounter. Drivers may also be cited or warned for multiple offenses. MCSO identified all ARS sections that were cited or warned during 2020 traffic stops and tabulated citations and warnings for each. The unit of analysis for this investigation was the violation. ARS subsections were not used in this analysis but aggregated into the main ARS sections. For example, ARS 28-701.A and 28-701.B were collapsed into ARS 28-701. This resulted in 148 aggregated ARS violation sections used during traffic stops. A list of these sections and their titles can be found in Appendix K. The unit of analysis for this investigation was the violation.

4. *What types of violations are identified as the reason a traffic stop was made?*

a. *Frequency of stop reason by categories (speed, non-speed moving, equipment, license/insurance/registration, and other violations) for all stops.*

b. *At the County, District, and Beat Levels*

c. *By time of day*

When MCSO deputies conduct traffic stops, they indicate the reason the stop was made. MCSO researchers identified these stop reasons and classified them into six categories using the stop reason field from the VSCF forms. Stop reasons in the VSCF were not uniform because deputies enter this information manually. For example, a speeding infraction may be entered as “Speeding,” “Speeding 15-20 over,” “701,” “701a.” etc. The categories were iteratively determined based on the content of the stop reasons field. Categories derived from the data included: speeding, non-speed moving violations, equipment violations, license/registration/insurance violations, other violations, and two or more stop reasons. Stop reason types

were tabulated at the office, district, and beat levels and by the time of day. The unit of analysis for this investigation was the traffic stop.

5. Are different racial/ethnic groups issued citations and warnings for the various violation types?

a. Frequency of violation type (criminal, criminal traffic, civil, petty, and incorrigible offense) by race/ethnicity (Hispanic/White) and outcome (citation or warning).

a. At the County, District, and Beat Levels

b. By time of day

MCSO investigated whether Hispanic and White drivers were differentially cited or warned for each of the various violation types. Because drivers can receive multiple citations and/or warnings for different types of offenses, each violation was categorized as criminal, criminal traffic, civil, petty, or incorrigible offense. This analysis was conducted for the Office as a whole, by district, beat and time of day. Fisher's Exact test was used to determine if the difference in proportions between White and Hispanic drivers were statistically significant. The unit of analysis for this investigation was the violation.

6. Are different racial/ethnic groups issued citations and warnings for various specific violations?

a. Frequency of violations by ARS codes with citations and warnings by race/ethnicity (Hispanic and White)

b. At the County, District, and Beat levels

c. By time of day

MCSO investigated the frequency of citations and warnings for specific ARS statutes and examined whether Hispanic or White drivers were differentially cited for specific offenses. These analyses were conducted for the Office as a whole, by district, beat and time of day. Fisher's Exact Test was used to determine if the difference in proportions of citations and warnings between White and Hispanic drivers was statistically significant. The unit of analysis for this investigation was the violation.

7. Is there a difference among racial/ethnic groups for the types of violations identified as the reason the traffic stop was made?

a. Frequency of stop reason by categories speed, non-speed moving, equipment, license/insurance/registration, and other violations by race/ethnicity (Hispanic/White).

b. At the County, District, and Beat Levels

c. By time of day

MCSO was interested in determining whether Hispanic and White drivers were contacted for different categories of traffic offenses. Using the categories of speed violations, non-speed moving violations, equipment violations, licensure/insurance/registration, other violations, and two or more stop reasons, we tabulated the reason for the stop by race/ethnicity. Chi-square and Fisher's Exact Tests were used to

determine if the difference in proportions for the different types of violation by race/ethnicity was statistically significant. The unit of analysis for this investigation was the traffic stop.

8. *Is there a difference among racial/ethnic groups in the number of citations given?*

- a. *Frequency of multiple violation stops by race/ethnicity for when a citation was issued.*
- b. *Average number of violations issued per stop by race/ethnicity (Hispanic/White) when a citation was issued*
- c. *At the County, District, and Beat levels*
- d. *By time of day*

Each traffic stop typically involves at least one violation (attempt to locate, be on the lookout for (BOLO), and similar stops excepted). However, many traffic stops may result from multiple violations or additional violations can be discovered upon contact with the driver (e.g., DUIs., license/insurance/registration violations). MCSO was interested in determining whether Hispanic and White drivers were differentially cited for multiple offenses. This analysis reports the average number of offenses cited when a citation was given. Warnings were excluded from this analysis because not all warnings are documented, e.g., verbal warnings. For this investigation, the unit of analysis was the traffic stop where citations were issued. T-tests were employed to determine statistical significance between the average number of offenses per citation issued for Hispanic and White drivers.

9.⁴ *What is the average length of stop for violation types (criminal, criminal traffic, civil, and petty), ARS codes, stop reason categories, and number of violations?*

- a. *We report the mean, median, standard deviation, skewness (percent above mean) for stop length by violation type, ARS code, stop reason categories and number of violations*
- b. *At the County, District, and Beat levels*
- c. *By time of day*

The length of a traffic stop changes depending on different circumstances. For example, criminal traffic citations may take longer to process than civil. This analysis sought to identify the legal characteristics of stops and their relationship to stop lengths. The analysis identified the ARS violation, the number of violations, what violations were cited or warned and whether the stop reason may be contributing to longer stops. The unit of analysis for the investigation of stop length for violation types and ARS codes was the violation. The unit of analysis for stop reasons and the number of violations was the traffic stop.

⁴ These stop length results are not discussed in the main body of this report. They are presented in the relevant Appendices G-J.

10.⁵ *Is there a difference among racial/ethnic groups in the average length of stop for violation types (criminal, criminal traffic, civil, petty, and incorrigible offense), ARS codes, stop reason categories and number of violations?*

a. We report the mean, median, standard deviation, skewness (percent above mean) for stop length by violation type, ARS code, stop reason categories and number of violations⁶ for different racial/ethnic groups (Hispanic/White)

b. At the County, District, and Beat levels

c. By time of day

MCSO sought to determine whether contextual factors influenced the length of stop for violation types—different ARS codes, stop reasons and the number of violations identified per stop. However, MCSO also sought to determine whether stop length was different for Hispanic and White drivers given these contextual factors. The unit of analysis for this investigation of stop length for types and ARS codes was the violation. The unit of analysis for stop reasons and the number of violations was the traffic stop. Main findings from this examination are not discussed in the body of this report. However, all results are available in Appendices G–J.

11. *Is there a difference among racial/ethnic groups in how speed was measured as reported on the citation and warning forms.*

a. Frequency and rates for speed estimated by Lidar/Radar use and other means (e.g., pacing) for racial/ethnic groups (Hispanic and White)

b. At the County, District, and Beat levels

c. By time of day

MCSO deputies measure speed in a variety of ways. This analysis sought to determine whether Hispanic and White drivers were identified for potential stops using different speed measurement methods. The unit of analysis for this investigation was the traffic stop. Different types of stops indicate different speed information (e.g., reckless driving or stop sign violations). Thus, all stops were included in the analysis and the analysis included stops when a speed measurement device or method was not identified on the citation or warning forms.

12. *Are Hispanic drivers more or less likely than White drivers to receive a criminal citation for speeding when their approximate speed is recorded in the citation is above the threshold for distinguishing between civil and criminal violations?*

a. Report the proportion of drivers from different racial/ethnic groups who are charged criminally at different speeds.

⁵ These stop length results are not discussed in the main body of this report. They are presented in the relevant Appendices G–J.

⁶ Examination of the difference in stop lengths between Hispanic and White drivers, by the number of violations, was only conducted at the County level.

b. Model the speeding citation type (civil/criminal) as a function of race/ethnicity using logistic regression and relevant controls for stop and driver characteristics including mph over the criminal speed threshold, stop location, time of day, driver's age, driver's gender, and driver's zip code income level.⁷ Controls for additional offenses were also used (e.g., license, registration, and insurance violations).

Speeding violations are the most common traffic violation for which MCSO deputies make a stop. MCSO sought to determine whether Hispanic drivers received criminal speeding citations (as opposed to civil speeding citations) more often, at similar speeds, than White drivers. To investigate this, a series of logistic regression models were used to model Civil/Criminal stop outcomes for Hispanic and White drivers while controlling for driver demographic information and certain characteristics of the stops: stop location, time of day, and MPH over the criminal speed threshold. Additional controls were investigated to determine whether receipt of a criminal citation was a function of additional offenses. MCSO also investigated whether there was evidence of “downgrading” speeds for different drivers at or below the criminal speed threshold by using a bunching analysis of citations for speeding violations.

Some clarification on the criminal speed threshold is required. Three circumstances exist for criminal speed based on Arizona Revised Statutes. These include:

- i. Exceed thirty-five miles per hour approaching a school crossing.
- ii. Exceed the posted speed limit in a business or residential district by more than twenty miles per hour, or if no speed limit is posted, exceed forty-five miles per hour.
- iii. Exceed eighty-five miles per hour in other locations.

MCSO utilized stop data to identify speeding violations approaching school crossings and GIS software and “Existing Land Use” shapefiles from the Maricopa County Association of Governments (2020) to identify stops in business/residential areas and areas that were not considered business and residential. Speed above the criminal threshold was coded according to the three legally defined thresholds given each conditional requirement for criminal speed and binned in 5-MPH increments (e.g., 1-5 MPH over, 6-10 MPH over, 11-15 MPH over, etc.).

Two main approaches were used in modeling criminal speeding citations. The first used speeding citations where there was one violation only—one speeding offense. The second used all citations when deputies issued a citation for speeding. This model sought to determine whether additional violations impact the likelihood of receiving a criminal citation for speeding. In both cases, the unit of analysis was the individual traffic stop.

⁷ Income was measured via proxy, using the median household income of the driver's zip code. These data were acquired from the U.S. Census Bureau, American Community Survey, 5-year estimates from 2019. An additional variable for the estimated value of the vehicle was discussed in the proposal for this research. However, upon inspection of the vehicle information data, it was determined that vehicle prices could not be determined for the majority of cases because of incomplete or vague descriptions of vehicle makes and models.

13. Are Hispanic and White drivers issued citations and warnings at different rates for comparable speeds above the speed limit?

- a. Report the proportion of drivers from different racial/ethnic groups who are cited at different speeds above the speed limit.*
- b. Model citation and warning outcomes for Hispanic and White drivers as a function of speed above speed limit and relevant controls stop location, time of day, driver's age, driver's gender, and driver's zip code income level.*
- c. Model citation and warning outcomes as a function of*

MCSO explored whether drivers were cited for speeding as a function of race/ethnicity, with age, gender, median income of the driver's zip code, MPH over speed limit—binned in 5-MPH increments (e.g., 1-5 MPH over, 6-10 MPH over, 11-15 MPH over, etc.), geography, time of day, safety corridors, and school zones acting as statistical controls. Controls for additional offenses were included in the modeling process to determine whether additional offenses influence the likelihood of receiving a citation for speeding.

14. Are Hispanic and White drivers cited or warned for the initial reason a stop was made?

- a. Agreement analysis to determine whether the difference in stop reason/citation activity is statistically different for the different groups.*

To conduct the agreement analysis, initial stop reason was coded into five different categories: speeding, non-speed moving violations, equipment violations, other violations, and two or more stop reasons. Following this, each stop was coded with outcomes for citations or warnings, using ARS codes, within these categories. MCSO used Cohen's Kappa to determine the level of agreement between stop reason and cite/warn violation. Further, independent sample t-tests were used to determine whether the differences in the proportion of Hispanic and White drivers in their level of agreement were statistically significant.

The remainder of this report provides results of the above investigations. Results are organized based on the level of analysis with Office and District analyses presented first, followed by beat. All results are provided in Appendices A–J, including those not discussed in the main body of the report.

MULTIVARIATE ANALYSES

FINDINGS

Results of this research identified a number of specific disparities in outcomes for Hispanic drivers at different levels of analyses (County, district, beat). The analyses also identify disparity in offenses that were documented in citation and warning forms. In this section we detail those findings and note when results were statistically significant. This results section is organized as follows. First, a brief analysis of incidental contacts is presented, identifying their rate of occurrence for all racial/ethnic groups and tests whether any racial/ethnic group differentially experience incidental contact during traffic stops. Second, results from the agreement analysis are presented and discussed, identifying whether Hispanic or White drivers were more likely to be cited or warned for violations different from the initial stop reason. Third, a series of regression results are presented and discussed modeling criminal speed and speeding outcomes and the impact additional violations have on the likelihood a driver will receive a criminal/civil citation, or citation/warning. Findings are discussed for each approach used in the logistic regression modeling.

INCIDENTAL CONTACTS

Incidental contacts between MCSO deputies occur when a traffic stop is initiated, and drivers are not issued citations or warnings. Review of comments from all incidental contact stops showed a variety of circumstances that resulted in incidental contact. Deputies most commonly used incidental contact forms when they were required to attend priority calls. Other reasons for incidental contacts included driver medical emergencies, no violations upon further investigation, contacting on-duty law enforcement, drivers who fled, MVD errors, or deputy errors (e.g., contacting the wrong vehicle). In several instances, deputies allowed other law enforcement to administer the stop once it had been initiated (e.g., National Forest Service or municipal police).

Incidental Contacts are excluded from subsequent analyses in this report. However, MCSO conducted a brief investigation of the contents of these stops to determine if race/ethnicity was associated with incidental contact outcome frequency. Table 1 reports the frequency of incidental contact stops by race/ethnicity. Fisher’s Exact Test found no statistically significant differences in incidental contact rates among racial/ethnic groups ($p=0.163$).

Table 1: Frequency of Incidental Contact, by Race/Ethnicity

Driver Race/Ethnicity	Total Number Stops	Number of Incidental Contacts	Incidental Contact % of Total Stops
Asian	462	6	1.30%
African American	1,415	8	0.57%
Hispanic	4,704	34	0.72%
Native American	224	3	1.34%
White	13,543	81	0.60%
Total	20,348	132	0.65%

AGREEMENT ANALYSIS

MCSO conducted an agreement analysis of initial stop reasons and ARS codes that were cited or warned. The analysis sought to determine whether Hispanic drivers were more or less likely to obtain a citation or warning for the driving behavior indicated by the deputy as the reason for the stop. Six cases were coded as “other” because deputies entered the wrong information in the stop reason field on the VSCF. These were included in the analysis although agreement between stop reasons and citation or warning results could not be determined for these cases. Categories matched for agreement were speeding violations, non-speed moving violations, equipment violations, registration/licensure/insurance/plates (Documentation), other violations, and two or more stop reasons. “Other violations” include several uncommon violation types such as Off Highway Vehicle (OHV) use by a minor without a helmet, cell phone use, BOLO and attempt to locate stops, load violations, littering, trespassing, and others. For stop reasons that indicated two or more violation types, agreement was assigned if at least one of the reasons for the stop was cited or warned. Results of the agreement analysis are provided in Table 2 below.

Table 2: Agreement between Stop Reasons and Violations that were Cited or Warned

	Hispanic Drivers		White Drivers	
	Percent Agreement	Number cases not in agreement	Percent Agreement	Number cases not in agreement
Speeding	97.09%	78	98.23%	149
Non-Speed Moving Violations	93.49%	63	97.23%	67
Equipment Violations	89.64%	57	94.18%	68
Documentation	91.40%	27	97.23%	31
Other	91.20%	11	96.46%	16
2 or More Stop Reasons	96.43%	1	100%	0
Overall	94.93%	237	97.54%	331
Kappa (SE)	0.918*** (0.005)		0.957*** (0.005)	
Z	104.87		179.38	

Analysis of agreement for both Hispanic and White drivers indicate a very high level of agreement for each group at 94.9 and 97.5 percent agreement, respectively. A t-test for difference in proportions indicated that the difference in agreement between Hispanic drivers and White drivers was statistically significant ($t=8.843$, $p<0.001$). Because this difference was uncovered, MCSO examined what types of violations were cited for each group when agreement did not exist. Tables 3 and 4 provide this information for Hispanic and White drivers, respectively. Note that the number of violations listed in Tables 3 and 4 are greater than the number of stops without agreement because multiple violations may be cited or warned during a single stop. ARS codes and shorthand descriptions of the offenses are provided to clarify the differences in these outcomes.

Table 3: Violations Cited or Warned when Agreement between Stop Reason and Citation/Warning did not Exist, Hispanic Drivers

ARS Code	Cite	Warn	ARS Code	Cite	Warn
4-251 Alcohol in Vehicle	4	0	28-1381 DUI	27	0
13-3102 Weapons	1	0	28-1382 DUI	10	0
28-644 Obey Traffic Control Device	1	0	28-1383 Agg. DUI	1	0
28-645 Red Light Violation	1	0	28-2153 Registration	14	1
28-693 Reckless Driving	6	1	28-2158 Registration	1	1
28-701 Speed	3	3	28-2322 Foreign License Plate	0	1
28-729 Failure to Maintain Lane	1	1	28-2354 Plates	2	6
28-754 Illegal Turn	1	2	28-2355 Plate tabs/stickers	0	1
28-775 Emergency Vehicles	2	0	28-1464 Ignition Interlock	2	0
28-797 School Crossing	1	0	28-2512 OHV Plate	0	1
28-855 Stop Sign	1	0	28-2531 Registration	4	0
28-871 Parking on Highway	0	1	28-2532 Registration	8	0
28-873/874 Parking	2	0	28-2533 Registration	0	1
28-907 Child Restraint	1	0	28-3151 Licensure	58	0
28-909 Seat Belt	8	0	28-3154 Instruction Permit	3	0
28-922 Lamps at Dark	0	1	28-3155 Restricted Instruction Permit	1	0
28-924 Headlights	0	2	28-3169 Licensure	5	0
28-925 Taillights	0	5	28-3415 Licensure	1	0
28-931 Lamp Colors	1	0	28-3473 Suspended License	18	0
29-939 Turn Signal	0	1	28-3480 License Restriction	1	0
28-964 OHV Helmet (Minor)	3	1	28-3482 Suspended License	29	0
28-981 Equipment	1	1	28-4135 Insurance	32	1
P12.B1 Curfew Violation	1	0	28-4139 Plate	9	0
P28.3.B OHV Violation	2	0	34-145 False Registration	0	1

As is apparent in Table 3, Hispanic drivers were most often cited with licensure violations (ARS 28-3151, 28-3473, 28-3482) when there was not agreement between stop reason and citation/warning result. Hispanic drivers also had a high number of DUI offenses (n=38) and registration violations (n=27; ARS 28-2153, 28-2158, 28-2531, 28-2532) relative to other violations when agreement was not met.

Similarly, in Table 4, White drivers had a high number of insurance (n=70; ARS 28-4135) and suspended license violations (n=47; ARS 28-3473 and 28-3482) relative to other violations. White drivers had a high number of DUI violations (n=36) when agreement was not met. In contrast to Hispanic drivers, White drivers did not have a high number of licensure violations for ARS 28-3151.

These results suggest that certain types of violations are commonly discovered after the stop has been initiated for other reasons. All drivers are asked for license, registration, and insurance upon contact and these violations are the most often cited when the original stop reason is not the same as the violation. Further, DUI investigations are rarely indicated as the reason for a stop as deputies generally determine impairment during interaction with the driver. Additional analyses of these types of violations are provided below in the logistic regression analysis.

Table 4: Violations Cited or Warned when Agreement between Stop Reason and Citation/Warning did not Exist, White Drivers

ARS Code	Cite	Warn	ARS Code	Cite	Warn
4-251 Alcohol in Vehicle	2	0	28-981 Equipment	0	2
4-244 Supply Alcohol to Minor	1	0	28-1179 OHV Equipment	1	0
13-2809 Evidence Tampering	1	0	28-1228 Insurance	1	0
13-2907 False Reporting	1	0	28-1381 DUI	25	0
28-448 Address Change	1	0	28-1382 DUI	11	0
28-622 Failure to Comply	1	0	28-1464 Ignition Interlock	1	0
28-645 Red Light Violation	2	0	28-2153 Registration	29	1
28-693 Reckless Driving	13	1	28-2158 Registration	8	1
28-695 Aggressive Driving	3	0	28-2322 Foreign License Plate	0	1
28-701 Speed	3	3	28-2354 Plates	1	5
28-727 No Passing Zones	1	0	28-2355 Plate tabs/stickers	0	1
28-729 Failure to Maintain Lane	2	2	28-2512 OHV Plate	0	1
28-754 Illegal Turn	0	2	28-2531 Registration	2	0
28-775 Emergency Vehicles	1	2	28-2532 Registration	31	0
28-797 School Crossing	0	1	28-2533 Registration	0	1
28-855 Stop Sign	3	1	28-3151 Licensure	10	0
28-871 Parking on Highway	0	1	28-3156 Instruction Permit	1	0
28-873/874 Parking	0	2	28-3169 Licensure	3	0
28-907 Child Restraint	0	0	28-3316 Foreign License Suspended	1	0
28-909 Seat Belt	11	0	28-3473 Suspended License	26	0
28-922 Lamps at Dark	1	1	28-3480 License Restriction	1	0
28-924 Headlights	0	2	28-3482 Suspended License	28	0
28-925 Taillights	0	5	28-4135 Insurance	70	1
28-939 Turn Signal	0	1	28-4139 Plate	5	0
28-959 Window Tint	0	5	34-145 False Registration	0	1
28-964 OHV Helmet (Minor)	1	2			

BUNCHING AND LOGISTIC REGRESSION RESULTS

A bunching analysis of citation/warning outcome was used to determine if deputies report lower speeds for White drivers when compared to Hispanic drivers when issuing a citation for speed and speed alone. This analysis sought to determine whether deputies “downgrade” White drivers more often to civil citations by reporting speeds below the criminal threshold.⁸

Following the bunching analysis, MCSO investigated speeding citation activity to determine if Hispanic and White drivers have differential outcomes when speeding citations were issued. Four series of regression analyses were used to conduct this investigation. The first series models speeding citations only, when only one violation was documented, to determine if Hispanic drivers are more likely to receive a criminal speeding citation (as opposed to a civil citation) than White drivers. The choice of single speeding violation citations was methodological. By doing so, MCSO eliminated the confounding effects of citations with multiple violations. This also isolated the effects of different stop characteristic and driver characteristic independent variables on the likelihood of a criminal citation for speed and speed alone.

The second analysis models all citations when speed was cited and includes citations where speed and other violations were documented (e.g., speeding and an insurance violation). This analysis explores whether additional violations had an effect on the likelihood that a criminal citation was issued. The third series of analyses use all citations and warnings for speed (with no additional violations documented) and models the citation outcome to determine whether Hispanic drivers are more likely than White drivers to receive a speeding citation, rather than a warning, when controlling for stop characteristics and driver demographics. The fourth series of analyses uses all citations and warnings where speed was cited or warned. This analysis investigates whether additional violations increase the likelihood that the driver will receive a citation. Variables and their operators used in the following analyses are listed in Table 5 below.

⁸ The bunching analysis was requested by the DOJ to determine if deputies are more likely to record speeds differently depending on the race of the driver.

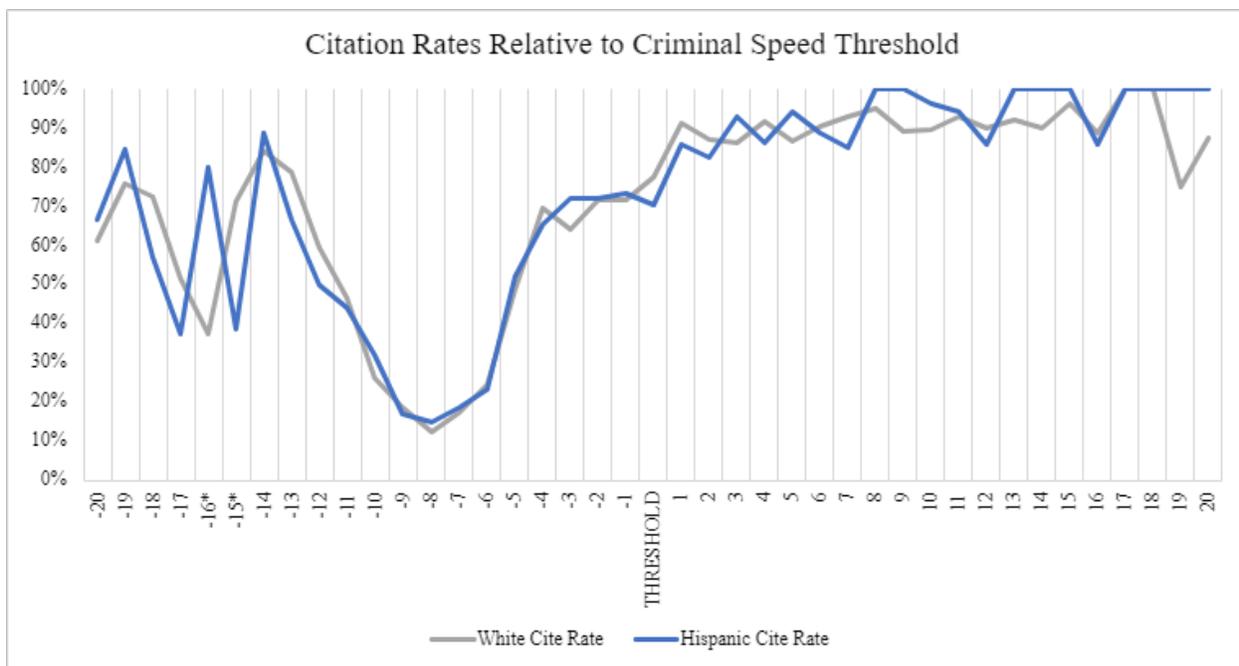
Table 5: Variables used in regression models and their operators

Beat	Beat the stop was made in	Plate	No violation = 0 Violation = 1
Cite/Warn	Driver warned = 0 Driver cited = 1	Race/Ethnicity	White = 0 Hispanic = 1
Civil/Criminal	Civil citation = 0 Criminal citation = 1	Registration	No violation = 0 Violation = 1
Driver's Age	Measured in years	Safety Corridor	Not in safety corridor = 0 Safety Corridor stop = 1
Driver's Sex	Female = 0 Male = 1	School Zone	Not in school zone = 0 School zone violation = 1
DUI	No violation = 0 Violation = 1	Speed Bins	MPH over the speed limit in 5 MPH increments
Insurance	No violation = 0 Violation = 1	Time of day	Measured in Hours as a 24-hour clock beginning at 5:00 am
Licensure	No violation = 0 Violation = 1	Total Violations	Total number of violations cited or warned for the stop.
Median income of driver's zip code	Median income of the driver's zip code, in thousands	X Coordinate	Longitude
MPH over Criminal Speed Threshold	Reported number of MPH over the criminal speed threshold	Y Coordinate	Latitude
MPH over Speed Limit	Reported number of MPH over speed limit.		

Bunching Analysis of Speeding Citation Outcomes

Figure 1 provides a graphical display of citation rates for White and Hispanic drivers, relative to the threshold for criminal speed. Stops with only one violation for speeding were utilized in this analysis to avoid the confounding effects of multiple violation citation activity. This analysis was requested by the DOJ and seeks to determine whether deputies are more lenient with White drivers by underreporting the speed observed to just below the criminal speeding threshold. If deputies intentionally downgraded the recorded speed for White drivers to avoid criminal charges, data would indicate a difference in citation rates immediately below the criminal speed threshold. Based on this analysis, there is no evidence of this practice as Hispanic and White citation rates for speeding are comparable across all speed differences except for speeds at 15 and 16 MPH below the criminal speed threshold. This finding was unsurprising as deputies have the discretion to issue a criminal or civil citation at speeds above the criminal speeding threshold.

Figure 1: Citation Rates at Speeds Above and Below Criminal Speed Threshold



One note of mention regarding the findings in Figure 1 is required. Citation rates that were high for speeds 10 to 20 miles under the criminal threshold represent stops that were made in rural areas with relatively low speed limits. For example, areas in Tonto National Forest near the Salt River often have relatively low speed limits (e.g., 45 MPH) for road safety, but are not considered business/residential or school zones. The threshold for criminal speed in these areas is 85 MPH. Thus, a motorist driving 65 MPH would be speeding at 20 MPH over the posted speed limit yet, would be 20 MPH under the criminal speed threshold. To put these numbers in context, the number of stops made for speeds 20 MPH below the criminal speed threshold is relatively low compared to the number of stops near the threshold. For example, at 20 MPH below the

threshold, 35 of 57 stops of White drivers resulted in a citation (61.4%) and 12 out of 18 stops of Hispanic drivers resulted in a citation (66.7%). Whereas the number of stops at one MPH below the criminal speed threshold are much higher. At one MPH under the threshold 283 of 396 White drivers were cited for speeding (71.5%) and 74 of 101 Hispanic drivers were cited at this speed (73.3%). This difference in citation rates for White and Hispanic drivers, at one MPH below the criminal speed threshold, was not statistically significant.

Logistic Regression and Civil/Criminal Citations for Speeding

As a starting point for the analysis Table 6 below provides a tabulation of the stops used in the civil/criminal modeling of citation outcomes in Tables 7-12, and the stops used in the cite/warn analysis of speed in Tables 13-19. This information is provided to contextualize citation activity for speeding as a single offense and speeding violations coupled with other violations. The regression models below in Tables 7-12 interrogate whether Hispanic drivers are more likely to be cited with a criminal speeding offense (as opposed to civil) utilizing different combinations of control variables. While the central focus is on the effect of race/ethnicity on the likelihood of receiving a criminal or civil citation for speed, MCSO investigated the effects of additional violations to determine whether the receipt of a criminal speeding violation is a function of additional violations. Tables 13-20 present analyses of speeding citation and warning activity to determine whether Hispanic drivers were more likely than White drivers to be cited for speed. Like the examination of civil/criminal citation activity. MCSO wished to investigate whether additional violations impact the likelihood that a speeding citation will be issued.

Table 6: Tabulation of Citation Outcomes for Speeding and Special Enforcement Areas, by Race/Ethnicity

	Single Citation for Speeding		Speeding Citations Coupled with Additional Violations	
	Hispanic	White	Hispanic	White
Criminal Citation	128	194	166	240
Civil Citation Above Criminal Threshold	385	1,010	459	1,100
Total Speeding Stops Receiving Citation	1,369	4,305	1,654	4,694
Citation	1,369	4,305	1,654	4,694
Warning	924	3,456	962	3,592
Total Speeding Stops	2,293	7,761	2,616	8,286
Citation	19	67	37	74
Warning	24	75	21	79
Safety Corridor Stops	43	142	58	153
Citation	22	127	23	130
Warning	6	14	6	18
School Zone Stops	28	141	26	148

Table 7 below provides five logistic regression models predicting the likelihood of receiving a criminal or civil citation for speeding. Only stops with speeding citations alone (no other offenses) and stops where the driver exceeded the criminal speed threshold were used in this estimating procedure. Without any controls (Model 1), Hispanic drivers were about 73 percent more likely to receive a criminal citation (rather than civil) for speed than White drivers. When demographic controls of driver's age, sex, and the median income of the driver's zip code are added to the model (Model 2), the odds of Hispanic drivers receiving a criminal citation are reduced to 1.394. Thus, with demographic controls included in the model, Hispanic drivers are about 39 percent more likely to receive a criminal citation. The odds ratios for race/ethnicity for both of these models were statistically significant at the $p < 0.001$ level and $p < 0.05$, respectively.

In Model 3, stop characteristics of location, time of day, and MPH over the criminal speed threshold (binned in 5-MPH increments) are included as statistical controls and the demographic information for the driver of age, sex, and the median income of driver's zip code are removed from the model. When controlling for stop characteristics alone, Hispanic drivers are about 43 percent more likely to receive a criminal citation when compared to White drivers. This finding was statistically significant at the $p < 0.05$ level. Stop characteristics of speed in 1-5 MPH and 6-10 MPH bin, X and Y coordinates and Time of day were all statistically significant control variables. Model 4, the Composite model, includes all demographic and stop characteristic controls. In Model 4, the effect of race/ethnicity was not statistically significant, while income, 1-5 MPH, 6-10 MPH speed bins, X-Coordinates, Y-Coordinates, and Time of day all remained statistically significant predictors of whether a driver is cited criminally in lieu of a civil citation for speeding. When income is removed as a statistical control (Model 5), the odds ratio indicates that Hispanic drivers are 1.4 times or 40 percent more likely than White drivers to receive a criminal speeding citation. This finding was statistically significant at the $p < 0.05$ level. Statistical controls in this model included the age and sex of the driver, and stop characteristics of speed, location (X and Y coordinates) and time of day.

As requested by experts with the U.S. Department of Justice, MCSO modeled the likelihood of receiving a criminal versus a civil citation as a function of stop characteristics alone (speed above the criminal speed threshold, time of day and location), with geography specified as patrol beats instead of Cartesian coordinates (X and Y). The results of these analyses are available in Table 8 below.

Based on the findings presented in Table 8 (Model 6), Hispanic drivers were almost 16 percent more likely to receive a criminal citation than White drivers, but this finding was not statistically significant. Time of day, speed bins of 1-5 MPH, 6-10 MPH, 16-20 MPH, 21-25 MPH, and 26-30 MPH were all statistically significant predictors of the driver receiving a criminal citation in lieu of a civil citation.⁹

⁹Additional variations of the "Beats" model (Model 6) were explored but are not fully presented here due to space considerations. With the demographic controls of age and sex added to the Beats model, the odds of a Hispanic driver receiving a criminal citation were 1.082 and were not statistically significant. When the odds of a criminal/civil citation were modeled as a function of speed and beats alone (no additional controls), the odds of Hispanic drivers receiving a criminal citation were 1.181 and were not statistically significant. Full models for these specifications are available upon request.

Table 7: Civil/Criminal Citation Outcomes Using Stops with Speed Violations Only (One Offense, White and Hispanic Stops Only), Binned Speeds

Variable	Race & Ethnicity Alone:	Demographic Controls:	Stop Characteristics & Race:	Composite Model:	Reduced Model (No Income):
	Model 1	Model 2	Model 3	Model 4	Model 5
	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.731*** (0.223)	1.394* (0.199)	1.433* (0.224)	1.260 (0.212)	1.400* (0.221)
Age	--	0.985*** (0.004)	--	0.992 (0.003)	0.992 (0.005)
Sex	--	1.506** (0.211)	--	1.248 (0.196)	1.255 (0.194)
Median Income of Driver's ZIP	--	0.991** (0.003)	--	0.991** (0.003)	--
1-5 MPH over Threshold	--	--	0.010*** (0.011)	0.009*** (0.010)	0.011*** (0.012)
6-10 MPH over Threshold	--	--	0.034** (0.037)	0.030** (0.033)	0.036** (0.039)
11-15 MPH over Threshold	--	--	0.104* (0.113)	0.093 (0.102)	0.111 (0.121)
16-20 MPH over Threshold	--	--	0.359 (0.403)	0.289 (0.326)	0.361 (0.405)
21-25 MPH over Threshold	--	--	0.223 (0.258)	0.171 (0.199)	0.205 (0.238)
26-30 MPH over Threshold	--	--	0.444 (0.564)	0.395 (0.504)	0.444 (0.565)
X Coordinate	--	--	1.545* (0.321)	1.633* (0.348)	1.538* (0.322)
Y Coordinate	--	--	0.312*** (0.093)	0.385* (0.120)	0.318*** (0.095)
Time of Day	--	--	0.961** (0.013)	0.958** (0.013)	0.957** (0.013)
Constant	0.192*** (0.015)	0.495* (0.149)	1.47e+39** (3.98e+40)	1.64e+39** (4.52e+40)	5.16e+38 (1.40e+40)
R ²	0.011	0.032	0.201	0.204	0.203
χ ²	17.72***	50.58***	329.49***	323.70***	331.83***
N	1,717	1,674	1,710	1,667	1,706

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Female drivers are the reference category; Stops in bins greater than 30 MPH above the criminal speed threshold were automatically removed from the model due to collinearity.

Table 8: Model 6—Logistic Regression Results for Civil/Criminal Speed Violations Outcomes Using Stops with Speed Violations Only—One Offense, White and Hispanic Stops Only (N = 1,610)

DOJ—Model Request #2: Race/Ethnicity, Stop Characteristics, and Beats					
Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)
Race/Ethnicity (Hispanic)	1.156 (0.212)	Time of Day	0.963* (0.015)		
Speed					
0-5 MPH Over Threshold	0.004*** (0.005)	11-15 MPH Over Threshold	0.051 (0.061)	21-25 MPH Over Threshold	0.144*** (0.181)
6-10 MPH Over Threshold	0.015*** (0.018)	16-20 MPH Over Threshold	0.250*** (0.301)	26-30 MPH Over Threshold	0.810*** (1.295)
Beats					
Beat 1	0.692 (1.041)	Beat 25	0.100 (0.149)	Beat 49	Omitted ^a
Beat 2	0.373 (0.553)	Beat 26	0.022 (0.377)	Beat 50	Omitted ^a
Beat 3	0.467 (0.744)	Beat 27	0.257 (0.384)	Beat 51	Omitted ^a
Beat 4	0.065 (0.130)	Beat 28	Omitted ^a	Beat 52	Omitted ^a
Beat 5	0.404 (0.616)	Beat 29	Omitted ^a	Beat 53	0.400 (0.823)
Beat 6	Omitted ^a	Beat 30	Omitted ^a	Beat 54	Omitted ^a
Beat 7	0.476 (0.749)	Beat 31	0.083 (0.139)	Beat 55	Omitted ^a
Beat 8	2.506 (4.371)	Beat 32	0.080 (0.121)	Beat 56	Omitted ^a
Beat 9	0.423 (0.630)	Beat 33	0.120 (0.180)	Beat 57	Omitted ^a
Beat 10	1.566 (2.381)	Beat 34	0.103 (0.152)	Beat 58	0.082 (0.131)
Beat 11	0.319 (0.471)	Beat 35	0.269 (0.417)	Beat 59	Omitted ^a
Beat 12	Omitted ^a	Beat 36	0.028 (0.045)	Beat 60	0.044 (0.079)
Beat 13	0.180 (0.265)	Beat 37	3.772 (7.152)	Beat 61	0.241 (0.381)
Beat 14	Omitted ^a	Beat 38	4.427 (8.102)	Beat 62	0.051 (0.084)
Beat 15	0.098 (0.166)	Beat 39	0.983 (1.651)	Beat 63	0.150 (0.250)
Beat 16	1.240 (1.883)	Beat 40	1.281 (2.360)	Beat 64	0.175 (0.260)
Beat 17	Omitted ^a	Beat 41	Omitted ^a	Beat 65	0.326 (0.521)
Beat 18	0.788 (1.167)	Beat 42	Omitted ^a	Beat 66	0.179 (1.161)
Beat 19	0.088 (0.131)	Beat 43	0.635 (1.171)	Beat 67	1.191 (0.351)
Beat 20	Omitted ^a	Beat 44	0.006 (0.013)	Beat 68	0.055 (0.103)
Beat 21	0.386 (0.573)	Beat 45	Omitted ^a	Beat 69	Omitted ^a
Beat 22	Omitted ^a	Beat 46	Omitted ^a	Beat 70	Omitted ^a
Beat 23	0.070 (0.116)	Beat 47	Omitted ^a	Beat 71	Omitted ^a
Beat 24	0.055 (0.081)	Beat 48	0.108 (0.163)		
Constant	124.087 (231.087)	$R^2 = 0.304$		$\chi^2 = 478.89$	

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Stops with speed bins above 30 MPH over the criminal threshold were thus excluded from the model because of collinearity; ^aVariables omitted because there was no variation in this condition.

Consideration of Models 4, and 5 together suggest that socioeconomic class is likely playing a role in the disparate outcomes in criminal citations for Hispanic drivers. However, because these models use only citations for speeding and speeding alone, additional legal factors influencing the likelihood of receiving a

criminal citation remain either uncontrolled (e.g., additional violations) or unaccounted for (e.g., traffic conditions or safety considerations).

In addition to single offense criminal speeding violations, MCSO considered certain additional offenses as possible contributors to the likelihood that a criminal citation was issued. That is, do additional offenses associated with a driver's ability to finance the driving privilege impact the likelihood of receiving a criminal citation for speeding at speeds above the criminal speed threshold? Drivers in Arizona are required to possess a driver's license and the vehicle they are driving must be registered, have valid plates, and covered by an insurance policy¹⁰. In the pages that follow, we report our findings investigating whether additional legal factors play a role in the likelihood that a driver is cited for criminal speed.

Tables 9 through 12 should be considered in conjunction. Analyses presented in these tables use all stops where a speeding citation was given (e.g., citations for speeding alone, and citations that included more than one violation) when the driver was eligible for a criminal speeding citation. The models calculate the odds of a criminal citation (versus civil) based on several factors, including the demographic and stop characteristic controls and consideration of additional violations and the types of those violations. These include whether the stop involved citations or warnings for DUIs, driver's license violations, insurance violations, registration violations, plate violations and the total number of violations documented during the stop.¹¹ The goal of this analysis was not only to determine whether Hispanic drivers were more likely to receive a criminal citation for speeding, but whether certain types of violations were also associated with an increase in the likelihood of a criminal citation.

In Table 9 below, Model 7 provides odds estimates using race/ethnicity as a sole predictor (no controls). According to this model, Hispanic drivers are almost 66 percent more likely to receive a criminal citation than their White counterparts. This finding was significant at the $p < 0.001$ level. Model 8 supplies odds estimates for receiving a criminal citation as a function of race/ethnicity and the demographic controls of age, sex, and median income of the driver's zip code. When controlling for age, sex, and income, Hispanic drivers were almost 34 percent more likely to receive a criminal citation for speeding. This finding was significant at the $p < 0.05$ level. The statistical controls for age, sex and income were all statistically significant.

Excluding demographic controls but controlling for stop characteristics (speed over the criminal speed threshold, X and Y coordinates, and the time of day), Model 9 indicates that Hispanic drivers are nearly 38 percent more likely to receive a criminal speeding citation when compared to White drivers ($p < 0.05$). In this model, controls of 1-5 MPH, 6-10 MPH, 11-15 MPH, income, X and Y coordinates and the time of day the stop was made were all statistically significant. Model 10, the Composite Model, includes all statistical controls for demographic characteristics of the driver (age, sex, median income of driver's zip code), and stop characteristics of speed, location of the stop and time of day. There was no statistically significant effect for race/ethnicity in this model. Controls of 1-5 MPH, 6-10 MPH, 11-15 MPH, income, X and Y coordinates and time of day the stop was made were all statistically significant.

¹⁰ Driver's may forgo insurance if they are able to demonstrate they have "financial responsibility" adequate to cover expenses in the event of an accident.

¹¹ Equipment violations were tested as a predictor of the likelihood of criminal citation. However, equipment violations were automatically dropped from the models by the statistical software package due to collinearity.

In Model 11, the Reduced Model, the statistical control for income is removed. According to this model Hispanic drivers are 34 percent more likely than White drivers to receive a criminal citation for speed. This finding was statistically significant at the $p < 0.05$ level. Controls of 1-5 MPH, 6-10 MPH, 11-15 MPH, income, X and Y coordinates and time of day remained statistically significant.

Table 9: Civil/Criminal Citation Outcomes Using Stops with Speed and Other Violations (White and Hispanic Stops Only)

Variable	Race & Ethnicity Alone	Demographic Controls	Stop Characteristics & Race/Ethnicity	Composite Model	Reduced Model (No Income)
	Model 7	Model 8	Model 9	Model 10	Model 11
	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.658*** (0.191)	1.338* (0.172)	1.376* (0.192)	1.214 (0.182)	1.340* (0.189)
Age	--	0.984*** (0.004)	--	0.992 (0.005)	0.993 (0.005)
Sex	--	1.493** (0.190)	--	1.236 (0.178)	1.237 (0.175)
Median Income of Driver's ZIP	--	0.993*** (0.003)	--	0.994* (0.003)	--
1-5 MPH over Threshold	--	--	0.009*** (0.009)	0.009* (0.009)	0.009*** (0.010)
6-10 MPH over Threshold	--	--	0.029** (0.031)	0.027** (0.029)	0.031** (0.034)
11-15 MPH over Threshold	--	--	0.087* (0.093)	0.082* (0.088)	0.094* (0.100)
16-20 MPH over Threshold	--	--	0.307 (0.337)	0.271 (0.297)	0.315 (0.345)
21-25 MPH over Threshold	--	--	0.214 (0.242)	0.182 (0.206)	0.205 (0.232)
26-30 MPH over Threshold	--	--	0.423 (0.526)	0.402 (0.501)	0.431 (0.537)
X Coordinate	--	--	1.618* (0.304)	1.645** (0.316)	1.593* (0.300)
Y Coordinate	--	--	0.313*** (0.085)	0.352*** (0.098)	0.318*** (0.086)
Time of Day	--	--	0.979 (0.011)	0.976* (0.012)	0.975* (0.011)
Constant	0.215*** (0.016)	0.510*** (0.140)	2.32e+41** (5.65e+42)	5.89e+40** (1.46e+42)	2.84e+40** (6.95e+41)
R ²	0.009	0.028	0.208	0.208	0.210
χ ²	18.86***	54.06***	411.52***	396.95***	413.66***
N	1,965	1,912	1,957	1,904	1,952

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; White drivers are the reference category; Female drivers are the reference category.

In Tables 10 and 11 below, additional violations are added to the model in an iterative fashion. Model 12 (Table 10) is supplied for comparison. As a starting point for discussion, Model 12 indicates that when controlling for the characteristics of the stop (speed, location, and time of day), Hispanic drivers are nearly 38 percent more likely than White drivers to receive a criminal citation instead of a civil citation ($p < 0.05$). Speed bins of 1-5 MPH, 6-10 MPH, and 11-15 MPH, and location (X and Y Coordinates) were all statistically significant predictors in this model.

In Model 13, DUI violations are included as a statistical control. Having a DUI violation increases the odds that a driver will be cited for criminal speed by about 200 percent ($p < 0.05$). In this model, the odds ratio for Hispanic drivers is 1.384 indicating that Hispanic drivers are nearly 39 percent more likely to receive a criminal citation than White drivers ($p < 0.05$). In models 14–17, violation types associated with licensure, insurance, registration, and plates are explored in an iterative fashion. None of these violation types displayed statistical significance when individually added to the model. Across each of these models, the odds ratio for race/ethnicity remained relatively stable, ranging from 1.359 to 1.377. These ratios were statistically significant at the $p < 0.05$ level. Thus, using the individual controls of licensure, insurance, registration, and plates, Hispanic drivers were between 34 and 38 percent more likely to receive a criminal speeding citation when compared to their White counterparts.

In Table 11, Model 12 is provided for comparison. The additional models presented here further explore the effect of additional violations on the likelihood a driver will receive a criminal citation. Model 18 includes the total number of violations that were cited or warned during the stop as a statistical control. In this model Hispanic drivers were about 34 percent more likely to receive a criminal citation for speeding ($p < 0.05$), and an increase in the number of other violations was associated with an increase in the odds that the driver would be cited criminally ($p < 0.001$). In Model 19, the variables DUI, licensure, insurance, registration, plate violations and the number of violations were included as controls. In this model, Hispanic drivers were about 35 percent more likely to receive a criminal citation for speeding when compared to White drivers ($p < 0.05$). Violations for plates were a significant predictor of criminal citation activity but are associated with a decrease in the likelihood that a driver is cited criminally ($p < 0.05$).

In Model 20, the Composite Model, all demographic and stop characteristic variables were included as statistical controls. In this model there was no statistically significant effect of race/ethnicity on the likelihood that a driver was cited criminally. Finally, in the Reduced Model (Model 21) median income of the driver's zip code was removed as demographic control while both DUI and the number of violations were included, as both of these variables indicated statistical significance in Models 12 and 17, respectively. In Model 21, race/ethnicity was not a statistically significant predictor of whether a driver receives a criminal or civil citation. Speed bins of 1-5, 6-10, and 11-15 MPH over the criminal speed threshold, and the number of violations remained statistically significant predictors of whether a driver would receive a criminal citation for speeding.

Table 10: Civil/Criminal Citation Outcomes Using Stops with Speed and Other Violations (White and Hispanic Stops Only)

Variable	Race/Ethnicity & Stop Characteristics					
	DUI	Licensure	Insurance	Registration	Plate	
	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17
	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.376* (0.192)	1.385* (0.194)	1.359* (0.191)	1.362* (0.191)	1.377* (0.192)	1.377* (0.192)
1-5 MPH over Threshold	0.009*** (0.009)	0.008*** (0.009)	0.009*** (0.009)	0.008*** (0.009)	0.008*** (0.009)	0.009*** (0.009)
6-10 MPH over Threshold	0.029** (0.031)	0.029** (0.031)	0.030** (0.032)	0.029** (0.031)	0.029** (0.301)	0.030** (0.031)
11-15 MPH over Threshold	0.087* (0.093)	0.084* (0.090)	0.088* (0.094)	0.086* (0.092)	0.087* (0.093)	0.088* (0.094)
16-20 MPH over Threshold	0.307 (0.337)	0.288 (0.316)	0.313 (0.343)	0.302 (0.330)	0.308 (0.337)	0.317 (0.347)
21-25 MPH over Threshold	0.214 (0.242)	0.214 (0.241)	0.216 (0.244)	0.212 (0.240)	0.215 (0.242)	0.214 (0.242)
26-30 MPH over Threshold	0.423 (0.526)	0.402 (0.499)	0.434 (0.539)	0.418 (0.519)	0.423 (0.525)	0.423 (0.525)
DUI	--	3.038* (1.596)	--	--	--	--
Licensure	--	--	1.302 (0.351)	--	--	--
Insurance	--	--	--	1.441 (0.420)	--	--
Registration	--	--	--	--	1.502 (0.529)	--
Plate	--	--	--	--	--	0.189 (0.215)
X Coordinate	1.618* (0.304)	1.624* (0.305)	1.599* (0.301)	1.595* (0.300)	1.617* (0.304)	1.615* (0.303)
Y Coordinate	0.313*** (0.085)	0.307*** (0.083)	0.319*** (0.086)	0.315*** (0.085)	0.316*** (0.085)	0.310*** (0.084)
Time of Day	0.979 (0.011)	0.976* (0.011)	0.979 (0.011)	0.979 (0.011)	0.979 (0.011)	0.978 (0.011)
Constant	2.32e+41*** (5.65e+42)	7.26e+41*** (1.77e+43)	3.35e+40*** (8.17e+41)	4.37e+40*** (1.06e+42)	1.70e+41*** (4.13e+42)	2.80e+41** (6.81e+42)
R ²	0.208	0.210	0.208	0.209	0.209	0.209
χ ²	411.52***	415.94***	412.45***	413.03***	412.78***	414.46***
N	1,957	1,957	1,957	1,957	1,957	1,957

***p<0.001; **p<0.01; *p<0.05; Model testing with equipment violations were excluded because of collinearity.

Table 11: Civil/Criminal Citation Outcomes Using Stops with Speed and Other Violations (White and Hispanic Stops Only)

Variable	Race/Ethnicity & Stop Characteristics	Total Violations	Stop Characteristics and Violations	Composite Model	Reduced Model
	Model 12	Model 18	Model 19	Model 20	Model 21
	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.376* (0.192)	1.343* (0.188)	1.352* (0.191)	1.201 (0.181)	1.313 (0.186)
Age	--	--	--	0.992* (0.005)	0.993 (0.004)
Sex	--	--	--	1.193 (0.173)	1.209 (0.172)
Median Income of Driver's ZIP	--	--	--	0.994* (0.003)	--
1-5 MPH over Threshold	0.009*** (0.009)	0.009*** (0.010)	0.010*** (0.010)	0.010*** (0.003)	0.010*** (0.011)
6-10 MPH over Threshold	0.029** (0.031)	0.031** (0.033)	0.032** (0.034)	0.030** (0.032)	0.032** (0.034)
11-15 MPH over Threshold	0.087* (0.093)	0.092* (0.099)	0.100* (0.108)	0.093* (0.100)	0.097* (0.104)
16-20 MPH over Threshold	0.307 (0.337)	0.309 (0.339)	0.332 (0.365)	0.292 (0.323)	0.311 (0.342)
21-25 MPH over Threshold	0.214 (0.242)	0.233 (0.263)	0.244 (0.277)	0.204 (0.233)	0.220 (0.249)
26-30 MPH over Threshold	0.423 (0.526)	0.444 (0.553)	0.426 (0.579)	0.436 (0.548)	0.445 (0.556)
DUI	--	--	0.470 (0.381)	0.358 (0.338)	1.370 (0.839)
Licensure	--	--	0.642 (0.226)	0.671 (0.245)	--
Insurance	--	--	0.612 (0.244)	0.680 (0.283)	--
Registration	--	--	0.750 (0.326)	0.833 (0.369)	--
Plate	--	--	0.086* (0.100)	0.098* (0.113)	--
Total Violations	--	1.452*** (0.158)	2.092** (0.504)	1.913* (0.506)	1.385* (0.177)
X Coordinate	1.618* (0.304)	1.541* (0.291)	1.525* (0.291)	1.561* (0.305)	1.527* (0.290)
Y Coordinate	0.313*** (0.085)	0.321*** (0.087)	0.311*** (0.085)	0.355*** (0.100)	0.323*** (0.088)
Time of Day	0.979 (0.011)	0.977 (0.011)	0.974* (0.011)	0.973* (0.012)	0.973* (0.012)
Constant	2.32e+41*** (5.65e+42)	2.91e+38*** (7.11e+39)	1.82+38*** (4.49e+39)	6.36e+37** (1.60e+39)	9.95e+37*** (2.46e+37)
R ²	0.208	0.214	0.218	0.215	0.215
χ ²	411.52***	422.82***	430.90***	410.15***	424.47
N	1,957	1,957	1,957	1,904	1,952

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Female drivers are the reference category. Models with equipment violations were excluded because of collinearity.

Table 12: Model 22—Logistic Regression Results for Civil/Criminal Using Stops with Speed with Other Violations and Stop Characteristics, White and Hispanic Stops Only (N = 1,886)

DOJ—Model Request #2: Race/Ethnicity, Stop Characteristics, and Beats

Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)
Race/Ethnicity (Hispanic)	1.146 (0.189)	Time of Day	0.985*** (0.013)		
Speed Over Criminal Speed Threshold					
0-5 MPH Over Threshold	0.002*** (0.003)	11-15 MPH Over Threshold	0.028** (0.035)	21-25 MPH Over Threshold	0.089 (0.118)
6-10 MPH Over Threshold	0.008*** (0.010)	16-20 MPH Over Threshold	0.147 (0.188)	26-30 MPH Over Threshold	0.235 (0.352)
Beats					
Beat 1	0.766 (1.198)	Beat 25	0.097 (0.151)	Beat 49	Omitted ^a
Beat 2	0.441 (0.678)	Beat 26	0.032 (0.055)	Beat 50	Omitted ^a
Beat 3	0.625 (0.997)	Beat 27	0.284 (0.442)	Beat 51	Omitted ^a
Beat 4	0.067 (0.134)	Beat 28	Omitted ^a	Beat 52	Omitted ^a
Beat 5	0.453 (0.710)	Beat 29	Omitted ^a	Beat 53	0.430 (0.907)
Beat 6	Omitted ^a	Beat 30	Omitted ^a	Beat 54	Omitted ^a
Beat 7	0.549 (0.883)	Beat 31	0.089 (0.154)	Beat 55	Omitted ^a
Beat 8	2.769 (4.974)	Beat 32	0.112 (0.174)	Beat 56	Omitted ^a
Beat 9	0.561 (0.869)	Beat 33	0.126 (0.197)	Beat 57	Omitted ^a
Beat 10	1.323 (2.080)	Beat 34	0.093 (0.144)	Beat 58	0.074 (0.123)
Beat 11	0.363 (0.651)	Beat 35	0.339 (0.542)	Beat 59	Omitted ^a
Beat 12	Omitted ^a	Beat 36	0.053 (0.085)	Beat 60	0.097 (0.162)
Beat 13	0.225 (0.345)	Beat 37	1.526 (2.673)	Beat 61	0.364 (0.576)
Beat 14	Omitted ^a	Beat 38	2.729 (4.752)	Beat 62	0.120 (0.192)
Beat 15	0.335 (0.561)	Beat 39	1.407 (2.432)	Beat 63	0.323 (0.528)
Beat 16	1.292 (2.047)	Beat 40	1.318 (2.500)	Beat 64	0.161 (0.250)
Beat 17	Omitted ^a	Beat 41	Omitted ^a	Beat 65	0.326 (0.540)
Beat 18	0.862 (1.334)	Beat 42	Omitted ^a	Beat 66	0.149 (0.277)
Beat 19	0.104 (0.160)	Beat 43	0.878 (1.609)	Beat 67	0.361 (0.559)
Beat 20	Omitted ^a	Beat 44	0.032 (0.062)	Beat 68	0.163 (0.289)
Beat 21	0.462 (0.715)	Beat 45	Omitted ^a	Beat 69	Omitted ^a
Beat 22	Omitted ^a	Beat 46	Omitted ^a	Beat 70	Omitted ^a
Beat 23	0.131 (0.222)	Beat 47	Omitted ^a	Beat 71	Omitted ^a
Beat 24	0.053 (0.097)	Beat 48	Omitted ^a		
Constant	176.290 (346.968)	$R^2 = 0.306$		$\chi^2 = 588.70$	

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Stops with speed bins above 30 MPH over the criminal threshold were thus excluded from the model because of collinearity; ^aVariables omitted because there was no variation in this condition.

As requested by experts with the U.S. Department of Justice, MCSO modeled the likelihood of receiving a criminal versus a civil citation with geography specified as beats in lieu of Cartesian coordinates (X and Y). The subset of stops used in this analysis included all speeding citations when the driver was eligible for a criminal speeding citation (i.e., drivers may have additional violations). The results of this analysis is available in Table 12 above.

Based on the analysis presented in Model 22, when controlling for MPH over the criminal speed threshold (binned in 5-MPH increments), patrol beats, and the time of day the stop was made, the odds that a Hispanic driver is cited for criminal speed in lieu of a civil citation was 1.146, but this difference was not statistically significant. Controls for the time of day and speed bins of 1-5 MPH, 6-10 MPH, and 11-15 MPH were statistically significant.¹²

In the twenty-two models presented above examining criminal/civil citation activity, various combinations of predictor and control variables were used to assist MCSO in identifying possible factors associated with the likelihood of receiving a criminal citation for speeding both as a single offense and speeding coupled with other violations documented during the stop. As a summary of the findings investigating civil and criminal citations for speed, the analyses presented here indicate that Hispanic drivers are more likely to receive a criminal citation. However, once certain contextual factors are accounted for, such as the number of violations and demographic characteristics of the drivers, the effect of race/ethnicity is no longer significant (Models 4, 10, 20, and 21). Further, when the variable for geography is operationalized as patrol beats, instead of X and Y coordinates, race/ethnicity was not a significant predictor of whether a driver would receive a criminal or civil citation for speed (Models 6, and 12).¹³ Implications of these findings are discussed more following the next section on citation and warning activity.

¹²Additional variations of the “Beats” model (Model 22) were explored but are not fully presented here due to space considerations. With the demographic controls of age and sex added predictors to Model 22, the odds of a Hispanic driver receiving a criminal citation were 1.073 and was not statistically significant. When the odds of a criminal/civil citation were modeled as a function of speed and beats alone (no additional controls), the odds of Hispanic drivers receiving a criminal citation were 1.154 and was not statistically significant. A full model using race/ethnicity, age, sex, speed, time of day and patrol beats produces an odds ratio for Hispanic drivers of 1.053 which was not statistically significant. Full models for these specifications are available upon request.

¹³Five additional analyses, reported in footnotes 9 and 12 of this report also indicate that modeling criminal/civil citation outcome with geography specified as patrol beats eliminates race/ethnicity as a statistically significant predictor both with and without other controls.

LOGISTIC REGRESSION AND CITATION/WARNING ACTIVITY FOR SPEEDING

In addition to investigating differential criminal/civil citation activity for Hispanic and White drivers, MCSO modeled citation and warning activity for single speed violations (one citation or warning with no other violations recorded) and citation and warning activity for speed coupled with additional violations.¹⁴ Tables 13 and 14 below provides the results of the investigation of this activity, modeling citation and warning outcomes for speed when speed was the only violation that was cited or warned. Models are presented in a stepwise fashion to illustrate the impact covariates have on the odds that a Hispanic driver will be cited, given different controls. These tables should be considered in conjunction. Following this, one Table 15 is provided that provide the results of the analysis using four predictor variables—race/ethnicity, time of day the stop was made, patrol beats (instead of X and Y coordinates), and speed binned in 5-MPH increments. All analyses presented in tables 13-15 utilized the same data.

Modeling race/ethnicity alone (Model 23—no controls), Hispanic drivers are about 19 percent more likely to receive a citation for speeding than White drivers. This effect was significant at the $p < 0.001$ level. In Model 24, utilizing demographic controls of age, sex, and the median income of the driver’s zip code, the effect of race/ethnicity persists, with Hispanic drivers approximately 17 percent more likely to receive a citation compared to White drivers ($p < 0.01$). Model 25 provides results of an analysis of citation and warning activity as a function of race/ethnicity, school zones, and safety corridors. Based on this model, Hispanic drivers are 20 percent more likely to receive a speeding citation when compared to White drivers. This finding was statistically significant at the $p < 0.001$ level. Based on this model, speeding in a school zone increases the likelihood a driver will be cited by nearly 500 percent ($p < 0.001$). Being stopped in a safety corridor decreased the odds that a driver is cited ($p < 0.05$).

Model 26 utilizes the stop location (X and Y coordinates) and time of day as statistical controls. Based on this analysis, Hispanic drivers are nearly 25 percent more likely to be cited for speeding than White drivers. This finding was significant at the $p < 0.001$ level. Model 27 utilizes controls for school zones, safety corridors, stop location (X and Y coordinates), and time of day. With these controls applied, Hispanic drivers are about 26 percent more likely than White drivers to be cited ($p < 0.001$). Model 28 introduces the observed speed over the posted speed limit, binned in 5-MPH increments. No other controls are utilized in

¹⁴ When examining the speeding variables for posted speed, approximate observed speed, and reasonable and prudent speed, there were several data entry errors in the data. Most common was that deputies would enter the posted speed into the observed speed field and the observed speed into the posted speed field. These cases were reconciled by reviewing comments in the VSCF or by reviewing BWC footage to confirm posted and observed speeds. Data was corrected in this way for 44 cases. Fifteen cases in the data contained posted speeds that were clearly incorrect (e.g., 656, 650, 145, etc.). These cases were also corrected by reviewing VSCF and or BWC footage. Only eight of these cases included violations for speed. A second issue with the speeding data is that deputies would indicate “school zone violation” for two types of violations. The first and most common is speeding in a school zone, and the second was for failing to stop when someone entered the crosswalk. Both stops have speed information entered. Those stops for failing to stop when someone entered the crosswalk were excluded from the analysis of speed and citation activity.

this model. Controlling for the driver's speed alone, there is no statistically significant effect of race/ethnicity on the likelihood that a driver will be cited for speed.

Model 29 utilizes the stop characteristics of speed, stop location (X and Y coordinates), and time of day as statistical controls. In this model there is no statistically significant effect of race/ethnicity on the likelihood that a driver will be cited for speed. In Model 30, the stop characteristics of location and time of day are removed from the model and only controls for school zones, safety corridors, speed are applied. In this model there was no statistically significant effect of race/ethnicity on the likelihood that the driver was cited. Based on this model, speeding in a school zone increases the likelihood that a driver will be cited by over 1700 percent.

In Model 31, the stop characteristics of location (X and Y coordinates) time of day, speed, school zones, and safety corridors are used as statistical controls. Based on this model, Hispanic drivers were approximately 13 percent more likely to receive a citation for speed than White Drivers ($p < 0.05$).

In Model 32 (Full Model), all demographic (driver age, sex, and median income of zip code) and stop characteristic (speed, X and Y coordinates, time of day, school zones, safety corridors) controls are applied. According to this model, Hispanic drivers are almost 15 percent more likely than White drivers to receive a citation for speeding ($p < 0.05$). In Model 32, median income is removed from the full model and all other demographic and stop characteristic controls are applied. In this model, there was no statistically significant effect of race/ethnicity on the likelihood that a driver will be cited for speed.

Finally, as requested by experts with the U.S. Department of Justice, MCSO modeled the likelihood of receiving a citation versus a warning with geography specified as beats in lieu of Cartesian coordinates (X and Y) and the stop characteristics alone (speed binned in 5-MPH increments, time of day, school zone stops, and safety corridor stops). The results from this analysis are provided in Table 15 (Model 34) and indicate that race/ethnicity was not a statistically significant predictor of the likelihood a driver will be cited for speed.¹⁵ No individual patrol beats were statistically significant in the model while school zone stops, and the time of day were both statistically significant. All 5-MPH speed bins were statistically significant, except for the 11-15 MPH speed bin.

¹⁵Additional variations of the "Beats" model (Model 34) were explored but are not fully presented here due to space considerations. With the demographic controls of age and sex added predictors to Model 34, the odds of a Hispanic driver receiving a citation instead of a warning were 1.029 and was not statistically significant. When the odds of receiving a citation were modeled as a function of speed and beats alone (no additional controls), the odds of Hispanic drivers receiving a citation were 1.106 and was not statistically significant. Full models for these specifications are available upon request.

Table 13: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed Violations Only—
One Offense, Hispanic and White Drivers Only

Variable	Race & Ethnicity Alone	Demographic Controls	School Zones and Safety Corridors	Location and Time of Day	School & Safety Corridors, Location & Time of Day	Race/Ethnicity and Speed
	Model 23	Model 24	Model 25	Model 26	Model 27	Model 28
Variable	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.189*** (1.126)	1.169** (0.061)	1.200*** (0.058)	1.246*** (0.063)	1.261*** (0.063)	1.034 (0.060)
Age	--	0.990*** (0.001)	--	--	--	--
Sex	--	1.175*** (0.050)	--	--	--	--
Median Income of Driver's Zip	--	1.005*** (0.001)	--	--	--	--
School Zone	--	--	5.880*** (1.406)	--	5.980*** (1.433)	--
Safety Corridor	--	--	0.743* (0.110)	--	0.802 (0.119)	--
1-5 MPH Over	--	--	--	--	--	1.114 (0.519)
6-10 MPH Over	--	--	--	--	--	0.255*** (0.092)
11-15 MPH Over	--	--	--	--	--	0.556 (0.179)
16-20 MPH Over	--	--	--	--	--	3.264*** (1.052)
21-25 MPH Over	--	--	--	--	--	11.204*** (3.684)
26-30 MPH Over	--	--	--	--	--	16.040*** (5.649)
31-35 MPH Over	--	--	--	--	--	18.959*** (7.646)
36-40 MPH Over	--	--	--	--	--	20.731*** (11.004)
41-45 MPH Over	--	--	--	--	--	49.958*** (53.195)
X Coordinate	--	--	--	0.745*** (0.043)	0.775*** (0.044)	--
Y Coordinate	--	--	--	2.039*** (0.169)	2.079*** (0.173)	--
Time of Day	--	--	--	0.994*** (0.004)	0.996*** (0.005)	--
Constant	1.246*** (0.028)	1.150 (0.105)	1.223*** (0.028)	2.73e-25 (1.95e-24)	6.26e-25*** (1.27e+12)	0.635 (0.203)
R ²	0.001	0.009	0.007	0.008	0.015	0.227
χ ²	12.96***	117.00***	99.35***	116.20***	3343.28***	3125.59***
N	10,054	9,826	10,054	10,054	10,028	10,037

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Speeds bins above 45 MPH over the speed limit were removed from the model because of collinearity.

Table 14: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed Violations Only—One Offense, Hispanic and White Drivers Only

Variable	Race/Ethnicity Speed, Location and Time	Race/Ethnicity School & Safety Corridors and Speed	Stop Characteristics	Full Model	Reduced Model
	Model 29 Odds Ratio (SE)	Model 30 Odds Ratio (SE)	Model 31 Odds Ratio (SE)	Model 32 Odds Ratio (SE)	Model 33 Odds Ratio (SE)
Race/Ethnicity	1.121 (0.067)	1.045 (0.061)	1.134* (0.068)	1.148* (0.073)	1.073 (0.066)
Age	--	--	--	0.993*** (0.001)	0.993*** (0.001)
Sex	--	--	--	1.065 (0.054)	1.040 (0.052)
Median Income of Driver's Zip	--	--	--	1.006*** (0.001)	--
School Zone	--	18.489*** (5.470)	17.707*** (5.241)	19.593*** (6.027)	18.967*** (5.637)
Safety Corridor	--	0.909 (0.164)	0.833 (0.151)	0.880 (0.161)	0.812 (0.148)
1-5 MPH Over	1.203 (0.565)	0.171** (0.029)	0.201*** (0.113)	0.194** (0.113)	0.206** (0.116)
6-10 MPH Over	0.239*** (0.087)	0.187*** (0.069)	0.177*** (0.066)	0.184*** (0.069)	0.189*** (0.071)
11-15 MPH Over	0.502* (0.163)	0.534 (0.172)	0.485*** (0.157)	0.526*** (0.172)	0.520* (0.169)
16-20 MPH Over	2.934** (0.952)	3.187*** (1.027)	2.885** (0.936)	3.046** (0.994)	3.057** (0.994)
21-25 MPH Over	10.583*** (3.502)	11.064*** (3.639)	10.535*** (3.483)	11.239 (3.739)	11.077*** (3.673)
26-30 MPH Over	15.456*** (5.473)	15.915*** (5.606)	15.415*** (5.455)	16.605*** (5.924)	15.825*** (5.612)
31-35 MPH Over	18.237*** (7.388)	18.597*** (7.502)	18.000*** (7.289)	19.736*** (8.105)	18.420*** (7.473)
36-40 MPH Over	19.979*** (10.637)	20.699*** (10.987)	20.107*** (10.701)	23.802*** (13.435)	20.164*** (10.742)
41-45 MPH Over	48.212*** (51.386)	49.831*** (53.060)	48.123*** (51.285)	45.741*** (48.887)	45.897*** (48.968)
X Coordinate	1.308** (0.091)	--	1.334*** (0.095)	1.261*** (0.091)	1.329*** (0.095)
Y Coordinate	1.398*** 0.138	--	1.397** (0.139)	1.350** (0.139)	1.473*** (0.148)
Time of Day	0.981*** (0.005)	--	0.985** (0.005)	0.080** (0.005)	0.981*** (0.005)
Constant	1.22e+8	0.635*** (0.203)	1.10e+9* (9.57e+9)	4.78e+6* (4.21e+7)	1.59e+8* (1.39e+9)
R ²	0.230	0.239	0.242	0.245	0.243
χ ²	3168.22	3284.03***	3322.44***	3297.84***	3342.54***
N	10,037	10,037	10,037	9,809	10,031

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Speeds bins above 45 MPH over the speed limit were removed from the model because of collinearity.

Table 15: Model 34—Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed Violations Only—One Offense, White and Hispanic Stops Only (N = 10,021)

DOJ—Model Request #2: Race/Ethnicity, Stop Characteristics, and Beats					
Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)
Race/Ethnicity (Hispanic)	1.118 (0.074)	Time of Day	0.984* (0.005)	School Zone	19.967*** (6.824)
		Safety Corridor	0.605 (0.117)		
MPH Over Speed Limit					
1-5 MPH Over	0.176** (0.109)	16-20 MPH Over	3.995*** (1.432)	31-35 MPH Over	40.775*** (17.854)
6-10 MPH Over	0.229*** (0.093)	21-25 MPH Over	20.202*** (7.377)	36-40 MPH Over	39.166*** (22.050)
11-15 MPH Over	0.581 (0.209)	26-30 MPH Over	30.924*** (11.994)	41-45 MPH Over	109.758*** (119.742)
Beats					
Beat 1	0.848 (1.108)	Beat 25	0.260 (0.339)	Beat 49	Omitted ^a
Beat 2	0.539 (0.704)	Beat 26	0.289 (0.377)	Beat 50	Omitted ^a
Beat 3	0.286 (0.376)	Beat 27	0.221 (0.290)	Beat 51	0.186 (0.243)
Beat 4	0.714 (0.948)	Beat 28	0.377 (0.647)	Beat 52	0.383 (0.559)
Beat 5	0.284 (0.375)	Beat 29	0.148 (0.296)	Beat 53	Omitted ^a
Beat 6	0.481 (0.648)	Beat 30	0.176 (0.233)	Beat 54	0.083 (0.127)
Beat 7	0.449 (0.591)	Beat 31	0.265 (0.347)	Beat 55	Omitted ^a
Beat 8	0.812 (1.202)	Beat 32	0.543 (0.706)	Beat 56	0.152 (0.235)
Beat 9	2.196 (2.975)	Beat 33	1.264 (1.649)	Beat 57	Omitted ^a
Beat 10	0.291 (0.384)	Beat 34	3.058 (3.962)	Beat 58	0.186 (0.242)
Beat 11	0.886 (1.165)	Beat 35	1.949 (2.584)	Beat 59	0.709 (0.930)
Beat 12	1.185 (1.582)	Beat 36	0.408 (0.530)	Beat 60	0.505 (0.658)
Beat 13	2.696 (3.521)	Beat 37	0.434 (0.570)	Beat 61	0.595 (0.772)
Beat 14	Omitted ^a	Beat 38	0.208 (0.272)	Beat 62	0.652 (0.846)
Beat 15	1.568 (2.082)	Beat 39	1.427 (1.966)	Beat 63	0.130 (0.171)
Beat 16	0.839 (1.098)	Beat 40	0.660 (0.926)	Beat 64	1.602 (2.074)
Beat 17	2.655 (3.604)	Beat 41	1.050 (1.641)	Beat 65	2.036 (2.661)
Beat 18	1.698 (2.219)	Beat 42	0.347 (0.519)	Beat 66	1.637 (1.161)
Beat 19	0.780 (1.012)	Beat 43	0.323 (0.475)	Beat 67	1.191 (1.546)
Beat 20	Omitted ^a	Beat 44	Omitted ^a	Beat 68	0.321 (0.426)
Beat 21	0.254 (0.332)	Beat 45	Omitted ^a	Beat 69	Omitted ^a
Beat 22	0.161 (0.211)	Beat 46	Omitted ^a	Beat 70	Omitted ^a
Beat 23	0.175 (0.231)	Beat 47	Omitted ^a	Beat 71	Omitted ^a
Beat 24	0.154 (0.200)	Beat 48	0.108 (0.163)		
Constant	0.836 (1.125)	R ² = 0.332		χ ² = 4556.45***	

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Speeds bins above 45 MPH over the speed limit were removed from the model because of collinearity.; ^aVariables omitted because there was no variation in this condition.

Based on this series of models in Tables 13-15, the most consistent predictors of whether a driver will be cited are age, school zones, location (X and Y coordinates) and time of day the stop was made. The effect

of race/ethnicity persists across the majority of the models presented here and is apparent when race/ethnicity is the only predictor (Model 23); when only demographic controls are applied (Model 24); when only controls for school zones and safety corridors are applied (Model 26); when controls for school zones and safety corridors, location and time are applied (Model 27); when demographic controls are removed from the model and only characteristics of the stop are used as controls (Model 31); and when all demographic and stop characteristic controls are used in the model (Model 32).

Race/ethnicity was not a statistically significant predictor when the speed at which the driver was traveling was the only control applied (Model 28); when the controls of speed, location and time of the stop are the only controls applied (Model 29); when speed, school zones, and safety corridors are the only controls used (Model 30); when all controls, except for income, are used to model the likelihood of receiving a speeding citation (Model 33); and when the variables for speed, school zones, safety corridors, time of day and patrol beats are used as controls (Model 34).

Tables 16-18 present the results of modeling citation and warning outcomes for speeding stops that include speeding alone and speed with other violations. The goal of these models was to illustrate how additional violations impact the overall likelihood of receiving a citation for speeding. Citation/warning outcomes were modeled based on demographic characteristics of the drivers, (age, sex, median income of the driver's zip code), school zones, safety corridors, speed over the speed limit binned in 5 MPH increments, geography (X and Y Coordinates), the time of day the stop was made and controls for additional offenses.

Model 35, in Table 16, provides a starting point for comparison. Based on Model 35, without any statistical controls, Hispanic drivers were nearly 32 percent more likely to receive a citation when compared to White drivers ($p < 0.001$). The reader should recognize that the different odds ratio presented here as opposed to those in Model 23 above reflect the addition of stops where more than one violation occurred. Model 36 provides the results of the analysis when demographic controls of age, sex, and median income of the driver's zip code are used as statistical controls. With demographic controls, Hispanic drivers are about 26 percent more likely to receive a speeding citation when compared to White drivers. When citation and warning outcomes are modeled as a function of race/ethnicity, school zones, and safety corridors (Model 37), Hispanic drivers were a little almost 33 percent more likely to receive a citation when compared to White drivers ($p < 0.001$). Model 38 provides estimates when the controls for location (X and Y Coordinates) and the time of day are applied as controls. Based on this model, Hispanic drivers were almost 38 percent more likely than White drivers to receive a citation for speeding ($p > 0.001$). In Model 39, race/ethnicity and the stop characteristics of geography and time of day the stop was made are used as predictors. In this model, Hispanic drivers are nearly 40 percent more likely to receive a citation for speeding than White drivers ($p < 0.001$). In Model 40, race/ethnicity and speed binned in 5-MPH increments are used as predictors. Controlling for speed alone, Hispanic drivers are approximately 17 percent more likely to receive a citation. This finding was significant at the $p < 0.01$ level.

Table 17 presents additional results utilizing combinations of different types of controls. Model 41 utilizes stop characteristics of speed, location (X and Y coordinates) and time of day. With these controls applied, Hispanic drivers are about 27 percent more likely to receive a citation than White drivers. Model 42 controls for speed, school zones and safety corridors. Results using this model specification indicate that Hispanic drivers are approximately 19 percent more likely to receive a speeding citation when compared to White drivers. This finding was significant at the $p > 0.01$ level. Model 43 provides results of modeling stop

outcomes based on all stop characteristics—school zones, safety corridor, speed binned in 5-MPH increments, location, and the time of day a stop was made. Based on this analysis, Hispanic drivers were about 29 percent more likely to receive a speeding citation when compared to White drivers. This finding was significant at the $p>0.001$ level. Model 44 provides results modeling citation and warning outcomes as a function of all control variables (demographic and stop characteristics). With all controls included, Hispanic drivers are approximately 26 percent more likely to receive a citation for speeding ($p>0.001$). Finally, in Model 45 all demographic and stop characteristic controls, except for the median income of the driver's zip code, are used predictors. When income is removed from the estimating procedure, Hispanic drivers are almost 21 percent more likely to receive a citation for speeding than White drivers. This finding was significant at the $p>0.01$ level.

Table 16: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed and Speed with Other Violations

	Race/Ethnicity Alone	Race/Ethnicity and Demographic Controls	Race/Ethnicity Safety Corridors and School Zones	Race/Ethnicity Location and Time	Race/Ethnicity School Zones, Safety Corridors, Location and Time	Race/Ethnicity and Speed
	Model 35	Model 36	Model 37	Model 38	Model 39	Model 40
Variable	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.316*** (0.061)	1.259*** 0.063	1.329*** (0.062)	1.378*** (0.066)	1.395*** (0.067)	1.173** (0.064)
Age	--	0.989*** (0.001)	--	--	--	--
Sex	--	1.203*** (0.049)	--	--	--	--
Median Income of Driver's Zip	--	1.004*** (0.001)	--	--	--	--
School Zone	--	--	4.722*** (1.042)	--	4.789*** (1.059)	--
Safety Corridor	--	--	0.789 (0.108)	--	0.848 (0.117)	--
1-5 MPH Over	--	--	--	--	--	1.073 (0.453)
6-10 MPH Over	--	--	--	--	--	0.284*** (0.091)
11-15 MPH Over	--	--	--	--	--	0.579 (0.166)
16-20 MPH Over	--	--	--	--	--	3.203*** (0.919)
21-25 MPH Over	--	--	--	--	--	10.599*** (3.115)
26-30 MPH Over	--	--	--	--	--	15.953*** (5.076)
31-35 MPH Over	--	--	--	--	--	19.932*** (7.474)
36-40 MPH Over	--	--	--	--	--	22.965*** (11.665)
41-45 MPH Over	--	--	--	--	--	61.378*** (64.503)
X Coordinate	--	--	--	0.070*** (0.043)	0.779*** (0.044)	--
Y Coordinate	--	--	--	2.016*** (0.162)	2.045*** (0.164)	--
Time of Day	--	--	--	0.994 (0.004)	0.996 (0.004)	--
Constant	1.307*** (0.029)	1.345** (0.118)	1.285*** (0.029)	1.63e-23*** (1.12e-22)	3.41e-23*** (2.35e-22)	0.667 (0.190)
R ²	0.002	0.011	0.007	0.009	0.014	0.221
χ ²	35.68***	156.18***	107.92***	137.71***	209.19***	3266.73***
N	10,902	10,643	10,902	10,902	10,902	10,882

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Female drivers are the reference category; Speeds in bins above 45 MPH were excluded from the model because of collinearity.

Table 17: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed and Speed with Other Violations

Variable	Race/Ethnicity Alone	Race/Ethnicity and Demographic Controls	Race/Ethnicity and Stop Characteristics	Full Model	Reduced Model
	Model 41	Model 42	Model 43	Model 44	Model 45
	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)	Odds Ratio (SE)
Race/Ethnicity	1.274*** (0.072)	1.188** 0.066	1.291*** (0.073)	1.264*** (0.076)	1.207** (0.070)
Age	--	--	--	0.991*** (0.001)	0.992*** (0.001)
Sex	--	--	--	1.088 (0.053)	1.065 (0.051)
Median Income of Driver's Zip	--	--	--	1.005** (0.001)	--
School Zone	--	12.129*** (3.176)	11.850*** (3.072)	13.139*** (3.522)	12.921*** (3.367)
Safety Corridor	--	0.925 (0.154)	0.837 (0.140)	0.871 (0.148)	0.813 (0.137)
1-5 MPH Over	1.162 (0.494)	0.268** (0.133)	0.308* (0.150)	0.305* (0.153)	0.316 (0.155)
6-10 MPH Over	0.268*** (0.086)	0.225*** (0.073)	0.213*** (0.070)	0.219*** (0.073)	0.226* (0.074)
11-15 MPH Over	0.522* (0.151)	0.559** (0.160)	0.507* (0.146)	0.548* (0.159)	0.541*** (0.157)
16-20 MPH Over	2.889*** (0.835)	3.131*** (0.899)	2.841*** (0.821)	2.980*** (0.865)	2.992*** (0.867)
21-25 MPH Over	10.055*** (2.974)	10.478*** (3.080)	10.013*** (2.960)	10.564*** (3.139)	10.443*** (3.096)
26-30 MPH Over	15.435*** (4.938)	15.848*** (5.043)	15.411*** (4.928)	16.322*** (5.259)	15.631*** (5.010)
31-35 MPH Over	19.391*** (7.302)	19.602*** (7.352)	19.173*** (7.219)	20.568*** (7.861)	19.398*** (7.318)
36-40 MPH Over	22.854*** (11.639)	22.926*** (11.646)	22.907*** (11.664)	26.632*** (14.442)	22.621*** (11.531)
41-45 MPH Over	59.046*** (62.106)	61.202*** (64.320)	58.791** (61.835)	53.929*** (56.847)	55.185** (58.093)
X Coordinate	1.355*** (0.091)	--	1.382** (0.094)	1.322** (0.092)	1.374*** (0.094)
Y Coordinate	1.433*** (0.136)	--	1.434*** (0.137)	1.444*** (0.142)	1.532*** (0.147)
Time of Day	0.983*** (0.004)	--	0.986** (0.005)	0.980** (0.005)	0.981*** (0.005)
Constant	2.79e+9*** (2.28e+10)	0.667 (0.190)	2.46e+10** (2.03e+11)	1.26e+8* (2.03e+11)	1.99e+9* (1.65e+10)
R ²	0.224	0.230	0.230	0.237	0.236
χ ²	3317.42***	3403.48***	3403.48***	3423.44***	3485.22***
N	10,882	10,882	10,882	10,623	10,857

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Female drivers are the reference category; Speeds in bins above 45 MPH were excluded from the model because of collinearity.

Tables 18 and 19 below provide results of modeling citation outcomes using stops with speeding violations and speeding coupled with other violations. The goal of these models was to determine if certain types of violations and/or the number of violations, coupled with a speeding violation increases the likelihood that a driver will be cited. Controls for the driver's age, sex, school zones, safety corridors, location and time of day are included in all models.

In Model 46, the violation of "licensure" is introduced. This variable indicates that the driver violated at least one driver's license-related ARS code, including not possessing a license, never having been issued a license, having a revoked or canceled license, and possessing an expired license. In this model, the likelihood Hispanic drivers were cited for speed is increased by approximately 12 percent compared to White drivers. ($p>0.05$). Licensure violations increase the odds of receiving a citation by over 860 percent. This finding was statistically significant at the $p<0.001$ level. In Model 47, insurance violations are introduced as a statistical control. In this model Hispanic drivers were almost 20 percent more likely to receive a citation, when compared to White drivers. This finding was significant at the $p<0.01$ level. Further, having an insurance violation, coupled with a speeding violation, increased the likelihood of a citation by over 150 percent ($p>0.001$).

In Model 48, registration violations are introduced as a statistical control. Having a registration violation increased the odds that a driver will be cited for speeding by nearly 160 percent ($p>0.001$). According to this model, Hispanic drivers were almost 21 percent more likely to receive a citation when speeding compared to White drivers. This result was significant at the $p<0.01$ level. Model 49 explores the impact plate violations have on the likelihood that a driver is cited. According to Model 49, plate violations increase the likelihood of a citation by nearly 400 percent. This finding was statistically significant at the $p<0.01$ level. Based on this model, Hispanic drivers are almost 21 percent more likely than White drivers to receive a speeding citation ($p>0.01$).

Model 50 introduces equipment violations as a statistical control. According to this model, equipment violations are associated with a decrease in the likelihood a driver is cited. This finding was significant at the $p>0.001$ level. Based on this model, Hispanic drivers are almost 21 percent more likely than White drivers to receive a speeding citation ($p>0.01$).

Table 18: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed and Speed with Other Violations

Variable	Licensure	Insurance	Registration	Plate	Equipment
	Model 46 Odds Ratio (SE)	Model 47 Odds Ratio (SE)	Model 48 Odds Ratio (SE)	Model 49 Odds Ratio (SE)	Model 50 Odds Ratio (SE)
Race/Ethnicity	1.124* (0.066)	1.199*** (0.070)	1.207** (0.070)	1.207** (0.070)	1.207** (0.070)
Age	0.992*** (0.001)	0.992*** (0.001)	0.992*** (0.001)	0.992*** (0.001)	0.992*** (0.001)
Sex	1.045 (0.050)	1.051 (0.050)	1.053 (0.050)	1.054 (0.051)	1.058 (0.051)
School Zone	13.646*** (3.592)	13.132*** (3.424)	13.078*** (3.417)	12.678*** (3.306)	12.784*** (3.328)
Safety Corridor	0.803 (0.137)	0.829 (0.141)	0.829 (0.140)	0.834 (0.141)	0.827 (0.140)
1-5 MPH Over	1.733 (1.258)	1.996 (1.448)	1.952 (1.414)	2.092 (1.517)	1.988 (1.448)
6-10 MPH Over	1.377 (0.866)	1.452 (0.913)	1.427 (0.897)	1.472 (0.925)	1.405 (0.886)
11-15 MPH Over	3.309* (2.014)	3.494* (2.127)	3.493* (2.127)	3.554* (2.164)	3.329* (2.033)
16-20 MPH Over	18.908 (11.506)	19.359*** (11.786)	19.421*** (11.825)	19.704*** (11.997)	18.418*** (11.246)
21-25 MPH Over	66.202*** (40.497)	67.242*** (41.151)	67.676*** (41.421)	68.615*** (41.995)	64.278*** (39.451)
26-30 MPH Over	98.536*** (61.466)	100.140*** (62.490)	100.676*** (62.830)	102.596*** (64.026)	96.830*** (60.595)
31-35 MPH Over	121.028*** (79.252)	124.033*** (81.242)	126.101*** (82.599)	127.129*** (83.271)	121.472*** (79.790)
36-40 MPH Over	147.223*** (108.812)	143.887*** (106.380)	149.066*** (110.203)	148.040*** (109.450)	138.850*** (102.848)
41-45 MPH Over	325.248*** (384.414)	352.064*** (12.557)	355.982*** (420.528)	364.945*** (431.030)	339.331*** (401.085)
Licensure	9.667*** (1.996)	--	--	--	--
Insurance	--	2.510*** (0.457)	--	--	--
Registration	--	--	2.596*** (0.480)	--	--
Plate	--	--	--	4.958** (2.931)	--
Equipment	--	--	--	--	0.090** (0.082)
X Coordinate	1.340*** (0.092)	1.342*** (0.092)	1.355*** (0.093)	1.360*** (0.093)	1.367*** (0.093)
Y Coordinate	1.462*** (0.142)	1.527*** (0.147)	1.506*** (0.145)	1.507*** (0.145)	1.511*** (0.146)
Time of Day	0.981*** (0.005)	0.981*** (0.005)	0.981*** (0.005)	0.981*** (0.005)	0.981*** (0.005)
Constant	8.21e+07* (6.91e+08)	2.40e+07* (2.01e+08)	1.12e+08* (9.33e+08)	1.55e+08* (1.29e+09)	2.76e+08* (331.014)
R ²	0.250	0.240	0.240	0.238	0.238
χ ²	3686.03***	3537.92***	3538.72***	3519.32***	3519.44***
N	10,857	10,857	10,857	10,857	10,857

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Female drivers are the reference category; Speeds in bins above 45 MPH were excluded from the model because of collinearity.

In Model 51 in Table 19, the total number of violations documented during the stop was added to the model. In this model, Hispanic drivers are 14.5 percent more likely to be cited than White drivers ($p < 0.05$). The number of violations was a strong predictor of citation activity and increased the odds of receiving a citation. For example, a driver with two violations was nearly 180 percent more likely to receive a citation than drivers with only one violation ($p < 0.001$). In Model 52, the Composite model, all violation types (licensure, insurance, registration, plates, and equipment) are included in the model with the total number of violations. In this Model, race/ethnicity is no longer a statistically significant predictor of whether the driver receives a citation, while the total number of violations, licensure violations, plate violations and equipment violations remain statistically significant at the $p < 0.001$ level.

Table 19: Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed and Speed with Other Violations

Total Violations				Composite Model			
Model 51		Model 52		Model 51		Model 52	
Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)
Race/Ethnicity	1.145* (0.067)	36-40 MPH Over	155.022*** (117.084)	Race/Ethnicity	1.114 (0.066)	36-40 MPH Over	120.547*** (89.327)
Age	0.993*** (0.001)	41-45 MPH Over	364.422*** (434.527)	Age	0.993*** (0.001)	41-45 MPH Over	275.003*** (325.536)
Sex	1.039 (0.050)	Total Violations	2.876*** (0.254)	Sex	1.042 (0.051)	Total Violations	2.741*** (0.483)
School Zone	14.135 (3.748)	Licensure	--	School Zone	13.795*** (3.647)	Licensure	3.579*** (0.926)
Safety Corridor	0.797 (0.137)	Insurance	--	Safety Corridor	0.773 (0.133)	Insurance	0.657 (0.171)
1-5 MPH Over	1.850 (1.372)	Registration	--	1-5 MPH Over	1.522 (1.110)	Registration	0.588 (0.149)
6-10 MPH Over	1.489 (1.372)	Plate	--	6-10 MPH Over	1.182 (0.746)	Plate	1.393*** (0.895)
11-15 MPH Over	3.882* (2.435)	Equipment	--	11-15 MPH Over	2.959 (1.806)	Equipment	0.024*** (0.022)
16-20 MPH Over	22.256*** (13.962)	X Coordinate	1.328*** (0.092)	16-20 MPH Over	17.152*** (10.464)	X Coordinate	1.336*** (0.093)
21-25 MPH Over	77.375*** (48.782)	Y Coordinate	1.474*** (0.143)	21-25 MPH Over	59.893*** (36.729)	Y Coordinate	1.454*** (0.142)
26-30 MPH Over	112.720*** (72.388)	Time of Day	0.980*** (0.005)	26-30 MPH Over	87.813*** (54.912)	Time of Day	0.981*** (0.005)
31-35 MPH Over	139.360*** (93.707)	Constant	6.81e+06 (5.75e+07)	31-35 MPH Over	110.328*** (72.461)	Constant	0.950 (7.696)
R ²	0.250			R ²	0.255		
χ ²	3690.80			χ ²	3762.45		
N	10,857			N	10,857		

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; White drivers are the reference category; Female drivers are the reference category; Stops in speed bins above 45 MPH above the speed limit were automatically removed from the estimation procedure by Stata because of collinearity.

Table 20: Model 53—Logistic Regression Results for Citation/Warning Outcomes Using Stops with Speed and Speed with Other Violations, White and Hispanic Stops Only (N = 10,847)

DOJ—Model Request #2: Race/Ethnicity, Stop Characteristics, and Beats					
Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)	Variable	Odds Ratio (SE)
Race/Ethnicity (Hispanic)	1.272*** (0.080)	Time of Day	0.986** (0.005)	School Zone	12.787*** (3.871)
		Safety Corridor	0.704 (0.129)		
MPH Over Speed Limit					
1-5 MPH Over	2.264 (1.719)	16-20 MPH Over	30.937*** (19.402)	31-35 MPH Over	335.715*** (226.670)
6-10 MPH Over	2.142 (1.387)	21-25 MPH Over	149.814*** (94.527)	36-40 MPH Over	346.714*** (263.350)
11-15 MPH Over	4.794* (3.007)	26-30 MPH Over	239.815*** (154.343)	41-45 MPH Over	959.246*** (1151.254)
Beats					
Beat 1	0.735 (0.819)	Beat 25	0.230 (0.256)	Beat 49	Omitted ^a
Beat 2	0.446 (0.498)	Beat 26	0.273 (0.304)	Beat 50	Omitted ^a
Beat 3	0.255 (0.287)	Beat 27	0.221 (0.248)	Beat 51	0.164 (0.183)
Beat 4	0.688 (0.782)	Beat 28	0.315 (0.494)	Beat 52	0.779 (0.983)
Beat 5	0.236 (0.266)	Beat 29	0.118 (0.223)	Beat 53	Omitted ^a
Beat 6	0.434 (0.503)	Beat 30	0.132 (0.150)	Beat 54	0.067 (0.091)
Beat 7	0.285 (0.320)	Beat 31	0.240 (0.270)	Beat 55	Omitted ^a
Beat 8	0.639 (0.839)	Beat 32	0.439 (0.488)	Beat 56	0.112 (0.149)
Beat 9	2.201 (2.603)	Beat 33	0.971 (1.083)	Beat 57	Omitted ^a
Beat 10	0.294 (0.332)	Beat 34	2.687 (2.967)	Beat 58	0.158 (0.176)
Beat 11	0.788 (0.888)	Beat 35	1.439 (1.633)	Beat 59	0.784 (0.878)
Beat 12	0.916 (1.048)	Beat 36	0.386 (0.428)	Beat 60	0.479 (0.531)
Beat 13	2.313 (2.583)	Beat 37	0.437 (0.490)	Beat 61	0.577 (0.638)
Beat 14	Omitted ^a	Beat 38	0.182 (0.203)	Beat 62	0.593 (0.657)
Beat 15	1.231 (1.404)	Beat 39	0.995 (1.185)	Beat 63	0.129 (0.145)
Beat 16	0.729 (0.815)	Beat 40	0.619 (0.760)	Beat 64	1.283 (1.415)
Beat 17	2.16 (2.535)	Beat 41	0.865 (1.215)	Beat 65	1.691 (1.889)
Beat 18	1.333 (1.489)	Beat 42	0.308 (0.407)	Beat 66	1.381 (1.558)
Beat 19	0.642 (0.710)	Beat 43	0.286 (0.372)	Beat 67	0.970 (1.073)
Beat 20	Omitted ^a	Beat 44	Omitted ^a	Beat 68	0.302 (0.343)
Beat 21	0.206 (0.229)	Beat 45	Omitted ^a	Beat 69	Omitted ^a
Beat 22	0.152 (0.170)	Beat 46	Omitted ^a	Beat 70	Omitted ^a
Beat 23	0.161 (0.182)	Beat 47	Omitted ^a	Beat 71	Omitted ^a
Beat 24	0.136 (0.151)	Beat 48	0.091 (0.123)		
Constant	0.127 (0.161)	R ² = 0.320		χ ² = 4726.79***	

***p<0.001; **p<0.01; *p<0.05; White drivers are the reference category; Speeds bins above 45 MPH over the speed limit were removed from the model because of collinearity.; ^aVariables omitted because there was no variation in this condition.

Finally, as requested by experts with the U.S. Department of Justice, MCSO modeled the likelihood of receiving a citation versus a warning with geography specified as beats in lieu of Cartesian coordinates (X and Y) and the stop characteristics alone (speed binned in 5-MPH increments, time of day, school zone stops, and safety corridor stops). The results from this analysis are provided in Table 20 (Model 53). This analysis differs from the one presented in Model 34 because it uses all speeding stops whether or not additional violations were documented. When controlling for the time of day, school zone stops, safety corridor stops and geography specified as beats, Hispanic drivers were about 27% more likely to receive a citation than White drivers. This finding was significant at the $p < 0.001$ level.¹⁶ No individual patrol beats were statistically significant in the model while school zone stops, safety corridor stops were both statistically significant. All 5-MPH speed bins above 10 MPH were statistically significant.

On the whole, modeling of citation and warning activity demonstrates that Hispanics are more likely to be cited when compared to White drivers. However, as the above analyses show, certain combinations of demographic and stop characteristic control variables reduce the effect of race/ethnicity as a predictor of citation activity (e.g., compare Model 35 to Models 36-46). One model in the above analyses is of particular interest. When race/ethnicity and speed are the only variables used in the modeling procedure for single speeding offense stops, (Model 28) the effect of race/ethnicity is not statistically significant.¹⁷ Furthermore, comparing Model 31 with Model 34, it appears that how geography is operationalized as a variable will impact the results of analyzing racial/ethnic disparity in citation/warning outcomes. When geography is modeled linearly (Model 31), there was a statistically significant effect of race/ethnicity. Whereas when the county is divided into discrete units based on patrol beats, there was no statistically significant effect of race/ethnicity (Model 34).

Finally, in the analysis of speeding stops that included more than one documented violation, there seems to be a strong impact of additional violations on whether a driver is cited for speed and licensure violations are somehow related to the observed disparity in citation outcomes between Hispanic and White drivers (compare Models 45 and 46).

¹⁶Additional variations of the “Beats” model (Model 53) were explored but are not fully presented here due to space considerations. With the demographic controls of age and sex added predictors to Model 53, the odds of a Hispanic driver receiving a citation were 1.164 and was statistically significant at the $p > 0.05$ level. When the odds of receiving a citation were modeled as a function of speed and beats alone (no additional controls), the odds of Hispanic drivers receiving a citation were 1.258 and were statistically significant at the $p < 0.001$ level. A full model estimating the odds of a receiving a citation—using speed, beats, time of day, age, sex, school zones, safety corridors, and the total number of violations—produces an odds ratio for Hispanic drivers of 1.103 and was not statistically significant. Full models for these specifications are available upon request.

¹⁷ By using single speeding citation/warning events, the confounding effects of additional violations are minimized.

Summary of Logistic Regression Analyses

It is important to note that MCSO expected to find disparate outcomes in these analyses based on the findings from the TSAR 6. While most models clearly demonstrate that the likelihood of a citation is increased for Hispanic drivers, controlling for certain demographic and stop characteristics, other models do not demonstrate evidence of disparate outcomes for speeding. Furthermore, when patrol beats are used as a proxy for geography, the effect of race/ethnicity was not statistically significant in predicting civil/criminal and citation/warning activity (one offense). One important insight gained from these models was that additional offenses and multiple offenses increase the likelihood that a driver will be cited. Furthermore, the speed above the speed limit remained the most consistent predictor of receiving a citation across all model specifications. These observations may be clarified by the analysis of categorical outcomes presented below. Specifically, certain types of violations are more common with Hispanic or White drivers. Finally, and important for drawing conclusions from these results, the number of violations recorded during stops remained a consistent predictor of both criminal speeding citation activity and speeding citation activity more broadly. Key findings from these analyses are summarized below.

- The effect of race/ethnicity is either reduced or disappears when certain statistical controls were applied or removed. Thus, the answer to the question of whether one's likelihood of receiving a citation based on race/ethnicity is increased depends on how other characteristics of the traffic stop are considered as statistical controls.
- Assumed income (measured by the median income of the driver's zip code) was a statistically significant predictor of citation activity across all models in which it was tested. However, in some models, assumed income operated opposite of what the research team had predicted. Drivers from zip codes with higher median income were more likely to be cited than drivers residing in zip codes with lower median income, when controlling for other stop characteristics and driver demographics.
- The total number of violations was a consistent predictor of citation activity across all models that it was used in and odds ratios for race/ethnicity were higher when this control was not applied.
- Although unsurprising, the speed a driver travels was a strong and consistent predictor of citation activity. This was true in all models for which the variable was applied (e.g., speed over criminal threshold, and speed above the speed limit).
- Licensure, insurance, and registration violations that are coupled with criminal speeding infractions have little effect on the likelihood that a driver will be cited for criminal speed. DUIs appear to be an important correlate of criminal speed citations. Plate violations are negatively associated with the likelihood that a driver receives a criminal citation as opposed to a civil citation, for speeds above the criminal speed threshold.
- Licensure, insurance, and registration violations are strong predictors of whether a driver receives a speeding citation. Licensure violations and speeding in school zones are the strongest predictors relative to all others tested in all models.
- One consistent trend across all models should be noted. When ignoring statistical significance, all of the odds ratios for Hispanic drivers were above 1.000 indicating Hispanic drivers were more likely to be cited than White drivers. Thus, the persistent effect of race/ethnicity in speeding citation outcomes must be acknowledged.

UNIVARIATE ANALYSES FINDINGS

There were a series of analyses run relevant to the citation rate benchmark for the County, the 7 districts and each of the 71 beats with traffic stops in 2020. Each of the analyses was run to answer a specific question, with a follow up question to identify statistically significant differences between Hispanic and White drivers¹⁸. The report will summarize the statistically significant differences at the County, District and Beat level with the complete results, including time of day results available in the noted appendices.

Stop Reason: What did the deputy document as the reason for stopping the motorist?

Findings for Stop Reason: Was there a difference between Hispanic and White drivers in the documented reason for the traffic stop? See Appendix A.

Cite/Warn Outcome: What are the rates of citations as a proportion of traffic stops?

Findings for Cite/Warn Outcome¹⁹: Was there a difference between Hispanic and White drivers in the rate of citations as a proportion of traffic stops? See Appendix B.

Violation Type: What are the rates of citations as a proportion of traffic stops within a violation type (e.g., criminal, civil traffic, etc.)?

Findings for Violation Type²⁰: Was there a difference between Hispanic and White drivers in the rate of citations for violations of a given type (e.g., criminal, civil traffic, etc.)? See Appendix C.

ARS: What are the rates of citations specific to the documented statute violated?

Findings for ARS: Was there a difference between Hispanic and White drivers in the rate of citations specific to the documented statute violated? See Appendix D.

Average Number of Cited Violations: What is the average number of violations documented for a traffic stop with an outcome of citation?

Findings for Average Number of Cited Violations: Was there a difference between Hispanic and White drivers in the average number of violations documented for a traffic stop with an outcome of citation? See Appendix E.

Cited Violation Count: What was the number of violations per citation for traffic stops with an outcome of citation?

Findings for Cited Violation Count: Was there a difference between Hispanic and White drivers in the number of violations per citation for traffic stops with an outcome of citation? See Appendix E.

¹⁸ None of the analyses identifying differences include control variables. The chi-square or t-test analyses ask whether a person in one category (driver race/ethnicity) is equally likely to be part of a group as someone from the other category.

¹⁹ This is the same question used as the citation benchmark, but this analysis is a different methodology that considers no other variables.

²⁰ Violation type is considered within the current Traffic Stop Annual Report (TSAR) as the sole control variable to consider the level of the offense that could speak to citation or warning as an outcome.

Speed Measure: What was the device/method used to measure motorists' speed for traffic stops with speed noted as the reason for stop?

Findings for Speed Measure: Was there a difference between Hispanic and White drivers in the device/method used to measure motorists' speed for traffic stops with speed noted as the reason for stop? See Appendix F.

INTERPRETING FINDINGS

MCSO examined the differences between Hispanic and White drivers at the Office and District Level. Table 20 below summarizes the findings where a t-test, Chi-Square or Fisher's exact test examined the differences between Hispanic and White drivers on a variety of traffic stop measures. Caution should be used interpreting these results as each analysis is independent of each other and, unlike the regression analyses discussed earlier, there are no controls for any additional variables that may be driving the differences observed. For example, we may find Hispanics may be more likely to be cited for a specific violation, but that will not control for circumstances where multiple violations occur at the same time. These analyses are presented below at the District and Beat levels in order to identify where differences are occurring across the office.

Stop Reason was categorized into six different categories: Speeding, Non-speed moving violations, Equipment Violation, License/registration/insurance, Other/missing, Two or more stop reasons. MCSO as a whole and Districts 1, 2, 3, 5, and 7 had statistically significant differences between Hispanic and White drivers as far as the reasons for which they were stopped.

Violation Types are categorized in the following categories: Civil Traffic, Criminal Traffic, Criminal, Petty Offenses, and Incurable Offenses/Minor. Most of the offenses are Civil Traffic and Criminal Traffic with an almost negligible number of Criminal, Petty and Incurable Minor Offenses. All but District 2 had statistically significant differences in outcome between Hispanic and White drivers across the Violation Type categories.

Drilling down further into the violations driving behaviors by looking at the specific ARS Codes, we do see differences between White and Hispanic drivers in every district but District 1. Statistically significant differences in citation and warning outcomes between Hispanic and White drivers occur across specific law violations in every district except District 1.

Differences in the number of violations (t-test of mean number of violations for Hispanics and White drivers) and the violation count (Fisher's Exact Test across the categories of the number of violations, 1-7.) for drivers who receive citations, identified that Hispanics had a higher number of violations than Whites across all of the districts.

As an additional measure, for all stops regardless of whether the reason of the stop was speeding, a chi-square test was conducted to determine if there was any difference between Hispanic and White drivers on what speed measurement tool was used to determine the speed of the offending driver's vehicle. The methods employed by MCSO vary based on the availability of equipment and the circumstances of the initiation of the stop. The speed measurement devices used were categorized into one of the 6 categories:

laser, pace, radar, time and distance, other, none/missing. Districts 3, 5, and 6 had statistically significant differences between Hispanics and White drivers across this speed measure.

The overall Citation/Warning outcome identified Districts 2, 4, and 5 as not having any statistically significant findings of differences between Hispanic drivers and White drivers.

The following section will describe the statistically significant differences observed at the Office and District Level across all these measures, and the results from all of these analyses can be found in their entirety in the relevant Appendices (A-F).

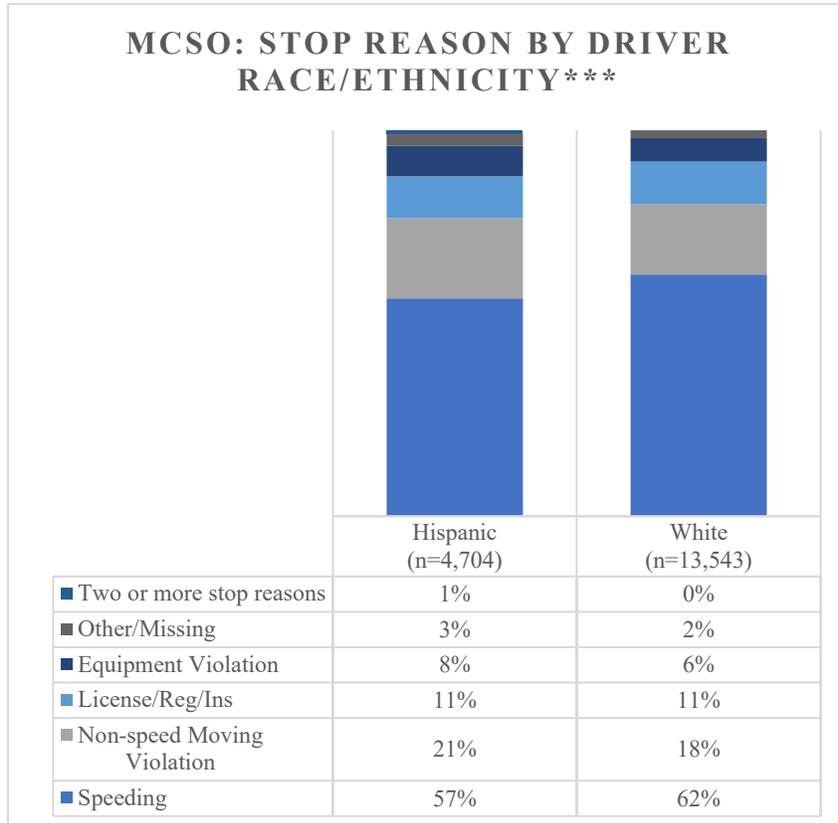
Table 20: Stop Outcome Findings of Disparity

District	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
1	2,341	29%	71%	86	***	*	***	---	**	***	---
2	2,854	50%	50%	86	*	---	---	***	***	***	---
3	2,947	27%	73%	72	**	**	***	*	***	***	***
4	3,065	12%	88%	87	---	---	*	*	***	***	---
5	1,239	25%	75%	67	***	---	*	*	***	***	***
6	2,986	24%	76%	70	---	***	***	***	*	*	***
7	2,700	14%	86%	58	**	**	***	**	***	***	---
OFFICE	18,132	26%	74%	148	***	*	***	***	***	***	***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

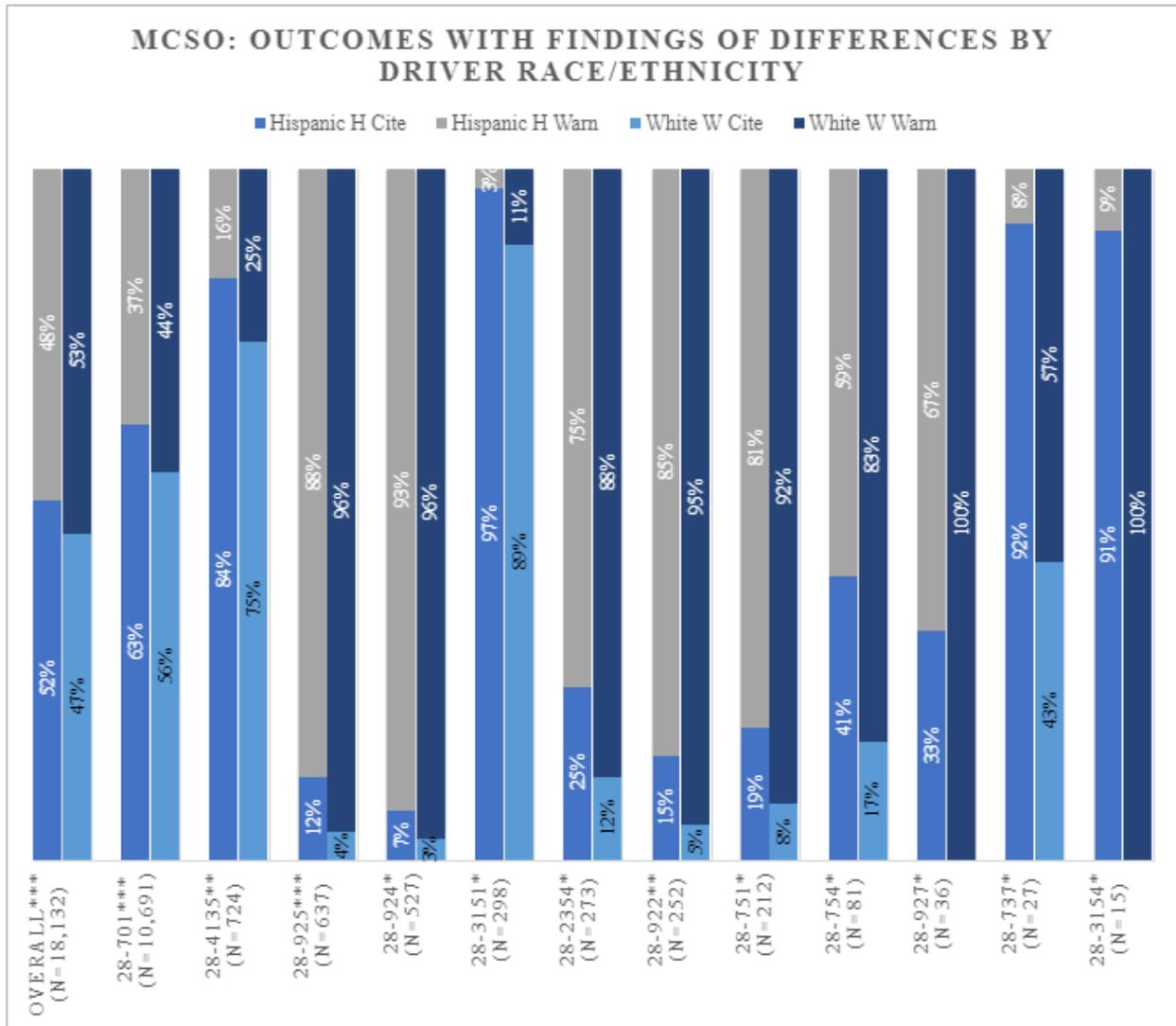
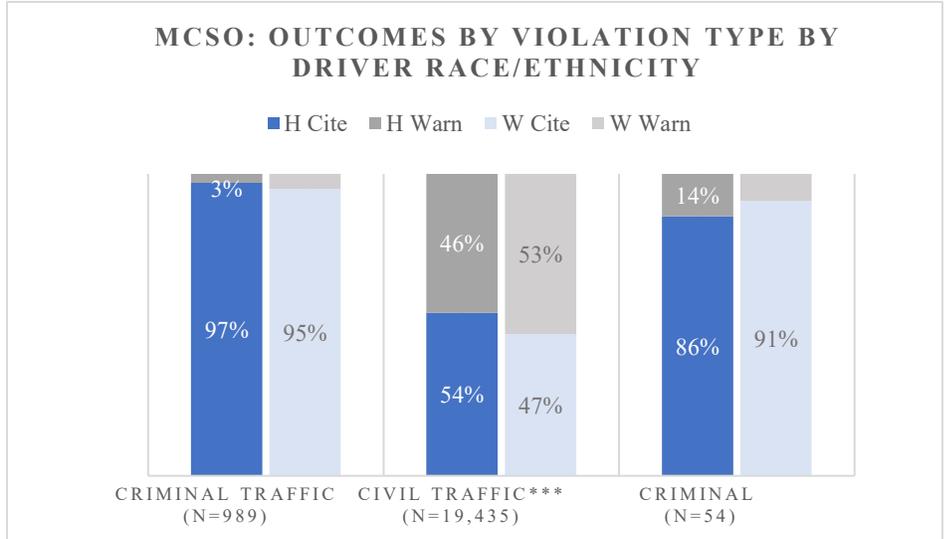
MCSO OFFICE STOP OUTCOME FINDINGS OF DISPARITY

Statistically significant findings were identified across all 7 of the measures in Table 20 for the office.

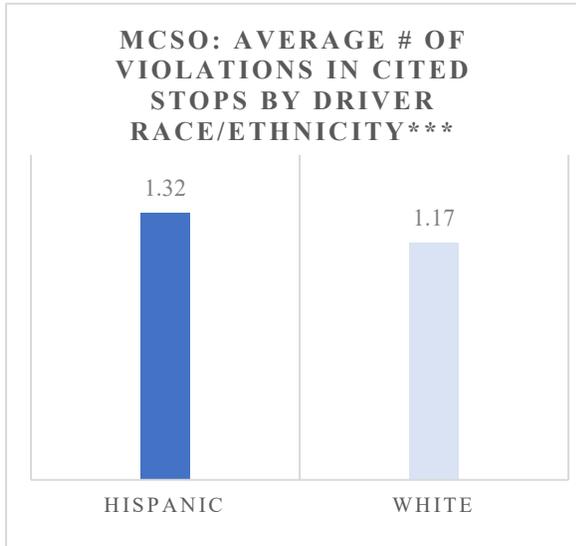


Moving Violations accounted for around 80 percent of the stop reasons for both Hispanics and White drivers. 62 percent of White drivers were stopped for speeding compared to 57 percent of Hispanic drivers. Conversely, Hispanic drivers had higher rates of being pulled over for non-speed moving violations, 21 percent compared to 18 percent for Whites, and equipment violations 8 percent and 6 percent.

Violation Types are categorized in the following categories: Civil Traffic, Criminal Traffic, Criminal, Petty Offenses, and Incurrable Offenses/Minor. There was only 1 incurrable stop and 2 petty stops across the office in 2020 so they are not represented in these visuals. At The Office level, Civil Traffic had statistically significant findings when comparing rates of citation/warning across Hispanics and Whites. 54 percent of the Hispanic drivers were cited compared to 47 percent of the White drivers.



As the findings from TSAR 6 indicated, there were statistically significant differences in Citation rate overall across all stops at the office level. MCSO had statistically significant differences in citation rate across 12 specific ARS statute violations at the office level. They were: 28-701 Speeding, 28-4135 Insurance, 28-925 Tail Lamps, 28-924 Head Lamps, 28-3151 No Driver's License, 28-2354 License Plate Display, 28-922 Lighted Lamps, 28-751 Position and Method of Turning, 28-754 Turn Signals, 28-927 Stop Lamps, 28-737 High Occupancy Vehicle Lane, and 28-3154 Learner's Permit violations.

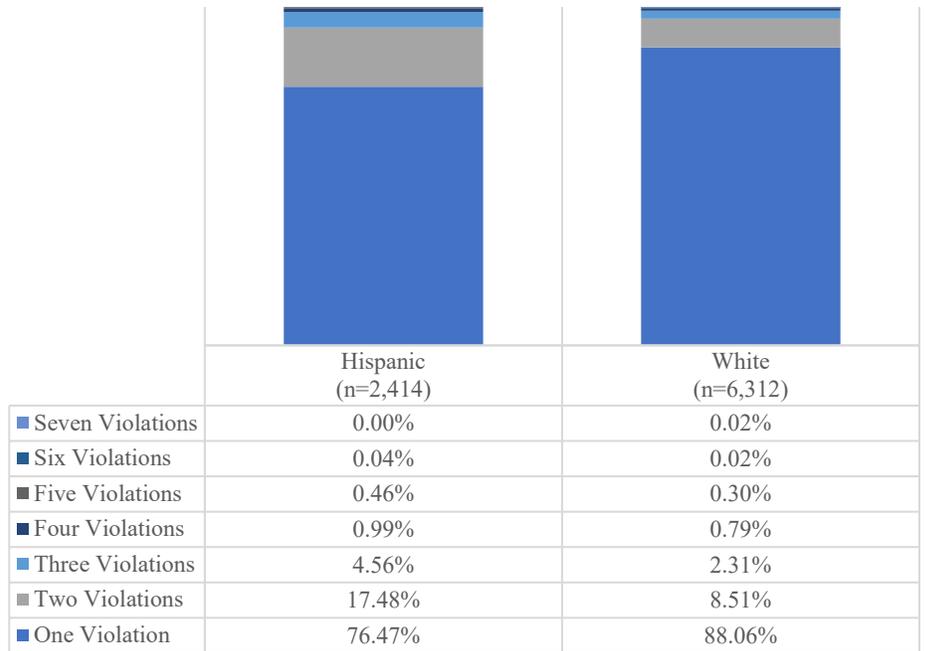


At the Office level White drivers had on average 1.17 violations on citations while Hispanic drivers had 1.44 violations per citation, a statistically significant difference that likely impacts many of the other measures when not controlled for in analyses.

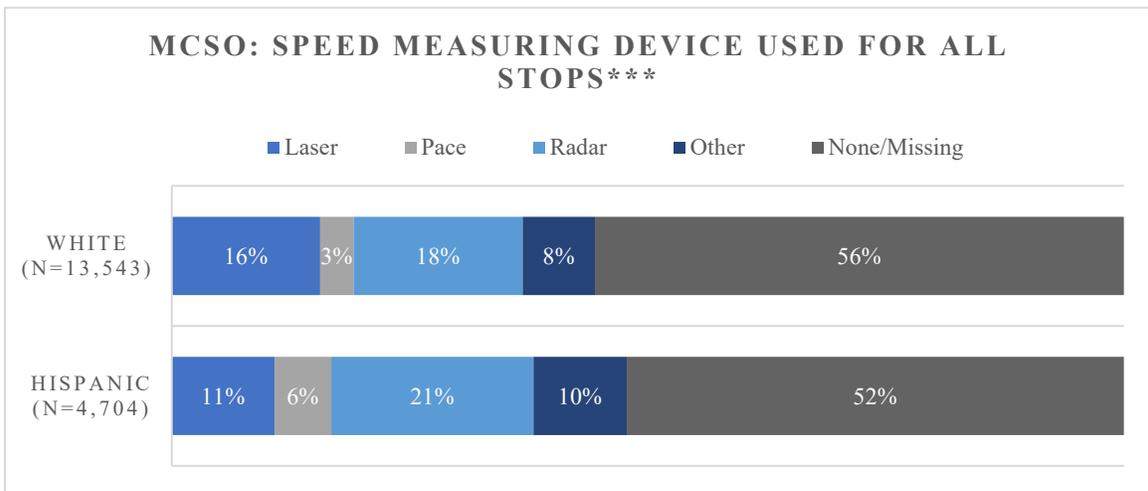
In addition to the mean number of violations being higher for Hispanic drivers per citation, there were significant differences when comparing the count of violations per citations.

88 percent of White drivers only received one violation on their citations while 76 percent of Hispanic drivers cited only had one violation noted. Hispanics had higher rates at each subsequent count of violations, 2-6.

MCSO: COUNT OF VIOLATIONS IN CITED STOPS BY DRIVER RACE/ETHNICITY***



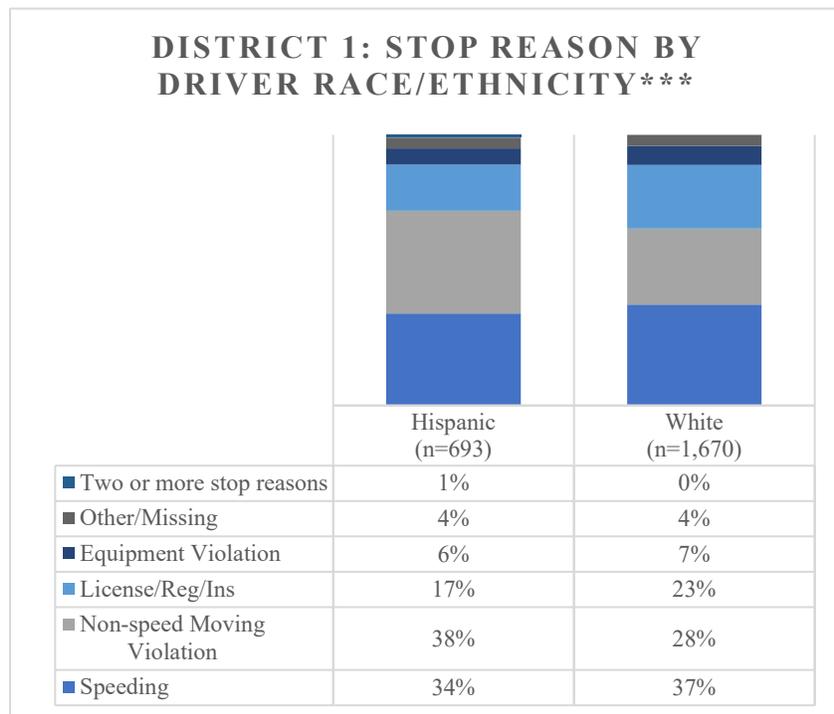
The speed measurement devices used were categorized into one of the 6 categories: laser, pace, radar, time and distance, other, none/missing. Time and distance was used infrequently (11 times) and shows up as 0 percent and as such is not included in the visual. Hispanic drivers were more likely to be cited for speed violations via Pacing and Other means than White drivers, while White drivers were more likely to be cited with radar and laser speed measurement devices. Deputies use varying methods to cite speeders as not all units are equipped with the same equipment so methods employed will vary across locations, vehicles and shifts.



DISTRICT STOP OUTCOME FINDINGS OF DISPARITY

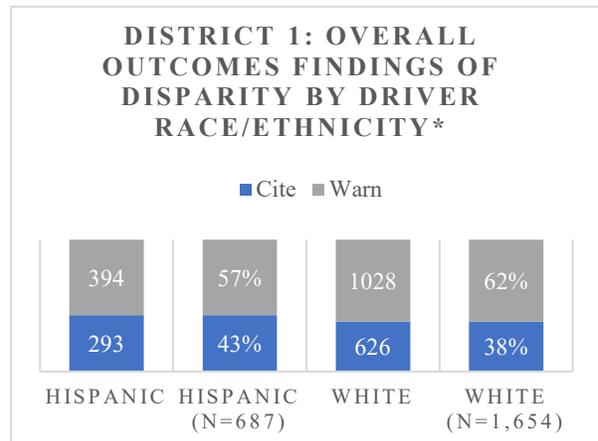
DISTRICT 1

District 1 had findings statistically significant differences between Hispanic and White drivers across five (5) of the seven measures described as shown in Table 20 above. Again, it is important to remember that the analyses in this section do not utilize control variables and are simply comparing the rates of documented behaviors and outcomes. The purpose of these analyses is to examine the differences between Hispanic and White driving behaviors and subsequent MCSO contact in an attempt to understand where some of the differences observed in the Traffic Stop Annual Report (TSAR) are coming from for the purpose of explaining and identifying a course of action for the Office and communities served.

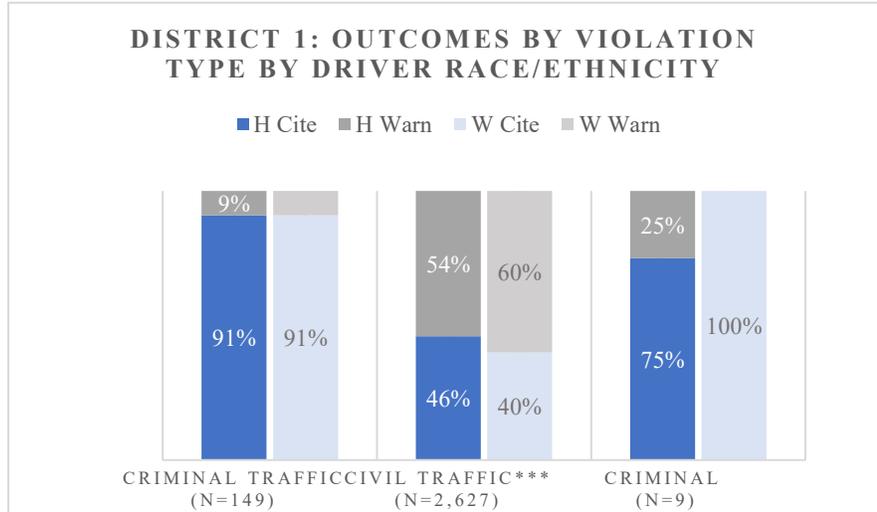


There were statistically significant differences in stop reason in District 1. Speeding was the most common reason for stop for White drivers while Non-Speed Moving Violations was the most common stop reason for Hispanic drivers. Moving Violations (Speeding and Non-Speed) comprised most of the stops in the district for both groups.

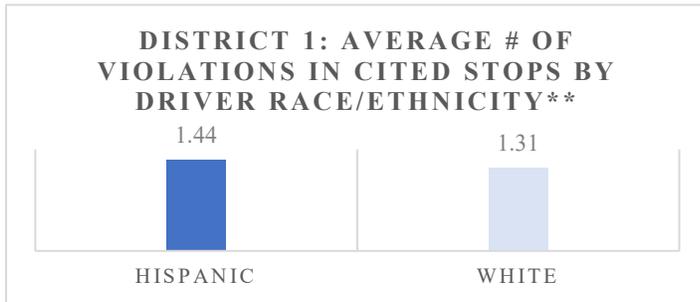
There were also statistically significant differences in the Citation/Warning outcomes between White and Hispanic drivers in District 1. 62 percent of the White drivers received a warning compared to 57 percent of Hispanic drivers.



The Violation Types for Hispanic and White drivers that occurred in District 1 during 2020 were as follows: 149 Criminal Traffic Stops (53 Hispanic, 96 White), 2,627 Civil Traffic Stops (799 Hispanic, 1,828 White) and 9 Criminal Stops (4 Hispanic, 5 White). 56 percent of the stops in District 1 resulted in warning, while 44 percent resulted in a Citation.



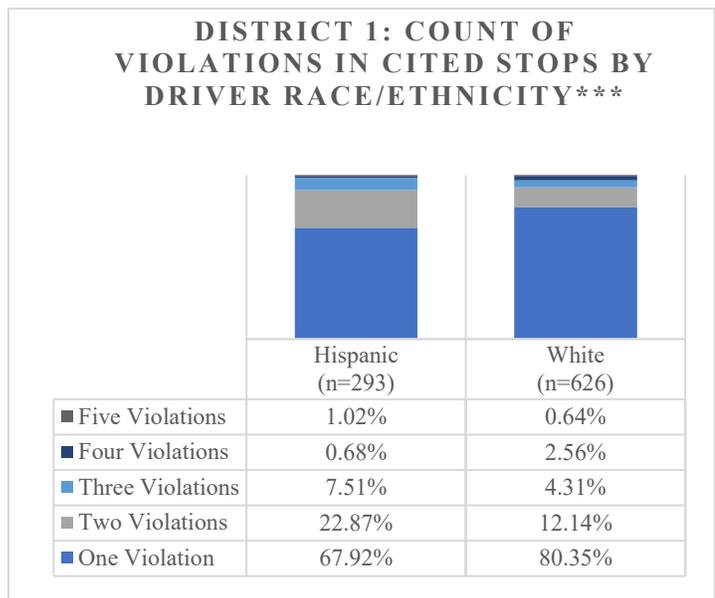
Civil Traffic represent the vast majority of stops in the district and the different rates of citation and warnings between Hispanic and White drivers were significant for Civil Traffic violations. 40 percent of White drivers' civil traffic violations resulted in a citation compared to 46 percent of the Hispanic drivers' violations for civil traffic. When further breaking down the offenses from the broad Violation Types into ARS categories, there were no significant differences across race when comparing the laws documented as having been broken, ARS codes, within District 1.



When considering the number of violations that occurred on each citation across race, significant differences were observed. White drivers had on average 1.31 violations on citations while Hispanic drivers were cited with an average of 1.44 violations per citation.

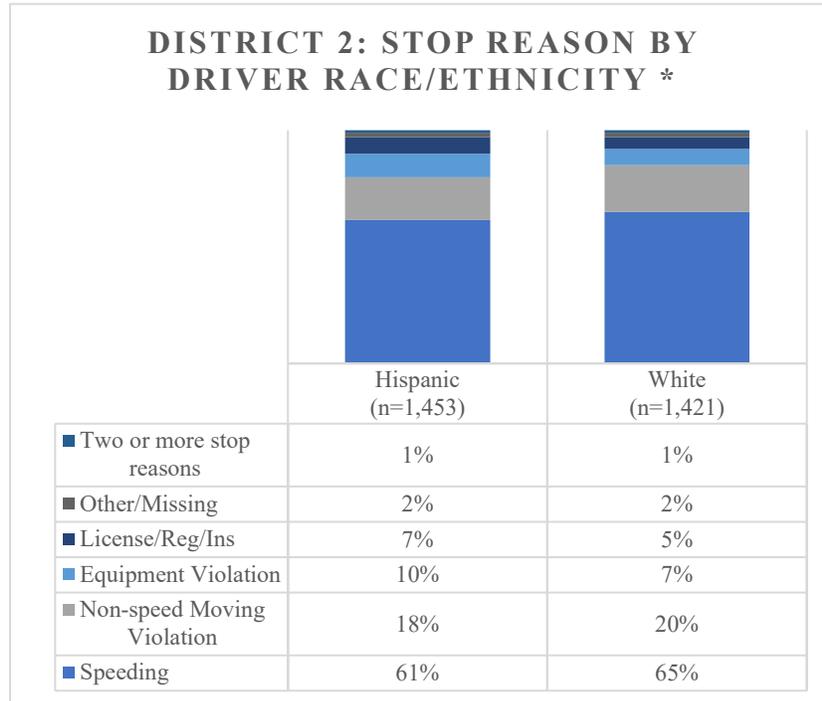
In addition to the mean number of violations being higher for Hispanic drivers per citation, there were significant differences when comparing the count of violations per citations. 80 percent of White citation recipients had only one violation noted while 68 percent of Hispanic citation recipients had only one violation.

There were no differences observed in District 1 regarding rates of use of various speed measuring devices across race.



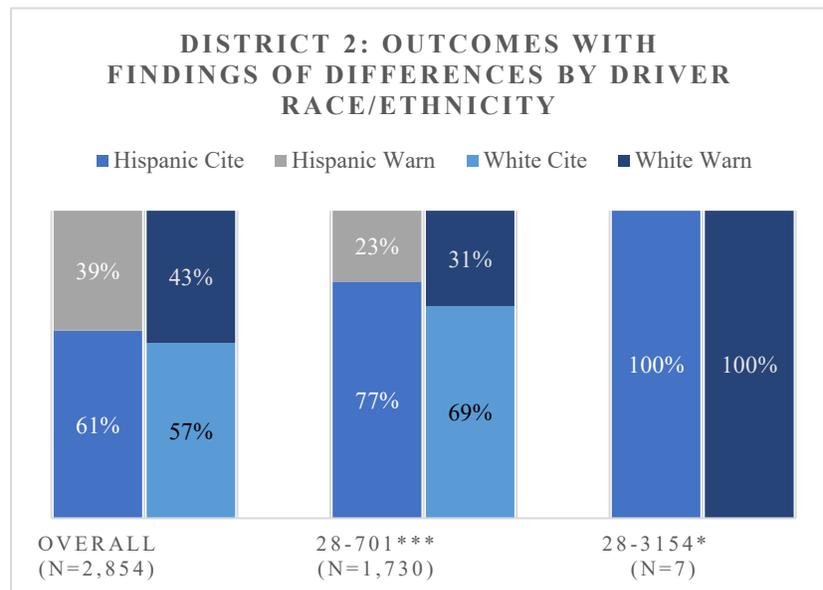
DISTRICT 2

District 2 had findings of statistically significant differences between Hispanic and White drivers across the four (4) of the seven measures described as shown in Table 20. above. There were differences across race in the stop reason, specific ARS violated, the mean number of violations per citation, and the count of violations per citation. Each finding will be discussed below.



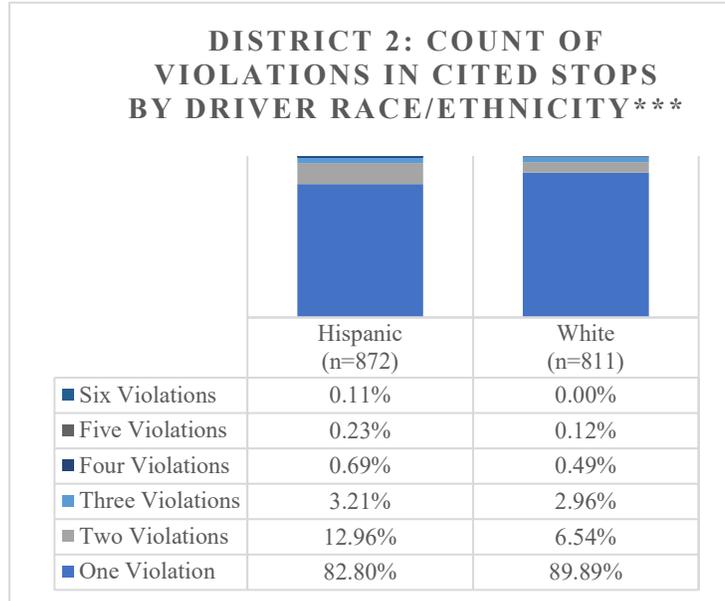
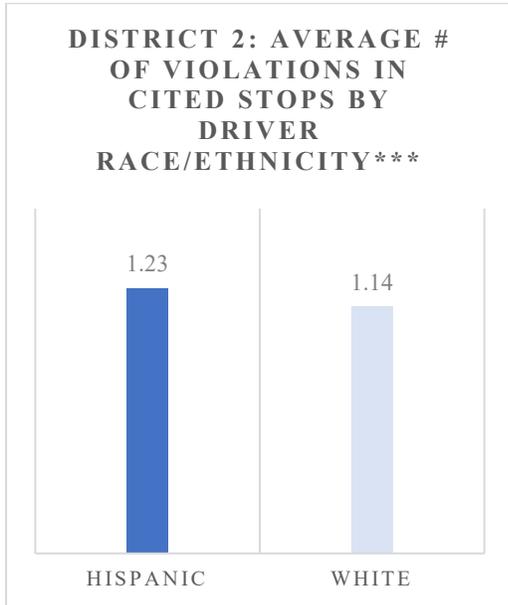
As in most Districts, we see Speeding and Non-Speed Moving Violations make up most of the stops across both Hispanic and White drivers. The differences can be found within the percentage of moving violations across race, 85 percent of stops of White drivers were for moving violations (speeding and other non-speed moving violations) compared to 79 percent for Hispanic drivers. 17 percent of the Hispanic stops were related to equipment violations and license/registration/insurance violations compared to only 12 percent of White Stops for those same reasons.

District 2 did not have statistically significant differences between Hispanic and White drivers regarding the broad Violation Type (Criminal Traffic, Civil Traffic, etc.) but did have statistically significant differences between Hispanic and White drivers across two specific ARS Codes. Speeding (28-701) and Learner's Permit Violations (28-3154), with greater percentages of Hispanics being cited for both offenses. There were only 7 Learner's Permit violations in District 2, however, 100 percent

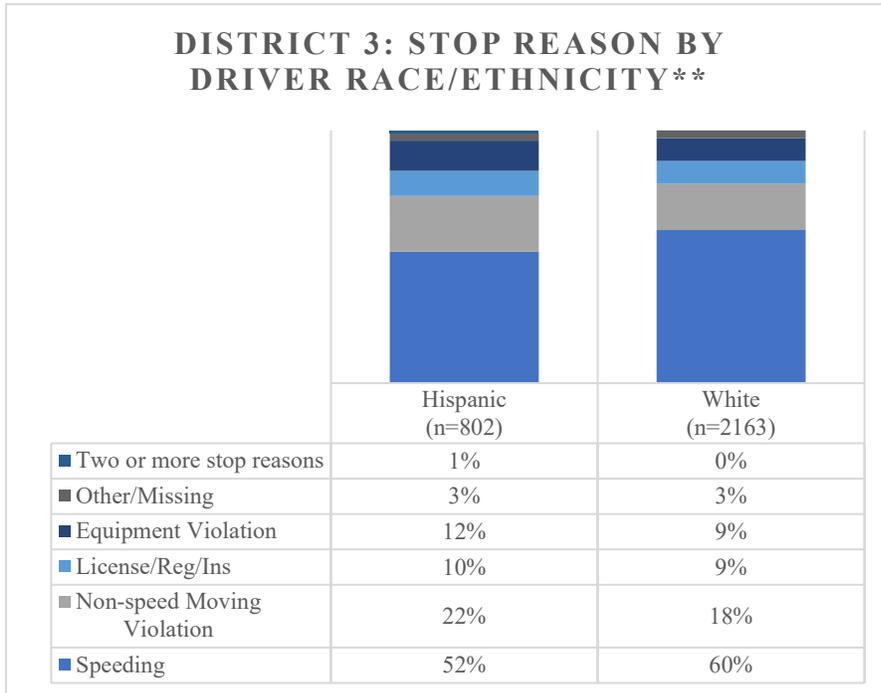


of the Hispanic drivers were cited while 100 percent of the White drivers were warned.

Both the mean number of violations per citation written and count of violations per citation yielded statistically significant differences with Hispanic drivers having more violations documented than White drivers.

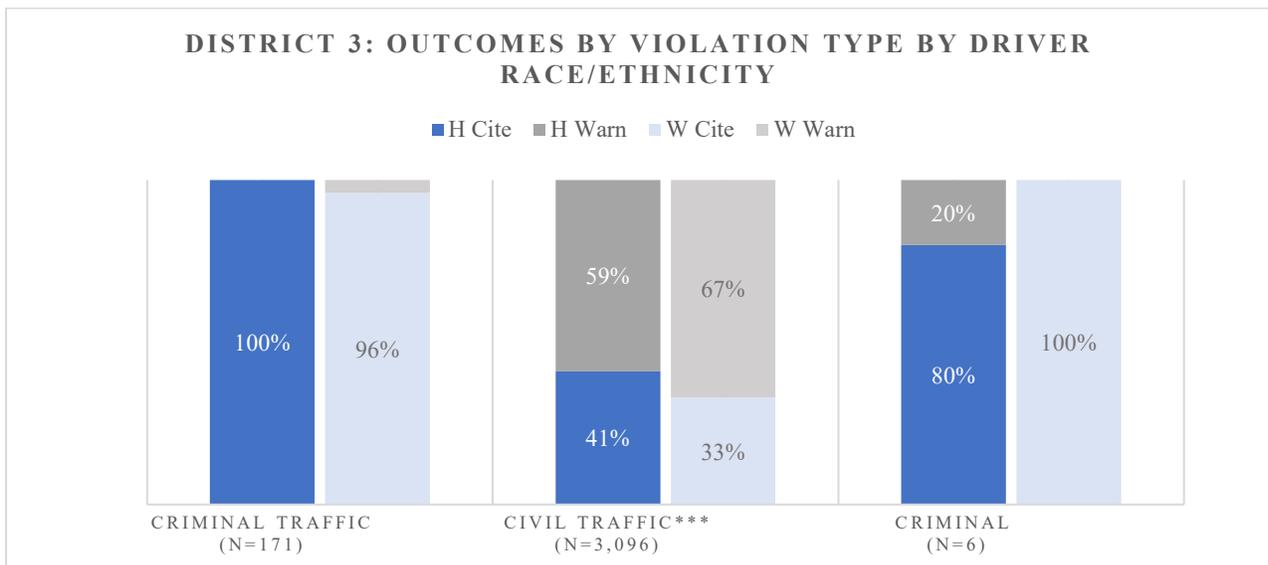


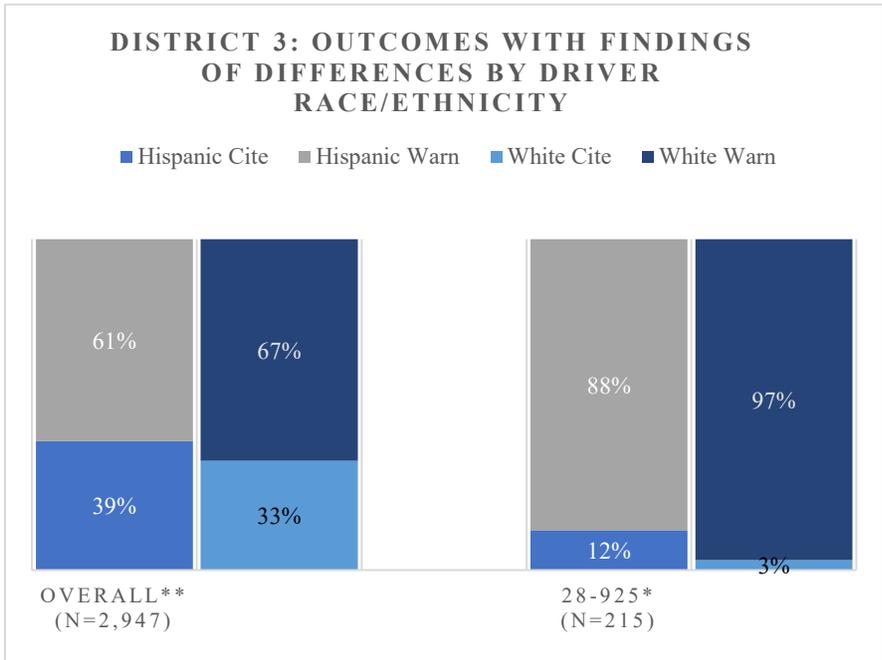
DISTRICT 3



District 3 had statistically significant differences across all 7 of the measures described in Table 20. Here again we see the pattern of Speeding and Non-Speed Moving Violations making up most of the stop reasons. Hispanic drivers had a greater percentage of Non-Speed Moving Violations, Equipment Violations, License/Registration/Insurance Violations and Two or more Stop Reasons.

When examining Violation Type across races we also find differences at the Civil Traffic category between Hispanic and White drivers. White drivers were warned at a higher rate (67%) than Hispanics (59%).

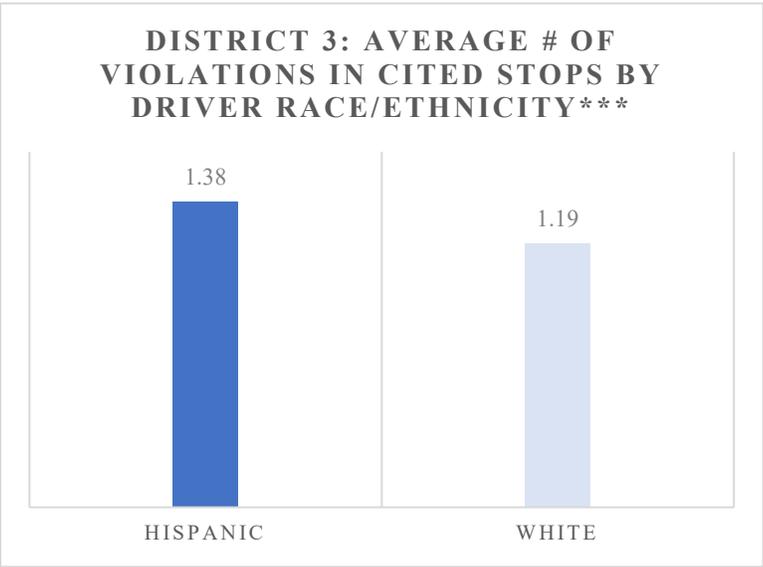




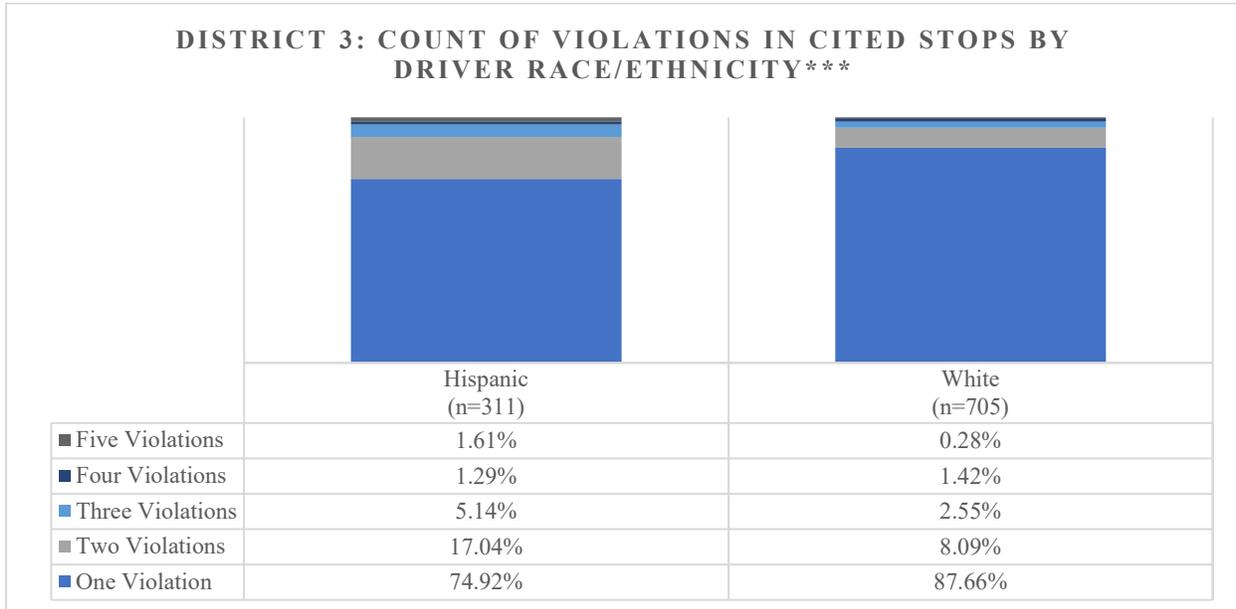
Across all violations and one specific ARS category differences were found. District 3 has one of the lowest citation rates, however the White drivers were cited in 33 percent of the stops while Hispanic drivers were cited in 39 percent of the stops. Across most of the specific violations there were no differences found. ARS 28-925 is related to tail lamps on a vehicle, trailer, or license plate. Hispanic drivers were cited 12 percent of the time for this violation while White drivers were cited 3 percent

of the time.

When considering the number of violations that occurred on each citation across race, significant differences were observed. Hispanic drivers had an average of 1.38 violations on citations while White drivers had an average of 1.19 violations per citation.

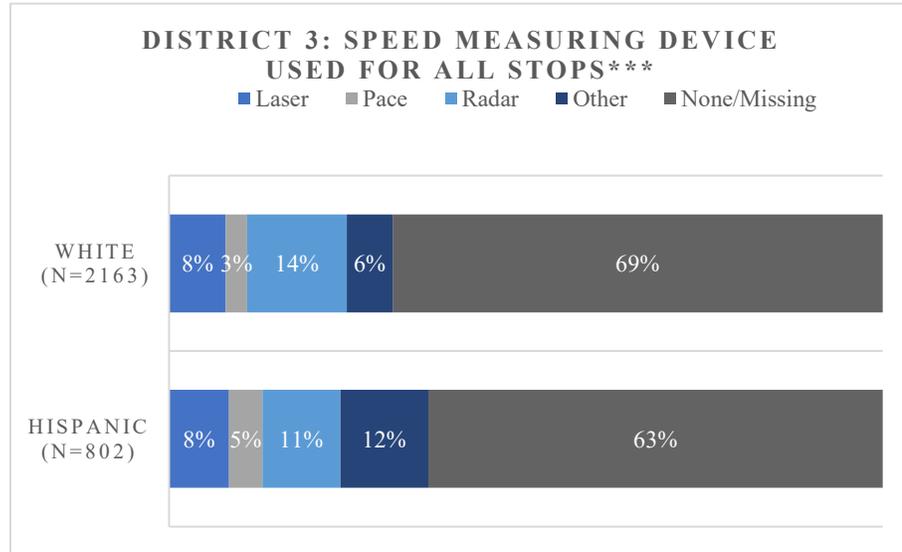


In addition to the mean number of violations being higher for Hispanic drivers per citation, there were also significant differences when comparing the count of violations per citations. 88 percent of White citation recipients had only one violation noted while 75 percent of Hispanic citation recipients had only one violation noted.



District 3 was one of three districts that had statistically significant differences in the method for which speed was measured.

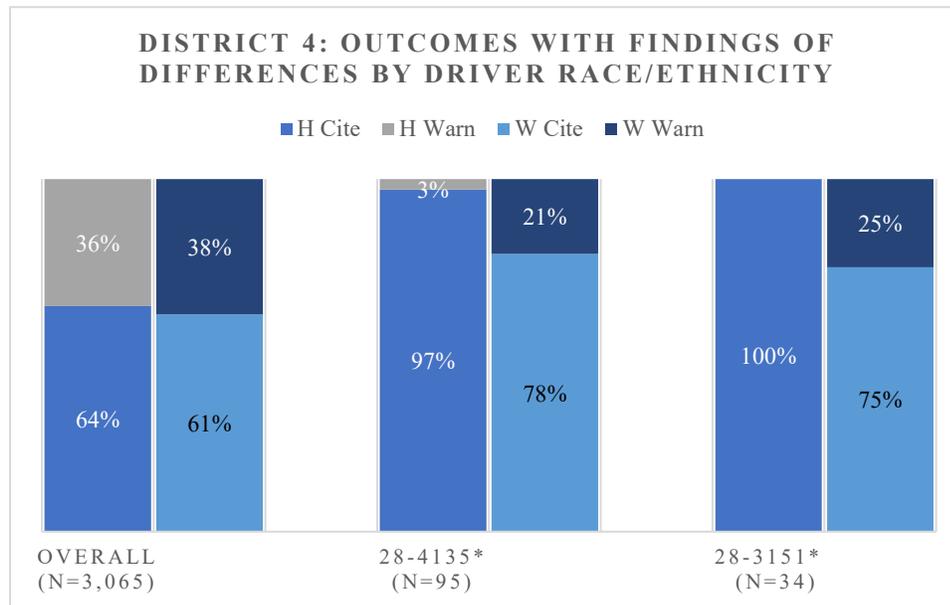
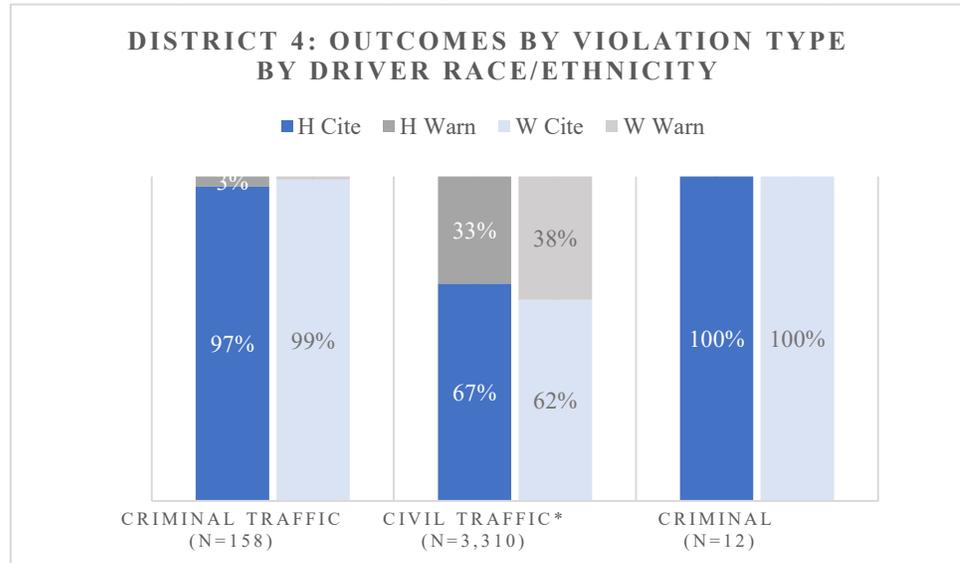
Speed measurement devices are not universally equipped across the office. The deployment of such devices may contribute to differences observed here and are not accounted for in this analysis. In District 3, Hispanic drivers were



more likely to be measured via pacing and other methods than White drivers, but less likely to be measured with a radar unit and equally likely to be measured with a laser unit.

DISTRICT 4

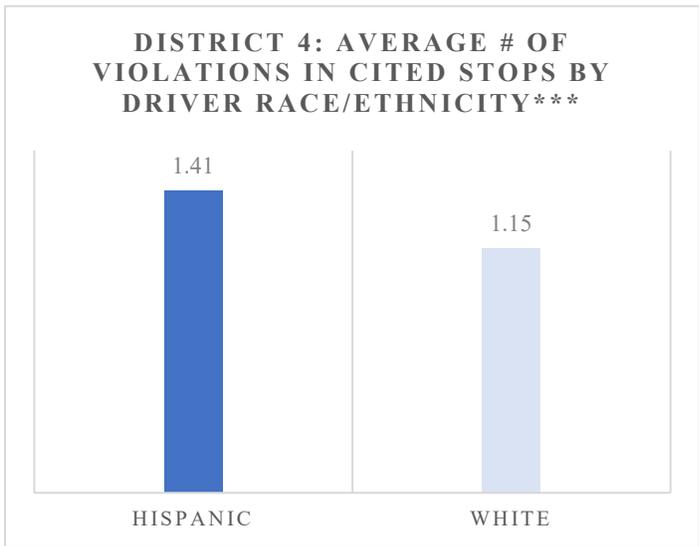
District 4 had statistically significant differences across 4 of the 7 measures indicated in Table 20. There were no statistically significant findings when examining stop reason, overall citation/warning outcomes, or across speed measurement devices. When examining outcomes across violation type, significant differences were observed within civil traffic violations. 67 percent of Hispanic with civil traffic offenses were cited while only 62 percent of White drivers were cited.



While there were not significant differences overall in District 4 in citation and warning outcomes, there were some significant differences at specific ARS codes.

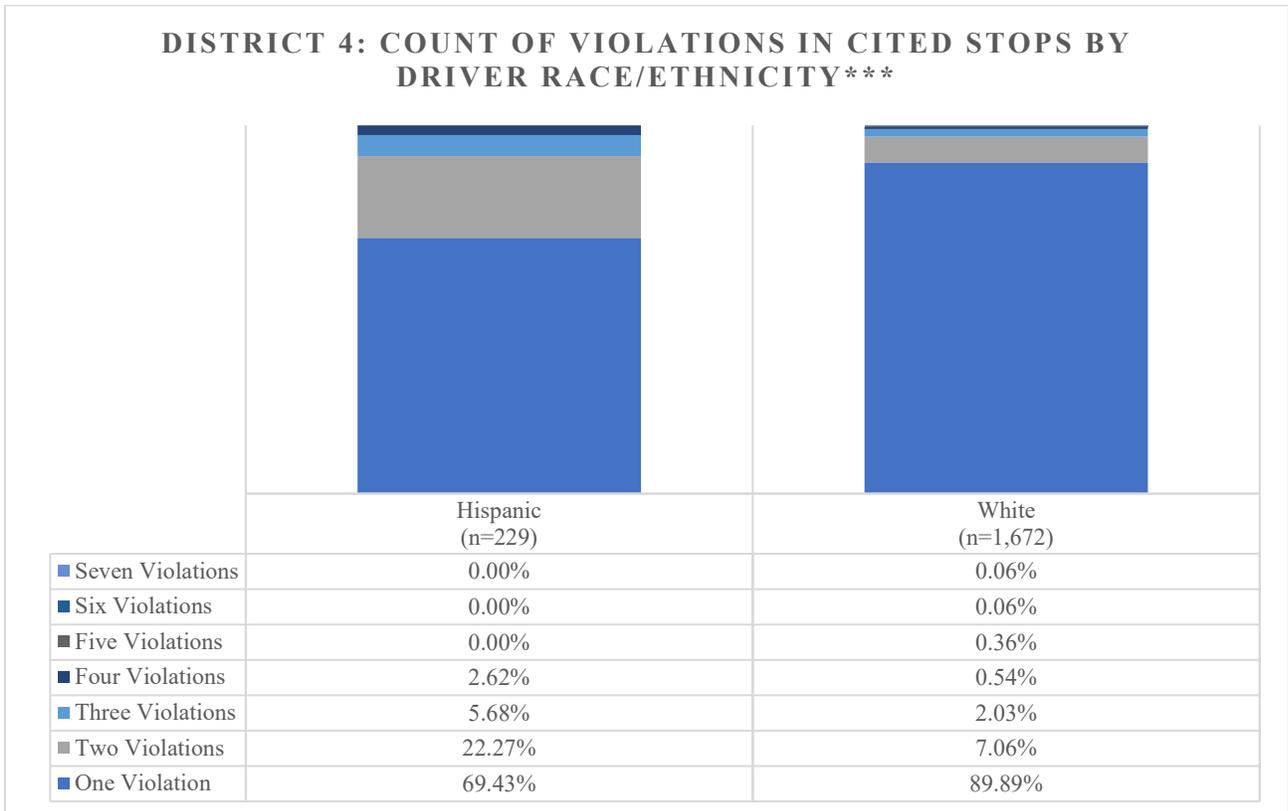
ARS 28-4135 is an insurance/ financial responsibility violation in which Hispanics were cited 97 percent of the time compared with 78 percent of White drivers receiving

citations when this violation was documented. ARS 28-3151 is the statute requiring a driver's license and 100 percent (n=26) of Hispanic drivers were cited while 75 percent (6 of 8) White drivers were cited when this violation was noted. The warnings issued for this violation were to 2 juvenile drivers.



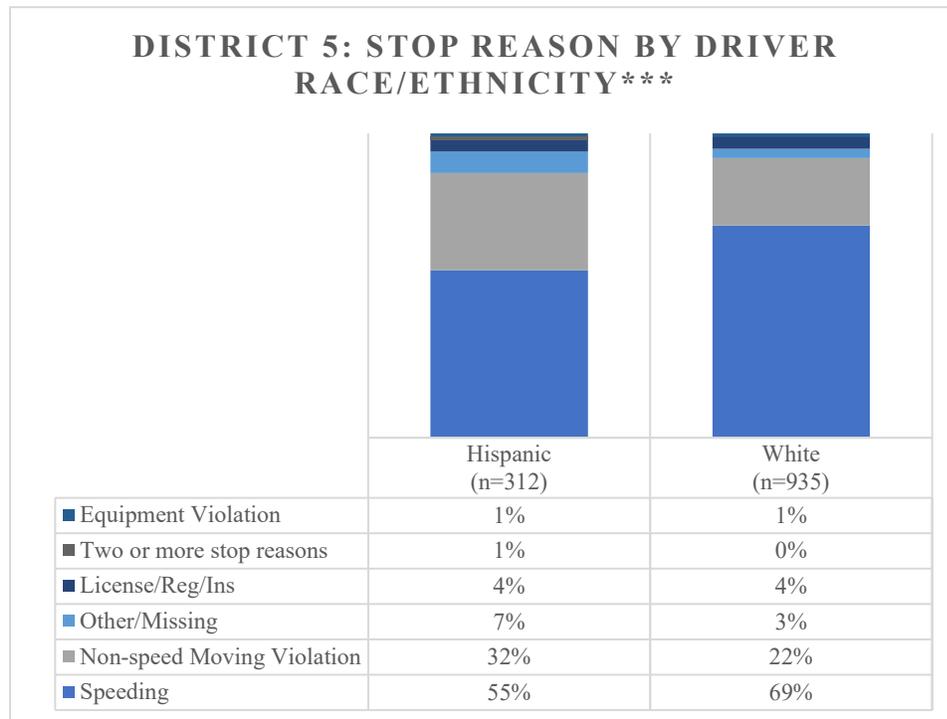
Both the mean number of violations per citation written and count of violations per citation yielded statistically significant differences with Hispanic drivers having more violations documented than White drivers. Hispanic drivers had 1.41 violations per citation while White drivers had 1.15.

The distribution of the number of violations per citation demonstrates that in District 4 Hispanic drivers were more likely to have citations with 2, 3, 4, and 5 violations than their White counterparts.



DISTRICT 5

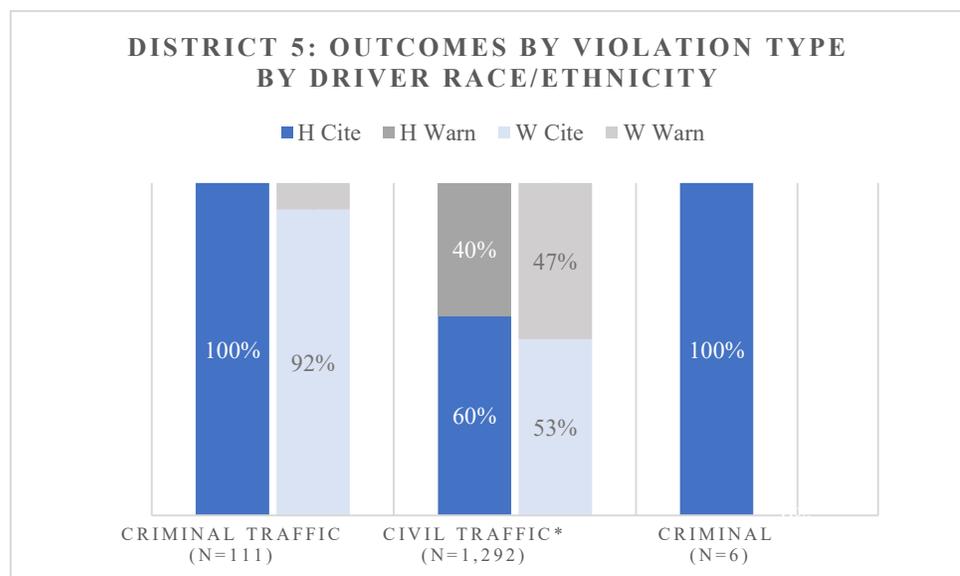
District 5 had 6 of the 7 measures with statistically significant findings. The only measure without statistically significant findings were the overall citation and warning outcomes.

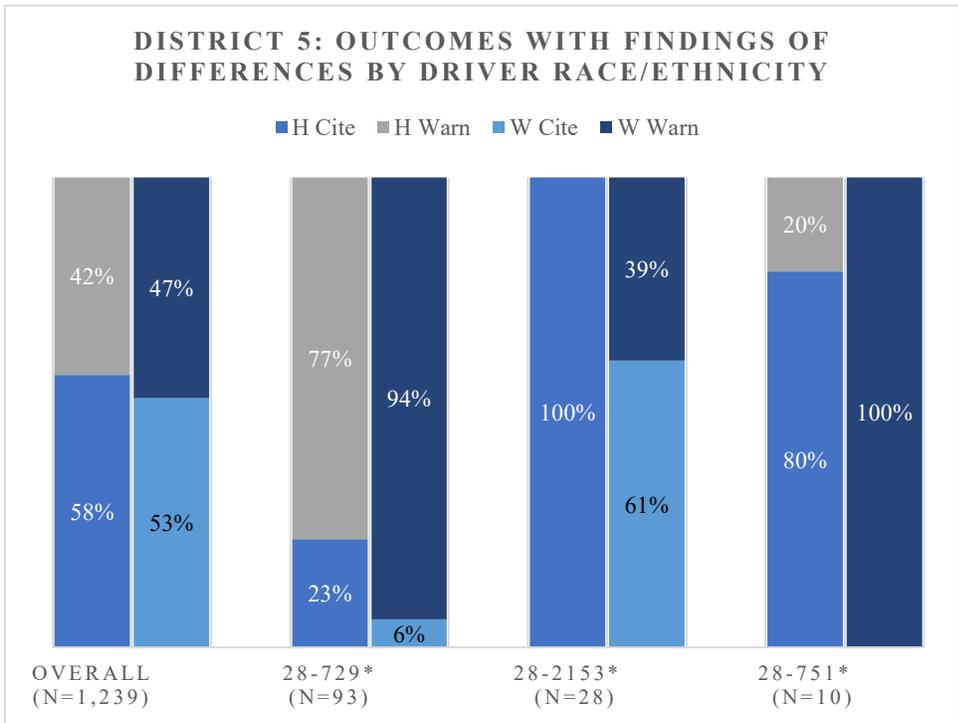


Like all the other districts, District 5 speeding and non-speed moving violations make up most of the stop reasons.

69 percent of White drivers were stopped for speeding while only 55 percent of Hispanic drivers had that listed as the reason for stop. Hispanic drivers were more likely to be stopped for non-speed moving violations.

Civil traffic offenses did have statistically significant differences in citation rates between Hispanic and White drivers with Hispanic drivers being cited 60 percent of the time while only 53 percent of White drivers were cited with violations in this category.





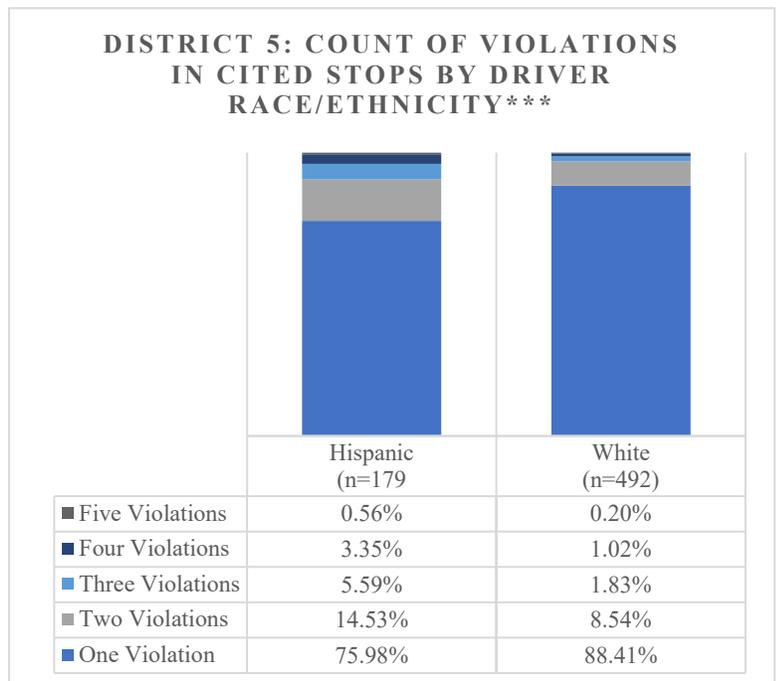
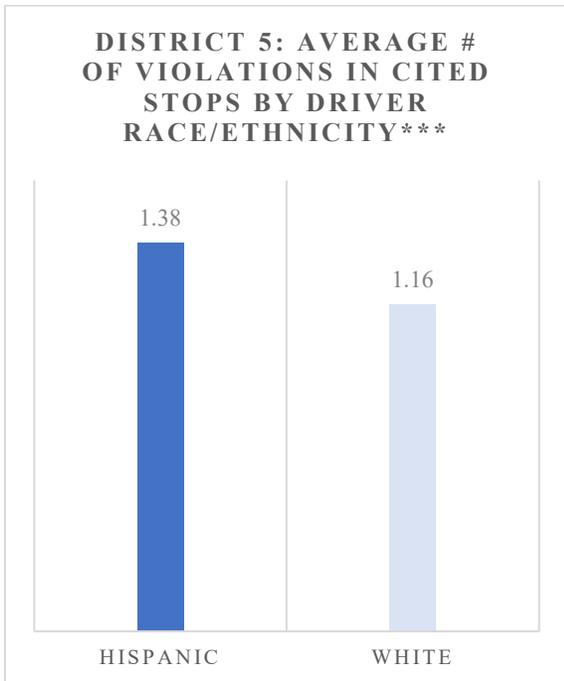
The specific ARS codes that exhibited statistically significant differences in rates of citations issued were:

ARS 28-729 lane violations,

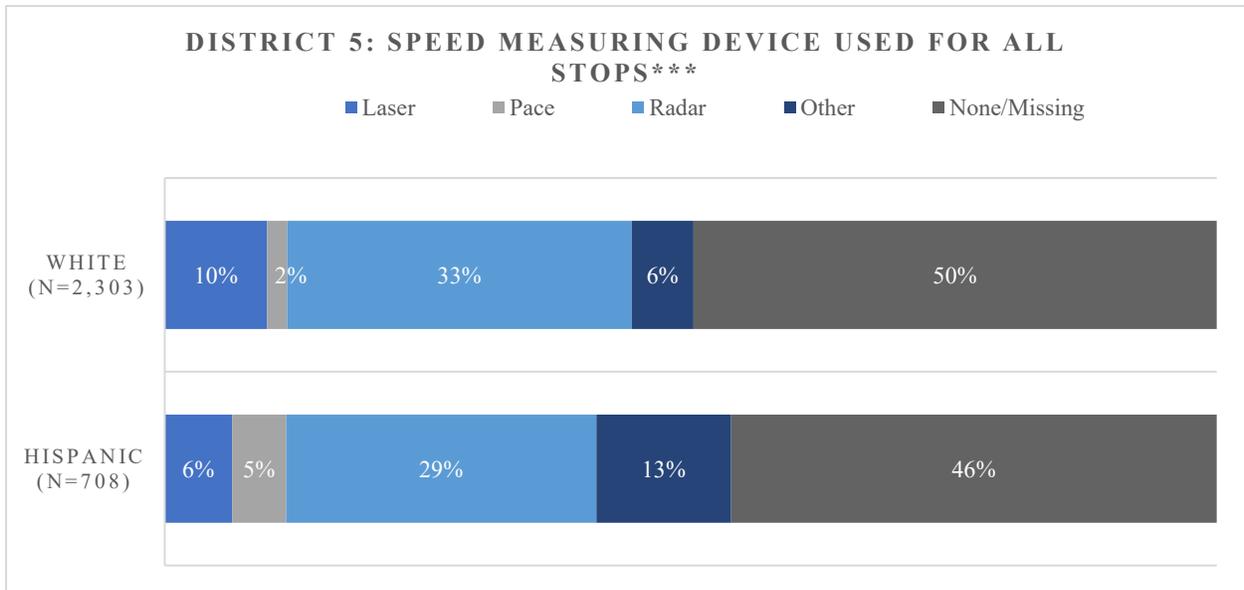
ARS 28-2153 registration violations and

ARS 28-751 turning violations.

In District 5 Hispanic drivers had a higher number of violations documented using both the mean count of violations and the count of violations as the method of measurement. In each of the count categories above 1 violation, Hispanic drivers had higher rates than White drivers.

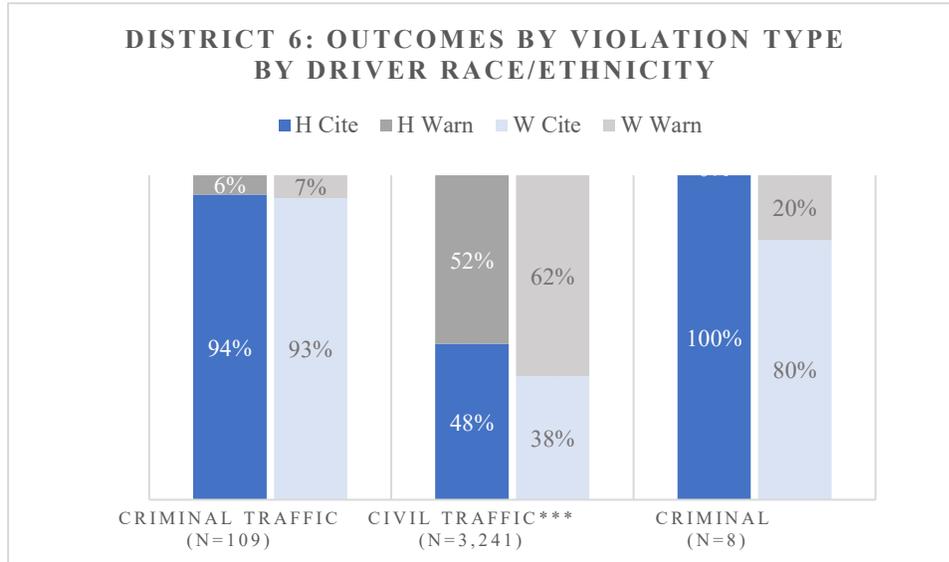


District 5 also had statistically significant differences in the method for which speed was measured. Hispanic drivers were more likely to have their speed measured using pacing or other as the method of measurement, while White drivers were more likely to have speed measured with laser and radar.



DISTRICT 6

District 6 did not have any statistically significant differences across races at the stop reason measure, but statistically significant differences were identified at all the other measures in Table 20.

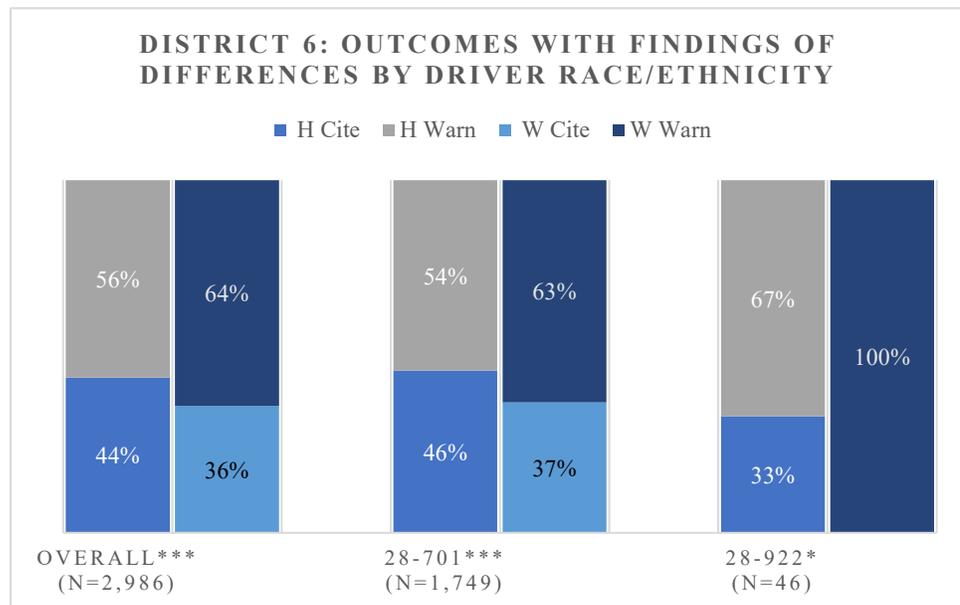


Again, differences occurred in the Civil Traffic category with 38 percent of White drivers cited compared to 48 percent of Hispanic drivers.

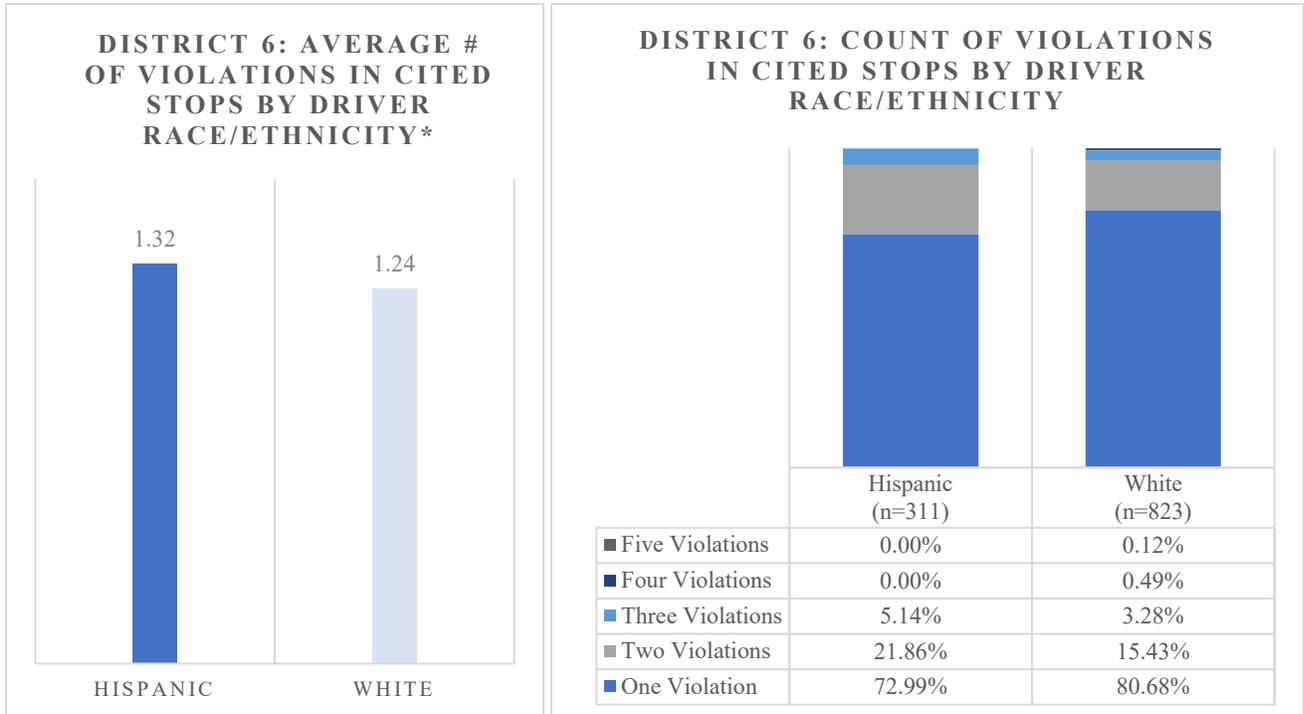
District 6 did have statistically significant differences overall in citation and warnings with 56 percent of Hispanic drivers receiving warnings while 64 percent of the White drivers received warnings.

ARS 28-701 Speeding violations represented over half of the violations in District 6 and differences were observed between Hispanic and White drivers with a citation rate of 46 percent and 37 percent respectively.

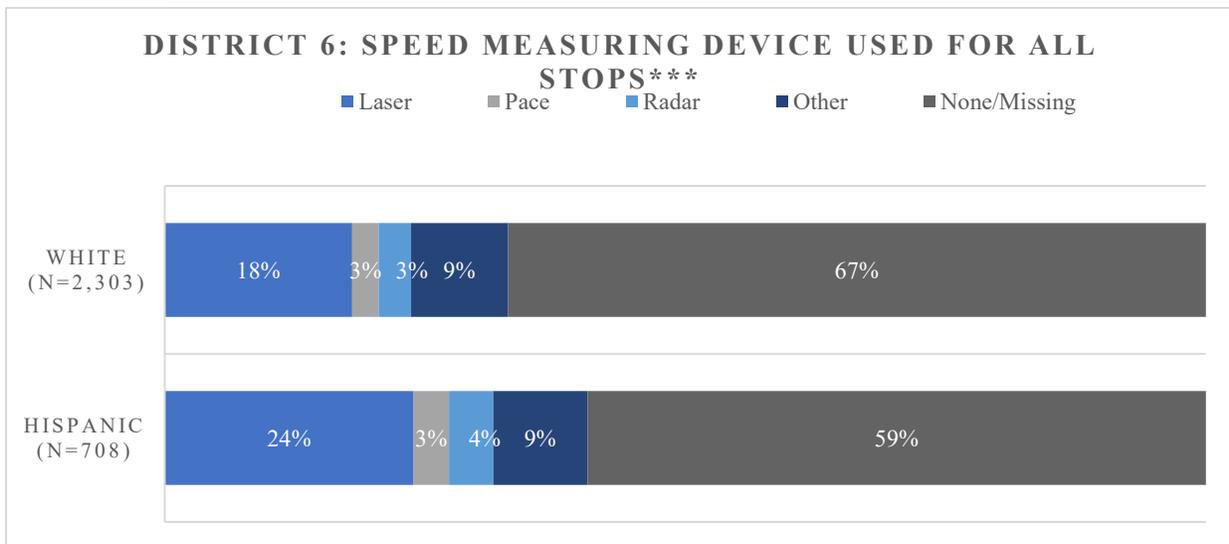
ARS 28-922 Lighted Lamps also found differences with 67 percent of the Hispanic drivers given warnings compared to 100 percent of the White drivers.



In District 6 Hispanic drivers had a higher mean number of cited violations and a greater percentage of multiple violations. In each of the count categories above one violation, Hispanic drivers have higher rates than White drivers except for those with four and five violations, which represent less than 1 percent of the citations.



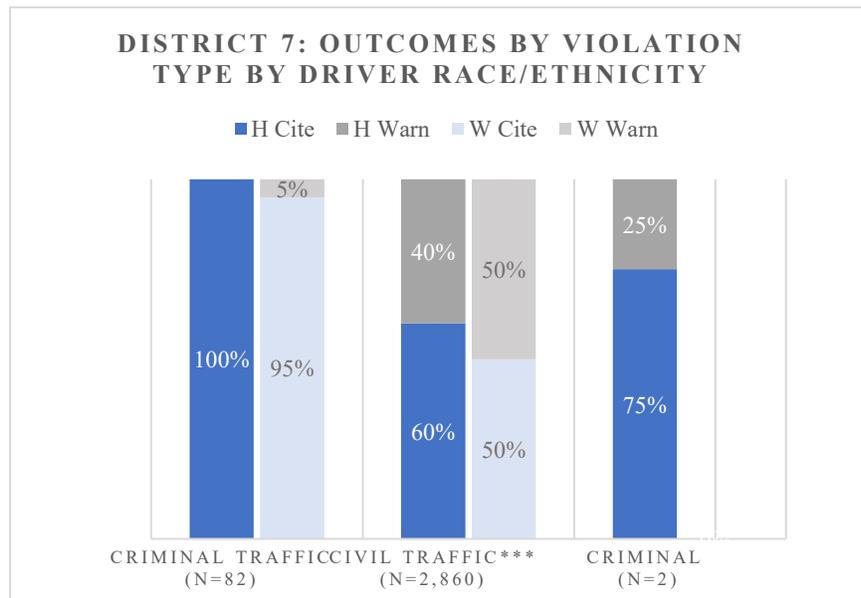
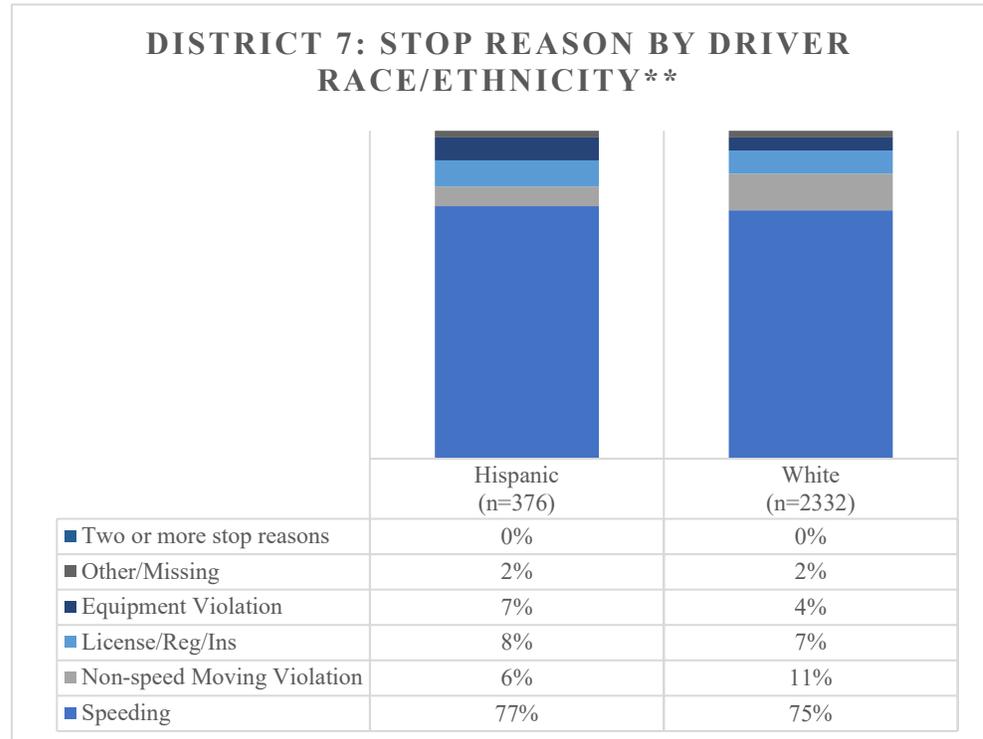
District 6 also had statistically significant differences in the method for which speed was measured. Hispanic drivers more likely to have their speed measured using laser and radar as the method of measurement.



DISTRICT 7

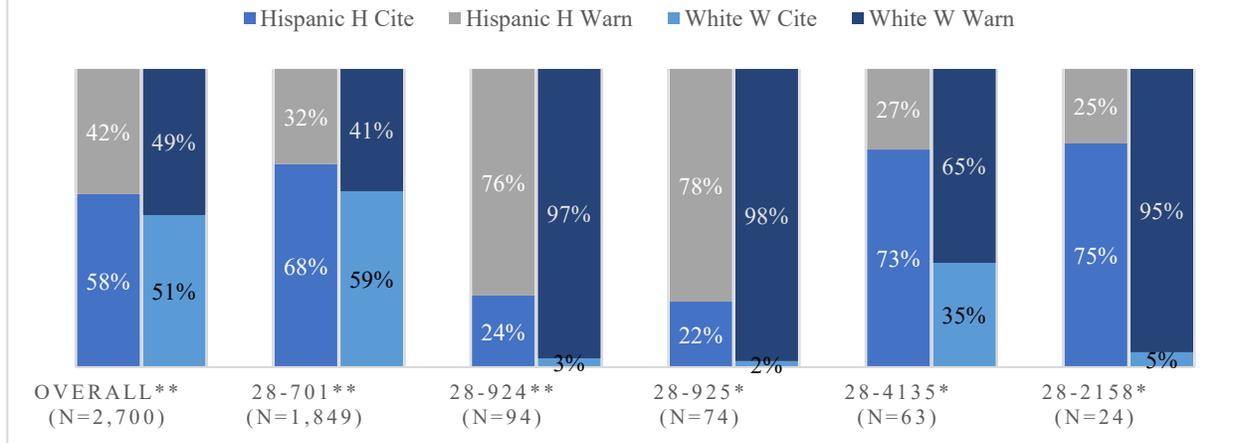
District 7 had statistically significant findings across 6 of 7 measures identified in Table 20.

District 7 is the only district to have a greater percentage of Hispanic drivers stopped for speeding and White drivers being stopped at higher rates for non-speed moving violations. Again, moving violations were most of the reasons stops were initiated in this district.



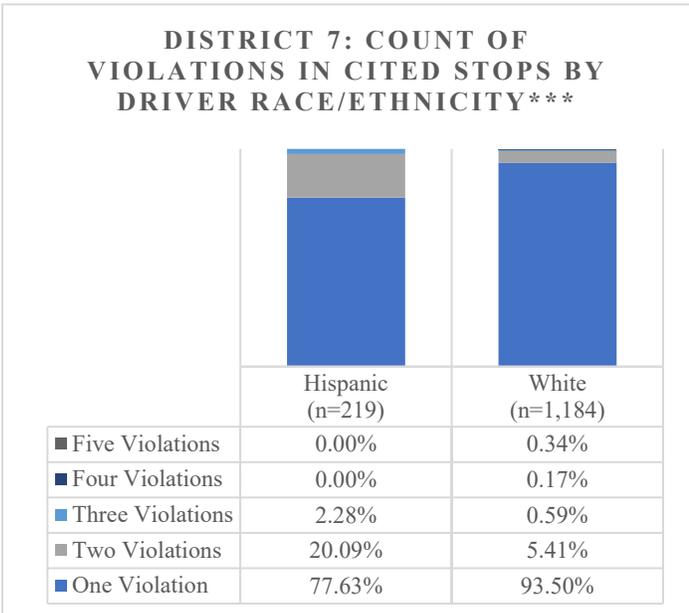
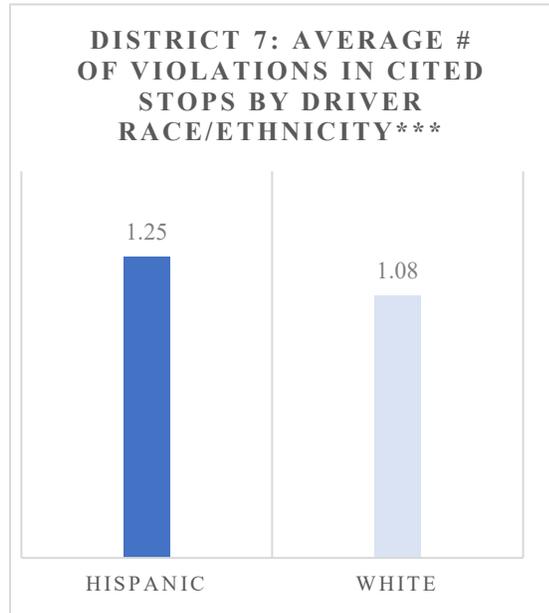
Like many other districts, Civil Traffic was the violation type that resulted in significant differences between Hispanic and White drivers with citation rates of 60 percent and 50 percent respectively.

DISTRICT 7: OUTCOMES WITH FINDINGS OF DIFFERENCES BY DRIVER RACE/ETHNICITY



Overall, District 7 did have significant differences in the rates of citations between the Hispanic and White drivers. 58 percent of Hispanic drivers were cited compared to 51 percent of White drivers. Additionally, there were significant differences in citation rates across five separate ARS Statutes: 28-701 Speeding, 28-924 Head Lamps, 28-925 Tail Lamps, 28-4135 Insurance, and 28-2158 Registration issues.

In District 7, both the mean number of violations per citation written and count of violations per citation yielded statistically significant differences with Hispanic drivers having more violations documented than White drivers.



BEAT STOP OUTCOME FINDINGS OF DISPARITY

In addition to considering Office-wide and district-level exploration of differences evidenced in the annual report particular to citation benchmark. MCSO was requested to explore these same scenarios by beat (location of the stop) and time of day (when stop occurred). The findings from each analysis are available in their entirety in the appendices. This report will summarize only the findings with statistically significant differences for the Beats. These findings are reported by the district in which the beats are located to provide context.²¹

BEATS IN DISTRICT 1

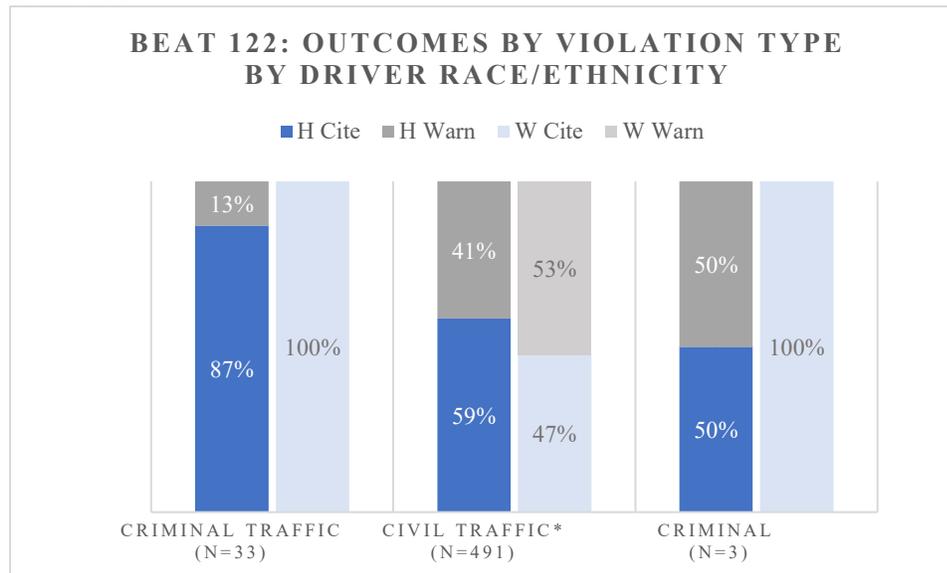
Stop Outcome Findings of Disparity

Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
121	357	23%	77%	33	---	---	---	---	---	---	---
122	379	27%	73%	50	---	---	*	---	*	**	---
123	280	19%	81%	35	---	*	---	*	---	---	---
124	246	24%	76%	49	---	---	---	---	---	---	---
125	261	25%	75%	43	---	*	**	**	---	---	*
126	224	54%	46%	36	---	---	---	---	**	---	---
127	609	34%	66%	55	---	---	*	---	**	***	---
128	19	26%	74%	8	---	---	---	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 1, 5 of the 8 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 1, the five (5) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

Beat 122



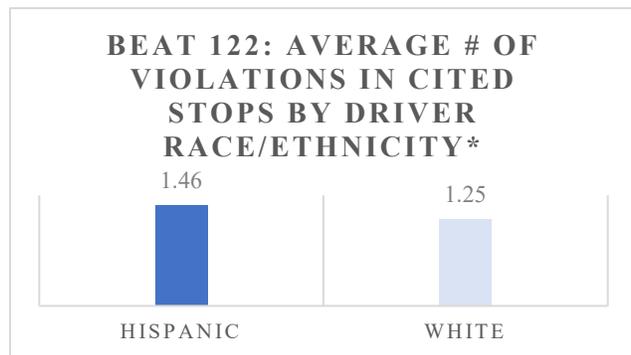
In Beat 122, the violation types included criminal traffic, civil traffic, and criminal.

Most violations were civil traffic, which was also the violation type for which there were findings of difference between Hispanic and White drivers in stop outcomes, Hispanic drivers cited in 59 percent of stops while

²¹ The numbers presented for the beats may not match exactly the numbers presented at the district-level analyses. The 'beat' variable is specific to the location of the stop, while the 'district' variable is the district to which the deputy who conducted the stop was assigned.

White drivers were cited in 47 percent of stops.

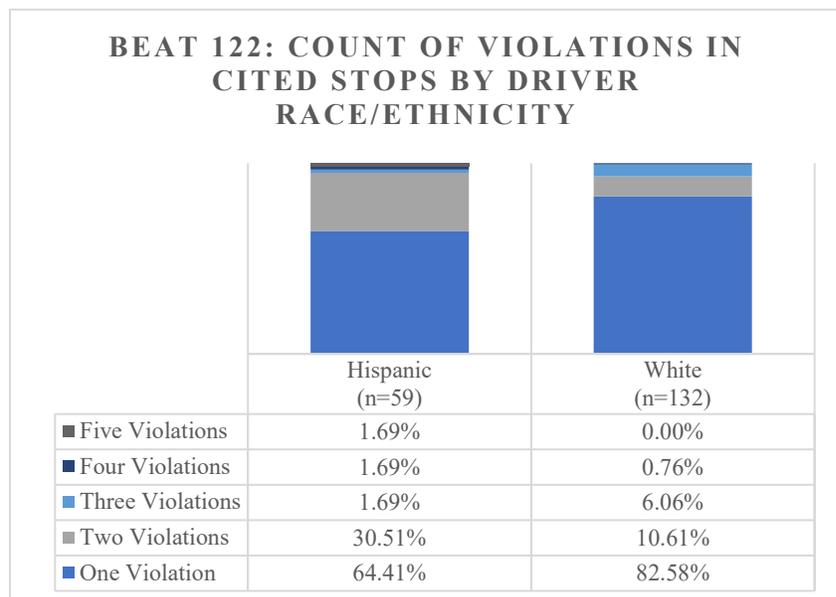
When stops conducted in Beat 122 were analyzed for disparities by violation or stop reason, there were no statistically significant findings. However, there were findings of disparity in outcomes between Hispanic and White drivers when the average and specific count of violations for cited stops were analyzed. Basically, when citations were the outcome of a stop, Hispanic drivers tended to have more violations than White drivers.



Among Hispanic drivers, there was an average of 1.46 violations per cited stops, compared to an average of 1.25 violations for White drivers. This difference was found to be statistically significant.

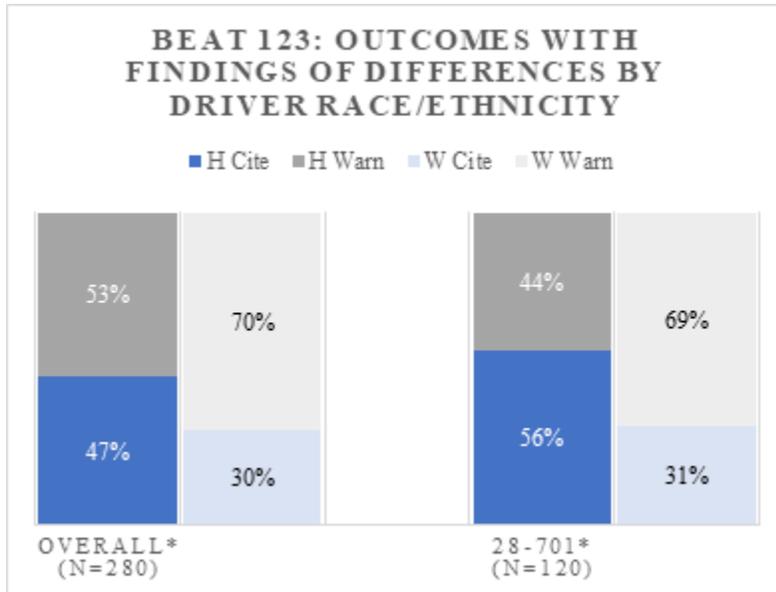
When looking at the distribution of violation counts per cited stop by Hispanic and White drivers, the difference in proportions was also found to be statistically significant. Of note is the proportionate difference between Hispanic and White drivers with two violations in a cited event.

No other significant differences were identified in the analyses for Beat 122.



Beat 123

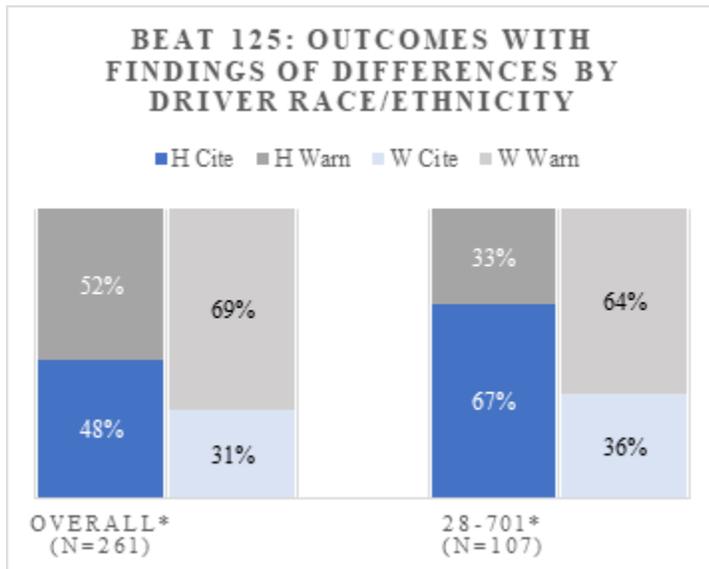
Beat 123 had statistically significant findings in disparity of overall outcomes (citation rate for Hispanic drivers compared to White drivers).



When looking at the violations specifically, speeding (28-701) had statistically significant differences in outcome by Hispanic drivers (56% cited) compared to White drivers (31% cited). The speeding (28-701) violation represented 38 percent of the beat's violations. No other significant differences were identified in the analyses for Beat 123.

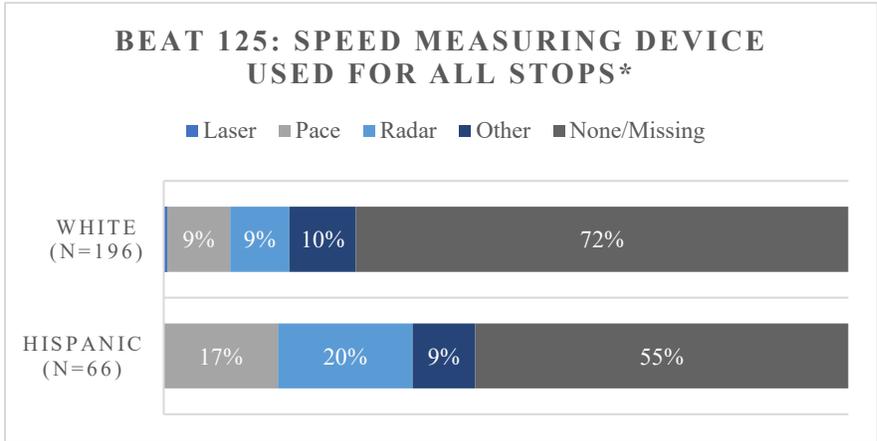
Beat 125

Beat 125 had findings of differences in outcomes between Hispanic and White drivers within five different analyses.



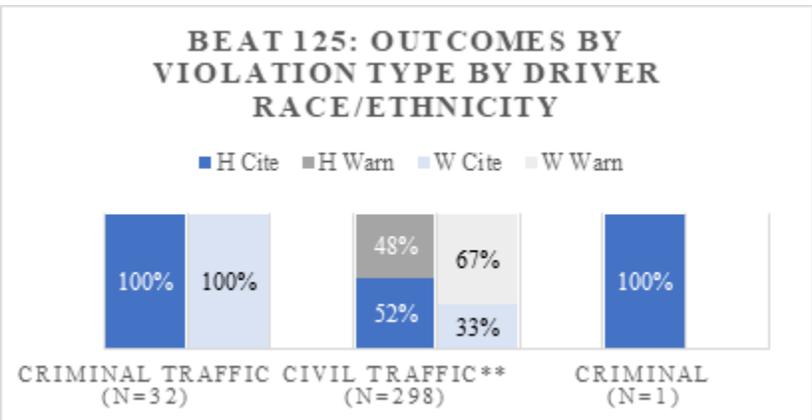
Differences were found by driver race/ethnicity for the overall outcomes with 48 percent of Hispanic drivers receiving a citation compared to 31 percent of White drivers in the 261 stops conducted in Beat 125.

When looking at the specific violations, there was statistically significant differences for speeding (28-701) violations. Speed (28-701) was the most common violation in Beat 125, representing 31 percent of the 345 violations cited or warned.



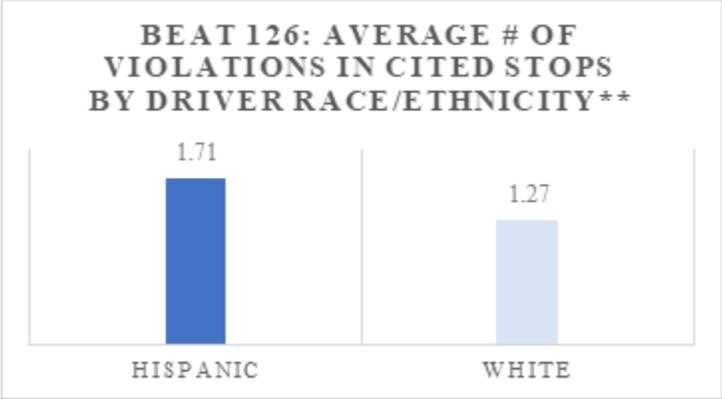
For all stops, the method used to measure speed of the vehicle had significant differences between Hispanic and White drivers. No identified measure was most common for both ethnicities, but pacing was nearly double the proportion of stops for Hispanic drivers compared to White drivers.

Finally, Beat 125 had statistically significant findings of difference when considering the type of violation, specifically for civil traffic. Civil traffic represented nearly 93 percent of violation types analyzed.



Beat 126

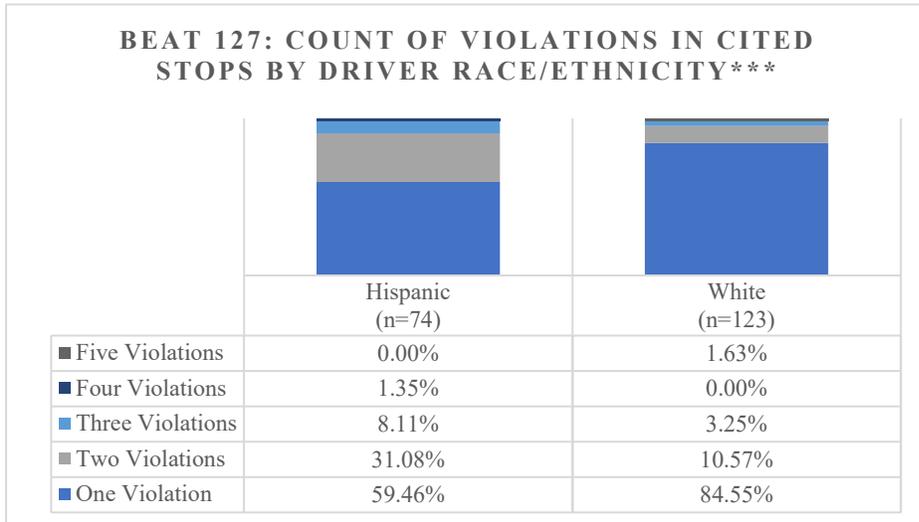
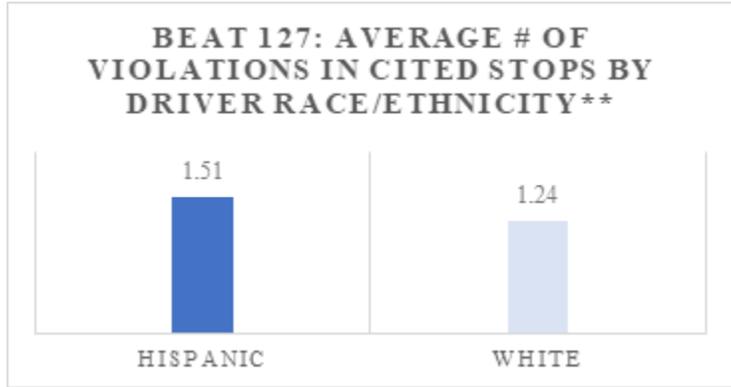
Beat 126 had one finding of significance between Hispanic and White drivers. There was significant difference in how many violations were averaged on cited stops. Hispanic drivers averaged 1.71 violations cited, while White drivers averaged 1.27 violations.



No other significant differences were identified in the analyses for Beat 126.

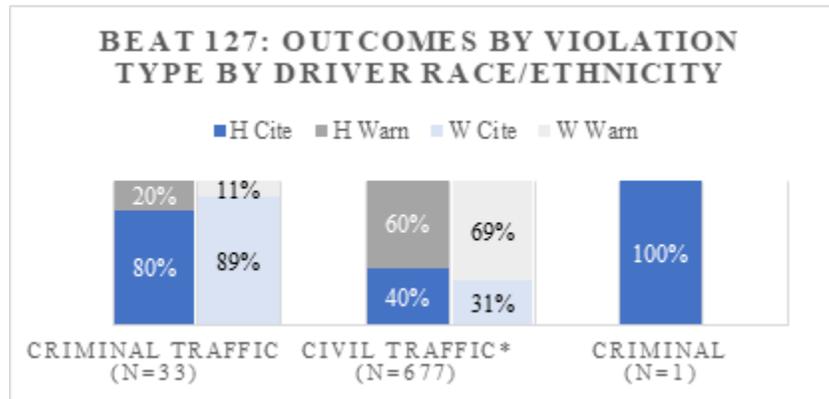
Beat 127

Beat 127 had findings of statistically significant differences between Hispanic and White drivers when considering both average number of violations during cited stops, and for the proportional count of violations across cited stops. Hispanic drivers averaged 1.51 violations per citation while White drivers averaged 1.24 violations per citation.



Across count of violations per citation, Hispanic drivers had only one violation in less than 60 percent of stops, compared to nearly 85 percent of White drivers.

Finally, Beat 127 had findings of difference between outcomes for Hispanic and White drivers for the violation type Civil Traffic, which represented 95 percent of the stop violations in Beat 127.



No other significant differences were identified in the analyses for Beat 127.

BEATS IN DISTRICT 2

Stop Outcome Findings of Disparity

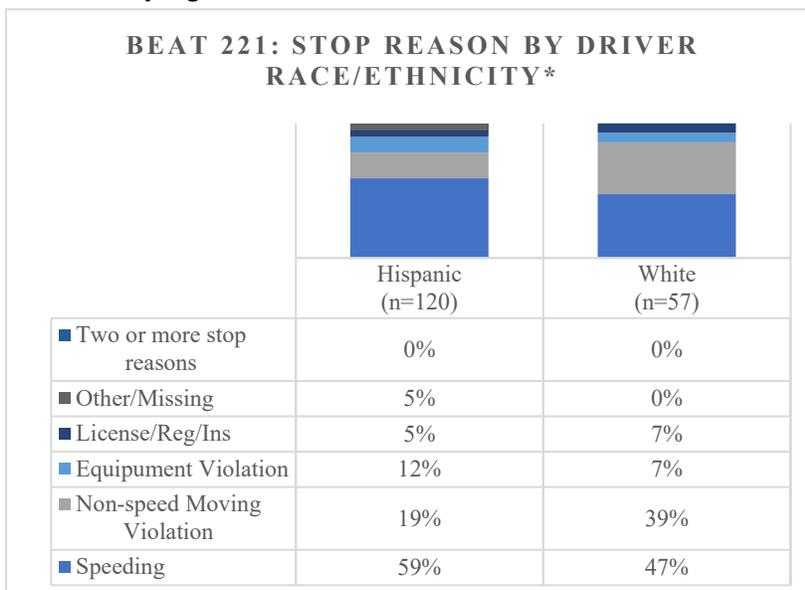
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
221	176	68%	32%	33	*	---	*	---	---	---	---
222	273	71%	29%	44	---	---	---	---	**	---	---
223	235	49%	51%	37	---	**	**	**	---	---	---
224	157	25%	75%	22	---	---	---	---	---	---	---
225	586	54%	46%	53	---	---	---	---	*	*	---
229	9	11%	89%	2	---	---	---	---	---	---	---
231	155	48%	52%	31	---	---	---	*	---	---	---
232	281	54%	46%	36	---	---	---	---	---	---	---
233	74	42%	58%	18	---	---	---	---	---	---	---
234	337	40%	60%	20	---	---	---	---	---	---	---
235	583	47%	53%	36	*	---	---	---	---	---	---
236	2	100%	0%	2	---	---	---	---	---	---	---
PIR	1	100%	0%	1	---	---	---	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

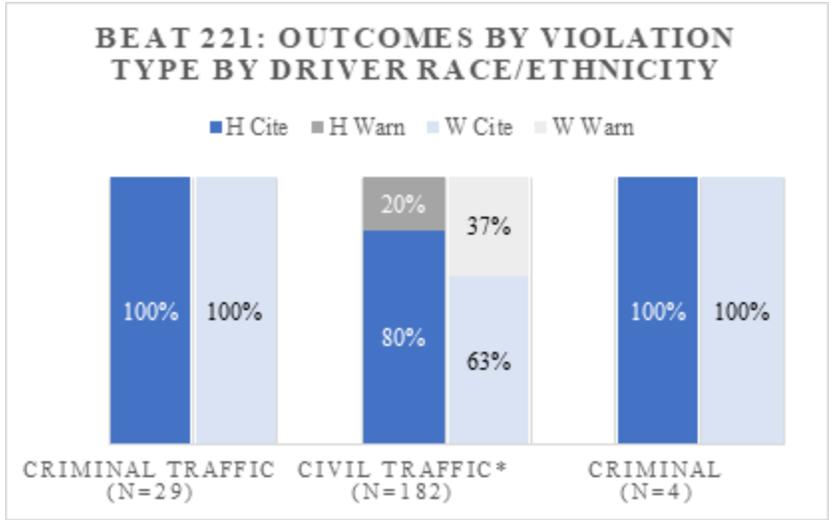
In District 2, 6 of the 13 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 2, the six (6) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

Beat 221

When stop reasons were compared between Hispanic and White drivers for stops that occurred in Beat 221, a statistically significant difference was found.



As noted in the chart, speeding was the most common stop reason for drivers of both ethnicities, though it was more common for Hispanic drivers. Non-speed moving violations was more common in White drivers.

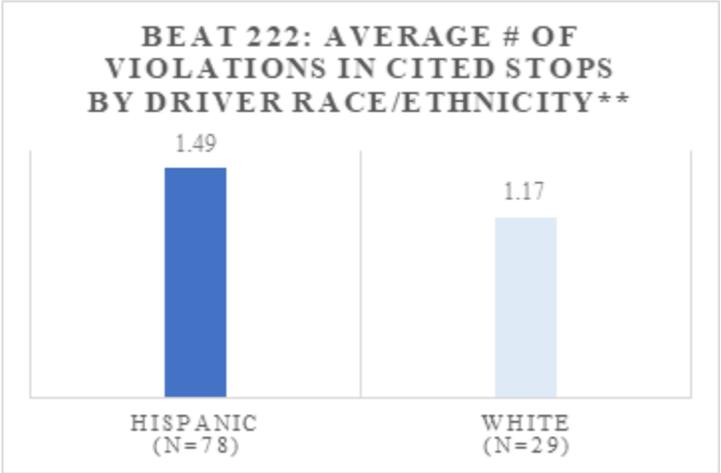


Comparisons between stop outcomes of Hispanic and White drivers by type of violation found differences in outcomes for civil traffic violations only. As demonstrated in the chart, all stops with criminal level violations resulted in a citation.

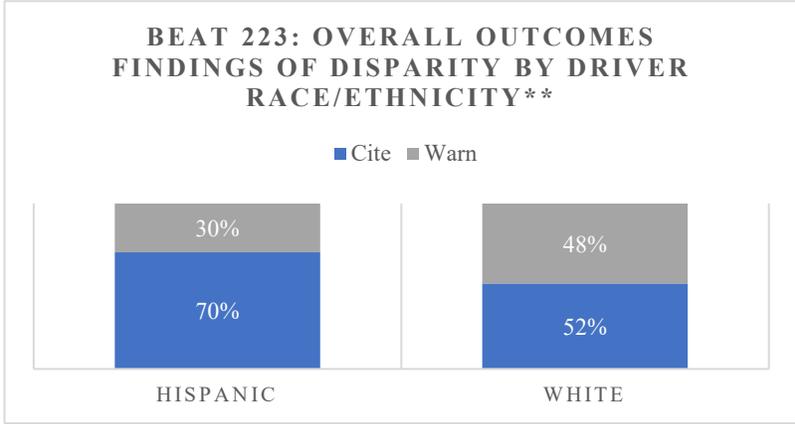
No other significant differences were identified in the analyses for Beat 221.

Beat 222

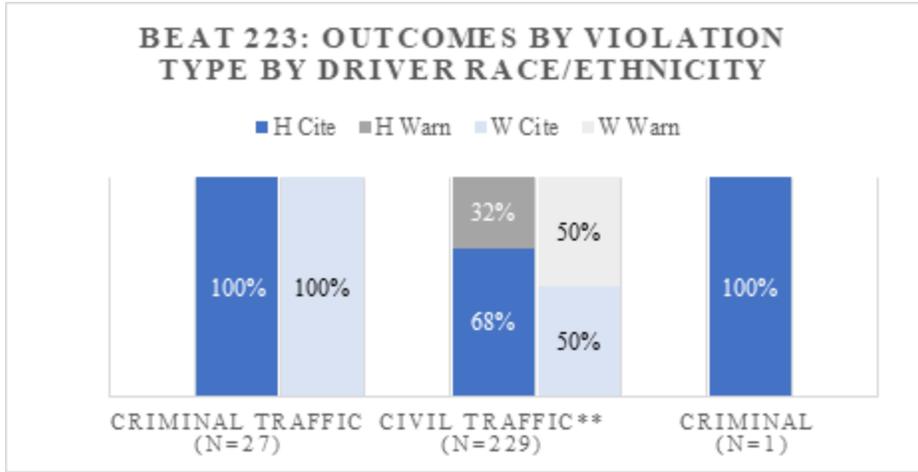
Beat 222 had statistically significant findings in only one of the analyses: the average number of cited violations per stop between Hispanic and White drivers. Hispanic drivers averaged 1.49 violations for stops with citation outcomes compared to the 1.17 violations averaged for White drivers. No other significant differences were identified in the analyses for Beat 222.



Beat 223

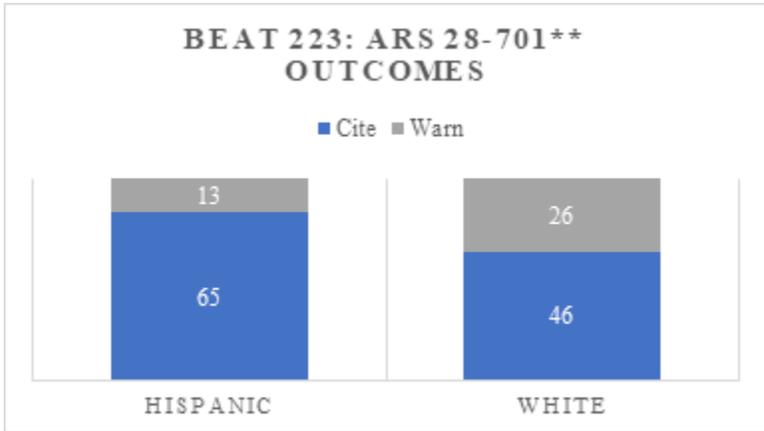


Beat 223 had 235 stops of Hispanic and White drivers, split nearly 50/50. Findings of statistically significant differences in outcomes occurred in the overall cite/warn outcome, by violation type, and at the level of specific violation. Overall, Hispanic drivers were cited in 70 percent of stops compared to 52 percent of stops for White drivers.



In terms of violation types, Hispanic drivers' outcomes were significantly different for civil traffic violations only. For this type of violation, Hispanic drivers were cited in 68 percent of the stops compared to White drivers being cited in 50 percent of the stops.

In review of difference in outcomes by specific violations, there was a statistically significant difference in outcome between Hispanic and White drivers for the primary speeding (28-701) violation. Among all stops in Beat 223 with this violation, Hispanic drivers were cited over 83 percent of the time compared to White drivers, who were cited nearly 64 percent of the time.



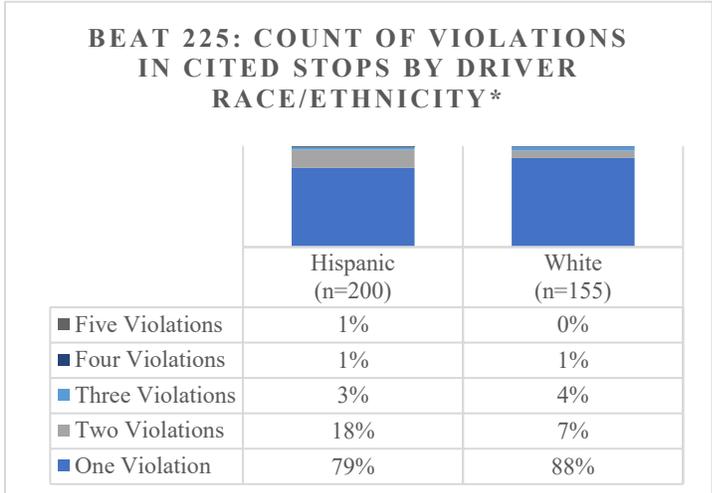
No other significant differences were identified in the analyses for Beat 223.

Beat 225

For Beat 225, any differences in outcomes of statistical significance were attributed to multiple violations: both average number of violations for cited outcomes and the count of violations per citation were significantly different between Hispanic and White drivers.



Regarding the average number of violations in stops with citation outcomes, Hispanic drivers averaged 1.27 violations per cited stop compared with the 1.17 violations of White drivers. This difference is statistically significant.

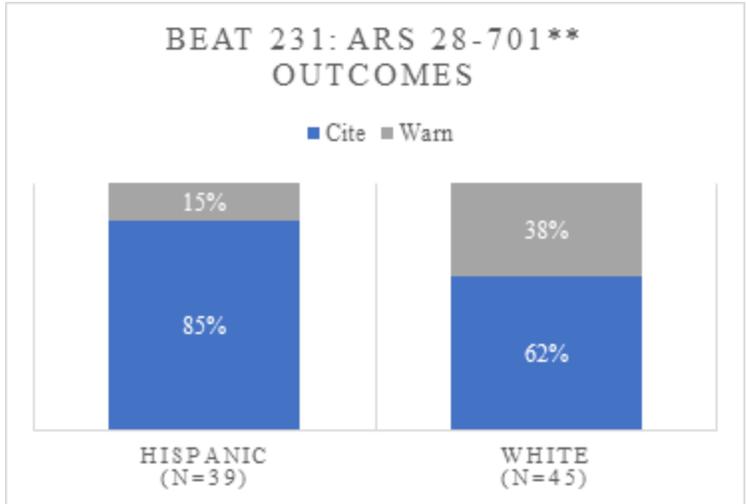


There was statistically significant difference between Hispanic and White drivers regarding proportionate number of violations. White drivers were more likely to receive one violation than Hispanic drivers, and Hispanic drivers received two violations per cite at more than twice the rate of White drivers.

No other significant differences were identified in the analyses for Beat 225.

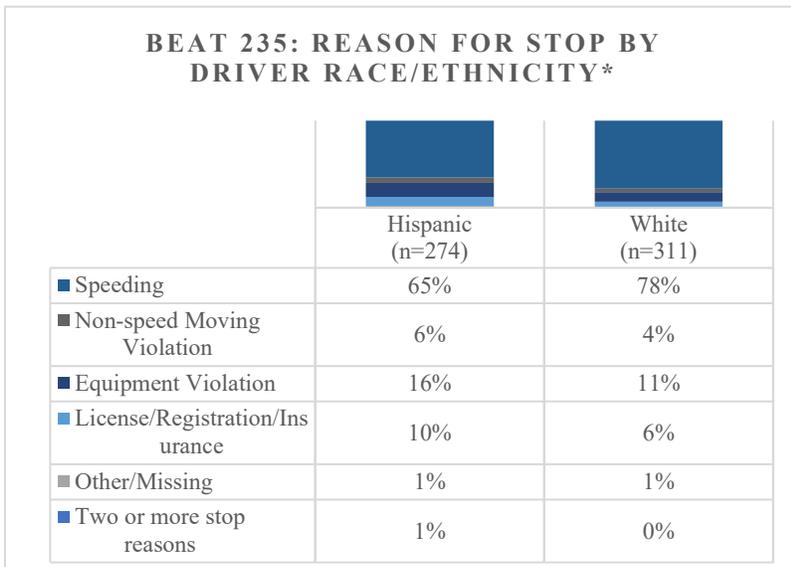
Beat 231

In Beat 231, statistically significant differences between Hispanic and White drivers were found only in at the statute level.



For drivers in Beat 231, the only difference in outcomes was found specific to the statutory violation of speeding (28-701), with Hispanic drivers being cited 85 percent of the time compared to White drivers with a citation occurring in 62 percent of stops.

Beat 235



Beat 235 differences were specific to stop reasons: even though speeding was by far the most common reason for traffic stops, equipment violations and license/registration/insurance were more commonly noted for Hispanic drivers than for White drivers as the reason for stop.

No other significant differences were identified in the analyses for Beat 235.

BEATS IN DISTRICT 3

Stop Outcome Findings of Disparity

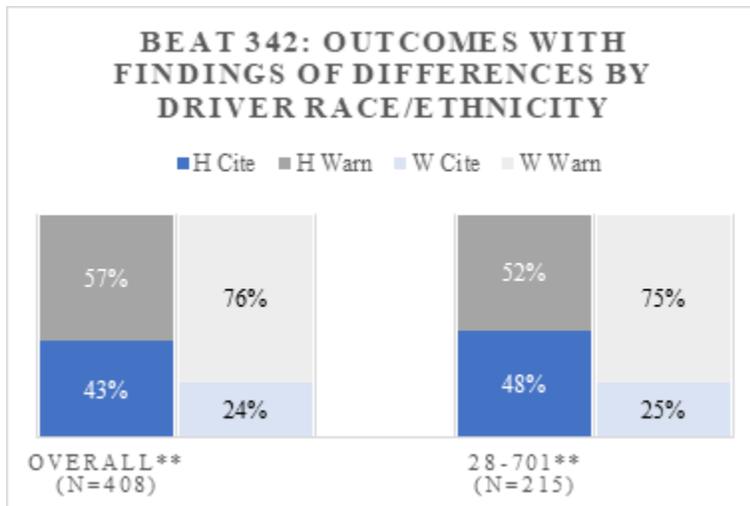
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
341	315	16%	84%	31	---	---	---	---	---	---	---
342	408	23%	77%	35	---	**	***	**	*	**	*
343	418	33%	67%	37	---	*	***	*	---	*	*
344	536	21%	79%	32	---	---	---	---	---	---	---
345	512	31%	69%	46	---	---	*	---	*	---	---
346	338	29%	71%	28	---	---	---	---	*	---	**
347	196	20%	80%	34	---	---	---	---	---	*	*
351	13	8%	92%	12	---	---	---	---	---	---	**
352	4	25%	75%	4	---	---	---	---	---	---	---
371	234	47%	53%	27	---	---	*	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 3, 7 of the 10 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 3, the six (6) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

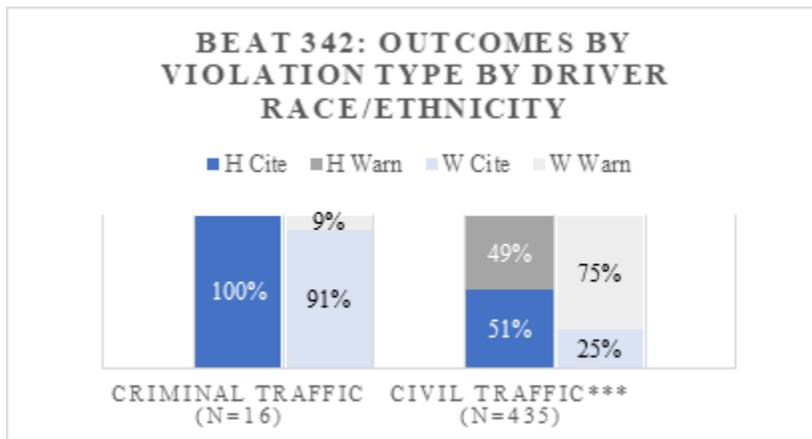
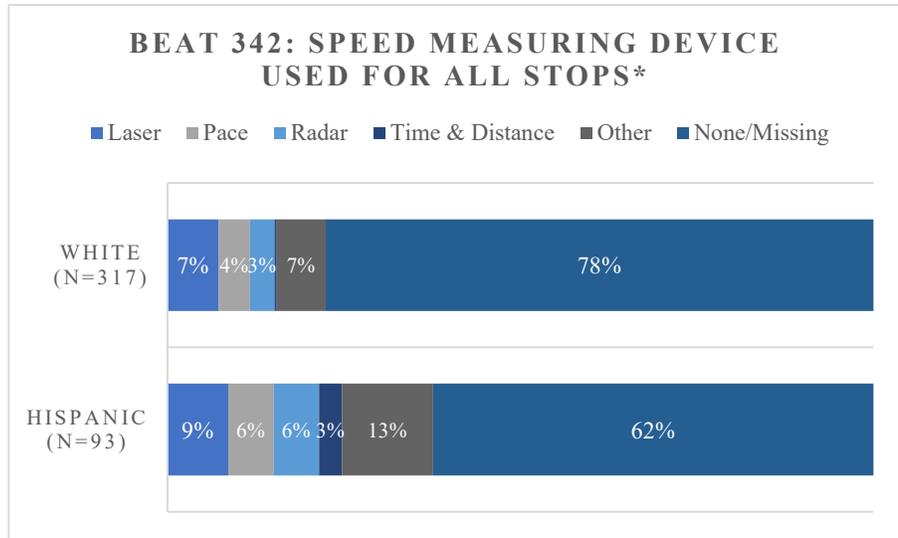
Beat 342

In Beat 342, race/ethnicity of the driver was found to not be a statistically significant factor in the reason for stop but was relevant in each of the analyses looking at differences between Hispanic and White drivers in cite/warn outcomes.



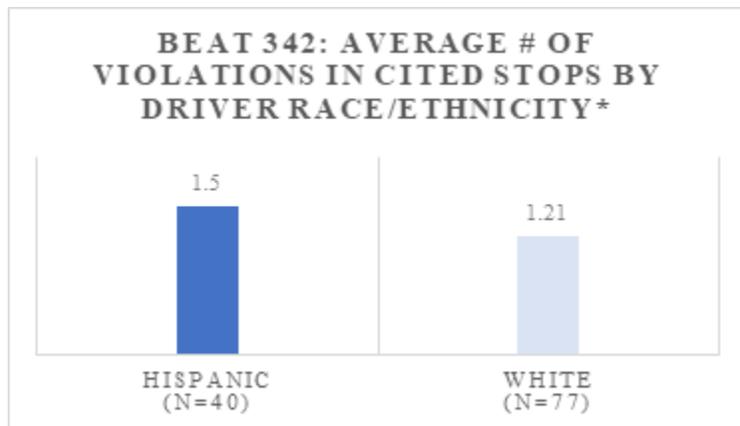
Overall, Hispanic drivers were cited at nearly twice the proportion compared to White drivers in Beat 342, though warnings were the most common outcome of traffic stops within the beat. As the most frequent violation, speeding (28-701) was the only specific violation with statistically significant differences in citation rates between Hispanic and White drivers, with Hispanic drivers being cited at nearly twice the rate.

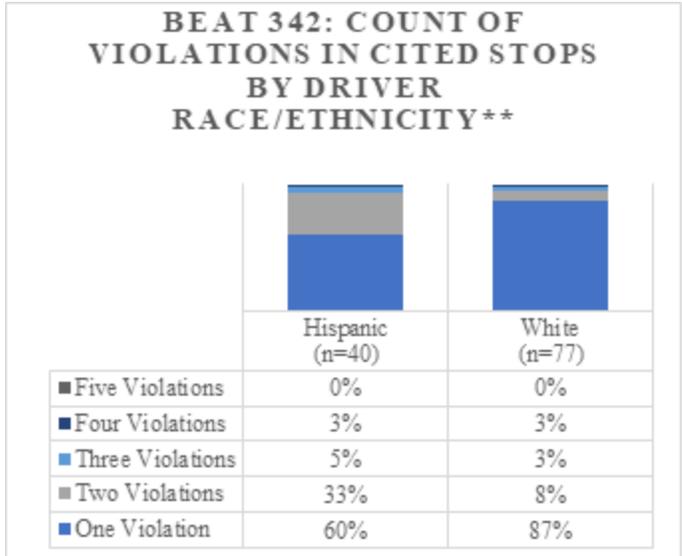
There were statistically significant differences between how the speed was captured for Hispanic drivers compared with White drivers.



Most violations were civil traffic, which also found differences in outcomes between Hispanic and White drivers, with White drivers less frequently cited than Hispanic drivers. For violations of civil traffic statutes, Hispanic drivers were cited at 51 percent compared to White drivers' citation rate of 25 percent.

These citation rate disparities may be explained to some extent by the number of violations cited for each stop. Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.5 violations for Hispanic drivers contrasted with 1.21 violations for White drivers.

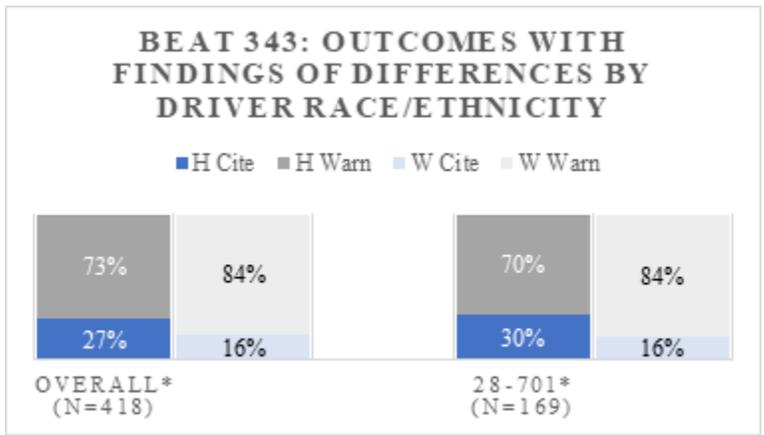




The findings indicate that Hispanic drivers were more likely to have multiple violations when they were cited; the proportionate number of cited stops with only one violation was 87 percent for White drivers and 60 percent for Hispanic drivers. Hispanic drivers had two violations on a third of their cited stops, while White drivers had two violations on less than 10 percent of their cited stops.

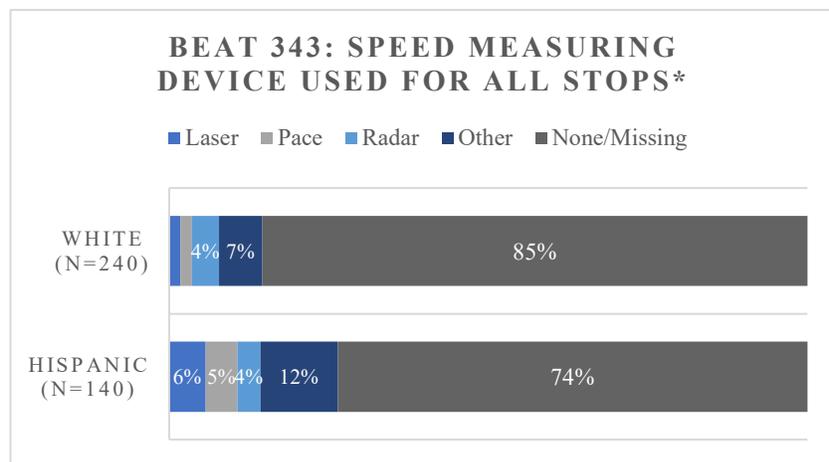
Beat 343

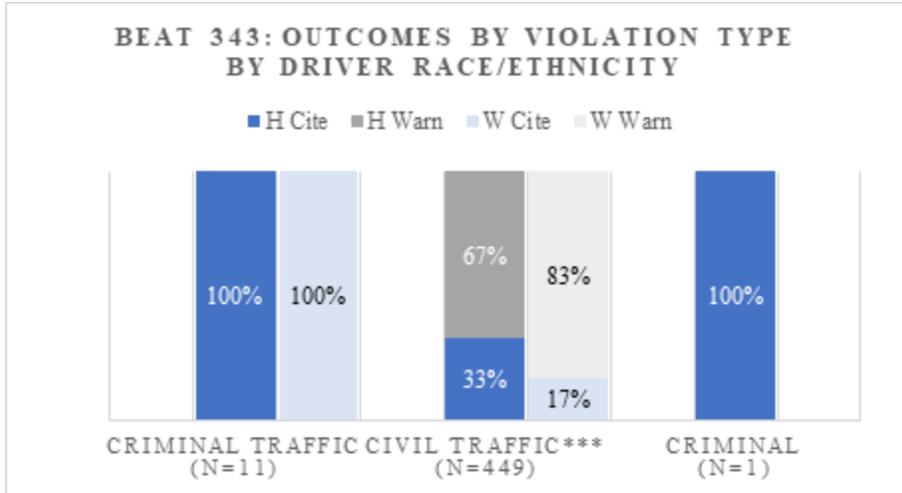
In Beat 343, race/ethnicity of the driver was found to not be a statistically significant factor in the reason for stop or in the average number of violations for citations but was relevant in each of the analyses looking at differences between Hispanic and White drivers in cite/warn outcomes.



Overall, Hispanic drivers were cited at nearly twice the proportion compared to White drivers in Beat 343, though warnings were the most common outcome of traffic stops within the beat. As the most frequent violation, speeding (28-701) was the only specific violation with statistically significant differences in citation rates between Hispanic and White drivers, with Hispanic drivers being cited at nearly twice the rate.

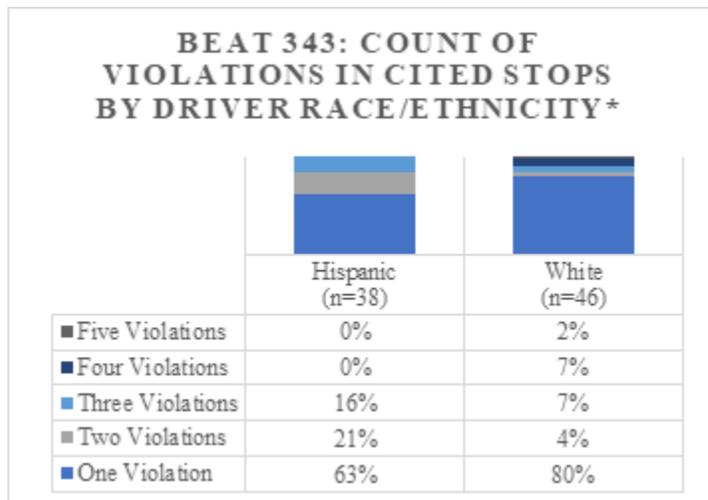
For all traffic stops, there was statistically significant differences between how the speed was captured for Hispanic drivers compared with White drivers. A higher proportion of Hispanic drivers had laser or some other device used to measure their speed, or were paced.





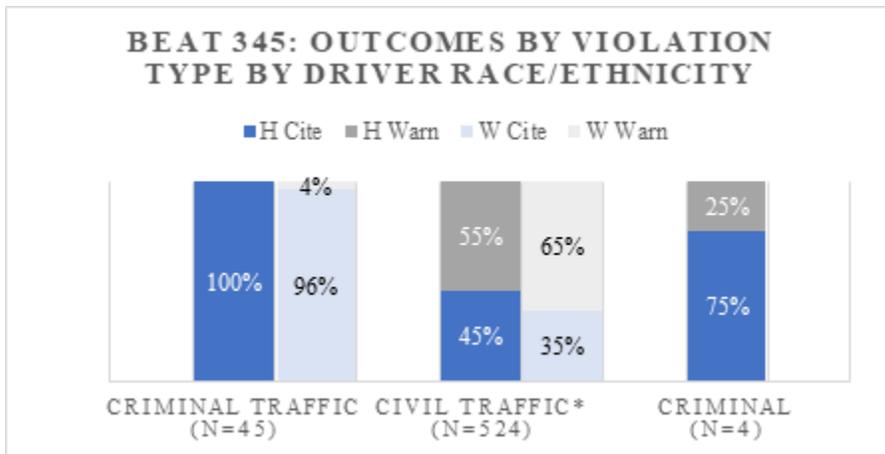
Most violations were civil traffic, which also found differences in outcomes between Hispanic and White drivers, with White drivers less frequently cited than Hispanic drivers. For violations of civil traffic statutes, Hispanic drivers were cited at 33 percent compared to White drivers' citation rate of 17 percent.

The findings indicate that Hispanic drivers were more likely to have 2 or 3 violations when they were cited. While White drivers also had multiple violations, the proportionate number of cited stops with only one violation was 80 percent for White drivers compared to 60 percent for Hispanic drivers.



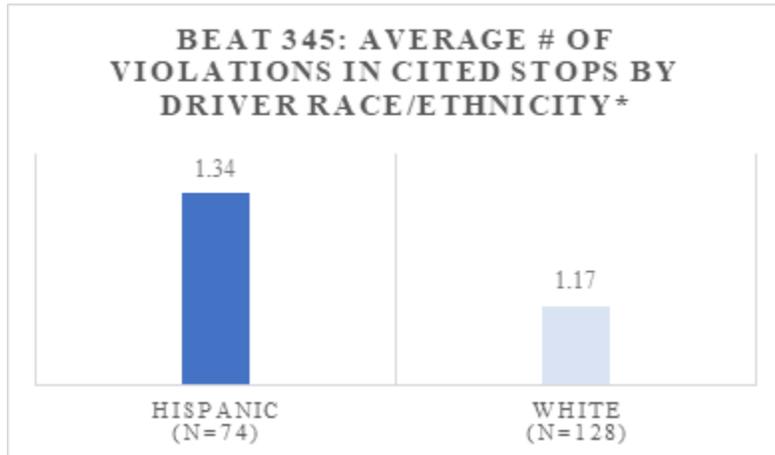
Beat 345

In Beat 345, there were two analyses with findings of difference in outcomes between Hispanic and White drivers: within violation type (civil traffic), and in the average number of violations per citation.



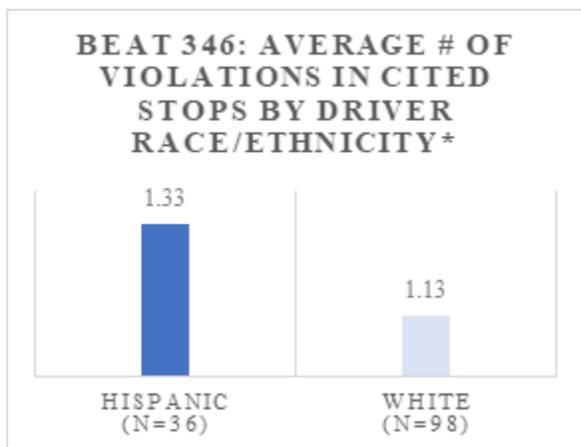
Most violations were civil traffic, which found differences in outcomes between Hispanic and White drivers, with White drivers less frequently cited than Hispanic drivers. For violations of civil traffic statutes, Hispanic drivers were cited at 45 percent compared to White drivers' citation rate of 35 percent.

These citation rate disparities may be explained to some extent by the number of violations cited for each stop. Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.34 violations for Hispanic drivers contrasted with 1.17 violations for White drivers.



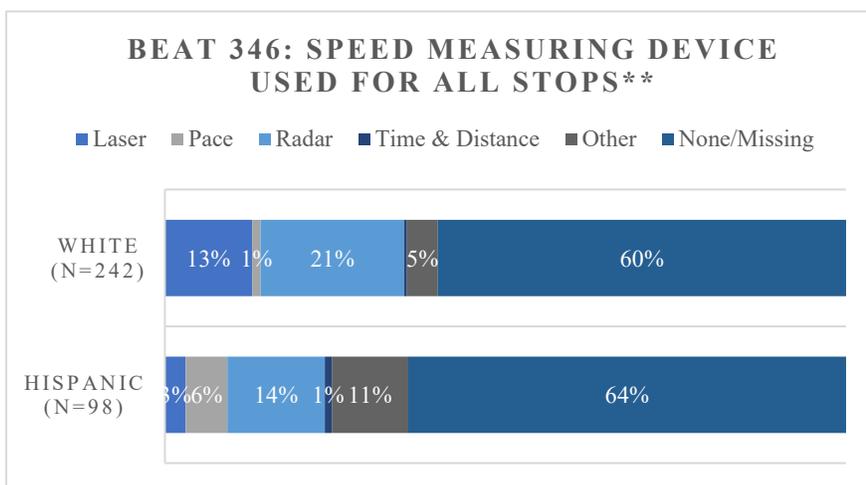
Beat 346

In Beat 346, there were two analyses with findings of difference in outcomes between Hispanic and White drivers: the average number of violations per citation, and the device used to measure speed in speeding violations.

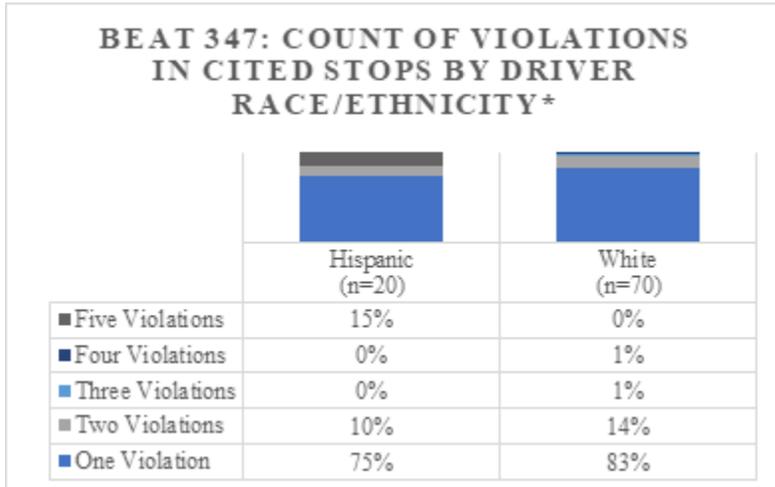


Hispanic drivers averaged 1.33 violations per citation when they were stopped in Beat 346, which is statistically significantly different from the average of 1.13 violations per citation among White drivers stopped in the beat.

The devices used to measure speed differed between Hispanic and White drivers. Laser and radar were far more frequently used for White drivers compared to their Hispanic peers. Hispanic drivers were more likely to be paced or had some other device used to measure their speed.



Beat 347

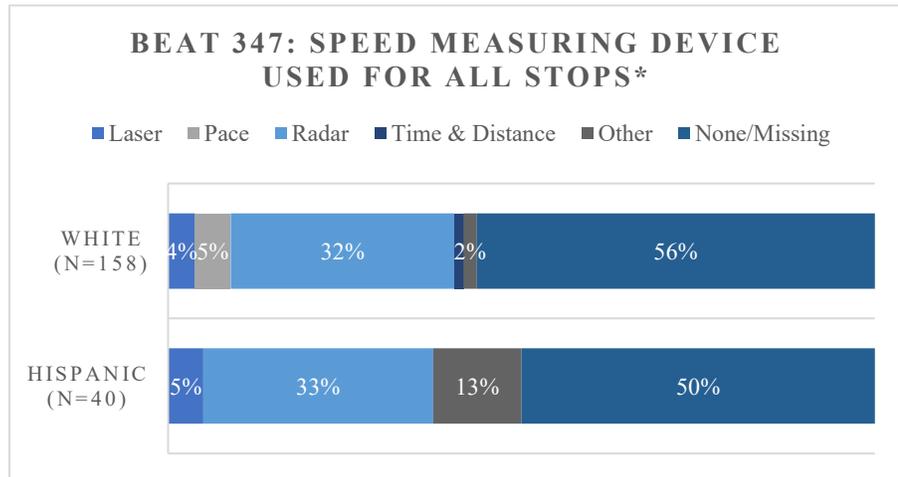


In Beat 347, there were two analyses with findings of difference in outcomes between Hispanic and White drivers: the count of violations per citation, and the device used to measure speed in speeding violations.

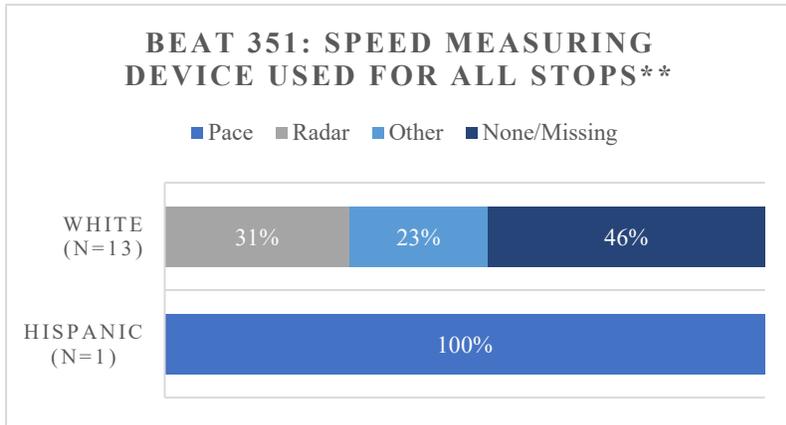
The findings indicate that Hispanic drivers were more likely to have multiple violations when they were cited; the proportionate number of cited stops with only one violation was 83 percent for White drivers and 75 percent for Hispanic drivers. Hispanic drivers had five violations in

15 percent of their cited stops, while White drivers never had a citation with five violations.

There was statistically significant difference between how the speed was captured for Hispanic drivers compared with White drivers. A higher proportion of White drivers were paced, and a higher proportion of Hispanic drivers had some other device used to measure their speed.



Beat 351

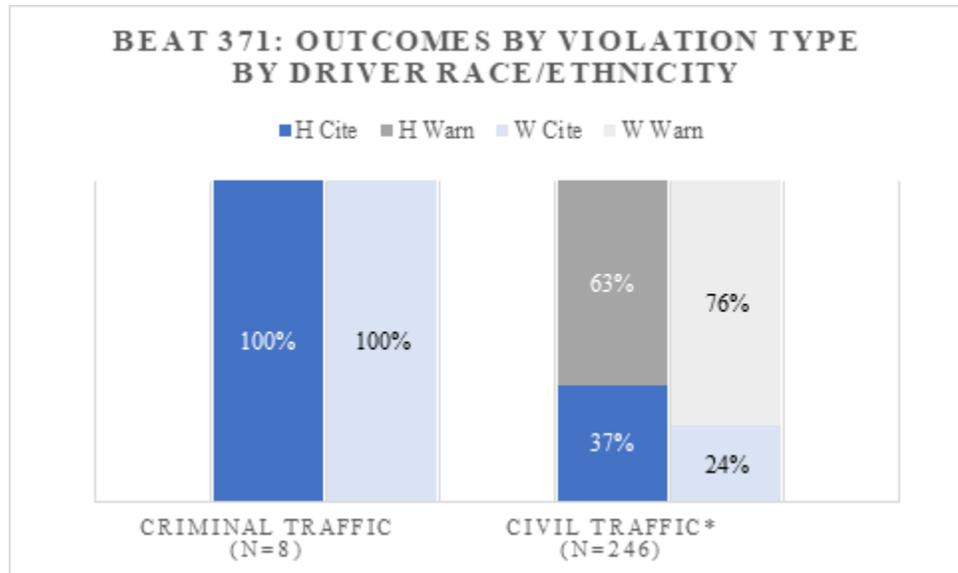


In Beat 351, there were very few stops. No differences were found for stop outcomes or for stop reason, but there was statistically significant difference in how speed was measured in the one stop of a Hispanic driver compared with the stops of White drivers.

Pacing was the method used to measure speed of the driver for the one stop of a Hispanic driver, and it was not used for any of the stops of White drivers.

Beat 371

In Beat 371, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the outcome within the violation type of civil traffic. As seen in the chart, Hispanic drivers were more likely to be cited for civil traffic violations than White drivers. Hispanic drivers were cited for over a third of the violations, while White drivers were only cited for a quarter of the violations which occurred.



BEATS IN DISTRICT 4

Stop Outcome Findings of Disparity

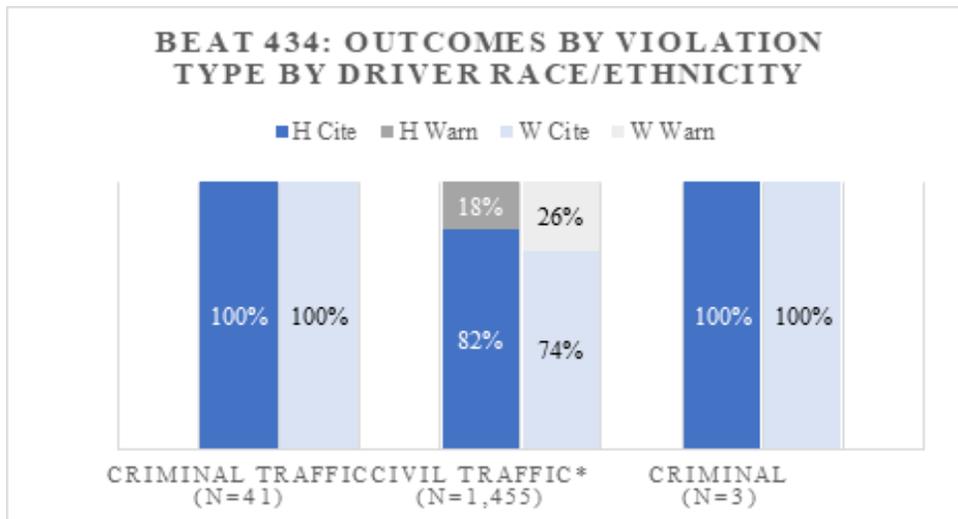
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
431	153	7%	93%	20	---	---	---	---	---	---	---
432	427	10%	90%	46	---	---	---	---	---	---	---
433	457	14%	86%	44	---	---	---	---	---	---	---
434	1343	12%	88%	46	---	---	*	---	***	***	---
435	184	17%	83%	39	---	---	---	---	---	---	*
436	515	9%	91%	46	---	---	---	---	*	***	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 4, 3 of the 6 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 4, the three (3) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

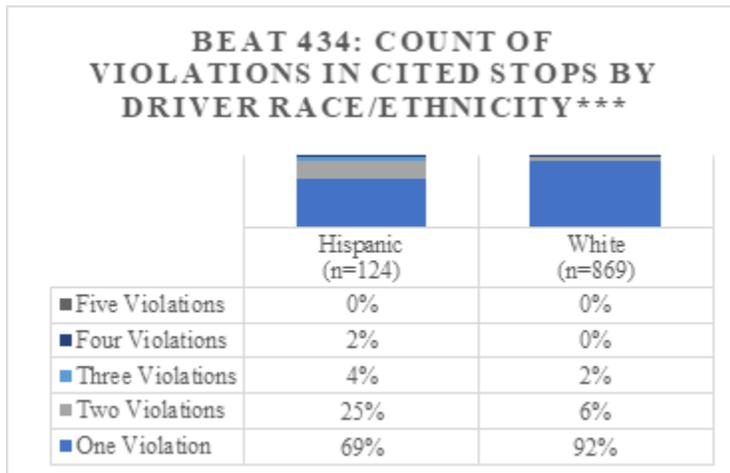
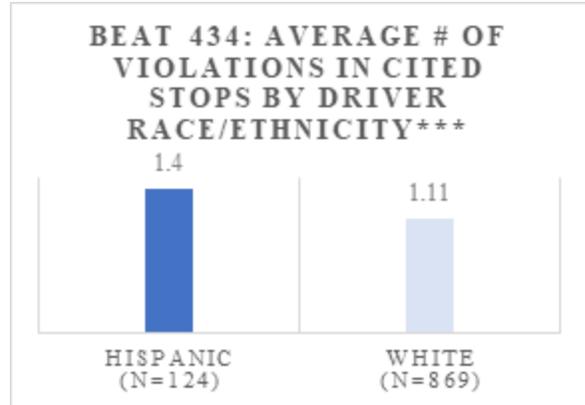
Beat 434

In Beat 347, there were three analyses with findings of difference in outcomes between Hispanic and White drivers: the outcome within the violation type of civil traffic, the average number of violations per citation, and the count of violations per citation.



As seen in the chart, Hispanic drivers were more likely to be cited for civil traffic violations than White drivers. Hispanic drivers were cited for 82 percent of civil traffic violations, while White drivers were cited for 74 percent of the violations which occurred.

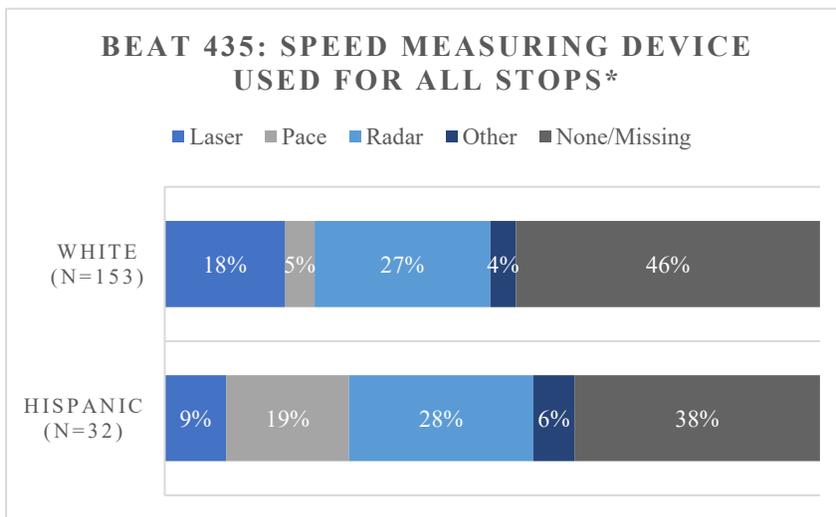
These citation rate disparities may be explained to some extent by the number of violations cited for each stop. Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.4 violations for Hispanic drivers contrasted with 1.11 violations for White drivers. Not only were there findings of differences across the average number of violations for a cite outcome, the count of violations per citation was statistically significant as well.



White drivers were cited with only one violation in 92 percent of the cited stops, compared to Hispanic drivers receiving a citation with one violation in 69 percent of the cited stops.

No other significant differences were identified in the analyses for Beat 434.

Beat 435

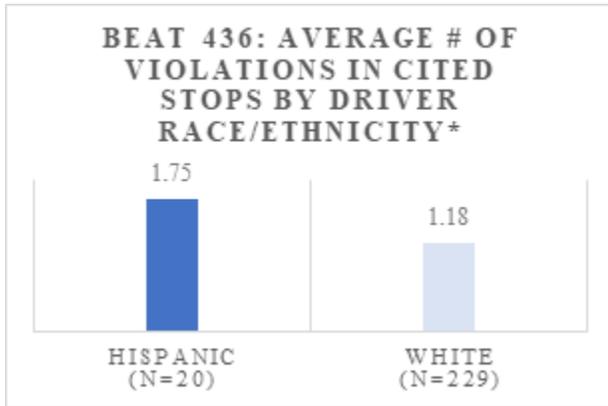


In Beat 435, there were no statistically significant differences in outcomes or stop reason identified, but there was a statistically significant finding for the device used to measure speed.

Of note, lasers were used to measure speed at twice the rate for White drivers compared to Hispanic drivers, and pacing was used at 4 times the rate for Hispanic drivers compared to White drivers.

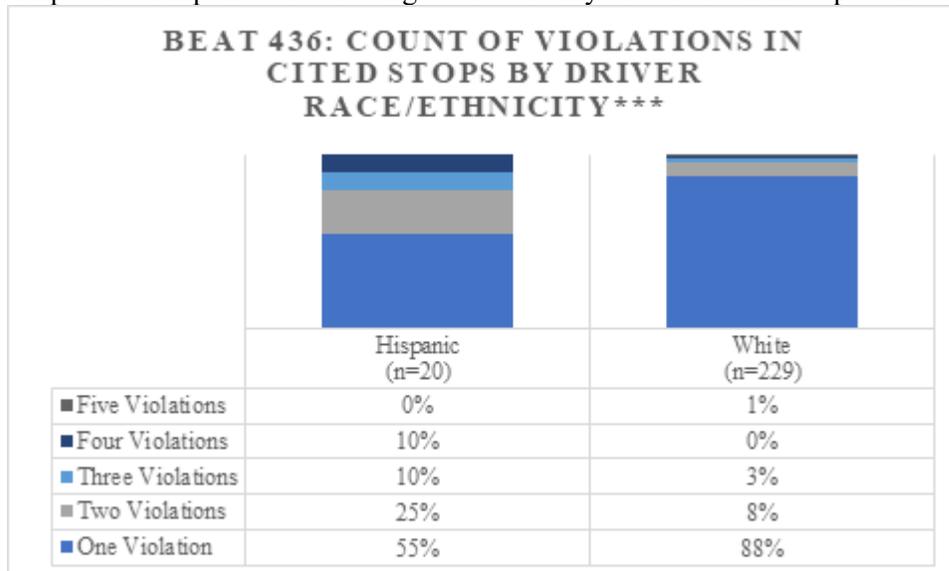
Beat 436

In Beat 436, there were no statistically significant differences in outcomes or stop reason identified, but there were statistically significant findings for both the average number of violations per citation and for the actual count of violations for cited stop.



Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.75 violations for Hispanic drivers contrasted with 1.18 violations for White drivers. Not only were there findings of differences across the average number of violations for a cite outcome, the count of violations per citation was statistically significant as well.

As seen in the chart below, White drivers were cited with only one violation in 88 percent of cited stops, compared to Hispanic drivers being cited with only one violation in 55 percent of cited stops.



BEATS IN DISTRICT 5

Stop Outcome Findings of Disparity

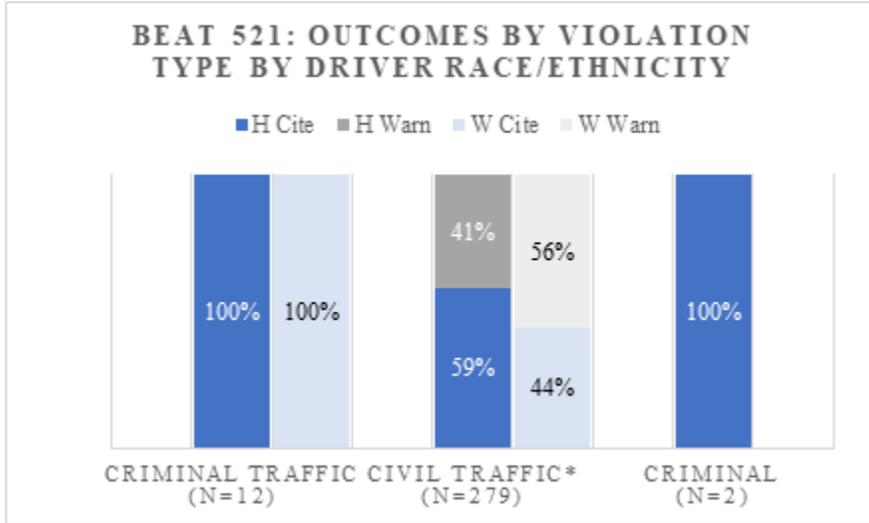
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
521	252	26%	74%	29	---	---	*	---	---	---	---
522	289	18%	82%	29	---	---	---	---	---	---	---
523	85	16%	84%	11	---	---	---	---	---	---	---
524	46	11%	89%	7	*	---	---	---	---	---	---
525	26	31%	69%	10	**	---	*	---	---	*	**
529	18	100%	0%	8	---	---	---	---	---	---	---
531	38	26%	74%	14	***	---	---	---	---	---	---
532	30	33%	67%	11	---	---	---	---	---	---	---
533	2	100%	0%	1	---	---	---	---	---	---	---
534	1	100%	0%	2	---	---	---	---	---	---	---
536	1	100%	0%	7	---	---	---	---	---	---	---
541	11	9%	91%	4	*	---	---	---	---	---	---
543	290	34%	66%	29	---	*	**	---	**	***	---
544	30	37%	63%	15	---	---	---	---	---	---	---
545	6	33%	67%	6	---	---	---	---	---	---	---
547	13	23%	77%	7	---	---	---	---	---	---	---
551	1	100%	0%	1	---	---	---	---	---	---	---
552	14	21%	79%	7	**	---	---	---	---	---	---
557	1	100%	0%	1	---	---	---	---	---	---	---
541 W	1	100%	0%	1	---	---	---	---	---	---	---
542 W	5	100%	0%	1	---	---	---	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 5, 7 of the 21 beats had findings of significance for specific measures. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 5, the seven (7) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

Beat 521

In Beat 521, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the outcome within the violation type of civil traffic.

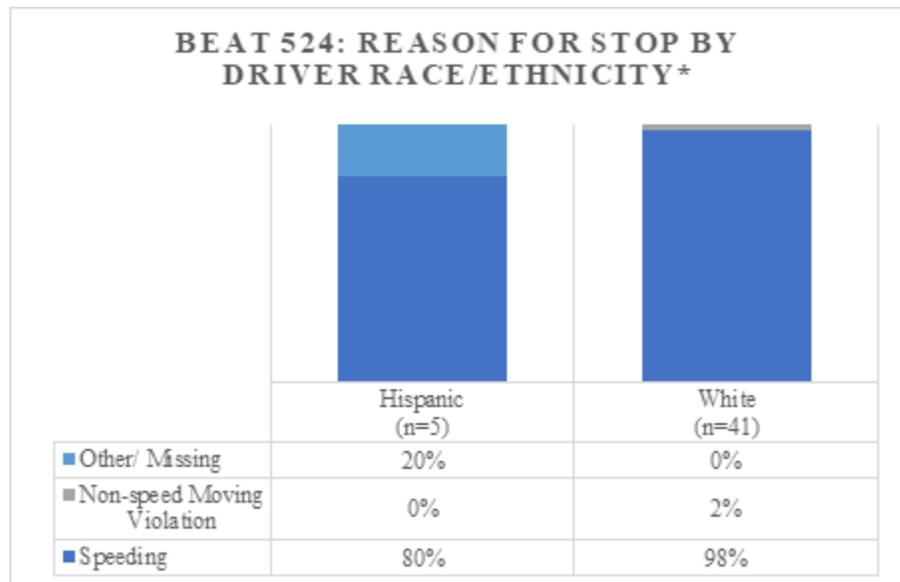


Hispanic drivers were more likely to be cited for civil traffic violations than White drivers. Hispanic drivers were cited for 59 percent of the violations, while White drivers were cited for 44 percent of their civil traffic violations.

Beat 524

In Beat 524, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the reason for stop.

Among stops of Hispanic and White drivers, only one stop from each demographic was not for speeding. The difference found is in the proportion of stops of Hispanic drivers being less (80%) for speeding than for that of White drivers (98%).

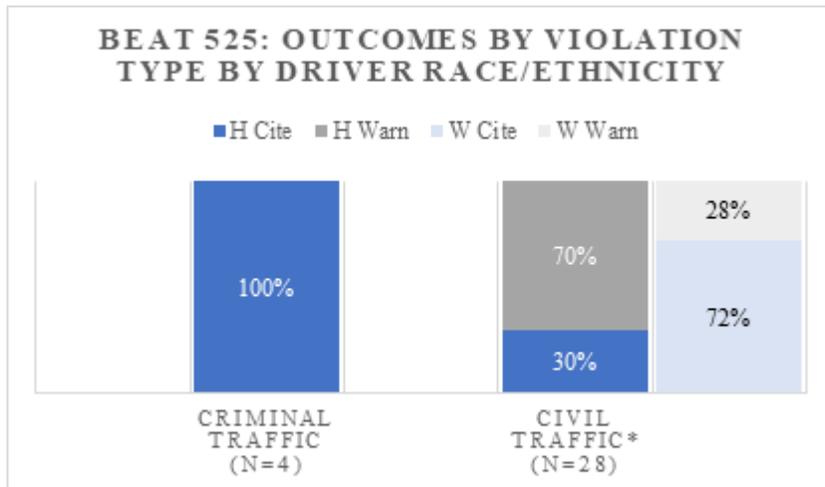
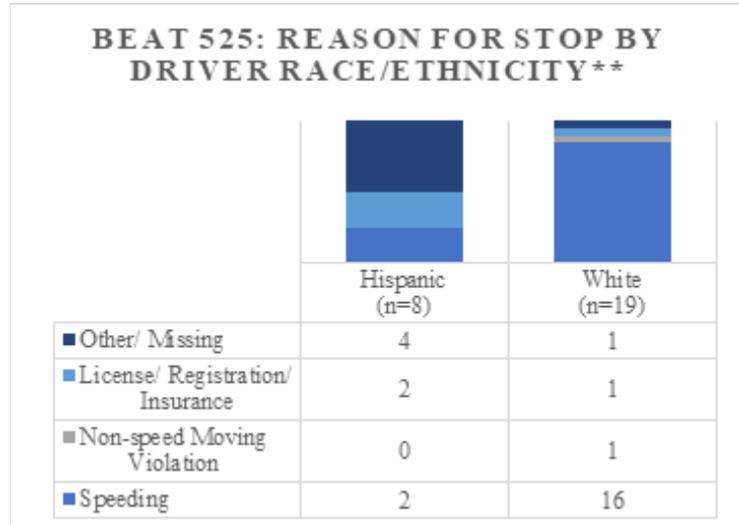


No other significant differences were identified in the analyses for Beat 524.

Beat 525

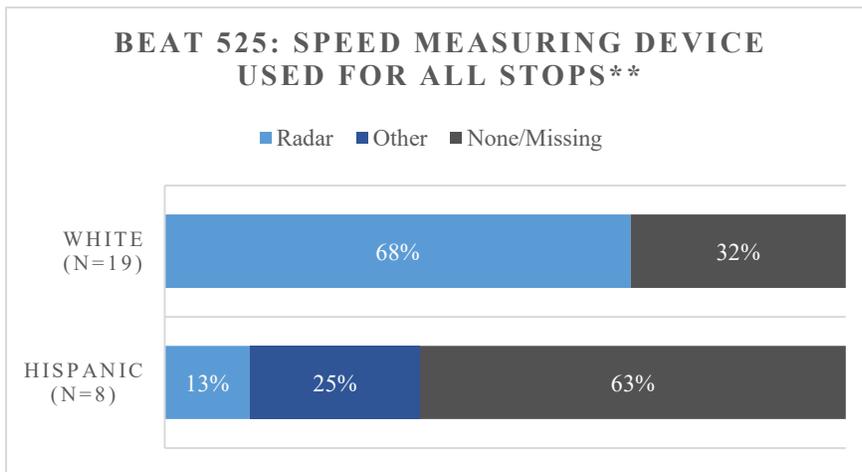
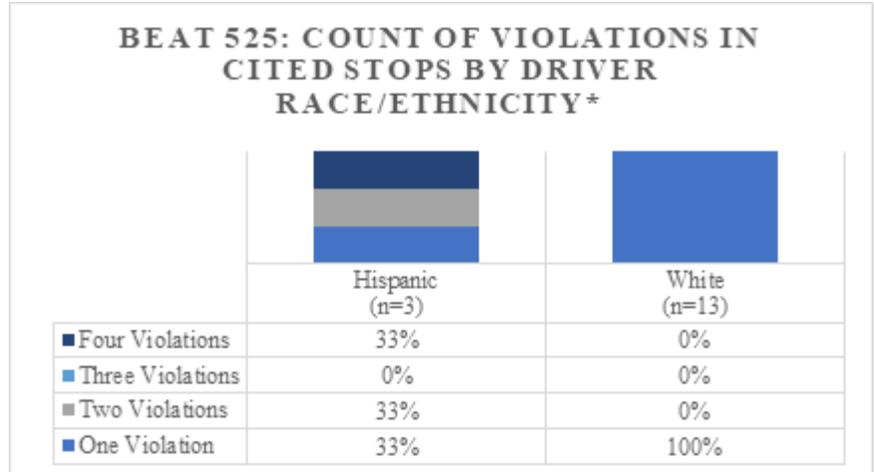
In Beat 525, four analyses found statistically significant differences between Hispanic and White drivers: the reason for stop, the outcomes when violations were in the category of civil traffic, the count of violations among those cited, and the devices used to measure speed.

The difference in stop reason is evidenced at the proportionate level: half of Hispanic drivers were stopped for an “other” reason, with the remaining half evenly split between license/registration/insurance violations and speeding. Among White drivers, speed was the reason for stop in nearly 85 percent of stops.



The majority of violations in Beat 525 during this time were of the type civil traffic. White drivers were more likely to be cited for civil traffic violations than Hispanic drivers, at a rate of 72 percent for White drivers compared to 30 percent for Hispanic drivers.

When cited, Hispanic drivers had multiple violations in 2 of the 3 stops, compared to White drivers who were cited with only one violation for all their cited stops.

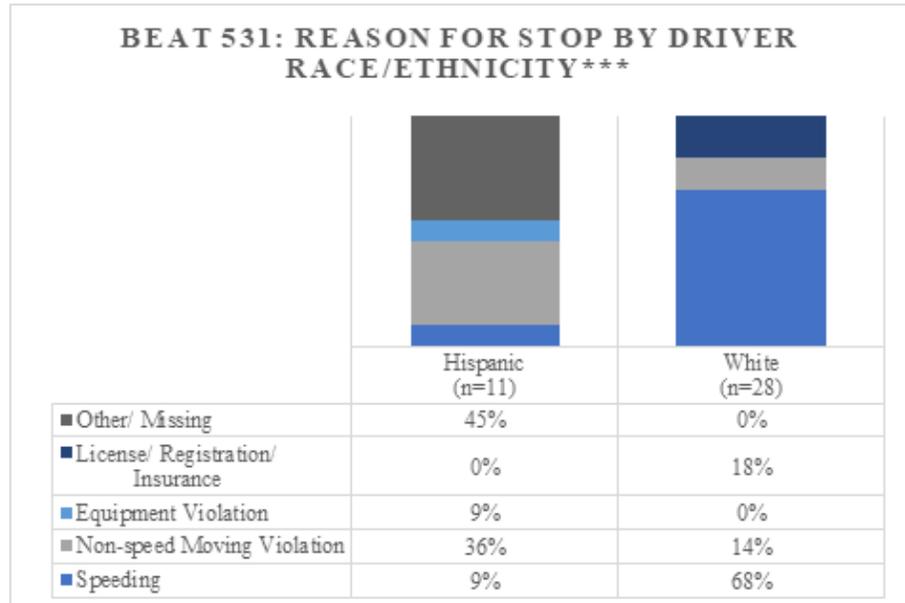


Finally, the device used to measure driver's speed differed: Hispanic drivers had no reported speed device in 63 percent of stops compared to White drivers with no reported speed device in 32 percent of stops. The use of radar was noted for drivers of both categories, but White drivers had radar used to measure speed in 68 percent of stops compared to Hispanic drivers at 13 percent.

Beat 531

In Beat 531, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the reason for stop.

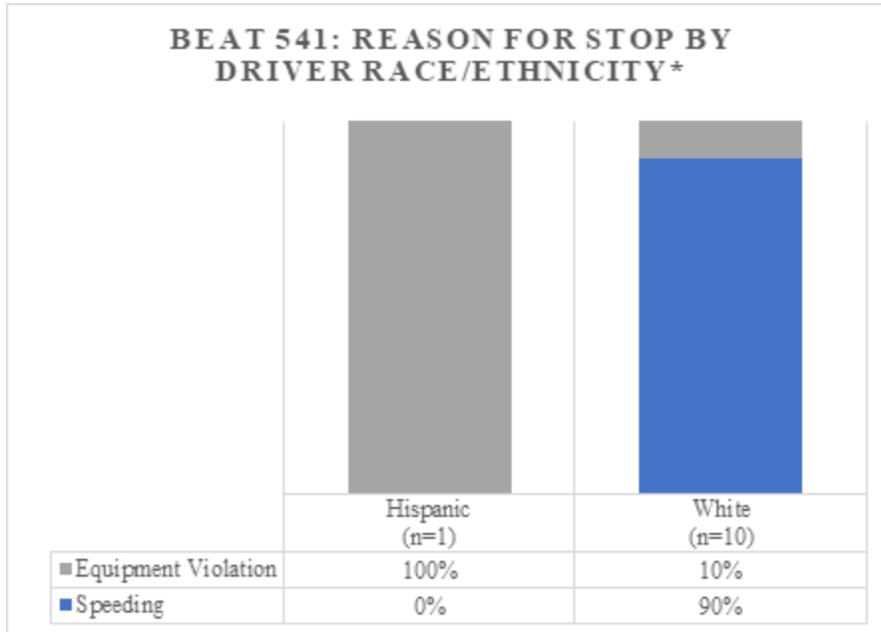
Among stops of Hispanic and White drivers, the most frequently noted reason for stop of Hispanic drivers was missing or other (45%), while none of the stops of White drivers had the same. The most frequent stop reason of White drivers was speeding (68%), which was the stop reason for one stop (9%) of Hispanic drivers.



No other significant differences were identified in the analyses for Beat 531.

Beat 541

In Beat 541, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the reason for stop.



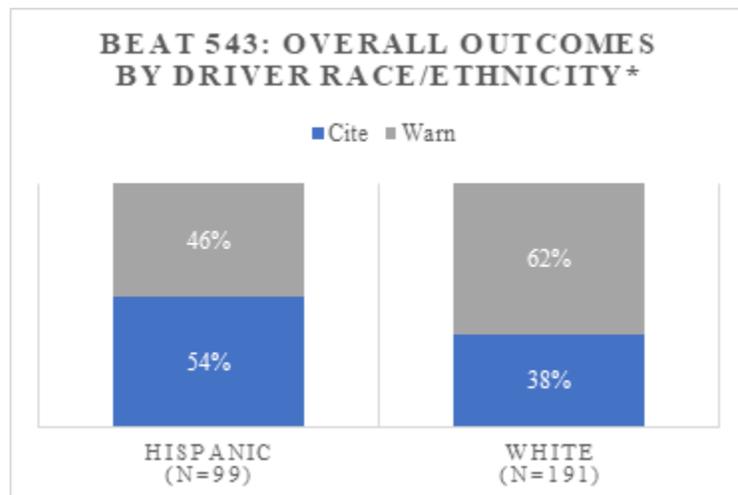
There were 11 stops of Hispanic and White drivers, with 10 of those stops being stops of White drivers. As noted in the chart, the proportional differences are statistically significant: the only stop of Hispanic drivers was for an equipment violation (100%), while equipment violation was the stop reason for only 10 percent of White drivers. The most frequent stop reason for White drivers was speeding (90%).

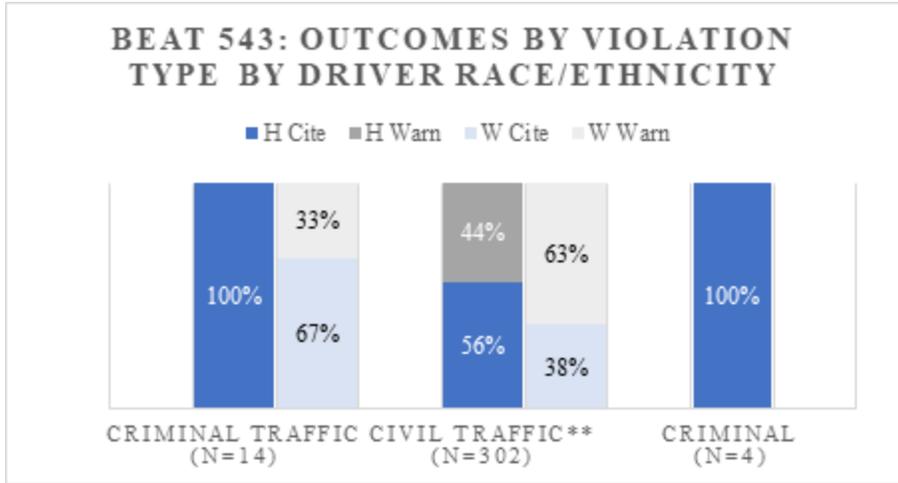
No other significant differences were identified in the analyses for Beat 541.

Beat 543

In Beat 543, there were four analyses with findings of difference between Hispanic and White drivers: traffic stop outcomes, outcomes of stops with civil traffic violations, average number of violations per citation, and the count of violations per citation.

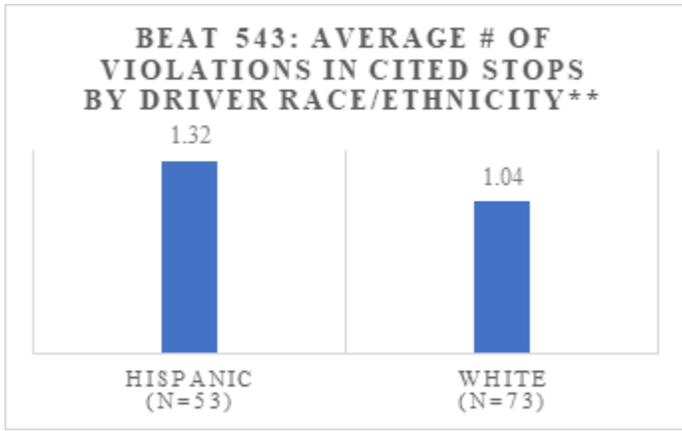
In traffic stops conducted in Beat 543, Hispanic drivers were cited in more than half (54%) of the traffic stops, while White drivers were cited in less than half (38%) of the traffic stops.



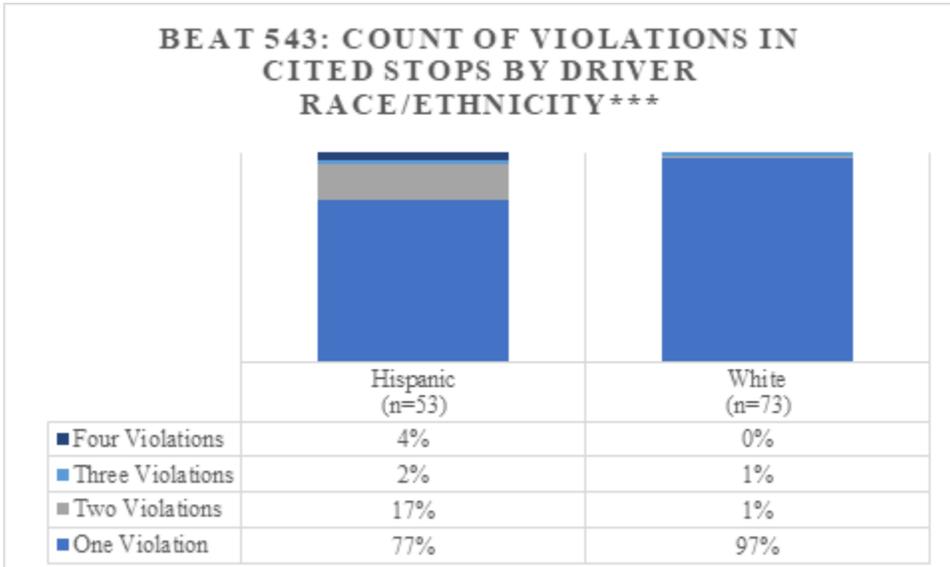


When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for more than half (56%) of the violations, while White drivers were cited for less than half (38%) of the violations.

These citation rate disparities may be explained to some extent by the number of violations cited for each stop. Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.32 violations for Hispanic drivers contrasted with 1.04 violations for White drivers.



Not only were there findings of differences across the average number of violations for a cite outcome, the count of violations per citation was statistically significant as well.

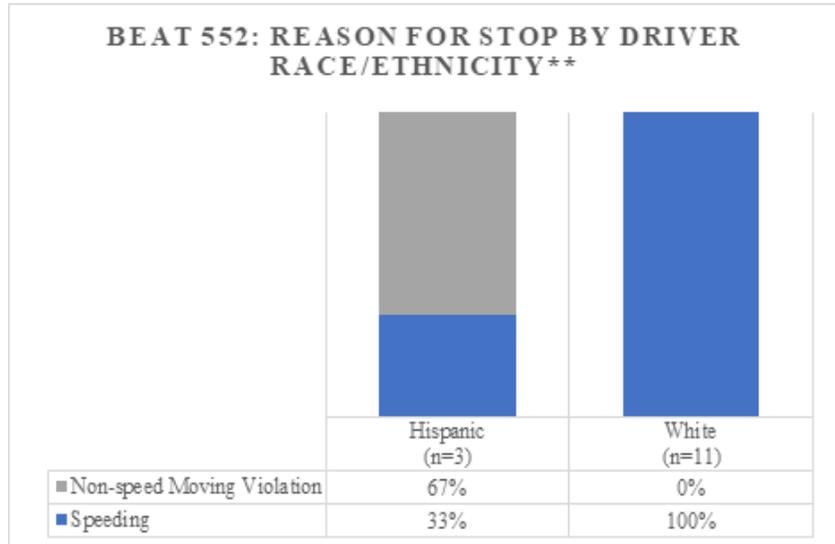


When cited, Hispanic drivers had multiple violations in nearly a quarter (23%) of stops, compared to White drivers who were cited with multiple violations in less than 3 percent of cited stops.

Beat 552

In Beat 552, there was one analysis with findings of difference in outcomes between Hispanic and White drivers: the reason for stop.

There were few stops in Beat 552. The proportional differences are statistically significant: Hispanic drivers were stopped for non-speed moving violations in 67 percent of stops, while every White driver was stopped for speeding.



No other significant differences were identified in the analyses for Beat 552.

BEATS IN DISTRICT 6

Stop Outcome Findings of Disparity

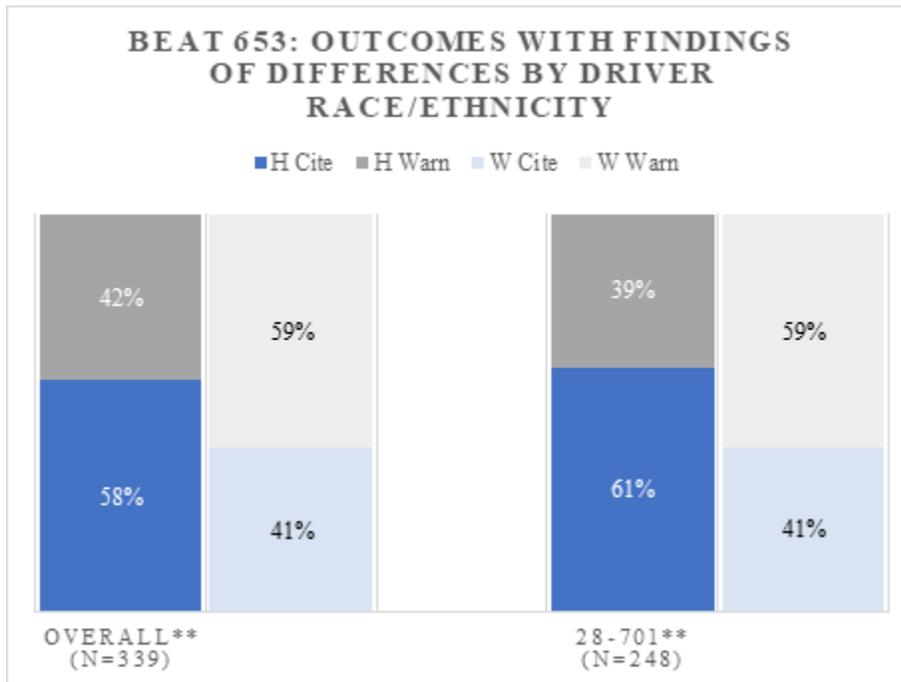
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
651	561	17%	83%	31	---	---	---	---	---	---	---
652	301	23%	77%	36	---	---	---	---	---	---	---
653	339	24%	76%	30	---	**	**	**	---	---	---
654	888	23%	77%	51	---	---	---	---	---	---	---
655	639	32%	68%	43	---	*	*	**	---	---	*
656	233	24%	76%	35	---	---	---	---	---	---	---
North Pinal	10	10%	90%	7	---	---	---	---	---	---	---
Pinal	21	24%	76%	14	---	---	---	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 6, 2 of the 8 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 6, the two (2) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

Beat 653

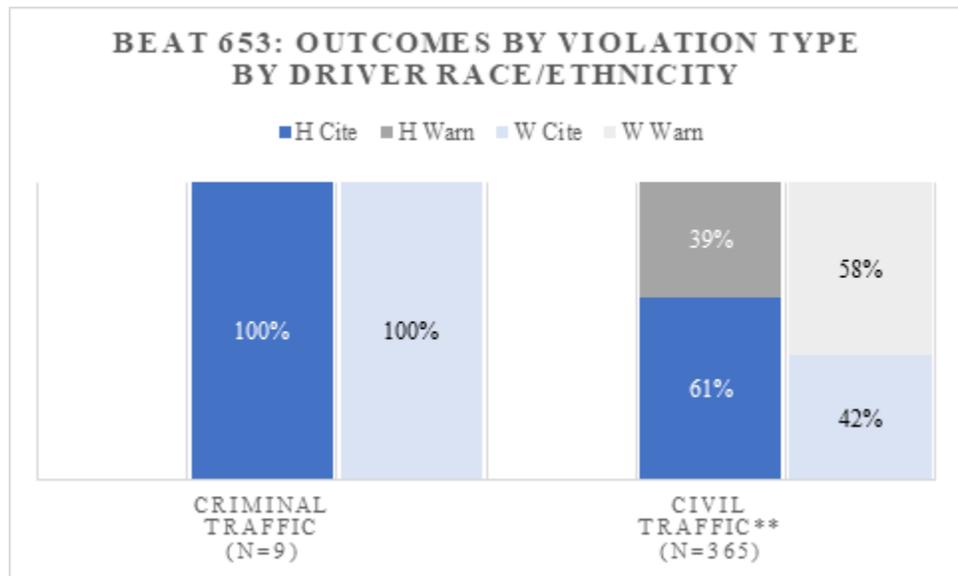
In Beat 653, three analyses found statistically significant differences between Hispanic and White drivers: the overall cite/warn outcomes, the outcomes when violations were in the category of civil traffic, and outcomes specific to statute.



Overall, Hispanic drivers were cited at a rate of 58 percent, compared to White drivers' citation rate of 41 percent.

As the most frequent violation, speeding (28-701) likely drove these findings of difference. As the only specific violation with findings of disparity in citation rates between Hispanic and White drivers, outcomes for stops with violation 28-701 reflected similar cite rates of 61 percent for Hispanic drivers and 41 percent for White drivers.

When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for more than half (61%) of the violations, while White drivers were cited for less than half (42%) of the violations.

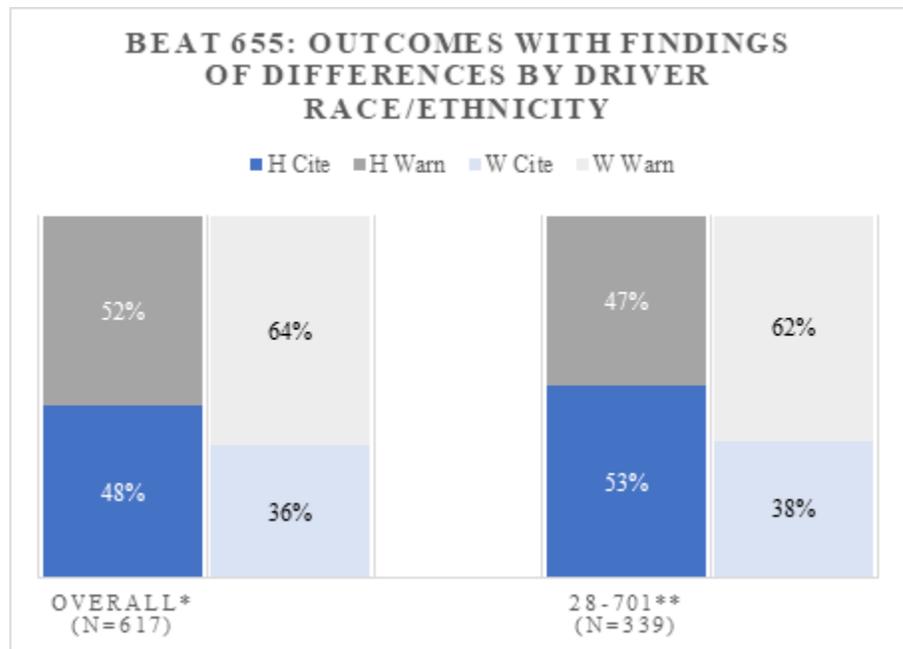


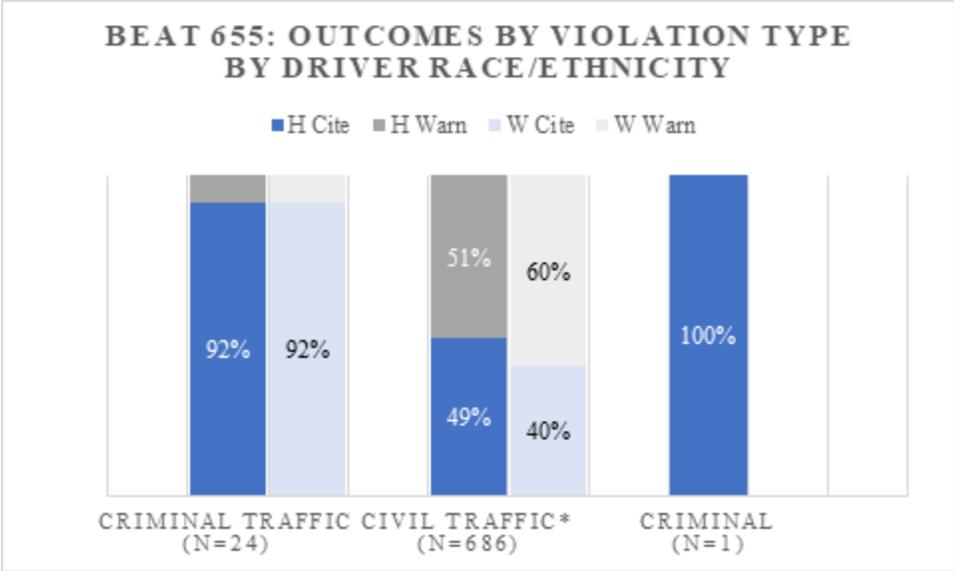
Beat 655

In Beat 655, four analyses found statistically significant differences between Hispanic and White drivers: the overall cite/warn outcomes, the outcomes when violations were in the category of civil traffic, outcomes specific to statute, and the device used to measure speed in traffic stops for speeding.

Overall, Hispanic drivers were cited at a rate of 48 percent, compared to White drivers' citation rate of 36 percent.

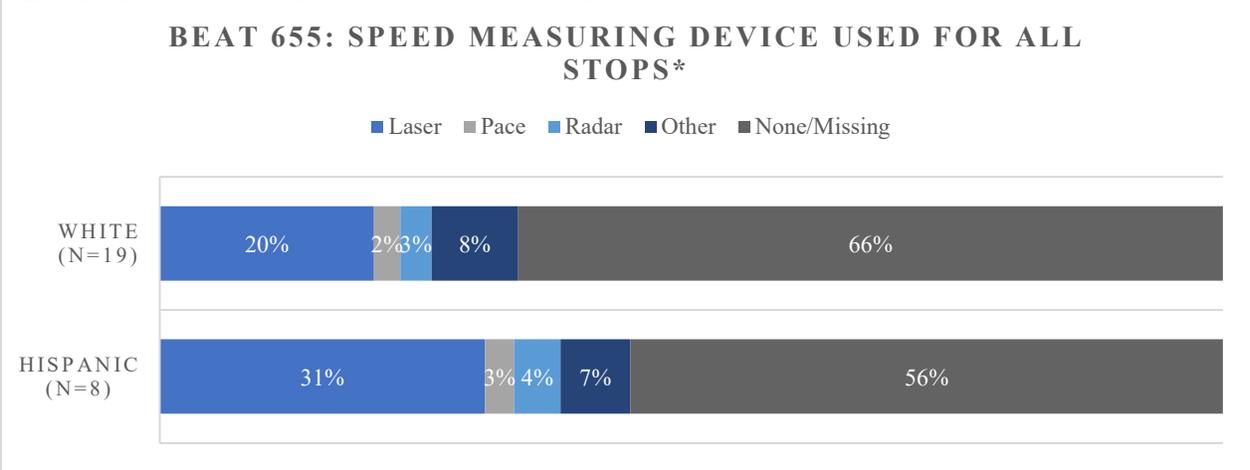
As the most frequent violation, speeding (28-701) likely drove these findings of difference. As the only specific violation with findings of disparity in citation rates between Hispanic and White drivers, outcomes for stops with violation 28-701 reflected similar cite rates of 53 percent for Hispanic drivers and 38 percent for White drivers.





When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for close to half (49%) of the violations, while White drivers were cited for less than half (40%) of the violations.

Finally, in stops for speed violations, the device used to measure the speed differed: even though no device was recorded in the majority of stops for both Hispanic and White drivers, the use of laser was used in a higher proportion for Hispanic drivers (31%) compared to White drivers (20%).



BEATS IN DISTRICT 7

Stop Outcome Findings of Disparity

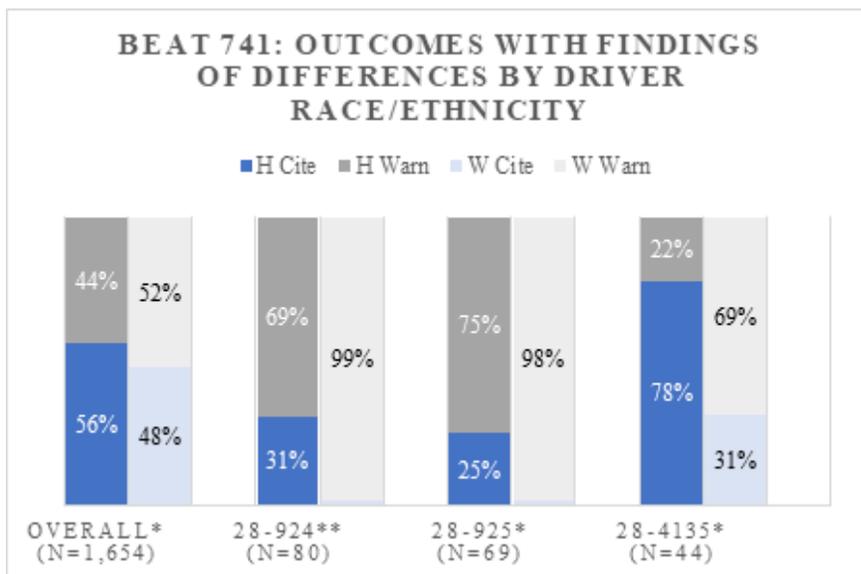
Beat	H/W Stops	% Hispanic	% White	# Statutes Violated	Stop Reason	C/W Outcome	Violation Type	ARS	# Cited Violations	Cited Violation Count	Speed Measure
741	1654	17%	83%	58	---	*	***	**	***	***	---
742	242	11%	89%	29	---	---	*	---	---	*	---
743	162	7%	93%	26	---	---	---	---	*	**	---
744	505	11%	89%	21	---	*	*	**	*	***	---
745	139	5%	95%	13	---	---	---	---	---	---	---

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

In District 7, 4 of the 5 beats had findings of significance regarding traffic stop outcomes. The table above indicates findings where driver race/ethnicity had potential impact on the analysis. Within District 7, the four (4) beats with findings of difference will be discussed more specifically. Each stop is a specific event; the count of violations that are cited or warned during an event can vary.

Beat 741

In Beat 741, five analyses found statistically significant differences between Hispanic and White drivers: the overall cite/warn outcomes, the outcomes when violations were in the category of civil traffic, outcomes specific to statute, average number of violations per citation, and the count of violations per citation.



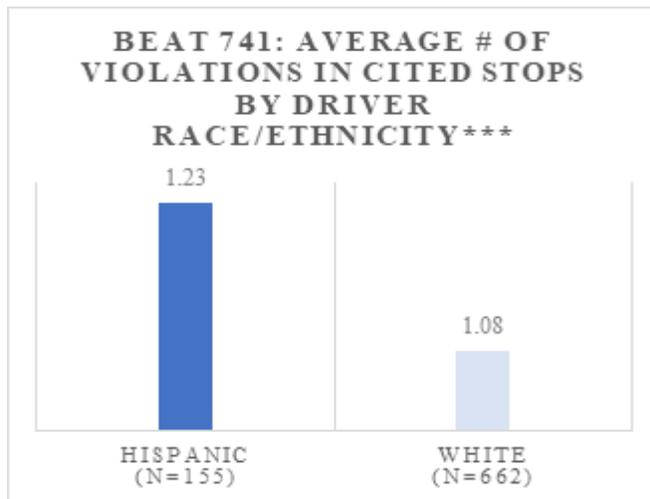
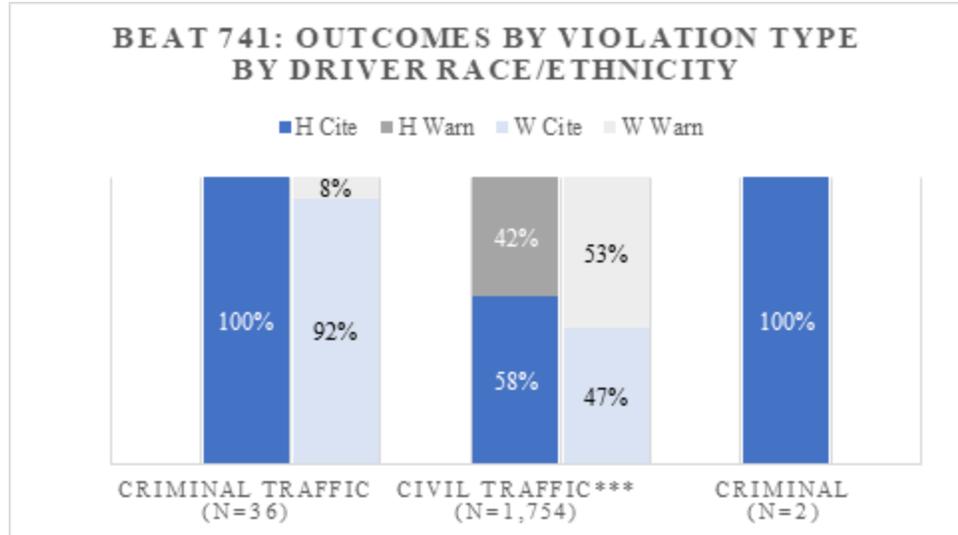
Overall, Hispanic drivers were cited at a rate of 56 percent, compared to White drivers' citation rate of 48 percent.

Beat 741 is the only beat with differences in outcomes at the statutory level that does not include speeding, as well as the only beat to have more than one statute with significant differences.

Statutory violations that had significant differences in outcomes between Hispanic and White

drivers included 28-924, 28-925, and 28-4135. For 28-924, Hispanic drivers were cited for 31 percent of stops with this violation, while White drivers were cited in 1 percent of stops with this violation. For 28-925, Hispanic drivers were cited for 25 percent of the violations while White drivers were cited in 2 percent of stops with this violation. For 28-4135, Hispanic drivers were cited in 78 percent of stops with this violation compared to White drivers' citation rate of 31 percent for this violation.

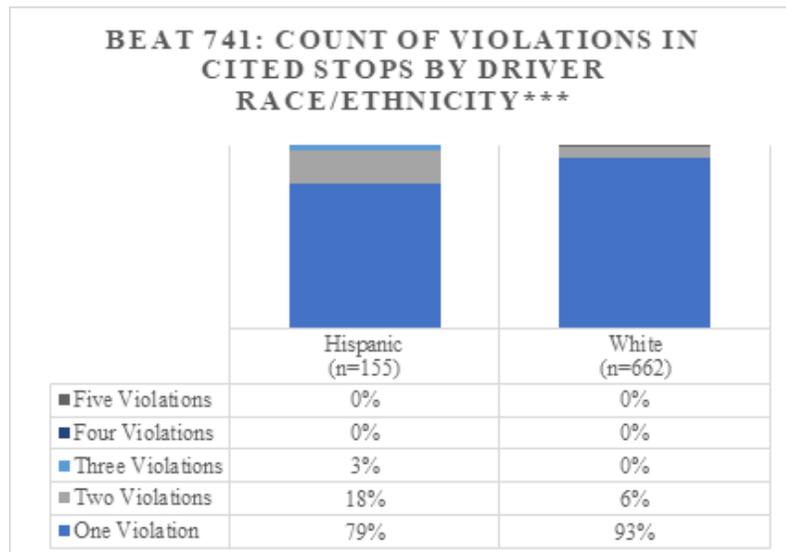
When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for over half (58%) of the violations, while White drivers were cited for slightly less than half (47%) of the violations.



These citation rate disparities may be explained to some extent by the number of violations cited for each stop. Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.23 violations for Hispanic drivers contrasted with 1.08 violations for White drivers.

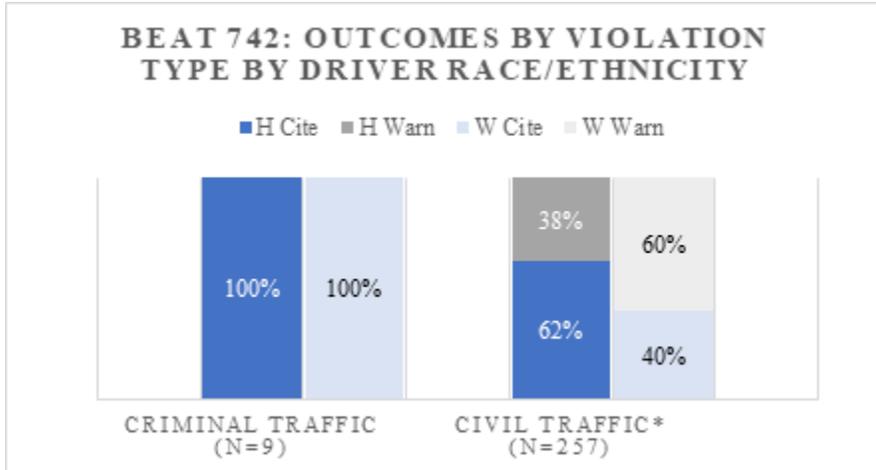
Not only were there findings of differences across the average number of violations for a cite outcome, the count of violations per citation was statistically significant as well.

When cited, Hispanic drivers more frequently had multiple violations than White drivers. Hispanic drivers had two violations in 18 percent of stops, compared to White drivers who were cited with two violations in 6 percent of cited stops. Three violations per cited stop occurred in 3 percent of stops of Hispanic drivers compared to 0 percent of stops of White drivers.



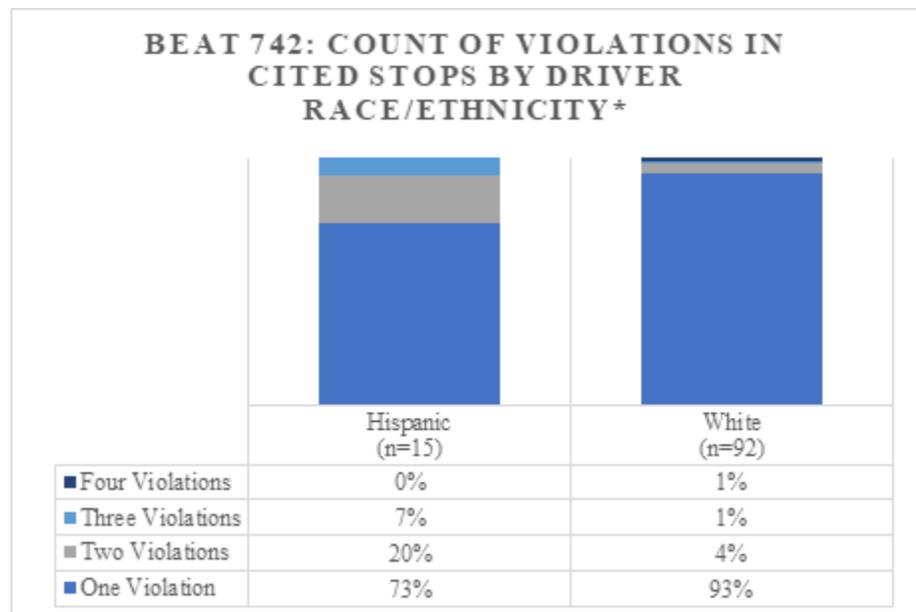
Beat 742

In Beat 742, two analyses found statistically significant differences between Hispanic and White drivers: the outcomes when violations were in the category of civil traffic and the count of violations per citation.



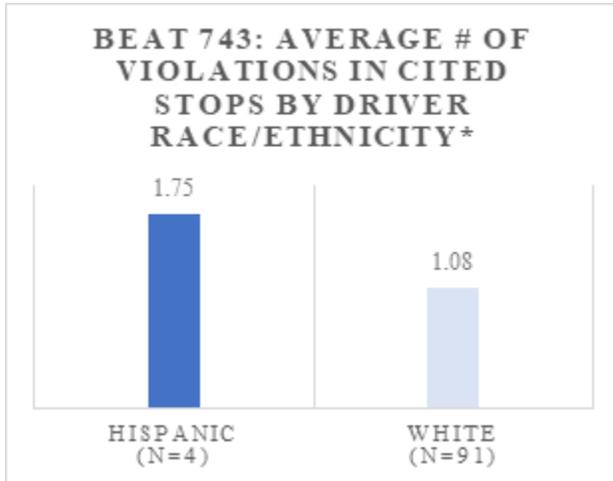
When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for over half (62%) of the violations, while White drivers were cited for less than half (40%) of the violations.

When cited, Hispanic drivers more frequently had multiple violations than White drivers. Hispanic drivers had two violations in 20 percent of stops, compared to White drivers who were cited with two violations in 4 percent of cited stops. Three violations per cited stop occurred in 7 percent of stops of Hispanic drivers compared to 1 percent of stops of White drivers.



Beat 743

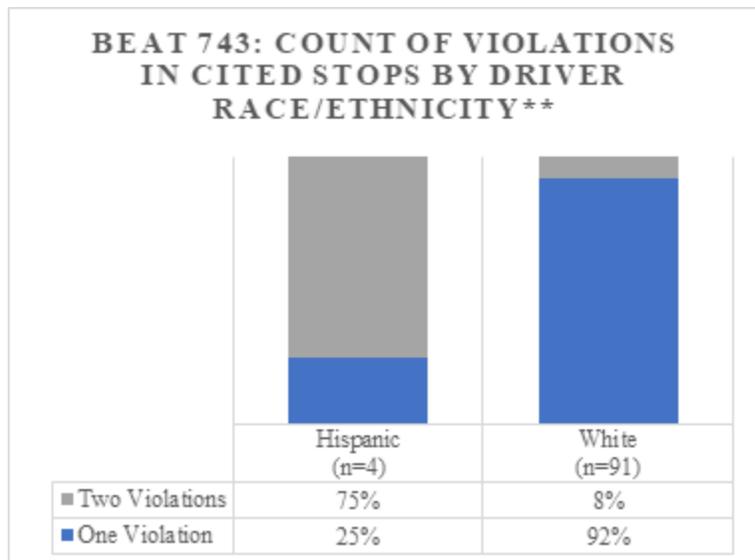
In Beat 743, two analyses found statistically significant differences between Hispanic and White drivers: the average number of violations per citation, and the count of violations per citation. No findings of differences in outcomes occurred, nor stop reason. Both of the findings in Beat 743 were specific to multiple violations in cited stops.



Differences were found between Hispanic and White drivers for the average number of violations per cited stop: 1.75 violations for Hispanic drivers contrasted with 1.08 violations for White drivers.

Not only were there findings of differences across the average number of violations for a cite outcome, the count of violations per citation was statistically significant as well.

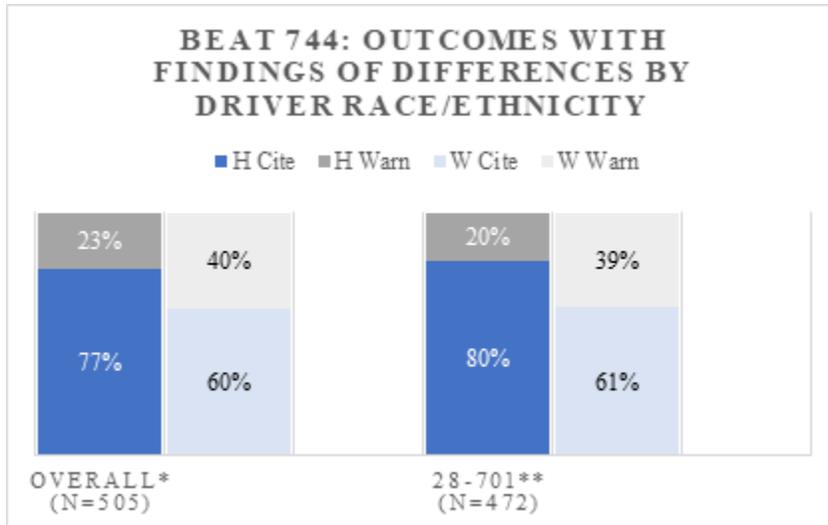
None of the cited stops in Beat 743 had more than two violations; the disparity is evidenced in the proportion of cited stops with 2 violations for Hispanic drivers (75%) compared with White drivers (8%).



No other significant differences were identified in the analyses for Beat 743.

Beat 744

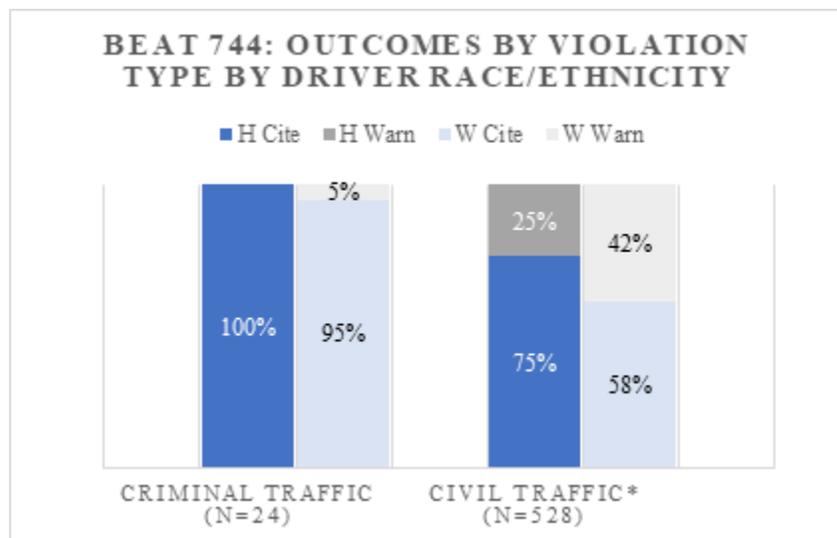
In Beat 744, five analyses found statistically significant differences between Hispanic and White drivers: the overall cite/warn outcomes, the outcomes when violations were in the category of civil traffic, outcomes specific to statute, average number of violations per citation, and the count of violations per citation.

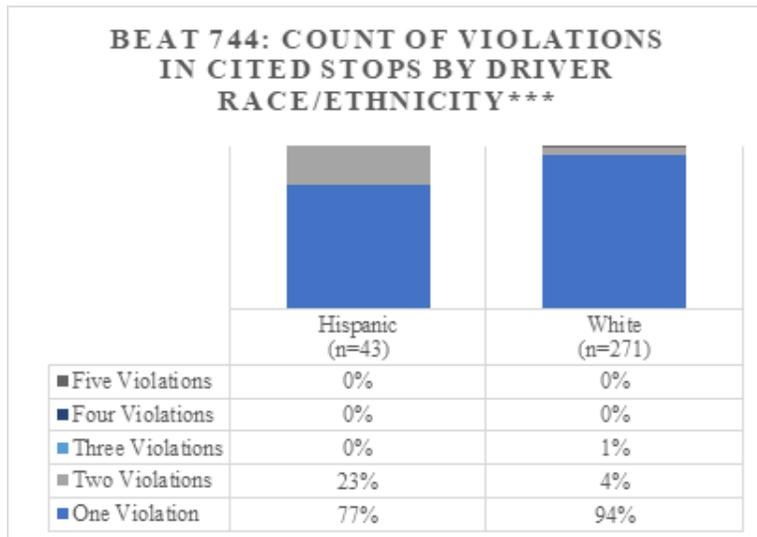


Overall, Hispanic drivers were cited at a rate of 77 percent, compared to White drivers' citation rate of 60 percent.

As the most frequent violation, speeding (28-701) likely drove these findings of difference. In cited stops with 28-701 violations, Hispanic drivers were cited in 80 percent of the stops compared to White drivers' citation rate of 61 percent.

When looking at outcomes by violation type, statistically significant differences were found between Hispanic and White drivers for civil traffic violations. Hispanic drivers were cited for 3 out of 4 (75%) of the violations, while White drivers were cited for just over half (58%) of the violations.





When cited, Hispanic drivers more frequently had multiple violations than White drivers. Hispanic drivers had two violations in 23 percent of stops, compared to White drivers who were cited with two violations in 4 percent of cited stops. Overall, there was only one violation on cites for 94 percent of White drivers compared to 77 percent of Hispanic drivers.

No other significant differences were identified in the analyses for Beat 744.

SUMMARY OF FINDINGS

In this section, we revisit the fourteen research questions and summarize the main findings for each. Readers should attend to the main body of the report and the accompanying appendices for a more in-depth account of these findings as only highlights are discussed below.

1. What types of violations are identified as the reason a traffic stop was made? Is there a difference among racial/ethnic groups for the types of violations identified as the reason the traffic stop was made?

Stop Reason was categorized into six different categories: Speeding, Non-speed moving violations, Equipment Violation, License/registration/insurance, Other/missing, Two or more stop reasons. Speeding represented 60 percent of the stop reasons across the office. Moving Violations, including speeding, accounted for around 80 percent of the stop reasons for both Hispanics and White drivers. 62 percent of White drivers were stopped for speeding compared to 57 percent of Hispanic drivers. Conversely, Hispanic drivers had higher rates of being pulled over for non-speed moving violations, 21 percent compared to 18 percent for Whites, and equipment violations 8 percent for Hispanic drivers and 6 percent White drivers.

MCSO as a whole and Districts 1, 2, 3, 5, and 7 had statistically significant differences between Hispanic and White drivers as far as the reasons for which they were stopped. On the whole, Hispanic Drivers were more likely to be stopped for non-speed related moving violations and equipment violations than White drivers. The specifics and variation across districts, beats and Time of Day can be found in Appendix A.

2. Are Hispanic and White drivers cited or warned for the initial reason a stop was made?

Analysis of agreement for both Hispanic and White drivers indicate a very high level of agreement for each group at 94.9 and 97.5 percent agreement, respectively. Given the difference in rates of agreement MCSO examined the violations that were most commonly associated with the lack of agreement.

Hispanic drivers were most often cited with licensure violations (ARS 28-3151, 28-3473, 28-3482) when there was not agreement between stop reason and citation/warning result. Hispanic drivers also had a high number of DUI offenses (n=38) and registration violations (n=27; ARS 28-2153, 28-2158, 28-2531, 28-2532) relative to other violations when agreement was not met.

Similarly, White drivers had a high number of insurance (n=70; ARS 28-4135) and suspended license violations (n=47; ARS 28-3473 and 28-3482) relative to other violations. White drivers had a high number of DUI violations (n=36) when agreement was not met. In contrast to Hispanic drivers, White drivers did not have a high number of licensure violations for ARS 28-3151.

These results suggest that certain types of violations are commonly discovered after the stop has been initiated for other reasons. All drivers are asked for license, registration, and insurance upon contact and these violations are the most often cited when the original stop reason is not the same as the violation. Further, DUI investigations are rarely indicated as the reason for a stop, which may be any observed violation such as failure to maintain lane, as deputies generally determine impairment, or the need to investigate for impairment, during the course of interaction with the driver.

3. What is the racial/ethnic composition of drivers who receive citations and warnings by MCSO deputies?

This question is the same question from the TSAR 6 that led to further analyses. As such, the expected findings of disparity in citation rates between Hispanic and White drivers at the County level were reflected. At the County level, the citation rate for Hispanic drivers was approximately 5 percent higher than White drivers. This report drilled down to district, beat and time of day levels as well.

At the district level, four of the seven districts had findings of disparate citation rates between Hispanic and White drivers at a statistically significant level. This included District 1, District 3, District 6, and District 7. These districts cover areas spread across the County geographically, though the district providing enforcement in the southwest region did not have statistically significant findings of disparity in outcome between Hispanic and White drivers, which is notable as this region has the highest proportion of Hispanic residents within the County. Among the districts with statistically significant findings, Hispanic drivers had a citation rate approximately 5-8 percent higher than White drivers.

Within beats, which are a concentrated geographic area in which the stop is located, there were findings of difference in 10 of the 71 beats with traffic stops. These 10 beats included Beats 123, 125, 223, 342, 343, 543, 653, 655, 741, and 744. Other than District 4, there was at least one beat in each district with findings of disparate outcomes at this level. In each of the beats with statistically significant difference in outcomes, Hispanic drivers had a citation rate approximately 15-20 percent higher than White drivers.

Across time of day, measured by which hour of the day the stop originated, there were findings of different outcomes between Hispanic and White drivers for 8 of the 24 hours (0800, 1000, 1100, 1200, 1800, 2000, 2200, and 2300 hours). The hours within different outcomes include both daytime and nighttime hours, as well as both heavy and light traffic times. In each of these timeframes, Hispanic drivers had a citation rate approximately 10-15 percent higher than White drivers. While not discussed extensively in this report, the full time of day findings are available within Appendix B.

4. What type of violations do MCSO deputies issue citations and warnings for during traffic stops? Are different racial/ethnic groups issued citations and warnings for the various violation types?

The type (or classification) of violation includes civil traffic, criminal, criminal traffic, petty and incorrigible offenses. Petty and incorrigible offenses represent approximately 0.01 percent of all of the violations. Civil traffic represents approximately 95 percent of all the violations. The magnitude of this contributes to the fact that this violation type was the only type with findings of difference in citation rates between Hispanic and White drivers.

At the County level, there was a statistically significant difference between Hispanic and White drivers for the civil traffic violation type, with Hispanic drivers cited at a rate approximately 6 percent higher than White drivers. The civil traffic violation type was near 50/50 for citations and warnings for both racial/ethnic groups; however, Hispanic drivers were slightly higher than 50 percent for citations in contrast to White drivers who were slightly lower than 50 percent for citations.

At the district level, again civil traffic violation was the most common type, and the only type with statistically significant findings of difference in citation rates between Hispanic and White drivers. With the exception of District 2, each district had findings of difference among civil traffic violations.

In District 1, warning was a more common outcome than citation for drivers of both racial/ethnic groups, but Hispanic drivers had a citation rate nearly 6 percent higher than White drivers. This was similar to District 3, with warning as a more common outcome but with Hispanic drivers having a citation rate nearly 9 percent higher than White drivers. In District 4, however, citation was more common outcome for both Hispanic and White drivers. Still, Hispanic drivers had a citation rate nearly 7 percent higher than White drivers for the civil traffic violation type. District 5 also had higher citation than warning rates for civil traffic violations for drivers of both racial/ethnic groups, though Hispanic drivers still had a citation rate 7 percent higher than White drivers. In District 6, warning was a more common outcome than citation for civil traffic violations, but there was statistically significant difference in citation rates between Hispanic and White drivers, with Hispanic drivers cited at a rate nearly 10 percent higher than White drivers. District 7 had findings of difference as well, with Hispanic drivers cited for approximately 60 percent of civil traffic violations compared to White drivers being cited for approximately 50 percent of the same violation type.

Among the 71 beats with traffic stops, 18 beats had statistically significant findings of different citation rates between Hispanic and White drivers for civil traffic violation types. Like districts, none of the beats had findings of difference for any other violation type. The 18 beats represent all seven districts, as the beats with differences are as follows: 122, 123, 125, 221, 223, 342, 342, 345, 371, 434, 521, 525, 543, 653, 655, 741, 742, and 744. Some of beats with differences had warning as the predominant outcome for civil traffic violations, while others had citation. Across these 18 beats, Hispanic drivers had higher citation rates, ranging from 8-25 percent higher than White drivers in the same beat.

There were also findings of disparate outcomes between Hispanic and White drivers by time of day, with 10 of the 24 hours having statistically significant differences in citation rate for Hispanic and White drivers. These 10 hours (0400, 0800, 1000, 1100, 1200, 1800, 2000, 2100, 2200, and 2300 hours) include both daylight and nighttime hours, with varying levels of traffic. For each of these hours, Hispanic drivers had a higher citation rate than White drivers, ranging from approximately 10-15 percent higher rates.

5. What specific violations do MCSO deputies issue citations and warnings for during traffic stops and what are the frequencies of violations by ARS codes for citations and warnings? Are different racial/ethnic groups issued citations and warnings for various specific violations?

There were 148 statutes noted during traffic stops in 2020²². Of these, 17 statutes had statistically significant differences in citation rates between Hispanic and White drivers in at least of the 103 analyses conducted. The analyses that were conducted looked at the presence of each violation in a stop and weighed the outcome of the stop itself; this means that the violation may have been the sole violation, or one of multiple. Additionally, if the violation was one of multiple, there was no weight given to whether the violation was primary or secondary.

The statutes were aggregated at the section level; it is notable that many statutes have subsections that further specify the nature of the offense. For this report, the analysis was done at the section level of statute. As an example, the most common offense across the County was 28-701, speeding. This statute has subsections that reference general civil levels of speed, criminal levels of speed, and speed within protected zones.

²² Appendix K: Arizona Revised Statutes provides the complete list of violations referenced in 2020 traffic stops, with brief descriptions of each.

In consideration of the common nature of speed as a violation (almost 60 percent of stops included 28-701 as a violation) and its broad nature, it is understandable that 28-701 is the violation with the most findings of statistically significant differences in citation rates between Hispanic and White drivers. It was found in 20 of the 103 analyses, with findings at the County level, for 3 of the 7 districts, 9 of the 71 beats, and 7 of the hours of the day. Citation rates in each of these analyses were for higher for Hispanic drivers than White drivers. For 28-701, differences ranged from 7-8 percent higher for Hispanic drivers at County and district levels, 15-30 percent higher for Hispanic drivers in beats with disparate outcomes, and about 10-20 percent higher among time of day findings of difference in citation rates.

In comparison, the other 16 specific violations with statistically significant findings had differences in 1-5 levels of the 103 analyses conducted. See Table 21 for specific findings.

Five of the violations with differences were for non-speed moving violations (28-729, 28-737, 28-751, 28-754, and 28-855). For differences to be identified, the violation must have occurred for at least one driver of each racial/ethnic group. The number of violations for non-speed moving violations was much smaller than for speeding. As a result, statistically significant findings ranged from approximately 15-80 percent higher citation rates for Hispanic drivers than White drivers. This broad range is a result of the varying frequency of these violations being cited or warned.

Four of the violations with findings of differences were for equipment violations (28-922, 28-924, 28-925, and 28-927). In each finding, Hispanic drivers were cited at a rate higher than White drivers, ranging from approximately 5-30 percent higher. Similar to findings from non-speed moving violations, the broad range is the result of the varying frequency of these violations being cited or warned.

The final seven violations with findings are in the category of license/registration/insurance. At the statutory level, the only statistically significant finding with White drivers cited at a higher rate than Hispanic drivers was during the time of day analysis: ARS 28-2532 was cited at a rate approximately 40 percent higher for White drivers than Hispanic drivers at 1500 hours. Other than this one finding, the remaining statistically significant differences in citation rate for the specific statutes was higher for Hispanic drivers than White drivers. There were notable differences specific to driver's licenses and permits (28-3151 and 28-3154), not only as a result of the proportionate differences but the actual frequency of the violation relative to the amount of stops of drivers of that race/ethnicity. This is suggestive of potential differences at the community level for these specific violations beyond disparate outcomes.

TABLE 21: ARS VIOLATIONS WITH FINDINGS OF DIFFERENCE, BY LEVEL

LEVEL OF ANALYSIS	28-701	28-729	28-737	28-751	28-754	28-855	28-922	28-924	28-925	28-927	28-2153	28-2158	28-2354	28-2532	28-3151	28-3154	28-4135
MCSO	***		*	*	*		**	*	***	*			*		*	**	**
DISTRICT 2	***															*	
DISTRICT 3								*									
DISTRICT 4															*		*
DISTRICT 5		*		*							*						
DISTRICT 6	***						**										
DISTRICT 7	**							**	*			**					*
123	*																
125	**																
223	**																
231	*																
342	**																
343	*																
653	**																
655	**																
741								**	*								*
744	**																
0700 HOURS	*																
0800 HOURS	***																
0900 HOURS	*																
1000 HOURS	***																*
1200 HOURS	*																
1400 HOURS				*													
1500 HOURS														*			
1800 HOURS	*								*								
2200 HOURS	**					*											

Statistical significance: *p<0.05; **p<0.01; ***p<0.001

6. Is there a difference among racial/ethnic groups in the number of violations per citation given?

Differences in the number of violations cited per traffic stop where a citation was issued were found to be statistically significant by two different measures: a) a t-test of mean number of violations for Hispanics and White drivers and b) a Fisher’s Exact Test of the violation count across the categories of the number of violations, 1-7. These tests identified that Hispanics had a higher number of violations than Whites across at the Office level and across all of the districts. Complete results across Office, district, beat and time of day are available in Appendix E.

7. Are Hispanic drivers more or less likely than White drivers to receive a criminal citation for speeding when their approximate speed is recorded in the citation is above the threshold for distinguishing between civil and criminal violations?

Hispanic drivers were more likely to receive a criminal citation for speeds above the criminal speed threshold when compared to White drivers in the majority of models presented in this report. However, certain combinations of control variables erase the effect of race/ethnicity as a statistically significant predictor of whether a driver receives a criminal or civil citation. This was the case for six different variations of applied statistical controls, suggesting that, in part, some of the observed variation in criminal/civil citation disparity can be attributed to certain race-neutral characteristics of the stop.

Licensure, insurance, plate, and registration violations that are coupled with criminal speeding infractions have little effect on the likelihood that a driver will be cited for criminal speed. DUIs appear to be an important correlate of criminal speed citations. DUI violations are positively associated with the likelihood that a driver receives a criminal citation as opposed to a civil citation, for speeds above the criminal speed threshold.

Based on the bunching analysis, there was no evidence to suggest deputies downgrade speeds on citation forms, favoring White drivers, for speeds considered criminal. This finding was not surprising as deputies have the discretion to write civil citations for any speed above the criminal speed threshold.

8. Are Hispanic and White drivers issued citations and warnings at different rates for comparable speeds above the speed limit?

Hispanic drivers were more likely to receive a citation for speed rather than a warning when compared to White drivers in the majority of models presented in this report. However, certain combinations of control variables erase the effect of race/ethnicity as a statistically significant predictor of citation and warning activity for speeding. This was the case for six different variations of applied statistical controls. Of particular interest is one model which modeled the likelihood of receiving a citation for speed when speed was the only offense (Model 28)²³. This model used only race/ethnicity and speed binned in 5-MPH increments as predictors. This model found no difference in the citation rate for White and Hispanic drivers who are observed speeding at the same speed.

Licensure violations and speeding in school zones were the strongest predictors of whether a driver received a citation for speeding.

9. Is there a difference among racial/ethnic groups in how speed was measured as reported on the citation and warning forms.

A chi-square test was conducted to determine if there was any difference between Hispanic and White drivers on what speed measurement tool was used to determine the speed of the offending driver's vehicle. The methods employed by MCSO vary based on the availability of equipment and the circumstances of the initiation of the stop. The speed measurement devices used were categorized into one of the 6 categories:

²³ By limiting the analysis to speeding with one violation, this analysis sought to avoid the confounding effects of additional violations on the likelihood that a driver is cited for speed.

laser, pace, radar, time and distance, other, none/missing. The Office and Districts 3, 5, and 6 had statistically significant differences between Hispanics and White drivers across this speed measure. Complete results are available at the Office, district, beat and time of day area in Appendix F.

While the focus of this quarterly report was the Citation and Warning benchmark, MCSO conducted another series of analyses examining differences in stop length by Stop Reason (Speeding, Non-Speed Moving Violations, License\Registration\Insurance, Other/Miscellaneous, Two or More Violations), broad Violation Type category (Criminal Traffic, Civil Traffic, Criminal, Petty, Incurrigible), Specific ARS Statutes, and Number of Violations. Like the Citation Benchmark there were also comparisons of stop length by stop reason, Violation Type, ARS Statute, and number of violations by race/ethnicity (Hispanic/White) at the Office, District, Beat and Time of Day level. Previous quarterly reports focused on identification of extended stops and the validation of documentation. These analyses consider what situations specifically reflect disparity in stop length to inform command on where, when and under which types of offenses stop length differences are observed. Additionally, MCSO will work with the Monitoring Team to identify if specific violations or stop reasons should added to the TSAR methodology as controls for the length of stop benchmark. The results of these analyses can be found in Appendix G (Stop Reason), Appendix H (Violation Type), Appendix I (ARS Statutes), and Appendix J (Number of Violations). While not discussed in this report the following questions are answered in the relevant appendices:

10. What is the average length of stop for violation types (criminal, criminal traffic, civil, and petty), ARS codes, stop reason categories, and number of violations?

11. Is there a difference among racial/ethnic groups in the average length of stop for violation types (criminal, criminal traffic, civil, petty, and incurrigible offense), ARS codes, stop reason categories and number of violations?

MCSO RESPONSE

The TSAR 6 identified increased disparity in citation outcomes for Hispanic drivers. The TSAR 6 was published in May 2021, using traffic stop data from calendar year 2020. Using the same data employed in TSAR 6, this research sought to identify actionable areas for response within Maricopa County. Additionally, the research aimed to illuminate some of the contributing factors to that disparity and guide refinement of methods used by MCSO relevant to the First and Second Orders.

This TSQR sought to address the following:

To determine whether differences between Hispanic drivers and White drivers were observed related to a) the types of citations/warnings issued, b) the specific violations that were cited or warned, c) the number of violations on citations issued, d) the reason a stop was initiated, and e) whether certain violations were disproportionately cited with members of the Plaintiff class. Additionally, the research examined speeding citations and warnings (the most common violation in MCSO's traffic stop data) to determine if Hispanic and White drivers were differentially cited for speeding violations.

1. CURRENT ACTIVITIES

The data used in this research predates a number of MCSO's current activities aimed at addressing racial and ethnic disparities identified in this report. The TSMR Pilot process began in April of 2021. The process analyzes all traffic stop activity and identifies individual deputies who have the most disparate outcomes evidenced each month. To address identified disparities, each deputy's activity is analyzed, reviewed, and intervened on when necessary. The current TSMR process is a culmination of years of work and the extensive cooperative efforts of MCSO, the Monitoring Team, and Parties. MCSO is continuing our cooperative efforts to refine the process as the Pilot progresses and anticipates full approval of the TSMR process by the Monitoring Team in the coming months.

This report represents the sixth consecutive TSQR published by MCSO and submitted to the Court. The purpose of these quarterly reports is to identify opportunities to improve data, measures, and processes associated with the TSAR and TSMR as well as focused efforts to reduce the found disparities. Further, these reports have generated a much deeper understanding of how disparities can arise during traffic stops and have led to the development of policy changes aimed at reducing racial/ethnic disparity in traffic stop outcomes. TSQR findings have also been incorporated into deputy and supervisor training. For example, CP-8, *Preventing Racial and Other Bias-Based Profiling* was modified to increase consistency in defining and identifying bias-based profiling and GH-4, *Bureau of Internal Oversight Audits And Inspections* were modified as a result of the TSQR #1, Supervisor Review Findings and Recommendations. Additionally, Bureau of Internal Oversight leadership has met with commanders in each district to share findings and obtain feedback about disparities in their districts.

MCSO continues to promote bias-free policing through regular CP-8, *Preventing Racial and Other Bias-Based Profiling* review, videos, and supervisor discussion with all employees. MCSO continues to reinforce bias-free policing as a fundamental value of the Office.

2. TRAINING

MCSO will use the results of this quarterly to inform the patrol deputies and supervisors of factors contributing to the observed disparate outcomes. Findings from this research will inform future ACT

trainings on increasing deputy awareness about how different enforcement activity can lead to disparities in traffic stop outcomes. The focus will be to suggest and inform the development of internal guidelines by each deputy in post-academy training. In addition to continuing to build on principles of fair and impartial decision making from past trainings, the training will also encourage self-reflection about the role each deputy plays in contributing to the disparities observed in the data. By sharing findings from this report, MCSO will provide deputies with an increased understanding of how they can help reduce disparities in traffic stop outcomes.

3. COMMUNITY ENGAGEMENT

Disparities identified in this report may well be the result of factors outside of the Office's control. Sometimes, for example, the statutes establish requirements that may have a disparate impact. The statutes regarding drivers' licenses illustrate this point. For example, ARS 28-3151 prohibits driving without a valid driver license, and ARS 28-3511 requires that a vehicle be towed if the person has never been issued a valid driver license in Arizona and does not present a license from another jurisdiction. When a tow is required, it extends the length of the stop. Verifying whether the person has a valid license can also extend the length of a stop. As Tables 3 and 4 indicate, Hispanic drivers are cited more often for violations of ARS. 28-3151 than White drivers, and no drivers are given warnings for this violation. White drivers, however, are cited more frequently for a suspended license under ARS 28-3473 than Hispanic drivers, and no drivers receive warnings for this violation. Although a tow is required for violations of ARS 28-3151, it is not generally required for violations of 28-3472. These violations do not become evident to the Deputy until after the stop has been made. It may be that the different citation rates indicate that Hispanic drivers are more likely to violate ARS 28-3151 than White drivers. The different towing requirements also lead to disparities. The evidence does not suggest these differences are based on Deputy discretion but by legal requirements and perhaps a difference in compliance with the requirements of ARS 28-3151 and 28-3511.

To be able to move forward in the goals of both public safety and racial equity, the Office will explore opportunities to share findings with stakeholders who can impact those areas directly and indirectly. Issues with licensing (28-3151), insurance (28- 4135), and registration (28-2532) contribute to disparate findings. MCSO can educate the community on the importance of complying with these requirements because of the impact these violations have on traffic stop outcomes. MCSO's Community Outreach Division is already partnering with the Mexican Consulate in developing an educational piece about importance of driver's licenses, registration, and auto insurance. This quarterly report supports the importance of that work. Community Outreach Division will continue to look at various community groups to expand the Office's educational efforts in this area, including faith and social services agencies.

Districts 1 and 6 had the greatest percentage of stops with license/registration/insurance violations, however all residents of the County would benefit from such information and all three of these violations are among the top 10 statutes cited office wide. Insurance violations represent 5 percent of office-wide Hispanic driver violations, while driver's license violations represent 4 percent of all Hispanic violations. In comparison, 3 percent of violations for White drivers were for insurance issues and 0.4 percent of violations for White drivers were for driver's license violations. Insurance and license issues are likely secondary violations, discovered after the vehicle has been stopped. As evidenced by use as a statistical control in the regression analysis, these violations contribute to the disparity in citations and warnings (Tables 16, 17 and 18). MCSO will share this information with the community, through various means including social media, to provide education on the importance of complying with these laws, encouraging community groups to provide a mechanism to help procure the required documentation and coverage. These efforts could impact citation and warning disparities observed across the office.

MCSO will also explore ways to address these disparities from the long-term perspective. For example, how might MCSO share information with entities in charge of infrastructure for areas with concentrated traffic safety issues? Given that non-speed moving violations are driving many of the differences observed between White and Hispanic stop reasons, sharing the information on intersections that have either many violations or accidents can lead to changes in roadway design or signage that help reduce violations.

MCSO can also share information with county and city officials about violations that disproportionately impact the Hispanic community. In addition to informing government stakeholders, MCSO will seek funding sources to ensure standard measures of speed from district to district.

4. DATA QUALITY AND CHANGES TO METHODOLOGY

MCSO continues to strive to improve its traffic data quality. Lessons learned while conducting these analyses included the need to train deputies and supervisors in how documentation is viewed from the perspective of analytics. This has the potential to improve data, positively impacting validity of the traffic stop data analyses that MCSO performs. MCSO has already made some clarifying adjustments to the VSCF. Based on conversations with deputies regarding the form's use in the field, there is opportunity to adjust the VSCF to further standardize MCSO's traffic stop data.

As with the results on the Citation/Warning benchmark, the results found in the Appendices (G-J) seem to indicate that more specific controls around types of violations on traffic stops would be appropriate for the TSAR Length of Stop benchmark. Many ARS codes may be too granular to incorporate into the TSAR methodology. However, some ARS violations such as DUIs, or licensure violations may be appropriately integrated into existing methodology. A more specific categorization of the violations should be considered as relevant matching variables in the propensity score analyses in the TSAR. MCSO will work with the Monitoring Team and Parties to better define the violation categories. For example, stop outcome is one of the benchmarks of the TSAR. The broad violation type (civil and criminal) is already considered within the TSAR methodology as a control variable. The TSAR and TSMR methodologies do not consider violations themselves, nor the number of violations per event.

The only universal finding across the districts was that Hispanic drivers were cited for more violations per citation than White drivers. These findings were statistically significant across two methods of analyses, a t-test of mean number of violations for Hispanics and White drivers and a Fisher's Exact Test across the categories of the number of violations, from 1 to 7. This and other findings from this report suggest that the introduction of additional controls, specifically around the specific violations cited and number of violations present in traffic stops will improve the measurement of disparity in outcomes across the Office.

MCSO is committed to examining disparities in traffic stop outcomes across the office and doing all it can to reduce them. This report represents the most comprehensive and transparent examination of Maricopa County traffic stop data to date. The inclusions of the driving/violation behaviors encountered during traffic stops adds a level of precision to our understanding of what may be causing disparity and MCSO will do all it can, both internally and externally, to reduce disparities across the county.